COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF KENTUCKY UTILITIES	**)**	
COMPANY FOR CERTIFICATES OF PUBLIC	**)**	
CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00026**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
ROBERT M. CONROY
DIRECTOR, RATES
KENTUCKY UTILITIES COMPANY

Filed: January 29, 2016

Q. Please state your name, position, and business address.

A. My name is Robert M. Conroy. I am the Director of Rates for Kentucky Utilities Company ("KU" or "Company") and Louisville Gas and Electric Company ("LG&E") and an employee of LG&E and KU Services Company, which provides services to LG&E and KU (collectively "Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes. I have previously testified before this Commission in numerous proceedings, including the Companies' most recent base rate cases (Case Nos. 2014-00371 (KU) and 2014-00372 (LG&E)) and environmental cost recovery ("ECR") compliance plan proceedings (Case Nos. 2011-00161 (KU) and 2011-00162 (LG&E)).

Q. Will you soon assume a new position with the Companies?

A. Yes. On February 1, 2016, I will assume the position of Vice President of State Regulation and Rates for the Companies. I will continue to be an employee of LG&E and KU Services Company in my new role. Also, I will continue to testify and participate in this proceeding, and do not anticipate having another witness adopt my testimony.

Q. What are the purposes of your testimony?

A. My testimony summarizes our other witnesses' testimony, KU's 2016 Environmental Compliance Plan ("2016 Plan"), and our request for certificates of public convenience and necessity ("CPCNs") for facilities contained in the 2016 Plan. I will also explain why KU is seeking environmental surcharge recovery of its 2016 Plan through the Environmental Cost Recovery ("ECR") Surcharge tariff beginning with bills that reflect the expense month July 2016, which will use the 10.00% return on common equity agreed to in KU's last rate case.[1] I will also address the plan to finance the proposed construction of facilities requiring CPCNs.

Overview of Testimony

Q. Please provide an overview of the testimony of the witnesses supporting KU's application in this proceeding.

A. In addition to my testimony, KU is presenting the testimony of seven other witnesses in this case in support of its application. These witnesses and the subjects of their testimony are:

- John N. Voyles, Jr., Vice President, Transmission and Generation Services, presents testimony that describes the engineering and construction aspects of the projects in KU's 2016 Plan that relate to disposal of coal combustion residuals ("CCR"),[2] and the projects' costs. Also, Mr. Voyles sponsors the 2016 Plan.
- R. Scott Straight, Director, Project Engineering, presents testimony that describes the engineering and construction aspects of the projects in KU's 2016 Plan not addressed by Mr. Voyles, and the projects' costs.
- Gary H. Revlett, Director, Environmental Affairs, presents testimony discussing the environmental regulations that necessitate KU's 2016 Plan. Also, Mr. Revlett discusses certain environmental regulations that likely will affect the Companies' coal-fired units in the near future.

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[1] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates,* Case No. 2014-00371, Order at 3 (June 30, 2015).

[2] The CCR Rule defines CCR as "fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers." 40 CFR 257.53. This definition includes what is commonly referred to as gypsum.

- Charles R. Schram, Director, Energy Planning, Analysis and Forecasting, presents testimony on the cost-effectiveness of the projects in KU's 2016 Plan, and presents as exhibits the cost-benefit studies KU performed related to the 2016 Plan.
- Derek A. Rahn, Manager, Revenue Requirement, presents testimony addressing how the environmental surcharge under KU's ECR tariff provisions will be calculated to include the costs of the 2016 Plan, presents the revisions to the monthly ECR reporting forms that KU proposes and explains why the revisions to the forms are appropriate, and discusses the bill impact on KU's customers.
- John J. Spanos, Senior Vice President, Gannett Fleming Valuation and Rate Consultants, LLC presents testimony demonstrating that the terminal net salvage value used with the depreciation rates and reserves in base rates does not reflect any surface impoundment closures under the Coal Combustion Residuals Final Rule ("CCR Rule") and proposes depreciation rates for the surface impoundment closures at each generation station to be used in the ECR filing.
- Christopher M. Garrett, Director, Accounting and Regulatory Reporting, presents testimony affirming that the costs for which KU is seeking recovery through its Environmental Surcharge tariff are not included in base rates, and describes the accounting associated with the projects in KU's 2016 Plan, all consistent with the Commission's prior orders. Also, Mr. Garrett addresses the accounting for the proposed CCR Rule compliance construction contained in Projects 39 through 42.

<u>2016 Plan and Recovery</u>

Q. Please describe the 2016 Plan KU proposes in this proceeding.

A. The projects in KU's 2016 Plan will serve the E.W. Brown, Ghent, Trimble County, Green River, Pineville, and Tyrone Generating Stations.[3] KU's 2016 Plan contains seven new capital projects; KU is seeking ECR recovery of the associated operating and maintenance ("O&M") expenses for only one project. (KU's 2016 Plan is attached as Exhibit JNV-1 to Mr. Voyles's testimony.) More specifically, KU's 2016 Plan contains projects to: build the second phase of the existing Brown landfill (Project 36); improve the sulfur dioxide removal efficiency of the wet flue-gas desulfurization unit ("WFGD") serving Ghent Unit 2 (Project 37); install low-cost and economical supplemental control technologies to reduce mercury re-emissions that will keep the Ghent units in compliance, and provide operational flexibility in maintaining compliance, with the federal Mercury and Air Toxics Standards ("MATS Rule") for mercury (Project 38); close the surface impoundments at Green River, Pineville, and Tyrone (collectively Project 39); and conduct CCR Rule compliance construction at Ghent, Trimble County, and Brown, with the construction of process water systems at those generating stations to enable ongoing coal-fired unit operations at those facilities (Projects 40 through 42).

Q. Please describe Project 36, constructing Phase II of the Brown landfill.

A. As Mr. Voyles describes, in accordance with Amended Project 29 (approved as part of KU's 2011 Plan) KU is converting its Main Ash Pond (a surface impoundment) at Brown to a dry storage landfill, Phase I of which will be in service this year. As Mr. Voyles explains in his testimony, when the Kentucky Division of Waste Management issued the permit for the Special Waste Landfill at Brown, it set forth a 10 foot height

[3] Although Green River, Pineville, and Tyrone no longer have active coal-fired generating operations, the projects contained in the 2016 Plan relate to environmental compliance at those facilities resulting from past coal-fired generation.

limit for each successive phase of lateral expansion such that the volume of CCR disposed in each phase be no more than 10 feet higher than adjoining phase(s). Because of this permit condition, the initial capacity of Phase I is limited to a height of 10 feet. Based on the historical production at Brown, Phase I's initial 10 feet of capacity may be exhausted by as early as the second quarter of 2018. Forecasted production volumes suggest there may be usable capacity until 2019.[4] To ensure KU's uninterrupted ability to dispatch the Brown coal-fired units with adequate time for construction and possible delays, KU is seeking approval to construct Phase II at this time, but will not begin construction before 2017.[5] The total expected capital cost of Phase II is $11.9 million (of which KU seeks to recover $5.3 million through the ECR mechanism as part of its 2016 Plan Project 36). KU is not seeking O&M cost recovery through the ECR mechanism for this project, as noted on Exhibit JNV-1 (an exhibit to Mr. Voyles's testimony).

As I further discuss below, in accordance with the Commission's recent orders concerning phased landfill construction, KU is seeking a CPCN for Phase II of the Brown landfill even though the capital cost of the project does not meet the financial materiality criterion of 807 KAR 5:001 Section 15(3).[6]

Finally, Mr. Schram's testimony and the cost-benefit analyses he sponsors demonstrate that investing in Phase II of the Brown landfill is economical even if the

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[4] Voyles Testimony at 14.
[5] Voyles Testimony at 15.
[6] *See In the Matter of: Investigation of Kentucky Utilities Company's and Louisville Gas and Electric Company's Respective Need for and Cost of Multiphase Landfills at the Trimble County and Ghent Generating Stations*, Case No. 2015-00194, Order at 31 (Dec. 15, 2015); *In the Matter of: Application of Duke Energy Kentucky, Inc. for a Declaratory Order that the Construction of a New Landfill Constitutes an Ordinary Extension in the Usual Course of Business or, in the Alternative, for a Certificate of Public Convenience and Necessity*, Case No. 2015-00089, Order at 10 (July 24, 2015).

Brown coal-fired units operate only through the end of 2021 (although KU is not committing or predicting that the units will retire in 2022 or later).

Q. Please describe Project 37, improvements to the WFGD for Ghent Unit 2.

A. As Mr. Straight discusses in greater detail, Project 37 will consist of installing new-technology spray nozzles and wall rings, both of which will increase the contact area of the limestone slurry with the flue gas, effectively increasing the liquid-to-gas ratio. Depending on the effectiveness of those measures, the project might also include replacing the recycle pump drive gearboxes to increase the flow of limestone slurry through the spray nozzles, thus further increasing the liquid-to-gas ratio.[7] These improvements are necessary to ensure the Ghent site can remain in compliance with the MATS Rule when Ghent Unit 2 is operating but other Ghent coal-fired units, which have higher sulfur dioxide removal efficiencies, are not operating.[8]

The total projected capital cost of these facilities is $7 million, all of which KU seeks to recover through the ECR mechanism as part of its 2016 Plan Project 37. KU is not seeking O&M cost recovery through the ECR mechanism for this project, as noted on the second page of Exhibit JNV-1.

Mr. Schram's testimony shows that making this capital investment is economical compared to the impaired ability of other options for MATS Rule compliance, and that investing in this project is economical even if the Ghent coal-fired units operate only through the end of 2021 (although KU is not committing or predicting that the units will retire in 2022 or later).[9]

[7] Straight Testimony at 4-5.
[8] Revlett Testimony at 22.
[9] Schram Testimony at 19-21.

Q. Please describe Project 38, installing supplemental mercury-related control technologies at Ghent.

A. In addition to the baghouses (pulse-jet fabric filters) with powdered activated carbon ("PAC") injection added to the Ghent Units in Project 35 as part of KU's 2011 Plan, some additional investment is necessary to ensure the Ghent coal-fired units can continually meet the mercury-emission limits of the MATS Rule. In particular, a phenomenon called mercury reemission that occurs in the WFGDs serving the Ghent units could result in excessive mercury emissions.[10] The purpose of Project 38 is to install equipment to apply additives to Ghent's coal to improve mercury oxidation, which in turn improves mercury capture in WFGDs because oxidized mercury is water soluble (elemental mercury is not).[11] Project 38 further includes equipment for injecting an organosulfide chemical additive into Ghent's WFGD reaction tanks to reduce mercury reemission.[12]

This project is related to the mercury-sorbent tests the Companies conducted on certain generating units from 2013 through 2015 and described to the Commission Staff in the Companies' quarterly ECR construction update meetings held during that time concerning the Companies' 2011 ECR Compliance Plan.[13] Based on the results of those tests, KU proposes to add the supplemental mercury control systems proposed in Project 38 to give KU the ability to inject these new additives either as a

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[10] Straight Testimony at 6-7.
[11] *Id.* at 7-8.
[12] *Id.* at 8.
[13] *See, e.g.,* Companies' 2011 ECR Compliance Plans Quarterly Report – Update #8, 3rd Quarter 2013 Report at 44 (Oct. 18, 2013); Companies' 2011 ECR Compliance Plans Quarterly Report – Update #7, 2nd Quarter 2013 Report at 38-39 (July 19, 2013); Companies' 2011 ECR Compliance Plans Quarterly Report – Update #6, 1st Quarter 2013 Report at 34-35 (Apr. 17, 2013); Companies' 2011 ECR Compliance Plans Quarterly Report – Update #5, 4th Quarter 2012 Report at 26 (Jan. 18, 2013).

total substitute for PAC or in combination with PAC injection, depending on the price and effectiveness of each.

The total projected capital cost of these facilities is $10.1 million, all of which KU seeks to recover through the ECR mechanism as part of its 2016 Plan Project 38. The projected annual O&M cost of these facilities presented on the second page of Exhibit JNV-1 is shown as zero for all years. That is not because the systems installed through Project 38 will have no O&M cost, particularly with respect to the cost of the additives to be injected and applied; rather, the cost of such additives will correspondingly offset PAC costs currently being recovered through the O&M shown in KU's monthly ECR reports for Project 35 (approved as part of KU's 2011 Plan). Therefore, the zero-O&M costs shown in Exhibit JNV-1 represent the expectation that the O&M costs of Project 38 will be less than or equal to corresponding O&M cost decreases currently being reported for Project 35.

Indeed, the projected O&M savings related to reduced PAC use are anticipated to be large enough that, as Mr. Schram's testimony shows, these proposed investments have the potential to pay for themselves in three to five years.[14]

Q. With regard to Projects 37 and 38, does KU have to continue to comply with the MATS Rule after the Supreme Court's recent decision in *Michigan v. EPA*?[15]

A. As Mr. Revlett discusses in greater detail, the Supreme Court's decision in *Michigan v. EPA* did not vacate or stay the effect of the MATS Rule, which has been in effect since 2012; instead, the Court ruled that the U.S. Environmental Protection Agency ("EPA"), by failing to take into account the costs of regulating the emissions covered by the MATS Rule, did not meet the requirements necessary to find that it was

[14] Schram Testimony at 21-22.
[15] 135 S.Ct. 2699; 192 L.Ed.2d 674 (2015).

appropriate and necessary to regulate such emissions.[16] The Court remanded the case to the U.S. Court of Appeals for the D.C. Circuit, which also has not yet stayed or vacated the rule.[17] Therefore, the rule remains in full effect. Moreover, EPA has already begun taking action to cure the rulemaking defect the Court cited: On December 1, 2015, EPA published in the Federal Register a proposed supplemental finding that, even when assessing the costs in several ways, it is appropriate and necessary to regulate the emissions covered by the MATS Rule.[18] Thus, KU must comply with the MATS Rule, and there is every reason to believe it will continue to have to do so for the foreseeable future.

Q. Please describe Project 39, surface impoundment closures at Green River, Pineville, and Tyrone.

A. KU has ceased all existing electric generating operations at Green River, Pineville, and Tyrone, though unclosed surface impoundments remain at those facilities. As Mr. Revlett discusses in his testimony, KU is proposing in this project to cap and close all of the inactive surface impoundments at Green River, Pineville, and Tyrone except one surface impoundment at Green River, which KU will "clean-close," meaning KU will dewater the surface impoundment and remove all CCR material, leaving only virgin materials in its place. KU will conduct all of these closures in accordance with applicable state regulations.[19] As Mr. Voyles discusses in his testimony, there are a number of benefits to closing these surface impoundments as part of the 2016 Plan, including: (1) minimizing the risk of environmental releases, potential citizen suits, or nuisance lawsuits; (2) minimizing cost escalation that could

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[16] *Id.*
[17] *Id.*
[18] 80 Fed. Reg. 75,025 *et seq.* (Dec. 1, 2015).
[19] Revlett Testimony at 20-21.

occur if KU closed the surface impoundments later; (3) taking advantage of economies of scale by closing these surface impoundments contemporaneously with other of the Companies' surface-impoundment closures; and (4) as Mr. Revlett explains, it is possible that complying with the federal Effluent Limitation Guidelines could ultimately require KU to close these surface impoundments under state law.[20]

The total projected capital cost of these surface impoundment closures is $77.9 million for all three stations (of which KU seeks to recover $77.5 million through the ECR mechanism as part of its 2016 Plan Project 39). KU is not seeking O&M cost recovery through the ECR mechanism for this project, as noted on the second page of Exhibit JNV-1.

Q. Please describe Projects 40 through 42, CCR Rule compliance construction and related construction of process water systems at Ghent (Project 40), Trimble County (Project 41), and Brown (Project 42).

A. For the reasons Mr. Revlett explains concerning compliance with the CCR Rule and federal Effluent Limitations Guidelines, it is prudent for KU to begin CCR Rule compliance construction at all of its currently active surface impoundments (i.e., those at Ghent, Trimble County, and Brown) and to construct new process water systems at those stations, and to complete all construction activity by the end of the year 2023.

To the extent feasible and consistent with the CCR Rule, KU will beneficially use CCR to reduce the need for and cost of using virgin fill material to achieve proper

[20] Voyles Testimony at 17-18.

grades prior to capping surface impoundments. One source of such fill material will be surface impoundments that KU plans to clean close.[21]

As Mr. Voyles explains, without surface impoundments, KU will require new process water systems to handle process water from ongoing station operations. KU plans to sequence the construction of the necessary process water systems to meet operational needs created by closures of existing surface impoundments.

The total projected capital cost of the proposed CCR Rule compliance construction and construction of process water systems is $364.2 million for Ghent (of which KU seeks to recover $339.9 million through the ECR mechanism as part of its 2016 Plan Project 40), $105.3 million for Trimble County (of which KU seeks to recover $101.9 million through the ECR mechanism as part of its 2016 Plan Project 41), and $101.3 million for Brown (of which KU seeks to recover $98.3 million through the ECR mechanism as part of its 2016 Plan Project 42).[22] As noted in the testimony of Mr. Voyles, as engineering proceeds and matures for each proposed closure and the assessments of the CCR Rule's criteria for each surface impoundment's circumstances becomes clearer, the closure approach and costs for a given surface impoundment could change, perhaps significantly, especially if larger quantities of virgin fill materials become necessary for closure.[23]

KU is not seeking O&M cost recovery through the ECR mechanism for these projects, as noted on the second page of Exhibit JNV-1. Mr. Garrett's testimony

[21] Voyles Testimony at 23.

[22] Please note that KU's cost for Trimble County reflects KU's 36% ownership share of the Trimble County Generating Station, not the total cost of capping and closing surface impoundments and constructing process water systems at Trimble County.

[23] Voyles Testimony at 23-24.

addresses cost recovery for ongoing groundwater-monitoring obligations under the CCR Rule.

Q. Are Projects 40 through 42 economical?

A. Yes. Mr. Voyles's testimony demonstrates that KU will address its surface impoundments in a lowest-reasonable-cost manner.

With respect to the process water systems KU proposes to construct at Ghent, Trimble County, and Brown to enable ongoing coal-fired generating operations, Mr. Schram's retirement analyses show that building those facilities is economical.[24]

Certificates of Public Convenience and Necessity

Q. Is KU requesting CPCNs in this proceeding?

A. Yes. KU is seeking four CPCNs, one to construct Phase II of the Brown landfill (Project 36) and three for CCR Rule compliance construction regarding surface impoundments and process water construction projects at Ghent, Trimble County, and Brown (one CPCN per generating station).

Q. How does the proposed construction meet the requirements for CPCNs set out in 807 KAR 5:001 § 15(2)?

A. As described in greater detail in the testimony of Messrs. Voyles and Revlett, KU will construct Phase II of the Brown landfill, and conduct the CCR Rule compliance construction and construct related process water systems at Ghent, Trimble County, and Brown, in accordance with the CCR Rule and applicable state environmental regulations.

It is important to note that the CPCNs KU is requesting related to surface impoundments at Ghent, Trimble County, and Brown are not for the specific surface-

[24] Schram Testimony at 5-6.

impoundment-closure plans KU currently anticipates and describes in the testimony of Mr. Voyles. As noted in the testimonies of Messrs. Voyles and Revlett, those plans and their costs could change, perhaps significantly, as engineering progresses and matures for each surface impoundment and as the CCR Rule's application to each surface impoundment's circumstances becomes clearer. KU is therefore explicitly requesting CPCN authority at each of Ghent, Trimble County, and Brown to perform all construction necessary to comply with the CCR Rule (and other applicable federal, state, and local requirements) in a lowest reasonable cost manner.

Furthermore, without the proposed process water systems at Ghent, Trimble County, and Brown, KU could not operate the coal-fired units at those generating stations. The continued service of these units for KU's customers is in the public interest; as Mr. Schram's testimony shows, it is more cost-effective to continue to operate the units (including the cost to construct the proposed process water systems) than to retire the units in 2019 and replace their capacity and energy with purchased power. Moreover, the proposed construction is not wastefully duplicative—to the extent surface impoundments are not available to handle process water, process water systems are necessary to serve that purpose—nor will it unnecessarily encumber the landscape because the facilities will be physically adjacent to existing generating-unit-related facilities on the Ghent, Trimble County, and Brown properties. And there is no facility or other utility with which the proposed construction will compete.

Concerning the remaining CPCN requirements, Mr. Voyles's testimony further provides a full description of the proposed construction projects and their projected capital costs. Mr. Revlett's testimony addresses the necessary environmental permit applications and other requirements. Finally, the Application itself contains the maps required for each requested CPCN.

Q. Why is KU requesting a CPCN for Phase II of the Brown landfill, which has an estimated capital cost of just $11.9 million?

A. As I noted above in my summary of the 2016 Plan project for the landfill-phase construction (Project 36), the Commission's recent orders concerning phased landfill construction have uniformly required utilities—including the Companies—to seek a CPCN for each new phase of an existing landfill.[25] Notably, the Commission's recent order in Case No. 2015-00194 required the Companies to seek a CPCN for each new phase of the Ghent and Trimble County landfills, limiting the existing CPCNs for those landfills to the first phase only.[26] Also, in the Commission's recent order concerning Duke Energy Kentucky, Inc.'s proposed new landfill at its East Bend Station, the Commission required Duke to seek a separate CPCN for each phase of the eight-phase landfill, where several of the phases were expected to have a capital cost of only $12.5 million each.[27] Therefore, KU is seeking a CPCN for Phase II of the Brown landfill in this proceeding even though the capital cost of the project does not meet the financial materiality criterion of 807 KAR 5:001 Section 15(3).

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[25] *See In the Matter of: Investigation of Kentucky Utilities Company's and Louisville Gas and Electric Company's Respective Need for and Cost of Multiphase Landfills at the Trimble County and Ghent Generating Stations*, Case No. 2015-00194, Order at 32 (Dec. 15, 2015); *In the Matter of: Application of Duke Energy Kentucky, Inc. for a Declaratory Order that the Construction of a New Landfill Constitutes an Ordinary Extension in the Usual Course of Business or, in the Alternative, for a Certificate of Public Convenience and Necessity*, Case No. 2015-00089, Order at 10 (July 24, 2015).

[26] *In the Matter of: Investigation of Kentucky Utilities Company's and Louisville Gas and Electric Company's Respective Need for and Cost of Multiphase Landfills at the Trimble County and Ghent Generating Stations*, Case No. 2015-00194, Order at 31 (Dec. 15, 2015).

[27] *In the Matter of: Application of Duke Energy Kentucky, Inc. for a Declaratory Order that the Construction of a New Landfill Constitutes an Ordinary Extension in the Usual Course of Business or, in the Alternative, for a Certificate of Public Convenience and Necessity*, Case No. 2015-00089, Order at 5, 10 (July 24, 2015).

Q. In view of KU's request for a CPCN for Phase II of the Brown landfill, which has an estimated capital cost of just $11.9 million, why is KU requesting a declaratory ruling that the surface impoundment closures at Green River, Pineville, and Tyrone do not require CPCNs?

A. As I noted in my previous answer, KU is seeking a CPCN for Phase II of the Brown landfill only because the Commission's recent orders concerning phased landfills appear to create a new requirement for utilities to seek a CPCN for each new phase of an existing landfill, not because Phase II of the Brown landfill meets the financial materiality criterion of 807 KAR 5:001 Section 15(3). The total capital cost of all of the proposed surface impoundment closures at Green River, Pineville, and Tyrone is less than 1.5% of KU's current net utility rate base, and therefore the closures do not meet the CPCN financial materiality criterion as the Commission has historically interpreted it.[28]

But out of an abundance of caution, KU has requested in the alternative that the Commission grant one CPCN per generating station for the surface impoundment closures at Green River, Pineville, and Tyrone if the Commission believes one or more of the stations' surface impoundment closures requires a CPCN. If required, the surface impoundment closures at those stations would meet the CPCN requirements set out in 807 KAR 5:001 Section 15(2):

[28] *See, e.g., In the Matter of: Tariff Filing of Warren County Water District To Establish the Rockfield School Sewer Capital Recovery Fee*, Case No. 2012-00269 (Nov. 19, 2012); *In the Matter of: Application of Big Rivers Electric Corporation for Approval of an Interconnection Agreement with Kentucky Utilities Company*, Case No. 2007-00058 (Apr. 16, 2007); *In the Matter of: Application of Southern Madison Water District to Issue Securities in the Approximate Amount of $860,000 for the Purpose of Refunding an Outstanding Revenue Bond of the District and Finance Certain System Improvements Pursuant to the Provisions of KRS 278.300 and 807 KAR 5:001*, Case No. 99-310 (Sept. 1, 1999).

- As described in greater detail in the testimony of Messrs. Voyles and Revlett, KU will conduct the surface impoundment closures at Green River, Pineville, and Tyrone in accordance with applicable state environmental regulations.
- As Mr. Voyles discusses in his testimony and as I summarized above, closing the inactive surface impoundments as part of the Companies' overall surface impoundment-closure effort would provide several benefits.
- The proposed construction will not be wastefully duplicative, and will likely improve the landscape by replacing open surface impoundments with vegetated hills.
- There is no facility or other utility with which the closed surface impoundments will compete.
- Concerning the remaining CPCN requirements, Mr. Voyles's testimony further provides a full description of the proposed surface impoundment closures and their projected capital costs. Mr. Revlett's testimony addresses the necessary environmental permit applications and other requirements. Finally, the Application contains the maps that would be required for each station's CPCN.

Q. How does KU plan to finance the 2016 Plan projects, including those requiring CPCNs?

A. KU expects to finance the costs of the new facilities with a combination of new debt and equity. The mix of debt and equity used to finance the project will be determined so as to allow KU to maintain its strong investment-grade credit rating. To the extent that tax-exempt financing may be available for these projects, the Companies anticipate using such opportunities to the extent that they are reasonably cost-effective.

<u>ECR Cost Recovery</u>

Q. How does KU propose to recover the cost of the pollution control projects in its 2016 Plan?

A. KU proposes to recover the cost of the projects in its 2016 Plan through KU's Rate Schedule ECR filed with this application and proposed to be effective for bills that reflect the expense month July 2016 (i.e., six months after the filing of the application in this proceeding, in accordance with KRS 278.183(2)).

Q. Please explain why it is appropriate for KU to recover the costs of its 2016 Plan projects through its ECR mechanism.

A. The relevant part of Kentucky's ECR statute states:

> [A] utility shall be entitled to the current recovery of its costs of complying with the Federal Clean Air Act as amended and those federal, state, or local environmental requirements which apply to coal combustion wastes and by-products from facilities utilized for production of energy from coal in accordance with the utility's compliance plan ….[29]

Concerning Phase II of the Brown landfill (Project 36), the project is required to dispose of CCR from coal-fired generation in a way consistent with the federal CCR Rule and state environmental requirements, and it is therefore appropriate to recover its costs through the ECR mechanism. Moreover, the Commission approved ECR recovery of the costs of Phase I of the Brown landfill.[30]

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[29] KRS 278.183(1).

[30] *In the Matter of: Application of Kentucky Utilities Company for Certificates of Public Convenience and Necessity and Approval of Its 2011 Compliance Plan for Recovery by Environmental Surcharge*, Case No. 2011-00161, Order at 21-22 (Dec. 15, 2011).

Concerning Projects 37 and 38, both projects pertain to the Ghent coal-fired units' ability to comply with the MATS Rule, a rule EPA promulgated under the Federal Clean Air Act as amended. Furthermore, the Commission has approved ECR recovery of numerous air-compliance-related projects for KU.[31] Therefore, it is appropriate for KU to recover the costs of Projects 37 and 38 through KU's ECR mechanism.

Finally, as discussed above and in Mr. Revlett's testimony, the CCR Rule compliance construction and construction of process water systems KU is proposing in its 2016 Plan relate directly to "coal combustion wastes and by-products from facilities utilized for production of energy from coal" and are to be carried out in accordance with applicable environmental requirements. The ongoing groundwater monitoring and other maintenance activities KU will continue to conduct at any closed surface impoundments will also be done in accordance with environmental requirements concerning "coal combustion wastes and by-products from facilities utilized for production of energy from coal," particularly the CCR Rule's requirements concerning any closed surface impoundments at Ghent, Trimble, and Brown. It is therefore appropriate for KU to seek ECR recovery of the costs contained in Projects 39 through 42.

Q. What evidence does KU present on the accounting of the cost for the 2016 Plan?

A. Mr. Garrett's testimony explains KU's reporting and accounting for the capital costs, removal costs, and O&M expenses associated with the pollution control facilities described in Mr. Voyles's and Mr. Straight's testimonies, and addresses KU's accounting for retirements and replacements associated with the 2016 Plan. Mr.

[31] *See, e.g., id.*

Garrett further affirms that the environmental compliance costs KU proposes to recover through its surcharge are not already in existing base rates and will be accounted for consistent with prior Commission orders.

Return on Equity

Q. What return on common equity is KU currently authorized in its ECR tariff?

A. KU is currently authorized to earn a return on equity ("ROE") of 10.00% per the Commission's June 30, 2015 Order in Case No. 2014-00371, KU's most recent base-rate case.[32]

Q. What ROE is KU requesting in this proceeding?

A. The Company is requesting continuation of the 10.00% ROE. In KU's 2014 rate case, all of the parties to the case stipulated that the 10.00% ROE should be used in KU's monthly environmental surcharge filings beginning with the July 2015 expense month.[33] The Commission's Final Order in that proceeding accepted the terms of the Stipulation, including the agreed upon 10.00% ROE for environmental surcharge filings.[34] The approved stipulation in the Company's most recent base-rate case has thus eliminated the controversy often associated with this issue. Moreover, it is particularly appropriate to continue with the 10.00% ROE in view of the Commission's recent approval of it in its June 30, 2015 final order in Case No. 2014-00371, as well as the ROE's recent implementation, which began with the expense month including July 1, 2015.[35] Finally, the Commission recently approved continuing to use a 10.00% ROE for ECR purposes in its final order in the

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[32] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates*, Case No. 2014-00371, Order at 3 (June 30, 2015).
[33] *Id.*
[34] *Id.*
[35] *Id.* at Appx. A pg. 4.

Company's most recent two-year ECR review proceeding, which order was effective for the December 2015 expense month.[36]

Q. What revenue allocation is KU proposing in this case?

A. KU is proposing to continue using the two-step revenue-allocation methodology approved by the Commission in KU's 2011 ECR Plan proceeding, Case No. 2011-00161, which KU has used in calculating its ECR charges since the Commission's approval in that proceeding.[37] The Commission reviewed this ECR revenue allocation methodology in its two most recent two-year reviews of KU's ECR mechanism and approved KU's ECR roll-ins based on the methodology.[38] In the most recent two-year review case, the Commission ordered KU to continue to use the methodology until the Commission directs KU to do otherwise.[39]

<u>Conclusion and Recommendation</u>

Q. What are your conclusion and recommendation to the Commission?

A. I recommend that the Commission grant KU its requested CPCNs to build Phase II of the Brown landfill and to conduct CCR Rule compliance construction and construct related process water systems at Ghent, Trimble County, and Brown. Also, I recommend that the Commission issue KU's requested ruling declaring that CPCNs are not required for the proposed surface impoundment closures at Green River,

[36] *In the Matter of: an Examination by the Public Service Commission of the Environmental Surcharge Mechanism of Kentucky Utilities Company for the Two-Year Billing Period Ending April 30, 2015*, Case No. 2015-00221, Order at 6-8 (Dec. 7, 2015).

[37] Case No. 2011-00161, Order at Appx. A pgs. 8-10.

[38] *In the Matter of: An Examination by the Public Service Commission of the Environmental Surcharge Mechanism of Kentucky Utilities Company for the Two-Year Billing Period Ending April 30, 2013*, Case No. 2013-00242, Order (Nov. 14, 2013); *In the Matter of: an Examination by the Public Service Commission of the Environmental Surcharge Mechanism of Kentucky Utilities Company for the Two-Year Billing Period Ending April 30, 2015*, Case No. 2015-00221, Order at 5 (Dec. 7, 2015).

[39] *In the Matter of: an Examination by the Public Service Commission of the Environmental Surcharge Mechanism of Kentucky Utilities Company for the Two-Year Billing Period Ending April 30, 2015*, Case No. 2015-00221, Order at 5 (Dec. 7, 2015).

Pineville, and Tyrone; in the alternative, I recommend that the Commission issue a CPCN for each generating station for which the Commission determines a CPCN is required. I further recommend that the Commission approve KU's 2016 Plan and application for cost recovery of its compliance costs through the Rate Schedule ECR tariff, the continuing use of the current 10.00% ROE for ECR purposes, and the use of the revised monthly ECR reporting forms beginning with the expense month of July 2016.

Q. Does this conclude your testimony?

A. Yes, it does.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) **SS:**
COUNTY OF JEFFERSON)

The undersigned, **Robert M. Conroy**, being duly sworn, deposes and says that he is Director - Rates for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Robert M. Conroy

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:
JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

Robert M. Conroy
Director, Rates
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
Telephone: (502) 627-3324

Previous Positions

Manager, Rates	April 2004 – Feb 2008
Manager, Generation Systems Planning	Feb. 2001 – April 2004
Group Leader, Generation Systems Planning	Feb. 2000 – Feb. 2001
Lead Planning Engineer	Oct. 1999 – Feb. 2000
Consulting System Planning Analyst	April 1996 – Oct. 1999
System Planning Analyst III & IV	Oct. 1992 - April 1996
System Planning Analyst II	Jan. 1991 - Oct. 1992
Electrical Engineer II	Jun. 1990 - Jan. 1991
Electrical Engineer I	Jun. 1987 - Jun. 1990

Professional/Trade Memberships

Registered Professional Engineer in Kentucky, 1995.
Financial Research Institutes Advisory Board
Edison Electric Institute - Rates and Regulatory Affairs Committee
Southeastern Energy Exchange - Rates and Regulation Committee

Education

Essentials of Leadership, London Business School, 2004

Masters of Business Administration

Indiana University (Southeast campus), December 1998

Center for Creative Leadership, Foundations in Leadership program, 1998.

Bachelor of Science in Electrical Engineering;
Rose Hulman Institute of Technology, May 1987

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF KENTUCKY UTILITIES	**)**	
COMPANY FOR CERTIFICATES OF PUBLIC	**)**	
CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00026**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
JOHN N. VOYLES, JR.
VICE PRESIDENT, TRANSMISSION AND GENERATION SERVICES
KENTUCKY UTILITIES COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is John N. Voyles, Jr. I am the Vice President of Transmission and Generation Services for Kentucky Utilities Company ("KU"), and I am an employee of LG&E and KU Services Company, which provides services to Louisville Gas and Electric Company ("LG&E") and KU (collectively "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Please describe your job responsibilities.

A. I have 39 years of experience in the utility industry. In addition to oversight of the Transmission system, my current responsibilities include support of the generating fleet for both Companies with Generation Engineering and System Lab departments. I am also responsible for Project Engineering, the department that oversees large construction projects including generating stations, pollution control equipment, and on-site Coal Combustion Residual (CCR)[1] management facilities. Prior to this assignment, I was the officer responsible for the generating fleet. Earlier in my career, I served as the corporate environmental director.

Q. Have you previously testified before this Commission?

A. Yes. I have previously testified before this Commission in the Companies' 2009 and 2011 environmental compliance plan proceedings (Case Nos. 2009-00197 and 2011-00161 (KU) and 2009-00198 and 2011-00162 (LG&E)), in Case No. 2014-00002 in which the Companies obtained a certificate of public convenience and necessity to

[1] The CCR Rule defines CCR as "fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers." 40 CFR 257.53. This definition includes what is commonly referred to as gypsum.

construct the Brown Solar Facility, as well as recently in Case No. 2015-00194, in which the Commission affirmed its approval of the Companies' landfills to dispose of CCR.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

Exhibit JNV-1	Kentucky Utilities Company's 2016 Environmental Compliance Plan
Exhibit JNV-2	CCR Rule – Summary of Scope and Estimate Development
Exhibit JNV-3	Green River CCR Management Facilities Plan
Exhibit JNV-4	Pineville CCR Management Facilities Plan
Exhibit JNV-5	Tyrone CCR Management Facilities Plan
Exhibit JNV-6	Ghent CCR Management Facilities Plan
Exhibit JNV-7	Trimble County CCR Management Facilities Plan
Exhibit JNV-8	Brown CCR Management Facilities Plan

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe certain of the proposed pollution control projects contained in KU's 2016 Environmental Compliance Plan ("2016 Plan"). The 2016 Plan is attached to my testimony as Exhibit JNV-1 and sets forth each new pollution control project for which KU is seeking environmental surcharge recovery. These projects are required for KU to comply with the federal Clean Air Act as amended ("CAA"), the federal Disposal of Coal Combustion Residuals from Electric Utilities ("CCR Rule"), the federal Mercury and Air Toxics Standards ("MATS Rule"), and state administrative regulations set forth in 401 KAR Chapter 45 (state closure rules for special wastes).

I will also be supporting KU's request for Certificates of Public Convenience and Necessity ("CPCNs") related to the proposed 2016 Plan projects by providing project details, including a description of the proposed projects, the timeframe for construction, and the estimated cost of the projects.

Project Overview and Description

Q. Please provide an overview of the projects in KU's 2016 Plan.

A. The seven new projects (Projects 36 through 42) contained on Page 1 of Exhibit JNV-1 are required in order for KU to comply with the CAA, CCR Rule, MATS Rule, and state regulations applicable to KU's power plants and the disposal of CCR. The total capital cost of the new projects in the 2016 Plan is estimated to be approximately $677.7 million. As explained in the testimonies of Robert M. Conroy and Christopher M. Garrett, KU is seeking to recover through the ECR mechanism only the portion of the 2016 Plan's cost that is not already being recovered through base rates. Therefore, only the portion of the 2016 Plan's total projected cost that KU seeks to recover through the ECR mechanism, $640 million, is reflected in Exhibit JNV-1. KU is also seeking recovery of operating and maintenance expenses associated with Project 38 as detailed on Page 2 of Exhibit JNV-1.

Q. Please describe KU's 2016 Plan as shown in Exhibit JNV-1.

A. The new pollution control projects in KU's 2016 Plan are shown in Exhibit JNV-1. Page 1 of Exhibit JNV-1 lists the capital costs associated with KU's compliance plan.

- ***Column 1*** assigns a number to the project for identification purposes in sequence with the projects from Case No. 93-465 (1 through 15),[2] Case No.

[2] *In the Matter of: The Application of Kentucky Utilities Company to Assess a Surcharge Under KRS 278.183 to Recover Costs of Compliance with Environmental Requirements for Coal Combustion Wastes and By-Products.*

2000-439 (16 and 17),[3] Case No. 2002-00146 (18),[4] Case No. 2004-00426 (19 through 22),[5] Case No. 2006-00206 (23 through 27),[6] Case No. 2009-00197 (28 through 33),[7] and Case No. 2011-00161 (34 and 35).[8]

- ***Column 2*** describes the air pollutant or byproduct to be controlled.
- ***Column 3*** identifies the pollution control facility that KU plans to upgrade, construct, and/or close to comply with the environmental regulations identified in Column 5.
- ***Column 4*** identifies the specific location of the pollution control facility.
- ***Column 5*** identifies the environmental regulations that require KU to act on the associated project.
- ***Column 6*** identifies the environmental permits required for KU's projects to satisfy the environmental regulations.
- ***Column 7*** shows the anticipated completion date of the specific project.
- ***Column 8*** displays the estimated capital cost of the project.

Page 2 of Exhibit JNV-1 lists the expected annual incremental operations and maintenance expenses associated with each project.

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[3] *In the Matter of: The Application of Kentucky Utilities Company for Approval of an Amended Compliance Plan for Purposes of Recovering the Costs of New and Additional Pollution Control Facilities and to Amend Its Environmental Cost Recovery Surcharge Tariff*

[4] *In the Matter of: The Application of Kentucky Utilities Company for Approval of Its 2002 Compliance Plan for Recovery by Environmental Surcharge*

[5] *In the Matter of: The Application of Kentucky Utilities Company for a Certificate of Public Convenience and Necessity to Construct Flue Gas Desulfurization Systems and Approval of Its 2004 Compliance Plan for Recovery by Environmental Surcharge*

[6] *In the Matter of: The Application of Kentucky Utilities Company for a Certificate of Public Convenience and Necessity to Construct a Selective Catalytic Reduction System and Approval of Its 2006 Compliance Plan for Recovery by Environmental Surcharge*

[7] *In the Matter of: The Application of Kentucky Utilities Company for Certificates of Public Convenience and Necessity and Approval of Its 2009 Compliance Plan by Recovery by Environmental Surcharge*

[8] *In the Matter of: The Application of Kentucky Utilities Company for Certificates of Public Convenience and Necessity and Approval of Its 2011 Compliance Plan for Recovery by Environmental Surcharge*

- ***Column 1*** assigns a number to the project for identification purposes in sequence with the projects from Case No. 93-465 (1 through 15),[9] Case No. 2000-439 (16 and 17),[10] Case No. 2002-00146 (18),[11] Case No. 2004-00426 (19 through 22),[12] Case No. 2006-00206 (23 through 27),[13] Case No. 2009-00197 (28 through 33),[14] and Case No. 2011-00161 (34 and 35).[15]
- ***Column 2*** describes the air pollutants or byproducts to be controlled.
- ***Column 3*** identifies the pollution control facilities that KU plans to upgrade, construct and/or close to comply with the environmental regulations.
- ***Column 4*** identifies the specific location of the pollution control facilities.
- ***Columns 5-13*** identify the incremental annual operation and maintenance costs associated with each project (through 2024).

Changing Federal Environmental Regulations

Q. How significantly has the federal landscape of environmental regulations changed since KU obtained approval of its 2011 Plan?

A. Since KU obtained approval of its 2011 Plan, the suite of federal environmental regulations the United States Environmental Protection Agency ("EPA") has

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[9] *In the Matter of: The Application of Kentucky Utilities Company to Assess a Surcharge Under KRS 278.183 to Recover Costs of Compliance with Environmental Requirements for Coal Combustion Wastes and By-Products.*
[10] *In the Matter of: The Application of Kentucky Utilities Company for Approval of an Amended Compliance Plan for Purposes of Recovering the Costs of New and Additional Pollution Control Facilities and to Amend Its Environmental Cost Recovery Surcharge Tariff*
[11] *In the Matter of: The Application of Kentucky Utilities Company for Approval of Its 2002 Compliance Plan for Recovery by Environmental Surcharge*
[12] *In the Matter of: The Application of Kentucky Utilities Company for a Certificate of Public Convenience and Necessity to Construct Flue Gas Desulfurization Systems and Approval of Its 2004 Compliance Plan for Recovery by Environmental Surcharge*
[13] *In the Matter of: The Application of Kentucky Utilities Company for a Certificate of Public Convenience and Necessity to Construct a Selective Catalytic Reduction System and Approval of Its 2006 Compliance Plan for Recovery by Environmental Surcharge*
[14] *In the Matter of: The Application of Kentucky Utilities Company for Certificates of Public Convenience and Necessity and Approval of Its 2009 Compliance Plan by Recovery by Environmental Surcharge*
[15] *In the Matter of: The Application of Kentucky Utilities Company for Certificates of Public Convenience and Necessity and Approval of Its 2011 Compliance Plan for Recovery by Environmental Surcharge*

promulgated that pertain to the generation of electricity from coal has continued to expand. The two federal regulations that necessitate nearly all of the capital costs in the 2016 Plan, which are the MATS Rule and CCR Rule, did not even exist in final form prior to 2011.

At that time, KU obtained approval to perform projects necessary to comply with, among other regulations, the National Ambient Air Quality Standards ("NAAQS"), the Cross State Air Pollution Rule ("CSAPR") and the then-proposed National Emission Standards for Hazardous Air Pollutants ("HAPS Rule"). As explained in the testimony of Gary H. Revlett, the EPA issued a final rule regarding air pollutants in the MATS Rule that contained even more stringent emission limits than in the proposed HAPS Rule.

Relatedly, the final CCR Rule, which provides a comprehensive set of requirements for the disposal of CCR from coal-fired power plants, is likewise more stringent and definitive than its proposed form. Thus, while the projects performed as part of the 2011 Plan were certainly required and remain viable, the newly-finalized regulations necessitate the additional pollution control projects KU has proposed in this case.

Q. With respect to the CCR Rule, please describe the status of the Companies' assessment of the structural stability; hydrologic and hydraulic ("H&H"), and air; groundwater monitoring and assessment requirements discussed in Mr. Revlett's testimony.

A. As described by Mr. Revlett, the CCR Rule establishes new operational standards and requirements for CCR management facilities relating to structural stability; H&H and air; groundwater monitoring and assessment; and location criteria, each of which is phased in over the first three years after the effective date of the Rule. The Companies are in the process of performing the required assessments and have plans to assure that all of the necessary improvements and/or closures of the CCR management facilities are completed within the deadlines set forth in the Rule.

In 2015 the Companies began the process of evaluating the first criteria, structural integrity, for all active surface impoundments to determine if any of the impoundments did not meet the new, more stringent structural Factors of Safety (FOS) specified in the CCR Rule. If conditions are identified that would not meet the specified FOS, the Rule allows corrections to be made within a specified time period. Through the Companies' engineering analyses, the Bottom Ash Pond at the Trimble County Generating Station – although compliant with all previously existing safety standards - was found to require upgrading to meet the new, more stringent FOS criteria. In order to meet the new FOS requirements, an engineered repair was developed for the north and south embankments of the Bottom Ash Pond that consisted of placing a rock buttress along the outboard slope of the embankment. The buttress is a mass of stone (rip-rap) and provides the additional stability needed to exceed the required FOS for slope stability. The rock buttress work commenced in fall 2015 and was completed in mid-December at a total cost of approximately $955,000. As of this time, all of the active CCR surface impoundments at KU's generating plants meet or exceed the required FOS in the Rule.

Second, the CCR Rule also requires that all CCR surface impoundments at active generating stations demonstrate sufficient H&H capacities to accommodate extraordinary rainfall events. In 2015 the Companies began the process of evaluating the H&H capacities of all active surface impoundments to determine if any of the impoundments would need upgraded inflow flood control systems to meet the standards under the CCR Rule. The Companies' analysis determined that none of the surface impoundments at KU's active generating plants required any upgrade to meet the new H&H standards.

The CCR Rule further requires that all CCR management facilities at active generating stations implement a groundwater monitoring and assessment program. For each CCR management facility, the Companies are required to install a groundwater monitoring system and obtain eight independent samples by October 17, 2017. At this time, the Companies are in the process of selecting engineering firms that will develop the groundwater monitoring plans. Once plans are complete, the Companies will install the groundwater monitoring wells. After the groundwater wells are installed, the eight independent samples will be collected and analyzed, and the results will be statistically evaluated in accordance with the requirements specified in the CCR Rule. The work is scheduled to meet the required dates in the CCR Rule.

Finally, the CCR Rule requires that all CCR management facilities at active generating stations be evaluated for compliance with Location Restrictions by October 17, 2018. The Companies are still in the process of evaluating whether these Location Restrictions affect any of their CCR management facilities. As discussed in Mr. Revlett's testimony, there is a high probability that the groundwater monitoring and assessment requirements could trigger closure obligations for one or more of the surface impoundments on or before the required Location Restrictions deadline. In the event closure is not triggered by other requirements, the Companies will complete the evaluation of the Location Restrictions prior to the October 17, 2018 deadline.

Q. Are there other new regulations the EPA has promulgated that KU must consider as a part of evaluating this 2016 Plan?

A. Yes, the EPA has very recently finalized both the Clean Power Plan ("CPP") and Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category ("ELG"). The CPP, which the EPA announced in August 2015, contains the first-ever national standards that address carbon dioxide emissions from both new and existing power plants. The ELG, which was published in final form in November 2015, regulates process wastewater discharges from power plants operating as utilities.

Q. Have the Companies determined what changes, if any, to its generation fleet will be necessary to comply with the CPP and ELG?

A At this time determinations regarding changes to the Companies' generating fleet for compliance with the CPP and ELG are premature. With respect to the CPP, the Companies cannot complete an assessment of a possible compliance plan until the Commonwealth of Kentucky determines how it will proceed with its state plan as described by Mr. Revlett. Important as well for the CPP will be the outcome of the multiple legal challenges that have been filed by industry groups, coal companies, utilities, and twenty-seven states—including Kentucky. In late December 2015 numerous parties—including the Companies and Commonwealth of Kentucky—petitioned the EPA for reconsideration of the CPP.

As for the impact of the ELG regulations, the Companies are evaluating the new guidelines for discharge limitations as they pertain to the Companies' generating fleet process wastewater streams. Further engineering must be completed to evaluate the generating fleet wastewater streams to ensure the compliance alternatives identified are determined to be the lowest reasonable cost compliance plan.

While the Companies are not proposing projects in the 2016 Plan to comply with the CPP or ELG, certain of the emission reductions and changes to the effluent discharges of process waters achieved by the proposed Projects may ultimately help the Companies comply with these new rules. In evaluating the Projects proposed in this case, the Companies looked to optimize their 2016 Plan by finding economical means of complying with the CCR Rule and MATS Rule in a manner consistent with the CPP and ELG.

Q. Is it fair to characterize this as another period of rapid change with regard to the environmental and air pollutant regulations with which the Companies must comply?

A. Yes. The scope and number of federal regulations that apply to the Companies is vastly different than a mere decade ago. Today's regulations are much more intertwined and complex, which impacts compliance planning. Further complicating matters is that several of the regulations provide the Companies with a very short window of time by which to comply, or risk the shutdown of entire generating *stations*—not just individual generating units. The more recently finalized regulations (CPP and ELG) have compliance deadlines that occur in six or seven years and specific actions have yet to be defined by the state of Kentucky. Consequently, the

Companies are forced to nimbly address a suite of new rules in the face of legal and operational uncertainties. Compressed compliance deadlines, especially with regard to the CCR Rule, require the Companies to act now. The Companies have developed, through conceptual engineering, a plan to comply with these federal regulations within a timeframe that avoids jeopardizing the economic dispatch of the Companies' generating fleet.

Q. How do the types of Projects proposed in this case to comply with the CCR Rule (and related state regulations) differ from Projects in prior cases?

A. Compliance with the CCR regulations or related state regulations apply to all CCR management facilities at both operating and retired generating stations. Hence the principal difference is that the vast majority of proposed capital investments in the 2016 Plan does not depend on the ongoing generating operations at the affected units, but are necessary regardless of whether the stations produce another kWh. For example, KU expects it will have to close a number of its past and current CCR management facilities that currently store CCR because of the requirements in the federal or state rules. These rules for CCR management facilities must be complied with irrespective of the continued operation of the generating units that produced the CCR.

Q. Given the fluidity of the regulations with which the Companies must comply, how are the Companies determining whether the proposed Projects are economical as compared not only to other alternatives, but also as to retiring the affected units and stations?

A. For the Projects KU has proposed that support ongoing operations at Brown and Ghent, such as Phase II of the Brown Landfill, the Company's present value revenue requirement analyses evaluate whether the project is economical for the station's continued operation through 2021. If the Companies determine that complying with the CPP and ELG is more costly than retiring coal units and replacing the capacity, they can likely operate the units through 2021 without incurring any CPP and ELG compliance costs. These analyses, which are set forth in the testimony of Charles R. Schram, show that the Projects in the 2016 Plan are the lowest reasonable cost alternatives, even if the units cease to operate past 2021.

At Trimble County, in addition to the investments required for the 2016 Plan projects, the Companies are already proceeding with spending $277 million from 2016 through 2021 for Phase I of the landfill and CCR treatment and transport facility ("CCRT"). While the relative benefits from these significant long-term investments will greatly exceed their cost, the point at which their benefits exceed their cost will occur after 2021. As a result, the Companies evaluated the Trimble County Projects over the Companies' standard 30-year analysis period with high-level estimates for CPP and ELG compliance costs.

KU Compliance Projects

Q. How did KU determine what to include in its compliance projects?

A. The proposed Projects are the result of an intensive assessment and ongoing engineering effort by the Companies' Project Engineering group and outside engineering firms (most notably CH2M[16] with respect to the CCR Rule-related

[16] CH2M was known as "CH2M Hill" during a portion of the time the firm was performing engineering work for the Companies.

investments). Through the Companies' and outside firms' work, the Companies developed order-of-magnitude estimates regarding the compliance expenditures that would be required for each generating unit to meet the regulatory requirements.

Once that was accomplished, the Companies' Generation Planning group performed analyses to determine if all of the compliance equipment and investments would be the lowest reasonable cost alternatives to achieve compliance with the applicable regulations. Generation Planning also determined for each generating unit whether it would be more cost-effective to put in place the suite of compliance facilities established or to retire the unit. (Mr. Schram's testimony and its attachments contain the full details of that analysis). The 2016 Plan is in fact, a cost-effective means for KU to comply with the applicable regulations.

<u>Project 36: Phase II of the Brown Landfill</u>

Q. What are the components of Project 36, and why are they necessary?

A. Project 36 involves constructing Phase II of the Brown Landfill, which is currently necessary to remain in compliance with the Special Waste Landfill Permit issued by the Kentucky Division of Waste Management ("KDWM") and store the CCR that is produced at the Brown Generating Station. Phase II requires regrading the clay subgrade to prepare the site for installation of the liner and leachate collection systems necessary for ongoing CCR disposal, but the scope of Phase II with respect to the capital investment and time for completion is considerably less than was required for Phase I. For example, as part of Phase I, KU constructed a CCRT facility to treat, dewater and prepare the CCR for disposal, as well as leachate and storm water ponds to support the entire landfill project and permit requirements. Additional facilities of this scope are not required in the later phases.

This Project relates to environmental control projects at Brown that began with the 2009 ECR Plan. In the 2009 ECR Plan, the Commission approved KU's proposal to increase the height and volume of the main and auxiliary ash ponds that store CCR at Brown. In the 2011 ECR Plan, the Commission approved the conversion of the Main Ash Pond to a dry landfill to comply with the anticipated federal requirements regarding CCR disposal. KU began constructing Phase I of the Brown Landfill in late 2014, which will be placed in service in 2016.

Q. Why is Phase II of the Landfill needed at this time?

A. When the KDWM issued the permit for the Special Waste Landfill, it set forth a 10 foot height limit for each successive phase of lateral expansion such that the volume of CCR disposed in each phase be no more than 10 feet higher than adjoining phase(s). Because of this permit condition, the design capacity of Phase I is limited to an initial height of 10 feet. Based on the historical production at Brown, Phase I's initial 10 feet of capacity may be exhausted by as early as the second quarter of 2018. Forecasted production volumes suggest there may be usable capacity until 2019. In any event, it is important that KU prepares to construct Phase II to ensure there is sufficient capacity to dispose of CCR because, based upon both historical and forecasted production volumes, the initial capacity of Phase I will soon be exhausted.

KU is continuing to assess and evaluate beneficial use and other alternatives that could affect when Phase I reaches its initial capacity. For example, KU is evaluating the costs of disposing certain types of CCR in municipal landfills (permitted to accept CCR materials). KU has also begun discussions with the KDWM to review the data necessary to modify the permit to raise the 10 foot height constraint on Phase I. In order to balance the need to ensure the Companies have available capacity to dispose of CCR with the obligation to only construct additional phases when it is required, KU is seeking approval to construct Phase II at this time, but will not begin construction before 2017. This will provide KU with time to review conditions that may affect the projected timing of Phase II, while still providing KU with adequate time to complete construction so as to avoid jeopardizing operation of the Brown units. If the Commission grants a CPCN for Phase II and KU later determines it will not be needed, KU would not construct it and would notify the Commission.

Q. When does KU propose to begin construction on Phase II?

A. KU plans to begin construction in 2017. Construction is expected to last approximately a year. Depending on suitable weather conditions during the construction periods, Phase II would be available for commercial operation prior to the end of 2018.

Q. How long is Phase II expected to have usable space to store CCR produced at Brown?

A. Forecasted production volumes suggest the initial vertical 10 foot capacity of Phase II will not be exhausted until the end of 2021.

Q. Is constructing Phase II of the Brown Landfill economical?

A. Yes, it is. The expected cost of Phase II is $11.9 million. As discussed in the testimony of Mr. Schram, it is economical to construct the Brown Landfill as compared to retiring the generation in 2019, the year Phase 1 would be at the capacity specified by the permit conditions based on forecasted production volumes.

Q. Is KU requesting a CPCN to construct Phase II of the Brown Landfill?

A. Yes. This is discussed in the testimony of Mr. Conroy.

<u>Project 37 and 38: Ghent WFGD Upgrade and Mercury Injection Control Systems</u>

Q. Is R. Scott Straight supporting the need for Project 37 in the 2016 Plan?

A. Yes. Mr. Straight describes the need for Project 37, which consists of improvements to the wet flue gas desulfurization systems at Ghent Unit 2 in order to further reduce sulfur dioxide emissions at the unit.

Q. Does Mr. Straight also support the need for Project 38 in the 2016 Plan?

A. Yes. Mr. Straight likewise describes the need for Project 38, which consists of supplemental injection systems on the Ghent units to further reduce the mercury emissions from the station.

<u>Project 39: Surface Impoundment Closures at the Retired Green River, Pineville, and Tyrone Generating Stations</u>

Q. Please provide an overview of Project 39.

A. As part of Project 39, KU proposes to close surface impoundments at Green River, Pineville, and Tyrone. Specifically, KU proposes to close three surface impoundments at Green River, one at Pineville, and one at Tyrone. Attached as Exhibits JNV-3, JNV-4, and JNV-5 are the CCR management facilities conceptual plans for the Green River, Pineville, and Tyrone stations, respectively. The CCR management facilities plans for these stations (as well as for the active generating stations discussed below) are comprised of the evaluation performed by CH2M, as supplemented by JNV-2, which is the Companies' description and explanation of modifications to the scope and estimates that have occurred subsequent to CH2M's development of the station evaluations.

Q. Please explain why KU is proposing to close these surface impoundments.

A. These CCR-containing surface impoundments are located at stations that no longer produce electricity. While the impoundments are being utilized for storm runoff purposes and site sump pump discharge basins, they are no longer receiving CCR. Because the coal-fired units at Green River, Pineville, and Tyrone were no longer in operation as of the effective date of the CCR Rule, the surface impoundments at these stations are not subject to the CCR Rule. With respect to Projects 40 to 42, KU is proposing to close surface impoundments at its stations with ongoing coal-fired generation due to the requirements of the CCR Rule as discussed in sections that follow.

As explained in the testimony of Mr. Revlett, the closure of impoundments at Green River, Pineville, and Tyrone would be completed in accordance with state law for the closure of special waste landfills. Closing these impoundments at this time is prudent for a number of reasons. First, closure will minimize risk by reducing the potential for environmental releases, and potential citizen or nuisance lawsuits arising from the CCR disposed of within the impoundments. Second, by closing these impoundments now, KU will minimize cost escalation for engineering, construction, and materials that could occur as other utilities begin entering the market to close surface impoundments under the CCR Rule and other states' laws. Third, by closing these surface impoundments at the same time as the impoundments at the Ghent, Trimble County, and Brown stations, KU has the opportunity to take advantage of economies of scale that will result if these closures are implemented along with the CCR Rule-required closures.

Finally, it is possible that compliance with ELG could lead to the mandatory closure of these impoundments under state law. As explained in Mr. Revlett's testimony, the water in those impoundments is considered "legacy wastewater." As legacy wastewater under ELG, KU will not be permitted to add to the impoundments the wastewater KU currently adds through sump pumps that are located at various locations at each generation facility. To the extent ELG prohibits that current practice, the impoundments could become "dry" under state law. If that happens, they would be regulated by the KDWM. If the impoundments are regulated by KDWM, they are subject to KDWM's authority to order remedial measures.

Q. Please explain what surface impoundments KU is proposing to close at Green River.

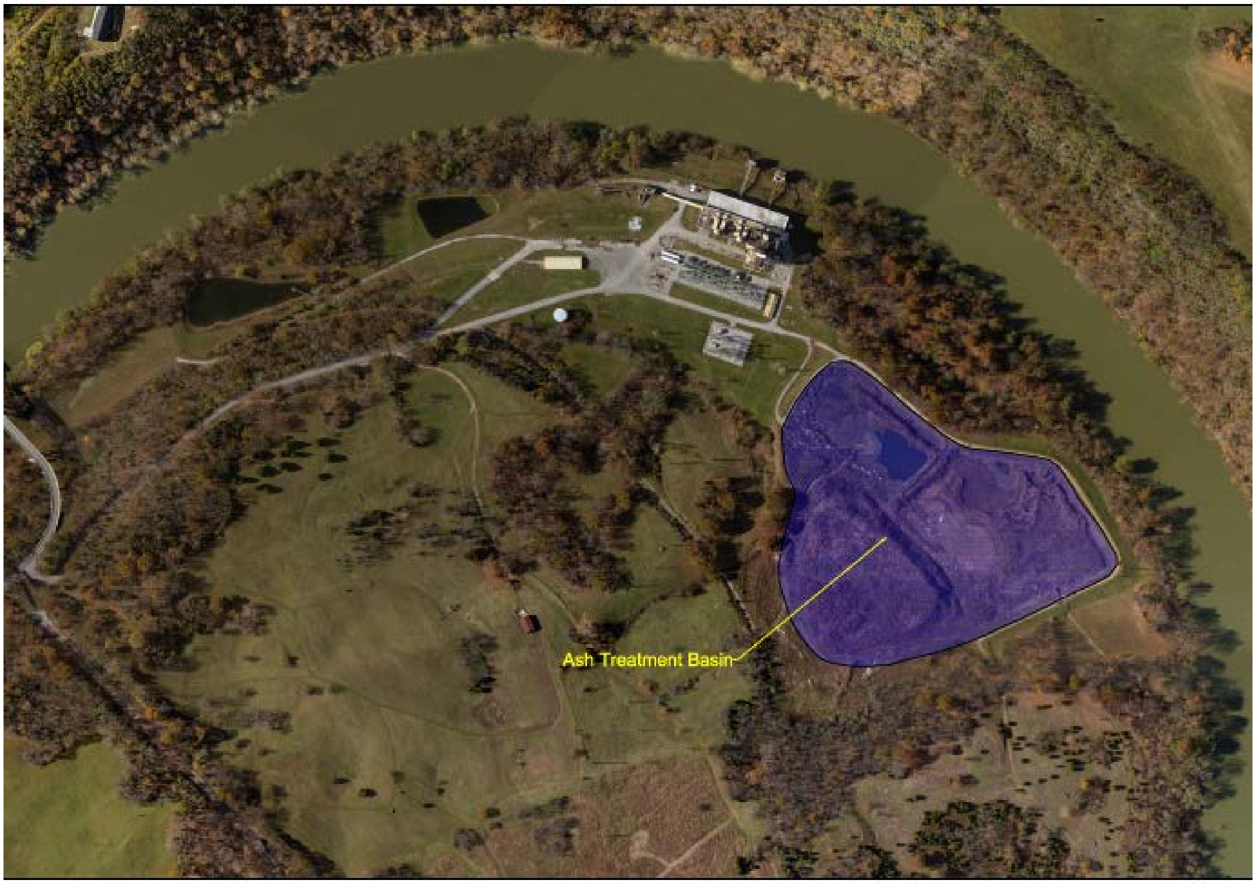
A. KU is proposing to close three surface impoundments at Green River by 2019. Specifically, these are the Main Ash Pond, Ash Treatment Basin #2 (ATB2), and the SO_2 Pond. As part of the process, the CCR stored in the SO_2 pond will be excavated (cleaned and closed) and used in the closure process of the Main Ash Pond and/or ATB2, and the other two impoundments will be capped and closed. The picture below represents the surface impoundments, in blue, that will be closed by 2019.

Q. Please explain what surface impoundments KU is proposing to close at Pineville.

A. KU is proposing to close the Ash Treatment Basin at Pineville by 2019. KU plans on closing the surface impoundment by regrading the ash and putting a cap on the basin. The picture below represents the surface impoundment, in blue, that will be closed by 2019.

Q. Please explain what surface impoundments KU is proposing to close at Tyrone.

A. KU is proposing to close the Ash Treatment Basin at Tyrone by 2019. KU plans on closing the pond by regrading the ash and putting a cap on the basin to close it. The picture below represents the surface impoundment, in blue, that will be closed by 2019.



Q. Are these closures economical?

A. Yes. As discussed above, including the closure of these facilities with Projects 40 to 42 is expected to provide the opportunity to take advantage of economies of scale. The anticipated costs of the closures at Green River, Pineville, and Tyrone are $77.9 million.

Q. Is KU requesting a CPCN for the surface impoundment closures at the retired generating stations?

A. No. As explained in the testimony of Mr. Conroy, KU believes that the closure of these impoundments is construction in the ordinary course of business for which a CPCN is not required. If the Commission disagrees, however, KU requests a CPCN for each station's closure plan.

Project 40 through 42: CCR Rule Compliance Construction and Construction of New Process Water Systems

Q. Please provide an overview of Projects 40 through 42.

A. These Projects involve the closure of surface impoundments containing CCR and the construction of process water systems at the Ghent, Trimble County, and Brown stations in order to assure compliance with the CCR Rule while supporting continued operation of the generating units at the stations. As Mr. Revlett explains, the CCR Rule requires that surface impoundments containing CCR close if the surface impoundment does not comply with the applicable structural and location requirements set forth in the Rule. In addition, any surface impoundment must close if it is determined to cause a statistical increase in CCR constituents in the groundwater above applicable groundwater protection standards. Therefore, in order to assure compliance with the CCR Rule's restrictions regarding surface impoundments, KU is proposing in Projects 40 to 42 to close five surface impoundments at Ghent, two surface impoundments at Trimble County, and one at Brown by 2023. Attached as Exhibits JNV-6, JNV-7 and JNV-8 are the CCR management facilities conceptual plans for the Ghent, Trimble County and Brown stations, respectively. The CCR management facilities plans for these stations are comprised of the evaluation performed by CH2M, as supplemented by JNV-2, which is the Companies' description and explanation of modifications to the scope and estimates that have occurred subsequent to CH2M's development of the station evaluations.

Q. How do the Companies plan to close the surface impoundments?

A. As explained in Mr. Revlett's testimony, the CCR Rule requires that CCR surface impoundments that do not meet the new structural, groundwater, and location requirements must close as set forth in the Rule. The utility must decide how to proceed based on a number of options. These options include closing the surface impoundment by capping it, or "clean closing" it by removing the CCR from the impoundment. Other options include relining and repurposing the impoundment.

In developing the closure plans for each generating station, the Companies are balancing several challenging factors: compressed compliance deadlines that risk the shutdown of entire stations; optimizing existing properties at each station; sequencing closures to support ongoing operations; and assessing how the closures of each surface impoundment can be performed in a manner that is the lowest reasonable cost option that meets the stringent requirements of the Rule aimed at minimizing environmental impacts. While these analyses continue to be refined as more detailed engineering work proceeds, the Companies have developed the closure plans and corresponding cost estimates presented in their applications that, except for a few impoundments, will involve leaving the CCR in place and installing a cap that meets the requirements of the CCR Rule. To the extent feasible and consistent with the CCR Rule, KU will beneficially use CCR to reduce the need for and cost of using virgin fill material to achieve proper grades prior to capping surface impoundments. One source of such fill material will be surface impoundments that KU plans to clean close.

As with the specific sequencing of when each closure will occur, the Companies will continue to evaluate whether capping and closing in this method is the lowest reasonable cost alternative of the three options under the CCR Rule for each surface impoundment in the context of the costs and benefits of each generating station and consistent with the CCR Rule's requirements. As engineering proceeds and matures for each proposed closure and the assessments of the CCR Rule's criterion for each surface impoundment's circumstances becomes clearer, the closure approach and costs for a given surface impoundment could change, perhaps significantly, especially if larger quantities of virgin fill materials become necessary for closure.

Q. Have the surface impoundments at Ghent, Trimble County, and Brown triggered closure processes under the CCR Rule?

A. At this time, no surface impoundments have been determined to trigger mandatory closure under the structural, groundwater, or location requirements in the CCR Rule. As explained above, the CCR Rule requires the Companies to assess each surface impoundment by, among other things, placing groundwater monitoring wells around each surface impoundment and gathering samples over a period of time to determine if the groundwater contains CCR in an amount that is outside the allowable limits. At some of the Companies' generating facilities, there are multiple, adjacent surface impoundments. If the groundwater samples contain CCR constituents above the applicable limits, it may be difficult to determine which specific impoundment would trigger the closure process. While the two most recent CCR surface impoundments installed by the Companies were constructed with lining systems (Trimble County Gypsum Storage Pond and Brown Auxiliary Ash Pond), if samples show CCR constituents above the applicable limits, it may not be possible to definitively determine which impoundment is the specific source, and closure of these lined surface impoundments ensures compliance with the CCR Rule. As the CCR Rule became effective in October 2015, the Companies' evaluation of all unlined and lined surface impoundments is ongoing.

Q. If the Companies' evaluation is ongoing, why is KU seeking approval to close surface impoundments at this time?

A. One of the most challenging aspects of the CCR Rule is that once a surface impoundment is deemed to have triggered the closure process under the Rule, the utility has a mere six months to cease placing CCR wastestreams in that impoundment and initiate the closure process. This compressed timeframe by which to begin closure has required the Companies to assess which impoundments, once the groundwater monitoring and data analysis required by the CCR Rule is complete, are likely to require closure based on information that is otherwise available. As explained in the testimony of Mr. Revlett, the information currently available indicates that the assessments required by the CCR Rule over the next several years are likely to trigger closure of the surface impoundments.

If not for the requirement to cease placement of CCR wastestreams into an existing surface impoundment within six months of a triggering event, the Companies would have preferred to wait to begin closure activities and construction of the process water systems until their analyses were complete. The timetable in the CCR Rule, however, simply does not permit the Companies to wait to make these determinations. As such, KU is proposing to close surface impoundments that, based on the Companies' judgment and experience, are reasonably anticipated to require closure under the CCR Rule. It is important to consider that these CCR Rule-related Projects differ from the usual projects in KU's Plans. The closures are not merely a means to comply with emission limits or discharge standards. The CCR Rule, if the trigger KU anticipates will occur is indeed met, *mandates* closure of the impoundments. KU believes, in consideration of the short timelines between triggering closure and cessation of placement of CCR wastestreams in an impoundment required to close, it is prudent to manage the process by determining economical means to effectuate the closures while supporting the ongoing generation at the stations, which will include the continued disposal of CCR.

Q. What is involved in the closure process that necessitates more than six months to initiate closure?

A. The Ghent, Trimble County, and Brown stations are important components of KU's generating fleet. KU has had to develop conceptual engineering plans that allow for the closure of the surface impoundments that are likely to trigger closure under the CCR Rule in a manner that accommodates the continuing day-to-day operations of these stations, including continued disposal of CCR. Sequencing the closures in a manner that does not interfere with generating operations at each station is complex, and the precise order in which the closure activities will occur will depend on further engineering and operational analyses that are ongoing.

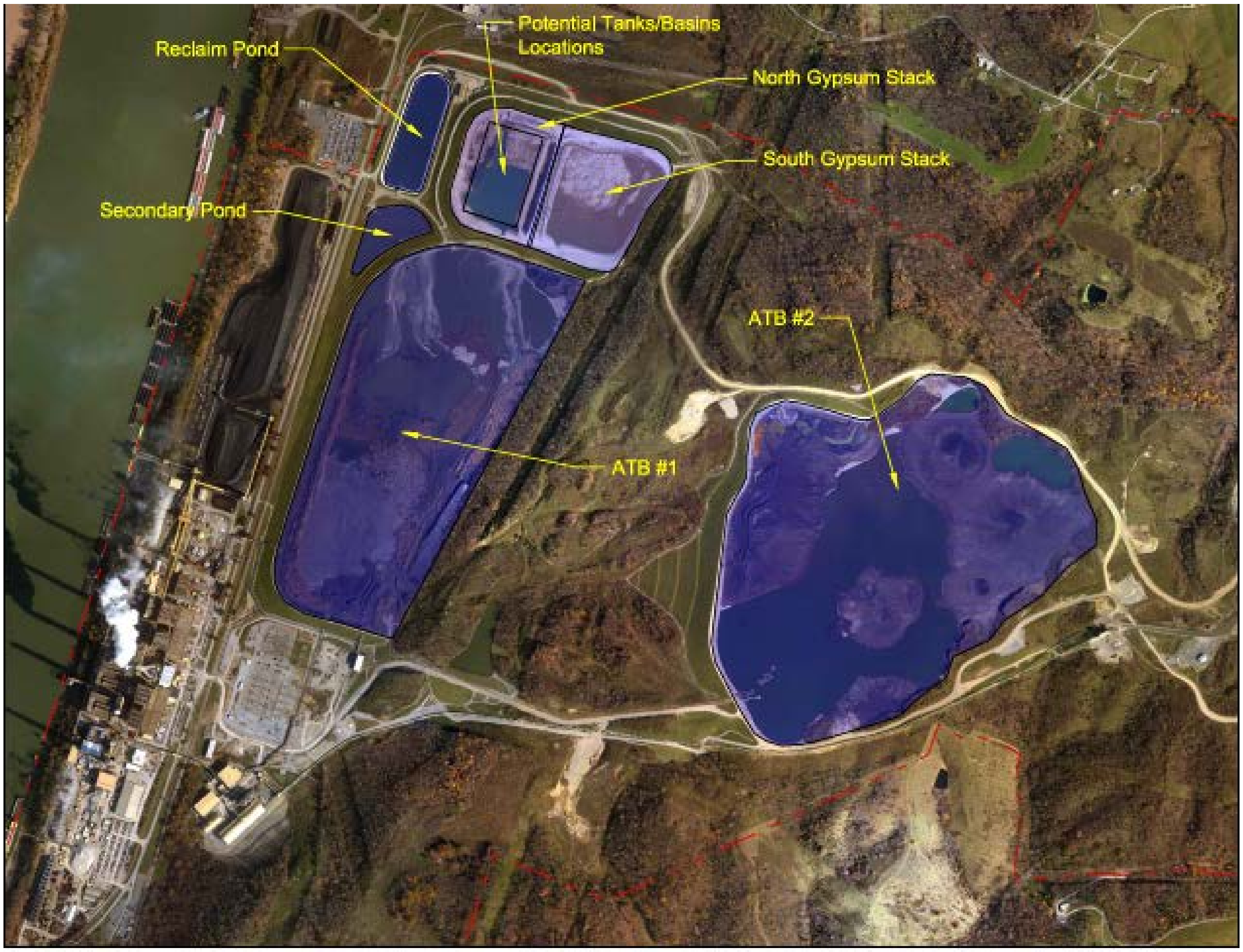
One of the most complex issues the Companies must address in closing the surface impoundments is how to handle the process water from ongoing operations in a manner that does not impede the closure processes or continued operation of the generating station. In order to manage this process, continue compliance with existing water discharge permits, and start the closure, KU will need to construct process water systems. KU will construct these systems, which will consist of elevated tanks, concrete basins, or a combination of both, to process the water involved in the closures and ongoing operations. The process water systems will be constructed on existing station property and will be sequenced appropriately to minimize costs and support future needs from the impact of other environmental rules and regulations.

The 2016 Plan also considers the impact of recently-enacted federal rules with which the Companies must comply; principally, the effects of ELG. As explained in the testimony of Mr. Revlett, utilities are required to begin complying with ELG as soon as possible beginning in 2018. Although there are no costs associated with complying with ELG in the 2016 Plan, consideration of these guidelines in designing the process water systems allows KU to optimize the closure process by increasing efficiencies in the interrelatedness of the CCR Rule and ELG, where possible. As explained in Mr. Revlett's testimony, the EPA has spoken directly to the interaction between the CCR Rule and ELG and encouraged utilities to make appropriate business decisions to meet both sets of requirements.

Q. Please explain what surface impoundments KU is proposing to close at Ghent in Project 40.

A. In Project 40, KU is proposing to close five surface impoundments at Ghent by 2022, as well as construct process water systems (sequenced appropriately as described above) as part of the Project. Specifically, KU plans to close the Ash Treatment Basin #1 ("ATB1"), the Ash Treatment Basin #2 ("ATB2"), the Gypsum Stack, the

Reclaim Pond, and the Secondary Pond. The proposed closures at Ghent illustrate the complexities associated with this Project, as KU expects that significant excavating of disposed CCR will be required to support the continued operations at Ghent. For example, KU plans to excavate and relocate CCR materials from ATB1 to ATB2 to allow both continued compliance with water discharge permits and uninterrupted operation of the generating units at the station. Also, KU expects to repurpose the Secondary Pond and Reclaim Pond into storm water runoff ponds. Attached to my testimony as Exhibit JNV-6 is the Ghent CCR Management Facilities Plan. The picture below represents the surface impoundments, in blue, that will be closed by 2022 as part of Project 40. The picture also notes possible locations of process water systems, as well.



Q. Is Project 40 economical?

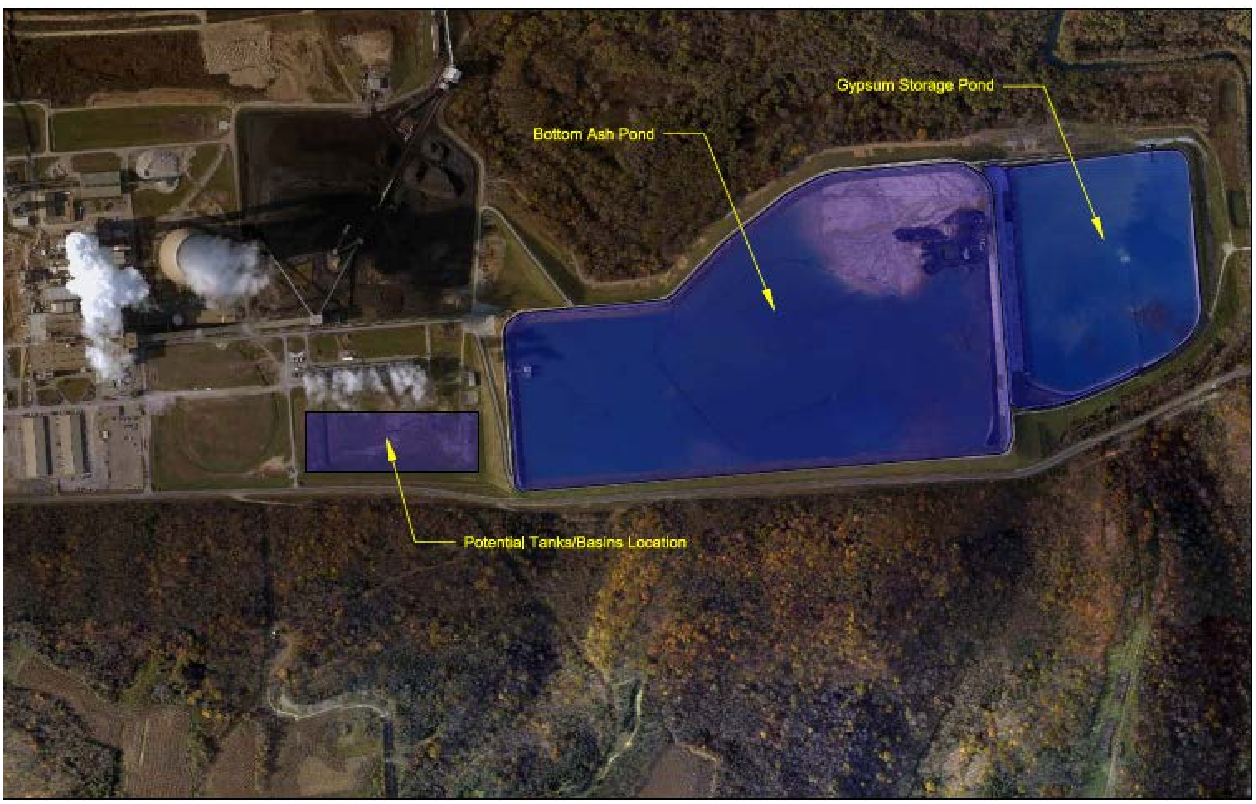
A. Yes. The expected cost of Project 40 is $364.2 million. As discussed in the testimony of Mr. Schram, KU evaluated the costs of the process water systems in Project 40 along with the costs of the other projects in the 2016 Plan for Ghent (Project 37 and 38). Even if the Ghent units are assumed to cease operation after 2021, the proposed projects are least-cost. The CCR management facility closure projects are required regardless of whether the Ghent units continue to operate past 2021.

Q. Is KU requesting a CPCN for Project 40?

A. Yes. This is discussed in the testimony of Mr. Conroy.

Q. Please explain what surface impoundments KU is proposing to close at Trimble County in Project 41.

A. In Project 41, KU is proposing to close two surface impoundments—the Bottom Ash Pond and Gypsum Storage Pond—at Trimble County by 2023. KU plans to cap and close the two surface impoundments, as well as construct process water systems (sequenced appropriately as described above) as part of the Project. Attached to my testimony as Exhibit JNV-7 is the Trimble County CCR Management Facilities Plan. The picture below represents the surface impoundments, in blue, that will be closed by 2023 as part of Project 41, along with proposed locations of process water systems.



Q. Is Project 41 economical?

A. Yes. The expected cost of Project 41 is $105.3 million. As discussed in the testimony of Mr. Schram, the Companies evaluated the costs of the process water systems in KU Project 41 and LG&E Project 30 along with the costs of the other projects in the 2016 Plan for Trimble County (LG&E Project 28). Continuing to operate the Trimble County coal units with the proposed projects is least-cost. The CCR management facility closure projects at Trimble County are required regardless of whether the Trimble County coal units continue to operate.

Q. Is KU requesting a CPCN for Project 41?

A. Yes. This is discussed in the testimony of Mr. Conroy.

Q. Please explain what surface impoundments KU is proposing to close at Brown in Project 42.

A. In Project 42, KU is proposing to close the Auxiliary Ash Pond at Brown by 2023. KU plans to grade the CCR and cap and close the Auxiliary Pond, as well as construct process water systems (sequenced appropriately as described above) as part of the Project. Attached to my testimony as Exhibit JNV-8 is the Brown CCR Management Facilities Plan. The picture below represents the surface impoundment, in blue, that will be closed by 2023 as part of Project 42, along with proposed locations of process water systems.

Q. Is Project 42 economical?

A. Yes. The expected cost of Project 42 is $101.3 million. As discussed in the testimony of Mr. Schram, KU evaluated the costs of the process water systems in Project 42 along with the costs of the other projects in the 2016 Plan for Brown (Project 36). Even if the Brown coal units are assumed to cease operation after 2021, the proposed projects are least-cost. The CCR management facility closure project at Brown is required regardless of whether the Brown coal units continue to operate past 2021.

Q. Is KU requesting a CPCN for Project 42?

A. Yes. This is discussed in the testimony of Mr. Conroy.

Q. What is your recommendation to the Commission?

A. My recommendation is that the Commission approve the projects in the 2016 Plan for recovery by environmental surcharge. I further recommend that the Commission grant KU the CPCNs it has requested.

Q. Does this conclude your testimony?

A. Yes it does.

1285739

VERIFICATION

COMMONWEALTH OF KENTUCKY	)	
	)	**SS:**
COUNTY OF JEFFERSON	)	

The undersigned, **John N. Voyles, Jr.**, being duly sworn, deposes and says that he is Vice President, Transmission and Generation Services for Kentucky Utilities Company and Louisville Gas and Electric Company and an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

John N. Voyles, Jr.

John N. Voyles, Jr.

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)

Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

John N. Voyles, Jr.

Vice President, Transmission and Generation Services
Louisville Gas and Electric Company and Kentucky Utilities Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-4762

Education

Rose-Hulman Institute of Technology, B.S. in Mechanical Engineering - 1976

Previous Positions

LG&E Energy, LLC
October 2010 - Present --Vice President, Transmission and Generation Services

E.ON U.S. LLC
June 2008 – October 2010 --Vice President, Transmission and Generation Services
2003 - 2008 --Vice President, Regulated Generation

LG&E Energy Corp.
February - May 2003 -- Director, Generation Services

Louisville Gas and Electric Company
1998 - 2003 -- General Manager, Cane Run, Ohio Falls and
Combustion Turbines
1996 -1998 -- General Manager, Jefferson County Operations
1991 - 1995 -- Director, Environmental Excellence
1989 - 1991 -- Division Manager, Power Production, Mill Creek
1984 - 1989 -- Assistant Plant Manager, Mill Creek
1982 - 1984 -- Technical and Administrative Manager, Mill Creek
1976 - 1982 -- Mechanical Engineer

Professional Development

Emory Business School -- Management Development Program
Center for Creative Leadership (La Jolla, CA)
University of Louisville -The Effective Executive
Harvard Business School - Finance for the Non-Financial Manager
MIT - Leading Innovation & Growth: Managing the International Energy Co.

Board/Committee Memberships

Fund for the Arts - Board Member
Ohio Valley Electric Co. (OVEC) - Board member and Executive Committee member
Electric Energy, Inc. - Board member

Edison Electric Institute (EEI) - Committee member Energy Supply Executive Advisory Committee and the Environment Executive Advisory Committee
Electric Power Research Institute (EPRI) - Chairman, Research Advisory Committee

KENTUCKY UTILITIES COMPANY
2016 ENVIRONMENTAL COMPLIANCE PLAN (Case No. 2016-00026)

Project	Air Pollutant or Waste/By-Product To Be Controlled	Control Facility	Generating Station	Environmental Regulation / Regulatory Requirement*	Environmental Permit*	Actual or Scheduled Completion	Actual (A) or Estimated (E) Projected Capital Cost ($Million)
36	Fly & Bottom Ash, Gypsum	CCR Storage Landfill (Phase II)	Brown Station	EPA CCR Rule	Division of Waste Mgmt - Landfill Permit	2017	$5.3 (E)
37	SO_2	Wet Flue Gas Desulfurization Improvements	Ghent Unit 2	Clean Air Act (1990) and MATS	Ky Division for Air Quality Title V Permit	2016	$7.0 (E)
38	Mercury (Hg)	Supplemental Mercury Related Control Technologies	Ghent Unit 1	Clean Air Act (1990) and MATS	Ky Division for Air Quality Title V Permit	2016	$2.6 (E)
			Ghent Unit 2			2016	$2.7 (E)
			Ghent Unit 3			2016	$2.7 (E)
			Ghent Unit 4			2016	$2.1 (E)
39	Fly & Bottom Ash, Gypsum	Surface Impoundment Closure	Green River Station	401 KAR Chapter 45	Division of Waste Mgmt - Landfill Permit and Division of Water - KPDES Permit	2018	$56.4 (E)
			Pineville Station			2019	$8.0 (E)
			Tyrone Station			2019	$13.1 (E)
40	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Construction and Construction of New Process Water Systems	Ghent Station	EPA CCR Rule	Division of Waste Mgmt - Landfill Permit and Division of Water - KPDES Permit	2022	$339.9 (E)
41	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Construction and Construction of New Process Water Systems	Trimble County Station (See Note 1)			2023	$101.9 (E)
42	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Construction and Construction of New Process Water Systems	Brown Station			2023	$98.3 (E)
							$640.0

* Sponsored by Witness Revlett

Note 1: KU and LG&E's costs split 48% / 52% respectively.
Note 2: CCP now known as CCR; HAPS now known as MATS; CATR now known as CSAPR

KENTUCKY UTILITIES COMPANY
2016 ENVIRONMENTAL COMPLIANCE PLAN (Case No. 2016-00026)

Project	Air Pollutant or Waste/By-Product To Be Controlled	Control Facility	Generating Station	Estimated Annual Operations and Maintenance Costs (Through 2024)								
				2016	2017	2018	2019	2020	2021	2022	2023	2024
36	Fly & Bottom Ash, Gypsum	CCR Storage Landfill (Phase II)	Brown Station	$0	$0	$0	$0	$0	$0	$0	$0	$0
37	SO_2	Wet Flue Gas Desulfurization Improvements	Ghent Unit 2	$0	$0	$0	$0	$0	$0	$0	$0	$0
38	Mercury (Hg)	Supplemental Mercury Related Control Technologies (See Note 1)	Ghent Unit 1	$0	$0	$0	$0	$0	$0	$0	$0	$0
			Ghent Unit 2	$0	$0	$0	$0	$0	$0	$0	$0	$0
			Ghent Unit 3	$0	$0	$0	$0	$0	$0	$0	$0	$0
			Ghent Unit 4	$0	$0	$0	$0	$0	$0	$0	$0	$0
39	Fly & Bottom Ash, Gypsum	Surface Impoundment Closures	Green River Station	$0	$0	$0	$0	$0	$0	$0	$0	$0
			Pineville Station	$0	$0	$0	$0	$0	$0	$0	$0	$0
			Tyrone Station	$0	$0	$0	$0	$0	$0	$0	$0	$0
40	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Construction and Construction of New Process Water Systems	Ghent Station	$0	$0	$0	$0	$0	$0	$0	$0	$0
41	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Construction and Construction of New Process Water Systems	Trimble County Station (See Note 2)	$0	$0	$0	$0	$0	$0	$0	$0	$0
42	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Construction and Construction of New Process Water Systems	Brown Station	$0	$0	$0	$0	$0	$0	$0	$0	$0

Note 1: The $0 O&M costs for Project 38 represent KU's expectation that the cost of the proposed additives will balance or partially offset costs currently being recovered through the O&M shown in KU’s monthly ECR reports for Project 35 (approved as part of KU’s 2011 Plan).
Note 2: KU and LG&E's costs split 48% / 52% respectively.

Project Engineering – LG&E and KU

CCR Rule – Summary of Scope & Estimate Development

Comparison of CH2M September 2015 Reports vs. 2016 ECR Filing

This document summarizes the comparison of the LG&E and KU (collectively, the "Companies") CCR Rule Compliance Construction and Construction of New Process Water Systems projects included in the January 2016 Environmental Cost Recovery ("2016 ECR") filing to the CH2M Reports. Table 1 below summarizes the cost differences between the CH2M reports and the 2016 ECR filing.

Station	CH2M Report	2016 ECR
E.W. Brown	$ 101,307,000	$ 101,307,000
Ghent	$ 365,482,000	$ 364,177,000
Green River	$ 56,829,000	$ 56,829,000
Mill Creek	$ 189,945,000	$ 196,941,000
Pineville	$ 8,029,000	$ 8,009,000
Trimble County	$ 291,022,000	$ 292,511,000
Tyrone	$ 13,141,000	$ 13,103,000

Table 1 –Comparison of CH2M Reports and 2016 ECR Filing

The basis of the Companies' compliance plan initiated with the engineering conceptual work performed in concert with CH2M, which is an outside engineering firm, throughout 2015. This initial conceptual engineering was finalized in station specific reports issued by CH2M in September of 2015. After the CH2M reports were issued, Project Engineering continued to perform additional analyses of the scope, schedule and cost to align with a refined sequencing of surface impoundment closures and potential selection of the locations for the new water process systems at each station. This ongoing engineering and planning was incorporated into the 2016 ECR filing.

CH2M Reports

Through most of 2015, the Companies worked with CH2M to review each specific surface impoundment that would need to be evaluated for closure. A conceptual closure profile was developed for each surface impoundment with calculations of estimated quantities of material required to fill the impoundment, construct the closure profile and for cover soils to meet the CCR Rule closure requirements. Included in these estimates were the conceptual cost estimates to engineer and construct new process water systems at each plant to manage the CCR transport waters prior to discharge. These new process water systems are required prior to closing the surface impoundments to support the ongoing operation of the stations' process waters. The operation of these new process water systems then allow the surface impoundments to be removed from the stations' process water streams, allowing the de-watering of the surface impoundments prior to the completion of the closure activities.

The September CH2M reports include an executive summary, conceptual closure narrative, estimate of material volumes and areas, implementation schedules, conceptual layout drawings, and the cost estimate spreadsheets for each impoundment at each station.

2016 ECR

Since finalizing the CH2M reports in September 2015, the Companies continued refining the closure plans for each station. This refinement included continued reviews of the sequencing of surface impoundment closures at each station to ensure impacts to each station's operations were minimized. Additional minor scopes were identified that would be required to support the surface impoundment closure plans and to bring some stations into compliance with the CCR Rule. Examples of these minor scope additions was the need to engineer and construct a new ash treatment basin ("ATB") spillway (with dike modifications) along with a new gypsum stack out pad at Mill Creek. Work continued with developing these emergent items and understanding their costs and schedule impacts. Additionally, further review of the CH2M conceptual plans resulted in sequencing changes needed to meet construction and regulatory deadlines while minimizing operations impacts. These additions and modifications were incorporated into the Companies' 2016 ECR plan. A more detailed explanation of these additions to the CCR Rule Compliance Construction and Construction of New Process Water Systems are discussed below.

E.W. Brown

New construction costs for process water tanks/basins in the CH2M report were shifted from 2016 into 2017, with the exception of $500K for engineering activities. Construction is now planned for the new process water systems over a two year period (2017-2018). Moving construction out of 2016 allows continued analysis of the impacts of the Clean Power Plan and Effluent Limitation Guidelines regulations on E.W. Brown, while still meeting the required in service date of early 2019 to support the CCR Rule surface impoundment closure requirements. The shifting of construction dollars out of 2016 resulted in escalation. However, the estimated escalation from the shift was considered minor after reviewing the E.W. Brown estimate, therefore, no additional monies were deemed necessary. Table 1 shows that the cost estimates for E.W. Brown are the same for the CH2M report and the 2016 ECR plan.

Ghent

The first change in the estimated costs at Ghent resulted from determining that the timing for groundwater monitoring for ATB #1 in the CH2M report was incorrect. Groundwater monitoring is required to start in 2016 and continue through 2017 to meet regulatory deadlines. Along with the timing of groundwater monitoring, it was determined that the timing of spend for closure activities of Ghent's surface impoundments was too short. The CH2M report was based on closure activities beginning in 2020 and extending through 2021. Based on Project Engineering's review of the necessary construction period for Ghent, changes were incorporated to start closure activities in 2019 and continue through 2022. The cost differences in the Ghent values in Table 1 are solely attributed to the adjustment in the timing of when spending will occur.

Mill Creek

After receipt of the finalized CH2M report, it was determined that for Mill Creek to remain in compliance with the CCR Rule requirements a new gypsum stack out pad was required to provide the hardscaping required for groundwater protection. The existing gypsum stack out pad was deemed to be deficient in coverage area, as well as the condition of the pad was not adequate to ensure minimal CCR leachate conveyance through the pad into the soil. The 2016 ECR plan for Mill Creek was increased by $3.5M for the construction of a new gypsum stack-out pad. Another scope identified post CH2M report was the need to construct a modified ATB spillway with a larger capability to meet the CCR Rule Hydrologic and Hydraulic requirements. $1.5M was added to the CH2M report values to account for this new scope with the remainder of the cost being consumed through the estimate contingency. Both of these scopes were identified through the Companies' continued review of the new CCR Rule requirements. In addition to the $5.0M added, adjustments to the sequencing surface impoundment closures resulted in approximately $2.0M for escalation.

Trimble County

The Bottom Ash Pond (BAP) required two adjustments to the CH2M report which are reflected in the 2016 ECR plan. The BAP Rock Buttress Project was added to the CH2M report at a cost of approximately $955K to account for scope required to meet the CCR Rule for dike stability that is more stringent in the CCR Rule than current State requirements. Much like the projects at Mill Creek, the Rock Buttress Project was an unplanned project that emerged out of analysis performed on the dikes of the BAP. The project began in October 2015 and was completed in December of 2015. Additionally, in order to comply with the new CCR Rule, the timing of spend for groundwater monitoring at the BAP was adjusted to occur in 2016 through 2017 similar to the adjustments made to the Ghent project. The Gypsum Storage Pond cost was slightly modified to include timing adjustments to the pre-closure/preparation scope. Dollars were shifted from the CH2M report timeline of 2016 through 2018 to 2017 through 2019.

Pineville and Tyrone

The timing of engineering spend was brought forward into 2016 from 2017, and construction quality assurance services were delayed a year, from 2017 to 2018. The Companies deemed it beneficial to begin engineering work at Pineville and Tyrone stations in concert with the active stations to take advantage of lessons learned and economies of scale. Additionally, the timing of several activities for Tyrone in the CH2M report were adjusted to correct a clerical error in the CH2M report.

Green River

No changes have been made to the Green River plan.

TECHNICAL MEMORANDUM

Coal Combustion Residual Pond Closure Evaluation: Green River Generating Station

PREPARED FOR:	Louisville Gas & Electric Company and Kentucky Utilities Company
PREPARED BY:	CH2M HILL, Inc.
DATE:	September 18, 2015

1 Executive Summary

Louisville Gas & Electric Company and Kentucky Utilities Company (LG&E-KU) tasked CH2M HILL, Inc. (CH2M) with performing coal combustion residuals (CCR) evaluations for seven generating stations to develop conceptual CCR ash pond closure approaches and capital cost estimates. The generating stations under evaluation are Ghent, Trimble County, Mill Creek, E.W. Brown, Green River, Tyrone, and Pineville. This technical memorandum applies solely to Green River Generating Station. The following scope activities were completed:

- Reviewed LG&E-KU provided historical CCR information and kickoff meeting workshop (June 2015).
- Developed a CCR pond closure compliance alternative that considers regulatory, geotechnical, and stormwater aspects as it relates to CCR ash ponds and associated cost estimates for the generating station. Discussion of the conceptual approach is included in Section 2, and drawings are contained in Attachment 1. The applicable ponds at Green River are the Main Ash Pond, Ash Treatment Basin (ATB) #2, and the SO2 Pond.
- The estimated cost for closing the three ponds is summarized in Exhibit 1-1. Cost information is included in Attachment 2.

Proposed Conceptual Closure Approach[1]	Low (-30%)	Total Capital Cost	High (+30%)
Main Ash Pond Closure	$12.9 M	$18.4 M	$23.9 M
ATB#2 Closure	$13.7 M	$19.5 M	$25.4 M
SO2 Closure	$9.6 M	$13.8 M	$17.9 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

2 Proposed Conceptual CCR Pond Closure Approach

2.1 Development of Proposed Conceptual CCR Pond Closure Approach

The proposed conceptual CCR pond closure approach was developed based on previous work completed by CH2M and discussions with LG&E-KU during the kickoff meeting on June 23, 2015. The Green River Generating Station is an operating facility with CCR wastewater generated and discharged to the ponds. However, the station will cease generation on October 19, 2015. The following defines the considered approach for closure for each of the three ponds. Additional assumptions are summarized in Section 2.2.

Main Ash Pond

- Regrade ash in pond to balance cuts/fills and install final cover. The surface water drainage channels will be sized to provide retention, and the existing outlet structure will be modified to regulate discharge storm event.

ATB#2

- Completely fill with CCR material and material from the SO2 Pond, and install final cover. The surface water drainage channels will be sized to provide retention, and the existing outlet structure may be modified or breach of the dike to regulate discharge storm event.

SO2 Pond

- Clean closure by excavation of CCRs from the SO2 Pond and load, transport, and place in ATB #2. Clean closure means removing CCR material, confirming removal, and documenting a report that verifies removal. The dikes will be left in place so the pond may be used in the future as a process pond.

Regulatory Strategy

- Compliance with the Final CCR Rule.
- Closure activities will be permitted by the Kentucky Department of Environmental Protection (KYDEP) under the Final CCR Rule.

The volume of CCR to be managed (that is, excavated, placed and regarded within the ponds) was developed using computer aided engineering (CAE) software and AutoCAD drawings provided by LG&E-KU. The proposed conceptual pond closure approach is presented in drawings provided in Attachment 1.

2.2 Design Assumptions

General

The general design assumptions used for the proposed conceptual CCR pond closure approach is as outlined in our proposal and discussed with LG&E-KU at our kickoff meeting on June 23, 2015, and summarized below:

- The existing conditions were established from AutoCAD files provided by LG&E-KU on June 23, 2015.

- In order to estimate the volume of CCR in the ATB #2 and SO2 Pond, a bottom surface was estimated and developed in AutoCAD based on data and elevations provided by LG&E-KU. It was determined that the SO2 Pond CCRs could be placed in ATB #2 and closed. It also was determined that the ash in the Main Ash Pond could be regraded to balance cuts/fills and closed.
- Where bathometric data were not supplied (ATB #2 and SO2 Pond), an assumed average depth of water was over the wet area from Google Earth images (dated 2015) accessed June 30, 2015.
- Volume calculations are based on an in-place (moist) density 1 ton per cubic yard (74 pounds per cubic foot) for all cut and placed CCR material, and does not account for shrinkage/swell during placement. Quantities do not consider settlement of in-place CCR because of dewatering or new fill/cover loads. Changes to these assumptions should be verified during design development.
- It is assumed these CCR ponds meet the structural integrity requirements, and the pond closure approaches are geotechnically stable as shown. This information will be confirmed during design development.
- Improvements to prepare a workable CCR surface include removing surface water, localized regrading to facilitate dewatering, and installing a geotextile, a layer of dry CCR, and geogrid.
- Final cover surface drainage channels are inside the perimeter dikes, and would include final cover and be lined with structural reinforcement (turf reinforcement mat, riprap etc.), as necessary.
- The dikes will be used without increasing or decreasing height. Some improvements may be required based on the U.S. Environmental Protection Agency (USEPA) dam assessment findings but are outside this project scope.
- CCR within the pond will be regarded and used to fill the pond beneath the final cover.
- The final cover (cap) is assumed to consist of 40-mil linear low-density polyethylene liner (LLDPE) placed directly on subgrade (CCR) and covered with geocomposite and 2 feet of soil cover. A vegetative cover will be established. The 2 feet of soil cover will consist of 1.5 feet of soil and 0.5 foot of vegetated topsoil. The final cover will extend on top of the dikes, due to the potential that ash may be contained within the dikes.
- A 5 percent slope was used for the final cover.
- No special dewatering structures will be required to remove the decant water from the wet coal ash materials in the ash ponds or localized dewatering of the ash to facilitate cover construction.
- Modification will be required to the National Pollutant Discharge Elimination System (NPDES) discharge structure location to ensure permit compliance.
    - The CCR pond discharge structures will be modified to ensure stormwater flows to the NPDES discharge structure and permit compliance.
    - The waste material from the discharge structures will be disposed of properly.
- It is anticipated these pond closure approaches will handle the stormwater runoff, but verification will be performed in design development.

Main Ash Pond

The general design assumptions used for the proposed conceptual closure approach (Main Ash Pond) is as derived from the LG&E-KU drawing and summarized below:

- The existing outfall location of the pond is to be modified to discharge surface drainage to the NPDES discharge location by gravity flow.
- A second discharge structure will be installed at the southern corner of the pond.

- **T**he CCR pond closure approach includes filling the Main Ash Pond with dry CCR material within but below the existing top of dike elevation and including retention and control of stormwater.
- The Main Ash Pond will receive CCR material from the generating station until closure. CCR material will include wet discharges as summarized in Table 2-1. Material accumulation in the Main Ash Pond will continue until October 19, 2015.
- Surface water within the Main Ash Pond will be removed before closure begins to allow surface stabilization and dry material placement.
- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade and will include the components described in the assumptions below. Conceptual grades are shown in Attachment 1, Exhibit 2-1. Significant grading features include the following:
  - A perimeter drainage ditch is shown inside the perimeter dike. The ditch shows a high point near the west end, dropping at approximately 0.5 percent to the east. One existing discharge penetration is shown through the dike leading to the NPDES permitted outfall.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 10 feet above the ditch invert or the top elevation of the berm crest, whichever is lower. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2-1 has an airspace capacity of approximately 368,000 cubic yards above the existing CCR surface grade.

ATB #2

The general design assumptions used for the proposed conceptual CCR pond closure approach (ATB #2) is as derived from the LG&E-KU drawing and summarized below:

- Surface water would be discharged off the final cover through the existing discharge outlet pipe on the south side. The discharge should be routed around ATB #2 to the existing drainage structures.
- The stormwater drainage channel will be designed along the western edge of ATB #2 to support with offsite stormwater drainage currently directed to ATB #2.
- The ATB #2 dike will be used without modification; however, some improvements may be required based on the USEPA dam assessment findings (not part of this project).
- The CCR pond closure approach includes filling ATB #2 with CCR material within but below the existing top of the perimeter dike elevation and including retention and control of stormwater.
- The primary outlet structure will be modified, and removed portions will be demolished and disposed.
- Surface water within ATB #2 will be removed before closure begins to allow surface stabilization and dry material placement.
- Surface water will be discharged off the final cover through the existing discharge outlet pipe on the east side or breach in dike. The discharge is to the existing drainage structures.
- No special dewatering structures will be required to remove decant water from the wet coal ash materials in the ash ponds or localized dewatering of the ash to facilitate cover construction.
- ATB #2 is developed as a multiple mound structure. Three mounds have been designed for this concept.
- ATB #2 to receive material from the SO2 Pond. Material will be trucked from the SO2 Pond to an unloading location. Material quantities are summarized in Table 2-2C. Material accumulation in ATB #2 will be completed by October 19, 2015.

- CCR materials from the SO2 Pond will be placed, graded, and used to fill the pond beneath the final cover.
- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade, and will include the components described in the assumptions below. Conceptual grades are shown in Attachment 1, Exhibit 2-2. Significant grading features include the following:
  - A perimeter drainage ditch is shown within the berm. The ditch shows a high point near the west end, dropping at approximately 0.5 percent to the east. One existing discharge penetration is shown through the dike leading to the NPDES permitted outfall.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 10 feet above the ditch invert or the top elevation of the berm crest, whichever is lower. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2-2 has an airspace capacity of approximately 492,000 cubic yards above the existing CCR surface grade.
- Airspace capacity under ABT #2 cover could be increased (or reduced), as necessary, by approximately 58,900 cubic yards per foot by extending the 4H:1V ditch slope height to the full perimeter berm elevation, or reducing the maximum height of one or all three mounds. Capacity could be reduced by modifying the 4H:1V ditch slope height. Ditch grades should also be refined to create local low points at the perimeter drainage ditch discharge point. Such design refinements should not significantly change the estimated closure costs.

SO2 Pond

The general design assumptions used for the proposed conceptual design (SO2 Pond) is as derived from the LG&E-KU drawing and summarized below:

- The top of the dike built is 10 feet wide, with 2.5H:1V side slopes.
- The top of the dike elevation is at elevation 405 feet.
- The original (bottom) elevation of the SO2 Pond is at elevation 385 feet.
- Excavation of the SO2 Pond will be to elevation 384 feet for clean closure.
- CCR will be removed from the SO2 Pond and loaded, transported, and placed in ATB #2.
- A final cover of fabriform will be constructed. Restoration construction will include preliminary grading to shape the cover subgrade, and will include the components described in the assumptions below. Conceptual grades are shown in Attachment 1, Exhibit 2-3. Significant grading features include the following:
  - The fabriform installation will consist of 60-mil HDPE liner, 10 ounce geotextile, and 0.5 foot fabriform cover.
  - A uniform slope along the bottom of the pond sloping to the existing pump station. The existing pump station will discharge upgraded stormwater piping leading to the NPDES permitted outfall.
- Improvements to of pump station structure and piping.
  - It is assumed that the pump station will have enough capacity to pump the stormwater to the NPDES permitted outfall.

3 Estimated Material Volumes and Areas

The volume of fly ash, bottom ash, and gypsum generated by the station and available for use as fill is summarized in Table 2-1. Total production rates by year are as communicated by LG&E-KU on June 23, 2015, and the portion sent to the ponds each year are based on the 2015 year to date production rates provided by LGE-KU on July 1, 2015.

Table 2-1. Estimated CCR Production by Year – Total and Distribution by Ponds

	Total CCR Production (Tons)				Assumed CCR Distribution (Tons)		
Year	**Bot Ash**	**Fly Ash**	**Gypsum**	**TOTAL**	**Main Ash Pond [1]**	**ATB #2**	**SO2 Pond [2]**
2015	8,259	33,035	-	**41,294**	41,294	-	-
2016 [3]	1,865	7,460	-	**9,325**	9,325	-	-
TOTAL					**50,619**	**0**	**0**

Notes:
[1] Assumes that 100 percent of bottom ash and fly ash will be sent to the Main Ash Pond through October 19, 2015, which will be the baseline for closure design.
[2] Assumes that all material from the SO2 Pond will be disposed of within ATB #2.
[3] Assume CCR generation will stop in October 2015. CCR generation in 2016 is the result of station decommissioning.

The proposed CCR pond closure approach was developed using computer aided engineering (CAE) software and AutoCAD files provided by LG&E-KU as described under assumptions above. Summaries of the estimated material quantities for each pond are shown in Tables 2-2A, 2-2B, and 2-2C.

Table 2-2A. Proposed Conceptual Pond Closure Approach Estimated Material Quantities – Main Ash Pond

Item	Units	Quantity
Total surface area	AC	41.1
Standing surface water (to remove)	GAL	15,074,898
Length of perimeter	LF	6,520
CUT: Existing Surface to Final Cover Subgrade		
CCR cut in 2017 - for Main Ash Pond	CY	160,500
Cut/regrade for cover subgrade/ditch	CY	13,800
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**370,800**
FILL SOURCES:		
From cut for final cover subgrade	CY	174,300
TOTAL POTENTIAL FILL through 2016	**CY**	**50,600**
Final cover soil volume	CY	145,900
Potential Excess Fill: (to be accommodated in settlement or sent to ATB#2)	**CY**	**2,800**

Table 2-2B. Proposed Conceptual Pond Closure Approach Estimated Material Quantities –ATB #2

Item	Units	Quantity
Total surface area	AC	36.5
Standing surface water (to remove)	GAL	34,312,100
Length of perimeter	LF	5,000
CUT: Existing Surface to Final Cover Subgrade		
Cut for final cover: Stormwater channel	CY	123,000
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**451,300**
FILL SOURCES:		
Cut for final cover: Stormwater channel	CY	123,000
From the SO2 Pond		198,800
TOTAL POTENTIAL FILL through 2016	**CY**	**0**
Final cover soil volume	CY	129,500
Potential Excess Airspace: (to be optimized in final design)	**CY**	**40,700**

Table 2-2C. Proposed Conceptual Pond Closure Approach Estimated Material Quantities –SO2 Pond

Item	Units	Quantity
Total surface area	AC	10.1
Standing surface water (to remove)	GAL	13,141,000
Length of perimeter	LF	2,780
CUT: Existing Surface to Final Cover Subgrade		
CCR cut in 2016 - for Temporary Treatment Pond - Send to ATB #2	CY	198,800
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**17,900**
FILL SOURCES:		
TOTAL POTENTIAL FILL through 2016	**CY**	**0**
Vegetative layer volume	CY	17,900
Potential Excess Fill/Airspace: (to be optimized in final design)	**CY**	**0**

The proposed conceptual pond closure approach shows that CCR from the SO2 Pond can be placed in ATB #2 and closed in-place. The SO2 Pond dikes may be able to be knocked down and used for final cover. However, this will need to be coordinated with the appropriate regulatory agency and therefore these volumes were not included in this evaluation. This estimate accounts for the usage of 1 foot of vegetative layer to be imported and placed over the SO2 Pond for clean closure. There is sufficient area available in the Main Ash Pond to balance ash cut/fills volumes and close in-place.

4 Schedule

Exhibits 2-4 in Attachment 3 show the proposed schedule to complete the design, permitting, and construction for each of the pond closures.

5 Construction Cost Estimate

The estimated construction cost for closing the ponds as described in Section 2 is shown within Attachment 2.

Proposed Conceptual Closure Design	Low (-30%)	Total Capital Cost	High (+30%)
Main Ash Pond Closure	$12.9 M	$18.4 M	$23.9 M
ATB#2 Closure	$13.7 M	$19.5 M	$25.4 M
SO2 Closure	$9.6 M	$13.8 M	$17.9 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

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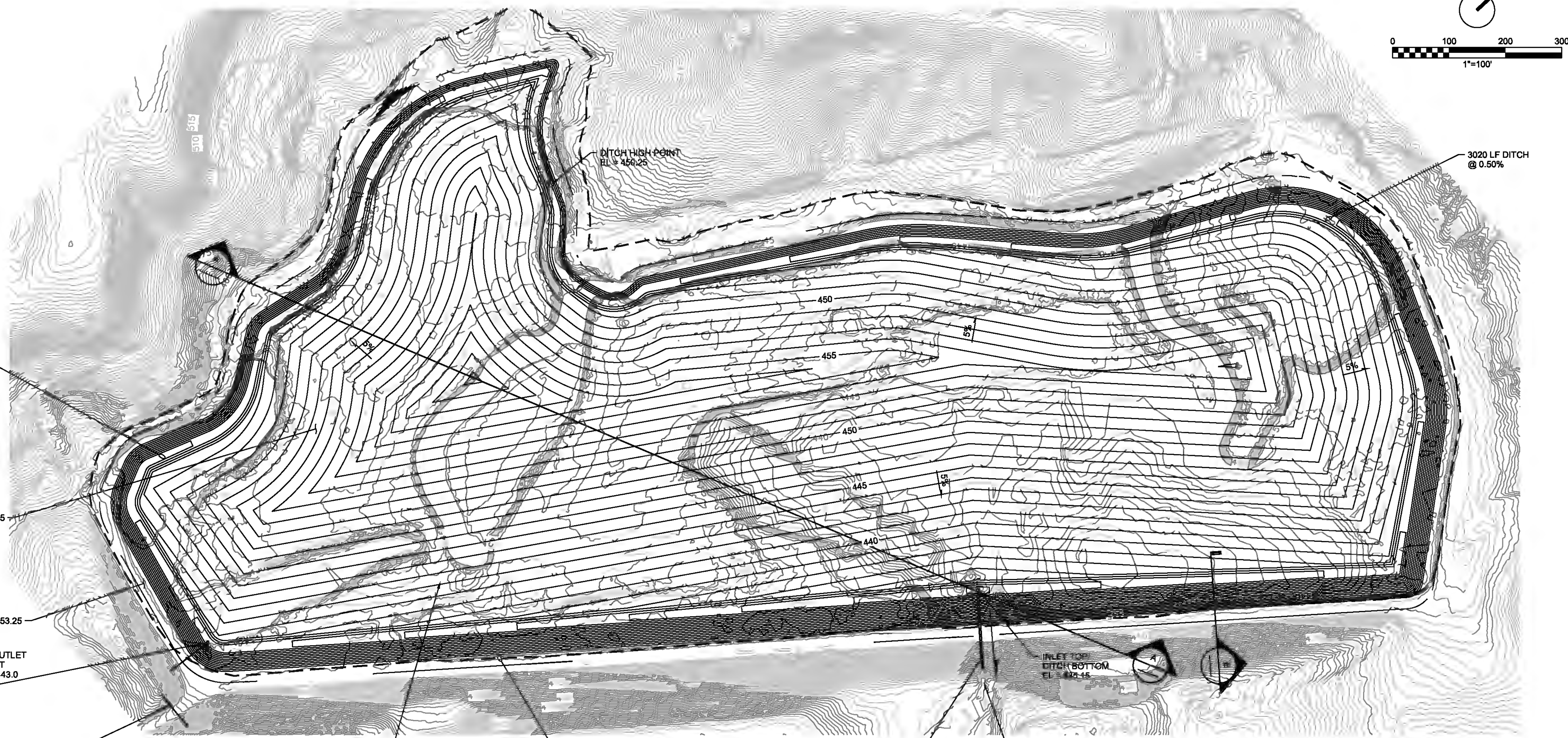
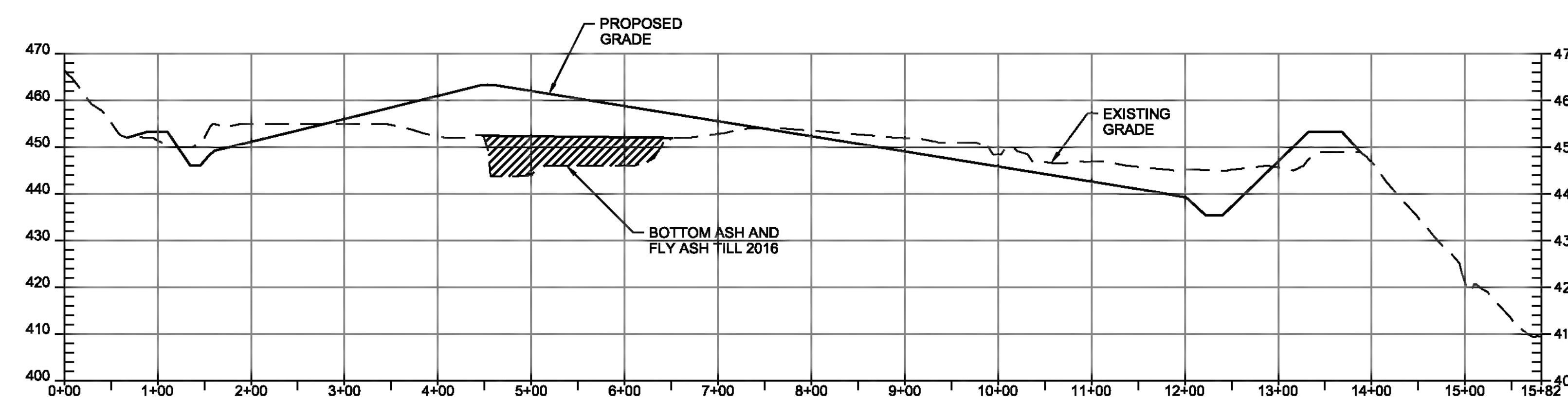
Attachment 1
Proposed Conceptual Alternative
CCR Closure





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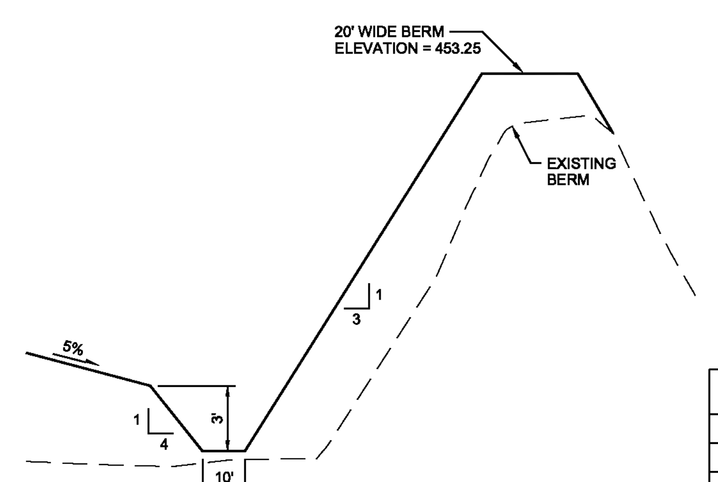

B SECTION
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ITEM	UNITS	MAIN ASH POND
TOTAL SURFACE AREA	ACRES	41.1
LENGTH OF PERIMETER	LINEAR FEET	6520
CUT	CUBIC YARDS	174,193
FILL TO FINAL GRADE	CUBIC YARDS	367,751
COVER FILL TO FINAL GRADE	CUBIC YARDS	145,877
EXCESS MATERIAL	CUBIC YARDS	7,160
TOTAL AIRSPACE AVAILABLE	CUBIC YARDS	-

NO.	DATE	REVISION	BY	APVD
DSGN	DR	CHK	APVD	

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL®

GREEN RIVER
CONCEPTUAL CLOSURE PLAN
MAIN ASH POND

VERIFY SCALE
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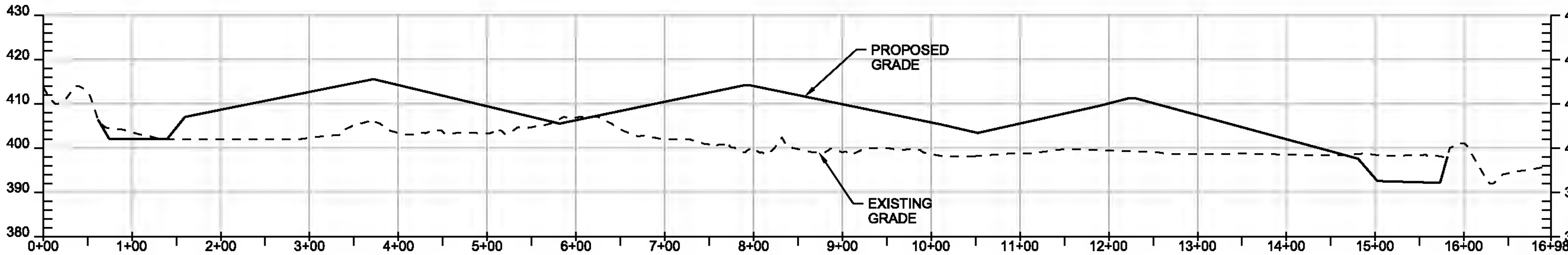

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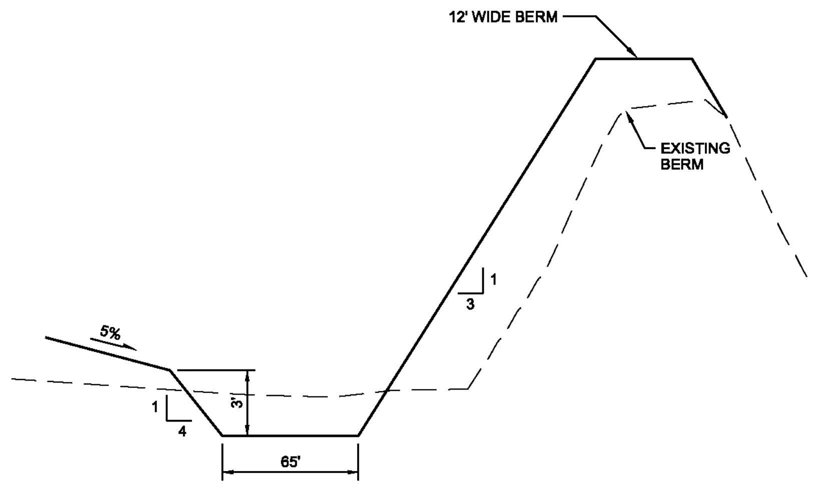

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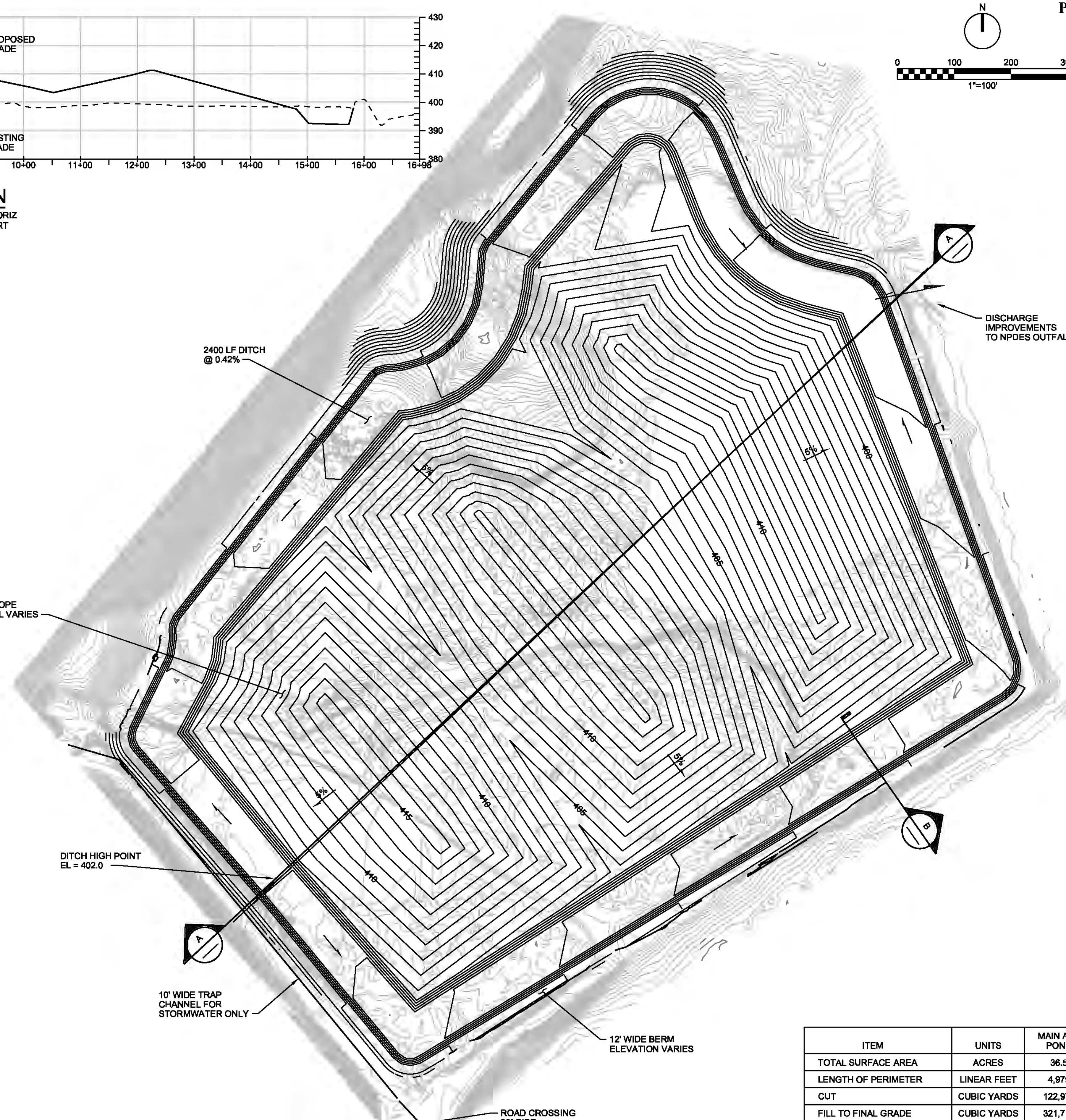

ITEM	UNITS	MAIN ASH POND
TOTAL SURFACE AREA	ACRES	36.5
LENGTH OF PERIMETER	LINEAR FEET	4,979
CUT	CUBIC YARDS	122,977
FILL TO FINAL GRADE	CUBIC YARDS	321,713
COVER FILL TO FINAL GRADE	CUBIC YARDS	129,484
EXCESS MATERIAL	CUBIC YARDS	-
TOTAL AIRSPACE AVAILABLE	CUBIC YARDS	40,723

NO.	DATE	REVISION	BY	APVD

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COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL®

GREEN RIVER
CONCEPTUAL CLOSURE PLAN
ASH TREATMENT POND #2

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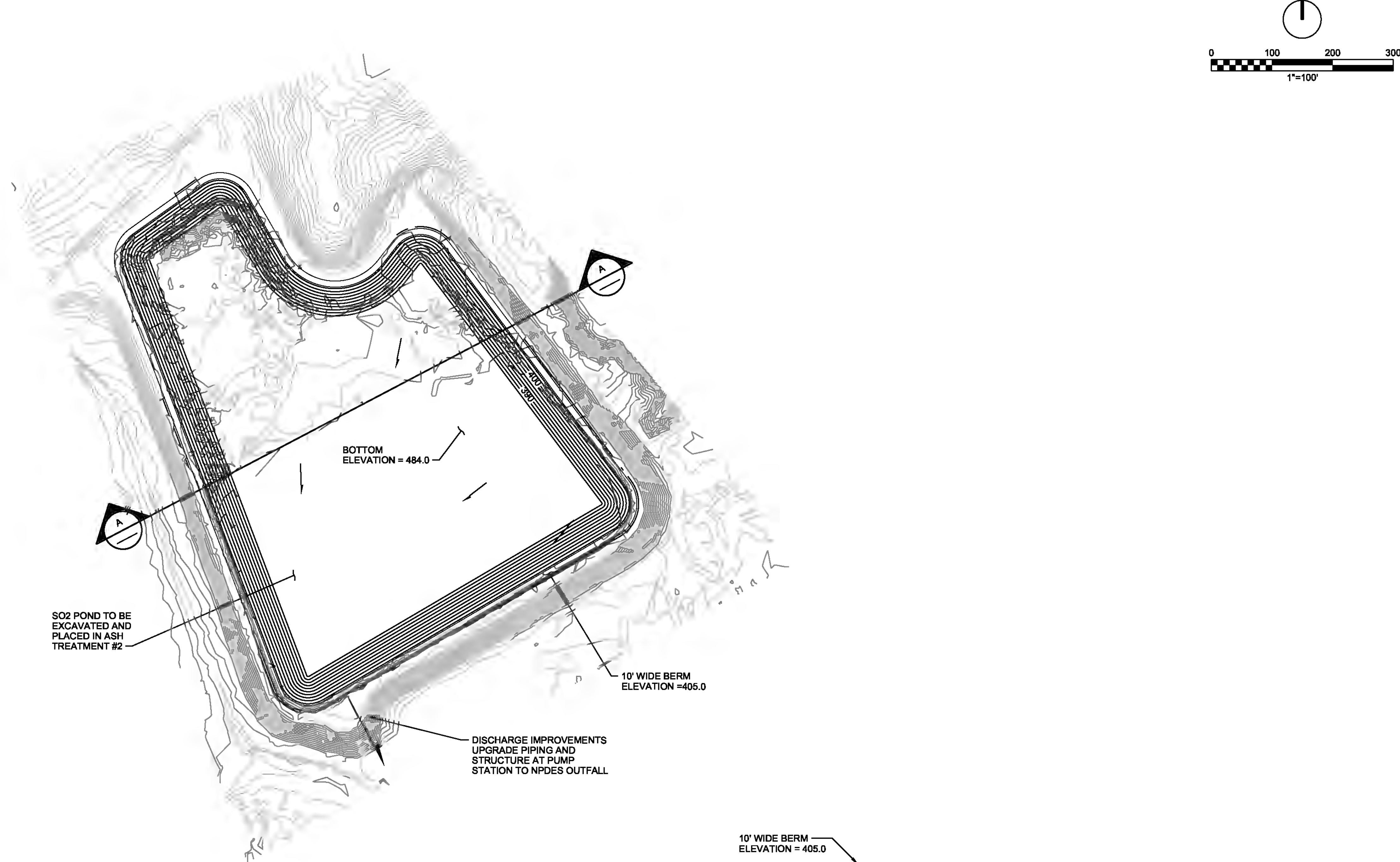

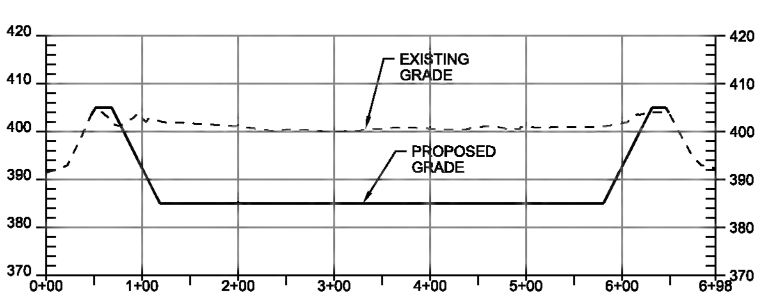

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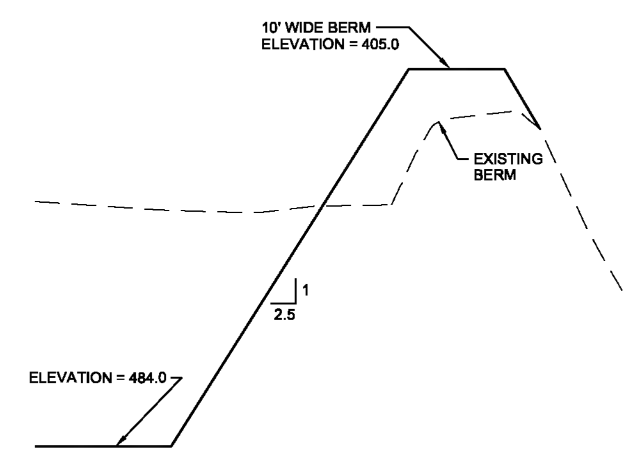

B SECTION
NTS

ITEM	UNITS	SO2 POND
TOTAL SURFACE AREA	ACRES	10.1
LENGTH OF PERIMETER	LINEAR FEET	2780
CUT	CUBIC YARDS	198,736
FILL TO FINAL GRADE	CUBIC YARDS	-
COVER FILL TO FINAL GRADE	CUBIC YARDS	17,892
EXCESS MATERIAL (TO ATB2)	CUBIC YARDS	198,736
TOTAL AIRSPACE AVAILABLE	CUBIC YARDS	-

NO. DATE REVISION BY APVD
DSGN DR CHK APVD

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL®

GREEN RIVER
CONCEPTUAL CLOSURE PLAN
SO2 POND

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Attachment 2
Proposed Conceptual Alternative
Cost Estimate

COST SUMMARY

Site:	Green River Generation Station	**Base Year:**	2015
Location:	Central City, Kentucky	**Date:**	September
Phase:	Proposed Conceptual CCR Closure	**ROM Level:**	Class 4

	Main Ash Pond	Ash Treatment Basin # 2	SO2 Pond
Remedial Technology	Fill Main Ash Pond with CCR's, cover and close in-place.	Fill ATB#2 Pond with CCR's from SO2 Pond, cover and close in-place.	Remove CCR's and clean close.
Description	Fill with CCR materials. Fill as needed for grading. Cover and close in place.	Fill ATB#2 Pond with CCR's from SO2 Pond and facility operations, cover and close in-place.	Completely cleaned of ash. CCRs placed in ATB#2 pond. Grade to drain and clean close.
Impoundment Closure	$17,771,575	$18,882,051	$13,287,123
LG&E Overhead	$622,005	$660,872	$465,049
New Construction	$0	$0	$0
LG&E Overhead	$0	$0	$0
Total Initial Costs	$18,393,581	$19,542,923	$13,752,172
Upper ROM Range	$23,911,655	$25,405,799	$17,877,824
Lower ROM Range	$12,875,506	$13,680,046	$9,626,521

This is not an offer for construction and/or project execution. Please note, these order of magnitude cost estimates are assumed to represent the actual installed cost within the range of - 30 percent to + 30 percent of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

ver 6.5

CCR Rule - Green River Generating Station Cost Estimate - Main Ash Pond

21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Main Ash Pond	**$18,393,581**	**3%**	**8%**	**37%**	**52%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%											
IMPOUNDMENT CLOSURE	**$13,670,443**	**3%**	**8%**	**37%**	**52%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%	**$435,000**	**$1,089,899**	**$5,456,600**	**$8,034,374**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$15,015,873**
Mobilization/Demobilization	**$50,000**	0%	0%	80%	20%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$43,264	$11,249	$0	$0	$0	$0	$0	$0	**$54,513**
Sediment & Erosion Control	**$32,500**	0%	0%	90%	10%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$31,637	$3,656	$0	$0	$0	$0	$0	$0	**$35,293**
Site Preparation	**$76,750**	0%	0%	80%	20%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$66,410	$17,267	$0	$0	$0	$0	$0	$0	**$83,677**
Dewatering	**$301,498**	0%	20%	80%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$62,712	$260,880	$0	$0	$0	$0	$0	$0	$0	**$323,592**
Repair On-Site Pond Embankments	**$250,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$270,400	$0	$0	$0	$0	$0	$0	$0	**$270,400**
Utility Services	**$100,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$108,160	$0	$0	$0	$0	$0	$0	$0	**$108,160**
Perimeter Berm (not required)	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	**$179,765**	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$97,217	$101,106	$0	$0	$0	$0	$0	$0	**$198,322**
Pre-Closure / Preparation	**$3,269,419**	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$1,768,102	$1,838,826	$0	$0	$0	$0	$0	$0	**$3,606,928**
Final Cover	**$5,811,206**	0%	0%	30%	70%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$1,885,620	$4,575,771	$0	$0	$0	$0	$0	$0	**$6,461,391**
Mechanical Improvements/Additions	**$0**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Primary Outlet Structure	**$535,000**	0%	0%	20%	80%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$115,731	$481,442	$0	$0	$0	$0	$0	$0	**$597,173**
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	**$175,905**	0%	0%	30%	70%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$57,078	$138,508	$0	$0	$0	$0	$0	$0	**$195,586**
Groundwater Monitoring	**$238,400**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%	$0	$49,587	$103,141	$107,267	$0	$0	$0	$0	$0	$0	**$259,996**
Conceptual Design	**$200,000**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$200,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$200,000**
Final Design and Permitting and permitting support	**$800,000**	20%	80%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$160,000	$665,600	$0	$0	$0	$0	$0	$0	$0	$0	**$825,600**
PDI	**$75,000**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$75,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$75,000**
Construction Management, including CQA and OE services	**$1,500,000**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%	$0	$312,000	$648,960	$674,918	$0	$0	$0	$0	$0	$0	**$1,635,878**
Closure Report	**$75,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$84,365	$0	$0	$0	$0	$0	$0	**$84,365**
Subtotal	**$13,670,443**												**$435,000**	**$1,089,899**	**$5,456,600**	**$8,034,374**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	$15,015,873
Contingency	$4,101,133	3%	8%	37%	52%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$2,252,381	$2,252,381	$0	$0	$0	$0	$0	$0	**$4,504,762**
Subtotal with Contigency	**$17,771,575**												**$435,000**	**$1,089,899**	**$7,708,981**	**$10,286,755**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$19,520,635**
LG&E & KU Overheads	$622,005	3%	8%	37%	52%	0%	0%	0%	0%	0%	0%	100%	$15,225	$38,146	$269,814	$360,036	$0	$0	$0	$0	$0	$0	**$683,222**
Project Total	**$18,393,581**												**$450,000**	**$1,128,000**	**$7,979,000**	**$10,647,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$20,204,000**

Assumptions	
LG&E & KU Overheads	3.50%
Escalation	4.00%
Contingency	30.00%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Mill Creek Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Green River Generating Station — COST ESTIMATE SUMMARY

Site: Green River Generating Station
Location: Central City, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Main Ash Pond
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$50,000.00	$50,000	
SUBTOTAL Mobilization/Demobilization				**$50,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	6,500	LF	$5.00	$32,500	
SUBTOTAL Sediment & Erosion Control				**$32,500**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350.00	$51,750	Assume 5 acres (Clearing embankments and around pond)
Surveying	1	LS	$15,000.00	$15,000	
Utility Locating	1	EA	$10,000.00	$10,000	
SUBTOTAL Surveying				**$76,750**	
Dewatering					
Dewatering and discharge through NPDES permit	15,074,898	GL	$0.02	$301,498	Assumes treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$301,498**	
Repair On-Site Pond Embankments					
Modifications on existing CCR Pond embankments	1	LS	$250,000.00	$250,000	No existing dam safety deficiencies are recognized for normal loading conditions, but rare or extreme hydrologic events may result in a dam safety deficiency. Risk may be in the range to take further action. In addition, historic and recent surface slope repairs, wet conditions at piezometer P-5 below the recent slope repair, series configuration and location above Ash Treatment Basin #2 warrants a conservative rating and diligent monitoring of the impoundment (per EPA Dam Assessment report).
SUBTOTAL Repair On-Site Pond Embankments				**$250,000**	
Utility Services					
Utility Modifications	1	LS	$100,000.00	$100,000	LG&E-KU to complete.
Shoring for tower foundations	1	LS	$0.00	$0	Shoring assumed to not be required.
SUBTOTAL Utility Modifications				**$100,000**	
Perimeter Berm (not required)	**1**	**LS**	**$0.00**	**$0**	
SUBTOTAL				**$0**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	4,748	CY	$37.86	$179,765	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$179,765**	
Pre-Closure / Preparation					
Cut/regrade for cover subgrade/ditch	174,193	CY	$8.10	$1,410,963	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Placement and Compaction	174,193	CY	$2.39	$416,321	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	174,193	CY	$0.57	$99,290	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	197,472	SY	$0.20	$39,494	RSM 31 22 16.10 3300
Geotextile (as needed, assume 100% of 40.8 acre area for filling)	238,709	SY	$2.46	$587,224	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of 40.8 acre area f	238,709	SY	$3.00	$716,126	CH2M HILL, recent quote on similar project
SUBTOTAL Geotextile (as needed, assume 100% of 40.8 acre area for filling)				**$3,269,419**	
Final Cover					
Final Cover: 40-mil Tex/smooth LLDPE	1,790,316	SF	$0.65	$1,163,705	
Geocomposite (includes materials and installation)	1,790,316	SF	$0.55	$984,674	
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	132,615	CY	$20.00	$2,652,300	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	132,615	CY	$4.36	$578,201	$4.36 haul; 12cy, 15mph, 2 mile, 15 minute (RS Means 31 23 23.20 1018)
- Placement and Compaction	132,615	CY	$2.39	$316,950	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	132,615	CY	$0.57	$75,591	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	198,924	SY	$0.20	$39,785	RSM 31 22 16.10 3300
SUBTOTAL - Moisture Conditioning/Dust Control				**$5,811,206**	
Mechanical Improvements/Additions					
Piping from Ash Pond to Plant	0	LS	$455,000.00	$0	plant not operating
Physical or Chemical Treatment plus CO2 Injection System	0	LS	$125,000.00	$0	plant not operating
SUBTOTAL Piping from Ash Pond to Plant				**$0**	
Primary Outlet Structure					
Outfall to be upgraded	1	LS	$385,000.00	$385,000	May 2015 cost estimate
Second Outfall Structure	1	LS	$150,000.00	$150,000	Install 24-inch culvert, Inlet and outlet structure within the embankment
SUBTOTAL Outfall to be upgraded				**$535,000**	
Emergency Outlet Structure					
Modify	0	LS	$0.00	$0	Not Applicable
SUBTOTAL Emergency Outlet Structure				**$0**	
Surface Restoration					
Mechanical Seeding & Mulching	41.1	AC	$3,550.00	$145,905	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$30,000.00	$30,000	
SUBTOTAL Mechanical Seeding & Mulching				**$175,905**	
Groundwater Monitoring					
New Monitoring wells, 4" (6,695 LF perimeter)	9	EA	$17,600.00	$158,400	assumes well spacing 1 well/750 feet; 9 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL Groundwater Monitoring				**$238,400**	
SUBTOTAL CONSTRUCTION				**$11,020,443**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$200,000.00	$200,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$800,000.00	$800,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$1,500,000.00	$1,500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$1,500,000.00	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$2,650,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$13,670,443**	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Green River Generating Station Cost Estimate - ATB #2

21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #2	**$19,542,923**	**4%**	**7%**	**39%**	**50%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%
IMPOUNDMENT CLOSURE	**$14,524,654**	**4%**	**7%**	**39%**	**50%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%
Mobilization/Demobilization	**$50,000**	0%	0%	80%	20%	0%	0%	0%	0%	0%	0%	100%
Sediment & Erosion Control	**$25,500**	0%	0%	90%	10%	0%	0%	0%	0%	0%	0%	100%
Site Preparation	**$118,500**	0%	0%	80%	20%	0%	0%	0%	0%	0%	0%	100%
Dewatering	**$686,241**	0%	20%	80%	0%	0%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$250,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Utility Services	**$50,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Perimeter Berm (not required)	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	**$109,373**	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Pre-Closure / Preparation	**$3,536,538**	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Final Cover (Install FML)	**$6,222,348**	0%	0%	30%	70%	0%	0%	0%	0%	0%	0%	100%
Surface Water Features	**$445,778**	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Restoration	**$159,575**	0%	0%	30%	70%	0%	0%	0%	0%	0%	0%	100%
Groundwater Monitoring	**$220,800**	0%	40%	60%	0%	0%	0%	0%	0%	0%	0%	100%
Conceptual Design	**$200,000**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$800,000**	40%	60%	0%	0%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$1,500,000**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%
Closure Report	**$75,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
Subtotal	**$14,524,654**											
Contingency	$4,357,396	4%	7%	39%	50%	0%	0%	0%	0%	0%	0%	100%
Subtotal with Contigency	**$18,882,051**											
LG&E & KU Overheads	$660,872	4%	7%	39%	50%	0%	0%	0%	0%	0%	0%	100%
Project Total	**$19,542,923**											

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #2											
IMPOUNDMENT CLOSURE	**$595,000**	**$1,045,791**	**$6,164,736**	**$8,126,514**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$15,932,041**
Mobilization/Demobilization	$0	$0	$43,264	$11,249	$0	$0	$0	$0	$0	$0	**$54,513**
Sediment & Erosion Control	$0	$0	$24,823	$2,868	$0	$0	$0	$0	$0	$0	**$27,691**
Site Preparation	$0	$0	$102,536	$26,659	$0	$0	$0	$0	$0	$0	**$129,195**
Dewatering	$0	$142,738	$593,791	$0	$0	$0	$0	$0	$0	$0	**$736,529**
Repair On-Site Pond Embankments	$0	$0	$270,400	$0	$0	$0	$0	$0	$0	$0	**$270,400**
Utility Services	$0	$0	$54,080	$0	$0	$0	$0	$0	$0	$0	**$54,080**
Perimeter Berm (not required)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	$0	$0	$59,149	$61,515	$0	$0	$0	$0	$0	$0	**$120,664**
Pre-Closure / Preparation	$0	$0	$1,912,560	$1,989,062	$0	$0	$0	$0	$0	$0	**$3,901,622**
Final Cover (Install FML)	$0	$0	$2,019,028	$4,899,507	$0	$0	$0	$0	$0	$0	**$6,918,535**
Surface Water Features	$0	$0	$241,077	$250,720	$0	$0	$0	$0	$0	$0	**$491,797**
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	$0	$0	$51,779	$125,650	$0	$0	$0	$0	$0	$0	**$177,429**
Groundwater Monitoring	$0	$91,853	$143,290	$0	$0	$0	$0	$0	$0	$0	**$235,143**
Conceptual Design	$200,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$200,000**
Final Design and Permitting and permitting support	$320,000	$499,200	$0	$0	$0	$0	$0	$0	$0	$0	**$819,200**
PDI	$75,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$75,000**
Construction Management, including CQA and OE services	$0	$312,000	$648,960	$674,918	$0	$0	$0	$0	$0	$0	**$1,635,878**
Closure Report	$0	$0	$0	$84,365	$0	$0	$0	$0	$0	$0	**$84,365**
Subtotal	**$595,000**	**$1,045,791**	**$6,164,736**	**$8,126,514**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$15,932,041**
Contingency	$0	$0	$2,389,806	$2,389,806	$0	$0	$0	$0	$0	$0	**$4,779,612**
Subtotal with Contigency	**$595,000**	**$1,045,791**	**$8,554,542**	**$10,516,320**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$20,711,653**
LG&E & KU Overheads	$20,825	$36,603	$299,409	$368,071	$0	$0	$0	$0	$0	$0	**$724,908**
Project Total	**$616,000**	**$1,082,000**	**$8,854,000**	**$10,884,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$21,436,000**

Assumptions	
LG&E & KU Overheads	3.50%
Escalation	4.00%
Contingency	30.00%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Mill Creek Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Green River Generating Station
Location: Central City, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #2
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$50,000.00	$50,000	
SUBTOTAL Mobilization/Demobilization				**$50,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	5,100	LF	$5.00	$25,500	
SUBTOTAL Sediment & Erosion Control				**$25,500**	
Site Preparation					
Clearing/Grubbing	10	AC	$10,350.00	$103,500	Lot of vegetation inside pond.
Surveying	1	LS	$10,000.00	$10,000	
Utility Locating	1	EA	$5,000.00	$5,000	
SUBTOTAL Site Preparation				**$118,500**	
Dewatering					
Dewatering and discharge through NPDES permit	34,312,066	GL	$0.02	$686,241	Assumes treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$686,241**	
Repair On-Site Pond Embankments					
Modifications on existing CCR Pond embankments	1	LS	$250,000.00	$250,000	the pond rating is unchanged due to potential dam safety deficiencies. The addendum notes overtopping of the pond under KDOW guidelines and provides two potential measures to bring ATB 2 into compliance. In addition, the location of ATB 2 below the relatively large Main Pond and series configuration of the impoundments at the site resulting in ATB 2 receiving discharge from all the other ponds warrants extreme conservatism in hazard classification, analyses and ratings. (per EPA Dam Assessment report).
SUBTOTAL Repair On-Site Pond Embankments				**$250,000**	
Utility Services					
Utility Modifications	1	LS	$50,000.00	$50,000	LG&E-KU to complete.
Shoring for conveyor support foundations	1	LS	$0.00	$0	Shoring assumed to not be required.
SUBTOTAL Utility Services				**$50,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	2889	CY	$37.86	$109,373	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$109,373**	
Pre-Closure / Preparation					
Hauling (assume 2 mile cycle)(CCR from facility)	198,736	CY	$2.96	$588,259	3 each, Cat 735 off-road trcuks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
Cut/regrade for cover subgrade/ditch	122,977	CY	$8.10	$996,114	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Placement and Compaction	321,713	CY	$2.39	$768,894	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	321,713	CY	$0.57	$183,376	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	176,660	SY	$0.20	$35,332	RSM 31 22 16.10 3300
Geotextile (as needed, assume 100% of 38.5 acre area for filling)	176,660	SY	$2.46	$434,584	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of 38.5 acre area fc	176,660	SY	$3.00	$529,980	CH2M HILL, recent quote on similar project
SUBTOTAL Pre-Closure / Preparation				**$3,536,538**	
Final Cover (Install FML)					
Final Cover: 40-mil Tex/smooth LLDPE	1,907,928	SF	$0.65	$1,240,153	
Geocomposite (includes materials and installation)	1,907,928	SF	$0.55	$1,049,360	
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	97,113	CY	$20.00	$1,942,260	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	32,371	CY	$20.00	$647,420	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	129,484	CY	$4.36	$564,550	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	129,484	CY	$2.39	$309,467	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	129,484	CY	$0.57	$73,806	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Drainage System Piping	36	AC	$10,000.00	$360,000	Allowance
Finish Grading, gentle slopes	176,660	SY	$0.20	$35,332	RSM 31 22 16.10 3300
SUBTOTAL Final Cover (Install FML)				**$6,222,348**	
Surface Water Features					
Items to meet NPDES Permit requirements	1	LS	$150,000.00	$150,000	
Surface Water Diversion Channel	1	LS	$160,000.00	$160,000	
Channel					10-ft bottom, 5-ft deep, 4H:1V sideslopes 1500 LF 7,650 CY
- Excavation and Load-out (excavator)	7,650	CY	$5.20	$39,780	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
- Hauling (assume 2-mile cycle)	7,650	CY	$4.36	$33,354	$4.36 haul; 12cy, 15mph, 2 mile, 15 minute (RS Means 31 23 23.20 1018)
- Placement and Compaction	7,650	CY	$2.39	$18,284	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	7,650	CY	$0.57	$4,361	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Road Crossing	1	EA	$10,000.00	$10,000	36-inch pipe for 50-ft
Outlet Structure	1	EA	$30,000.00	$30,000	Similar to the second outfall structure at the Main ash pond - Match cost but no inlet structure
SUBTOTAL Surface Water Features				**$445,778**	
Emergency Outlet Structure					
Surface Restoration					
Mechanical Seeding & Mulching	36.5	AC	$3,550.00	$129,575	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$30,000.00	$30,000	
SUBTOTAL Surface Restoration				**$159,575**	
Groundwater Monitoring					
New Monitoring wells, 4" (5,561 LF perimeter)	8	EA	$17,600.00	$140,800	assumes well spacing 1 well/750 feet; 8 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$220,800**	
SUBTOTAL CONSTRUCTION				**$11,874,654**	
Design, Project & Construction Management, and Closure Report					

Site: Green River Generating Station
Location: Central City, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #2
Base Year: 2015
Date: 1/18/2016

Conceptual Design	1	LS	$200,000.00	$200,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$800,000.00	$800,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$1,500,000.00	$1,500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$11,874,654.47	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$2,650,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$14,524,654**	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.
The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Green River Generating Station Cost Estimate - SO2 Pond
21-Sep-15

Item	Cost 2015 Dollars												2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check											
Proposed Conceptual Alternative CCR Closure - SO2 Pond	**$13,752,172**	**2%**	**6%**	**30%**	**62%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%											
IMPOUNDMENT CLOSURE	**$10,220,864**	**2%**	**6%**	**30%**	**62%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%	**$169,000**	**$673,863**	**$3,301,361**	**$7,144,714**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$11,288,938**
Mobilization/Demobilization	**$50,000**	0%	0%	80%	20%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$43,264	$11,249	$0	$0	$0	$0	$0	$0	**$54,513**
Sediment & Erosion Control	**$14,500**	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$7,842	$8,155	$0	$0	$0	$0	$0	$0	**$15,997**
Site Preparation	**$66,750**	0%	0%	80%	20%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$57,757	$15,017	$0	$0	$0	$0	$0	$0	**$72,774**
Dewatering	**$262,819**	0%	30%	70%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$81,999	$198,985	$0	$0	$0	$0	$0	$0	$0	**$280,985**
Utility Services	**$50,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$54,080	$0	$0	$0	$0	$0	$0	$0	**$54,080**
Excavation and Haul CCRs to ATB #2	**$2,228,300**	0%	0%	90%	10%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$2,169,117	$250,653	$0	$0	$0	$0	$0	$0	**$2,419,770**
Liner System & Fabriform	**$5,208,395**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$5,858,736	$0	$0	$0	$0	$0	$0	**$5,858,736**
Mechanical Improvements/Additions	**$150,000**	0%	10%	30%	60%	0%	0%	0%	0%	0%	0%	100%	$0	$15,600	$48,672	$101,238	$0	$0	$0	$0	$0	$0	**$165,510**
Transport & Disposal	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Groundwater Monitoring	**$168,000**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%	$0	$34,944	$72,684	$75,591	$0	$0	$0	$0	$0	$0	**$183,218**
Soil Sampling	**$24,500**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$25,480	$0	$0	$0	$0	$0	$0	$0	$0	**$25,480**
Surface Restoration	**$57,600**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$64,792	$0	$0	$0	$0	$0	$0	**$64,792**
Conceptual Design	**$60,000**	80%	20%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$48,000	$12,480	$0	$0	$0	$0	$0	$0	$0	$0	**$60,480**
Final Design and Permitting and permitting support	**$230,000**	20%	80%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$46,000	$191,360	$0	$0	$0	$0	$0	$0	$0	$0	**$237,360**
PDI	**$75,000**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$75,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$75,000**
Construction Management, including CQA and OE services	**$1,500,000**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%	$0	$312,000	$648,960	$674,918	$0	$0	$0	$0	$0	$0	**$1,635,878**
Closure Report	**$75,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$84,365	$0	$0	$0	$0	$0	$0	**$84,365**
Subtotal	**$10,220,864**												**$169,000**	**$673,863**	**$3,301,361**	**$7,144,714**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$11,288,938**
Contingency	$3,066,259	2%	6%	30%	62%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$1,693,341	$1,693,341	$0	$0	$0	$0	$0	$0	**$3,386,681**
Subtotal with Contigency	**$13,287,123**												**$169,000**	**$673,863**	**$4,994,701**	**$8,838,055**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$14,675,620**
LG&E & KU Overheads	$465,049	2%	6%	30%	62%	0%	0%	0%	0%	0%	0%	100%	$5,915	$23,585	$174,815	$309,332	$0	$0	$0	$0	$0	$0	**$513,647**
Project Total	**$13,752,172**												**$175,000**	**$697,000**	**$5,170,000**	**$9,147,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$15,189,000**

Assumptions	
LG&E & KU Overheads	3.50%
Escalation	4.00%
Contingency	30.00%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Mill Creek Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Green River Generating Station — COST ESTIMATE SUMMARY

Site: Green River Generating Station
Location: Central City, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - SO2 Pond
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$50,000.00	$50,000	
SUBTOTAL Mobilization/Demobilization				**$50,000**	
Sediment & Erosion Control					
Sediment and Erision Control Measures	2,900	LF	$5.00	$14,500	
SUBTOTAL Sediment & Erosion Control				**$14,500**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350.00	$51,750	
Surveying	1	LS	$5,000.00	$5,000	
Utility Locating	2	EA	$5,000.00	$10,000	
SUBTOTAL Site Preparation				**$66,750**	
Dewatering					
Dewatering and discharge through NPDES permit	13,140,935	GL	$0.02	$262,819	Assumes treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$262,819**	
Utility Services					
Utility Modifications	1	LS	$50,000.00	$50,000	LG&E-KU to complete.
SUBTOTAL Utility Services				**$50,000**	
Excavation and Haul CCRs to ATB #2					
Excavate and Direct Load to ATB #2	198,736	CY	$9.56	$1,899,916	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Regrade Material within SO2 pond (10.1 acres x 2' thick)	39,107	CY	$8.10	$316,768	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Finish Grading, gentle slopes	12	AC	$968.00	$11,616	
SUBTOTAL Excavation and Haul CCRs to ATB #2				**$2,228,300**	
Liner System & Fabriform					
Liner System Area (10.1 acres + 10%)					
60-mil Tex/smooth HDPE	483,952	SF	$0.85	$411,359	
10 oz. Geotextile (includes materials and installation)	483,952	SF	$0.20	$96,790	CH2M HILL recent project.
- Fabriform (6" thick product)	483,952	SF	$6.73	$3,256,994	Based on previous engineer's estimate
- Placement and Compaction	483,952	CY	$2.39	$1,156,644	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	483,952	CY	$0.57	$275,852	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	53,772	SY	$0.20	$10,754	RSM 31 22 16.10 3300
SUBTOTAL Liner System & Fabriform				**$5,208,395**	
Mechanical Improvements/Additions					
Piping to NPDES Outfall	1	LS	$100,000.00	$100,000	allowance
Items to be constructed to meet NPDES Permitting Requirements	1	LS	$50,000.00	$50,000	allowance
SUBTOTAL Mechanical Improvements/Additions				**$150,000**	
Transport & Disposal					
Groundwater Monitoring					
New Monitoring wells, 4" (3,422 LF perimeter)	5	EA	$17,600.00	$88,000	assumes well spacing 1 well/750 feet; 5 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$168,000**	
Soil Sampling					
Confirmation Sampling (5/Acre)	50	EA	$100.00	$5,000	
Confirmation Sample Analysis	50	EA	$150.00	$7,500	single marker metal
Sample Packaging and Shipping	48	EVENT	$250.00	$12,000	4 per month for 12 months
SUBTOTAL Soil Sampling				**$24,500**	
Surface Restoration					
Mechanical Seeding & Mulching	12.0	AC	$3,550.00	$42,600	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$15,000.00	$15,000	
SUBTOTAL Surface Restoration				**$57,600**	
SUBTOTAL CONSTRUCTION				**$8,280,864**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$60,000.00	$60,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$230,000.00	$230,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$1,500,000.00	$1,500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$8,280,863.84	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$1,940,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$10,220,864**	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. Excavation volume quantities include removing CCR material from pond.
3. Excavated ponds taken out of service will have embankments removed and graded to drain.
4. Groundwater Monitoring is not required due to clean closure.
5. Confirmation sampling is required to confirm clean closure.
6. No waste characterization sample and profile will be required.
7. No road repair is included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

Green River Facility Backup Quantities — Nathan Zink — 7/14/2015

CCR Production Rates

CCR Production Handling Assumptions:

% Bot Ash Wet Sluice to ATB1:	100%
% Fly Ash Wet Sluice to ATB1:	100%
% Gypsum returned:	0%

CCR Production - 2015 Plan (tons)

Year	Green River Bot Ash	Fly Ash	Gypsum	TOTAL	Accumulated Material (Tons) ATB2	Gypsum Stack
2015	8,259	33,035	-	41,294	41,294	-
2016	-	-	-	-	-	-
2017	-	-	-	-	-	-
2018	-	-	-	-	-	-
2019	-	-	-	-	-	-
2020	-	-	-	-	-	-
2021	-	-	-	-	-	-
2022	-	-	-	-	-	-
2023	-	-	-	-	-	-
2024	-	-	-	-	-	-
2025	-	-	-	-	-	-
Total:				**Assumed Additional Accumulated Material (2015 thru closure):**	41,294	-

Projected Material Generation - Handling Assumptions:

A. Bottom Ash and Flyash:
- Until October 19, 2015 assume all fly ash and bottom ash slurried to Main Ash Pond, and
- After October 19, 2015 all material to the Main Ash Pond

B. Gypsum
- No gypsum production at Green River Station

Approximate density of CCR in-place: 1 ton/CY

Orange:	To be confirmed by CAD
Yellow:	Based on assumptions as listed
	Based on CAD check on 7/13/15 - Doug Corbett and Nathan Zink

Pond Quantity Balance Estimate - By Pond:

Main Ash Pond

Item	Units	ATB 1	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	41.1				
Standing Surface Water (to remove)	GAL	15,074,898	Assume 10.6 acres with 8-ft average over wet pond area. Confirm with CAD.		8	ft
Length of perimeter	LF	6,520				
CUT:						
CCR cut in 2017 - for Main Ash Pond	CY	160,429	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
Cut/regrade for cover subgrade/ditch	CY	13,764	Assume Trapazoidal channel 3H:1V 3-ft deep with 10-ft bottom	CAD - confirm cut to grade ditches for final cover	57	SF
FILL (to cover subgrade):						
CCR for Fill - from Baseline	CY	41,294				
Total Fill - Existing surface to final grade	CY	152,251	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Total Fill for Closure of Pond	CY	205,758	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	4,034				
Final Cover Soil Volume	CY	132,615	CAD to update			
Final Cover Surface Area	AC	41.1	CAD to update	Cover for Anchor trench to estmate 20-ft offset from total surface area	10%	
Structural Support						
Geogrid	AC	49.3	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Geofabric	AC	49.3	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Amount of CCR/import fill required to close pond [a]	CY	899,585	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Cut: existing surface to final grade	CY	409,085	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Fill: existing surface to final grade	CY	1,698,880	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Net: existing surface to final grade	CY	1,289,795	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			

Ash Treatment Basin #2 (ATB2)

Item	Units	ATB 2	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	36.5				
Standing Surface Water (to remove)	GAL	34,312,066	Assume 1.3 acres (8-ft deep) and 6.8 acres (14-ft deep) with 13-ft average over wet pond area. Confirm with CAD. No bathometric data provided.		13	ft
Length of perimeter	LF	4,979				
CUT						
Cut for Final Cover: Stormwater channel	CY	122,977	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
FILL						
From SO2 Pond	CY	198,736				
CCR fill - to estimated to fill water areas	CY	170,207	Assumed 105.5 acre-ft needed to fill the two existing locations of water			
CCR fill - For three (3) mounds at 5% slope	CY	28,529	Assumed Mound running NW to SE length 800-LF	Each mound is estimated to approximately 40,400 cubic yards of fill		
Total Fill - Existing surface to final grade	CY	321,713	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
		225,071				
Total Fill for Closure of Pond	CY	328,147	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	6,434				
Final Cover Soil Volume	CY	129,484	Total surface area +20% and 2-ft of cover soil - CAD to update	Cover for Anchor trench to estmate 20-ft offset from total surface area	10%	
Final Cover Surface Area	AC	36.5	CAD to update			
Structural Support						
Geogrid	AC	43.8	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Geofabric	AC	43.8	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Total Fill: existing surface to final grade	CY	399,120	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			
Net: existing surface to final grade	CY	300,455	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			
Final cover volume	CY	113,790	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			
Amount of CCR/import fill required to close pond [a]	CY	512,910	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			

SO2 Pond

Item	Units	ATB 1	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	10.1				
Standing Surface Water (to remove)	GAL	13,140,935	Assume 4' over pond area. Confirm with CAD. - No Bathometric data provided		4	ft
Length of perimeter	LF	2,780				
CUT:						
CCR cut in 2016 - for Temporary Treatment Pond - Send to ATB2	CY	198,736	Excavate total surface area to 7.2 acres (bottom, 21' deep pond at 2.5H:1V Slopes). Send to ATB2 in 2016		7.2	ac
FILL (to cover subgrade):						
CCR for Fill - from Borrow Source for Clean Closure	CY	17,892	Assume total surface area with an average depth of 1-ft	Cover for Anchor trench to estmate 20-ft offset from total surface area	10%	
ADDITIONAL FILL NEEDED for Final Cover: to cover subgrade	CY	0	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Final Cover Soil Volume	CY	17,892	CAD to update			
Final Cover Surface Area	AC	10.1	CAD to update			
Amount of CCR/import fill required to close pond [a]	CY	0	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Cut: existing surface to final grade	CY	198,245	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Fill: existing surface to final grade	CY	3,485	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Net: existing surface to final grade	CY	194,760	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			

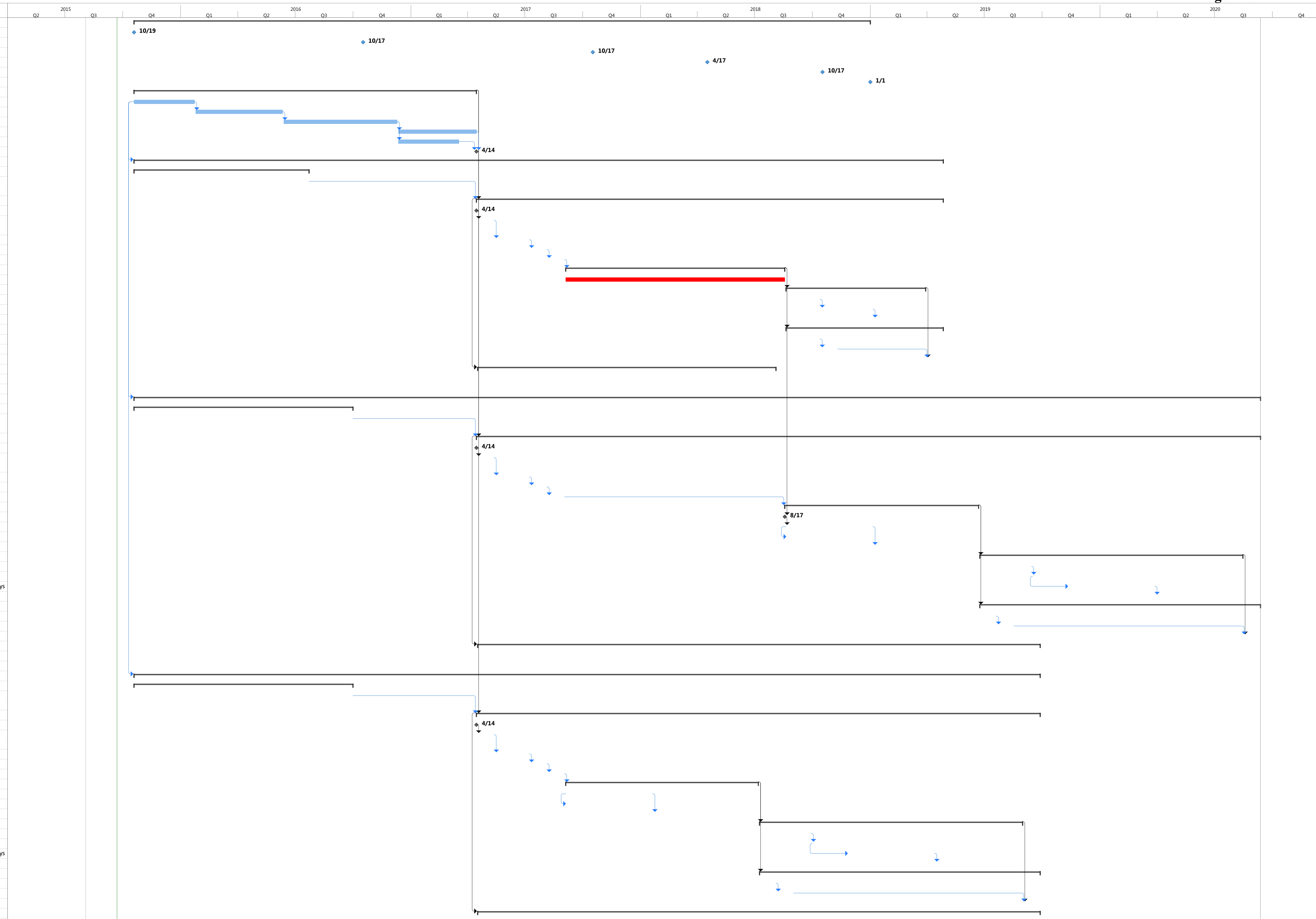
[a] Dewatering and settlement of ash through closure activities will affect the quantities of fill material. In situ ash and geotechnical soil borings and testing are recommended to determine settlement during closure design.

[b] Represents volume of pond.

Other Key Assumptions:

Attachment 3
Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Regulatory Milestones**	**836 days**	**Mon 10/19/15**	**Tue 1/1/19**	
2		CCR Rule Effective Date	0 days	Mon 10/19/15	Mon 10/19/15	
3		Structural Integrity - Initial Assessment(s	0 days	Mon 10/17/16	Mon 10/17/16	
4		Groundwater - Background Analysis	0 days	Tue 10/17/17	Tue 10/17/17	
5		Groundwater - Detection Analysis	0 days	Tue 4/17/18	Tue 4/17/18	
6		Groundwater - Assessment Analysis	0 days	Wed 10/17/18	Wed 10/17/18	
7		Groundwater Corrective Action	0 days	Tue 1/1/19	Tue 1/1/19	
8		**Engineering Phase**	**390 days**	**Mon 10/19/15**	**Fri 4/14/17**	
9		Preliminary Design	70 days	Mon 10/19/15	Fri 1/22/16	
10		Final Design	100 days	Mon 1/25/16	Fri 6/10/16	9
11		KY DEP Permitting	130 days	Mon 6/13/16	Fri 12/9/16	10
12		KY PSC Rate Approval	90 days	Mon 12/12/16	Fri 4/14/17	11
13		Procurement of Contractor	70 days	Mon 12/12/16	Fri 3/17/17	11
14		Issue NtP	0 days	Fri 4/14/17	Fri 4/14/17	13,12
15		**SO2 Pond**	**920 days**	**Mon 10/19/15**	**Fri 4/26/19**	**9SS**
16		**LG&E Activities**	**200 days**	**Mon 10/19/15**	**Fri 7/22/16**	
17		Remove and Discharge surface water	200 days	Mon 10/19/15	Fri 7/22/16	
18		**Contractor Activities**	**530 days**	**Fri 4/14/17**	**Fri 4/26/19**	**8,17**
19		Mobilize	0 days	Fri 4/14/17	Fri 4/14/17	
20		Install Sediment and Erosion Control	20 days	Mon 4/17/17	Fri 5/12/17	19
21		Site Preparation	40 days	Mon 5/15/17	Fri 7/7/17	20
22		Roads	20 days	Mon 7/10/17	Fri 8/4/17	21
23		On Site Impoundments	20 days	Mon 8/7/17	Fri 9/1/17	22
24		**Preclosure Activities**	**250 days**	**Mon 9/4/17**	**Fri 8/17/18**	**23**
25		Cut and Transport to ATB #2	250 days	Mon 9/4/17	Fri 8/17/18	
26		**Redevelopment Activities**	**160 days**	**Mon 8/20/18**	**Fri 3/29/19**	**24**
27		Shape Subgrade	40 days	Mon 8/20/18	Fri 10/12/18	
28		Place HDPE Liner and Geotextile	60 days	Mon 10/15/18	Fri 1/4/19	27
29		Liner System and Fabriform	60 days	Mon 1/7/19	Fri 3/29/19	28
30		**Surface Water Features**	**180 days**	**Mon 8/20/18**	**Fri 4/26/19**	**24**
31		Primary Outlet Structure	40 days	Mon 8/20/18	Fri 10/12/18	
32		Emergency Outlet Structure	20 days	Mon 10/15/18	Fri 11/9/18	31
33		Surface Restoration	20 days	Mon 4/1/19	Fri 4/26/19	26,32
34		**Construction Management Services**	**340 days**	**Mon 4/17/17**	**Fri 8/3/18**	**18SS**
35		CQA and OE services	340 days	Mon 4/17/17	Fri 8/3/18	
36						
37		**ATB #2**	**1280 days**	**Mon 10/19/15**	**Fri 9/11/20**	**9SS**
38		**LG&E Activities**	**250 days**	**Mon 10/19/15**	**Fri 9/30/16**	
39		Remove and Discharge surface water	250 days	Mon 10/19/15	Fri 9/30/16	
40		**Contractor Activities**	**890 days**	**Fri 4/14/17**	**Fri 9/11/20**	**39,8**
41		Mobilize	0 days	Fri 4/14/17	Fri 4/14/17	
42		Install Sediment and Erosion Control	20 days	Mon 4/17/17	Fri 5/12/17	41
43		Site Preparation	40 days	Mon 5/15/17	Fri 7/7/17	42
44		Roads	20 days	Mon 7/10/17	Fri 8/4/17	43
45		On Site Impoundments	20 days	Mon 8/7/17	Fri 9/1/17	44
46		**Preclosure Activities**	**220 days**	**Fri 8/17/18**	**Fri 6/21/19**	**45**
47		Place SO2 Pond Material	0 days	Fri 8/17/18	Fri 8/17/18	24
48		Stabilize upper CCR surface	100 days	Mon 8/20/18	Fri 1/4/19	47
49		Dewater during stabilization	100 days	Mon 8/20/18	Fri 1/4/19	48SS
50		Cut/regrade for cover subgrade/dit	120 days	Mon 1/7/19	Fri 6/21/19	48
51		**Closure Activities**	**300 days**	**Mon 6/24/19**	**Fri 8/14/20**	**46**
52		Shape Cover Subgrade	60 days	Mon 6/24/19	Fri 9/13/19	
53		Place FML and Geocomposite	60 days	Mon 9/16/19	Fri 12/6/19	52
54		Cover soil	100 days	Mon 11/11/19	Fri 3/27/20	53SS+40 days
55		Vegetated Cover	100 days	Mon 3/30/20	Fri 8/14/20	54
56		**Surface Water Features**	**320 days**	**Mon 6/24/19**	**Fri 9/11/20**	**46**
57		Primary Outlet Structure	20 days	Mon 6/24/19	Fri 7/19/19	
58		Emergency Outlet Structure	20 days	Mon 7/22/19	Fri 8/16/19	57
59		Surface Restoration	20 days	Mon 8/17/20	Fri 9/11/20	51,58
60		**Construction Management Services**	**640 days**	**Mon 4/17/17**	**Fri 9/27/19**	**40SS**
61		CQA and OE services	640 days	Mon 4/17/17	Fri 9/27/19	
62						
63		**Main Ash Pond**	**1030 days**	**Mon 10/19/15**	**Fri 9/27/19**	**9SS**
64		**LG&E Activities**	**250 days**	**Mon 10/19/15**	**Fri 9/30/16**	
65		Remove and Discharge surface water	250 days	Mon 10/19/15	Fri 9/30/16	
66		**Contractor Activities**	**640 days**	**Fri 4/14/17**	**Fri 9/27/19**	**65,8**
67		Mobilize	0 days	Fri 4/14/17	Fri 4/14/17	
68		Install Sediment and Erosion Control	20 days	Mon 4/17/17	Fri 5/12/17	67
69		Site Preparation	40 days	Mon 5/15/17	Fri 7/7/17	68
70		Roads	20 days	Mon 7/10/17	Fri 8/4/17	69
71		On Site Impoundments	20 days	Mon 8/7/17	Fri 9/1/17	70
72		**Preclosure Activities**	**220 days**	**Mon 9/4/17**	**Fri 7/6/18**	**71**
73		Stabilize upper CCR surface	100 days	Mon 9/4/17	Fri 1/19/18	
74		Dewater during stabilization	100 days	Mon 9/4/17	Fri 1/19/18	73SS
75		Cut/regrade for cover subgrade/dit	120 days	Mon 1/22/18	Fri 7/6/18	73
76		**Closure Activities**	**300 days**	**Mon 7/9/18**	**Fri 8/30/19**	**72**
77		Shape Cover Subgrade	60 days	Mon 7/9/18	Fri 9/28/18	
78		Place FML and Geocomposite	60 days	Mon 10/1/18	Fri 12/21/18	77
79		Cover soil	100 days	Mon 11/26/18	Fri 4/12/19	78SS+40 days
80		Vegetated Cover	100 days	Mon 4/15/19	Fri 8/30/19	79
81		**Surface Water Features**	**320 days**	**Mon 7/9/18**	**Fri 9/27/19**	**72**
82		Primary Outlet Structure	20 days	Mon 7/9/18	Fri 8/3/18	
83		Emergency Outlet Structure	20 days	Mon 8/6/18	Fri 8/31/18	82
84		Surface Restoration	20 days	Mon 9/2/19	Fri 9/27/19	76,83
85		**Construction Management Services**	**640 days**	**Mon 4/17/17**	**Fri 9/27/19**	**66SS**
86		CQA and OE services	640 days	Mon 4/17/17	Fri 9/27/19	



Project: Brown rev11
Date: Tue 9/22/15

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

TECHNICAL MEMORANDUM

Coal Combustion Residual Pond Closure Evaluation: Pineville Generating Station

PREPARED FOR:	Louisville Gas & Electric Company and Kentucky Utilities Company
PREPARED BY:	CH2M HILL, Inc.
DATE:	September 18, 2015

1 Executive Summary

Louisville Gas & Electric Company and Kentucky Utilities Company (LG&E-KU) tasked CH2M HILL, Inc. (CH2M) with performing coal combustion residuals (CCR) evaluations for eight sites to develop conceptual CCR ash pond closure approach and cost estimates. The generating stations under evaluation are Ghent, Trimble County, Mill Creek, E.W. Brown, Cane Run, Green River, Tyrone, and Pineville.

This report applies to Pineville Generating Station (Exhibit 1). The following scope activities were completed:

- Review of LG&E-KU provided historical CCR information and kickoff meeting workshop (June 2015)
- Development of a CCR compliance alternative that consider regulatory, geotechnical, and stormwater aspects as it relates to CCR and ash ponds and associated cost estimates for the site.
- The Ash Treatment Basin (ATB) was identified as the applicable CCR unit for Pineville.
- The estimated cost for closing the ATB is summarized in Table 1-1. Detailed cost information is included in Attachment 2.

Proposed Conceptual CCR Pond Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
Remove surface water. Construct final cover (maximum grades). Install new surface water control pond and outlet structure.	$4.9 M	$7.0 M	$9.1 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX and OPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

2 Proposed Conceptual CCR Pond Closure Approach

2.1 Development of Proposed Conceptual CCR Pond Closure Approach

The proposed conceptual CCR pond closure approach was developed based on previous work completed by CH2M and discussions with LG&E-KU during the kickoff meeting on June 23, 2015. The Pineville Generating Station is a closed facility and is not generating CCR wastewater at this time. The following defines the considered approach for closure for the ATB. Additional assumptions are summarized in Section 2.2.

- Surface water within ATB will be removed before closure begins, as needed, to allow surface improvement and dry material placement in ATB. Other potential subgrade improvements are described under the assumptions below.
- An aggregate perimeter road surrounding the ATB on top of the dike will be constructed.
- A final cover will be constructed. Cover construction will include preliminary CCR grading to shape the cover subgrade and will include the components described in the design assumptions below. Conceptual grades are shown in Exhibit 2. Significant grading features include the following:
  - A perimeter drainage ditch is shown within the dike. The ditch shows a high point along the north side, dropping at approximately 0.5 percent to the east and west around ATB.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 3 feet above the ditch invert. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2 has a net airspace capacity of approximately 914 cubic yards above the existing CCR surface grade.

The amount of CCR required to fill the ATB ponds and removed from the remaining ponds was developed using computer aided engineering (CAE) software in AutoCAD using drawings provided by LG&E-KU. The proposed conceptual pond closure approach drawings are provided in Attachment 1.

2.2 Design Assumptions

This section discusses the design assumptions associated with the conceptual design.

Ash Treatment Basin

The general design assumptions used for the conceptual alternative is as derived from the LG&E-KU drawing discussed above and are summarized below:

- The existing grade is established from AutoCAD files provided by LG&E-KU on June 23, 2015.
- The ATB dike will be used without modification. Some improvements may be required based on the U.S. Environmental Protection Agency (USEPA) dam assessment findings, which is not part of this project.
- No additional CCR material will be deposited in the ATB.

- A 2 percent volume reduction has been included in consideration of settlement of in-place CCR because of dewatering or new fill/cover loads. Changes to these assumptions should be verified during design development.
- The conceptual pond closure approach is assumed to be geotechnically stable as shown. This must be confirmed during design development.
- Improvements assumed to prepare a workable CCR surface include removing surface water and localized regrading to facilitate dewatering.
- Final surface drainage channels are within the ATB dikes, would include final cover, and would be lined with turf reinforcement mat.
- The final cover is considered equivalent on a material quantity basis to the published CCR rule final cover requirements. The CCR Rule does not apply to the closure of this site (KYDEP regulations apply to the closure) but for costing purposes we have used a Final CCR Rule compliant cover design.
- The final cover is assumed to consist of 40-mil linear low-density polyethylene liner (LLDPE) placed directly on subgrade (CCR) and covered with geocomposite or strip drains and 2 feet of soil cover. A vegetative cover will be established.
- A 3 percent slope was used for the final cover.
- Ditches were included in the grading for the pond. The ditch geometry for ATB was assumed to consist of a trapezoidal channel with 4H:1V on the inner slope and 3H:1V on the outer side slopes. A bottom width of 10 feet was used to convey the estimated 100-year, 24-hour storm event (worst case) flow, as documented in the CH2M memorandum dated January 2015. Additional drainage features over the 5 percent cover (such as more closely spaced surface water ditches or other features) may be required, which have not been considered herein.
- A new surface water management pond will be installed south of the ATB to manage clean surface water from the closed ATB. The existing ATB primary outlet structure may/may not be able to be modified to regulate discharge, removed portions demolished and disposed of.
- No special dewatering structures will be required to remove decant water from the wet coal ash materials in the ash pond.

3 Estimated Material Volumes and Areas

The Pineville Generating Station is closed and is not generating CCR material. No additional CCR material will be deposited in the ATB from the station.

The conceptual alternative was developed using AutoCAD files provided by LG&E-KU as described under Section 2.2, Design Assumptions. Summaries of the estimated material quantities for the ATB is shown in Tables 3-1.

Table 3-1. Proposed Conceptual Estimated Material Quantities - ATB

Item	Units	Quantity
Total surface area	AC	8.4
Standing surface water (to remove)	GAL	5,474,290
Length of perimeter	LF	2,950
Length of perimeter road to be installed on the dike	LF	2,610
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**86,771**
FILL SOURCES:		
Fill as part of surface regrading	CY	28,316
From soil volume for material for road and dike	CY	45,705
TOTAL POTENTIAL FILL	**CY**	**0**
Final cover soil volume	CY	12,750
New Surface Water Pond (Surface Area)	AC	0.5
New Surface Water Outlet	Each	2

4 Schedule

Exhibit 4-1 presented in Attachment 3 illustrates the proposed schedule to complete the design, permitting, and construction for the ATB closure. We assumed the design work would begin in 2016 to reduce the long-term escalation costs; however, since this pond closure does not need to comply with the Final CCR rule timeline, LG&E-KU has the flexibility to revise this schedule as needed.

5 Construction Cost Estimate

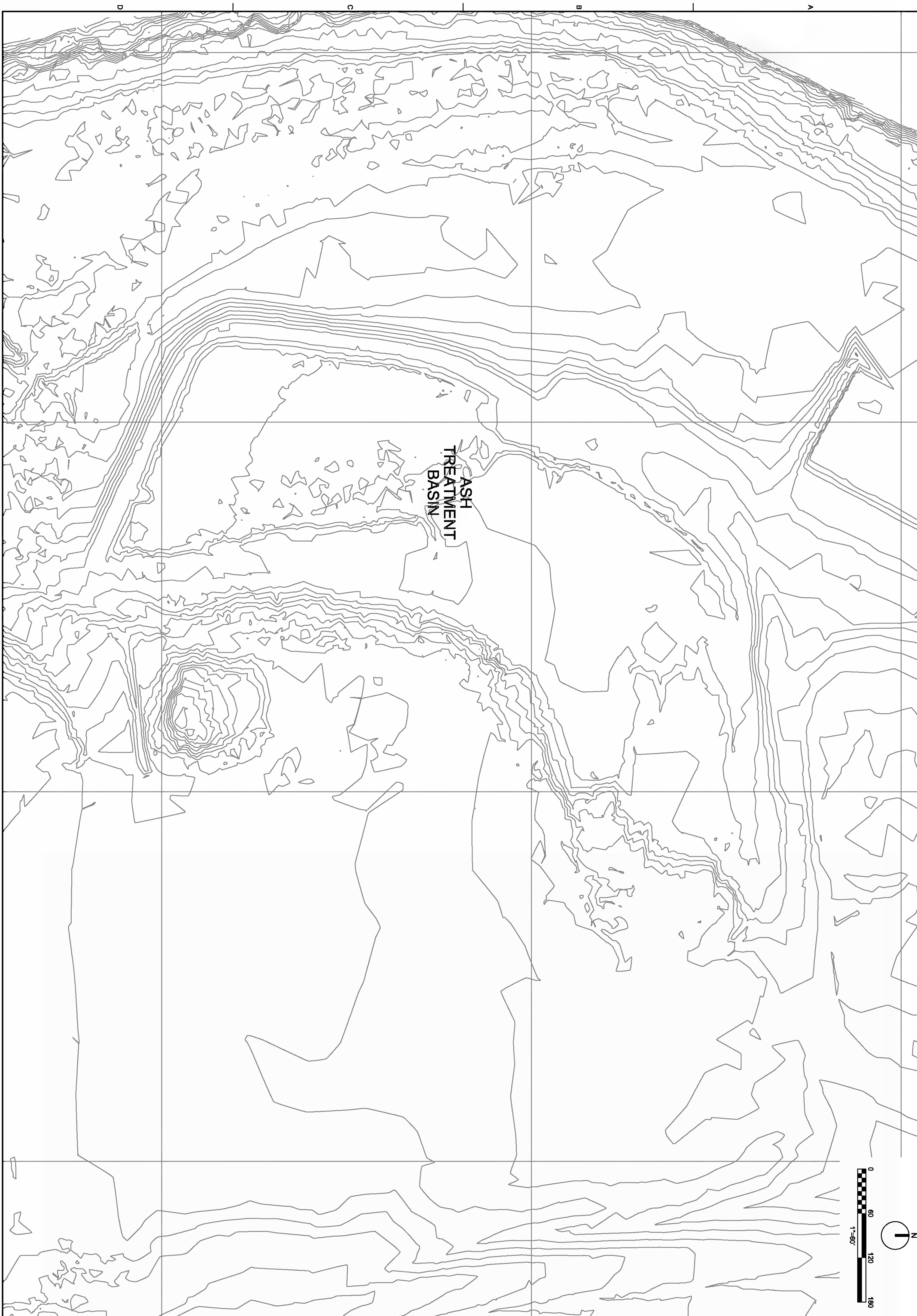
The estimated construction cost for closing the Ponds as described in Section 2 is shown in Table 5-1.

Proposed Conceptual Closure Alternative	Low (-30%)	Total Capital Cost	High (+30%)
Remove surface water. Construct final cover (maximum grades). Install new surface water control pond and outlet structure.	$4.9 M	$7.0 M	$9.1 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX and OPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

Attachment 1
Proposed Conceptual Alternative CCR Closure



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PLOT DATE: 2015/07/24
PLOT TIME: 9:44:13 AM

CH2MHILL

PINEVILLE

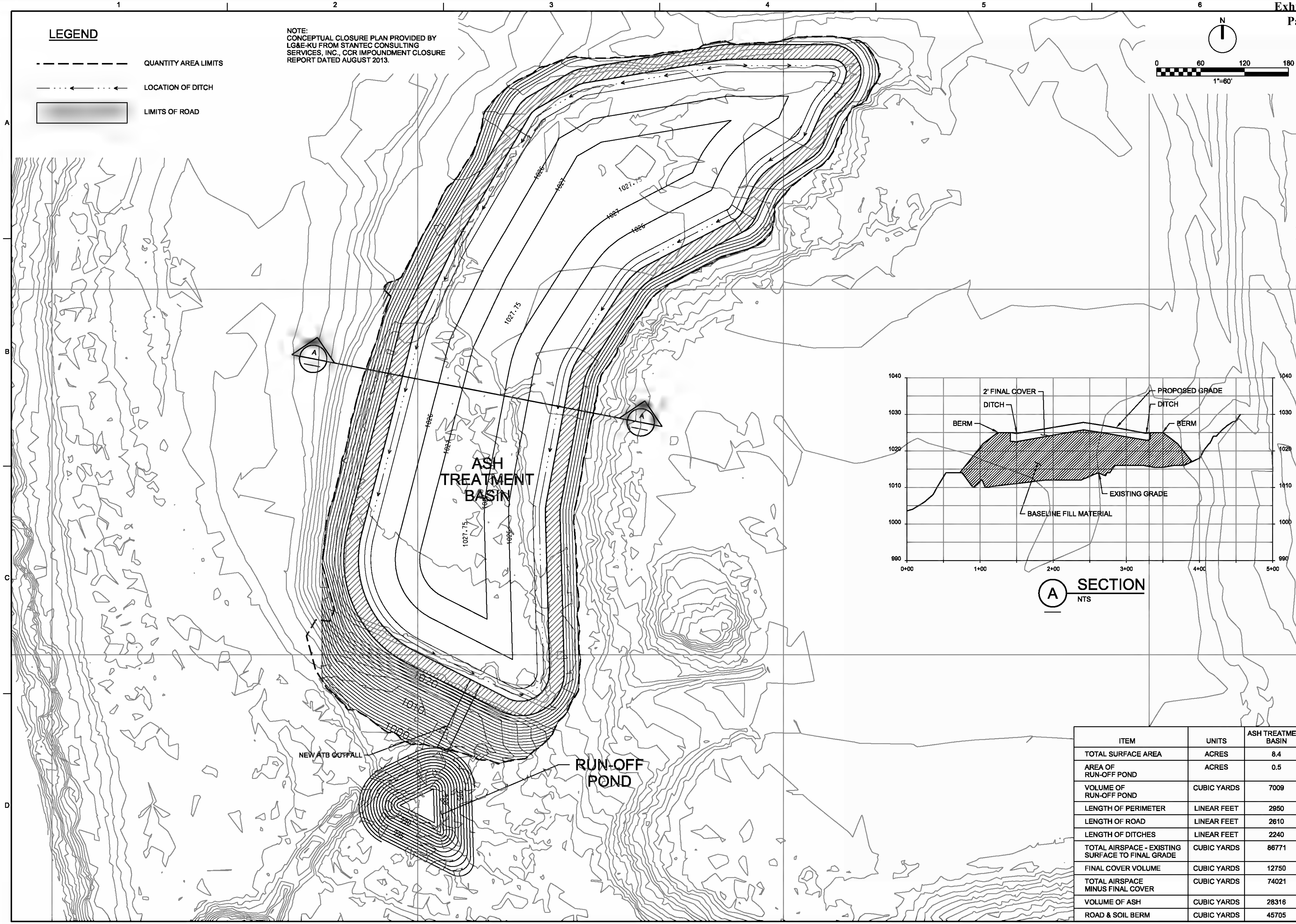
EXISTING CONDITIONS

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 1
SHEET	of

NO.	DATE	REVISION	BY	APVD
DSGN	DR	CHK	APVD	



ITEM	UNITS	ASH TREATMENT BASIN
TOTAL SURFACE AREA	ACRES	8.4
AREA OF RUN-OFF POND	ACRES	0.5
VOLUME OF RUN-OFF POND	CUBIC YARDS	7009
LENGTH OF PERIMETER	LINEAR FEET	2950
LENGTH OF ROAD	LINEAR FEET	2610
LENGTH OF DITCHES	LINEAR FEET	2240
TOTAL AIRSPACE - EXISTING SURFACE TO FINAL GRADE	CUBIC YARDS	86771
FINAL COVER VOLUME	CUBIC YARDS	12750
TOTAL AIRSPACE MINUS FINAL COVER	CUBIC YARDS	74021
VOLUME OF ASH	CUBIC YARDS	28316
ROAD & SOIL BERM	CUBIC YARDS	45705

NO.	DATE	REVISION	BY	APVD
DSGN	DR	CHK	APVD	

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL®

PINEVILLE
PROPOSED CONCEPTUAL CLOSURE PLAN
ASH TREATMENT BASIN

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2
SHEET	of

Attachment 2
Proposed Conceptual Alternative Cost Estimate

COST COMPARISON FOR REMEDIAL ALTERNATIVES

Site:	Pineville Generation Station	**Base Year:**	2015
Location:	Pineville, Kentucky	**Date:**	September
Phase:	Proposed Conceptual CCR Closure	**ROM Level:**	Class 4

	Pineville Generating Station	
Remedial Technology	Fill Ash Treatment Pond with CCR's, install final cover and close in-place.	
Description	Fill Ash Treatment Pond with CCR's generated at facility or from other LG&E-KU facilities, install final cover, stormwater control improvements and close in-place.	
Empoundment Closure	$6,748,131	
LG&E Overhead	$236,185	
Total Initial Costs	$6,984,316	
Upper ROM Range	$9,079,611	
Lower ROM Range	$4,889,021	

This is not an offer for construction and/or project execution. Please note, these order of magnitude cost estimates are assumed to represent the actual installed cost within the range of - 30 percent to + 30 percent of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

ver 6.5

CCR Rule - Pineville Generating Station Cost Estimate - ATB
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - ATB	**$6,748,131**	**0%**	**0%**	**8%**	**29%**	**63%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%											
IMPOUNDMENT CLOSURE	**$5,190,870**	**0%**	**0%**	**8%**	**29%**	**63%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%	**$0**	**$0**	**$465,175**	**$1,677,045**	**$3,825,325**	**$0**	**$0**	**$0**	**$0**	**$0**	**$5,967,544**
Mobilization/Demobilization	**$50,000**	0%	0%	0%	80%	20%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$44,995	$11,699	$0	$0	$0	$0	$0	**$56,693**
Sediment & Erosion Control	**$25,000**	0%	0%	0%	35%	65%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$9,843	$19,010	$0	$0	$0	$0	$0	**$28,853**
Site Preparation	**$71,750**	0%	0%	0%	60%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$48,425	$33,575	$0	$0	$0	$0	$0	**$82,000**
Dewatering	**$109,486**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$123,157	$0	$0	$0	$0	$0	$0	**$123,157**
Repair On-Site Pond Embankments	**$200,000**	0%	0%	0%	30%	70%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$67,492	$163,780	$0	$0	$0	$0	$0	**$231,272**
Utility Services	**$50,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$56,243	$0	$0	$0	$0	$0	$0	**$56,243**
Perimeter Berm (not required)	**$0**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	**$98,815**	0%	0%	0%	30%	70%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$33,346	$80,919	$0	$0	$0	$0	$0	**$114,265**
Pre-Closure / Preparation	**$1,587,751**	0%	0%	0%	30%	70%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$535,801	$1,300,211	$0	$0	$0	$0	$0	**$1,836,012**
Closure/Final Cover	**$1,289,343**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$1,508,349	$0	$0	$0	$0	$0	**$1,508,349**
New Storm Water Pond	**$137,471**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$154,636	$0	$0	$0	$0	$0	$0	**$154,636**
Mechanical Improvements/Additions	**$50,000**	0%	0%	0%	30%	70%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$16,873	$40,945	$0	$0	$0	$0	$0	**$57,818**
Surface Water Features	**$100,000**	0%	0%	0%	70%	30%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$78,740	$35,096	$0	$0	$0	$0	$0	**$113,836**
Primary Outlet Structure	**$30,000**	0%	0%	0%	60%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$20,248	$14,038	$0	$0	$0	$0	$0	**$34,286**
Stormwater Pond Outlet Structure	**$50,000**	0%	0%	0%	70%	30%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$39,370	$17,548	$0	$0	$0	$0	$0	**$56,918**
Surface Restoration	**$65,855**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$77,041	$0	$0	$0	$0	$0	**$77,041**
Groundwater Monitoring	**$150,400**	0%	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$32,535	$67,672	$70,379	$0	$0	$0	$0	$0	**$170,585**
Conceptual Design	**$65,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$70,304	$0	$0	$0	$0	$0	$0	$0	**$70,304**
Final Design and Permitting and permitting support	**$260,000**	0%	0%	50%	30%	20%	0%	0%	0%	0%	0%	100%	$0	$0	$140,608	$87,739	$60,833	$0	$0	$0	$0	$0	**$289,180**
PDI	**$75,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$81,120	$0	$0	$0	$0	$0	$0	$0	**$81,120**
Construction Management including CQA and OE services	**$650,000**	0%	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$140,608	$292,465	$304,163	$0	$0	$0	$0	$0	**$737,236**
Closure Report	**$75,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$87,739	$0	$0	$0	$0	$0	**$87,739**
Subtotal	**$5,190,870**												**$0**	**$0**	**$465,175**	**$1,677,045**	**$3,825,325**	**$0**	**$0**	**$0**	**$0**	**$0**	**$5,967,544**
Contingency	$1,557,261	0%	0%	8%	29%	63%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$895,132	$895,132	$0	$0	$0	$0	$0	**$1,790,263**
Subtotal with Contingency	**$6,748,131**												**$0**	**$0**	**$465,175**	**$2,572,176**	**$4,720,457**	**$0**	**$0**	**$0**	**$0**	**$0**	**$7,757,807**
LG&E & KU Overheads	$236,185	0%	0%	0%	35%	65%	0%	0%	0%	0%	0%	100%	$0	$0	$16,281	$90,026	$165,216	$0	$0	$0	$0	$0	**$271,523**
Project Total	**$6,984,316**												**$0**	**$0**	**$481,000**	**$2,662,000**	**$4,886,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$8,029,000**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30.0%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Pineville Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Pineville Generating Station
Location Pineville, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - ATB
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$50,000.00	$50,000	
SUBTOTAL Mobilization/Demobilization				**$50,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	1	LS	$25,000.00	$25,000	allowance for BPM
SUBTOTAL Sediment & Erosion Control				**$25,000**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350.00	$51,750	Clear & grub areas to receive fill, as required
Surveying	1	LS	$10,000.00	$10,000	
Utility Locating	2	EA	$5,000.00	$10,000	
SUBTOTAL Site Preparation				**$71,750**	
Dewatering					
Dewatering and discharge through NPDES permit	5,474,290	GL	$0.02	$109,486	Assumes minor treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$109,486**	
Repair On-Site Pond Embankments					
Access Modifications on existing CCR Pond embankments	1	LS	$200,000.00	$200,000	Assume embankments in good condition.
SUBTOTAL Repair On-Site Pond Embankments				**$200,000**	
Utility Services					
Utility Modifications	1	LS	$50,000.00	$50,000	LG&E-KU to complete.
SUBTOTAL Utility Services				**$50,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	2,610	CY	$37.86	$98,815	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$98,815**	
Pre-Closure / Preparation					
Cut/regrade material within pond	40,656	CY	$8.10	$329,314	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Material for Road and Soil Berm					
- Excavation and Load-out (from off-site borrow area)	45,705	CY	$20.00	$914,100	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2 mile cycle)	45,705	CY	$4.36	$199,274	$4.36 haul; 12cy, 15mph, 2 mile, 15 minute (RS Means 31 23 23.20 1018)
- Placement and Compaction	45,705	CY	$2.39	$109,235	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	45,705	CY	$0.57	$26,052	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes (assume 100% of pond)	48,884	SY	$0.20	$9,777	RSM 31 22 16.10 3300
SUBTOTAL Pre-Closure / Preparation				**$1,587,751**	
Closure/Final Cover					
Final Cover: 40-mil Tex/smooth LLDPE	365,904	SF	$0.65	$237,838	
Geocomposite (includes materials and installation)	365,904	SF	$0.55	$201,247	
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	20,328	CY	$20.00	$406,560	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	6,776	CY	$20.00	$135,520	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	27,104	CY	$4.36	$118,173	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	27,104	CY	$2.39	$64,779	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	27,104	CY	$0.57	$15,449	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Drainage System Piping	10	AC	$10,000.00	$100,000	Allowance
Finish Grading, gentle slopes	48,884	SY	$0.20	$9,777	RSM 31 22 16.10 3300
SUBTOTAL Closure/Final Cover				**$1,289,343**	
New Storm Water Pond					0.5 acre
Excavate New Pond					
- Excavation and Load-out	7,009	CY	$6.60	$46,259	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
- Hauling (assume 2 mile cycle)	7,009	CY	$4.36	$30,559	$4.36 haul; 12cy, 15mph, 2 mile, 15 minute (RS Means 31 23 23.20 1018)
- Placement and Compaction	7,009	CY	$2.39	$16,752	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	7,009	CY	$0.57	$3,995	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Surface Grading, lagoon bottoms	2,420	SY	$3.87	$9,365	RSM 31 22 16.10 3500
Cover Soil (aggregate - 1 feet thick)					
- Dense Grade Aggregate (materials, hauling and placement)	807	CY	$37.86	$30,540	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL New Storm Water Pond				**$137,471**	
Mechanical Improvements/Additions					
Items to be constructed to meet NPDES Permitting Requirements	1	LS	$50,000.00	$50,000	allowance
SUBTOTAL Mechanical Improvements/Additions				**$50,000**	
Surface Water Features					
Items to meet NPDES Permit requirements	1	LS	$100,000.00	$100,000	allowance
SUBTOTAL Surface Water Features				**$100,000**	
Primary Outlet Structure					
Modify	1	LS	$30,000.00	$30,000	allowance
SUBTOTAL Primary Outlet Structure				**$30,000**	
Stormwater Pond Outlet Structure					
Construct	1	LS	$50,000.00	$50,000	allowance
SUBTOTAL Stormwater Pond Outlet Structure				**$50,000**	
Surface Restoration					
Mechanical Seeding & Mulching	10	AC	$3,550.00	$35,855	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$30,000.00	$30,000	
SUBTOTAL Surface Restoration				**$65,855**	
Groundwater Monitoring					
New Monitoring wells (2,950 LF perimeter)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 4 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL Groundwater Monitoring				**$150,400**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$4,090,870**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$65,000.00	$65,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$260,000.00	$260,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management including CQA and OE services	1	LS	$650,000.00	$650,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$4,090,870.36	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$1,060,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$5,150,870**	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. Excavation volume quantities include removing CCR material from ponds.
3. Excavated ponds taken out of service will have embankments removed and graded to drain.
8. No road repair is included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

Pineville Facility Backup Quantities | Dave Lake | 7/21/2015

CCR Production Handling Assumptions:

% Bot Ash Wet Sluice to ATB:	100%
% Fly Ash Wet Sluice to ATB:	100%
% Gypsum to ATB:	0%

CCR Production Rates

CCR Production - 2015 Plan (tons)

Year	Pineville Bot Ash	Fly Ash	Gypsum	TOTAL
2015				-
2016				-
2017				-
2018				-
2019				-
2020				-
2021				-
2022				-
2023				-
2024				-
2025				-
Total:				

Accumulated Material (Tons)
ATB

Assumed Additional Accumulated Material (2015 thru closure): -

Projected Material Generation - Handling Assumptions:
Pineville Generating Station is closed and not producing CCR material

Approximate density of CCR in-place: 1 ton/CY

Assume dry material for this exersize

Orange:	To be confirmed by CAD
Yellow:	Based on assumptions as listed

Pond Quantity Balance Estimate:

Ash Treatment Basin

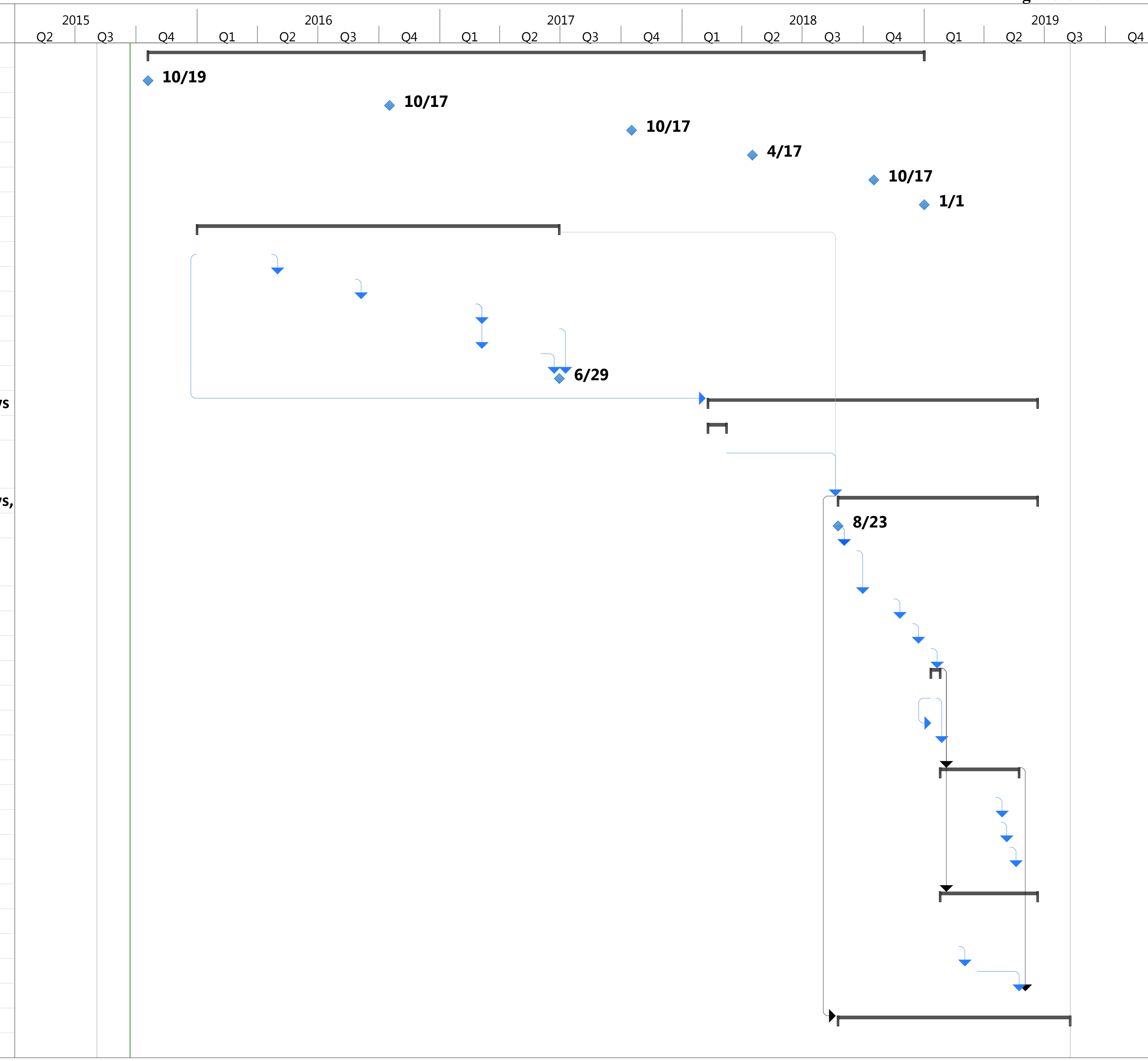
Item	Units	ATB	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	8.4				
Standing Surface Water (to remove)	GAL	5,474,290	Assume 2-ft average over pond area. Confirm with CAD.		2	ft
Length of perimeter	LF	2,950				
CUT:						
CCR cut in 2017	CY	111,460	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
FILL (to cover subgrade):						
CCR for Fill - from Baseline	CY	0				
Length of Perimeter Road to be installed on dyke	LF	2,610				
Soil Volume for material for road and dyke	CY	45,705				
Total Fill - as part of surface regrading	CY	53,005	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Total Fill for Closure of Pond	CY	914	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	914				
Final Cover Soil Volume	CY	12,750	CAD to update			
Final Cover Surface Area	AC	8.4	CAD to update			
Structural Support						
Geogrid	AC	0.0	not required as no new fill is being placed			
Geofabric	AC	0.0	not required as no new fill is being placed			
Surface Water Containment						
New Surface Water Pond Surface Area	AC	0.5				
Cut volume for New Surface Water Pond	CY	3,970				

Other Key Assumptions:

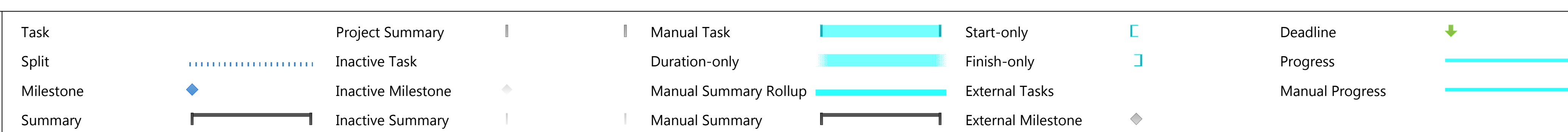
[a] Dewatering and settlement of ash through closure activities will affect the quantities of fill material. In situ ash and geotechnical soil borings and testing are recommended to determine settlement during closure design.

Attachment 3
Proposed Conceptual Alternative Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Regulatory Milestones**	**836 days**	**Mon 10/19/15**	**Tue 1/1/19**	
2	CCR Rule Effective Date	0 days	Mon 10/19/15	Mon 10/19/15	
3	Structural Integrity - Initial Assessment(s	0 days	Mon 10/17/16	Mon 10/17/16	
4	Groundwater - Background Analysis	0 days	Tue 10/17/17	Tue 10/17/17	
5	Groundwater - Detection Analysis	0 days	Tue 4/17/18	Tue 4/17/18	
6	Groundwater - Assessment Analysis	0 days	Wed 10/17/18	Wed 10/17/18	
7	Groundwater - Corrective Action	0 days	Tue 1/1/19	Tue 1/1/19	
8	**Engineering Phase**	**390 days**	**Fri 1/1/16**	**Thu 6/29/17**	
9	Preliminary Design	80 days	Fri 1/1/16	Thu 4/21/16	
10	Final Design	90 days	Fri 4/22/16	Thu 8/25/16	9
11	KY DEP Permitting	130 days	Fri 8/26/16	Thu 2/23/17	10
12	KY PSC Rate Approval	90 days	Fri 2/24/17	Thu 6/29/17	11
13	Procurement of Contractor	70 days	Fri 2/24/17	Thu 6/1/17	11
14	Issue NtP	0 days	Thu 6/29/17	Thu 6/29/17	13,12
15	**ATB**	**355 days**	**Fri 2/9/18**	**Thu 6/20/19**	**9SS+550 days**
16	**LG&E Activities**	**20 days**	**Fri 2/9/18**	**Thu 3/8/18**	
17	Remove and Discharge surface water	20 days	Fri 2/9/18	Thu 3/8/18	
18	**Contractor Activities**	**215 days**	**Thu 8/23/18**	**Thu 6/20/19**	**8FS+300 days,**
19	Mobilize	0 days	Thu 8/23/18	Thu 8/23/18	
20	Install Sediment and Erosion Control	20 days	Fri 8/24/18	Thu 9/20/18	19
21	Site Preparation	40 days	Fri 9/21/18	Thu 11/15/18	20
22	Roads	20 days	Fri 11/16/18	Thu 12/13/18	21
23	On Site Impoundments	20 days	Fri 12/14/18	Thu 1/10/19	22
24	**Preclosure Activities**	**10 days**	**Fri 1/11/19**	**Thu 1/24/19**	**23**
25	Stabilize upper CCR surface	5 days	Fri 1/11/19	Thu 1/17/19	
26	Dewater during stabilization	5 days	Fri 1/11/19	Thu 1/17/19	25SS
27	Cut/regrade for cover subgrade/dit	5 days	Fri 1/18/19	Thu 1/24/19	25
28	**Closure Activities**	**85 days**	**Fri 1/25/19**	**Thu 5/23/19**	**24**
29	Shape Cover Subgrade	60 days	Fri 1/25/19	Thu 4/18/19	
30	Place FML and Geocomposite	5 days	Fri 4/19/19	Thu 4/25/19	29
31	Cover soil	10 days	Fri 4/26/19	Thu 5/9/19	30
32	Vegetated Cover	10 days	Fri 5/10/19	Thu 5/23/19	31
33	**Surface Water Features**	**105 days**	**Fri 1/25/19**	**Thu 6/20/19**	**24**
34	New Stormwater Pond	60 days	Fri 1/25/19	Thu 4/18/19	
35	Primary Outlet Structure	20 days	Fri 1/25/19	Thu 2/21/19	
36	Emergency Outlet Structure	20 days	Fri 2/22/19	Thu 3/21/19	35
37	Surface Restoration	20 days	Fri 5/24/19	Thu 6/20/19	28,36
38	**Construction Management Services**	**250 days**	**Fri 8/24/18**	**Thu 8/8/19**	**18SS**
39	CQA and OE services	250 days	Fri 8/24/18	Thu 8/8/19	



Project: 20150915_Pineville_R1.
Date: Tue 9/22/15



TECHNICAL MEMORANDUM

Coal Combustion Residual Pond Closure Evaluation: Tyrone Generating Station

PREPARED FOR: Louisville Gas & Electric Company and Kentucky Utilities Company

PREPARED BY: CH2M HILL, Inc.

DATE: November 20, 2015

1 Executive Summary

Louisville Gas & Electric Company and Kentucky Utilities Company (LG&E-KU) tasked CH2M HILL, Inc. (CH2M) with performing coal combustion residuals (CCR) evaluations for eight sites to develop conceptual CCR ash pond closure approach and cost estimates. The generating stations under evaluation are Ghent, Trimble County, Mill Creek, E.W. Brown, Cane Run, Green River, Tyrone, and Pineville.

This report applies to Tyrone Generating Station (Exhibit 1). The following scope activities were completed:

- Review of LG&E-KU provided historical CCR information and kickoff meeting workshop (June 2015)
- Development of a CCR compliance alternative that consider regulatory, geotechnical, and stormwater aspects as it relates to CCR and ash ponds and associated cost estimates for the site.
- The Ash Treatment Basin (ATB) was identified as the applicable CCR unit for Tyrone. Other CCR units that could be affected by the CCR regulations at the site, but that were not evaluated further, include the Beneficial Reuse Stockpile and the possible CCR Fill Area.
- The estimated cost for closing the ATB is summarized in Table 1-1. Detailed cost information is included in Attachment 2.

Table 1-1. Tyrone Proposed Conceptual Cost Estimate

Proposed Conceptual CCR Pond Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
Fill ATB with material from the Beneficial Reuse Stockpile onsite. Remove surface water. Construct final cover (maximum grades). Install new surface water control pond and outlet structure.	$8.1 M	$11.6 M	$15.1 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX and OPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

2 Proposed Conceptual CCR Pond Closure Approach

2.1 Development of Proposed Conceptual CCR Pond Closure Approach

The proposed conceptual CCR pond closure approach was developed based on previous work completed by CH2M and discussions with LG&E-KU during the kickoff meeting on June 23, 2015. The Tyrone Generating Station is a closed facility and is not generating CCR wastewater at this time. The following defines the considered approach for closure for the ATB. Additional assumptions are summarized in Section 2.2.

- CCR material from the Beneficial Reuse Stockpile onsite (approximately 90,000 cubic yards) will be excavated and placed in the ATB.
- Surface water within ATB will be removed before closure begins, as needed, to allow surface improvement and dry material placement in ATB. Other potential subgrade improvements are described under the assumptions below.
- An aggregate perimeter road surrounding the ATB on top of the dike will be constructed.
- A final cover will be constructed. Cover construction will include preliminary CCR grading to shape the cover subgrade and will include the components described in the design assumptions below. Conceptual grades are shown in Exhibit 2. Significant grading features include the following:
  - A perimeter drainage ditch is shown within the dike. The ditch shows a high point along the southwestern side, dropping at approximately 0.5 percent to the east and west around the ATB.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 3 feet above the ditch invert. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2 has a net airspace capacity of approximately 39,290 cubic yards above the existing CCR surface grade.

The amount of CCR required to fill the ATB ponds and removed from the remaining ponds was developed using computer aided engineering (CAE) software in AutoCAD using drawings provided by LG&E-KU. The proposed conceptual pond closure approach drawings are provided in Attachment 1.

2.2 Design Assumptions

This section discusses the design assumptions associated with the conceptual design.

Ash Treatment Basin

The general design assumptions used for the conceptual alternative is as derived from the LG&E-KU drawing discussed above and are summarized below:

- The existing grade is established from AutoCAD files provided by LG&E-KU on June 23, 2015.

- The ATB dike will be used without modification. Some improvements may be required based on the U.S. Environmental Protection Agency (USEPA) dam assessment findings, which is not part of this project.
- The existing Beneficial Reuse Stockpile material at the site will be placed in the ATB prior to closure of the ATB.
- All volume calculations are based on an in-place (moist) density 1 ton per cubic yard (74 yards per cubic foot) for all cut and placed CCR material and does not account for shrinkage/swell during placement. A 2 percent volume reduction has been included in consideration of settlement of in-place CCR because of dewatering or new fill/cover loads. Changes to these assumptions should be verified during design development.
- The conceptual pond closure approach is assumed to be geotechnically stable as shown. This must be confirmed during design development.
- Improvements assumed to prepare a workable CCR surface include removing surface water, localized regrading to facilitate dewatering, and installing a geotextile, a layer of dry CCR, and geogrid.
- Final surface drainage channels are within the ATB dikes, would include final cover, and would be lined with turf reinforcement mat.
- The final cover is considered equivalent on a material quantity basis to the published CCR rule final cover requirements. The CCR Rule does not apply to the closure of this site (KYDEP regulations apply to the closure) but for costing purposes we have used a Final CCR Rule compliant cover design.
- The final cover is assumed to consist of 40-mil linear low-density polyethylene liner (LLDPE) placed directly on subgrade (CCR) and covered with geocomposite or strip drains and 2 feet of soil cover. A vegetative cover will be established.
- A 5 percent slope was used for the final cover.
- Ditches were included in the grading for the pond. The ditch geometry for ATB was assumed to consist of a trapezoidal channel with 4H:1V on the inner slope and 3H:1V on the outer side slopes. A bottom width of 10 feet was used to convey the estimated 100-year, 24-hour storm event (worst case) flow, as documented in the CH2M memorandum dated January 2015. Additional drainage features over the 5 percent cover (such as more closely spaced surface water ditches or other features) may be required, which have not been considered herein.
- A new surface water management pond will be installed northeast of the ATB to manage clean surface water from the closed ATB. The existing ATB primary outlet structure may/may not be able to be modified to regulate discharge, removed portions demolished and disposed of.
- No special dewatering structures will be required to remove decant water from the wet coal ash materials in the ash pond.

3 Estimated Material Volumes and Areas

The Tyrone Generating Station is closed and is not generating CCR material. No additional CCR material will be deposited in the ATB from the station. Existing beneficial reuse stockpiled CCR material at the site will be deposited in the ATB prior to closure of the ATB.

The conceptual alternative was developed using AutoCAD files provided by LG&E-KU as described under Section 2.2, Design Assumptions. Summaries of the estimated material quantities for the ATB is shown in Tables 3-1.

Table 3-1. Proposed Conceptual Estimated Material Quantities - ATB

Item	Units	Quantity
Total surface area	AC	9.8
Standing surface water (to remove)	GAL	6,386,671
Length of perimeter	LF	2,975
Length of perimeter road to be installed on the dike	LF	2,810
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**213,555**
FILL SOURCES:		
Fill as part of surface regrading		39,290
From soil volume for material for road and dike	CY	65,650
From Beneficial Reuse Stockpile	CY	90,000
TOTAL POTENTIAL FILL	**CY**	**0**
Final cover soil volume	CY	18,615
New Surface Water Pond (Surface Area)	AC	0.5
New Surface Water Outlet	Each	2

4 Schedule

Exhibit 4-1 as presented in Attachment 3 illustrates the proposed schedule to complete the design, permitting, and construction for the ATB closure. We assumed the design work would begin in 2016 to reduce the long-term escalation costs; however, since this pond closure does not need to comply with the Final CCR rule timeline, LG&E-KU has the flexibility to revise this schedule as needed,

5 Construction Cost Estimate

The estimated construction cost for closing the Ponds as described in Section 2 above is shown in Table 5-1.

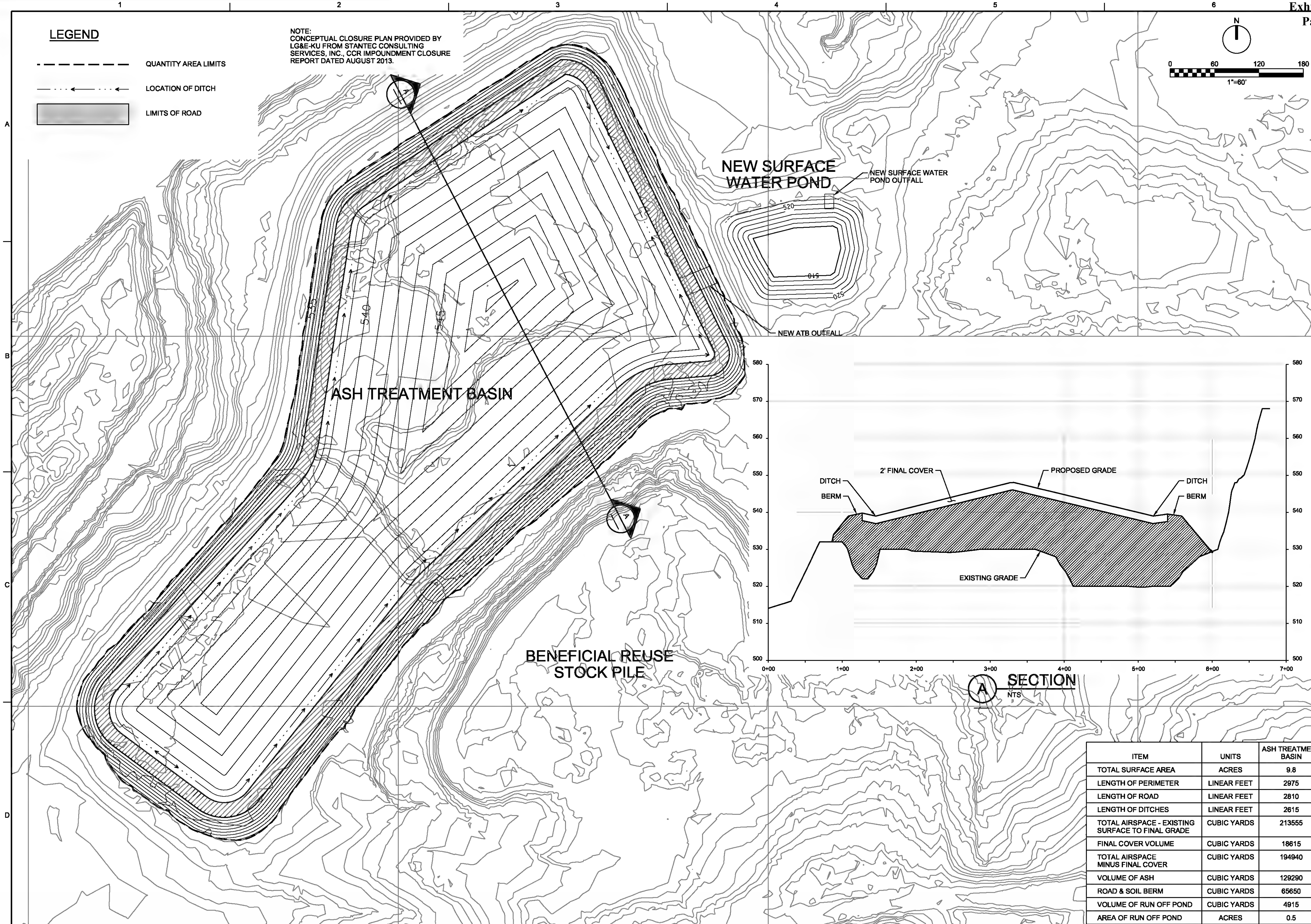
Table 5-1. Tyrone Proposed Conceptual Cost Estimate

Proposed Conceptual Closure Alternative	Low (-30%)	Total Capital Cost	High (+30%)
Fill ATB with material from the Beneficial Reuse Stockpile onsite. Remove surface water. Construct final cover (maximum grades). Install new surface water control pond and outlet structure.	$8.1 M	$11.6 M	$15.1 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX and OPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

Attachment 1
Proposed Conceptual Alternative CCR Closure



A SECTION
NTS

ITEM	UNITS	ASH TREATMENT BASIN
TOTAL SURFACE AREA	ACRES	9.8
LENGTH OF PERIMETER	LINEAR FEET	2975
LENGTH OF ROAD	LINEAR FEET	2810
LENGTH OF DITCHES	LINEAR FEET	2615
TOTAL AIRSPACE - EXISTING SURFACE TO FINAL GRADE	CUBIC YARDS	213555
FINAL COVER VOLUME	CUBIC YARDS	18615
TOTAL AIRSPACE MINUS FINAL COVER	CUBIC YARDS	194940
VOLUME OF ASH	CUBIC YARDS	129290
ROAD & SOIL BERM	CUBIC YARDS	65650
VOLUME OF RUN OFF POND	CUBIC YARDS	4915
AREA OF RUN OFF POND	ACRES	0.5

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL

TYRONE
PROPOSED CONCEPTUAL
CLOSURE PLAN
ASH TREATMENT BASIN

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2
SHEET	of

Attachment 2
Proposed Conceptual Alternative
Cost Estimate

COST COMPARISON FOR REMEDIAL ALTERNATIVES

Site:	Tyrone Generation Station	**Base Year:**	2015
Location:	Versailles, Kentucky	**Date:**	November
Phase:	Proposed Conceptual CCR Closure	**ROM Level:**	Class 4

	Tyrone Generating Station	
Remedial Technology	Fill Ash Treatment Pond with CCR's, install final cover and close in-place.	
Description	Fill Ash Treatment Pond with CCR's generated at facility or from other LG&E-KU facilities, install final cover, stormwater control improvements and close in-place.	
Contracted Direct Capital Cost	$11,229,393	
LG&E Overhead	$393,029	
Total Initial Costs	$11,622,422	
Upper ROM Range	$15,109,149	
Lower ROM Range	$8,135,695	

This is not an offer for construction and/or project execution. Please note, these order of magnitude cost estimates are assumed to represent the actual installed cost within the range of - 30 percent to + 30 percent of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

ver 6.5

CCR Rule - Tyrone Generating Station Cost Estimate - ATB
20-Nov-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - ATB	**$11,229,393**	**0%**	**0%**	**15%**	**58%**	**27%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%											
IMPOUNDMENT CLOSURE	**$8,637,995**	**0%**	**0%**	**15%**	**58%**	**27%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%	**$0**	**$0**	**$1,390,029**	**$5,641,851**	**$2,734,252**	**$0**	**$0**	**$0**	**$0**	**$0**	**$9,766,132**
Mobilization/Demobilization	**$50,000**	0%	0%	0%	80%	20%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$44,995	$11,699	$0	$0	$0	$0	$0	**$56,693**
Sediment & Erosion Control	**$25,000**	0%	0%	0%	80%	20%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$22,497	$5,849	$0	$0	$0	$0	$0	**$28,347**
Site Preparation	**$71,750**	0%	0%	0%	80%	20%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$64,567	$16,787	$0	$0	$0	$0	$0	**$81,355**
Dewatering	**$127,733**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$143,683	$0	$0	$0	$0	$0	$0	**$143,683**
Repair On-Site Pond Embankments	**$200,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$224,973	$0	$0	$0	$0	$0	$0	**$224,973**
Utility Services	**$50,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$56,243	$0	$0	$0	$0	$0	$0	**$56,243**
Perimeter Berm (not required)	**$0**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	**$106,387**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$119,670	$0	$0	$0	$0	$0	$0	**$119,670**
Pre-Closure / Preparation	**$3,158,911**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$3,553,345	$0	$0	$0	$0	$0	$0	**$3,553,345**
Closure/Final Cover	**$1,387,601**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$1,623,297	$0	$0	$0	$0	$0	**$1,623,297**
New Storm Water Pond	**$108,323**	0%	0%	0%	60%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$73,109	$50,689	$0	$0	$0	$0	$0	**$123,798**
Mechanical Improvements/Additions	**$50,000**	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$28,122	$29,246	$0	$0	$0	$0	$0	**$57,368**
Surface Water Features	**$100,000**	0%	0%	0%	60%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$67,492	$46,794	$0	$0	$0	$0	$0	**$114,286**
Primary Outlet Structure	**$30,000**	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$16,873	$17,548	$0	$0	$0	$0	$0	**$34,421**
Stormwater Pond Outlet Structure	**$50,000**	0%	0%	0%	60%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$33,746	$23,397	$0	$0	$0	$0	$0	**$57,143**
Surface Restoration	**$71,890**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$84,101	$0	$0	$0	$0	$0	**$84,101**
Groundwater Monitoring	**$150,400**	0%	0%	40%	40%	20%	0%	0%	0%	0%	0%	100%	$0	$0	$65,069	$67,672	$35,189	$0	$0	$0	$0	$0	**$167,930**
Conceptual Design	**$250,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$270,400	$0	$0	$0	$0	$0	$0	$0	**$270,400**
Final Design and Permitting and permitting support	**$1,000,000**	0%	0%	60%	40%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$648,960	$449,946	$0	$0	$0	$0	$0	$0	**$1,098,906**
PDI	**$75,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$81,120	$0	$0	$0	$0	$0	$0	$0	**$81,120**
Construction Management including CQA and OE services	**$1,500,000**	0%	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$324,480	$674,918	$701,915	$0	$0	$0	$0	$0	**$1,701,314**
Closure Report	**$75,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$87,739	$0	$0	$0	$0	$0	**$87,739**
Subtotal	**$8,637,995**												**$0**	**$0**	**$1,390,029**	**$5,641,851**	**$2,734,252**	**$0**	**$0**	**$0**	**$0**	**$0**	**$9,766,132**
Contingency	$2,591,398	0%	0%	15%	58%	27%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$1,464,920	$1,464,920	$0	$0	$0	$0	$0	**$2,929,840**
Subtotal with Contigency	**$11,229,393**												**$0**	**$0**	**$1,390,029**	**$7,106,770**	**$4,199,172**	**$0**	**$0**	**$0**	**$0**	**$0**	**$12,695,971**
LG&E & KU Overheads	$393,029	0%	0%	15%	58%	27%	0%	0%	0%	0%	0%	100%	$0	$0	$48,651	$248,737	$146,971	$0	$0	$0	$0	$0	**$444,359**
Total Project Cost	**$11,622,422**												**$0**	**$0**	**$1,439,000**	**$7,356,000**	**$4,346,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$13,141,000**

Assumptions	
LG&E & KU Overheads	3.50%
Escalation	4.00%
Contingency	30.00%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Tyrone Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Tyrone Generating Station **COST ESTIMATE SUMMARY**

Site: Tyrone Generating Station
Location: Versailles, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - ATB
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$50,000.00	$50,000	
SUBTOTAL Mobilization/Demobilization				**$50,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	1	LS	$25,000.00	$25,000	allowance for BPM
SUBTOTAL Sediment & Erosion Control				**$25,000**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350.00	$51,750	Clear & grub areas to recevie fill, as required
Surveying	1	LS	$10,000.00	$10,000	
Utility Locating	2	EA	$5,000.00	$10,000	
SUBTOTAL Site Preparation				**$71,750**	
Dewatering					
Dewatering and discharge through NPDES permit	6,386,671	GL	$0.02	$127,733	Assumes minor treatment required for TSS. Pump water to existing outlet structure.
SUBTOTAL Dewatering				**$127,733**	
Repair On-Site Pond Embankments					
Access Modications on existing CCR Pond embankments	1	LS	$200,000.00	$200,000	Assume embankments in good condition.
SUBTOTAL Repair On-Site Pond Embankments				**$200,000**	
Utility Services					
Utility Modifications	1	LS	$50,000.00	$50,000	LG&E-KU to complete.
SUBTOTAL Utility Services				**$50,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	2,810	CY	$37.86	$106,387	allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$106,387**	
Pre-Closure / Preparation					
Cut/regrade material within pond	47,432	CY	$8.10	$384,199	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Geotextile (as needed, assume 100% of area for filling)	57,112	SY	$2.46	$140,496	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of area for filling)	57,112	SY	$3.00	$171,336	CH2M HILL, recent quote on similar project
CCR Beneficial Re-use from stockpile on-site					
Excavation and Load from Stockpile (CCR from facility)	90,000	CY	$1.39	$125,100	1 988 RT Loader (8 CY), rent $85.95 + FOG $95.81/hr + opr $75/hr x 50 hrs/9,216 CY/week
- Hauling (assume 2 mile cycle)(CCR from facility operations)	90,000	CY	$2.96	$266,400	3 each, Cat 735 off-road trucks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
- Placement and Compaction (from Plant)	90,000	CY	$2.39	$215,100	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	90,000	CY	$0.57	$51,300	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Material for Road and Soil Berm					
- Excavation and Load-out (from off-site borrow area)	65,650	CY	$20.00	$1,313,000	allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2 mile cycle)	65,650	CY	$4.36	$286,234	$4.36 haul; 12cy, 15mph, 2 mile, 15 minute (RS Means 31 23 23.20 1018)
- Placement and Compaction	65,650	CY	$2.39	$156,904	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	65,650	CY	$0.57	$37,421	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes (assume 100% of pond)	57,112	SY	$0.20	$11,422	RSM 31 22 16.10 3300
SUBTOTAL Pre-Closure / Preparation				**$3,158,911**	
Closure/Final Cover					
Final Cover: 40-mil Tex/smooth LLDPE	426,888	SF	$0.65	$277,477	
Geocomposite (includes materials and installation)	426,888	SF	$0.55	$234,788	
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	23,717	CY	$20.00	$474,330	allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	7,906	CY	$20.00	$158,110	allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	31,622	CY	$4.36	$137,872	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	31,622	CY	$2.39	$75,577	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	31,622	CY	$0.57	$18,025	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	57,112	SY	$0.20	$11,422	RSM 31 22 16.10 3300
SUBTOTAL Closure/Final Cover				**$1,387,601**	
New Storm Water Pond					**0.5 acre**
Excavate New Pond					
- Excavation and Load-out	4,915	CY	$6.60	$32,439	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
- Hauling (assume 2 mile cycle)	4,915	CY	$4.36	$21,429	$4.36 haul; 12cy, 15mph, 2 mile, 15 minute (RS Means 31 23 23.20 1018)
- Placement and Compaction	4,915	CY	$2.39	$11,747	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	4,915	CY	$0.57	$2,802	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Surface Grading, lagoon bottoms	2,420	SY	$3.87	$9,365	RSM 31 22 16.10 3500
Cover Soil (aggregate - 1 feet thick)					
- Dense Grade Aggregate (materials, hauling and placement)	807	CY	$37.86	$30,540	allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL New Storm Water Pond				**$108,323**	
Mechanical Improvements/Additions					
Items to be constructed to meet NPDES Permitting Requirements	1	LS	$50,000.00	$50,000	allowance
SUBTOTAL Mechanical Improvements/Additions				**$50,000**	
Surface Water Features					
Items to meet NPDES Permit requirements	1	LS	$100,000.00	$100,000	allowance
SUBTOTAL Surface Water Features				**$100,000**	
Primary Outlet Structure					
Modify	1	LS	$30,000.00	$30,000	allowance
SUBTOTAL Primary Outlet Structure				**$30,000**	
Stormwater Pond Outlet Structure					
Construct	1	LS	$50,000.00	$50,000	allowance
SUBTOTAL Stormwater Pond Outlet Structure				**$50,000**	
Surface Restoration					
Mechanical Seeding & Mulching	12	AC	$3,550.00	$41,890	
Quantity/Final Survey	1	LS	$30,000.00	$30,000	
SUBTOTAL Surface Restoration				**$71,890**	
Groundwater Monitoring					
New Monitoring wells, 4" (2,975 LF perimeter)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 4 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$150,400**	
SUBTOTAL CONSTRUCTION				**$5,737,995**	
Design, Project & Construction Management, and Closure Report					
Conceputal Design	1	LS	$250,000.00	$250,000	LGE provided based on experience
Final Design and Permitting and permitting support	1	LS	$1,000,000.00	$1,000,000	LGE provided based on experience
PDI	1	LS	$75,000.00	$75,000	LGE provided based on experience
Construction Management including CQA and OE services	1	LS	$1,500,000.00	$1,500,000	$500,000 per year
Construction Contractor Performance and Payment Bonds	0	LS	$5,737,994.78	$0	LGE provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Construction Contractor Performance and Payment Bonds				**$2,900,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$8,637,995**	

Assumptions:

1. Areas and volumes were estimated based on CADD files provided by client.
Conceptual grading plans were prepared and quantity take-offs obtained from.
2. Excavation volume quantities include removing CCR material from ponds.
3. Excavated ponds taken out of service will have embankments removed and graded to drain.
8. No road repair is included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

Tyrone Facility Backup Quantities | Dave Lake | 7/21/2015

CCR Production Handling Assumptions:

% Bot Ash Wet Sluice to ATB:	100%
% Fly Ash Wet Sluice to ATB:	100%
% Gypsum to ATB:	0%

CCR Production Rates

CCR Production - 2015 Plan (tons)

Year	Tyrone Bot Ash	Fly Ash	Gypsum	TOTAL
2015				-
2016				-
2017				-
2018				-
2019				-
2020				-
2021				-
2022				-
2023				-
2024				-
2025				-
Total:				

Accumulated Material (Tons)
ATB

Assumed Additional Accumulated Material (2015 thru closure): -

Projected Material Generation - Handling Assumptions:
Tyrone Generating Station is closed and not producing CCR material

Approximate density of CCR in-place: 1 ton/CY | Assume dry material for this exersize

Orange:	To be confirmed by CAD
Yellow:	Based on assumptions as listed

Pond Quantity Balance Estimate:

Ash Treatment Basin

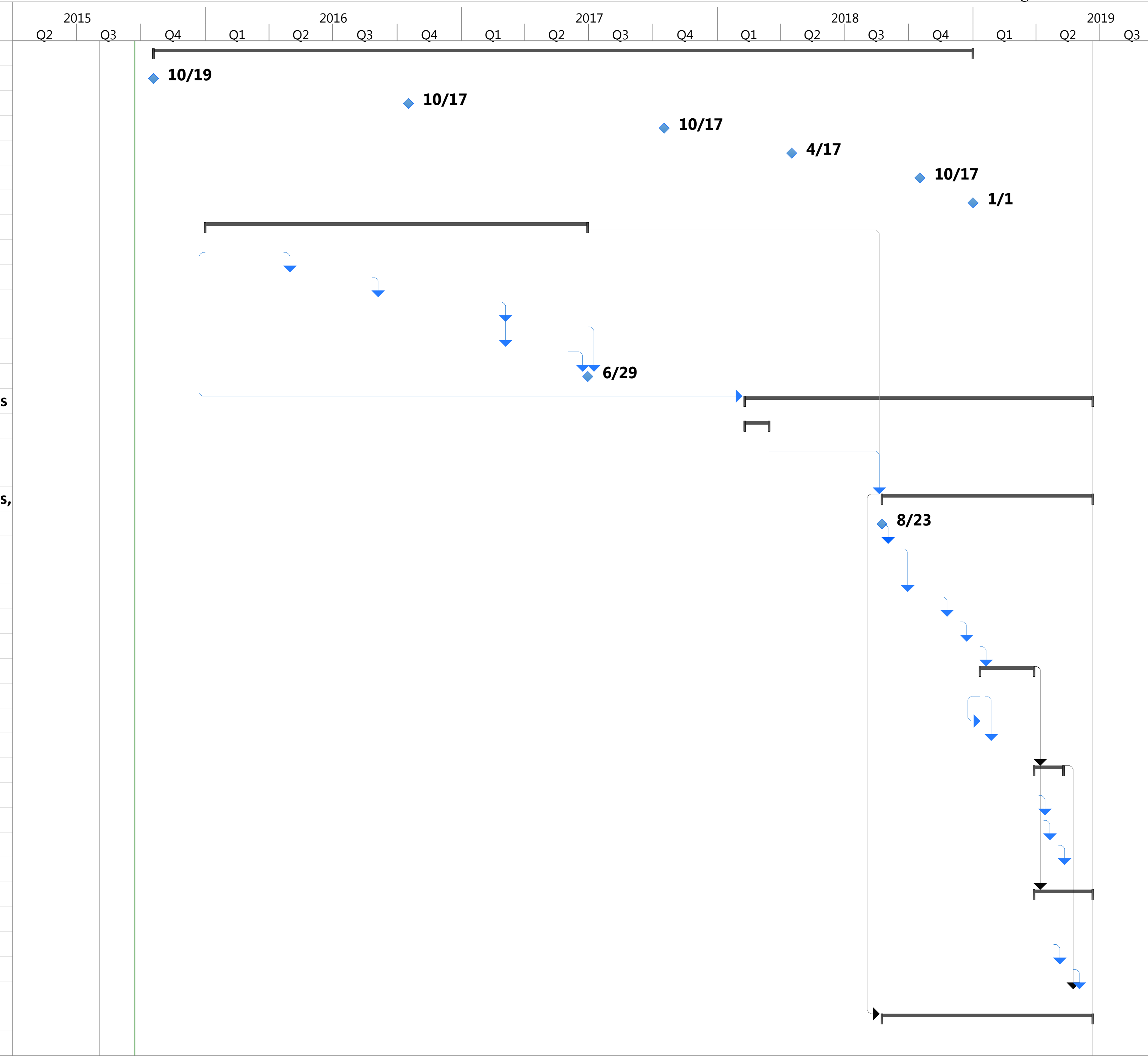
Item	Units	ATB	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	9.8				
Standing Surface Water (to remove)	GAL	6,386,671	Assume 2-ft average over pond area. Confirm with CAD.		2	ft
Length of perimeter	LF	2,975				
CUT:						
CCR cut in 2017	CY	213,555	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
FILL (to cover subgrade):						
CCR for Fill - from Baseline	CY	0				
CCR for Fill - from Beneficial Reuse Stockpile onsite	CY	90,000				
Length of Perimeter Road to be installed on dyke	LF	2,810				
Soil Volume for material for road and dyke	CY	65,650				
Total Fill - as part of surface regrading	CY	39,290	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Total Fill for Closure of Pond	CY	1,313	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	1,313				
Final Cover Soil Volume	CY	18,615	CAD to update			
Final Cover Surface Area	AC	9.8	CAD to update			
Structural Support						
Geogrid	AC	11.8	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Geofabric	AC	11.8	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Surface Water Containment						
New Surface Water Pond Surface Area	AC	0.5				
Cut volume for New Surface Water Pond	CY	3,970				

Other Key Assumptions:

[a] Dewatering and settlement of ash through closure activities will affect the quantities of fill material. In situ ash and geotechnical soil borings and testing are recommended to determine settlement during closure design.

Attachment 3
Proposed Conceptual Alternative Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Regulatory Milestones**	**836 days**	**Mon 10/19/15**	**Tue 1/1/19**	
2		CCR Rule Effective Date	0 days	Mon 10/19/15	Mon 10/19/15	
3		Structural Integrity - Initial Assessment(s	0 days	Mon 10/17/16	Mon 10/17/16	
4		Groundwater - Background Analysis	0 days	Tue 10/17/17	Tue 10/17/17	
5		Groundwater - Detection Analysis	0 days	Tue 4/17/18	Tue 4/17/18	
6		Groundwater Assessment Analysis	0 days	Wed 10/17/18	Wed 10/17/18	
7		Groundwater - Corrective Action	0 days	Tue 1/1/19	Tue 1/1/19	
8		**Engineering Phase**	**390 days**	**Fri 1/1/16**	**Thu 6/29/17**	
9		Preliminary Design	80 days	Fri 1/1/16	Thu 4/21/16	
10		Final Design	90 days	Fri 4/22/16	Thu 8/25/16	9
11		KY DEP Permitting	130 days	Fri 8/26/16	Thu 2/23/17	10
12		KY PSC Rate Approval	90 days	Fri 2/24/17	Thu 6/29/17	11
13		Procurement of Contractor	70 days	Fri 2/24/17	Thu 6/1/17	11
14		Issue NtP	0 days	Thu 6/29/17	Thu 6/29/17	13,12
15		**ATB**	**355 days**	**Fri 2/9/18**	**Thu 6/20/19**	**9SS+550 days**
16		**LG&E Activities**	**25 days**	**Fri 2/9/18**	**Thu 3/15/18**	
17		Remove and Discharge surface water	25 days	Fri 2/9/18	Thu 3/15/18	
18		**Contractor Activities**	**215 days**	**Thu 8/23/18**	**Thu 6/20/19**	**8FS+300 days,**
19		Mobilize	0 days	Thu 8/23/18	Thu 8/23/18	
20		Install Sediment and Erosion Control	20 days	Fri 8/24/18	Thu 9/20/18	19
21		Site Preparation	40 days	Fri 9/21/18	Thu 11/15/18	20
22		Roads	20 days	Fri 11/16/18	Thu 12/13/18	21
23		On Site Impoundments	20 days	Fri 12/14/18	Thu 1/10/19	22
24		**Preclosure Activities**	**55 days**	**Fri 1/11/19**	**Thu 3/28/19**	**23**
25		Stabilize upper CCR surface	5 days	Fri 1/11/19	Thu 1/17/19	
26		Dewater during stabilization	5 days	Fri 1/11/19	Thu 1/17/19	25SS
27		Cut/regrade for cover subgrade/dit	50 days	Fri 1/18/19	Thu 3/28/19	25
28		**Closure Activities**	**30 days**	**Fri 3/29/19**	**Thu 5/9/19**	**24**
29		Shape Cover Subgrade	5 days	Fri 3/29/19	Thu 4/4/19	
30		Place FML and Geocomposite	5 days	Fri 4/5/19	Thu 4/11/19	29
31		Cover soil	15 days	Fri 4/12/19	Thu 5/2/19	30
32		Vegetated Cover	5 days	Fri 5/3/19	Thu 5/9/19	31
33		**Surface Water Features**	**60 days**	**Fri 3/29/19**	**Thu 6/20/19**	**24**
34		New Stormwater Pond	60 days	Fri 3/29/19	Thu 6/20/19	
35		Primary Outlet Structure	20 days	Fri 3/29/19	Thu 4/25/19	
36		Emergency Outlet Structure	20 days	Fri 4/26/19	Thu 5/23/19	35
37		Surface Restoration	20 days	Fri 5/24/19	Thu 6/20/19	28,36
38		**Construction Management Services**	**215 days**	**Fri 8/24/18**	**Thu 6/20/19**	**18SS**
39		CQA and OE services	215 days	Fri 8/24/18	Thu 6/20/19	



Project: 20150915_Tyrone_R1.m
Date: Tue 9/22/15

Task		Project Summary		Manual Task		Start-only		Deadline	
Split		Inactive Task		Duration-only		Finish-only		Progress	
Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks		Manual Progress	
Summary		Inactive Summary		Manual Summary		External Milestone			

TECHNICAL MEMORANDUM

Coal Combustion Residual Pond Closure Evaluation: Ghent Generating Station

PREPARED FOR: Louisville Gas & Electric Company and Kentucky Utilities Company

PREPARED BY: CH2M HILL, Inc.

DATE: September 29, 2015

1 Executive Summary

Louisville Gas & Electric Company and Kentucky Utilities Company (LG&E-KU) tasked CH2M HILL Engineers (CH2M) with performing coal combustion residuals (CCR) evaluations for eight sites to develop conceptual CCR ash pond closure approaches and cost estimates. The generating stations under evaluation are Ghent, Trimble County, Mill Creek, E.W. Brown, Cane Run, Green River, Tyrone, and Pineville.

This technical memorandum applies to Ghent Generating Station. The following scope activities were completed:

- Reviewed LG&E-KU provided historical CCR information and kickoff meeting workshop (June 2015).
- Developed a CCR pond closure approach that considers regulatory, civil, geotechnical, and stormwater aspects as it relates to CCR and ash ponds and associated cost estimates for the site. Discussion of the conceptual CCR pond closure approach is included in Section 2, and drawings (Exhibits 2-1 through 2-4) are contained in Attachment 1.
- The applicable ponds at the Ghent Station are the Ash Treatment Basin #1 (ATB1), Gypsum Stack, Secondary Pond, Reclaim Pond, and the Ash Treatment Basin #2 (ATB2)
- Construct new concrete process tanks for management of wastewater that can no longer be managed in the ponds that will be closed; construct dewatering facility for removing water from solids.
- The estimated cost for closing the ponds is summarized in Exhibit 1-1. Detailed cost information is included in Attachment 2.

Exhibit 1-1. Ghent Proposed Conceptual Pond Closure Approach Cost Estimate

Proposed Conceptual CCR Pond Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
ATB1	$39.9 M	$57.0 M	$74.0 M
Gypsum Stack	$49.7 M	$71.0 M	$92.3 M
Concrete Process Tanks and Dewatering Facility	$73.3 M	$104.7 M	$136.1 M
ATB2	$55.6 M	$79.4 M	$103.3 M
Secondary Pond	$2.1 M	$3.0 M	$3.9 M
Reclaim Pond	$3.3 M	$4.7 M	$6.1 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

2 Proposed Conceptual CCR Pond Closure Approach

2.1 Development of Proposed Conceptual CCR Pond Closure Approach

The proposed conceptual CCR pond closure approach was developed based on previous work completed by CH2M and discussions with LG&E-KU during the kickoff meeting on June 23, 2015. The Ghent Generating Station is an operating facility with CCR wastewater generated and discharged to the ponds. The following defines the considered approach for closure for each of the five ponds. Additional assumptions are summarized in Section 2.2.

ATB1

- ATB1 will be reactivated starting in early 2017 or sooner to receive CCR material currently discharged to the Gypsum Stack, ATB2, and other process flows. This will include dredging approximately 10 acres of CCR to a depth of approximately 10 feet and reconfiguring process piping. The initial dredged material will be transported to ATB2.
- Material accumulated in ATB1 will include some wet discharges; but by January 2017, the CCR material sent to ATB1 (gypsum and ash) are expected to be dry. Expected CCR material discharges to ATB1 are summarized in Table 2-1. Material accumulation in ATB1 will continue until at least 2019, but could continue until 2023 or until the future fill capacity of ATB1 is maximized.
- Wet material sent to ATB1 after 2017 will be periodically dredged from the 10-acre area and moved elsewhere within ATB1.
- Surface water within ATB1 (outside the dredged area) will be removed before closure begins, as needed, to allow surface improvement and dry material placement in ATB1. Other potential subgrade improvements are described under assumptions below.
- CCR Rule Compliance Activities will begin in 2015.

- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade and will include the components described in the assumptions below. Conceptual grades are shown in Exhibits 2-1 and 2-2. Significant grading features include the following:
  - A perimeter drainage ditch is shown inside the dike. The ditch shows a high point near the western end, dropping at approximately 0.5 percent to the east. Two discharges penetrations are shown through the berm leading to a new stormwater pond in the Secondary Pond footprint.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 10 feet above the ditch invert or the top elevation of the dike crest, whichever is lower elevation. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2-1 has a net fill capacity (after reduction for ditch cut material) of approximately 1.8 million cubic yards above the existing CCR surface grade.
- Fill capacity under the ATB1 cover could be increased by nearly 1 million cubic yards by extending the 4H:1V ditch slope height to the full perimeter dike elevation. Capacity could be reduced to essentially zero net fill by reducing the 4H:1V ditch slope height to 3 feet, and constructing a multicell cover with lower individual crest elevations. Ditch grades could be refined to create local low points at the two perimeter drainage ditch discharge points. Such design refinements should not significantly change the estimated closure costs.

Gypsum Stack

- Surface water present in the Gypsum Stack will be removed in parallel with gypsum excavation.
- CCR (gypsum) will be excavated from the northern portion of the Gypsum Stack starting before 2017 to allow completion by mid-2017. Extents of excavation are shown on Exhibits 2-1 and 2-2. Any liner/leachate collection system and contaminated subsoils below the CCR also will be removed. The material will be transported for placement in ATB2.
- The north and east berms adjacent to the northern portion of the Gypsum Stack will be regraded to level the site. Alternately, the material could be stockpiled for future use as cover soil at ATB1 or ATB2.
- Process water tanks will be built within the regraded northern portion of the Gypsum Stack for startup in 2018.
- CCR (gypsum) will be excavated from the remainder of the Gypsum Stack (southern portion) after the northern portion is excavated. Contaminated subsoils below the CCR also will be removed. The material will be transported for placement in ATB2.
- The east dike adjacent to the southern portion of the Gypsum Stack will be regraded to flatten the site. Alternately, the material could be stockpiled for future use as cover soil at ATB1 or ATB2. Future EGL facilities may be constructed in this area.

ATB2

- CCR discharge to ATB2 will terminate after ATB1 is reactivated to accept discharge (in 2017).
- Surface water within ATB2 will be removed starting several months before closure begins, as needed to allow surface stabilization and dry material placement in ATB2. Other potential subgrade improvements are described under the assumptions below.
- CCR materials and subliner soils from the Gypsum Stack (northern portion) will be disposed within ATB2 starting before 2017. Other CCR materials and subliner soils from the Gypsum Stack (southern portion), Secondary Pond, and Reclaim Pond will follow.

- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade and will include the components described in the assumptions below. Conceptual grades are shown in Exhibits 2-3 and 2-4. Significant grading features include the following:
  - A perimeter drainage ditch is shown within the dike. The ditch shows a high point near the eastern end, dropping at approximately 0.5 percent around both the northern and southern sides of the pond to the west. Two discharges penetrations are shown through the dike; one (western side) leading to an existing surface water pond, and a second (northern side) leading a new ditch and stormwater pond in the Reclaim Pond footprint.
  - The final grades include 4H:1V slopes along the inside of the ditch extending 3 feet above the ditch invert. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2-3 has a net fill capacity (after reduction for ditch cut material) of approximately 4.4 million cubic yards above the existing CCR surface grade
- A surface water ditch will be improved to convey surface water to the existing Sediment Pond (from western side of ATB2), and a new ditch will be constructed to convey surface water to a new stormwater pond in the Reclaim Pond footprint (from northern side of ATB2).
- Fill capacity under the ATB2 cover could be increased (or reduced) as necessary to accept the final CCR excavation quantities at closure by either raising (or lowering) the ditch grade, or by extending the 4H:1V ditch slope height more than 3 feet above the ditch invert. Ditch grades could also be refined to create local low points at the two perimeter drainage ditch discharge points. Such design refinements should not significantly change the estimated closure costs.

Secondary Pond

- Surface water present in the Secondary Pond will be removed.
- The CCR will be excavated and disposed in ATB2. One foot of subsoils below the CCR also will be removed.
- The excavated pond will be converted to a Stormwater Pond. Modifications will include:
  - Regrading the pond sideslopes and bottom.
  - Installing erosion protection on exposed surfaces.
  - Installing two new outfalls into the pond from the ATB1 stormwater ditches.
  - Modifying the outfall from the pond as necessary to accommodate stormwater flows.

Reclaim Pond

- Surface water present in the Reclaim Pond will be removed.
- The CCR will be excavated and disposed in ATB2. One foot of subsoils below the CCR also will be removed.
- The excavated pond will be converted to a stormwater pond. Modifications will include:
  - Regrading the pond sideslopes and bottom.
  - Installing erosion protection on exposed surfaces.
  - Installing a new outfall into the pond from the ATB2 stormwater ditch.
  - Modifying the outfall from the pond as necessary to accommodate stormwater flows.

Regulatory Strategy

- Compliance with the Final CCR Rule.
- Closure activities will be permitted by the Kentucky Department of Environmental Protection (KYDEP) under the Final CCR Rule.

The amount of CCR required to fill the ATB ponds and removed from the remaining ponds was developed using computer aided engineering (CAE) software in AutoCAD using drawings provided by LG&E-KU. The proposed conceptual pond closure approach drawings are provided in Attachment 1.

2.2 Design Assumptions

This section discusses the design assumptions associated with the conceptual design.

ATB1 and ATB2

The general design assumptions used for the proposed conceptual alternative (ATB1 and ATB2) are summarized below:

- The existing grade is established from AutoCAD files provided by LG&E-KU on June 23, 2015.
- The ATB dikes will be used without modification. Some improvements may be required based on the U.S. Environmental Protection Agency (USEPA) dam assessment findings, but that work is not part of this project.
- By January 2017, the CCR material sent to the ponds is expected to be dry.
- The top of the ATB1 and ATB2 berms already includes an aggregate perimeter road.
- Periodic dredging of the 10-acre area within ATB1 and placement elsewhere in ATB1, as needed, to manage solids in 2017 and beyond are not included in the costs for this project.
- All volume calculations are based on an in-place (moist) density 1 ton per cubic yard (74 pounds per cubic foot) for cut and placed CCR material and does not account for shrinkage/swell during placement. Volumes do not consider settlement of in-place CCR because of dewatering or new fill/cover loads. Changes to these assumptions should be verified during design development.
- The conceptual pond closure approaches are assumed to be geotechnically stable as shown. This must be confirmed during design development.
- Improvements assumed to prepare a workable CCR surface include removing surface water, localized regrading to facilitate dewatering, and installing a geotextile, a layer of dry CCR, and geogrid.
- Final cover surface drainage channels are within the ATB dikes, would include final cover, and would be lined with turf reinforcement mat.
- The CCR is assumed to fill the ATB beneath the final cover.
- The final cover is assumed to consist of 40-mil linear low-density polyethylene liner (LLDPE) placed directly on subgrade (CCR) and covered with geocomposite or strip drains and 2 feet of soil cover including 0.5 foot of topsoil. A vegetative cover will be established.
- A 5 percent slope was assumed for the final cover.
- Ditches were included in the grading for the ponds. The ditch geometry for ATB1 and ATB2 was assumed to consist of a trapezoidal channel with 4H:1V on the inner slope and 3H:1V on the outer side slopes. A bottom width of 10 feet was used to convey the estimated 100-year, 24-hour storm event (worst case) flow, as documented in the CH2M memorandum dated January 2015. Additional drainage features over the 5 percent cover (such as more closely spaced surface water ditches or other features) may be required, which have not been considered herein.
- The existing ATB2 primary outlet structure could be modified to regulate discharge, and the removed portions would be demolished and disposed. The existing ATB1 primary outlet structure may/may not be able to be modified to regulate discharge, with the removed portions demolished and disposed of.

- No special dewatering structures will be required to remove the decant water from the wet coal ash materials in the ash ponds or localized dewatering of the ash to facilitate cover construction.

Gypsum Stack
The general design assumptions used for the conceptual alternative (Gypsum Stack) area as follows:

- The existing grade is established from AutoCAD files provided by LG&E-KU on June 23, 2015.
- The top of the original dike is 20 feet wide, with 3H:1V side slopes.
- The top of the original dike elevation is at elevation 520 feet.
- The original (bottom) elevation of the ash treatment basin is at elevation 500 feet.
- Complete removal of CCRs from the Gypsum Stack and loading, transport, and placement in ATB2 will occur in two stages (northern portion followed by southern portion).
- It is assumed that the gypsum material can be excavated and hauled using standard off-road construction equipment (multiple excavators and large-capacity off-road trucks). Dredging and/or temporary stockpiling before loading and hauling will not be required.
- One foot of material will be excavated and removed below the CCR material, which will include leachate collection liner and piping and potentially contaminated subsoil. This material will be disposed in ATB2.
- The original berms surrounding the gypsum excavated in Stage 1 (northern portion) can be removed/regraded before excavating gypsum in Stage 2 (southern portion).
- An east-west berm of material crossing the center of the Gypsum Stack is suitable to leave in place after regrading the Stage 1 berm and until completion of the gypsum excavation in Stage 2.
- The site will be regraded to construct new concrete process tanks in a location to be determined by LG&E-KU plant personnel. There will be four concrete tanks covering approximately 11.0 acres at a depth of 24-feet (two tanks 780-feet x 195-feet and two tanks 780-feet x 125-feet). Also included will be a dewatering system facility, within this vicinity of the concrete tanks.

Secondary and Reclaim Ponds
The general design assumptions used for the conceptual alternative (Secondary and Reclaim ponds) are as summarized below:

- The existing grade is established from AutoCAD files provided by LG&E-KU.
- Both ponds will be cleaned to the bottom of the CCR, which will be placed in the ATBs.
- Pond bottoms and side slopes will be regraded for conversion to stormwater ponds.
- New surface water outfalls into the ponds will be installed to accept stormwater from ATB1 (in Secondary Pond – two outfalls) and ATB2 (in Reclaim Pond – one outfall).

3 Estimated Material Volumes and Areas

The amount of fly ash, bottom ash, and gypsum generated by the facility and available for use as fill is summarized in Table 3-1. Total production rates by year are as communicated by LG&E-KU on June 23, 2015, and the portion sent to the ponds each year are based on the 2015 year to date production rates provided by LG&E-KU on July 1, 2015.

Table 3-1. Estimated CCR Production by Year – Total and Distribution by Ponds

Year	Total CCR Production (Tons)				Assumed CCR Distribution (Tons)		
	Bot Ash	**Fly Ash**	**Gypsum**	**TOTAL**	**ATB2**	**Gypsum Stack**	**ATB1** [2]
2015	95,524	382,098	971,368	**1,448,991**	85,972	330,265	-
2016	110,978	443,910	1,024,652	**1,579,540**	99,880	348,382	-
2017	113,956	455,825	1,042,262	**1,612,044**	-	-	354,369
2018	110,325	441,301	1,019,121	**1,570,747**	-	-	346,501
2019	108,994	435,976	1,014,263	**1,559,233**	-	-	344,849
2020	110,869	443,476	1,029,599	**1,583,944**	-	-	350,064
2021	106,731	426,924	990,608	**1,524,263**	-	-	336,807
2022	106,190	424,761	985,907	**1,516,858**	-	-	335,208
2023	111,034	444,136	1,031,235	**1,586,405**	-	-	350,620
TOTAL					**185,852**	**678,647**	**2,418,418**

Notes:
[1] Assumes that 18 percent of bottom ash and fly ash will be sent to ATB2 through end of 2016, converting to dry ash disposal at the onsite landfill in 2017 and later. Assumes 34 percent of gypsum will be sent to the Gypsum Stack through 2016, and then to ATB1 until closure (as dry material). Remaining material is assumed to be either beneficially used offsite or sent to the onsite landfill.
[2] Material assumed to be sent to ATB1 until the closure airspace capacity is full, with remainder sent to landfill.

The proposed conceptual design alternative was developed using AutoCAD files provided by LG&E-KU as described under assumptions above. Summaries of the estimated material quantities for each pond are shown in Tables 3-2A through 3-2E.

Table 3-2A. Proposed Conceptual Estimated Material Quantities - ATB1

Item	Units	Quantity
Total surface area	AC	111.2
Standing surface water (to remove)	GAL	56,296,720
Length of perimeter	LF	9,279
CUT: Existing Surface to Final Cover Subgrade		
Dredge for temporary treatment pond in 2017 - Send to ATB2	CY	161,333
Cut to Shape Cover Subgrade - Keep in ATB1	CY	362,465
FILL CAPACITY: Existing Surface to Final Cover Subgrade	**CY**	2,191,904
FILL SOURCES:		
From cut for final cover subgrade	CY	362,465
From CCR accumulation in ATB-1 - Jan. 2017 thru 2018	CY	700,870
From CCR accumulation in ATB-1 - Jan. 2019 thru 2023	CY	1,717,548
TOTAL POTENTIAL FILL through 2018	**CY**	1,063,335
TOTAL POTENTIAL FILL through 2023	**CY**	2,780,883
Final cover soil volume	CY	382,494

Table 3-2A. Proposed Conceptual Estimated Material Quantities - ATB1

Item	Units	Quantity
New ditch to Secondary Pond	LF	1,200

Table 3-2B. Proposed Conceptual Estimated Material Quantities – Gypsum Stack

Item	Units	Quantity
Total surface area	AC	60.28
Standing Surface Water (to remove)	GAL	58,039,125
Length of perimeter	LF	6,065
CUT - From Estimated Final Surface at Closure		
From existing surface to estimated CCR extents - send to ATB2	CY	3,666,633
From accumulation in Gypsum Stack through 2016 - Send to ATB2	CY	678,647
TOTAL Gypsum CUT - Send to ATB2	**CY**	4,345,280
Stage 1 - North	CY	1,402,173
Stage 2 - South	CY	2,943,107
Total subsoil cut - below gypsum - Send to ATB2	CY	97,257
BERM REGRADING	**CY**	79,216

Table 3-2C. Proposed Conceptual Estimated Material Quantities - ATB2

Standing Surface Water (to remove)	Units	Quantity
Total surface area	AC	154.5
Standing surface water (to remove)	GAL	247,302,756
Length of perimeter	LF	10,164
CUT: Existing Surface to Final Cover Subgrade		
Cut from existing surface to final subgrade - keep in ATB2	CY	497,662
FILL CAPACITY: Existing surface to final cover subgrade	**CY**	**4,937,298**
FILL SOURCES:		
From ATB1 temporary treatment pond	CY	161,333
From CCR accumulation in ATB-2 through 2016	CY	185,852
From Gypsum Stack - Stage 1	CY	1,441,828
From Gypsum Stack - Stage 2	CY	3,000,709
From Secondary Pond - CCR and subsoil	CY	22,977
From Reclaim Pond	CY	35,622
From cut for final cover subgrade	CY	497,662
TOTAL POTENTIAL FILL	**CY**	**5,345,983**
Potential EXCESS FILL (to be accommodated by refined ATB-2 cover design)	**CY**	**408,685**
Final cover soil volume	CY	547,874
New ditch to Reclaim Pond	LF	3,500

Table 3-2D. Proposed Conceptual Estimated Material Quantities - Secondary Pond

Item	Units	Quantity
Area of pond	AC	4.16
Standing surface water (to remove)	GAL	13,362,163
Length of perimeter	LF	1,955
CUT:		
From existing surface to estimated CCR extents - send to ATB2	CY	16,266
From subsoil below CCR - Send to ATB2	CY	6,711

Table 3-2E. Proposed Conceptual Estimated Material Quantities - Reclaim Pond

Item	Units	Quantity
Area of pond	AC	7.36
Standing surface water (to remove)	GAL	18,297,183
Length of perimeter	LF	2,565
CUT:		
From existing surface to estimated CCR extents - send to ATB2	CY	23,748
From subsoil below CCR - Send to ATB2	CY	11,874

4 Schedule

Exhibits 4-1 (in Attachment 3) shows the proposed schedule to complete the design, permitting, and construction for each of the pond closures.

5 Construction Cost Estimate

The estimated construction cost for closing the Ponds as described in Section 2 is shown on Table 5-1. Attachment 2 presents the breakdown of cost for closure.

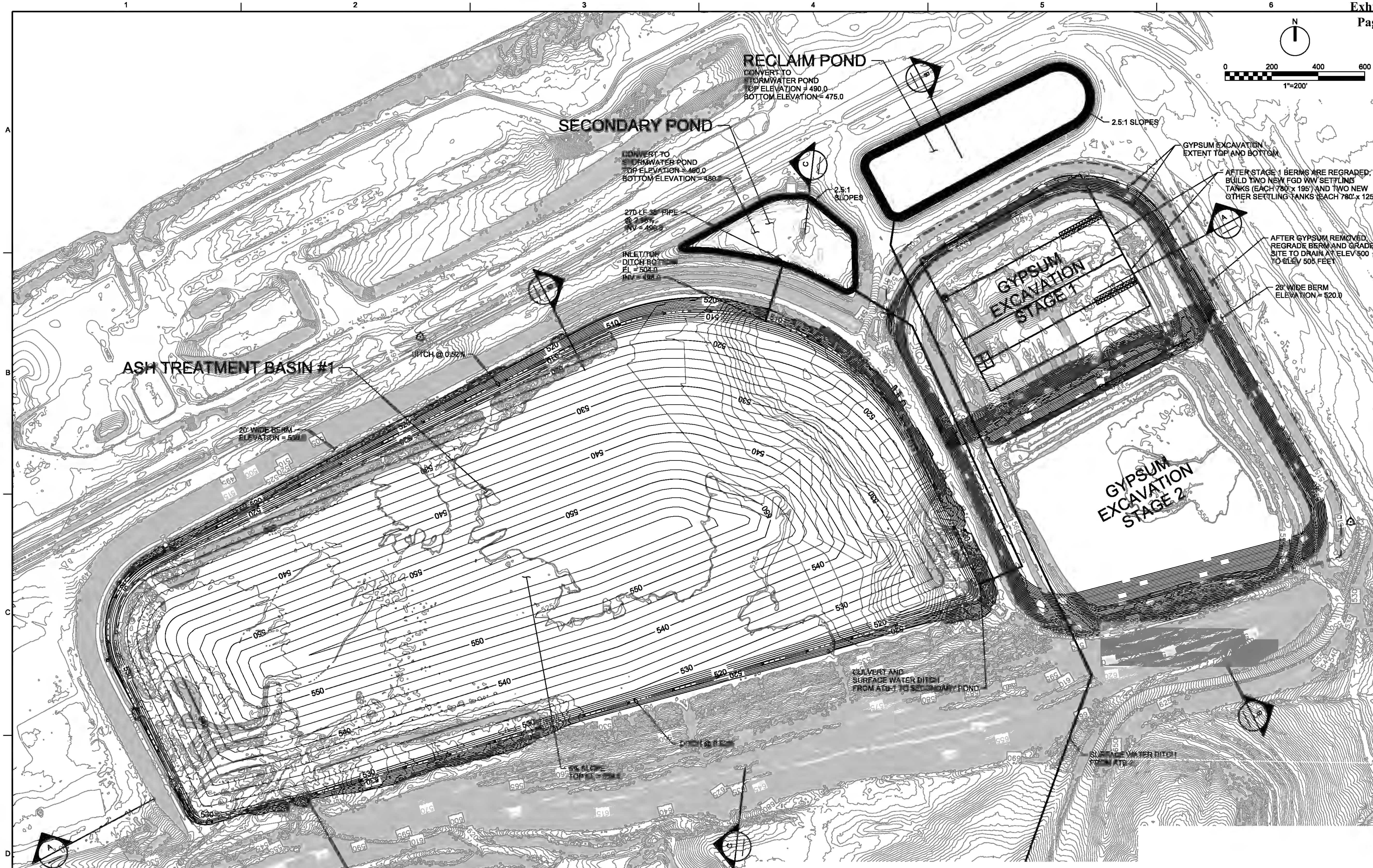
Table 5-1. Ghent Proposed Conceptual Pond Closure Approach Cost Estimate

Proposed Conceptual CCR Pond Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
ATB1	$39.9 M	$57.0 M	$74.0 M
Gypsum Stack	$49.7 M	$71.0 M	$92.3 M
Concrete Process Tanks	$73.3 M	$104.7 M	$136.1 M
ATB2	$55.6 M	$79.4 M	$103.3 M
Secondary Pond	$2.1 M	$3.0 M	$3.9 M
Reclaim Pond	$3.3 M	$4.7 M	$6.1 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

Attachment 1
Proposed Conceptual Alternative CCR Closure



Item	Units	Gypsum Stack	Reclaim Pond	Secondary Pond	ATB-1
Final Surface Area	AC	60.28	7.36	4.16	111.2
Length of Perimeter	LF	6,065	2,565	1,955	9,279
Total Cut - Existing to Final *	CY	4,539,794	35,622	22,977	362,465
Total Fill - Existing to Final	CY	97,257	11,874	6,711	2,574,398
Net Fill - Existing to Final	CY	-4,442,537	-23,748	-16,266	2,211,933
Final Cover Volume	CY	-	-	-	382,494
Total Fill Capacity	CY				1,829,439

* Includes cut for 2' cover subgrade at ATB-1

NO.	DATE	REVISION	BY	APVD
DSGN	DR	CHK	APVD	

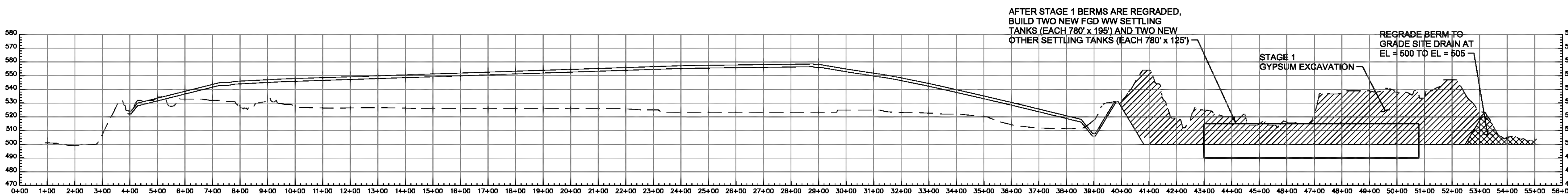
COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL.

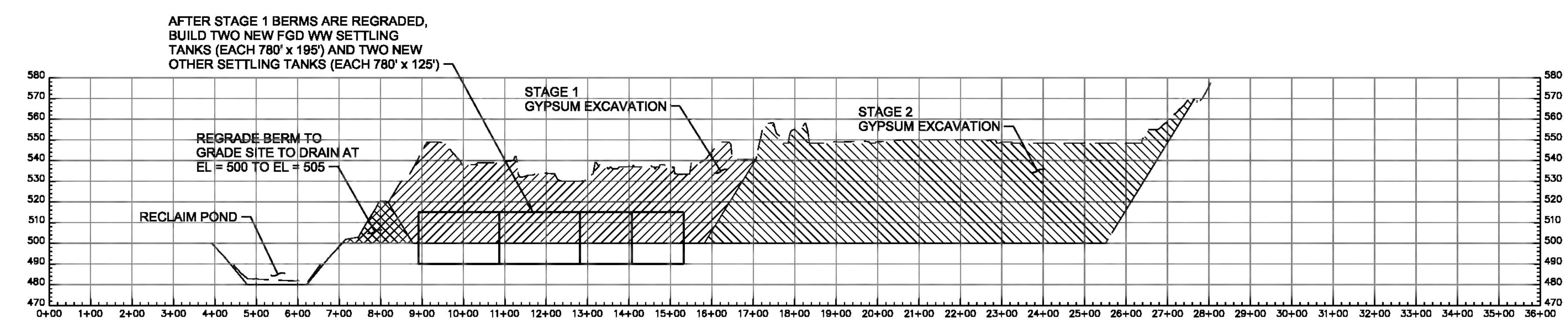
GHENT - CONCEPTUAL CLOSURE PLAN
ASH TREATMENT BASIN #1, RECLAIM POND, SECONDARY POND AND GYPSUM STACK

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	SEPTEMBER 2015
PROJ	488248
DWG	EXHIBIT 2-1
SHEET	of



A SECTION
NTS



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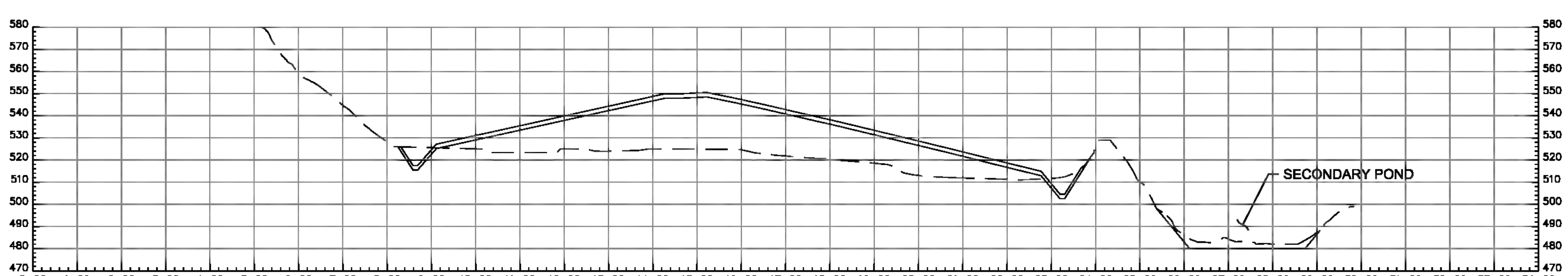

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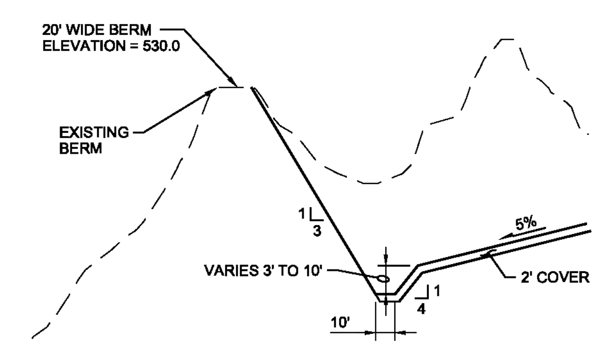


D SECTION
NTS

CH2MHILL

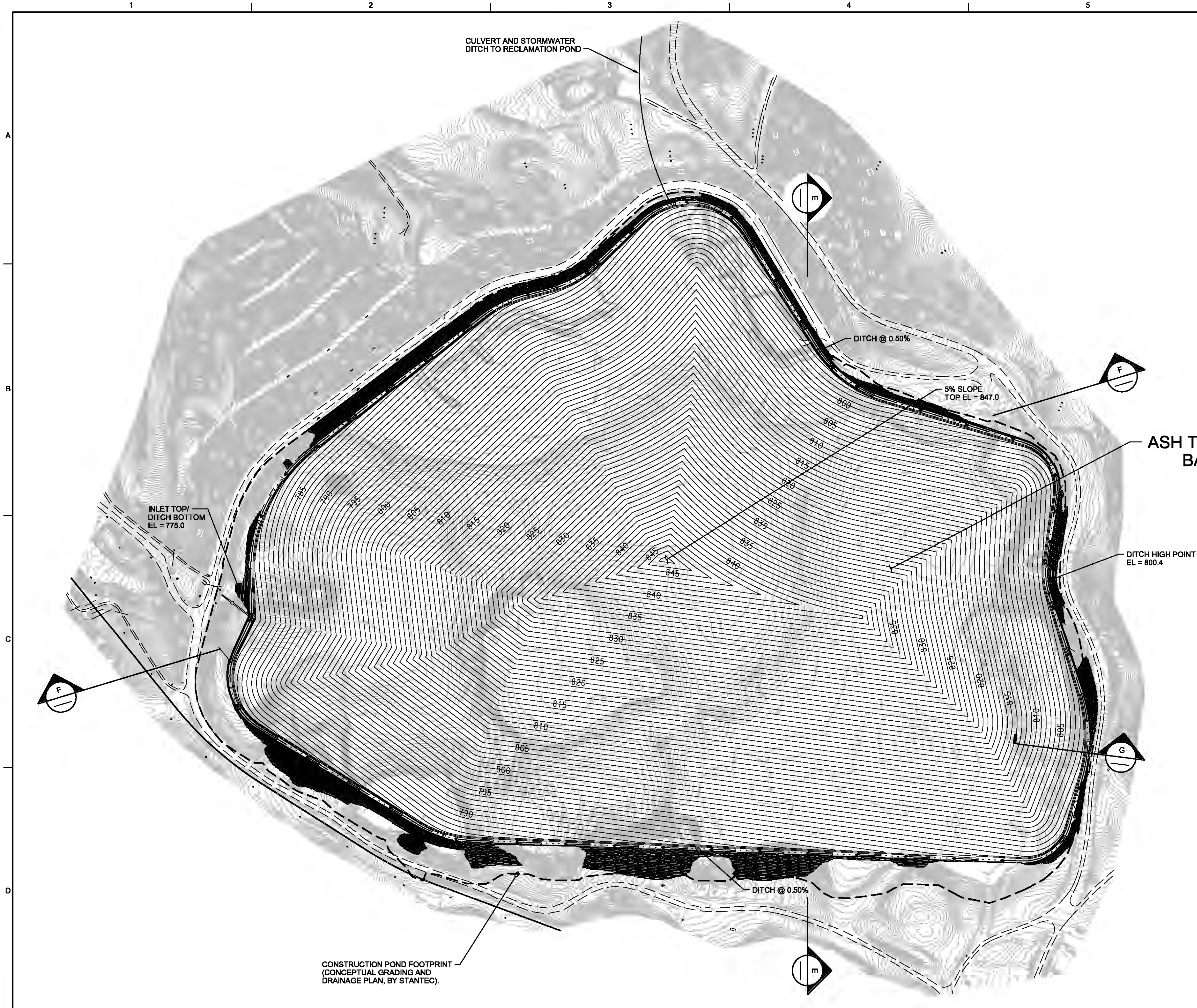
GHENT - CONCEPTUAL CLOSURE PLAN
ASH TREATMENT BASIN #1,
RECLAIM POND, SECONDARY POND
AND GYPSUM STACK CROSS SECTIONS

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

NO.	DATE	REVISION	BY	APVD
DSGN		DR	CHK	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	SEPTEMBER 2015
PROJ	488248
DWG	EXHIBIT 2-2
SHEET	of



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0 200 400 600
1"=200'

Item	Units	ATB-2
Final Surface Area	AC	154.51
Length of Perimeter	LF	10,164
Total Cut - Existing to Final *	CY	497,662
Total Fill - Existing to Final	CY	5,485,172
Net Fill - Existing to Final	CY	4,987,510
Final Cover Volume	CY	547,874
Total Fill Capacity	CY	4,439,636

* Includes cut for 2' cover subgrade at ATB-2

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

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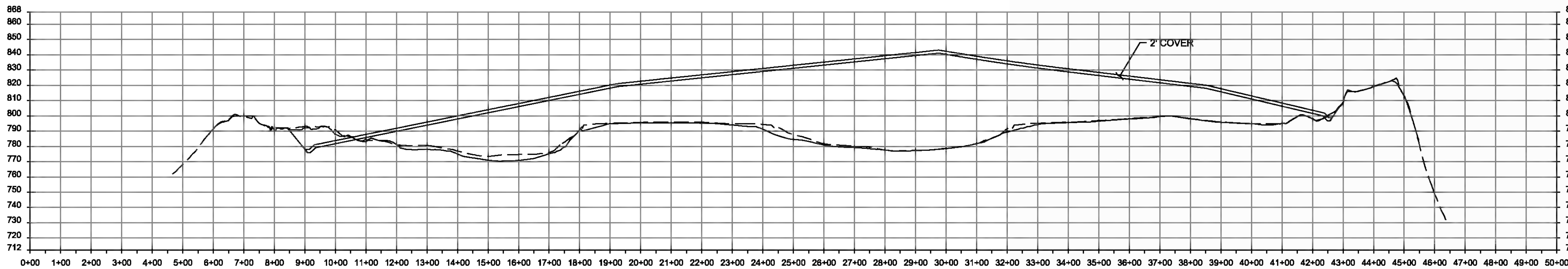
GHENT - CONCEPTUAL CLOSURE PLAN ASH TREATMENT BASIN #2

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2-3
SHEET	of



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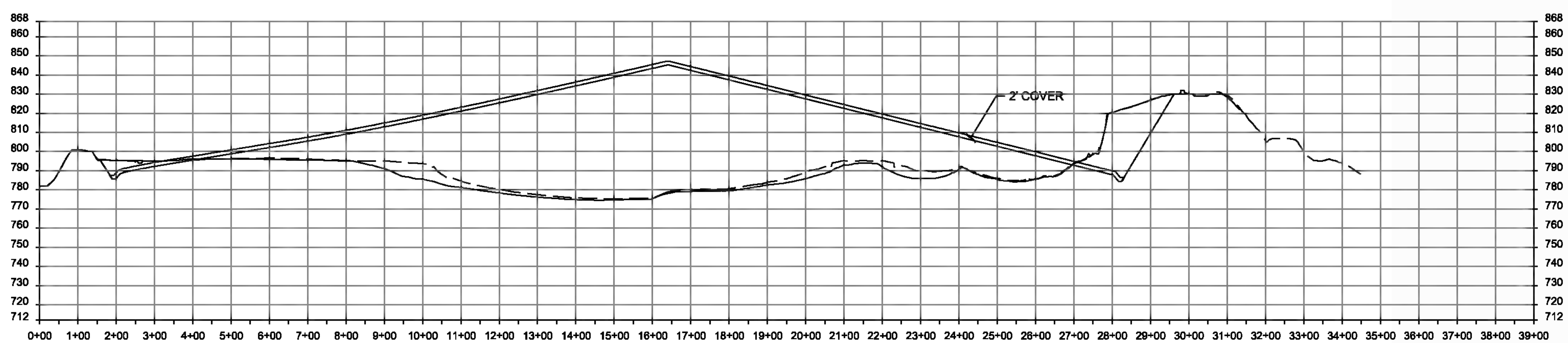

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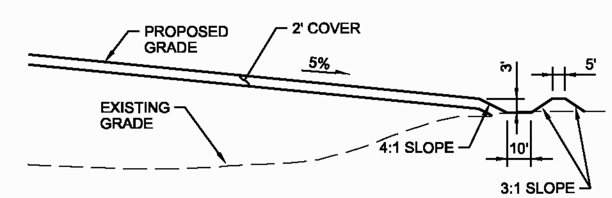

G SECTION
NTS

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL.

GHENT - CONCEPTUAL CLOSURE PLAN
ASH TREATMENT BASIN #2 SECTIONS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2-4
SHEET	of

Attachment 2
Proposed Conceptual Alternative Cost Estimate

COST SUMMARY

Site:	Ghent Generating Station	**Base Year:**	2015
Location:	Ghent, Kentucky	**Date:**	September
Phase:	Proposed Conceptual CCR Closure	**ROM Level:**	Class 4

	Ash Treatment Basin #1	Gypsum Stack	Concrete Tanks	Secondary Pond	Reclaim Pond	Ash Treatment Basin #2
Remedial Technology	Fill ATB #1 with CCR's, install final cover and close in-place.	Remove CCR's and close in-place	Installation of CCR concrete tanks	Remove CCR's and line pond	Remove CCR's, line and converted to Process Water Pond	Fill ATB #2 with CCR's, install final cover and close in-place.
Description	Completely fill with CCR material; incorporate 10 Acre flat area for material storage and future WWTP; and final cover installed.	Completely cleaned of ash, remove embankments and grade to drain.	Installation of four new concrete treatement tanks to handle waste water associtated with CCR materials at the facility.	Completely cleaned of ash and lined with a FML	Completely cleaned of ash and lined with a FML and coverted to a Process Water Pond	Completely fill with CCR material and final cover installed. (2,900,000 CY from Gypsum Stack, 58,530 CY from Secondary, 176,535 from Process Water/Reclaim + balance from operations)
Impoundment Closure	$55,033,740	$68,593,914	$0	$2,921,001	$4,566,925	$76,754,383
LG&E Overhead	$1,926,181	$2,400,787	$0	$102,235	$159,842	$2,686,403
New Construction	$0	$0	$101,120,756	$0	$0	$0
LG&E Overhead	$0	$0	$3,539,226	$0	$0	$0
Total Initial Costs	$56,959,921	$70,994,701	$104,659,982	$3,023,236	$4,726,768	$79,440,787
Upper ROM Range	$74,047,897	$92,293,111	$136,057,977	$3,930,207	$6,144,798	$103,273,023
Lower ROM Range	$39,871,944	$49,696,291	$73,261,988	$2,116,265	$3,308,737	$55,608,551

This is not an offer for construction and/or project execution. Please note, these order of magnitude cost estimates are assumed to represent the actual installed cost within the range of - 30 percent to + 30 percent of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

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CCR Rule - Ghent Generating Station Cost Estimate - ATB #1

21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #1	**$55,033,740**	**2%**	**5%**	**6%**	**2%**	**3%**	**2%**	**31%**	**26%**	**0%**	**0%**	**77%**
IMPOUNDMENT CLOSURE	**$42,333,646**	**2.4%**	**7.1%**	**8.2%**	**2.4%**	**3.8%**	**2.1%**	**40.7%**	**33.2%**	**0.0%**	**0.0%**	**100%**
Mobilization/Demobilization	**$100,000**	0%	30%	0%	0%	0%	0%	50%	20%	0%	0%	100%
Sediment & Erosion Control	**$51,000**	0%	0%	50%	0%	0%	0%	50%	0%	0%	0%	100%
Site Preparation	**$247,000**	0%	0%	50%	0%	0%	0%	50%	0%	0%	0%	100%
Dewatering	**$1,125,934**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$250,000**	0%	0%	30%	30%	20%	20%	0%	0%	0%	0%	100%
Utility Services	**$100,000**	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	100%
Perimeter Berm	**$0**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	**$286,053**	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Dredge 10-acre area for treatment cell	**$1,116,424**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Closure	**$11,537,699**	0%	0%	0%	0%	0%	0%	50%	50%	0%	0%	100%
Final Cover	**$17,595,856**	0%	0%	0%	0%	0%	0%	60%	40%	0%	0%	100%
Mechanical Improvements/Additions	**$1,755,334**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Water Features	**$118,395**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
Primary Outlet Structure	**$60,000**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Restoration	**$431,150**	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%
Groundwater Monitoring	**$308,800**	0%	0%	0%	0%	0%	20%	40%	40%	0%	0%	100%
Conceptual Design	**$600,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$2,500,000**	0%	40%	40%	20%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$3,000,000**	0%	5%	10%	10%	15%	20%	20%	20%	0%	0%	100%
Closure Report	**$75,000**	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%
CCR Rule Compliance Activities in 2015	**$1,000,000**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal	**$42,333,646**											
Contingency	$12,700,094	2%	7%	8%	2%	4%	2%	41%	33%	0%	0%	100%
Subtotal with Contigency	**$55,033,740**											
LG&E & KU Overheads	$1,926,181	2.4%	7.1%	8.2%	2.4%	3.8%	2.1%	40.7%	33.2%	0.0%	0.0%	100%
TOTAL PROJECT COST	**$56,960,000**											

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #1											
IMPOUNDMENT CLOSURE	**$1,000,000**	**$3,142,281**	**$3,755,705**	**$1,145,142**	**$1,902,113**	**$1,083,010**	**$21,825,340**	**$18,497,871**	**$0**	**$0**	**$52,351,462**
Mobilization/Demobilization	$0	$31,200	$0	$0	$0	$0	$63,266	$26,319	$0	$0	$120,785
Sediment & Erosion Control	$0	$0	$27,581	$0	$0	$0	$32,266	$0	$0	$0	$59,846
Site Preparation	$0	$0	$133,578	$0	$0	$0	$156,267	$0	$0	$0	$289,844
Dewatering	$0	$0	$0	$0	$1,317,184	$0	$0	$0	$0	$0	$1,317,184
Repair On-Site Pond Embankments	$0	$0	$81,120	$84,365	$58,493	$60,833	$0	$0	$0	$0	$284,810
Utility Services	$0	$52,000	$54,080	$0	$0	$0	$0	$0	$0	$0	$106,080
Perimeter Berm	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Roads	$0	$0	$154,698	$160,886	$0	$0	$0	$0	$0	$0	$315,583
Dredge 10-acre area for treatment cell	$0	$1,161,081	$0	$0	$0	$0	$0	$0	$0	$0	$1,161,081
Closure	$0	$0	$0	$0	$0	$0	$7,299,435	$7,591,412	$0	$0	$14,890,847
Final Cover	$0	$0	$0	$0	$0	$0	$13,358,623	$9,261,978	$0	$0	$22,620,601
Mechanical Improvements/Additions	$0	$0	$1,898,569	$0	$0	$0	$0	$0	$0	$0	$1,898,569
Surface Water Features	$0	$0	$0	$0	$0	$144,046	$0	$0	$0	$0	$144,046
Primary Outlet Structure	$0	$0	$0	$0	$0	$72,999	$0	$0	$0	$0	$72,999
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Surface Restoration	$0	$0	$0	$0	$0	$0	$0	$567,364	$0	$0	$567,364
Groundwater Monitoring	$0	$0	$0	$0	$0	$75,140	$156,292	$162,544	$0	$0	$393,977
Conceptual Design	$0	$624,000	$0	$0	$0	$0	$0	$0	$0	$0	$624,000
Final Design and Permitting and permitting support	$0	$1,040,000	$1,081,600	$562,432	$0	$0	$0	$0	$0	$0	$2,684,032
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	$78,000
Construction Management, including CQA and OE services	$0	$156,000	$324,480	$337,459	$526,436	$729,992	$759,191	$789,559	$0	$0	$3,623,118
Closure Report	$0	$0	$0	$0	$0	$0	$0	$98,695	$0	$0	$98,695
CCR Rule Compliance Activities in 2015	$1,000,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,000,000
Subtotal	**$1,000,000**	**$3,142,281**	**$3,755,705**	**$1,145,142**	**$1,902,113**	**$1,083,010**	**$21,825,340**	**$18,497,871**	**$0**	**$0**	**$52,351,462**
Contingency	$0	$0	$0	$0	$0	$0	$7,852,719	$7,852,719	$0	$0	$15,705,439
Subtotal with Contigency	**$1,000,000**	**$3,142,281**	**$3,755,705**	**$1,145,142**	**$1,902,113**	**$1,083,010**	**$29,678,059**	**$26,350,590**	**$0**	**$0**	**$68,056,901**
LG&E & KU Overheads	$35,000	$109,980	$131,450	$40,080	$66,574	$37,905	$1,038,732	$922,271	$0	$0	$2,381,992
TOTAL PROJECT COST	**$1,035,000**	**$3,252,261**	**$3,887,155**	**$1,185,222**	**$1,968,687**	**$1,120,915**	**$30,716,791**	**$27,272,861**	**$0**	**$0**	**$70,438,892**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Ghent Generating Station" technical memo dated July 24, 2015
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 -Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Ghent Generating Station | **COST ESTIMATE SUMMARY**

Site: Ghent Generating Station
Location: Ghent, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #1
Base Year 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$100,000.00	$100,000	
SUBTOTAL Mobilization/Demobilization				**$100,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	10200	LF	$5.00	$51,000	
SUBTOTAL Sediment & Erosion Control				**$51,000**	
Site Preparation					
Clearing/Grubbing	20	AC	$10,350.00	$207,000	
Surveying	1	LS	$25,000.00	$25,000	
Utility Locating	1	EA	$15,000.00	$15,000	
SUBTOTAL Site Preparation				**$247,000**	
Dewatering					
Dewatering and discharge through NPDES permit	56,296,720	GL	$0.02	$1,125,934	Assumes treatment required for TSS. Pump water to existing outlet structure.
SUBTOTAL Dewatering				**$1,125,934**	
Repair On-Site Pond Embankments					
Access Modifications on existing CCR Pond embankments	1	LS	$250,000.00	$250,000	Minimal, based off of USEPA dam assessment report
SUBTOTAL Repair On-Site Pond Embankments				**$250,000**	
Utility Services					
Utility Modifications	1	LS	$100,000.00	$100,000	Allowance LG&E-KU to complete.
SUBTOTAL Utility Services				**$100,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	7556	CY	$37.86	$286,053	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$286,053**	
Dredge 10-acre area for treatment cell					
Dredging to create 10 acre area for treatment (no treatment of the influent or effluent. No additional water handling)	161,333	CY	$3.68	$593,705	161,333 CY @ 900 CY/10-hr days = 180 work days @ 5 days/week = 36 weeks = 9 months. Dredge $30K/month X 9 + 180 days @ $1,800/day labor /161,333
Rent 2 booster pumps, including hose, fittings, etc, to sluice to ATB-2	161,333	CY	$3.24	$522,719	Booster pump @ $25K/month x 2 each = $360,000. Fuel/consumables @ $400/day x 180 = 72,000. Total = $522,000
SUBTOTAL Dredge 10-acre area for treatment cell				**$1,116,424**	
Closure					
Geotextile (as needed, assume 100% of 111.2 acre area for filling)	538,208	SY	$2.46	$1,323,992	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of 111.2 acre area for fi	538,208	SY	$3.00	$1,614,624	CH2M HILL, recent quote on similar project
Cut/regrade for cover subgrade/ditch	362,465	CY	$8.10	$2,935,967	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Placement and Compaction (from Plant, under cover, fill capacity reduced by ditch grading and secondary pond material)	1,806,462	CY	$2.39	$4,317,444	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	2,168,927	CY	$0.57	$1,236,288	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	546,920	SY	$0.20	$109,384	RSM 31 22 16.10 3300
SUBTOTAL Closure				**$11,537,699**	
Final Cover					
Final Cover: 40-mil Tex/smooth LLDPE	4,922,280	SF	$0.65	$3,199,482	
Geocomposite (includes materials and installation)	4,922,280	SF	$0.55	$2,707,254	
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	286,871	CY	$20.00	$5,737,410	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	95,624	CY	$20.00	$1,912,470	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	382,494	CY	$4.36	$1,667,674	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	382,494	CY	$2.39	$914,161	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	382,494	CY	$0.57	$218,022	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Drainage System Piping	113	AC	$10,000.00	$1,130,000	Allowance
Finish Grading, gentle slopes	546,920	SY	$0.20	$109,384	RSM 31 22 16.10 3300
SUBTOTAL Final Cover				**$17,595,856**	
Mechanical Improvements/Additions					
Piping to ATB-1 (from GS and ATB-2)	1	LS	$1,755,334.00	$1,755,334	May 2015 estimate
SUBTOTAL Mechanical Improvements/Additions				**$1,755,334**	
Surface Water Features					
Ditch Erosion Protection - Perimeter Ditch	9279	LF	$5.00	$46,395	vegetative
Culvert through berm to Secondary Pond, from NE corner (36")	270	LF	$100.00	$27,000	
Culvert through berm to Secondary Pond, from SE corner (36")	270	LF	$100.00	$27,000	
Ditch to Secondary Pond, from SE corner	1200	LF	$15.00	$18,000	
SUBTOTAL Surface Water Features				**$118,395**	
Primary Outlet Structure					
Modify	1	LS	$50,000.00	$50,000	
Demolition and Disposal of removed portion	1	LS	$10,000.00	$10,000	
SUBTOTAL Primary Outlet Structure				**$60,000**	
Emergency Outlet Structure					
Surface Restoration					
Mechanical Seeding & Mulching	113.0	AC	$3,550.00	$401,150	
Quantity/Final Survey	1	LS	$30,000.00	$30,000	
SUBTOTAL Surface Restoration				**$431,150**	
Groundwater Monitoring					
New Monitoring wells, 4" (9,300 LF perimeter)	13	EA	$17,600.00	$228,800	assumes well spacing 1 well/750 feet; 13 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$308,800**	
SUBTOTAL CONSTRUCTION				**$35,083,646**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$600,000.00	$600,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$2,500,000.00	$2,500,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$3,000,000.00	$3,000,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0%		$35,083,645.92	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$6,250,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$41,333,646**	
NEW CONSTRUCTION (COST ASSOCIATED WITH GYPSUM STACK)					
FGD Treatment Tanks					
Common Equipment					
FGD Treatment Tanks					
Common Items					
Construction Material					
Other Construction					

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Ghent Generating Station Cost Estimate - Gypsum Stack
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check
Proposed Conceptual Alternative CCR Closure - Gypsum Stack	**$68,593,914**	**0%**	**15%**	**35%**	**26%**	**23%**	**1%**	**0%**	**0%**	**0%**	**0%**	**100%**
IMPOUNDMENT CLOSURE	**$52,764,549**	**0.0%**	**14.6%**	**35.0%**	**26.4%**	**22.8%**	**1.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100%**
Mobilization/Demobilization	$50,000	0%	0%	80%	0%	0%	20%	0%	0%	0%	0%	100%
Sediment & Erosion Control	$30,325	0%	0%	40%	60%	0%	0%	0%	0%	0%	0%	100%
Site Preparation	$91,750	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Dewatering	$580,391	0%	70%	30%	0%	0%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Utility Services	$25,000	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	100%
Perimeter Berm	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Closure (northern portion)	$14,957,339	0%	40%	60%	0%	0%	0%	0%	0%	0%	0%	100%
Closure (south portion)	$30,980,061	0%	0%	25%	40%	35%	0%	0%	0%	0%	0%	100%
Final Cover (Install FML) (Not applicable/required)	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Ditches (included in Final Cover)	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Water Features	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Primary Outlet Structure	$350,000	0%	0%	50%	0%	50%	0%	0%	0%	0%	0%	100%
Emergency Outlet Structure	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Restoration	$217,065	0%	0%	30%	10%	30%	30%	0%	0%	0%	0%	100%
Groundwater Monitoring	$238,400	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%
Soil Sampling	$94,219	0%	20%	20%	10%	20%	30%	0%	0%	0%	0%	100%
Conceptual Design	$500,000	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	$2,000,000	0%	20%	30%	30%	10%	10%	0%	0%	0%	0%	100%
PDI	$75,000	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	$2,500,000	0%	10%	20%	30%	30%	10%	0%	0%	0%	0%	100%
Closure Report	$75,000	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
Subtotal	**$52,764,549**											
Contingency	$15,829,365	0.0%	14.6%	35.0%	26.4%	22.8%	1.2%	0.0%	0.0%	0.0%	0.0%	100%
Subtotal with Contigency	**$68,593,914**											
LG&E & KU Overheads	$2,400,787	0.0%	14.6%	35.0%	26.4%	22.8%	1.2%	0.0%	0.0%	0.0%	0.0%	100%
TOTAL PROJECT COST	**$70,995,000**											

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Gypsum Stack											
IMPOUNDMENT CLOSURE	**$0**	**$8,000,962**	**$19,964,566**	**$15,672,261**	**$14,099,117**	**$764,527**	**$0**	**$0**	**$0**	**$0**	**$58,501,433**
Mobilization/Demobilization	$0	$0	$43,264	$0	$0	$12,167	$0	$0	$0	$0	$55,431
Sediment & Erosion Control	$0	$0	$13,120	$20,467	$0	$0	$0	$0	$0	$0	$33,587
Site Preparation	$0	$0	$49,618	$51,603	$0	$0	$0	$0	$0	$0	$101,222
Dewatering	$0	$422,525	$188,325	$0	$0	$0	$0	$0	$0	$0	$610,850
Repair On-Site Pond Embankments	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Utility Services	$0	$13,000	$13,520	$0	$0	$0	$0	$0	$0	$0	$26,520
Perimeter Berm	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Roads	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Closure (northern portion)	$0	$6,222,253	$9,706,714	$0	$0	$0	$0	$0	$0	$0	$15,928,967
Closure (south portion)	$0	$0	$8,377,008	$13,939,342	$12,684,801	$0	$0	$0	$0	$0	$35,001,151
Final Cover (Install FML) (Not applicable/required)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Ditches (included in Final Cover)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Surface Water Features	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Primary Outlet Structure	$0	$0	$189,280	$0	$204,725	$0	$0	$0	$0	$0	$394,005
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Surface Restoration	$0	$0	$70,433	$24,417	$76,181	$79,228	$0	$0	$0	$0	$250,259
Groundwater Monitoring	$0	$49,587	$103,141	$107,267	$0	$0	$0	$0	$0	$0	$259,996
Soil Sampling	$0	$19,598	$20,381	$10,598	$22,045	$34,389	$0	$0	$0	$0	$107,011
Conceptual Design	$0	$520,000	$0	$0	$0	$0	$0	$0	$0	$0	$520,000
Final Design and Permitting and permitting support	$0	$416,000	$648,960	$674,918	$233,972	$243,331	$0	$0	$0	$0	$2,217,181
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	$78,000
Construction Management, including CQA and OE services	$0	$260,000	$540,800	$843,648	$877,394	$304,163	$0	$0	$0	$0	$2,826,005
Closure Report	$0	$0	$0	$0	$0	$91,249	$0	$0	$0	$0	$91,249
Subtotal	**$0**	**$8,000,962**	**$19,964,566**	**$15,672,261**	**$14,099,117**	**$764,527**	**$0**	**$0**	**$0**	**$0**	**$58,501,433**
Contingency	$0	$0	$0	$0	$8,775,215	$8,775,215	$0	$0	$0	$0	$17,550,430
Subtotal with Contigency	**$0**	**$8,000,962**	**$19,964,566**	**$15,672,261**	**$22,874,332**	**$9,539,742**	**$0**	**$0**	**$0**	**$0**	**$76,051,863**
LG&E & KU Overheads	$0	$280,034	$698,760	$548,529	$800,602	$333,891	$0	$0	$0	$0	$2,661,815
TOTAL PROJECT COST	**$0**	**$8,280,996**	**$20,663,326**	**$16,220,790**	**$23,674,934**	**$9,873,633**	**$0**	**$0**	**$0**	**$0**	**$78,713,678**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Ghent Generating Station" technical memo dated July 24, 2015
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 -Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

CCR Rule - Ghent Generating Station Cost Estimate - Gypsum Stack
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Gypsum Stack	**$77,785,197**	**0%**	**18%**	**40%**	**42%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**100%**											
NEW CONSTRUCTION (COST ASSOCIATED WITH GYPSUM STACK)	**$77,785,197**	**0.0%**	**18.3%**	**40.0%**	**41.7%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100%**	**$0**	**$14,818,460**	**$33,652,988**	**$36,471,014**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$84,942,462**
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	$25,990,121	0%	10%	40%	50%	0%	0%	0%	0%	0%	0%	100%	$0	$2,702,973	$11,244,366	$14,617,676	$0	$0	$0	$0	$0	$0	$28,565,014
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cost	$19,445,076	0%	10%	40%	50%	0%	0%	0%	0%	0%	0%	100%	$0	$2,022,288	$8,412,718	$10,936,533	$0	$0	$0	$0	$0	$0	$21,371,538
Dewatering Facilityl Order of Magnitude Capital Cost	$32,300,000	0%	30%	40%	30%	0%	0%	0%	0%	0%	0%	100%	$0	$10,077,600	$13,974,272	$10,899,932	$0	$0	$0	$0	$0	$0	$34,951,804
Mechanical Improvements/Additions	$50,000	0%	30%	40%	30%	0%	0%	0%	0%	0%	0%	100%	$0	$15,600	$21,632	$16,873	$0	$0	$0	$0	$0	$0	$54,105
Subtotal	**$77,785,197**												**$0**	**$14,818,460**	**$33,652,988**	**$36,471,014**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$84,942,462**
Contingency	$23,335,559.03	0%	18%	40%	42%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$12,741,369	$12,741,369	$0	$0	$0	$0	$0	$0	$25,482,739
Subtotal with Contigency	**$101,120,756**												**$0**	**$14,818,460**	**$46,394,357**	**$49,212,383**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$110,425,200**
LG&E & KU Overheads	$3,539,226	0.0%	18.3%	40.0%	41.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%	$0	$518,646	$1,623,802	$1,722,433	$0	$0	$0	$0	$0	$0	$3,864,882
TOTAL PROJECT COST	**$104,660,000**												**$0**	**$15,337,107**	**$48,018,159**	**$50,934,816**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$114,290,082**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Ghent Generating Station" technical memo dated July 24, 2015
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 -Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Ghent Generating Station
Location: Ghent, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Gypsum Stack
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$50,000	$50,000	
SUBTOTAL Mobilization/Demobilization				**$50,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	6065	LF	$5	$30,325	
SUBTOTAL Sediment & Erosion Control				**$30,325**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350	$51,750	Minimal
Surveying	1	LS	$25,000	$25,000	
Utility Locating	1	EA	$15,000	$15,000	
SUBTOTAL Site Preparation				**$91,750**	
Dewatering					
Dewatering of pond and transfer to Reclaim pond	58,039,125	GL	$0.01	$580,391	Drain/pump to reclaim pond, then pump back to plant for reuse. Assumes no treatment required.
SUBTOTAL Dewatering				**$580,391**	
Repair On-Site Pond Embankments					
Utility Services					
Utility Modifications	1	LS	$25,000	$25,000	LG&E-KU to complete.
SUBTOTAL Utility Services				**$25,000**	
Roads					
Closure (northern portion)					
Remove Embankment, Spread Berm Contents (northern portion)	43,410	CY	$8.10	$351,621	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Excavate and Load to go to ATB-2	1,402,173	CY	$9.56	$13,404,774	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Over Excavate (subsoil) and Load to ATB-2	39,655	CY	$9.56	$379,102	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Moisture Conditioning/Dust Control	1,441,828	CY	$0.57	$821,842	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
SUBTOTAL Closure (northern portion)				**$14,957,339**	
Closure (south portion)					
Excavate and Load to ATB-2	2,943,107	CY	$9.56	$28,136,103	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Over Excavate (subsoil) and Load to ATB-2	57,602	CY	$9.56	$550,675	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Remove Embankment, Spread Berm Contents (southern portion)	35,806	CY	$8.10	$290,029	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Placement and Compaction	79,216	CY	$2.39	$189,326	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	3,079,925	CY	$0.57	$1,755,557	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	291,852	SY	$0.20	$58,370	RSM 31 22 16.10 3300
SUBTOTAL Closure (south portion)				**$30,980,061**	
Final Cover (Install FML) (Not applicable/required)					
Cover Soil (1 feet thick)				$0	
Surface Water Features					
Primary Outlet Structure					
Remove liners, piping, etc. (entire pond = 60.3 acres)	1	LS	$100,000	$100,000	(Remove leachate collection system)
Disposal of liners, piping etc.	1	LS	$250,000	$250,000	Assumed
SUBTOTAL Primary Outlet Structure				**$350,000**	
Emergency Outlet Structure					
Surface Restoration					
Mechanical Seeding & Mulching	60.3	AC	$3,550	$214,065	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$3,000	$3,000	Assume, minimal.
SUBTOTAL Surface Restoration				**$217,065**	
Groundwater Monitoring					
New Monitoring wells, 4" (6,100 LF perimeter)	9	EA	$17,600.00	$158,400	assumes well spacing 1 well/750 feet; 9 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$238,400**	
Soil Sampling					
Confirmation Sampling (5/Acre)	302	EA	$100	$30,150	
Confirmation Sample Analysis	302	EA	$150	$45,225	single marker metal
Sample Packaging and Shipping	75	EVENT	$250	$18,844	4 samples per cooler
SUBTOTAL Soil Sampling				**$94,219**	
SUBTOTAL CONSTRUCTION				**$47,614,549**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$500,000	$500,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$2,000,000	$2,000,000	LG&E provided, based on experience
PDI	1	LS	$75,000	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$2,500,000	$2,500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$47,614,549	$0	LG&E provided
Closure Report	1	LS	$75,000	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$5,150,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$52,764,549**	
NEW CONSTRUCTION					
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	1.0	LS	$25,990,121	$25,990,121	**2 tanks, each is 780' x 320' x 22' deep. (~12 acres) - Total CCR tanks (-Contingency)(only the CCR costs for these tanks are included here)**
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cos	1.0	LS	$19,445,075.78	$19,445,076	**Rerfer to tab "Capital Cost Estimate" shows the Order of Magnitude Cost (-Contingency), details are not reflected below**
Dewatering Facility Order of Magnitude Capital Cost	1.0	LS	$32,300,000.00	$32,300,000	**From ELG Cost Sheet (-Contingency) July 2, 2015**
FGD Treatment Tanks					Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mix Tank Mixers	1.0	LS	$99,908	$99,908	" "
Flocculation Tank Mixers	1.0	LS	$99,908	$99,908	" "
Ferric Chloride Feed Pumps	1.0	LS	$15,333	$15,333	" "
Sulfuric Acid Feed Pumps	1.0	LS	$15,333	$15,333	" "
Organosulfide Feed Pumps	1.0	LS	$15,333	$15,333	" "
Polymer Blending Systems	1.0	LS	$53,400	$53,400	" "
Sodium Hydroxide Feed Pumps	1.0	LS	$15,333	$15,333	" "
Common Equipment					
Ferric chloride tank	1.0	LS	$18,299	$18,299	" "
Sulfuric Acid tank	1.0	LS	$18,299	$18,299	" "
Sodium Hydroxide Tank	1.0	LS	$18,299	$18,299	" "

Site: Ghent Generating Station
Location: Ghent, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Gypsum Stack
Base Year: 2015
Date: 1/18/2016

Safety Shower	1.0	LS	$30,000	$30,000	" "
Total Equipment Cost (TEC)	**1.0**	**LS**	**$399,000**	**$399,000**	**" "**
Freight	1.0	LS	$12,761	$12,761	" "
Purchased Equipment Cost - Delivered (PEC-D)	**1.0**	**LS**	**$411,761**	**$411,761**	**" "**

Site: Ghent Generating Station
Location: Ghent, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Gypsum Stack
Base Year: 2015
Date: 1/18/2016

Organosulfide Tank					" "
Mix Tanks Wall Concrete	1.0	LS	$52,093	$52,093	" "
Mix Tanks Slab Concrete	1.0	LS	$8,084	$8,084	" "
Floculation Tanks Wall Concrete	1.0	LS	$52,093	$52,093	" "
Floculation Tanks Slab Concrete	1.0	LS	$8,084	$8,084	" "
Settling Tanks Wall Concrete	1.0	LS	$3,616,889	$3,616,889	" "
Settling Tanks Slab Concrete	1.0	LS	$6,988,276	$6,988,276	" "
Total Ramp concrete	1.0	LS	$308,102	$308,102	" "
FGD Treatment Tanks					" "
Excavation - Soft	1.0	LS	$1,914,559	$1,914,559	" "
Pre Engineered building	1.0	LS	$120,000	$120,000	" "
Lining Tanks	1.0	LS	$1,381,136	$1,381,136	" "
Construction Material					
Construction Material	1.0	LS	$14,449,315.64	$14,449,316	" "
State Sales Tax	1.0	LS	$4,044.16	$4,044	" "
Total Constuction Material	**1**	LS	$14,453,359.80	**$14,453,360**	" "
Total Equipment and Construction	**1.0**	**LS**	**$14,865,120.99**	**$14,865,121**	" "
Other Construction					
Electrical and I&C	1.0	LS	$743,000	$743,000	" "
Piping	1.0	LS	$1,189,000	$1,189,000	" "
Yard Improvements (a)	1.0	LS	$1,189,000	$1,189,000	" "
Metals and Finishes	1.0	LS	$446,000	$446,000	" "
Subtotal Equipment/Construction/Other	**1**	LS	$18,432,121	**$18,432,121**	" "
Total Direct Costs (TDC)	**1.0**	**LS**	**$18,432,121**	**$18,432,121**	" "
Contractor's Field General Conditions	1.0	LS	$922,000	$922,000	" "
Contractor's OH&P	1.0	LS	$2,765,000	$2,765,000	" "
Contingency	**1.0**	**LS**	**$3,686,000**	**$3,686,000**	" "
Total Construction Cost (TCC)	**1.0**	**LS**	**$25,805,121**	**$25,805,121**	" "
Engineering, SDCc and Startup	**1.0**	**LS**	**$3,871,000**	**$3,871,000**	" "
Total Estimated Order of Magnitude Capital Cost	**1.0**	**LS**	**$29,676,121**	**$29,676,121**	" "
Total Estimated Order of Magnitude Capital Cost (-Contingency)	**1.0**	**LS**	**$25,990,121**	**$25,990,121**	Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mechanical Improvements/Additions					
Piping to new concrete tank	1	LS	$50,000	$50,000	allowance
SUBTOTAL Mechanical Improvements/Additions				**$50,000**	
SUBTOTAL NEW CONSTRUCTION				$77,785,197	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Ghent Generating Station Cost Estimate - Secondary Pond
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check
Proposed Conceptual Alternative CCR Closure - Secondary Pond	**$2,921,001**	**0%**	**17%**	**14%**	**7%**	**62%**	**0%**	**0%**	**0%**	**0%**	**0%**	**100%**
IMPOUNDMENT CLOSURE	**$2,246,924**	**0.0%**	**16.7%**	**13.8%**	**7.1%**	**62.4%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100%**
Mobilization/Demobilization	**$10,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Sediment & Erosion Control	**$9,775**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Site Preparation	**$5,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Dewatering	**$133,622**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$0**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Utility Services	**$25,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Perimeter Berm	**$0**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Roads	**$54,827**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Closure	**$236,784**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Storm Pond Bottom Construction	**$332,016**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Surface Water Features	**$100,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Primary Outlet Structure	**$55,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Surface Restoration	**$3,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Groundwater Monitoring	**$150,400**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%
Soil Sampling	**$6,500**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Conceptual Design	**$20,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$500,000**	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$500,000**	0%	0%	0%	20%	80%	0%	0%	0%	0%	0%	100%
Closure Report	**$30,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Subtotal	**$2,246,924**											
Contingency	$674,077	0.0%	16.7%	13.8%	7.1%	62.4%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Subtotal with Contingency	**$2,921,001**											
LG&E & KU Overheads	$102,235	0.0%	16.7%	13.8%	7.1%	62.4%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
TOTAL PROJECT COST	**$3,023,000**											

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Secondary Pond											
IMPOUNDMENT CLOSURE	**$0**	**$390,083**	**$335,469**	**$180,158**	**$1,639,584**	**$0**	**$0**	**$0**	**$0**	**$0**	**$2,545,295**
Mobilization/Demobilization	$0	$0	$0	$0	$11,699	$0	$0	$0	$0	$0	$11,699
Sediment & Erosion Control	$0	$0	$0	$0	$11,435	$0	$0	$0	$0	$0	$11,435
Site Preparation	$0	$0	$0	$0	$5,849	$0	$0	$0	$0	$0	$5,849
Dewatering	$0	$0	$0	$0	$156,318	$0	$0	$0	$0	$0	$156,318
Repair On-Site Pond Embankments	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Utility Services	$0	$0	$0	$0	$29,246	$0	$0	$0	$0	$0	$29,246
Perimeter Berm	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Roads	$0	$0	$0	$0	$64,140	$0	$0	$0	$0	$0	$64,140
Closure	$0	$0	$0	$0	$277,004	$0	$0	$0	$0	$0	$277,004
Storm Pond Bottom Construction	$0	$0	$0	$0	$388,412	$0	$0	$0	$0	$0	$388,412
Surface Water Features	$0	$0	$0	$0	$116,986	$0	$0	$0	$0	$0	$116,986
Primary Outlet Structure	$0	$0	$0	$0	$64,342	$0	$0	$0	$0	$0	$64,342
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Surface Restoration	$0	$0	$0	$0	$3,510	$0	$0	$0	$0	$0	$3,510
Groundwater Monitoring	$0	$31,283	$65,069	$67,672	$0	$0	$0	$0	$0	$0	$164,024
Soil Sampling	$0	$0	$0	$0	$7,604	$0	$0	$0	$0	$0	$7,604
Conceptual Design	$0	$20,800	$0	$0	$0	$0	$0	$0	$0	$0	$20,800
Final Design and Permitting and permitting support	$0	$260,000	$270,400	$0	$0	$0	$0	$0	$0	$0	$530,400
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	$78,000
Construction Management, including CQA and OE services	$0	$0	$0	$112,486	$467,943	$0	$0	$0	$0	$0	$580,430
Closure Report	$0	$0	$0	$0	$35,096	$0	$0	$0	$0	$0	$35,096
Subtotal	**$0**	**$390,083**	**$335,469**	**$180,158**	**$1,639,584**	**$0**	**$0**	**$0**	**$0**	**$0**	**$2,545,295**
Contingency	$0	$0	$0	$381,794	$381,794	$0	$0	$0	$0	$0	$763,588
Subtotal with Contingency	**$0**	**$390,083**	**$335,469**	**$561,952**	**$2,021,379**	**$0**	**$0**	**$0**	**$0**	**$0**	**$3,308,883**
LG&E & KU Overheads	$0	$13,653	$11,741	$19,668	$70,748	$0	$0	$0	$0	$0	$115,811
TOTAL PROJECT COST	**$0**	**$403,736**	**$347,210**	**$581,621**	**$2,092,127**	**$0**	**$0**	**$0**	**$0**	**$0**	**$3,424,694**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Ghent Generating Station" technical memo dated July 24, 2015
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 -Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Ghent Generating Station
Location: Ghent, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Secondary Pond
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$10,000.00	$10,000	
SUBTOTAL Mobilization/Demobilization				**$10,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	1955	LF	$5.00	$9,775	Minimal
SUBTOTAL Sediment & Erosion Control				**$9,775**	
Site Preparation					
Surveying	1	LS	$2,000.00	$2,000	
Utility Locating	1	EA	$3,000.00	$3,000	
SUBTOTAL Site Preparation				**$5,000**	
Dewatering					
Dewatering of pond directly to outfall	13,362,163	GL	$0.01	$133,622	Minimal - pump to outfall, assumes no treatment required.
SUBTOTAL Dewatering				**$133,622**	
Repair On-Site Pond Embankments					
Utility Services					
Utility Modifications	1	LS	$25,000.00	$25,000	LG&E-KU to complete.
SUBTOTAL Utility Services				**$25,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	1448	CY	$37.86	$54,827	Jeff Heun with LG&E (November 13, 2012)(+4% escalation for 2 years)
SUBTOTAL Roads				**$54,827**	
Closure					
Excavate and load to ATB #2	16,266	CY	$6.60	$107,356	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
Over Excavate and Load (subsoil)	6,711	CY	$6.60	$44,293	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
Hauling (assume 2 mile cycle)	22,977	CY	$2.96	$68,012	3 each, Cat 735 off-road trcuks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
Moisture Conditioning/Dust Control	22,977	CY	$0.57	$13,097	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	20,134	SY	$0.20	$4,027	RSM 31 22 16.10 3300
SUBTOTAL Closure				**$236,784**	
Storm Pond Bottom Construction					
Surface Grading, lagoon bottoms	20,134	SY	$3.87	$77,920	RSM 31 22 16.10 3500
Cover Soil (aggregate - 1 feet thick)					
- Dense Grade Aggregate (materials, hauling and placement)	6711	CY	$37.86	$254,096	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Storm Pond Bottom Construction				**$332,016**	
Surface Water Features					
Items to meet NPDES Permit requirements	1	LS	$100,000.00	$100,000	
SUBTOTAL Surface Water Features				**$100,000**	
Primary Outlet Structure					LG&E to advise - include pump station?
Modify inter-connecting piping between ponds and NPDES permit outfall.	1	LS	$50,000.00	$50,000	
Demolition and Disposal of removed portion	1	LS	$5,000.00	$5,000	
SUBTOTAL Primary Outlet Structure				**$55,000**	
Emergency Outlet Structure					
Surface Restoration					
Quantity/Final Survey	1	LS	$3,000.00	$3,000	
SUBTOTAL Surface Restoration				**$3,000**	
Groundwater Monitoring					
New Monitoring wells, 4" (1 up-gradient + 3 down-gradient)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 8 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$150,400**	
Soil Sampling					
Confirmation Sampling (5/Acre)	21	EA	$100.00	$2,080	
Confirmation Sample Analysis	21	EA	$150.00	$3,120	single marker metal
Sample Packaging and Shipping	5	EVENT	$250.00	$1,300	4 samples per cooler
SUBTOTAL Soil Sampling				**$6,500**	
SUBTOTAL CONSTRUCTION				**$1,121,924**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$20,000.00	$20,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$65,000.00	$500,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$160,000.00	$500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$1,121,923.66	$0	LG&E provided
Closure Report	1	LS	$30,000.00	$30,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$1,125,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$2,246,924**	

NEW CONSTRUCTION

FGD Treatment Tanks	
Common Equipment	
Organosulfide Tank	" "
FGD Treatment Tanks	" "
Construction Material	
Other Construction	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Ghent Generating Station Cost Estimate - Reclaim Pond
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check
Proposed Conceptual Alternative CCR Closure - Reclaim Pond	**$4,566,925**	**0%**	**14%**	**12%**	**2%**	**0%**	**6%**	**66%**	**0%**	**0%**	**0%**	**100%**
IMPOUNDMENT CLOSURE	**$3,513,020**	**0.0%**	**14.4%**	**12.4%**	**1.7%**	**0.0%**	**5.7%**	**65.8%**	**0.0%**	**0.0%**	**0.0%**	**100%**
Mobilization/Demobilization	**$10,000**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Sediment & Erosion Control	**$12,825**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Site Preparation	**$5,000**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Dewatering	**$182,972**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$0**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Utility Services	**$25,000**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Perimeter Berm	**$0**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Roads	**$71,934**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Closure	**$367,975**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Storm Pond Bottom Construction	**$587,413**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Primary Outlet Structure	**$205,000**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Surface Restoration	**$3,000**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Groundwater Monitoring	**$150,400**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%
Soil Sampling	**$11,500**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Conceptual Design	**$25,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$750,000**	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$1,000,000**	0%	0%	0%	0%	0%	20%	80%	0%	0%	0%	100%
Closure Report	**$30,000**	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Subtotal	**$3,513,020**											
Contingency	$1,053,906	0.0%	14.4%	12.4%	1.7%	0.0%	5.7%	65.8%	0.0%	0.0%	0.0%	100%
Subtotal with Contingency	**$4,566,925**											
LG&E & KU Overheads	$159,842	0.0%	14.4%	12.4%	1.7%	0.0%	5.7%	65.8%	0.0%	0.0%	0.0%	100%
TOTAL PROJECT COST	**$4,726,768**											

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Reclaim Pond											
IMPOUNDMENT CLOSURE	**$0**	**$525,283**	**$470,669**	**$67,672**	**$0**	**$243,331**	**$2,926,201**	**$0**	**$0**	**$0**	**$4,233,156**
Mobilization/Demobilization	$0	$0	$0	$0	$0	$0	$12,653	$0	$0	$0	$12,653
Sediment & Erosion Control	$0	$0	$0	$0	$0	$0	$16,228	$0	$0	$0	$16,228
Site Preparation	$0	$0	$0	$0	$0	$0	$6,327	$0	$0	$0	$6,327
Dewatering	$0	$0	$0	$0	$0	$0	$231,518	$0	$0	$0	$231,518
Repair On-Site Pond Embankments	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Utility Services	$0	$0	$0	$0	$0	$0	$31,633	$0	$0	$0	$31,633
Perimeter Berm	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Roads	$0	$0	$0	$0	$0	$0	$91,019	$0	$0	$0	$91,019
Closure	$0	$0	$0	$0	$0	$0	$465,606	$0	$0	$0	$465,606
Storm Pond Bottom Construction	$0	$0	$0	$0	$0	$0	$743,265	$0	$0	$0	$743,265
Primary Outlet Structure	$0	$0	$0	$0	$0	$0	$259,390	$0	$0	$0	$259,390
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Surface Restoration	$0	$0	$0	$0	$0	$0	$3,796	$0	$0	$0	$3,796
Groundwater Monitoring	$0	$31,283	$65,069	$67,672	$0	$0	$0	$0	$0	$0	$164,024
Soil Sampling	$0	$0	$0	$0	$0	$0	$14,551	$0	$0	$0	$14,551
Conceptual Design	$0	$26,000	$0	$0	$0	$0	$0	$0	$0	$0	$26,000
Final Design and Permitting and permitting support	$0	$390,000	$405,600	$0	$0	$0	$0	$0	$0	$0	$795,600
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	$78,000
Construction Management, including CQA and OE services	$0	$0	$0	$0	$0	$243,331	$1,012,255	$0	$0	$0	$1,255,586
Closure Report	$0	$0	$0	$0	$0	$0	$37,960	$0	$0	$0	$37,960
Subtotal	**$0**	**$525,283**	**$470,669**	**$67,672**	**$0**	**$243,331**	**$2,926,201**	**$0**	**$0**	**$0**	**$4,233,156**
Contingency	$0	$0	$0	$0	$0	$634,973	$634,973	$0	$0	$0	$1,269,947
Subtotal with Contingency	**$0**	**$525,283**	**$470,669**	**$67,672**	**$0**	**$878,304**	**$3,561,175**	**$0**	**$0**	**$0**	**$5,503,103**
LG&E & KU Overheads	$0	$18,385	$16,473	$2,369	$0	$30,741	$124,641	$0	$0	$0	$192,609
TOTAL PROJECT COST	**$0**	**$543,668**	**$487,142**	**$70,040**	**$0**	**$909,045**	**$3,685,816**	**$0**	**$0**	**$0**	**$5,695,712**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Ghent Generating Station" technical memo dated July 24, 2015
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 -Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Ghent Generating Station — COST ESTIMATE SUMMARY

Site: Ghent Generating Station
Location: Ghent, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Reclaim Pond
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$10,000.00	$10,000	
SUBTOTAL Mobilization/Demobilization				**$10,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	2565	LF	$5.00	$12,825	Minimal
SUBTOTAL Sediment & Erosion Control				**$12,825**	
Site Preparation					
Surveying	1	LS	$3,000.00	$3,000	
Utility Locating	1	EA	$2,000.00	$2,000	
SUBTOTAL Site Preparation				**$5,000**	
Dewatering					
Dewatering of pond and transfer to another pond	18,297,183	GL	$0.01	$182,972	Assume pumping back to plant for reuse.
SUBTOTAL Dewatering				**$182,972**	
Repair On-Site Pond Embankments					
Utility Services					
Utility Modifications	1	LS	$25,000.00	$25,000	LG&E-KU to complete.
SUBTOTAL Utility Services				**$25,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	1900	CY	$37.86	$71,934	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$71,934**	
Closure					
Excavate and load from stockpile	23,748	CY	$6.60	$156,737	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation,
Over Excavate and Load (subsoil)	11,874	CY	$6.60	$78,368	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation,
Hauling (assume 2 mile cycle)	35,622	CY	$2.96	$105,441	3 each, Cat 735 off-road trcuks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/h
Moisture Conditioning/Dust Control	35,622	CY	$0.57	$20,305	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr
Finish Grading, gentle slopes	35,622	SY	$0.20	$7,124	RSM 31 22 16.10 3300
SUBTOTAL Closure				**$367,975**	
Storm Pond Bottom Construction					
Surface Grading, lagoon bottoms	35,622	SY	$3.87	$137,859	RSM 31 22 16.10 3500
Cover Soil (aggregate - 1 feet thick)					
- Dense Grade Aggregate (materials, hauling and placement)	11874	CY	$37.86	$449,555	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Storm Pond Bottom Construction				**$587,413**	
Primary Outlet Structure					LG&E to advise - include pump station?
Modify inter-connecting piping between ponds.	1	LS	$50,000.00	$50,000	(Assumed some work required)
Demolition and Disposal of removed portion	1	LS	$5,000.00	$5,000	Assumed
Remove liners, piping, etc. (entire pond = 7.36 acres)	1	LS	$50,000.00	$50,000	(Remove leachate collection system)
Disposal of liners, piping etc.	1	LS	$100,000.00	$100,000	Assumed
SUBTOTAL Primary Outlet Structure				**$205,000**	
Emergency Outlet Structure					
Surface Restoration					
Quantity/Final Survey	1	LS	$3,000.00	$3,000	
SUBTOTAL Surface Restoration				**$3,000**	
Groundwater Monitoring					
New Monitoring wells, 4" (1 up-gradient + 3 down-gradient)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 4 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$150,400**	
Soil Sampling					
Confirmation Sampling (5/Acre)	37	EA	$100.00	$3,680	
Confirmation Sample Analysis	37	EA	$150.00	$5,520	single marker metal
Sample Packaging and Shipping	9	EVENT	$250.00	$2,300	4 samples per cooler
SUBTOTAL Soil Sampling				**$11,500**	
SUBTOTAL CONSTRUCTION				**$1,633,020**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	100%		$25,000.00	$25,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	100%		$100,000.00	$750,000	LG&E provided, based on experience
PDI	100%		$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	100%		$260,000.00	$1,000,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$1,633,019.55	$0	LG&E provided
Closure Report	1	LS	$30,000.00	$30,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$1,880,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$3,513,020**	
NEW CONSTRUCTION					
FGD Treatment Tanks					
Common Equipment					
FGD Treatment Tanks					" "
Common Items					" "
Construction Material					
Other Construction					

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Ghent Generating Station Cost Estimate - ATB #2

21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #2	**$76,754,383**	**0%**	**11%**	**16%**	**14%**	**10%**	**29%**	**20%**	**0%**	**0%**	**0%**	**100%**
IMPOUNDMENT CLOSURE	**$59,041,833**	**0.0%**	**10.5%**	**15.6%**	**14.3%**	**9.8%**	**28.9%**	**20.4%**	**0.5%**	**0.0%**	**0.0%**	**100%**
Mobilization/Demobilization	**$100,000**	0%	0%	10%	30%	0%	40%	10%	10%	0%	0%	100%
Sediment & Erosion Control	**$60,000**	0%	0%	50%	0%	25%	25%	0%	0%	0%	0%	100%
Site Preparation	**$454,000**	0%	0%	50%	0%	25%	25%	0%	0%	0%	0%	100%
Dewatering	**$4,946,055**	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$500,000**	0%	0%	35%	15%	15%	15%	20%	0%	0%	0%	100%
Utility Services	**$100,000**	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Perimeter Berm	**$0**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	**$336,533**	0%	0%	50%	40%	10%	0%	0%	0%	0%	0%	100%
Pre-Closure / Preparation	**$0**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Closure	**$21,805,199**	0%	20%	20%	20%	20%	20%	0%	0%	0%	0%	100%
Final Cover (Install FML)	**$22,502,976**	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	100%
Surface Water Features	**$143,320**	0%	0%	0%	0%	0%	0%	80%	20%	0%	0%	100%
Primary Outlet Structure	**$110,000**	0%	0%	0%	0%	0%	0%	80%	20%	0%	0%	100%
Emergency Outlet Structure	**$0**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Restoration	**$582,350**	0%	0%	0%	0%	0%	0%	80%	20%	0%	0%	100%
Groundwater Monitoring	**$326,400**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%
Conceptual Design	**$900,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$2,000,000**	0%	30%	30%	10%	10%	20%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$4,000,000**	0%	5%	25%	25%	25%	20%	0%	0%	0%	0%	100%
Closure Report	**$100,000**	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%
Subtotal	**$59,041,833**											
Contingency	$17,712,550	0.0%	10.5%	15.6%	14.3%	9.8%	28.9%	20.4%	0.5%	0.0%	0.0%	100%
Subtotal with Contingency	**$76,754,383**											
LG&E & KU Overheads	$2,686,403	0.0%	10.5%	15.6%	14.3%	9.8%	28.9%	20.4%	0.5%	0.0%	0.0%	100%
TOTAL PROJECT COST	**$79,441,000**											

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #2											
IMPOUNDMENT CLOSURE	**$0**	**$6,449,373**	**$9,977,645**	**$9,509,871**	**$6,783,066**	**$20,751,266**	**$15,221,818**	**$364,689**	**$0**	**$0**	**$69,057,728**
Mobilization/Demobilization	$0	$0	$10,816	$33,746	$0	$48,666	$12,653	$13,159	$0	$0	$119,041
Sediment & Erosion Control	$0	$0	$32,448	$0	$17,548	$18,250	$0	$0	$0	$0	$68,246
Site Preparation	$0	$0	$245,523	$0	$132,779	$138,090	$0	$0	$0	$0	$516,392
Dewatering	$0	$0	$2,674,827	$2,781,820	$0	$0	$0	$0	$0	$0	$5,456,646
Repair On-Site Pond Embankments	$0	$0	$189,280	$84,365	$87,739	$91,249	$126,532	$0	$0	$0	$579,165
Utility Services	$0	$0	$54,080	$56,243	$0	$0	$0	$0	$0	$0	$110,323
Perimeter Berm	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Roads	$0	$0	$181,997	$151,422	$39,370	$0	$0	$0	$0	$0	$372,789
Pre-Closure / Preparation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Closure	$0	$4,535,481	$4,716,901	$4,905,577	$5,101,800	$5,305,872	$0	$0	$0	$0	$24,565,630
Final Cover (Install FML)	$0	$0	$0	$0	$0	$13,689,155	$14,236,722	$0	$0	$0	$27,925,877
Surface Water Features	$0	$0	$0	$0	$0	$0	$145,076	$37,720	$0	$0	$182,796
Primary Outlet Structure	$0	$0	$0	$0	$0	$0	$111,348	$28,950	$0	$0	$140,299
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Surface Restoration	$0	$0	$0	$0	$0	$0	$589,487	$153,267	$0	$0	$742,753
Groundwater Monitoring	$0	$67,891	$141,214	$146,862	$0	$0	$0	$0	$0	$0	$355,967
Conceptual Design	$0	$936,000	$0	$0	$0	$0	$0	$0	$0	$0	$936,000
Final Design and Permitting and permitting support	$0	$624,000	$648,960	$224,973	$233,972	$486,661	$0	$0	$0	$0	$2,218,566
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	$78,000
Construction Management, including CQA and OE services	$0	$208,000	$1,081,600	$1,124,864	$1,169,859	$973,322	$0	$0	$0	$0	$4,557,645
Closure Report	$0	$0	$0	$0	$0	$0	$0	$131,593	$0	$0	$131,593
Subtotal	**$0**	**$6,449,373**	**$9,977,645**	**$9,509,871**	**$6,783,066**	**$20,751,266**	**$15,221,818**	**$364,689**	**$0**	**$0**	**$69,057,728**
Contingency	$0	$0	$0	$0	$0	$0	$10,358,659	$10,358,659	$0	$0	$20,717,318
Subtotal with Contingency	**$0**	**$6,449,373**	**$9,977,645**	**$9,509,871**	**$6,783,066**	**$20,751,266**	**$25,580,477**	**$10,723,349**	**$0**	**$0**	**$89,775,046**
LG&E & KU Overheads	$0	$225,728	$349,218	$332,845	$237,407	$726,294	$895,317	$375,317	$0	$0	$3,142,127
TOTAL PROJECT COST	**$0**	**$6,675,101**	**$10,326,863**	**$9,842,717**	**$7,020,473**	**$21,477,560**	**$26,475,794**	**$11,098,666**	**$0**	**$0**	**$92,917,173**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Ghent Generating Station" technical memo dated July 24, 2015
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 -Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Ghent Generating Station | **COST ESTIMATE SUMMARY**

Site: Ghent Generating Station
Location: Ghent, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin #2
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$100,000.00	$100,000	
SUBTOTAL Mobilization/Demobilization				**$100,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	12,000	LF	$5.00	$60,000	Assumed
SUBTOTAL Sediment & Erosion Control				**$60,000**	
Site Preparation					
Clearing/Grubbing	40	AC	$10,350.00	$414,000	
Surveying	1	LS	$25,000.00	$25,000	
Utility Locating	1	EA	$15,000.00	$15,000	
SUBTOTAL Site Preparation				**$454,000**	
Dewatering					
Dewatering of pond and transfer to another pond	247,302,756	GL	$0.02	$4,946,055	Assumes minor treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$4,946,055**	
Repair On-Site Pond Embankments					
Existing CCR Pond embankments	1	LS	$500,000.00	$500,000	Minimal, based off of USEPA dam assessment report
SUBTOTAL Repair On-Site Pond Embankments				**$500,000**	
Utility Services					
Utility Modifications	1	LS	$100,000.00	$100,000	LG&E-KU to complete.
SUBTOTAL Utility Modifications				**$100,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	8889	CY	$37.86	$336,533	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$336,533**	
Pre-Closure / Preparation					
SUBTOTAL Pre-Closure / Preparation				**$0**	Moved to Closure Tasks
Closure					
Cut/regrade for cover subgrade/ditch	497,662	CY	$8.10	$4,031,062	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Geotextile (as needed, assume 100% of 167.7 acre area for filling)	747,828	SY	$2.46	$1,839,658	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of 154.51 acre are	747,828	SY	$3.00	$2,243,485	CH2M HILL, recent quote on similar project
Placement and Compaction (from GS north area)	1,441,828	CY	$2.39	$3,445,969	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Placement and Compaction (from Reclaim Pond)	35,622	CY	$2.39	$85,137	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Placement and Compaction (from GS south area)	3,000,709	CY	$2.39	$7,171,695	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	4,975,821	CY	$0.57	$2,836,218	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	759,880	SY	$0.20	$151,976	RSM 31 22 16.10 3300
SUBTOTAL Closure				**$21,805,199**	
Final Cover (Install FML)					
Final Cover: 40-mil Tex/smooth LLDPE	6,838,920	SF	$0.65	$4,445,298	
10 oz. Geotextile (includes materials and installation)	6,838,920	SF	$0.20	$1,367,784	CH2M HILL recent project.
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	410,906	CY	$20.00	$8,218,110	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	136,969	CY	$20.00	$2,739,370	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	547,874	CY	$4.36	$2,388,731	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	547,874	CY	$2.39	$1,309,419	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	547,874	CY	$0.57	$312,288	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Drainage System Piping	157	AC	$10,000.00	$1,570,000	Allowance
Finish Grading, gentle slopes	759,880	SY	$0.20	$151,976	RSM 31 22 16.10 3300
SUBTOTAL Final Cover (Install FML)				**$22,502,976**	
Surface Water Features					
Ditch Erosion Protection - Perimeter Ditch	10164	LF	$5.00	$50,820	vegetative
Culvert through berm to Channel, West Side (36")	200	LF	$100.00	$20,000	
Culvert through berm to Channel, North Side (36")	200	LF	$100.00	$20,000	
Ditch to Reclaim Pond, from North Side	3500	LF	$15.00	$52,500	
SUBTOTAL Surface Water Features				**$143,320**	
Primary Outlet Structure					
Modify inter-connecting piping between ponds.	1	LS	$100,000.00	$100,000	(Assumed some work required)
Demolition and Disposal of removed portion	1	LS	$10,000.00	$10,000	Assumed
SUBTOTAL Primary Outlet Structure				**$110,000**	
Emergency Outlet Structure					
Surface Restoration					
Mechanical Seeding & Mulching	157.0	AC	$3,550.00	$557,350	
Quantity/Final Survey	1	LS	$25,000.00	$25,000	
SUBTOTAL Surface Restoration				**$582,350**	
Groundwater Monitoring					
New Monitoring wells, 4" (10,200 LF perimeter)	14	EA	$17,600.00	$246,400	assumes well spacing 1 well/750 feet; 14 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$326,400**	
SUBTOTAL CONSTRUCTION				**$51,966,833**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$900,000.00	$900,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$3,400,000.00	$2,000,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$8,400,000.00	$4,000,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$51,966,833.38	$0	LG&E provided
Closure Report	1	LS	$100,000.00	$100,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Construction Contractor Performance and Payment Bonds				**$7,075,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$59,041,833**	

NEW CONSTRUCTION

FGD Treatment Tanks
Common Equipment
FGD Treatment Tanks
Common Items
Construction Material
Other Construction

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

LG&E-KU
Ghent Station
Settling Tank-based Treatment System
Table 3. Estimated Capital Cost

Item	Value	Units	No. Provided	Unit Cost ($ ea)	Amount	Installation ($ ea)	Total Installed Cost ($)	CCR Cost	ELG Cost
FGD Treatment Tanks									
Mix Tank Mixers	2.0	hp	2	41,628	83,257	8,326	99,908	99,908	
Flocculation Tank Mixers	2.0	hp	2	41,628	83,257	8,326	99,908	99,908	
Ferric Chloride Feed Pumps	6.3	gph	2	6,266	12,533	1,400	15,333	15,333	
Sulfuric Acid Feed Pumps	6.3	gph	2	6,266	12,533	1,400	15,333	15,333	
Organosulfide Feed Pumps	2.5	gph	2	6,266	12,533	1,400	15,333	15,333	
Polymer Blending Systems	0.6	gph	2	25,000	50,000	1,700	53,400	53,400	
Sodium Hydroxide Feed Pumps	6.3	gph	2	6,266	12,533	1,400	15,333	15,333	
Other Wastewater Treatment Tanks									
Mix Tank Mixers	20.0	hp	2	64,571	129,143	12,914	154,971		154,971
Flocculation Tank Mixers	20.0	hp	2	64,571	129,143	12,914	154,971		154,971
Ferric Chloride Feed Pumps	73.8	gph	2	6,266	12,533	1,400	15,333		15,333
Sulfuric Acid Feed Pumps	73.8	gph	2	6,266	12,533	1,400	15,333		15,333
Organosulfide Feed Pumps	29.5	gph	2	6,266	12,533	1,400	15,333		15,333
Polymer Blending Systems	7.4	gph	2	25,000	50,000	1,700	53,400		53,400
Sodium Hydroxide Feed Pumps	73.8	gph	2	6,266	12,533	1,400	15,333		15,333
Mix Tank Blower	500	SCFM	2	2,850	5,700	1,140	7,980		7,980
Common Equipment									-
Ferric chloride tank	15,000	gal	1	30,499	30,499	6,100	36,599	18,299	18,299
Sulfuric Acid tank	15,000	gal	1	30,499	30,499	6,100	36,599	18,299	18,299
Organosulfide Tank	8,000	gal	1	17,476	17,476	3,495	20,971		20,971
Polymer feed Totes	265	gal	6		-	-	-		-
Sodium Hydroxide Tank	15,000	gal	1	30,499	30,499	6,100	36,599	18,299	18,299
Safety Shower			2	25,000	50,000	5,000	60,000	30,000	30,000
Area Labor Adjustment Factor	100.0%	applies to installation cost only							
Total Equipment Cost (TEC)							**938,000**	**399,000**	**539,000**
Area Labor Adjustment Factor									
Total Process Equipment					739,733				
Freight	4%	of Proc Equip					30,000	12,761	17,239
Purchased Equipment Cost - Delivered (PEC-D)							**968,000**	**411,761**	**556,239**
FGD Treatment Tanks									
Mix Tanks Wall Concrete	80	CY	1	650	52,093		52,093	52,093	
Mix Tanks Slab Concrete	27	CY	1	300	8,084		8,084	8,084	
Floculation Tanks Wall Concrete	80	CY	1	650	52,093		52,093	52,093	
Floculation Tanks Slab Concrete	27	CY	1	300	8,084		8,084	8,084	
Settling Tanks Wall Concrete	5564	CY	1	650	3,616,889		3,616,889	3,616,889	
Settling Tanks Slab Concrete	23,294	CY	1	300	6,988,276		6,988,276	6,988,276	
Total Ramp concrete	514	CY	2	300	308,102		308,102	308,102	
Other Treatment Tanks									
Mix Tanks Wall Concrete	126	CY	1	650	81,784		81,784		81,784
Mix Tanks Slab Concrete	85	CY	1	300	25,624		25,624		25,624
Floculation Tanks Wall Concrete	126	CY	1	650	81,784		81,784		81,784
Floculation Tanks Slab Concrete	85	CY	1	300	25,624		25,624		25,624
Settling Tanks Wall Concrete	5,067	CY	1	650	3,293,333		3,293,333		3,293,333
Settling Tanks Slab Concrete	15,005	CY	1	300	4,501,641		4,501,641		4,501,641
Total Ramp concrete	514	CY	2	300	308,102		308,102		308,102
Common Items									
Excavation - Soft	527,280	CY	1	5.97	3,147,862		3,147,862	1,914,559	1,233,302
Pre Engineered building	1,200	ft2	1	200	240,000		240,000	120,000	120,000
Lining Tanks	75,694	SY	1	30	2,270,824		2,270,824	1,381,136	889,687
Construction Material							25,010,197	14,449,316	10,560,881
State Sales Tax	1.0%	Proc Eq					7,000	4,044	2,956
Total Constuction Material							**25,017,197**	**14,453,360**	**10,563,837**
Total Equipment and Construction							**25,985,197**	**14,865,121**	**11,120,076**
Electrical and I&C	5%						1,299,000	743,000	556,000
Piping	8%						2,079,000	1,189,000	890,000
Yard Improvements (a)	8%	of Equip + Const.					2,079,000	1,189,000	890,000
Metals and Finishes	3%	of Equip + Const.					780,000	446,000	334,000
Subtotal							32,222,197	18,432,121	13,790,076
Total Direct Costs (TDC)							**32,222,197**	**18,432,121**	**13,790,076**
Contractor's Field General Conditions	5%	of TDC					1,611,000	922,000	690,000
Contractor's OH&P	15%	of TDC					4,833,000	2,765,000	2,069,000
Contingency	20%	of TDC					6,444,000	3,686,000	2,758,000
Escalation Factor	0%	of TDC					0	0	0
Total Construction Cost (TCC)							**45,110,197**	**25,805,121**	**19,307,076**
Engineering, SDC[c] and Startup	15%	of TCC					6,767,000	3,871,000	2,896,000
Total Estimated Order of Magnitude Capital Cost							**51,877,197**	**29,676,121**	**22,203,076**
Annual Cost of Capital (7% over 20 years)							$4,897,000	$2,801,000	$2,096,000

(a) Includes fencing, grading, roads, sidewalks, and similar items.

(b) The enclosed Engineer's Estimate is only an estimate of possible construction costs. This estimate is limited to the conditions existing at its issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

(c) SDC stands for Services During Construction (Startup, Engineer/Site Reps, etc.)

Individual Unit Cost Summary

Cost Worksheet 1 - Individual Unit Cost Line Items

Item	Unit Cost	Units	References
Mobilization/Demobilization			
Workplan, procurement, mobilization, demobilization	50,000	LS	Allowance
Sediment & Erosion Control			
Sediment and Erision Control Measures	25,000	LS	Allowance includes SWPPP and implementation and maintenance.
Transport & Disposal			
Waste Characterization	$1,500	EA	Lab Estimate for TCLP (VOA, SVOA, Pesticides/Herbicides, Metals)
T&D non-hazardous soil to off-site LF	61.1	Ton	Quote of $47 + 30% due to anticipated landfill capacity issues
T&D non-hazardous CCR to off-site LF	61.1	Ton	Quote of $47 + 30% due to anticipated landfill capacity issues
T&D non-hazardous soil to on-site LF	7.18	CY	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018)
T&D non-hazardous CCR to on-site LF	7.18	CY	Backfill Placement$1.98 (RSM 31 23 23.14 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018)
T&D non-hazardous CCR to Schahfer LF	21.4	Ton	Provided by client. Unit rate provided by client, does not include construction, post-closure care and maintenance for 20-years typical for Subtitle D landfills.
T&D non-hazardous CCR to stockpile and to on-site LF	9.03	CY	Excavator Loading $1.85 (RSM 31 23 16.42 0260) + Backfill Placement$1.98 (RSM 31 23 23.14 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018)
Transportation, Pineville to EW Brown LF	34.78	Ton	107 miles one way @ $4/loaded mile to + $2.5/empty mile return / 20 tons per truck. No disposal charge.
Transportation, Tyrone to EW Brown LF	11.05	Ton	34 miles one way @ $4/loaded mile to + $2.5/empty mile return / 20 tons per truck. No disposal charge.
Slurry Wall			
Install Slurry Wall	$0	LF	Place-holder. Included in RCRA Consultant
Repair On-Site Pond Embankments			
Geotechnical Repairs on existing CCR Pond embankments	$1,000,000	LS	Allowance. Items may include embankment soil removal/replacement; localized dewatering; stump removal; drainage improvements; Dike height adjustments, etc.
Site Preparation			
Clearing/Grubbing	$10,350	AC	Eng. Estimate
Site Debris Clean Up & Removal	$276	AC	RSM 017140300
Surveying	$10,000	LS	
Utility Locating	$5,000	LS	Allowance
Dewatering & Drying of Saturated Coal Ash	$30,000	AC	Number for site preparation in areas with high water table. Eg. Michigan City, Bailly ??? Check with Nick.
Dewatering	$50,000	LS	Allowance to pump water from ponds to on site treatment facility
Earthwork Items			
Site Work Soil			
Excavate and Temporarily Stockpile Onsite, dragline, haul (pond)	$20.81	CY	$8.35 dragline 1/2 cy cap = 30cy/hr (RSM 31 23 16.42 0950) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Excavate and load, dragline (pond)	$16.45	CY	$8.35 dragline 1/2 cy cap = 30cy/hr+no haul (RSM 31 23 16.42 0950) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Surface Grading, lagoon bottoms	$3.87	SY	RSM 31 22 16.10 3500
Excavate and load from stockpile	$6.60	CY	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
Moisture Conditioning/Dust Control	$0.57	CY	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Remove Embankment, Spread Berms	$8.94	CY	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul + $0.84 Compaction, Sheepsfoot, 6"' lift, 2 passes (RSM 31 23 23.23 5600)
Finish Grading, gentle slopes	$0.20	SY	RSM 31 22 16.10 3300
Site Work CCR			
Excavate and Temporarily Stockpile Onsite (pond)	$20.81	CY	$8.35 dragline 1/2 cy cap = 30cy/hr (RSM 31 23 16.42 0950) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Excavate and load (pond)	$16.45	CY	$8.35 dragline 1/2 cy cap = 30cy/hr+no haul (RSM 31 23 16.42 0950) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Excavate and Temporarily Stockpile Onsite, excavator, haul (pond)	$9.56	CY	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Excavate and Temporarily Stockpile Onsite, excavator, no haul (pond)	$5.20	CY	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Excavation and Load from Stockpile (CCR from facility operations)	$1.39	CY	1 988 RT Loader (8 CY), rent $85.95 + FOG $95.81/hr + opr $75/hr x 50 hrs/9,216 CY/week
Hauling (assume 2 mile cycle)(CCR from facility operations)	$2.96	CY	3 each, Cat 735 off-road trcuks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
Moisture Conditioning/Dust Control	$0.57	CY	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Surface Grading, lagoon bottomns	$3.87	SY	RSM 31 22 16.10 3500
Excavate and load from stockpile (excavator)	$6.60	CY	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
Finish Grading, gentle slopes	$0.20	SY	RSM 31 22 16.10 3300
Fill and Borrow			
Unclassified Fill, Delivered, Offsite Source, Placed	$17.82	CY	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $15/cy delivered
Topsoil, Delivered, Offsite Source, Placed	$23.95	CY	$3.95 (RSM 31 23 23.14 2420) + $20/cy delivered
Haul (2 mile cycle)	$4.36	CY	$4.36 haul; 12cy, 15mph, 2 mile, 15 minute (RS Means 31 23 23.20 1018)
Compacted Clay, 6-inch lifts, Offsite Source, Placed	$23.54	CY	$1.98 place (RSM 31 23 23.13 4220) + $1.56 compact (RSM 31 23 23.23 5640) + $20/cy delivered
Unclassified Fill, Delivered, On-site Source, Placed	$9.03	CY	Placement $1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + Excavator Loading $1.85 (RSM 31 23 16.42 0260) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)
Finish Grading, gentle slopes	$0.20	SY	RSM 31 22 16.10 3300
Site Restoration Items			
Revegetation			
Mechancial Seeding and Mulching	$3,550	AC	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600)
Seed	$856	AC	Seeding, slope mix, 6#, tractor spreader - material only (RSM 32 92 19.14 4500)
Site Survey	$30,000	LS	
Confirmation Sample Collection	$100	EA	
Confirmation Sample Analysis	$150	EA	single metal
Sample Packaging and Shipping	$250	Event	
On-Site Landfill			
Surface Grading, lagoon bottom	$ 18,730	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500) ($430/1000 sf)
Base Liner: Soil Liner (12")	$ 23,905	AC	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $12/cy delivered
Base Liner: 60-mil HDPE	$ 39,204	AC	Price Based on $.90 SF.
Base Liner: Sand Drainage Layer (12 inches)	$ 30,653	AC	Price is based on Drainage Sand $15/BCY and placement $4/BYD
Base Liner: Geotextile	$ 11,665	AC	Geotextile, woven, 200 lb tensile (RSM 31 32 19.16 1500)
Base Liner: Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/BCY and placement $3.5/BCY
Final Cover: 40-mil Tex/smooth LLDPE	$ 28,414	AC	Price Based on $0.65 SF.
Final Cover: Sand Drainage Layer (12 inches)	$ 30,653	AC	Price is based on Drainage Sand $15/BCY and placement $4/BYD
Final Cover: Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/BCY and placement $3.5/BCY
Final Cover: Topsoil Layer (6 inches)	$ 19,352	AC	$3.95 (RSM 31 23 23.14 2420) + $20/cy delivered
Finish Grading, gentle slopes	$ 968	AC	RSM 31 22 16.10 3300 ($0.20/SY)
Leachate Collection pipes	$ 30,000	AC	Allowance
Leachate header	$ 5,000	AC	Allowance
SUBTOTAL	$ 313,564	AC	
Reconstruct and Reline On-Site Pond			
Remove overlying soils and 30 mil Hypalon liner	$ 17,000	AC	Based on a crew at $8,500/Day for two days
Regrade and Compact Subgrade	$ 17,000	AC	Based on a crew at $8,500/Day for two days
Compacted Clay (1 x 10^{-7}) Soil Liner (24 inches)	$ 96,800	AC	Price is based on Clay Fill @ $20/CY and placement @ $10/CY
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Geonet	$ 28,314	AC	$0.65/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/TCY and placement $3.5/TCY
SUBTOTAL	$ 234,958	AC	
Reconstruct and Line Pond, Install Steel Wear Plates			
Remove and stockpile 18" Coarse Graded Crushed Ballast (3/4" to 1 1/2")	$30,760	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018 = $12.71/cy
Remove 6" Sand	$ 10,250	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018 = $12.71/cy
Remove existing 30 mil Hypalon liner	$ 17,000	AC	Based on a crew at $8,500/Day for two days
Remove 6" Sand	$ 10,250	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018 = $12.71/cy
Regrade and Compact Compacted Clay Subgrade	$ 21,250	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500)($0.43/SF) + compaction, 6" lifts, 4 passes (RSM 31 23 23.23 5640)($1.56/cy(assume 1' thick))
Compacted Clay (1 x 10^{-7}) Soil Liner (24 inches)	$ 96,800	AC	Price is based on Clay Fill @ $20/CY and placement @ $10/CY
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Geonet	$ 28,314	AC	$0.65/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
18" Coarse Graded Crushed Ballast-reused (3/4" to 1 1/2" size)	$ 29,500	AC	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018) + $5/CY load = $12.18/cy
Steel Wear Plates - 3/8" - 2000 SF TOTAL for working area	$ 19,200	AC	3/8" x 2000 SF = 65 CF x 490lb/cf = 16 tons @ $1,200/ton
SUBTOTAL	$ 301,658	AC	
Reconstruct and Line Bottom Ash Storage Area			
Remove 30" Bottom Ash/Soil	$51,265	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018) = $12.71/cy
Regrade and Compact Subgrade	$ 21,250	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500)($0.43/SF) + compaction, 6" lifts, 4 passes (RSM 31 23 23.23 5640)($1.56/cy(assume 1' thick))
Compacted Clay (1 x 10^{-7}) Soil Liner (24 inches)	$ 96,800	AC	Price is based on Clay Fill @ $20/CY and placement @ $10/CY
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Geonet	$ 28,314	AC	$0.65/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
18" Coarse Graded Crushed Ballast-reused (3/4" to 1 1/2" size)	$ 29,500	AC	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018) + $5/CY load = $12.18/cy
SUBTOTAL	$ 265,463	AC	

Individual Unit Cost Summary

Leachate Collection System (1 per pond)			
Final grade	$ 1,258	EA	$0.43/SF Finish grading lagoon bottoms (RSM 31 22 16.10 3500) x (45' x 65') =
Trenching	$ 1,083	EA	$3.61/LF. (RSM G1030 805 1800)
60-mil HDPE liner	$ 9,620	EA	Assume 7125 SF. Price based on .90/SF + 50% small quantity ($1.35)
HDPE geonet	$ 3,950	EA	Assume 45'x65' SF. Price based on .90/SF + 50% small quantity ($1.35)
Leak Detection Fill (25' x 45' x5' = 210 CY)	$ 3,990	EA	Price is based on Drainage Sand $15/BCY and placement $4/BYD
10-inch dia HDPE Pipe (2 each at 300')	$ 21,200	EA	$32/LF. RSM 33 11 13.35 0400 + $1,000/pipe fittings
2-inch dia PVC Pipe (1 each at 300')	$ 868	EA	$2.59/LS. RSM 33 11 13.20 1120 + $100 fittings
SUBTOTAL	$ 41,969	EA	
Cover Existing Pond			
Stabilize	$ 109,020	AC	assume 5' thick = 8,067 BCY/Acre = 12,600 tons. 3% Portland = 378 tons @ $75/ton + $10/cy handling
Final grade	$ 18,730	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500)
40-mil Tex/smooth LLDPE	$ 28,414	AC	Price Based on $0.65 SF
Sand Drainage Layer (12 inches)	$ 30,653	AC	Price is based on Drainage Sand $15/BCY and placement $4/BYD
Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/BCY and placement $3.5/BCY
Topsoil Layer (6 inches)	$ 19,352	AC	$3.95 (RSM 31 23 23.14 2420) + $20/cy delivered
SUBTOTAL	$ 224,327	AC	
Periodic Cleaing of Pond			
Dredge 2' of material	$28	CY	Hydraulic dredge (pumped 1000' to shore) = 15.55 + haul 12cy 15mph 2 mile (RSM 35 20 23.23 1100 + 31 23 23.20 1018) = $12.71/cy totals $28.26/cy for 1 acre x 2' deep = 3,226.67 BCY
Excavate and load from stockpile	$6.60	CY	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)

Individual Unit Cost Summary

Cost Worksheet 1 - Individual Unit Cost Line Items

Item	Unit Cost	Units	References
Mobilization/Demobilization			
Workplan, procurement, mobilization, demobilization	50,000	LS	Allowance
Sediment & Erosion Control			
Sediment and Erision Control Measures	25,000	LS	Allowance includes SWPPP and implementation and maintenance.
Transport & Disposal			
Waste Characterization	$1,500	EA	Lab Estimate for TCLP (VOA, SVOA, Pesticides/Herbicides, Metals)
T&D non-hazardous soil to off-site LF	61.1	Ton	Quote of $47 + 30% due to anticipated landfill capacity issues
T&D non-hazardous CCR to off-site LF	61.1	Ton	Quote of $47 + 30% due to anticipated landfill capacity issues
T&D non-hazardous soil to on-site LF	7.18	CY	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018)
T&D non-hazardous CCR to on-site LF	7.18	CY	Backfill Placement$1.98 (RSM 31 23 23.14 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018)
T&D non-hazardous CCR to Schahfer LF	21.4	Ton	Provided by client. Unit rate provided by client, does not include construction, post-closure care and maintenance for 20-years typical for Subtitle D landfills.
T&D non-hazardous CCR to stockpile and to on-site LF	9.03	CY	Excavator Loading $1.85 (RSM 31 23 16.42 0260) + Backfill Placement$1.98 (RSM 31 23 23.14 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018)
Transportation, Pineville to EW Brown LF	34.78	Ton	107 miles one way @ $4/loaded mile to + $2.5/empty mile return / 20 tons per truck. No disposal charge.
Transportation, Tyrone to EW Brown LF	11.05	Ton	34 miles one way @ $4/loaded mile to + $2.5/empty mile return / 20 tons per truck. No disposal charge.
Slurry Wall			
Install Slurry Wall	$0	LF	Place-holder. Included in RCRA Consultant
Repair On-Site Pond Embankments			
Geotechnical Repairs on existing CCR Pond embankments	$1,000,000	LS	Allowance. Items may include embankment soil removal/replacement; localized dewatering; stump removal; drainage improvements; Dike height adjustments, etc.
Site Preparation			
Clearing/Grubbing	$10,350	AC	Eng. Estimate
Site Debris Clean Up & Removal	$276	AC	RSM 017140300
Surveying	$10,000	LS	
Utility Locating	$5,000	LS	Allowance
Dewatering & Drying of Saturated Coal Ash	$30,000	AC	Number for site preparation in areas with high water table. Eg. Michigan City, Bailly ??? Check with Nick.
Dewatering	$50,000	LS	Allowance to pump water from ponds to on site treatment facility
Earthwork Items			
Site Work Soil			
Excavate and Temporarily Stockpile Onsite, dragline, haul	$20.81	CY	$8.35 dragline 1/2 cy cap = 30cy/hr (RSM 31 23 16.42 0950) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Excavate and Temporarily Stockpile Onsite, excavator, no haul	$5.20	CY	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Excavate and load, dragline	$16.45	CY	$8.35 dragline 1/2 cy cap = 30cy/hr+no haul (RSM 31 23 16.42 0950) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Surface Grading, lagoon bottoms	$3.87	SY	RSM 31 22 16.10 3500
Excavate and load from stockpile	$6.60	CY	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
Remove Embankment, Spread Berms	$8.94	CY	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul + $0.84 Compaction, Sheepsfoot, 6"' lift, 2 passes (RSM 31 23 23.23 5600)
Finish Grading, gentle slopes	$0.20	SY	RSM 31 22 16.10 3300
Site Work CCR			
Excavate and Temporarily Stockpile Onsite	$20.81	CY	$8.35 dragline 1/2 cy cap = 30cy/hr (RSM 31 23 16.42 0950) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Excavate and load	$16.45	CY	$8.35 dragline 1/2 cy cap = 30cy/hr+no haul (RSM 31 23 16.42 0950) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Surface Grading, lagoon bottomns	$3.87	SY	RSM 31 22 16.10 3500
Excavate and load from stockpile	$6.60	CY	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
Finish Grading, gentle slopes	$0.20	SY	RSM 31 22 16.10 3300
Fill and Borrow			
Unclassified Fill, Delivered, Offsite Source, Placed	$17.82	CY	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $15/cy delivered
Topsoil, Delivered, Offsite Source, Placed	$23.95	CY	$3.95 (RSM 31 23 23.14 2420) + $20/cy delivered
Compacted Clay, 6-inch lifts, Offsite Source, Placed	$23.54	CY	$1.98 place (RSM 31 23 23.13 4220) + $1.56 compact (RSM 31 23 23.23 5640) + $20/cy delivered
Unclassified Fill, Delivered, On-site Source, Placed	$9.03	CY	Placement $1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + Excavator Loading $1.85 (RSM 31 23 16.42 0260) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)
Finish Grading, gentle slopes	$0.20	SY	RSM 31 22 16.10 3300
Site Restoration Items			
Revegetation			
Mechancial Seeding and Mulching	$3,550	AC	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600)
Seed	$856	AC	Seeding, slope mix, 6#, tractor spreader - material only (RSM 32 92 19.14 4500)
Site Survey	$30,000	LS	
Confirmation Sample Collection	$100	EA	
Confirmation Sample Analysis	$150	EA	single metal
Sample Packaging and Shipping	$250	Event	
On-Site Landfill			
Surface Grading, lagoon bottom	$ 18,730	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500) ($430/1000 sf)
Base Liner: Soil Liner (12")	$ 23,905	AC	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $12/cy delivered
Base Liner: 60-mil HDPE	$ 39,204	AC	Price Based on $.90 SF.
Base Liner: Sand Drainage Layer (12 inches)	$ 30,653	AC	Price is based on Drainage Sand $15/BCY and placement $4/BYD
Base Liner: Geotextile	$ 11,665	AC	Geotextile, woven, 200 lb tensile (RSM 31 32 19.16 1500)
Base Liner: Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/BCY and placement $3.5/BCY
Final Cover: 40-mil Tex/smooth LLDPE	$ 28,414	AC	Price Based on $0.65 SF.
Final Cover: Sand Drainage Layer (12 inches)	$ 30,653	AC	Price is based on Drainage Sand $15/BCY and placement $4/BYD
Final Cover: Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/BCY and placement $3.5/BCY
Final Cover: Topsoil Layer (6 inches)	$ 19,352	AC	$3.95 (RSM 31 23 23.14 2420) + $20/cy delivered
Finish Grading, gentle slopes	$ 968	AC	RSM 31 22 16.10 3300 ($0.20/SY)
Leachate Collection pipes	$ 30,000	AC	Allowance
Leachate header	$ 5,000	AC	Allowance
SUBTOTAL	$ 313,564	AC	
Reconstruct and Reline On-Site Pond			
Remove overlying soils and 30 mil Hypalon liner	$ 17,000	AC	Based on a crew at $8,500/Day for two days
Regrade and Compact Subgrade	$ 17,000	AC	Based on a crew at $8,500/Day for two days
Compacted Clay (1 x 10^{-7}) Soil Liner (24 inches)	$ 96,800	AC	Price is based on Clay Fill @ $20/CY and placement @ $10/CY
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Geonet	$ 28,314	AC	$0.65/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/TCY and placement $3.5/TCY
SUBTOTAL	$ 234,958	AC	
Reconstruct and Line Pond, Install Steel Wear Plates			
Remove and stockpile 18" Coarse Graded Crushed Ballast (3/4" to 1 1/2")	$30,760	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018 = $12.71/cy
Remove 6" Sand	$ 10,250	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018 = $12.71/cy
Remove existing 30 mil Hypalon liner	$ 17,000	AC	Based on a crew at $8,500/Day for two days
Remove 6" Sand	$ 10,250	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018 = $12.71/cy
Regrade and Compact Compacted Clay Subgrade	$ 21,250	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500)($0.43/SF) + compaction, 6" lifts, 4 passes (RSM 31 23 23.23 5640)($1.56/cy(assume 1' thick))
Compacted Clay (1 x 10^{-7}) Soil Liner (24 inches)	$ 96,800	AC	Price is based on Clay Fill @ $20/CY and placement @ $10/CY
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Geonet	$ 28,314	AC	$0.65/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
18" Coarse Graded Crushed Ballast-reused (3/4" to 1 1/2" size)	$ 29,500	AC	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018) + $5/CY load = $12.18/cy
Steel Wear Plates - 3/8" - 2000 SF TOTAL for working area	$ 19,200	AC	3/8" x 2000 SF = 65 CF x 490lb/cf = 16 tons @ $1,200/ton
SUBTOTAL	$ 301,658	AC	
Reconstruct and Line Bottom Ash Storage Area			
Remove 30" Bottom Ash/Soil	$51,265	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018) = $12.71/cy
Regrade and Compact Subgrade	$ 21,250	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500)($0.43/SF) + compaction, 6" lifts, 4 passes (RSM 31 23 23.23 5640)($1.56/cy(assume 1' thick))
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18" Coarse Graded Crushed Ballast-reused (3/4" to 1 1/2" size)	$ 29,500	AC	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018) + $5/CY load = $12.18/cy
SUBTOTAL	$ 265,463	AC	

Individual Unit Cost Summary

Leachate Collection System (1 per pond)			
Final grade	$ 1,258	EA	$0.43/SF Finish grading lagoon bottoms (RSM 31 22 16.10 3500) x (45' x 65') =
Trenching	$ 1,083	EA	$3.61/LF. (RSM G1030 805 1800)
60-mil HDPE liner	$ 9,620	EA	Assume 7125 SF. Price based on .90/SF + 50% small quantity ($1.35)
HDPE geonet	$ 3,950	EA	Assume 45'x65' SF. Price based on .90/SF + 50% small quantity ($1.35)
Leak Detection Fill (25' x 45' x5' = 210 CY)	$ 3,990	EA	Price is based on Drainage Sand $15/BCY and placement $4/BYD
10-inch dia HDPE Pipe (2 each at 300')	$ 21,200	EA	$32/LF. RSM 33 11 13.35 0400 + $1,000/pipe fittings
2-inch dia PVC Pipe (1 each at 300')	$ 868	EA	$2.59/LS. RSM 33 11 13.20 1120 + $100 fittings
SUBTOTAL	$ 41,969	EA	
Cover Existing Pond			
Stabilize	$ 109,020	AC	assume 5' thick = 8,067 BCY/Acre = 12,600 tons. 3% Portland = 378 tons @ $75/ton + $10/cy handling
Final grade	$ 18,730	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500)
40-mil Tex/smooth LLDPE	$ 28,414	AC	Price Based on $0.65 SF
Sand Drainage Layer (12 inches)	$ 30,653	AC	Price is based on Drainage Sand $15/BCY and placement $4/BYD
Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/BCY and placement $3.5/BCY
Topsoil Layer (6 inches)	$ 19,352	AC	$3.95 (RSM 31 23 23.14 2420) + $20/cy delivered
SUBTOTAL	$ 224,327	AC	
Periodic Cleaing of Pond			
Dredge 2' of material	$28	CY	Hydraulic dredge (pumped 1000' to shore) = 15.55 + haul 12cy 15mph 2 mile (RSM 35 20 23.23 1100 + 31 23 23.20 1018) = $12.71/cy totals $28.26/cy for 1 acre x 2' deep = 3,226.67 BCY
Excavate and load from stockpile	$6.60	CY	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)

GHENT Facility Backup Quantities M. Gavin 7/15/2015

CCR Production Rates

CCR Production Handling Assumptions:

% Bot Ash Wet Sluice to ATB2:	18%	2015 YTD - per J. Oswein e-mail of 7/1/2015
% Bot Ash Wet Sluice to ATB2:	18%	2015 YTD - per J. Oswein e-mail of 7/1/2015
% Gypsum returned to Ponds:	34%	2015 YTD - per J. Oswein e-mail of 7/1/2015

CCR Production - 2015 Plan (tons)

Year	Ghent Bot Ash	Fly Ash	Gypsum	TOTAL	Accumulated Material (Tons) ATB-2	Gypsum Stack	ATB-1 2017-2018	2019-2023
2015	95,524	382,098	971,368	1,448,991	85972	330265		
2016	110,978	443,910	1,024,652	1,579,540	99880	348382		
2017	113,956	455,825	1,042,262	1,612,044		0	354369	
2018	110,325	441,301	1,019,121	1,570,747			346501	
2019	108,994	435,976	1,014,263	1,559,233				344849
2020	110,869	443,476	1,029,599	1,583,944				350064
2021	106,731	426,924	990,608	1,524,263				336807
2022	106,190	424,761	985,907	1,516,858				335208
2023	111,034	444,136	1,031,235	1,586,405				350620
2024	111,891	447,563	1,038,722	1,598,175				
2025	111,608	446,432	1,035,935	1,593,975				
				Assumed Additional Accumulated Material:	185852	678647	700870	1717548

Projected Material Generation - Handling Assumptions:

A. Bottom Ash and Flyash:
- Until Jan 2017, assume portion of fly ash and bottom ash slurried to ATB #2 (per above %), and remainder to landfill
- After Jan 2017, all ash will be dry (to landfill)

B. Gypsum
- Will continue to sell portion of Gypsum for off-site beneficial reuse, landfill portion, and send rest to ponds (per assumptions above)
- Until Jan 2017, assume portion gypsum production (per above %) will be accumulated in Gypsum Stack and/or ATB-2
- From Jan 2017 to Jan 2019, assume portion gypsum production (per above %) will accumulate in ATB-1
- After Jan 2019 through 2023, assume ATB-1 may or may not take same yearly production (consider both cases)

Approximate density of CCR in-place: 1 ton/CY (Assumed)

Orange:	To be confirmed by CAD
Yellow:	Based on assumptions as listed
Green:	Confirmed by CAD
Blue:	Per CAD but need to doublecheck

Pond Quantity Balance Estimate - By Pond:

Ash Treatment Basin #1 (ATB1)

Item	Units	Quantity	Notes	Key Item to Confir	Estimated input value:		
Total surface area	AC	111.2					
Standing surface water (to remove)	GAL	56,296,720	Per CAD: Volume Report. Water surface at Elev. 522.				1.55 Avg. depth
Length of perimeter	LF	9,279					
CUT: Existing Surface to Final Cover Subgrade							
CCR cut in 2017 for temporary treatment pond - send to ATB2	CY	161,333	Dredge 10 acre, 10' deep pond. Send to ATB2 in 2017		10	ac	
Cut from existing surface to final subgrade - keep in ATB1	CY	362,465	Per CAD.	CAD - confirm cut to grade ditches for final cover			
AIRSPACE CAPACITY: Existing Surface to Final Cover Subgrade	CY	2,191,904	CAD to update per final grades				
FILL SOURCES:							
From Secondary Pond - CCR and subsoil	CY	22,977					
From cut for final cover subgrade	CY	362,465	CAD to confirm				
From CCR accumulation in ATB-1 - Jan. 2017 thru 2018	CY	700,870		CAD - find min. final cover grading option to balance this			
From CCR accumulation in ATB-1 - Jan. 2019 thru 2023	CY	1,717,548	CAD to minimize additional fill needed for 2019 closure. May be 4 years additioanl accumulation (1.7 MCY?) through 2023 for max case				
TOTAL POTENTIAL FILL through 2018	**CY**	**1,086,313**	CAD to confirm concept can be made to manage this (multi-small hill)				
TOTAL POTENTIAL FILL through 2023	**CY**	**2,803,861**	CAD to design cover to maximize fill - up to this value if possible				
Final cover soil volume	CY	382,494	CAD to update				
Final cover surface area	AC	113	Per CAD (area within ditch) plus 10' strip around perimeter ditch				
Surface Water features							
Ditch Erosion Protection - Perimeter Ditch	LF	9,279					
Culvert/Tunnel through berm to Secondary Pond - From NE corner	LS	1					
Culvert/Tunnel through to Secondary Pond - From SE corner	LS	1					
Ditch to Secondary Pond - From SE corn	LF	1,200	CAD to confirm				

From	To	Subject	Cc	Size	Received	Categories
Reif, Marty	Zink, Natha	RE: LGE-KU	Mckelvey,	19 KB	12:53 PM	

Gypsum Stack

Item	Units	Quantity	Notes	Key Item to Confir	Estimated input value:		
Total surface area	AC	60.28	Per CAD: Volume Report				
Standing Surface Water (to remove)	GAL	58,039,125	Per CAD: Volume Report. Water surface at Elev. 540	CAD: Compare topo to water elev.			2.96 Avg. depth
Length of perimeter	LF	6,065	CAD to confirm				
CUT - From Estimated Final Surface at Closure							
From current survey surface to estimated CCR extents - send to ATB2	CY	**3,666,633**	From CAD: Volume report	CAD: Confirm w/r/t elevation 500 bottom elevation			
Stage 1	CY	1,175,957	From CAD: Volume report				
Stage 2	CY	2,490,676	From CAD: Volume report				
From accumulation 2015 to Jan. 2017 - Send to ATB2	CY	678,647					
TOTAL Gypsum CUT - Send to ATB2	**CY**	**4,345,280**					
Stage 1 - North	CY	1,402,173					
Stage 2 - South	CY	2,943,107					
Total Subsoil Cut - below Gypsum - Send to ATB2	CY	97,257			1	ft	
Stage 1	CY	39,655					
Stage 2	CY	57,602					
BERM REGRADING	**CY**	**79,216**					
Stage 1 - North (N & E berms)	CY	43410	From CAD: Volume report				
Stage 2 - South (E berm)	CY	35806	From CAD: Volume report				

Ash Treatment Basin #2 (ATB2)

Standing Surface Water (to remove)	Units	Quantity	Notes	Key Item to Confir	Estimated input value:	
Total surface area	AC	154.51	Per CAD: Volume Report			
Standing Surface Water (to remove)	GAL	247,302,756	Per CAD: Volume Report. Water suface at Elev. 792.		3	ft
Length of perimeter	LF	10,164	Per CAD: Volume Report			
CUT						
Cut from existing surface to final subgrade - keep in ATB2	CY	497,662	Per CAD: Volume Report			
FILL CAPACITY: Existing surface to final cover subgrade	CY	4,937,298	Per CAD: Volume Report			
FILL SOURCES:						
From ATB1 temporary treatement pond	CY	161,333	Per above			
From CCR accumulation in ATB-2 through 2016	CY	185,852	Projection - per above			
From Gypsum Stack - Stage 1	CY	1,441,828	Assume 1/3 of Gypsum Stack cut			
From Gypsum Stack - Stage 2	CY	3,000,709	Assume 2/3 of Gypsum Stack cut			
From Reclaim Pond	CY	35,622				
From cut for final cover subgrade	CY	497,662	Per above			
TOTAL POTENTIAL FILL	CY	5,323,006				
Potential EXCESS FILL (to be accomodated by refined ATB-2 cover design)	CY	385,708				
Final Cover Soil Volume	CY	547,874	Per CAD: Volume Report			
Final Cover Surface Area	AC	157	Per CAD (area within ditch) plus 10' strip around perimeter ditch			
Surface Water features						
Ditch Erosion Protection - Perimeter Ditch	LF	10,164				
Culvert/Tunnel through berm to Channel - West Side	LS	1				
Modify Ditch and Sed Pond - from West Side	LS	1				
Culvert/Tunnel through to Secondary Pond - North Side	LS	1				
Ditch to Reclaim Pond - from North Side	LF	3,500	CAD to confirm			

Secondary Pond

Item	Units	Quantity	Notes	Key Item to Confir	Estimated input value:		
Area of pond	AC	4.16					
Standing Surface Water (to remove)	GAL	13,362,163	Per CAD: Elev. 492 to existing		5	ft	9.86 Avg. depth
Length of perimeter	LF	1,955					
CUT							
From existing surface to estimated CCR extents - send to ATB1	CY	16,266	Per CAD: Volume report				
From subsoil below CCR - Send to ATB1	CY	6,711			1	ft	
FILL - bottom of pond to final grade (clean fill)	CY	0					
Volume of pond	CY	22,977	May not be same as CCR cut above - CAD to confirm design pond volume				
	GAL	4,641,150					

Reclaim Pond

Item	Units	Quantity	Notes	Key Item to Confir	Estimated input value:		
Area of pond	AC	7.36					
Standing Surface Water (to remove)	CY	90592	Per CAD (Elev. 498 to 492)				
Standing Surface Water (to remove)	GAL	18,297,183			5	ft	7.63 Avg. depth
Length of perimeter	LF	2,565					
CUT							
From existing surface to estimated CCR extents - send to ATB2	CY	23,748	Assume average 2 ft excavation of CCR across pond area		2	ft	
From subsoil below CCR - Send to ATB2	CY	11,874			1	ft	
FILL - Bottom of pond to final grade (clean fill)	CY	0					
Volume of pond	CY	35,622	May not be same as CCR cut above - CAD to confirm design pond volume				3.00 Avg. depth
	GAL	7,195,262					

[a] Dewatering and settlement of ash through closure activities will affect the quantities of fill material. In situ ash and geotechnical soil borings and testing are recommended to determine settlement during closure design.

[b] Represents volume of pond.

Other Key Assumptions:

LG&E-KU
Ghent Station
Settling Tank-based Treatment System
Mass Balances - FGD Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	FGD Wastewater	Mix Tank Influent	Sodium Hydroxide Feed (2)	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
3-Month Average Flow											
Volumetric Flow, 3-month average	gpm	1,324	1,324	0.07	0.07	0.03	0.66	0.066	1,351	125	1,219
Total Mass Flow	lb/hr	675,780	675,780	42	47	16	331	61	676,230	66,277	609,953
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	14	0	0	0			
Mass Flow Liquid	lb/hr	662,530	662,530	42	47	16	331	61	662,966	53,022	609,944
Mass Flow Solids	lb/hr	13,251	13,251	0	14	0	0	0	13,265	13,255	9.1
Specific Gravity		0.00	0.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	0.0	0.0	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	2,112	2,112	0.11	0.11	0.04	1.06	0.066	2,156	200	1,945
Total Mass Flow	lb/hr	1,077,982	1,077,982	68	75	25	528	61	1,078,700	105,650	973,049
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	22	0	0	0			
Mass Flow Liquid	lb/hr	1,056,845	1,056,845	68	75	25	528	61	1,057,540	84,520	973,020
Mass Flow Solids	lb/hr	21,137	21,137	0	22	0	0	0	21,159	21,130	29.2
Specific Gravity		0.00	0.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	0.0	0.0	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4

Notes:

xx	User Entered

LG&E-KU
Ghent Station
Settling Tank-based Treatment System
Mass Balances - Other Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	Other Wastewater	Mix Tank Influent	Sodium Hydroxide Feed	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
DESIGN FLOW											
Volumetric Flow, 3 month ave	gpm	9,365	9,365	0.47	0.47	0.19	4.68	0.468	9,372	2	9,371
Total Mass Flow	lb/hr	4,686,715	4,686,715	300	429	111	2,343	431	4,689,898	894	4,689,004
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.0%	20%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	99	0	0	0			
Mass Flow Liquid	lb/hr	4,686,246	4,686,246	300	330	111	2,343	431	4,689,330	396	4,688,934
Mass Flow Solids	lb/hr	469	469	0	99	0	0	0	568	497	70.3
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	24,611	24,611	1.23	1.23	0.49	12.31	0.468	24,630	11	24,619
Total Mass Flow	lb/hr	12,316,576	12,316,576	788	868	291	6,158	431	12,324,941	5,612	12,319,329
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.0%	20%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	260	0	0	0			
Mass Flow Liquid	lb/hr	12,315,344	12,315,344	788	868	291	6,158	431	12,323,449	4,490	12,318,959
Mass Flow Solids	lb/hr	1,232	1,232	0	260	0	0	0	1,492	1,122	369.6
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4

Notes:

xx User Entered

Equipment Sizing

	FGD Treatment	Other Water Treatment	Tom's comments - red = not addressed, black = addressed
Mix Tanks			
Average Flow, gpm	1,324	9,365	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	2,112	24,611	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	16.0	20.0	
HDT Peak, Min	10	7.6	
Mix Tank Volume, gal	21,120	187,044	
Mix Tank Volume, cf	2,823	25,004	
Side Water Depth, ft	18	23	Need to account for the mix tanks being higher than the settling tanks to allow fro head drop
Freeboard, ft	2	2	
Wall Height, ft	20	25	
Length/width, ft	13	33	inside dimensions
Slab Area, sf	364	1,153	
Wall length, ft	27	68	Wall length split between Mix tanks and floc tanks
Wall Area, sf	1,082	1,699	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	80	126	
Slab Volume, cy	27	85	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	2.11	18.70	
Actual HP	2	20	
Number	2	2	
Outlet Pipe Nominal Diameter, in	14	32	FRP Pipe
Outlet Pipe ID, in	14	32	
Outlet Pipe Velocity, fps	4.40	4.91	Design for2 to 5 fps
Pipe Head Loss to Floculation Tank, Ft	0.68	0.79	
Number of Dip Tubes	1	2	We will want to design 2 different size dip tubes for other wastewater, a lower one that is smaller for low flows and a larger one for high flow conditions. We need a minimum velocity to suck solids out of the tank, and max velocity to prevent shear.

Flocculation Tanks			
Average Flow, gpm	1,324	9,365	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	2,112	24,611	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	16.0	20.0	
HDT Peak, Min	10	7.6	
Flocculation Tank Volume, gal	21,120	187,044	
Flocculation Tank Volume, cf	2,823	25,004	
Side Water Depth, ft	18.0	23.0	
Freeboard, ft	2	2	
Wall Height, ft	20.0	25.0	
Length/width, ft	13	33	inside dimensions
Slab Area, sf	364	1,153	
Wall length, ft	27	68	Wall length split between Mix tanks and floc tanks
Wall Area, sf	1,082	1,699	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	80	126	
Slab Volume, cy	27	85	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	2.11	18.7	
Actual HP	1.5	20	
Number	2	2	
Outlet Pipe Nominal Diameter, in	14	32	FRP
Outlet Pipe ID, in	14	32	
Outlet Pipe Velocity, fps	4.40	4.91	Design for max 3-4 fps
Pipe Head Loss to Floculation Tank	0.68	0.79	
Number of Dip Tubes	1	2	

Settling Tanks

Average Flow, gpm	1,324	9,365	Calculate overflow rate on peak flow, solids storage on average flow
Max Design Flow, gpm	2,112	24,611	
Design solids, mg/L	20,000	100	
Daily solids production , lbs/day	318,351	13,626	
Solids concentration (Settled solids)	20%	5%	Settled solids
Solids density, lbs/cf	80	80	dry solids
Solids generation, cf/day	19,897	3,406	
Solids Storage, days	92	343	
Solids Storage per tank, cf	1,825,200	1,170,000	> 1 yr solids capacity for Other WW ssytem.
Number of Tanks	2	2	
Wall Height, ft	24	24	
Freeboard, ft	2	2	
Side Water Depth, ft	22	22	
Water depth above settled solids	10	10	
Solids Depth,ft	12	12	
Total Tank Volume, gal per tank	25,029,576	16,044,600	
Total Tank Volume, CF per tank	3,346,200	2,145,000	
Solids Storage Volume, gal per tank	13,652,496	8,751,600	
Solids Storage Volume, CF per tank	1,825,200	1,170,000	
Tank Width, ft	195	125	Set based on solids storage capacity for FGD WW and overflow rate for other WW Treatment
L/W Ratio	4	6.2	
Tank Length, ft	780	780	Tank length for Other WW is set equal to the FGD WW tank and the Other WW tank width
Slab Area, sf	314,472	202,574	
Wall length, ft	3,130	2,850	
Wall Area, sf	75,120	68,400	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.0	2.0	
Wall Volume, cy	5,564	5,067	
Slab Volume, cy	23,294	15,005	
Overflow Rate Average, gpm/sf	0.0087	0.0961	
Overflow Rate peak, gpm/sf	0.0139	0.2524	Want to stay at < 0.26 gpm/sf
Flow capacity based on average overflow rate, gpm	1,300	9,400	one train
Flow capacity based on Peak overflow rate, gpm	2,110	24,610	One train

Access Ramp to Settling Tank

Access Ramp Inside Settling tank Width, ft	30	30	Need two way truck traffic
Ramp Slope, %	12%	12%	
Ramp tickness, ft	1.50	1.50	Assumed.
Ramp Length, ft	201	201	
Ramp area, sf	6043	6043	
Ramp side wall area sf	2400	2400	
Ramp side wall Thickness, ft	2	2	
Sidewall concerte, cft	4800	4800	
Access Ramp concrete, cft	9065	9065	
Total Ramp concrete, ft3	13865	13865	
Total Ramp concrete, cy	514	514	Per ramp

Excavation	527,280		

Liner

Liner, ft2	398,527	282,720	
Liner, SY	44,281	31,413	

Chemical Feeds

Ferric Chloride Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,112	24,611	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	Use 50
Maximum Feed Rate, gph	6.3	73.8	
Average Flow to treat, gpm	1,324	9,365	
Average Feed Rate, gph	4.0	28.1	
Average Treatment Volume, MGD	1.91	13.49	
Average Usage, gpd	95	674	
Average usage of chemical for FGD WW and Other WW	770		
Max Day Treatment Volume, MG	3.04	35.4	
Maximum Usage, gpd	152	1772	
Max usage of chemical for FGD WW and Other WW, gpd	1,924		
Nominal Storage Tank Volume, gal	11,000		
Number of Tanks	1		
Total Storage Volume, gal	15,000		Includes 4000 gallon extra capacity for tank truck loading

Storage Time at normal max usage, days	8		
Storage Time at average usage, days	19		Size for 14 to 21 days capacity at average usage

Sulfuric Acid Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,112	24,611	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	6	74	
Average Flow to treat, gpm	1,324	9,365	
Average Feed Rate, gph	4.0	28	
Average Treatment Volume, MGD	1.9	13.5	
Average Usage, gpd	95	674	
Average usage of chemical for FGD WW and Other WW	770		
Max Day Treatment Volume, MG	3.04	35.4	
Maximum Usage, gpd	152	1772	
Max usage of chemical for FGD WW and Other WW	1,924		
Nominal Storage Tamk Volume, gal	11,000		
Number of tanks	1		
Total Storage Volume, gal	15,000		Each tank. Includes 4000 gal for tanker truck.
Storage Time at normal max usage, days	8		
Storage Time at average usage, days	19		Size for 14 to 21 days capacity at average usage

Sodium Hydroxide Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,112	24,611	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	6.3	73.8	
Average Flow to treat, gpm	1,324	9,365	
Average Feed Rate, gph	4.0	28.1	
Average Treatment Volume, MGD	1.91	13.5	
Average Usage, gpd	95	674	
Average usage of chemical for FGD WW and Other WW	770		
Max Day Treatment Volume, MG	3.04	35.4	
Normal Maximum Usage, gpd	152	1772	
Max usage of chemical for FGD WW and Other WW	1,924		
Nominal Storage Tank Volume, gal	11,000		common Tank
Number of tanks	1		
Total Storage Volume, gal	15,000		Includes 4000 gallon extra capacity for tank truck loading
Storage Time at normal max usage, days	6		
Storage Time at average usage, days	19		Size for 14 to 21 days capacity at average usage

Organosulfide Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,112	24,611	
Dose (volume of chemical/volume of wastewater), ppmv	20	20	
Maximum Feed Rate, gph	2.53	29.5	
Average Flow to treat, gpm	1,324	9,365	
Average Feed Rate, gph	1.6	11.2	
Average Treatment Volume, MGD	1.91	13.5	
Average Usage, gpd	38.1	270	
Average usage of chemical for FGD WW and Other WW, gpd	308		
Max Day Treatment Volume, MG	3.04	35.4	
Normal Maximum Usage, gpd	60.8	709	
Max usage of chemical for FGD WW and Other WW, gpd	770		
Nominal Storage Tank Volume, gal	4,000		
Number of tanks	1		
Total Storage Volume, gal	8,000		
Storage Time at normal max usage, days	10		
Storage Time at average usage, days	26		Size for ~ 21 days capacity at average usage

Polymer Feed System

Number of polymer blending units	2	2	
Maximum Flow to treat, gpm	2,112	24,611	
Dose (volume of chemical/volume of wastewater), ppmv	5	5	1:100 ratio neat polymer to water
Maximum Feed Rate, gph	0.63	7.38	
Dilution Water Feed (volume to volume of neat polymer)	100	100	
Maximum Flow of Dilution water, gph	63.4	738.3	
Average Flow to treat, gpm	1,324	9,365	
Average Feed Rate, gph	0.40	2.81	
Average Treatment Volume, MGD	1.91	13.49	
Average Usage, gpd	9.5	67.4	
Average usage of chemical for FGD WW and Other WW, gpd	77		
Max Day Treatment Volume, MG	3.04	35.4	
Normal Maximum Usage, gpd	15.2	177	
Max usage of chemical for FGD WW and Other WW, gpd	192		
Nominal Storage Tote Volume, gal	265		265 or 320 gallons are standard volumes/sizes for totes
Number of totes	6		
Total Storage Volume, gal	1,590		
Storage Time at normal max usage, days	8		
Storage Time at average usage, days	21		Size for ~ 21 days capacity at average usage

Note: User Input

12 feet of solids, 10 feet of water and 2 feet of freeboard

Head loss influent Mix tank to Floccuation Tank FGD Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		14	14		0.78	2,112	4.71	4.40	0.30	150	0.00	0.24	0.24
	pipe	FRP		14	14	18		2,112	4.71	4.40	0.30	150	0.07	0.00	0.07
0	tee, branch	FRP		14	14		0.72	2,112	4.71	4.40	0.30	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		14	14		0.19	2,112	4.71	4.40	0.30	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		14	14		0.19	2,112	4.71	4.40	0.30	150	0.00	0.06	0.06
				14	14			2,112							
	pipe	FRP		14	14	4		2,112	4.71	4.40	0.30	150	0.01	0.00	0.01
1	exit loss	FRP		14	14		1.00	2,112	4.71	4.40	0.30	150	0.00	0.30	0.30

Total head loss **0.68**
total minor loss **0.60**

Head loss influent Mix tank to Floccuation Tank, Other Water Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		32	32		0.78	12,306	27.42	4.91	0.38	150	0.00	0.29	0.29
	pipe	FRP		32	32	23		12,306	27.42	4.91	0.38	150	0.04	0.00	0.04
0	tee, branch	FRP		32	32		0.72	12,306	27.42	4.91	0.38	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		32	32		0.19	12,306	27.42	4.91	0.38	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		32	32		0.19	12,306	27.42	4.91	0.38	150	0.00	0.07	0.07
				32	32			12,306							
				32	32										
	pipe	FRP		32	32	4		12,306	27.42	4.91	0.38	150	0.01	0.00	0.01
1	exit loss	FRP		32	32		1.00	12,306	27.42	4.91	0.38	150	0.00	0.38	0.38

Total head loss **0.79**
total minor loss **0.74**

Excavation Calculation FGD WW and Other WW Tanks

Settling Tank Depth below grade=	22	ft
Depth Below Tank for Excavation =	4	ft
Depth of excavation	26	ft
Side Slope (H:V) =	1	ft/ft
Tank wall thickness	2	ft
FGD WW Tank Length =	780	ft
FGD WW Tank Width =	195	ft
Number of FGD WW Tanks =	2	each
Other WW Tank Length =	780	ft
Other WW Tank Width =	125	ft
Number of Other WW Tanks =	2	each
Total Length of tanks with walls	784	ft
Total Width of tanks with walls	650	ft
Excavated tank area volume	14,236,560	cf
Total Excavated Volume	527,280	cy

Trapezoidal calculation, average width of cut time average length of cut times depth

LG&E-KU
Ghent Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
Ramps	***Access to Settling Tanks***	Number	2	2
		Length, ft	201	201
		Width, ft	30	30
		Slope, %	12%	12%
		Materials	Reinforced Concrete	Reinforced Concrete
Mix Tanks	***Tanks***	Number	2	2
		Average Flow, gpm	1,324	9,365
		Peak Flow, gpm	2,112	24,611
		Detention Time at Average Flow, min	16	20
		Detention Time at Peak Flow, min	10	7.6
		Dimension, ft (square)	13	33
		Wall Height, ft	20	25
		Freeboard, ft	2	2
		Side Water Depth, ft	18	23
		Volume, gal	21,120	187,044
		Materials	Reinforced Concrete	Reinforced Concrete
	Mix Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	2	20
	Mix Tank Blower	Number		2
		Type		Rotary Lobe
		Air Required, scfm		500
		Horsepower, each		20
	Dip Tubes	Number	2	2
		Diameter, in	14	32
		Head loss, ft	0.68	0.79
		Materials	FRP	FRP
FlocculationTanks	***Tanks***	Number	2	2
		Average Flow, gpm	1,324	9,365
		Peak Flow, gpm	2,112	24,611
		Detention Time at Average Flow, min	16	20
		Detention Time at Peak Flow, min	10	8
		Dimension, ft (square)	13	33
		Wall Height, ft	20	25
		Freeboard, ft	2	2
		Side Water Depth, ft	18	23
		Volume, gal	21,120	187,044
		Materials	Reinforced Concrete	Reinforced Concrete
	Flocculation Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	2	20
	Dip Tubes	Number	2	2
		Diameter, in	14	32
		Head loss, ft	0.68	0.79
		Materials	FRP	FRP
Settling Tanks	***Tanks***	Number	2	2
		Average Flow, gpm	1,324	9,365
		Peak Flow, gpm	2,112	24,611
		Solids Concentration, mg/L	20,000	100
		Average dry solids generation, lbs/day	318,351	13,626
		Solids Settled Concentration (%)	20%	5%
		Solids density, lbs/cf	80	80
		Solids Generation, cf/day	19,897	3,406
		Length, ft	780	780
		Width, ft	195	125
		Wall Height, ft	24	24
		Freeboard, ft	2	2
		Side Water Depth, ft	22	22
		Settling Depth, ft	10	10
		Solids Depth, ft	12	12
		Total Liquid Volume, gal per tank	25,029,576	16,044,600
		Solids Storage Design Criteria, days	90	90
		Solids Storage Volume, gal	13,652,496	8,751,600
		Solid Storage Provided per tank, days	92	343
		Average Overflow Rate, gpm/sf	0.01	0.10
		Peak Overflow Rate, gpm/sf	0.01	0.25
		Materials	Reinforced Concrete	Reinforced Concrete

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Ghent Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
Ferric Chloride Feed System	*Ferric Chloride Storage Tank*	Number	1	
		Tank Volume, gal	15,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	95	674
		Average Chemical Use, gal/d	770	
		Peak Chemical Use, gal/d	152	1,772
		Peak Chemical Use, gal/d	1,924	
		Average Use Storage, days	19	
		Peak Use Storage, days	8	
		Chemical Stored	35% Ferric Chloride	
	Ferric Chloride Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	6.3	73.8
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	35% Ferric Chloride	35% Ferric Chloride
Sulfuric Acid Feed System	*Sulfuric Acid Storage*	Number	1	
		Tank Volume, gal	15,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	95	674
		Average Chemical Use, gal/d	770	
		Peak Chemical Use, gal/d	152	1,772
		Peak Chemical Use, gal/d	1,924	
		Average Use Storage, days	19	
		Peak Use Storage, days	8	
		Chemical Stored	93% Sulfuric Acid	
	Sulfuric Acid Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	6.3	73.8
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	93% Sulfuric Acid	0
Sodium Hydroxide Feed System	*Sodium Hydroxide Storage*	Number	1	
		Tank Volume, gal	15,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	95	674
		Average Chemical Use, gal/d	770	
		Peak Chemical Use, gal/d	152	1,772
		Peak Chemical Use, gal/d	1,924	
		Average Use Storage, days	19	
		Peak Use Storage, days	6	
		Chemical Stored	25% and 50% NaOH	
	Sodium Hydroxide Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	6.3	73.8
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	25% and 50% NaOH	0
Organosulfide Feed System	*Organosulfide Tote/tank Storage*	Number	1	
		Tank Volume, gal	8,000	
		Dose, ppmv	20	20
		Average Chemical Use, gal/d	38	270
		Average Chemical Use, gal/d	308	
		Peak Chemical Use, gal/d	61	709
		Peak Chemical Use, gal/d	770	
		Average Use Storage, days	26	
		Peak Use Storage, days	10	
		Chemical Stored	Organosulfide	
	Organosulfide Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	2.53	29.5
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Organosulfide	Organosulfide
Polymer Feed System	*Polymer Tote Storage*	Number	6	
		Volume, gal each	265	
		Volume Storage, gal	1,590	
		Dose, ppmv	5	5
		Average Chemical Use, gal/d	10	67
		Average Chemical Use, gal/d	77	
		Peak Chemical Use, gal/d	15	177
		Peak Chemical Use, gal/d	192	
		Average Use Storage, days	21	
		Peak Use Storage, days	8	
		Chemical Stored	Anionic Emulsion Polymer	
	Polymer Blending Systems	Type	Polymer Blending System	Polymer Blending System
		Capacity, gph	0.63	7.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Anionic Emulsion Polymer	Anionic Emulsion Polymer

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Ghent Station

Settling Tank-based Treatment System

Table 2. Electrical Load

Item	Location	HP	No. Provided	No. Active	Installed HP	Active HP	% of Time On	Total HP for O&M
FGD WW Teatment								
Mix Tank Mixers	TBD	2	2	1	4	2	100%	2
Floculation Tank Mixers	TBD	2	2	1	3	2	100%	2
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Other WW Teatment								
Mix Tank Mixers	TBD	20	2	1	40	20	100%	20
Floculation Tank Mixers	TBD	20	2	1	40	20	100%	20
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Mix Tank Blower	TBD	20	2	1	40	20	10%	2
Miscellaneous (bldg heating, lights, etc.)		100			100	100	30%	30
Totals					247	174		86
MW								0.064467
MW-Hr/year								560

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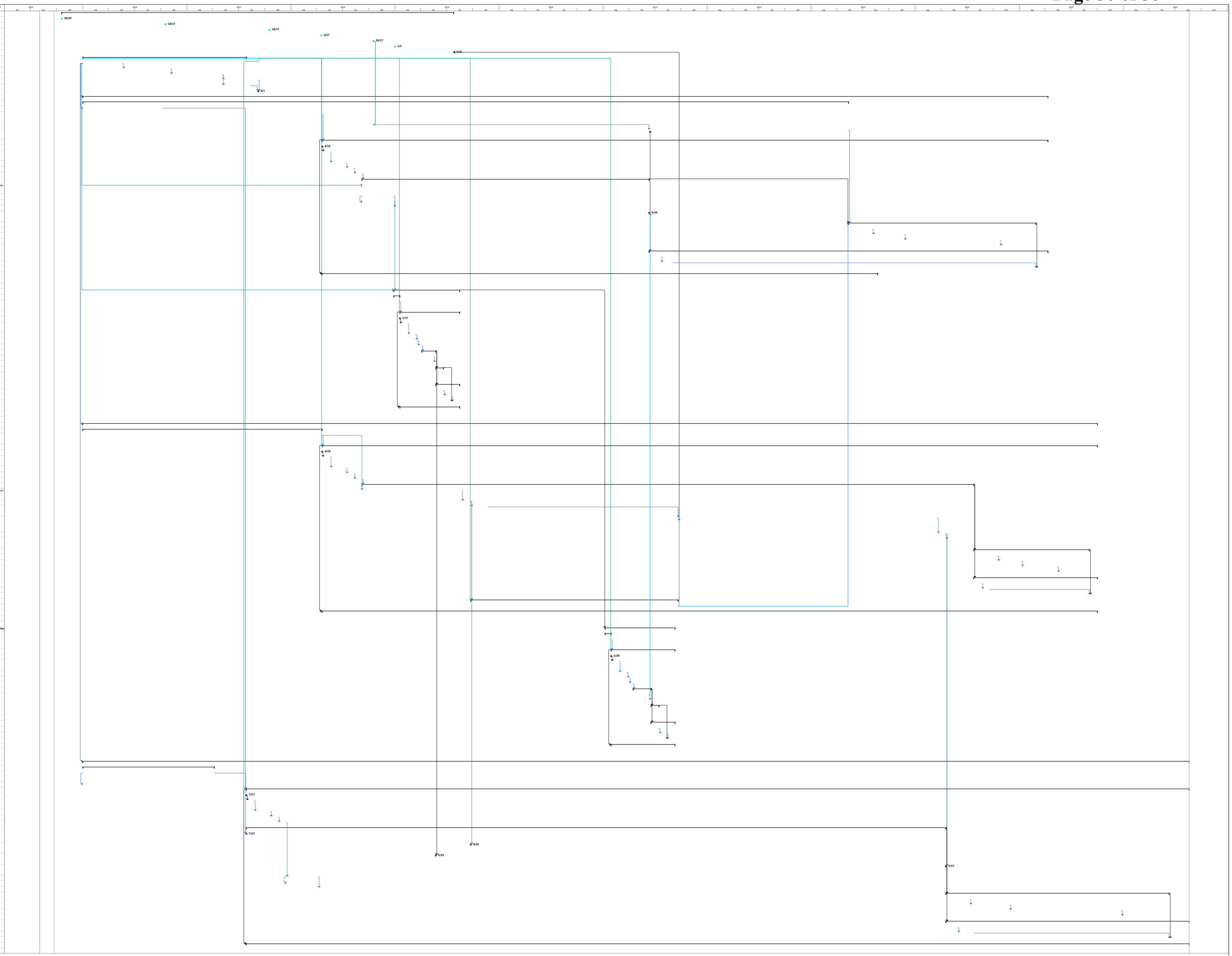
Ghent Station
Settling Tank-based Treatment System
Table 4. Estimated O&M Cost

Item	Quantity	Units	Unit Cost	Cost
Labor	1,040	hours/yr	$30	$31,200
Maintenance (% of Purchased Equipment Cost)	968,000	$	3%	$29,040
Solids for Disposal	272,183	tons/yr	-	-
Energy	560	MW-Hr/yr	$100	$56,000
Chemicals				
Ferric Chloride	224,726	gal/yr	$2	$373,044
Acid	67,418	gal/yr	$2	$157,757
Organosulfide	89,890	gal/yr	$20	$1,797,804
Polymer	22,473	gal/yr	$8	$178,882
Caustic	224,726	gal/yr	$1	$247,198
Total Annual O&M				$2,871,000
Cost per 1000 Gallon Treated (excludes labor)				**$0.51**
Annualized Cost				$7,768,000

Attachment 3
Proposed Conceptual Alternative Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Regulatory Milestones**	**984 days**	**Mon 10/19/15**	**Thu 7/25/19**	
2	CCR Rule Effective Date	0 days	Mon 10/19/15	Mon 10/19/15	
3	Structural Integrity - Initial Assessment(s	0 days	Mon 10/17/16	Mon 10/17/16	
4	Groundwater - Background Analysis	0 days	Tue 10/17/17	Tue 10/17/17	
5	Groundwater - Detection Analysis	0 days	Tue 4/17/18	Tue 4/17/18	
6	Groundwater - Assessment Analysis	0 days	Wed 10/17/18	Wed 10/17/18	
7	Groundwater Corrective Action	0 days	Tue 1/1/19	Tue 1/1/19	
8	Divert water to Concrete pond	0 days	Thu 7/25/19	Thu 7/25/19	93FF
9	**Engineering Phase**	**410 days**	**Fri 1/1/16**	**Thu 7/27/17**	
10	Preliminary Design	100 days	Fri 1/1/16	Thu 5/19/16	
11	Final Design	120 days	Fri 5/20/16	Thu 11/3/16	10
12	KY DEP Permitting	130 days	Fri 11/4/16	Thu 5/4/17	11
13	KY PSC Rate Approval	90 days	Fri 5/5/17	Thu 9/7/17	12
14	Procurement of Contractor	70 days	Fri 5/5/17	Thu 8/10/17	12
15	Issue NtP	0 days	Thu 9/7/17	Thu 9/7/17	14,13
16	**ATB #1**	**2420 days**	**Fri 1/1/16**	**Thu 4/10/25**	**10SS**
17	**LG&E Activities**	**1920 days**	**Fri 1/1/16**	**Thu 5/11/23**	
18	Dredge material from ATB #1	200 days	Fri 1/1/16	Thu 10/6/16	10SS
19	Remove and Discharge surface water	600 days	Fri 1/1/16	Thu 4/19/18	
20	Accumulate CCR in 2016-2018	725 days	Wed 1/6/16	Wed 10/17/18	6FF
21	Place Beneficial Use CCR to achieve final grades	500 days	Fri 6/11/21	Thu 5/11/23	20,28
22	**Contractor Activities**	**1820 days**	**Thu 4/19/18**	**Thu 4/10/25**	**9,19**
23	Mobilize	0 days	Thu 4/19/18	Thu 4/19/18	
24	Install Sediment and Erosion Control	20 days	Fri 4/20/18	Thu 5/17/18	23
25	Site Preparation	40 days	Fri 5/18/18	Thu 7/12/18	24
26	Roads	20 days	Fri 7/13/18	Thu 8/9/18	25
27	On Site Impoundments	20 days	Fri 8/10/18	Thu 9/6/18	26
28	**Preclosure Activities**	**720 days**	**Fri 9/7/18**	**Thu 6/10/21**	**27**
29	Mechanical upgrades - piping to ATB #1 (From GS to ATB #2)	90 days	Fri 9/7/18	Thu 1/10/19	18SS+30 days
30	Stabilize upper CCR surface	80 days	Fri 9/7/18	Thu 12/27/18	
31	Dewater during stabilization	80 days	Fri 9/7/18	Thu 12/27/18	30SS
32	Cut/regrade for cover subgrade/dit	150 days	Fri 12/28/18	Thu 7/25/19	30
33	Complete Placcement of CCR and subsoil from Reclaim Pond	0 days	Thu 6/10/21	Thu 6/10/21	108
34	**Closure Activities**	**470 days**	**Fri 5/12/23**	**Thu 2/27/25**	**28,21,94**
35	Shape Cover Subgrade	60 days	Fri 5/12/23	Thu 8/3/23	
36	Place FML and Geocomposite	80 days	Fri 8/4/23	Thu 11/23/23	35
37	Cover soil	240 days	Fri 11/24/23	Thu 10/24/24	36
38	Vegetated Cover	90 days	Fri 10/25/24	Thu 2/27/25	37
39	**Surface Water Features**	**1000 days**	**Fri 6/11/21**	**Thu 4/10/25**	**28**
40	Primary Outlet Structure	30 days	Fri 6/11/21	Thu 7/22/21	
41	Stormwater featurs	30 days	Fri 7/23/21	Thu 9/2/21	40
42	Surface Restoration	30 days	Fri 2/28/25	Thu 4/10/25	34,41
43	**Construction Management Services**	**1392 days**	**Fri 4/20/18**	**Mon 8/21/23**	**22SS**
44	CQA and OE services	1392 days	Fri 4/20/18	Mon 8/21/23	
45					
46	**Secondary Pond**	**165 days**	**Fri 12/28/18**	**Thu 8/15/19**	**10SS,31**
47	**LG&E Activities**	**15 days**	**Fri 12/28/18**	**Thu 1/17/19**	
48	Remove and Discharge surface water	15 days	Fri 12/28/18	Thu 1/17/19	
49	**Contractor Activities**	**150 days**	**Thu 1/17/19**	**Thu 8/15/19**	**48,9**
50	Mobilize	0 days	Thu 1/17/19	Thu 1/17/19	
51	Install Sediment and Erosion Control	20 days	Fri 1/18/19	Thu 2/14/19	50
52	Site Preparation	20 days	Fri 2/15/19	Thu 3/14/19	51
53	Roads	5 days	Fri 3/15/19	Thu 3/21/19	52
54	On Site Impoundments	10 days	Fri 3/22/19	Thu 4/4/19	53
55	**Preclosure Activities**	**35 days**	**Fri 4/5/19**	**Thu 5/23/19**	**54**
56	Remove CCR and Haul to ATB #2	30 days	Fri 4/5/19	Thu 5/16/19	
57	Overexcavate subsoil for closure	5 days	Fri 5/17/19	Thu 5/23/19	56
58	**Closure Activities**	**20 days**	**Fri 5/24/19**	**Thu 6/20/19**	**55**
59	Shape Cover Subgrade	5 days	Fri 5/24/19	Thu 5/30/19	
60	Cover soil - For Stormwater Pond	20 days	Fri 5/24/19	Thu 6/20/19	
61	**Surface Water Features**	**60 days**	**Fri 5/24/19**	**Thu 8/15/19**	**55**
62	Primary Outlet Structure	20 days	Fri 5/24/19	Thu 6/20/19	
63	Stormwater featurs	20 days	Fri 6/21/19	Thu 7/18/19	62
64	Surface Restoration	20 days	Fri 7/19/19	Thu 8/15/19	58,63
65	**Construction Management Services**	**150 days**	**Fri 1/18/19**	**Thu 8/15/19**	**49SS**
66	CQA and OE services	150 days	Fri 1/18/19	Thu 8/15/19	
67					
68	**Gypsum Stack (GS)**	**2544 days**	**Fri 1/1/16**	**Wed 10/1/25**	**10SS**
69	**LG&E Activities**	**600 days**	**Fri 1/1/16**	**Thu 4/19/18**	
70	Remove and Discharge surface water	600 days	Fri 1/1/16	Thu 4/19/18	
71	**Contractor Activities**	**1944 days**	**Thu 4/19/18**	**Wed 10/1/25**	**70,9**
72	Mobilize	0 days	Thu 4/19/18	Thu 4/19/18	
73	Install Sediment and Erosion Control	20 days	Fri 4/20/18	Thu 5/17/18	72
74	Site Preparation	40 days	Fri 5/18/18	Thu 7/12/18	73
75	Roads	20 days	Fri 7/13/18	Thu 8/9/18	74
76	On Site Impoundments	20 days	Fri 8/10/18	Thu 9/6/18	75
77	**Preclosure Activities**	**1534 days**	**Fri 9/7/18**	**Wed 7/24/24**	**76**
78	Remove CCR from the Northern Portion of GS (for haul to ATB #2)	250 days	Fri 9/7/18	Thu 8/22/19	70FS+60 days
79	Overexcavate subsoil for closure	22 days	Fri 8/23/19	Mon 9/23/19	78
80	Collapse Berms - North GS Pond (N & E berms) to elevation ~505	44 days	Tue 9/24/19	Fri 11/22/19	79
81	Remove CCR from the Southern Portion of GS (for haul to ATB #2 and ATB #1)	650 days	Tue 9/21/21	Mon 3/18/24	80,94
82	Overexcavate subsoil for closure	22 days	Tue 3/19/24	Wed 4/17/24	81
83	Collapse Berms - South GS Pond (E berm) to elevation ~505	70 days	Thu 4/18/24	Wed 7/24/24	82
84	**Closure Activities**	**290 days**	**Thu 7/25/24**	**Wed 9/3/25**	**77**
85	Shape Cover Subgrade	60 days	Thu 7/25/24	Wed 10/16/24	
86	Place FML and Geocomposite	60 days	Thu 10/17/24	Wed 1/8/25	85
87	Cover soil	90 days	Thu 1/9/25	Wed 5/14/25	86
88	Vegetated Cover	80 days	Thu 5/15/25	Wed 9/3/25	87
89	**Surface Water Features**	**310 days**	**Thu 7/25/24**	**Wed 10/1/25**	**77**
90	Primary Outlet Structure	20 days	Thu 7/25/24	Wed 8/21/24	
91	Emergency Outlet Structure	20 days	Thu 8/22/24	Wed 9/18/24	90
92	Surface Restoration	20 days	Thu 9/4/25	Wed 10/1/25	84,91
93	**Concrete Process Tank**	**520 days**	**Tue 6/14/19**	**Wed 6/28/21**	**5,79**
94	Construct concrete CCR process tank	520 days	Tue 6/14/19	Mon 6/30/21	
95	**Construction Management Services**	**1944 days**	**Fri 4/20/18**	**Wed 10/1/25**	**71SS**
96	CQA and OE services	1944 days	Fri 4/20/18	Wed 10/1/25	
97					
98	**Reclaim Pond**	**175 days**	**Fri 1/8/21**	**Thu 9/9/21**	**60FS+363 days**
99	**LG&E Activities**	**15 days**	**Fri 1/8/21**	**Thu 1/28/21**	
100	Remove and Discharge surface water	15 days	Fri 1/8/21	Thu 1/28/21	
101	**Contractor Activities**	**160 days**	**Thu 1/28/21**	**Thu 9/9/21**	**100,9**
102	Mobilize	0 days	Thu 1/28/21	Thu 1/28/21	
103	Install Sediment and Erosion Control	20 days	Fri 1/29/21	Thu 2/25/21	102
104	Site Preparation	20 days	Fri 2/26/21	Thu 3/25/21	103
105	Roads	5 days	Fri 3/26/21	Thu 4/1/21	104
106	On Site Impoundments	10 days	Fri 4/2/21	Thu 4/15/21	105
107	**Preclosure Activities**	**35 days**	**Fri 4/16/21**	**Thu 6/3/21**	**106**
108	Remove CCR and Haul to ATB #1	30 days	Fri 4/16/21	Thu 5/27/21	
109	Overexcavate subsoil for closure	5 days	Fri 5/28/21	Thu 6/3/21	108
110	**Closure Activities**	**20 days**	**Fri 6/4/21**	**Thu 7/1/21**	**107**
111	Shape Cover Subgrade	5 days	Fri 6/4/21	Thu 6/10/21	
112	Cover soil - For Stormwater Pond	20 days	Fri 6/4/21	Thu 7/1/21	
113	**Surface Water Features**	**60 days**	**Fri 6/18/21**	**Thu 9/9/21**	**107**
114	Primary Outlet Structure	20 days	Fri 6/18/21	Thu 7/15/21	
115	Stormwater featurs	20 days	Fri 7/16/21	Thu 8/12/21	114
116	Surface Restoration	20 days	Fri 8/13/21	Thu 9/9/21	110,115
117	**Construction Management Services**	**160 days**	**Fri 1/29/21**	**Thu 9/9/21**	**101SS**
118	CQA and OE services	160 days	Fri 1/29/21	Thu 9/9/21	
119					
120	**ATB #2**	**2774 days**	**Fri 1/1/16**	**Wed 8/19/26**	**10SS**
121	**LG&E Activities**	**330 days**	**Fri 1/1/16**	**Thu 4/6/17**	
122	Remove and Discharge surface water	330 days	Fri 1/1/16	Thu 4/6/17	
123	Accumulate CCR in 2016	200 days	Fri 1/1/16	Thu 10/6/16	122SS
124	**Contractor Activities**	**2364 days**	**Thu 7/27/17**	**Wed 8/19/26**	**122,9**
125	Mobilize	0 days	Thu 7/27/17	Thu 7/27/17	
126	Install Sediment and Erosion Control	20 days	Fri 7/28/17	Thu 8/24/17	125
127	Site Preparation	40 days	Fri 8/25/17	Thu 10/19/17	126
128	Roads	20 days	Fri 10/20/17	Thu 11/16/17	127
129	On Site Impoundments	20 days	Fri 11/17/17	Thu 12/14/17	128
130	**Preclosure Activities**	**1754 days**	**Thu 7/27/17**	**Wed 4/17/24**	
131	Complete placement of CCR (dredged) from ATB #1	0 days	Thu 7/27/17	Thu 7/27/17	18
132	Complete placement of CCR and subsoil from GS (North Area)	0 days	Mon 9/23/19	Mon 9/23/19	79
133	Complete placement of CCR and subsoil from Secondary Pond	0 days	Thu 5/23/19	Thu 5/23/19	55
134	Complete placement of CCR and subsoil from GS (South Area)	0 days	Wed 4/17/24	Wed 4/17/24	82
135	Stabilize upper CCR surface	80 days	Fri 12/15/17	Thu 4/5/18	129
136	Dewater during stabilization	80 days	Fri 12/15/17	Thu 4/5/18	135SS
137	Cut/regrade for cover subgrade/dit	150 days	Fri 4/6/18	Thu 11/1/18	135
138	**Closure Activities**	**560 days**	**Thu 4/18/24**	**Wed 6/10/26**	**130,82**
139	Shape Cover Subgrade	60 days	Thu 4/18/24	Wed 7/10/24	
140	Place FML and Geocomposite	100 days	Thu 7/11/24	Wed 11/27/24	139
141	Cover soil	280 days	Thu 11/28/24	Wed 12/24/25	140
142	Vegetated Cover	120 days	Thu 12/25/25	Wed 6/10/26	141
143	**Surface Water Features**	**610 days**	**Thu 4/18/24**	**Wed 8/19/26**	**138**
144	Primary Outlet Structure	30 days	Thu 4/18/24	Wed 5/29/24	
145	Stormwater featurs	40 days	Thu 5/30/24	Wed 7/24/24	144
146	Surface Restoration	50 days	Thu 6/11/26	Wed 8/19/26	138,145
147	**Construction Management Services**	**2364 days**	**Fri 7/28/17**	**Wed 8/19/26**	**124SS**
148	CQA and OE services	2364 days	Fri 7/28/17	Wed 8/19/26	



Project: Brown rev11
Date: Tue 9/22/15

TECHNICAL MEMORANDUM

Coal Combustion Residual Evaluation: Trimble County Generating Station

PREPARED FOR:	Louisville Gas & Electric Company and Kentucky Utilities Company
PREPARED BY:	CH2M HILL Engineers
DATE:	September 29, 2015

1 Executive Summary

Louisville Gas & Electric Company and Kentucky Utilities Company (LG&E-KU) tasked CH2M HILL Engineers. (CH2M) with performing coal combustion residuals (CCR) evaluations for seven generation stations to develop conceptual CCR ash pond closure approaches and capital cost estimates. The generating stations under evaluation are Ghent, Trimble County, Mill Creek, E.W. Brown, Green River, Tyrone, and Pineville. This report applies solely to Trimble County Generating Station. The following scope activities were completed:

- Review of LG&E-KU provided historical CCR information and kickoff meeting workshop (June 2015)
- Developed a CCR pond closure compliance alternative that considers regulatory, civil, geotechnical, and stormwater aspects as it relates to CCR ash ponds and associated cost estimates for the generating station. Discussion of the conceptual approach is included in Section 2, and drawings are contained in Attachment 1. The applicable ponds at Trimble County are the Bottom Ash Pond (BAP) and Gypsum Storage Pond.
- Construct new concrete process tanks (four) for management of wastewater that can no longer be managed in the ponds that will be closed; construct dewatering facility for removing water from solids.

The estimated cost for closing the two ponds is summarized in Exhibit 1-1. Cost information is included in Attachment 2.

Proposed Conceptual Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
BAP Closure	\$76.1 M	\$108.7 M	\$141.3 M
Gypsum Storage Closure	\$23.3 M	\$33.3 M	\$43.3 M
Concrete Process Tanks and Dewatering Facility	\$75.1 M	\$107.2 M	\$139.4 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

2 Proposed Conceptual CCR Closure

2.1 Development of Proposed Conceptual CCR Closure

The proposed conceptual CCR pond closure approach was developed based on previous work completed by CH2M and discussions with LG&E-KU during the kickoff meeting on June 23, 2015. The Trimble County Generating Station is an operating facility with CCR wastewater generated and discharged to the ponds. The following defines the considered approach for closure for each of the two ponds. Additional assumptions are summarized in Section 2.2.

BAP

- Completely fill with CCR material generated at the facility, regrade ash in pond to balance cuts/fills, and install final cover. The surface water drainage channels will be sized to provide retention, and an outlet structure will be sized or breach of the dike to regulate discharge during a storm event.
- Surface water within BAP will be removed before closure begins, as needed, to allow surface improvement and dry material placement in BAP. Other potential subgrade improvements are described under assumptions below.
- BAP will receive material from the station and gypsum storage pond (in 2018) until airspace capacity is full. Excess CCR material will be properly disposed of in a landfill. Details are located in Section 3 - Estimated Material Volumes and Areas, Table 3-1

Gypsum Storage Pond

- Completely fill with CCR material generated at the facility, regrade ash in pond to balance cuts/fills, and install final cover. The surface water drainage channels will be sized to provide retention and an outlet structure will be sized or breach of the dike to regulate discharge during a storm event to the existing construction sedimentation pond.
- Surface water within Gypsum Storage Pond will be removed before closure begins, as needed, to allow surface improvement and dry material placement in Gypsum Storage Pond. Other potential subgrade improvements are described under assumptions below.
- Gypsum Storage Pond will receive material from the station until airspace capacity is full. Excess CCR material will be properly disposed of in BAP. Details are located in Section 3 - Estimated Material Volumes and Areas, Table 3-1

Regulatory Strategy

- Compliance with the Final CCR Rule.
- Closure activities will be permitted by the Kentucky Department of Environmental Protection (KYDEP).

The volume of CCR to be managed (that is, excavated, placed and regarded within the ponds) was developed using AutoCAD drawings provided by LG&E-KU and computer aided engineering (CAE) software. The proposed conceptual pond closure approach is presented in drawings provided in Attachment 1.

2.2 Design Assumptions

General

The general design assumptions used for the proposed conceptual CCR pond closure approach is as outlined in our proposal and discussed with LG&E-KU at our kickoff meeting on June 23, 2015, and summarized below:

- It is anticipated for this analysis that Trimble County Generation Station will be able to discharge pond water via National Pollutant Discharge Elimination System (NPDES) permitted outfall.
  - CH2M assumes that Trimble County Generation Station will be able to develop an acceptable regulatory approach(es) to support managing water. BAP was constructed post 1982 and contains fly ash transport water. At the time of closure, the BAP is estimated to contain in excess of 410 million gallons (MG) of water and the Gypsum Storage Pond contains an excess of 225 MG of water. This accumulated water will need to be removed in order to close this ponds. Costs associated with development of this approach and implementation of the approach are not included in this project or cost estimate. However, a cost to dewater the pond has been included but does not include treatment. It is anticipated that LG&E-KU will have an approved management approach in-place by 1st quarter of 2017. Once approval to dewater is in place, BAP and Gypsum Storage Pond will begin the dewatering process and closure activities will begin. For this scenario to be feasible it is assumed that the CCR ponds will meet structural integrity requirements within the Final CCR Rule.
    - BAP is estimated to have 410 MG of water. CH2M estimated within the schedule 900 working days (approximately 3.5 years) to dewater BAP. The rate of dewatering for BAP will be 500,000 gallons per day (GPD) to achieve this schedule. The cost estimate and schedule does not take into account permitting and infrastructure development for the treatment of process water.
    - Gypsum Storage Pond is estimated to have 225 MG of water. CH2M estimated within the schedule 450 working days (approximately 2.0 years) to dewater the Gypsum Storage Pond. The rate of dewatering for Gypsum Storage Pond will be 500,000 GPD to achieve this schedule. The cost estimate and schedule does not take into account permitting and infrastructure development for the treatment of process water.
- The existing conditions were established from AutoCAD files provided by LG&E-KU on June 23, 2015. In order to estimate the volume of CCR in the BAP and Gypsum Storage Pond, a surface was developed in AutoCAD based on data and elevations provided by LG&E-KU. It was determined that the ash in the BAP and Gypsum Storage Pond could be regraded to balance cuts/fills and closed.
- Volume calculations are based on an in-place (moist) density 1 ton per cubic yard (74 pounds per cubic foot) for all cut and placed CCR material, and does not account for shrinkage/swell during placement. Quantities do not consider settlement of in-place CCR because of dewatering or new fill/cover loads. Changes to these assumptions should be verified during design development.
- It is assumed these CCR ponds meet the structural integrity requirements, and the pond closure approaches are geotechnically stable as shown. This information will be confirmed during design development.

- Improvements to prepare a workable CCR surface include removing surface water, localized regrading to facilitate dewatering, and installing a geotextile, a layer of dry CCR, and geogrid.
- Final cover surface drainage channels are inside the perimeter dikes, and would include final cover and be lined with structural reinforcement (turf reinforcement mat, riprap etc.), as necessary.
- The dikes will be used without increasing or decreasing height. Some improvements may be required based on the U.S. Environmental Protection Agency (USEPA) dam assessment findings but are outside this project scope. The dikes may be able to be knocked down and used for final cover. However, this will need to be coordinated with the appropriate regulatory agency and therefore these volumes were not included in this evaluation.
- CCR within the ponds will be regarded and used to fill the pond beneath the final cover.
- The final cover (cap) is assumed to consist of 40-mil linear low-density polyethylene liner (LLDPE) placed directly on subgrade (CCR) and covered with geocomposite and 2 feet of soil cover. A vegetative cover will be established. The 2 feet of soil cover will consist of 1.5 feet of soil and 0.5 foot of vegetated topsoil. The final cover will extend on top of the dikes, due to the potential that ash may be contained within the dikes.
- A maximum of five percent slope was used for the final cover. CH2M developed closure design to reach the five percent slope or to account for beneficial reuse of CCR material until 2023 within the pond will be regarded and used to fill the pond beneath the final cover.
- Modification will be required to the NPDES discharge structure location to ensure permit compliance.
  - The CCR pond discharge structures will be modified to ensure stormwater flows to the NPDES discharge structure and permit compliance.
  - The waste material from the discharge structures will be disposed of properly.
- It is anticipated these pond closure approaches will handle the stormwater runoff, but verification will be performed in design development.

BAP

The general design assumptions used for the proposed conceptual closure approach (BAP) is as derived from the LG&E-KU drawing and summarized below:

- Material accumulated in BAP will include some wet discharges; but by 2017, the CCR material sent to BAP (CCR material) are expected to be dry. Expected CCR material discharges to BAP are summarized in Table 3-1. Material accumulation in BAP will continue until at least 2019, but could continue until 2023 or until the future fill capacity of BAP is maximized.
  - It is anticipated that capacity (5% cover slope) for BAP will be achieved in the 1st quarter of 2023, based on the projections provided by LG&E-KU in the June 2015 kickoff meeting workshop. This date may change due to actual plant generation rates.
  - BAP to receive material from the Gypsum Storage Pond around first quarter of 2018. Material will be re-routed from the Gypsum Storage Pond to an unloading location. Material quantities are summarized in Table 3-2A. Material accumulation in BAP will be completed by first quarter of 2023.
  - BAP to receive beneficial reuse material until December 31, 2023
- CCR materials from BAP will be placed, graded, and used to fill the pond beneath the final cover.
- CCR Rule Compliance Activities will begin in 2015.
- The top of the BAP berm already includes an aggregate perimeter road.

- A new BAP primary outlet structure will be required to regulate discharge. The outlet structure will discharge to the north to an existing drainage swale.
- Surface water within BAP will be partially removed before closure begins to allow surface stabilization and dry material placement.
- Surface drainage channels are within the BAP dikes.
- Surface water will be discharged off the final cover through the existing discharge outlet pipe on the east side or breach in dike. The discharge is to the existing drainage structures.
- A groundwater monitoring well system currently exists and was considered sufficient.
- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade, and will include the components described in the assumptions below. Conceptual grades are shown in Attachment 1, Exhibit 2-1. Significant grading features include the following:
  - A perimeter drainage ditch is shown within the berm. The ditch shows a high point near the south end, dropping at approximately 0.5 percent to the northwest. One existing discharge penetration is shown through the dike leading to the NPDES permitted outfall.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 10 feet above the ditch invert or the top elevation of the berm crest, whichever is lower. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2-1 has an airspace capacity of approximately 5,283,100 cubic yards above the existing CCR surface grade.
- Airspace capacity under ABT cover could be increased (or reduced), as necessary, by approximately 152,500 cubic yards per foot by extending the 4H:1V ditch slope height to the full perimeter berm elevation, or reducing the maximum height of the mound. Capacity could be reduced by modifying the 4H:1V ditch slope height. Ditch grades should also be refined to create local low points at the perimeter drainage ditch discharge point. Such design refinements should not significantly change the estimated closure costs.

Gypsum Storage Pond

The general design assumptions used for the proposed conceptual closure approach (Gypsum Storage Pond) is as derived from the LG&E-KU drawing and summarized below:

- The Gypsum Storage Pond base consists of a compacted clay layer; geosynthetic clay liner (GCL); and a 60 mil flexible membrane liner (FML).
- Material accumulated in Gypsum Storage Pond will include some wet discharges; but by January 2017, the CCR material sent to BAP (gypsum) are expected to be dry. Expected CCR material discharges to Gypsum Storage Pond are summarized in Table 3-1. Material accumulation in Gypsum Storage Pond will continue until at least 2019, but could continue until 2023 or until the future fill capacity of BAP is maximized.
  - It is anticipated that capacity (5% cover slope) for Gypsum will be achieved in the 1st quarter of 2018, based on the projections provided by LG&E-KU in the June 2015 kickoff meeting workshop. This date may change due to actual plant generation rates.
  - Gypsum Storage Pond to receive material from the plant until around first quarter of 2018. Material will be re-routed from the Gypsum Storage Pond to an unloading location at BAP. Material quantities are summarized in Table 3-2B. Material accumulation in Gypsum Storage Pond will be completed by first quarter of 2018.
- The station will construct new concrete process tanks in a location to be determined by LG&E-KU plant personnel. There will be four concrete tanks covering approximately 12.4 acres at a depth of

24-feet (two tanks 740-feet x 185-feet feet and two tanks 740-feet x 180-feet). Also within this vicinity of the concrete tanks, will be a dewatering system facility to remove water from solids.

- CCR materials from the Gypsum Storage Pond will be placed, graded, and used to fill the pond beneath the final cover.
- The top of the Gypsum Storage Pond berm already includes an aggregate perimeter road.
- Surface water within Gypsum Storage Pond will be removed before closure begins to allow surface stabilization and dry material placement.
- Surface drainage channels are within the Gypsum Storage Pond embankments.
- Surface water would be discharged off the final cover through a new Gypsum Storage Pond primary outlet structure will be required to regulate discharge. The outlet structure will discharge to the north to an existing construction sediment pond then to drainage swale. In addition, the existing discharge structure may be able to be modified to regulate discharge to the existing drainage swale.
- A groundwater monitoring well system currently exists and was considered sufficient.
- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade, and will include the components described in the assumptions below. Conceptual grades are shown in Attachment 1, Exhibit 2-2. Significant grading features include the following:
  - A perimeter drainage ditch is shown within the berm. The ditch shows a high point near the west end, dropping at approximately 0.5 percent to the east. One existing discharge penetration is shown through the dike leading to the NPDES permitted outfall.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 10 feet above the ditch invert or the top elevation of the berm crest, whichever is lower. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2-2 has an airspace capacity of approximately 1,747,200 cubic yards above the existing CCR surface grade.
- Airspace capacity under Gypsum Storage Pond cover could be increased (or reduced), as necessary, by approximately 53,900 cubic yards per foot by extending the 4H:1V ditch slope height to the full perimeter berm elevation, or reducing the maximum height of the mound. Capacity could be reduced by modifying the 4H:1V ditch slope height. Ditch grades should also be refined to create local low points at the perimeter drainage ditch discharge point. Such design refinements should not significantly change the estimated closure costs.

3 Estimated Material Volumes and Areas

The volume of fly ash, bottom ash, and gypsum generated by the station and available for use as fill is summarized in Table 3-1. Total production rates by year were provided by LG&E-KU on June 23, 2015, and the portion sent to the ponds each year are based on the 2015 year to date production rates provided by LGE-KU on July 1, 2015.

Table 3-1. Estimated CCR Production by Year – Total and Distribution by Ponds

	Total CCR Production (Tons)				Assumed CCR Distribution (Tons)	
Year	Bot Ash	Fly Ash	Gypsum	TOTAL	BAP [1]	Gypsum Storage Pond [2]
2015	51,952	207,810	496,454	756,216	259,762	496,454
2016	62,958	251,833	538,194	852,986	314,791	538,194
2017	63,732	254,930	534,152	852,814	318,662	534,152

2018	62,686	250,746	542,295	855,727	677,312[3]	70,644[3]
2019	62,284	249,135	539,487	850,906	850,906	
2020	61,651	246,602	534,571	842,824	842,824	
2021	61,982	247,927	534,620	844,529	844,529	
2022	61,096	244,382	529,256	834,734	834,734	
2023	62,147	248,589	536,011	846,747	34,299[4]	
				TOTAL	**4,977,819[5]**	**1,639,444[5]**

Notes:
[1] Assumes that 100 percent of bottom ash and fly ash will be sent to the BAP through October 17, 2018, which will be the baseline for closure design.
[2] Assumes that 100 percent of gypsum will be sent to the Gypsum Storage Pond through October 17, 2018, which will be the baseline for closure design.
[3] Material assumed to be sent to Gypsum Storage Pond until the closure airspace capacity is full, with remainder sent to BAP.
[4] Material assumed to be sent to BAP until the closure airspace capacity is full, with remainder sent to landfill. Approximately 0.8 M tons of bottom ash, fly ash, and gypsum will need to be diverted to the land fill from 2023.
[5] Final cover volume is removed from the calculation of Assumed CCR Distribution.

The proposed CCR pond closure approach was developed using CAE software and AutoCAD files provided by LG&E-KU as described under assumptions above. Summaries of the estimated material quantities for each pond are shown in Tables 3-2A and 3-2B.

Table 3-2A. Proposed Conceptual Pond Closure Approach Estimated Material Quantities – BAP

Item	Units	Quantity
Total surface area	AC	94.6
Standing surface water (to remove)	GAL	410,955,900
Length of perimeter	LF	8,700
CUT: Existing Surface to Final Cover Subgrade		
Cut/regrade for cover subgrade/ditch	CY	4,900
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**4,982,700**
FILL SOURCES:		
From cut for final cover subgrade	CY	4,900
From CCR accumulation in BAP - Jan. 2017 thru 2018	CY	1,570,500
From CCR accumulation in BAP - Jan. 2019 thru 2023	CY	3,407,300
TOTAL POTENTIAL FILL through 2018	**CY**	**3,317,700**
TOTAL POTENTIAL FILL through 2023	**CY**	**4,219,700**
Final cover soil volume	CY	305,300
Potential Excess Fill: (to be accommodated in settlement)	**CY**	**105,700**
Potential Excess Fill: (to be sent to Landfill)	**CY**	**812,500**

Table 3-2B. Proposed Conceptual Pond Closure Approach Estimated Material Quantities –Gypsum Storage Pond

Item	Units	Quantity
Total surface area	AC	33.4
Standing surface water (to remove)	GAL	225,005,750
Length of perimeter	LF	4,700
CUT: Existing Surface to Final Cover Subgrade		
Cut for final cover: Stormwater channel	CY	9,800
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**1,660,200**
FILL SOURCES:		
Cut for final cover: Stormwater channel	CY	9,800
From CCR accumulation in BAP - Jan. 2017 thru 2018	CY	1,650,400
TOTAL POTENTIAL FILL through 2018	**CY**	**1,650,400**
Final cover soil volume	CY	107,800
Potential Excess Fill: (to be accommodated in settlement)	**CY**	**35,400**
Potential Excess Fill: (to be sent to BAP in 2018)	**CY**	**460,700**

The proposed conceptual pond closure approach shows that CCR from the Gypsum Storage Pond can be closed in-place. The Gypsum Storage Pond dikes may be able to be knocked down and used for final cover. However, this will need to be coordinated with the appropriate regulatory agency and therefore these volumes were not included in this evaluation. There is sufficient area available in BAP to balance ash cut/fills volumes and close in-place.

4 Schedule

Exhibits 2-3 in Attachment 3 show the proposed schedule to complete the design, permitting, and construction for each of the pond closures.

5 Construction Cost Estimate

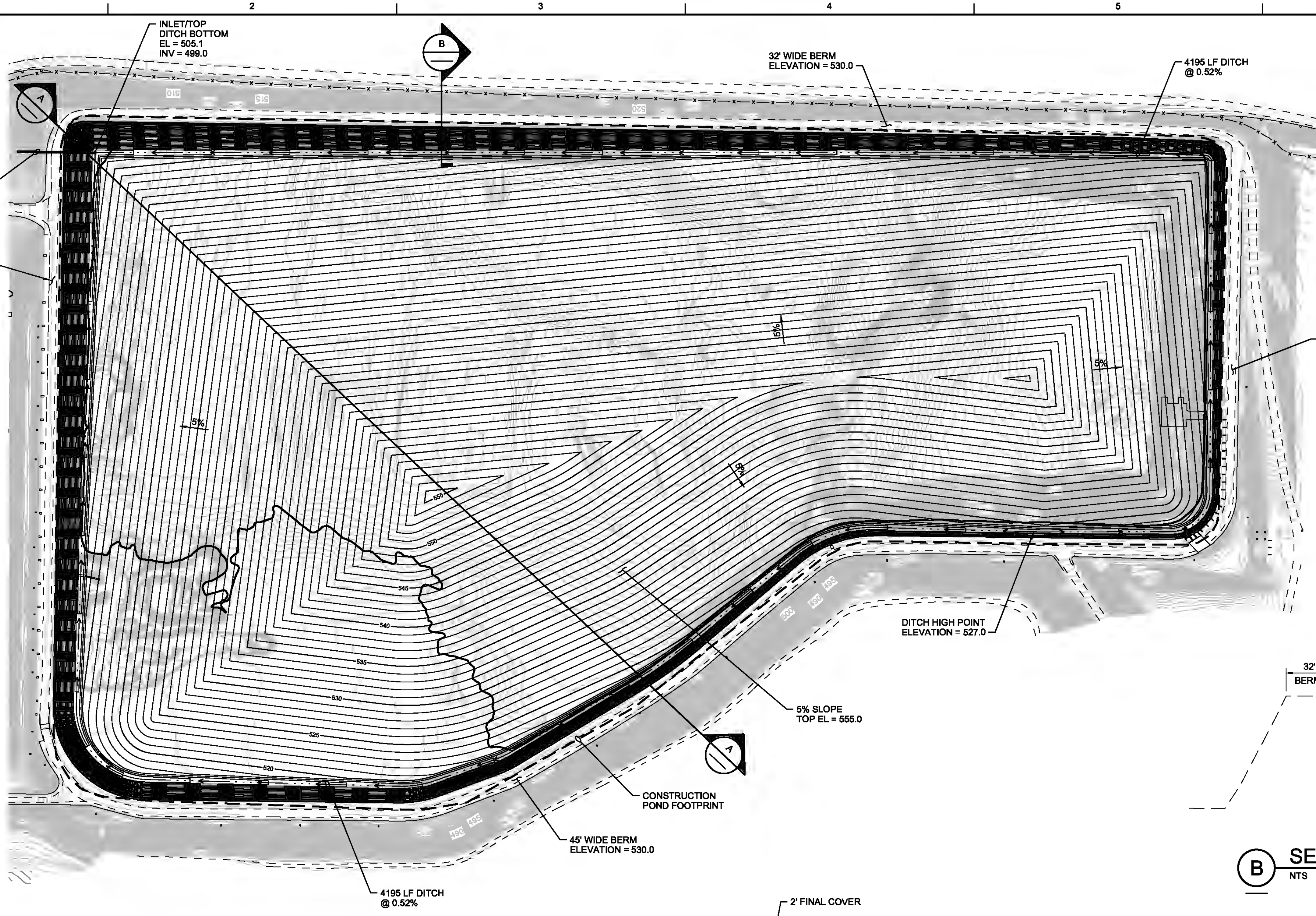
The estimated construction cost for closing the ponds as described in Section 2 is shown within Attachment 2.

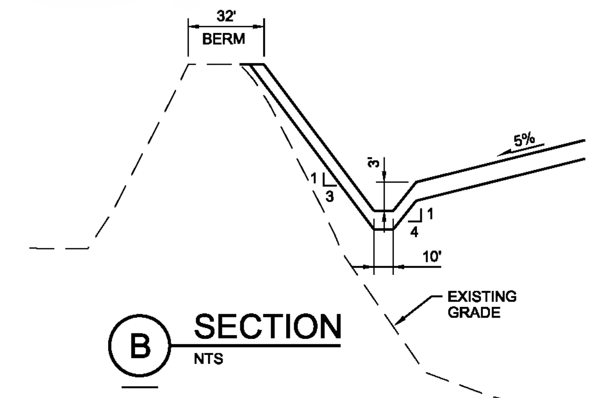
Proposed Conceptual Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
BAP Closure	$76.1 M	$108.7 M	$141.3 M
Gypsum Storage Pond Closure	$23.3 M	$33.3 M	$43.3 M
Concrete Tanks	$75.1 M	$107.2 M	$139.4 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

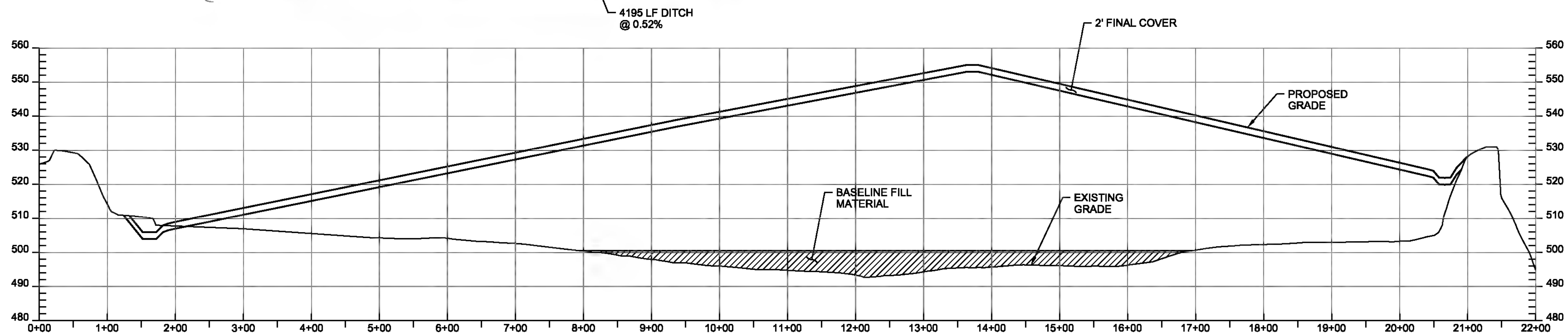
This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

Attachment 1
Proposed Conceptual Alternative CCR Closure





B SECTION
NTS



A SECTION
SCALE: 1" = 100' HORIZ
1" = 20' VERT

ITEM	UNITS	ATB
TOTAL SURFACE AREA	ACRES	94.6
LENGTH OF PERIMETER	LINEAR FEET	8,700
CUT	CUBIC YARDS	4,900
FILL TO FINAL GRADE	CUBIC YARDS	4,982,700
COVER FILL TO FINAL GRADE	CUBIC YARDS	305,300
EXCESS MATERIAL	CUBIC YARDS	812,500
TOTAL AIRSPACE AVAILABLE	CUBIC YARDS	-

NO.	DATE	REVISION	BY	APVD
DSGN	DR	CHK	APVD	

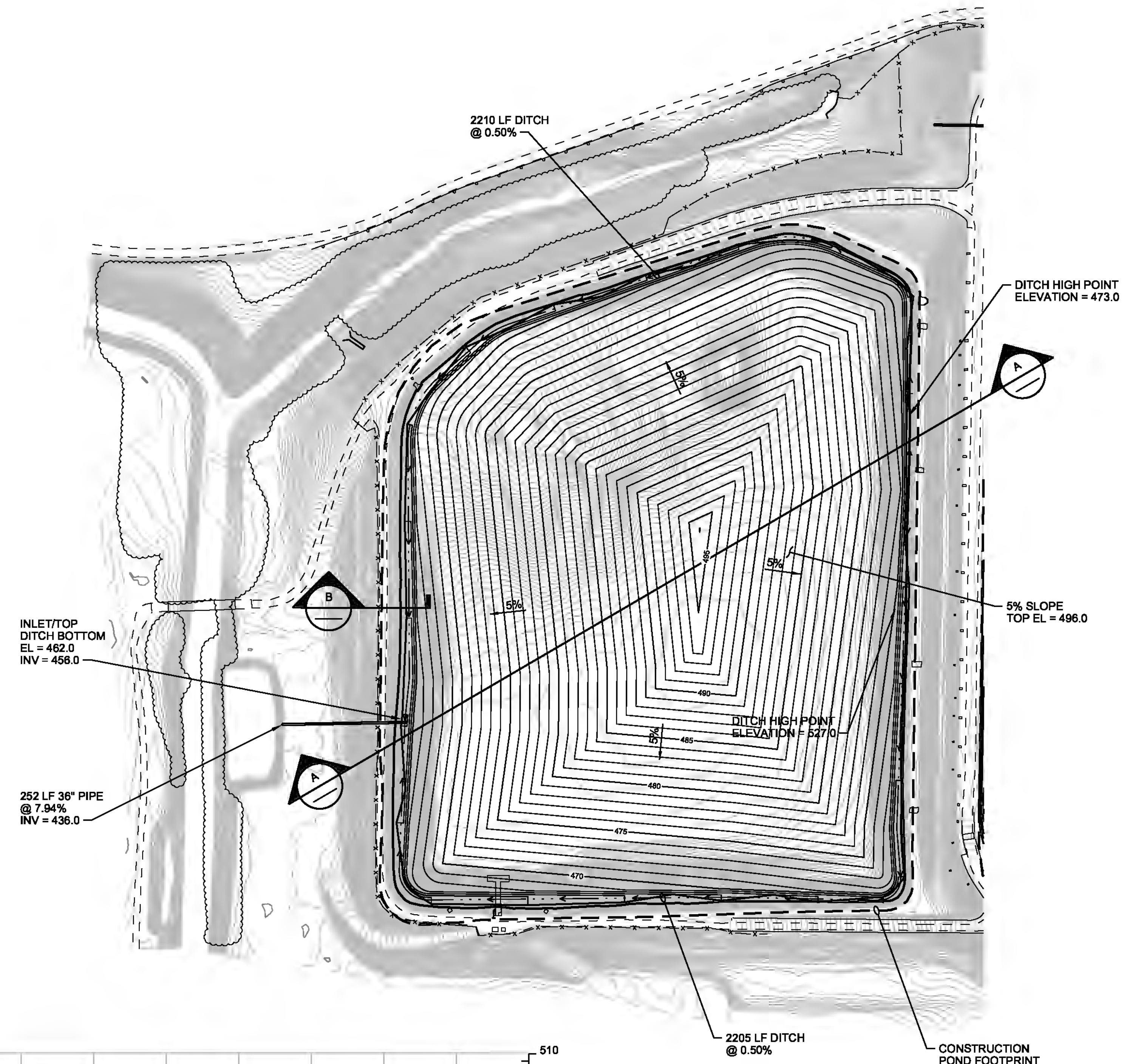
COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

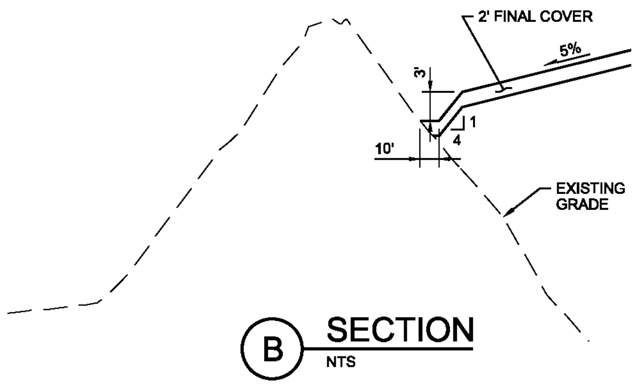
CH2MHILL

TRIMBLE
CONCEPTUAL CLOSURE PLAN
ASH TREATMENT BASIN

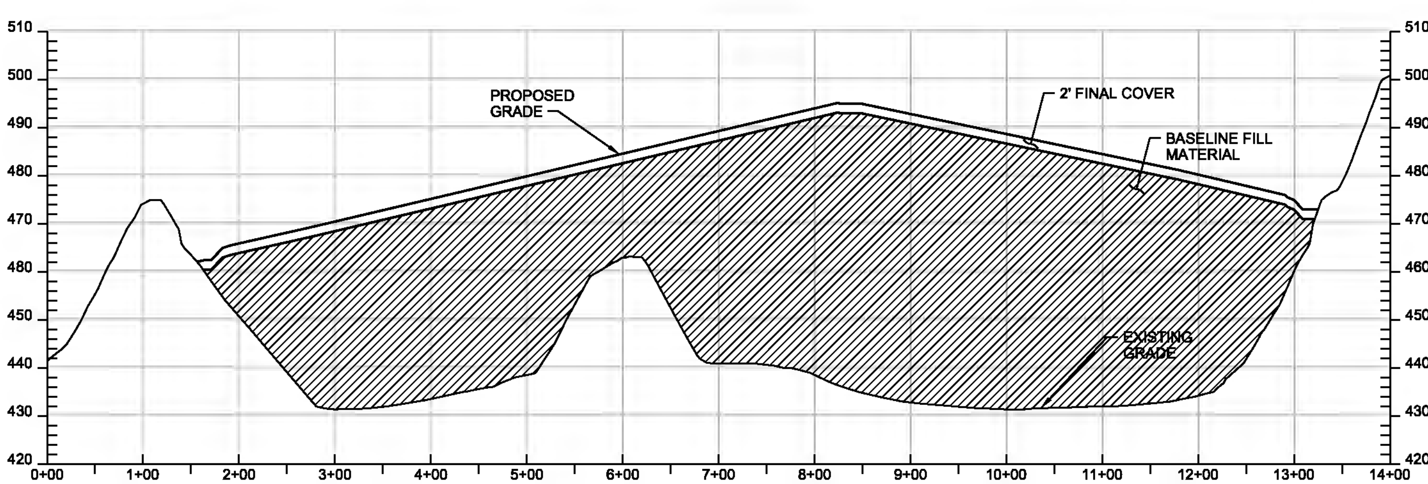
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2-1
SHEET	of





B SECTION
NTS



A SECTION
SCALE: 1" = 100' HORIZ
1" = 20' VERT

ITEM	UNITS	GYPSUM STACK
TOTAL SURFACE AREA	ACRES	33.4
LENGTH OF PERIMETER	LINEAR FEET	4,700
CUT	CUBIC YARDS	4,900
FILL TO FINAL GRADE	CUBIC YARDS	1,660,200
COVER FILL TO FINAL GRADE	CUBIC YARDS	107,800
EXCESS MATERIAL	CUBIC YARDS	460,700
TOTAL AIRSPACE AVAILABLE	CUBIC YARDS	-

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL.

TRIMBLE
CONCEPTUAL CLOSURE PLAN
GYPSUM STACK

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2-2
SHEET	of

Attachment 2
Proposed Conceptual Alternative
Cost Estimate

COST SUMMARY

Site:	Trimble County Generating Station	**Base Year:**	2015
Location:	Bedford, Kentucky	**Date:**	September
Phase:	Proposed Conceptual CCR Closure	**ROM Level:**	Class 4

	Ash Treatment Basin	Gypsum Storage	Concrete Tanks
Remedial Technology	Fill ATB with CCR's, install final cover and close in-place. (Not including Pond water management)	Fill Gypsum Storage with CCR's, install final cover and close in-place.	Installation of CCR concrete tanks
Description	Completely fill with CCR material and final cover installed. CCR fill from plant operations.	Completely fill with CCR material and final cover installed. CCR fill from plant operations.	Installation of four new concrete treatement tanks to handle waste water associtated with CCR materials at the facility.
Impoundment Closure	$105,048,293	$32,171,062	$0
LG&E Overhead	$3,676,690	$1,125,987	$0
New Construction	$0	$0	$103,620,614
LG&E Overhead	$0	$0	$3,626,721
Total Initial Costs	$108,724,984	$33,297,049	$107,247,336
Upper ROM Range	$141,342,479	$43,286,164	$139,421,536
Lower ROM Range	$76,107,488	$23,307,935	$75,073,135

This is not an offer for construction and/or project execution. Please note, these order of magnitude cost estimates are assumed to represent the actual installed cost within the range of - 30 percent to + 30 percent of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

CCR Rule - Trimble Generating Station Cost Estimate - ATB
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Check
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin	**$105,048,293**	**1%**	**1%**	**3%**	**10%**	**11%**	**26%**	**19%**	**16%**	**12%**	**0%**	**0%**	**0%**	**100%**
IMPOUNDMENT CLOSURE	**$80,806,379**	**1.5%**	**1.5%**	**3.1%**	**9.5%**	**10.5%**	**26.4%**	**19.5%**	**16.0%**	**12.1%**	**0.0%**	**0.0%**	**0.0%**	**100%**
Mobilization/Demobilization	**$100,000**	0%	0%	0%	0%	80%	0%	0%	0%	20%	0%	0%	0%	100%
Sediment & Erosion Control	**$90,000**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Site Preparation	**$91,750**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Dewatering	**$16,438,235**	0%	0%	10%	30%	30%	30%	0%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$250,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Utility Services	**$100,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Perimeter Berm	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	**$490,497**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Pre-Closure / Preparation	**$42,352,122**	0%	0%	0%	5%	5%	35%	35%	20%	0%	0%	0%	0%	100%
Final Cover (Install FML)	**$12,652,050**	0%	0%	0%	0%	0%	0%	0%	30%	70%	0%	0%	0%	100%
Mechanical Improvements/Additions	**$1,500,000**	0%	0%	0%	0%	20%	60%	20%	0%	0%	0%	0%	0%	100%
Surface Water Features	**$125,000**	0%	0%	0%	0%	0%	0%	0%	20%	80%	0%	0%	0%	100%
Primary Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Restoration	**$432,925**	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Groundwater Monitoring	**$308,800**	0%	0%	0%	0%	0%	20%	40%	40%	0%	0%	0%	0%	100%
Conceptual Design	**$500,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$1,500,000**	0%	40%	40%	20%	0%	0%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$2,500,000**	0%	0%	10%	10%	10%	20%	20%	20%	10%	0%	0%	0%	100%
Closure Report	**$100,000**	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
CCR Rule Compliance Activities in 2015	**$1,200,000**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal	**$80,806,379**													
Contingency	$24,241,913.82	1%	1%	3%	10%	11%	26%	19%	16%	12%	0%	0%	0%	100%
Subtotal with Contingency	**$105,048,293**													
LG&E & KU Overheads	$3,676,690	1%	1%	3%	10%	11%	26%	19%	16%	12%	0%	0%	0%	100%
TOTAL PROJECT COST	**$108,724,984**													

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin													
IMPOUNDMENT CLOSURE	**$1,200,000**	**$1,222,000**	**$2,697,320**	**$8,660,414**	**$9,956,022**	**$25,923,647**	**$19,924,678**	**$16,994,679**	**$13,356,358**	**$0**	**$0**	**$0**	**$99,935,118**
Mobilization/Demobilization	$0	$0	$0	$0	$93,589	$0	$0	$0	$27,371	$0	$0	$0	**$120,960**
Sediment & Erosion Control	$0	$0	$0	$0	$52,644	$54,749	$0	$0	$0	$0	$0	$0	**$107,393**
Site Preparation	$0	$0	$0	$0	$53,667	$55,814	$0	$0	$0	$0	$0	$0	**$109,481**
Dewatering	$0	$0	$1,777,960	$5,547,234	$5,769,123	$5,999,888	$0	$0	$0	$0	$0	$0	**$19,094,204**
Repair On-Site Pond Embankments	$0	$0	$0	$0	$292,465	$0	$0	$0	$0	$0	$0	$0	**$292,465**
Utility Services	$0	$0	$0	$112,486	$0	$0	$0	$0	$0	$0	$0	$0	**$112,486**
Perimeter Berm	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	$0	$0	$0	$0	$573,813	$0	$0	$0	$0	$0	$0	$0	**$573,813**
Pre-Closure / Preparation	$0	$0	$0	$2,382,019	$2,477,300	$18,034,741	$18,756,131	$11,146,501	$0	$0	$0	$0	**$52,796,692**
Final Cover (Install FML)	$0	$0	$0	$0	$0	$0	$0	$4,994,770	$12,120,642	$0	$0	$0	**$17,115,413**
Mechanical Improvements/Additions	$0	$0	$0	$0	$350,958	$1,094,988	$379,596	$0	$0	$0	$0	$0	**$1,825,541**
Surface Water Features	$0	$0	$0	$0	$0	$0	$0	$32,898	$136,857	$0	$0	$0	**$169,755**
Primary Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	$0	$0	$0	$0	$0	$0	$0	$0	$592,488	$0	$0	$0	**$592,488**
Groundwater Monitoring	$0	$0	$0	$0	$0	$75,140	$156,292	$162,544	$0	$0	$0	$0	**$393,977**
Conceptual Design	$0	$520,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$520,000**
Final Design and Permitting and permitting support	$0	$624,000	$648,960	$337,459	$0	$0	$0	$0	$0	$0	$0	$0	**$1,610,419**
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$78,000**
Construction Management, including CQA and OE services	$0	$0	$270,400	$281,216	$292,465	$608,326	$632,660	$657,966	$342,142	$0	$0	$0	**$3,085,175**
Closure Report	$0	$0	$0	$0	$0	$0	$0	$0	$136,857	$0	$0	$0	**$136,857**
CCR Rule Compliance Activities in 2015	$1,200,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$1,200,000**
Subtotal	**$1,200,000**	**$1,222,000**	**$2,697,320**	**$8,660,414**	**$9,956,022**	**$25,923,647**	**$19,924,678**	**$16,994,679**	**$13,356,358**	**$0**	**$0**	**$0**	$99,935,118
													$0
Contingency	$0	$0	$0	$0	$0	$0	$0	$14,990,268	$14,990,268	$0	$0	$0	**$29,980,535**
Subtotal with Contingency	**$1,200,000**	**$1,222,000**	**$2,697,320**	**$8,660,414**	**$9,956,022**	**$25,923,647**	**$19,924,678**	**$31,984,947**	**$28,346,625**	**$0**	**$0**	**$0**	**$129,915,653**
													$0
LG&E & KU Overheads	$42,000	$42,770	$94,406	$303,114	$348,461	$907,328	$697,364	$1,119,473	$992,132	$0	$0	$0	**$4,547,048**
TOTAL PROJECT COST	**$1,242,000**	**$1,264,770**	**$2,791,726**	**$8,963,529**	**$10,304,482**	**$26,830,975**	**$20,622,042**	**$33,104,420**	**$29,338,757**	**$0**	**$0**	**$0**	**$134,462,701**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Trimble Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Trimble County Generating Station
Location: Bedford, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$100,000.00	$100,000	
SUBTOTAL Mobilization/Demobilization				**$100,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	18000	LF	$5.00	$90,000	allowance for BPM
SUBTOTAL Sediment & Erosion Control				**$90,000**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350.00	$51,750	Clear & grub areas to recevie fill, as required
Surveying	1	LS	$25,000.00	$25,000	
Utility Locating	1	EA	$15,000.00	$15,000	
SUBTOTAL Site Preparation				**$91,750**	
Dewatering					
Dewatering and discharge through NPDES permit	410,955,884	GL	$0.04	$16,438,235	500,000 gl/day. Assumes major treatment required for TSS. Pump water to new outlet structure for entire project (3 years). Does not include treatment associated with zero discharge restriction or NPDES Outfall development
SUBTOTAL Dewatering				**$16,438,235**	
Repair On-Site Pond Embankments					
Access Modications on existing CCR Pond embankments	1	LS	$250,000.00	$250,000	Minimal, based off of USEPA dam assessment report
SUBTOTAL Repair On-Site Pond Embankments				**$250,000**	
Utility Services					
Utility Modifications	1	LS	$100,000.00	$100,000	Allowance LG&E-KU to complete.
SUBTOTAL Shoring for tower foundations				**$100,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)(40' x 1' x perimete	12,956	CY	$37.86	$490,497	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$490,497**	
Pre-Closure / Preparation					
Divider Dike - Excavation and Load (CCR from facility operations)(dike is 1,500 ' long x 25' wide at top, 3:1 slopes, 20' tall)	85,300	CY	$1.39	$118,567	1 988 RT Loader (8 CY), rent $85.95 + FOG $95.81/hr + opr $75/hr x 50 hrs/9,216 CY/week
Divider Dike - Hauling (assume 2 mile cycle)(CCR from facility operations)	85,300	CY	$2.96	$252,488	3 each, Cat 735 off-road trcuks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
Divider Dike - Placement and Compaction	85,300	CY	$2.39	$203,867	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Divider Dike - Moisture Conditioning/Dust Control	85,300	CY	$0.57	$48,621	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Geotextile (as needed, assume 100% of area for filling)	549,340	SY	$2.46	$1,351,376	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of area for filling)	549,340	SY	$3.00	$1,648,020	CH2M HILL, recent quote on similar project
Excavation and Load from Stockpile after Dec 2017 (CCR from facility operations)	5,283,080	CY	$1.39	$7,343,481	1 988 RT Loader (8 CY), rent $85.95 + FOG $95.81/hr + opr $75/hr x 50 hrs/9,216 CY/week
Hauling (assume 2 mile cycle)(CCR from facility operations)	5,283,080	CY	$2.96	$15,637,917	3 each, Cat 735 off-road trcuks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
Placement and Compaction	5,283,080	CY	$2.39	$12,626,561	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	5,283,080	CY	$0.57	$3,011,356	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes (assume 100% of pond)	549,340	SY	$0.20	$109,868	RSM 31 22 16.10 3300
SUBTOTAL Pre-Closure / Preparation				**$42,352,122**	
Final Cover (Install FML)					
Final Cover: 40-mil Tex/smooth LLDPE	4,944,060	SF	$0.65	$3,213,639	
10 oz. Geotextile (includes materials and installation)	4,944,060	SF	$0.20	$988,812	CH2M HILL recent project.
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	228,946	CY	$20.00	$4,578,915	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	76,315	CY	$20.00	$1,526,305	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	305,261	CY	$4.36	$1,330,938	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	305,261	CY	$2.39	$729,574	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	305,261	CY	$0.57	$173,999	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	549,340	SY	$0.20	$109,868	RSM 31 22 16.10 3300
SUBTOTAL Final Cover (Install FML)				**$12,652,050**	
Mechanical Improvements/Additions					
Piping to Ash Pond from Plant	1	LS	$1,500,000.00	$1,500,000	allowance
SUBTOTAL Piping to Ash Pond from Plant				**$1,500,000**	
Surface Water Features					
Physical or Chemical Treatment plus CO2 Injection System	1	LS	$125,000.00	$125,000	May 2015 cost estimate -Green River System
SUBTOTAL Physical or Chemical Treatment plus CO2 Injection System				**$125,000**	
Primary Outlet Structure					
SUBTOTAL Primary Outlet Structure				**$0**	
Emergency Outlet Structure					
Surface Restoration					
Mechanical Seeding & Mulching	113.5	AC	$3,550.00	$402,925	
Quantity/Final Survey	1	LS	$30,000.00	$30,000	
SUBTOTAL Surface Restoration				**$432,925**	
Groundwater Monitoring					
New Monitoring wells, 4" (9,216 LF perimeter)	13	EA	$17,600.00	$228,800	assumes well spacing 1 well/750 feet; 13 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$308,800**	
SUBTOTAL CONSTRUCTION				**$74,931,379**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$500,000.00	$500,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$1,500,000.00	$1,500,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$2,500,000.00	$2,500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$2,500,000.00	$0	LG&E provided
Closure Report	1	LS	$100,000.00	$100,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$4,675,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$79,606,379**	
NEW CONSTRUCTION					
FGD Treatment Tanks					
Common Equipment					
Common Items					
Construction Material					
Other Construction					

Site: Trimble County Generating Station
Location: Bedford, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin
Base Year: 2015
Date: 1/18/2016

Assumptions:

1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.
6. No allowance for pond water management.
7. No allowance for floating membrane and pumping for rain water management.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Trimble Generating Station Pond Cost Estimate - Gypsum Storage
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Check
Proposed Conceptual Alternative CCR Closure - Gypsum Storage	**$32,171,062**	**0%**	**10%**	**12%**	**13%**	**48%**	**17%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**100%**
IMPOUNDMENT CLOSURE	**$24,746,971**	**0.0%**	**9.9%**	**11.9%**	**13.4%**	**47.7%**	**17.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100%**
Mobilization/Demobilization	**$50,000**	0%	0%	0%	0%	80%	20%	0%	0%	0%	0%	0%	0%	100%
Sediment & Erosion Control	**$46,500**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Site Preparation	**$91,750**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Dewatering	**$9,000,230**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$250,000**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Utility Services	**$25,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	**$176,049**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Pre-Closure / Preparation	**$6,423,630**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Closure/Final Cover	**$4,781,057**	0%	0%	0%	0%	30%	70%	0%	0%	0%	0%	0%	0%	100%
Surface Water Features	**$150,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Primary Outlet Structure	**$300,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Restoration	**$152,355**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
Groundwater Monitoring	**$150,400**	0%	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	0%	100%
Conceptual Design	**$500,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$1,000,000**	0%	60%	20%	20%	0%	0%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$1,500,000**	0%	0%	10%	30%	30%	30%	0%	0%	0%	0%	0%	0%	100%
Closure Report	**$75,000**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
Subtotal	**$24,746,971**													
Contingency	$7,424,091	0%	10%	12%	13%	48%	17%	0%	0%	0%	0%	0%	0%	100%
Subtotal with Contingency	**$32,171,062**													
LG&E & KU Overheads	$1,125,987	0%	10%	12%	13%	48%	17%	0%	0%	0%	0%	0%	0%	100%
TOTAL PROJECT COST	**$33,297,049**													

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Proposed Conceptual Alternative CCR Closure - Gypsum Storage													
IMPOUNDMENT CLOSURE	**$0**	**$2,558,115**	**$3,190,214**	**$3,717,239**	**$13,810,041**	**$5,144,276**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$28,419,885**
Mobilization/Demobilization	$0	$0	$0	$0	$46,794	$12,167	$0	$0	$0	$0	$0	$0	**$58,961**
Sediment & Erosion Control	$0	$0	$0	$0	$27,199	$28,287	$0	$0	$0	$0	$0	$0	**$55,486**
Site Preparation	$0	$0	$0	$0	$53,667	$55,814	$0	$0	$0	$0	$0	$0	**$109,481**
Dewatering	$0	$0	$0	$0	$10,528,996	$0	$0	$0	$0	$0	$0	$0	**$10,528,996**
Repair On-Site Pond Embankments	$0	$0	$0	$0	$146,232	$152,082	$0	$0	$0	$0	$0	$0	**$298,314**
Utility Services	$0	$0	$0	$28,122	$0	$0	$0	$0	$0	$0	$0	$0	**$28,122**
Roads	$0	$0	$0	$0	$205,952	$0	$0	$0	$0	$0	$0	$0	**$205,952**
Pre-Closure / Preparation	$0	$1,336,115	$2,779,119	$2,890,284	$0	$0	$0	$0	$0	$0	$0	$0	**$7,005,518**
Closure/Final Cover	$0	$0	$0	$0	$1,677,948	$4,071,821	$0	$0	$0	$0	$0	$0	**$5,749,769**
Surface Water Features	$0	$0	$0	$0	$175,479	$0	$0	$0	$0	$0	$0	$0	**$175,479**
Primary Outlet Structure	$0	$0	$0	$0	$350,958	$0	$0	$0	$0	$0	$0	$0	**$350,958**
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	$0	$0	$0	$0	$0	$185,363	$0	$0	$0	$0	$0	$0	**$185,363**
Groundwater Monitoring	$0	$0	$32,535	$67,672	$70,379	$0	$0	$0	$0	$0	$0	$0	**$170,585**
Conceptual Design	$0	$520,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$520,000**
Final Design and Permitting and permitting support	$0	$624,000	$216,320	$224,973	$0	$0	$0	$0	$0	$0	$0	$0	**$1,065,293**
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$78,000**
Construction Management, including CQA and OE services	$0	$0	$162,240	$506,189	$526,436	$547,494	$0	$0	$0	$0	$0	$0	**$1,742,359**
Closure Report	$0	$0	$0	$0	$0	$91,249	$0	$0	$0	$0	$0	$0	**$91,249**
Subtotal	**$0**	**$2,558,115**	**$3,190,214**	**$3,717,239**	**$13,810,041**	**$5,144,276**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$28,419,885**
Contingency	$0	$0	$0	$0	$4,263,056	$4,263,056	$0	$0	$0	$0	$0	$0	$8,526,112
Subtotal with Contingency	**$0**	**$2,558,115**	**$3,190,214**	**$3,717,239**	**$18,073,097**	**$9,407,332**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$36,945,997**
LG&E & KU Overheads	$0	$89,534	$111,657	$130,103	$632,558	$329,257	$0	$0	$0	$0	$0	$0	$1,293,110
TOTAL PROJECT COST	**$0**	**$2,647,649**	**$3,301,871**	**$3,847,342**	**$18,705,655**	**$9,736,589**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$38,239,107**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Trimble Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

CCR Rule - Trimble Generating Station Cost Estimate - Concrete Tanks
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Check
Proposed Conceptual Alternative CCR Closure - Gypsum Storage	**$103,620,614**	**0%**	**0%**	**50%**	**50%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**100%**
NEW CONSTRUCTION	**$79,708,165**	**0.0%**	**0.0%**	**50.0%**	**50.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100%**
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	$23,800,328	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cost	$23,407,837	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Dewatering Facilityl Order of Magnitude Capital Cost	$32,300,000	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Mechanical Improvements/Additions	$200,000	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal	$79,708,165													
Contingency	$23,912,449.40	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal with Contingency	**$103,620,614**													
LG&E & KU Overheads	$3,626,721	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
TOTAL PROJECT COST	**$107,247,336**													

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Proposed Conceptual Alternative CCR Closure - Gypsum Storage													
NEW CONSTRUCTION	**$0**	**$0**	**$43,106,175**	**$44,830,422**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$87,936,598**
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	$0	$0	$12,871,217	$13,386,066	$0	$0	$0	$0	$0	$0	$0	$0	$26,257,283
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cost	$0	$0	$12,658,958	$13,165,317	$0	$0	$0	$0	$0	$0	$0	$0	$25,824,275
Dewatering Facilityl Order of Magnitude Capital Cost	$0	$0	$17,467,840	$18,166,554	$0	$0	$0	$0	$0	$0	$0	$0	$35,634,394
Mechanical Improvements/Additions	$0	$0	$108,160	$112,486	$0	$0	$0	$0	$0	$0	$0	$0	$220,646
Subtotal	**$0**	**$0**	**$43,106,175**	**$44,830,422**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$87,936,598**
Contingency	$0	$0	$13,190,490	$13,190,490	$0	$0	$0	$0	$0	$0	$0	$0	$26,380,979
Subtotal with Contingency	**$0**	**$0**	**$56,296,665**	**$58,020,912**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$114,317,577**
													$0
LG&E & KU Overheads	$0	$0	$1,970,383	$2,030,732	$0	$0	$0	$0	$0	$0	$0	$0	$4,001,115
TOTAL PROJECT COST	**$0**	**$0**	**$58,267,048**	**$60,051,644**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$118,318,692**
													$0

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Trimble Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Trimble County Generating Station
Location: Bedford, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Gypsum Storage
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$50,000.00	$50,000	
SUBTOTAL Mobilization/Demobilization				**$50,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	9300	LF	$5.00	$46,500	allowance for BPM
SUBTOTAL Sediment & Erosion Control				**$46,500**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350.00	$51,750	Clear & grub areas to recevie fill, as required
Surveying	1	LS	$25,000.00	$25,000	
Utility Locating	1	EA	$15,000.00	$15,000	
SUBTOTAL Site Preparation				**$91,750**	
Dewatering					
Dewatering and discharge through NPDES permit	225,005,750	GL	$0.04	$9,000,230	500,000 gl/day. Assumes major treatment required for TSS. Pump water to new outlet structure for entire project (3 years). Does not include treatment associated with zero discharge restriction or NPDES Outfall development
SUBTOTAL Dewatering				**$9,000,230**	
Repair On-Site Pond Embankments					
Access Modications on existing CCR Pond embankments	1	LS	$250,000.00	$250,000	Minimal, based off of USEPA dam assessment report
SUBTOTAL Repair On-Site Pond Embankments				**$250,000**	
Utility Services					
Utility Modifications	1	LS	$25,000.00	$25,000	LG&E-KU to complete. Cost to coordinate.
SUBTOTAL Utility Services				**$25,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)(27' wide x 1' thick x perimeter)	4650	CY	$37.86	$176,049	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$176,049**	
Pre-Closure / Preparation					
Geotextile (as needed, assume 100% of area for filling)	194,084	SY	$2.46	$477,447	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of area for filling)	194,084	SY	$3.00	$582,252	CH2M HILL, recent quote on similar project
Placement and Compaction (from Plant)	1,772,161	CY	$2.39	$4,235,465	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	1,772,161	CY	$0.57	$1,010,132	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Cut/regrade for cover subgrade/ditch	9,817	CY	$8.10	$79,518	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Finish Grading, gentle slopes (assume 100% of pond)	194,084	SY	$0.20	$38,817	RSM 31 22 16.10 3300
SUBTOTAL Pre-Closure / Preparation				**$6,423,630**	
Closure/Final Cover					
Final Cover: 40-mil Tex/smooth LLDPE	1,746,756	SF	$0.65	$1,135,391	
Geocomposite (includes materials and installation)	1,746,756	SF	$0.55	$960,716	
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	72,643	CY	$20.00	$1,452,855	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	24,214	CY	$20.00	$484,285	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	96,857	CY	$4.36	$422,297	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	96,857	CY	$2.39	$231,488	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	96,857	CY	$0.57	$55,208	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	194,084	SY	$0.20	$38,817	RSM 31 22 16.10 3300
SUBTOTAL Closure/Final Cover				**$4,781,057**	
Surface Water Features					
Items to meet NPDES Permit requirements for discharge	1	LS	$150,000.00	$150,000	allowance
SUBTOTAL Surface Water Features				**$150,000**	
Primary Outlet Structure					
Install outlet structure	1	LS	$150,000.00	$150,000	May 2015 cost estimate - Green River System Second Outfall Structure
Demolition of existing pump station and disposal	1	LS	$50,000.00	$50,000	
Clean out (1) construction sediment pond	1	LS	$100,000.00	$100,000	allowance
SUBTOTAL Primary Outlet Structure				**$300,000**	
Emergency Outlet Structure					
Surface Restoration					
Mechanical Seeding & Mulching	40.1	AC	$3,550.00	$142,355	
Quantity/Final Survey	1	LS	$10,000.00	$10,000	
SUBTOTAL Surface Restoration				**$152,355**	
Groundwater Monitoring					
New Monitoring wells, 4" (1,813 LF perimeter)(minimum 1 up-gradient and 3 down-gradient)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 4 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$150,400**	
SUBTOTAL CONSTRUCTION				**$21,596,971**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1		$500,000.00	$500,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1		$1,000,000.00	$1,000,000	LG&E provided, based on experience
PDI	1		$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1		$1,500,000.00	$1,500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$21,596,970.94	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$3,150,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$24,746,971**	
NEW CONSTRUCTION					
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	1.0	LS	$23,800,327.73	$23,800,328	**2 tanks, each is 740'x185'x24' deep; 2 tanks (~6.3 acres) - Total CCR tanks (-Contingency)(this estimate contains only the CCR portion of the cost for both tanks)**
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cos	1.0	LS	$23,407,836.93	$23,407,837	**Rerfer to tab "Capital Cost Estimate" shows the Order of Magnitude Cost (-Contingency), details are not reflected below**
Dewatering Facility Order of Magnitude Capital Cost	1.0	LS	$32,300,000.00	$32,300,000	**From ELG Cost Sheet (-Contingency) July 2, 2015**
FGD Treatment Tanks					Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mix Tank Mixers	1.0	LS	$99,908.31	$99,908	" "
Flocculation Tank Mixers	1.0	LS	$99,908.31	$99,908	" "
Ferric Chloride Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Sulfuric Acid Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Organosulfide Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Polymer Blending Systems	1.0	LS	$53,400.00	$53,400	" "
Sodium Hydroxide Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Common Equipment					
Ferric chloride tank	1.0	LS	$14,950.55	$14,951	" "
Sulfuric Acid tank	1.0	LS	$4,464.43	$4,464	" "
Sodium Hydroxide Tank	1.0	LS	$17,183.10	$17,183	" "
Safety Shower	1.0	LS	$30,000.00	$30,000	" "
Total Equipment Cost (TEC)	1.0	LS	$381,000.00	$381,000	" "
Freight	1.0	LS	$12,041.72	$12,042	" "
Purchased Equipment Cost - Delivered (PEC-D)	1.0	LS	$393,041.72	$393,042	" "
Mix Tanks Wall Concrete	1.0	LS	$51,414.06	$51,414	" "
Mix Tanks Slab Concrete	1.0	LS	$7,874.04	$7,874	" "

Privileged Confidential
Attorney-Client Privileged
Prepared at the Direction of Counsel

Site: Trimble County Generating Station
Location: Bedford, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Gypsum Storage
Base Year: 2015
Date: 1/18/2016

Floculation Tanks Wall Concrete	1.0	LS	$51,414.06	$51,414	" "
Floculation Tanks Slab Concrete	1.0	LS	$7,874.04	$7,874	" "
Settling Tanks Wall Concrete	1.0	LS	$3,432,000.00	$3,432,000	" "
Settling Tanks Slab Concrete	1.0	LS	$6,300,696.36	$6,300,696	" "
Total Ramp Concrete	1.0	LS	$308,101.52	$308,102	" "
Common Items					
Excavation - Soft	1.0	LS	$1,719,848.99	$1,719,849	" "
Pre Engineered building	1.0	LS	$120,000.00	$120,000	" "
Lining Tanks	1.0	LS	$1,217,033.91	$1,217,034	" "
Construction Material					
Construction Material	1.0	LS	$13,216,256.98	$13,216,257	" "
State Sales Tax	1.0	LS	$3,029.03	$3,029	" "
Total Constuction Material	**1**	LS	$13,219,286.01	**$13,219,286**	" "
Total Equipment and Construction	**1.0**	**LS**	**$13,612,327.73**	**$13,612,328**	" "
Other Construction					
Electrical and I&C	1.0	LS	$681,000.00	$681,000	" "
Piping	1.0	LS	$1,089,000.00	$1,089,000	" "
Yard Improvements (a)	1.0	LS	$1,089,000.00	$1,089,000	" "
Metals and Finishes	1.0	LS	$408,000.00	$408,000	" "
Subtotal	**1**	LS	$16,879,327.73	**$16,879,328**	" "
Total Direct Costs (TDC)	**1.0**	**LS**	**$16,879,327.73**	**$16,879,328**	" "
Contractor's Field General Conditions	1.0	LS	$844,000.00	$844,000	" "
Contractor's OH&P	1.0	LS	$2,532,000.00	$2,532,000	" "
Contingency	**1.0**	**LS**	**$3,376,000.00**	**$3,376,000**	" "
Total Construction Cost (TCC)	**1.0**	**LS**	**$23,631,327.73**	**$23,631,328**	" "
Engineering, SDCc and Startup	**1.0**	**LS**	**$3,545,000.00**	**$3,545,000**	" "
Total Estimated Order of Magnitude Capital Cost	**1.0**	**LS**	**$27,176,327.73**	**$27,176,328**	" "
Total Estimated Order of Magnitude Capital Cost (-Contingency)	**1.0**	**LS**	**$23,800,327.73**	**$23,800,328**	Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mechanical Improvements/Additions					
Piping to new concrete tank from Gypsum Stack	1	LS	$50,000.00	$50,000	allowance
Piping to new concrete tank from ATB	1	LS	$50,000.00	$50,000	
Items to be constructed to meet NPDES Permitting Requirements	1	LS	$100,000.00	$100,000	allowance
SUBTOTAL Mechanical Improvements/Additions				**$200,000**	
SUBTOTAL NEW CONSTRUCTION				$79,708,165	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

Trimble County Facility Backup Quantities   Nathan Zink   7/6/2015

CCR Production Rates

CCR Production Handling Assumptions:

% Bot Ash Wet Sluice to ATB1:	100%
% Fly Ash Wet Sluice to ATB1:	100%
% Gypsum returned:	100%

CCR Production - 2015 Plan (tons)

	Trimble County				Accumulated Material (Tons)					
Year	Bot Ash	Fly Ash	Gypsum	TOTAL	ATB	Gypsum Stack				
2015	51,952	207,810	496,454	756,216	259,762	496,454	baseline Gypsum (2nd Quarter 2018			
2016	62,958	251,833	538,194	852,986	314,791	538,194		1,772,161	Quarterly Gypsum	
2017	63,732	254,930	534,152	852,814	318,662	534,152	baseline ATB			135,573.69
2018	62,686	250,746	542,295	855,727	313,432	542,295		1,545,582		
2019	62,284	249,135	539,487	850,906	311,419	539,487	beneficial re-use			
2020	61,651	246,602	534,571	842,824	308,253	534,571		4,219,740		
2021	61,982	247,927	534,620	844,529	309,909	534,620				
2022	61,096	244,382	529,256	834,734	305,478	529,256			5,765,322	
2023	62,147	248,589	536,011	846,747	310,736	536,011			5,283,080	
2024	-	-	-	-	-	-			482,242	
2025	-	-	-	-	-	-			211,687	
Total:	**Assumed Additional Accumulated Material (2015 thru closure):**				2,752,442	4,785,041		7,537,483		

Projected Material Generation - Handling Assumptions:

A. Bottom Ash and Flyash:
- Until October 19, 2015 assume all fly ash and bottom ash slurried to ATB Pond, and
- After December 2017 assume all material will be dry processed
- After October 19, 2018 all material to the ATB Pond

B. Gypsum
- Until October 19, 2018 assume all gypsum slurried to Gypsum Stack and
- After October 19, 2018 all material to the Main Ash Pond

Approximate density of CCR in-place: 1 ton/CY

Orange:	To be confirmed by CAD
Yellow:	Based on assumptions as listed

Pond Quantity Balance Estimate - By Pond:

Gypsum Stack

Item	Units	Gypsum	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	33.4				
Standing Surface Water (to remove)	GAL	225,005,750	1,114,036 CY of Volume for the wet pond area. Confirmed with CAD.		8	ft
Length of perimeter	LF	4,650				
CUT:						
CCR cut in 2017 - for Gypsum Stack	CY	10	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
Cut/regrade for cover subgrade/ditch	CY	9,817	Assume Trapazoidal channel 3H:1V 3-ft deep with 10-ft bottom	CAD - confirm cut to grade ditches for final cover	57	SF
FILL (to cover subgrade):						
CCR for Fill - from Baseline	CY	1,772,161				
Total Fill - Existing surface to final grade	CY	1,747,215	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Total Fill for Closure of Pond	CY	1,807,614	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	35,443				
Final Cover Soil Volume	CY	96,857	CAD to update			
Final Cover Surface Area	AC	33.4	CAD to update			
Structural Support						
Geogrid	AC	40.1	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Geofabric	AC	40.1	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Amount of CCR/import fill required to close pond [a]	CY	899,585	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Cut: existing surface to final grade	CY	409,085	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Fill: existing surface to final grade	CY	1,698,880	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Net: existing surface to final grade	CY	1,289,795	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			

3,148,738.00

ATB

Item	Units	ATB	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	94.6				
Standing Surface Water (to remove)	GAL	410,955,884	2,034,702 CY of Volume for the wet pond area. Confirmed with CAD.		13	ft
Length of perimeter	LF	8,712				
CUT						
Cut for Final Cover: Stormwater channel	CY	4,915	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
FILL						
From Gypsum Stack	CY	24,946				
CCR fill - For closure at 5% slope	CY	5,283,080	Assumed Mound running NW to SE length 800-LF	Each mound is estimated to approximately 40,400 cubic yards of fill		
Total Fill - Existing surface to final grade	CY	29,861	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Total Fill for Closure of Pond	CY	135,522	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	105,662				
Final Cover Soil Volume	CY	305,261	Total surface area +20% and 2-ft of cover soil - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Final Cover Surface Area	AC	94.6	CAD to update			
Structural Support						
Geogrid	AC	113.5	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Geofabric	AC	113.5	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Total Fill: existing surface to final grade	CY	399,120	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			
Net: existing surface to final grade	CY	300,455	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			
Final cover volume	CY	113,790	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			
Amount of CCR/import fill required to close pond [a]	CY	512,910	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			

[a] Dewatering and settlement of ash through closure activities will affect the quantities of fill material. In situ ash and geotechnical soil borings and testing are recommended to determine settlement during closure design.

[b] Represents volume of pond.

Other Key Assumptions:

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Mass Balances - FGD Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	FGD Wastewater	Mix Tank Influent	Sodium Hydroxide Feed (2)	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
DESIGN FLOW											
Volumetric Flow, 3-month averag	gpm	1,175	1,175	0.06	0.06	0.02	0.59	0.059	1,199	111	1,082
Total Mass Flow	lb/hr	599,729	599,729	38	41	14	294	54	600,129	58,819	541,310
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	12	0	0	0			
Mass Flow Liquid	lb/hr	587,970	587,970	38	41	14	294	54	588,357	47,055	541,302
Mass Flow Solids	lb/hr	11,759	11,759	0	12	0	0	0	11,772	11,764	8.1
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	2,053	2,053	0.10	0.10	0.04	1.03	0.059	2,095	194	1,890
Total Mass Flow	lb/hr	1,047,868	1,047,868	66	72	24	514	54	1,048,565	102,699	945,867
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	22	0	0	0			
Mass Flow Liquid	lb/hr	1,027,321	1,027,321	66	72	24	514	54	1,027,997	82,159	945,838
Mass Flow Solids	lb/hr	20,546	20,546	0	22	0	0	0	20,568	20,540	28.4
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4

Notes:

xx	User Entered

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Mass Balances - Other Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	Other Wastewater	Mix Tank Influent	Sodium Hydroxide Feed	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
DESIGN FLOW											
Volumetric Flow, 3 month ave	gpm	5,213	5,213	0.26	0.26	0.10	2.61	0.261	5,217	1	5,216
Total Mass Flow	lb/hr	2,608,846	2,608,846	167	239	62	1,304	240	2,610,618	673	2,609,945
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.01%	5%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	55	0	0	0			
Mass Flow Liquid	lb/hr	2,608,585	2,608,585	167	184	62	1,304	240	2,610,302	396	2,609,906
Mass Flow Solids	lb/hr	261	261	0	55	0	0	0	316	277	39.1
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.01	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	63.3	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	34,144	34,144	1.71	1.71	0.68	17.07	0.261	34,171	61	34,108
Total Mass Flow	lb/hr	17,087,366	17,087,366	1,093	1,205	403	8,543	240	17,098,972	31,158	17,067,813
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.01%	5%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	361	0	0	0			
Mass Flow Liquid	lb/hr	17,085,658	17,085,658	1,093	1,205	403	8,543	240	17,096,902	29,600	17,067,301
Mass Flow Solids	lb/hr	1,709	1,709	0	361	0	0	0	2,070	1,558	512.0
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.01	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	63.3	62.4

Notes:

xx	User Entered

Equipment Sizing

	FGD Treatment	Other Water Treatment	Tom's comments - red = not addressed, black = addressed
Mix Tanks			
Average Flow, gpm	1,175	5,213	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	2,053	34,144	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	17	20	
HDT Peak, Min	10	3	
Mix Tank Volume, gal	20,530	102,432	
Mix Tank Volume, cf	2,744	13,693	
Side Water Depth, ft	18	23	Need to account for the mix tanks being higher than the settling tanks to allow fro head drop
Freeboard, ft	2	2	
Wall Height, ft	20	25	
Length/width, ft	12	24	inside dimensions
Slab Area, sf	354	644	
Wall length, ft	27	51	Wall length split between Mix tanks and floc tanks
Wall Area, sf	1,068	1,270	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	79	94	
Slab Volume, cy	26	48	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	2.05	10.24	
Actual HP	2.0	10.0	
Number	2	2	
Outlet Pipe Nominal Diameter, in	14	40	FRP Pipe
Outlet Pipe ID, in	14	40	
Outlet Pipe Velocity, fps	4.28	4.36	Design for max 2-5 fps
Pipe Head Loss to Flocculation Tank, Ft	0.64	0.61	
Number of Dip Tubes	1	2	We will want to design 2 different size dip tubes for other wastewater, a lower one that is smaller for low flows and a larger one for high flow conditions. We need a minimum velocity to suck solids out of the tank, and max velocity to prevent shear.

Flocculation Tanks

Design Flow, gpm	1,175	5,213	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	2,053	34,144	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	17	20	
HDT Peak, Min	10	3	
Flocculation Tank Volume, gal	20,530	102,432	
Flocculation Tank Volume, cf	2,744	13,693	
Side Water Depth, ft	18	23	
Freeboard, ft	2	2	
Wall Height, ft	20.0	25.0	
Length/width, ft	12	24	inside dimensions
Slab Area, sf	354	644	
Wall length, ft	27	51	Wall length split between Mix tanks and floc tanks
Wall Area, sf	1,068	1,270	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	79	94	
Slab Volume, cy	26	48	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	2.05	10.2	
Actual HP	2.0	10.0	
Number	2	2	
Outlet Pipe Nominal Diameter, in	14	40	FRP
Outlet Pipe ID, in	14	40	
Outlet Pipe Velocity, fps	4.28	4.36	Design for max 2-5 fps
Pipe Head Loss to Floculation Tank	0.64	0.61	
Number of Dip Tubes	2	2	

Settling Tanks

Design Flow, gpm	1,175	5,213	Calculate overflow rate on peak flow, solids storage on average flow
Max Design Flow, gpm	2,053	34,144	
Design solids, mg/L	20,000	100	
Daily solids production , lbs/day	282,562	8,639	
Solids concentration (Settled solids)	20%	5%	Settled solids
Solids density, lbs/cf	80	80	dry solids
Solids generation, cf/day	17,660	2,160	
Solids Storage, days	93	740	About 2 yrs for Other WW
Solids Storage per tank, cf	1,642,800	1,598,400	
Number of Tanks	2	2	
Wall Height, ft	24	24	
Freeboard, ft	2	2	
Side Water Depth, ft	22	22	
Water depth above settled solids	10	10	
Solids Depth,ft	12	12	
Total Tank Volume, gal per tank	22,528,264	21,919,392	
Total Tank Volume, CF per tank	3,011,800	2,930,400	
Solids Storage Volume, gal per tank	12,288,144	11,956,032	
Solids Storage Volume, CF per tank	1,642,800	1,598,400	
Tank Width, ft	185	180	Set based on solids storage capacity for FGD WW and overflow rate for other WW Treatment
L/W Ratio	4	4.1	
Tank Length, ft	740	740	Tank length for Other WW is set equal to the FGD WW tank and the Other WW tank width
Slab Area, sf	283,531	275,472	
Wall length, ft	2,970	2,950	
Wall Area, sf	71,280	70,800	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.0	2.0	
Wall Volume, cy	5,280	5,244	
Slab Volume, cy	21,002	20,405	
Overflow Rate Average, gpm/sf	0.0086	0.0391	
Overflow Rate peak, gpm/sf	0.015	0.256	Want to stay at < 0.26 gpm/sf
Flow capacity based on average overflow rate, gpm	1,200	5,200	one train

Flow capacity based on Peak overflow rate, gpm	2,050	34,140	One train

Access Ramp to Settling Tank			
Access Ramp Inside Settling tank Width, ft	30	30	Need two way truck traffic
Ramp Slope, %	12%	12%	
Ramp tickness, ft	1.50	1.50	Assumed.
Ramp Length, ft	201	201	
Ramp area, sf	6043	6043	
Ramp side wall area sf	2400	2400	
Ramp side wall Thickness, ft	2	2	
Sidewall concerte, cft	4800	4800	
Access Ramp concrete, cft	9065	9065	
Total Ramp concrete, ft3	13865	13865	
Total Ramp concrete, cy	514	514	Per ramp

Excavation, cy	567,975		
Liner			
Liner, ft2	363,699	356,143	
Liner, SY	40,411	39,571	

Chemical Feeds

Ferric Chloride Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	Use 50
Maximum Feed Rate, gph	6.2	102.4	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	3.5	15.6	
Average Treatment Volume, MGD	1.69	7.51	
Average Usage, gpd	85	375	
Average usage of chemical for FGD WW and Other WW	460		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	148	2458	
Max usage of chemical for FGD WW and Other WW, gpd	2,606		
Nominal Storage Tank Volume, gal	8,000		
Number of Tanks	1		
Total Storage Volume, gal	12,000		Includes 4000 gallon extra capacity for tank truck loading
Storage Time at normal max usage, days	5		
Storage Time at average usage, days	26		Size for 14 to 21 days capacity at average usage

Sulfuric Acid Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	6	102	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	3.525	15.639	
Average Treatment Volume, MGD	1.692	7.50672	
Average Usage, gpd	84.6	375	
Average usage of chemical for FGD WW and Other WW	460		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	148	2458	
Max usage of chemical for FGD WW and Other WW	2,606		
Nominal Storage Tamk Volume, gal	10,000		
Number of tanks	1		
Total Storage Volume, gal	14,000		Each tank. Includes 4000 gal for tanker truck.
Storage Time at normal max usage, days	4		
Storage Time at average usage, days	22		Size for 14 to 21 days capacity at average usage

Sodium Hydroxide Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	6.2	102.4	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	3.5	15.6	
Average Treatment Volume, MGD	1.69	7.5	
Average Usage, gpd	85	375	
Average usage of chemical for FGD WW and Other WW	460		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	148	2458	
Max usage of chemical for FGD WW and Other WW	2,606		
Nominal Storage Tank Volume, gal	10,000		common Tank
Number of tanks	1		
Total Storage Volume, gal	14,000		Includes 4000 gallon extra capacity for tank truck loading
Storage Time at normal max usage, days	5		
Storage Time at average usage, days	30		Size for 14 to 21 days capacity at average usage

Organosulfide Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	20	20	
Maximum Feed Rate, gph	2.46	41.0	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	1.41	6.26	
Average Treatment Volume, MGD	1.69	7.5	
Average Usage, gpd	33.8	150	
Average usage of chemical for FGD WW and Other WW, gpd	184		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	59.1	983	
Max usage of chemical for FGD WW and Other WW, gpd	1,042		
Nominal Storage Tank Volume, gal	4,000		
Number of tanks	1		
Total Storage Volume, gal	8,000		
Storage Time at normal max usage, days	4		
Storage Time at average usage, days	22		Size for 14 to 21 days capacity at average usage

Polymer Feed System

Number of polymer blending units	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	5	5	1:100 ratio neat polymer to water
Maximum Feed Rate, gph	0.62	10.24	
Dilution Water Feed (volume to volume of neat polymer)	100	100	
Maximum Flow of Dilution water, gph	61.6	1024.3	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	0.35	1.56	
Average Treatment Volume, MGD	1.69	7.51	
Average Usage, gpd	8.5	37.5	
Average usage of chemical for FGD WW and Other WW, gpd	46		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	14.8	246	
Max usage of chemical for FGD WW and Other WW, gpd	261		
Nominal Storage Tote Volume, gal	265		265 or 320 gallons are standard volumes/sizes for totes
Number of totes	4		
Total Storage Volume, gal	1,060		
Storage Time at normal max usage, days	4		
Storage Time at average usage, days	23		Size for 14 to 21 days capacity at average usage

Note: User Input

Head loss influent Mix tank to Floccuation Tank FGD Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		14	14		0.78	2,053	4.57	4.28	0.29	150	0.00	0.22	0.22
	pipe	FRP		14	14	18		2,053	4.57	4.28	0.29	150	0.06	0.00	0.06
0	tee, branch	FRP		14	14		0.72	2,053	4.57	4.28	0.29	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		14	14		0.19	2,053	4.57	4.28	0.29	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		14	14		0.19	2,053	4.57	4.28	0.29	150	0.00	0.05	0.05
				14	14			2,053							
	pipe	FRP		14	14	4		2,053	4.57	4.28	0.29	150	0.01	0.00	0.01
1	exit loss	FRP		14	14		1.00	2,053	4.57	4.28	0.29	150	0.00	0.29	0.29

Total head loss **0.64**
total minor loss **0.56**

Head loss influent Mix tank to Floccuation Tank, Other Water Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		40	40		0.78	17,072	38.04	4.36	0.30	150	0.00	0.23	0.23
	pipe	FRP		40	40	23		17,072	38.04	4.36	0.30	150	0.02	0.00	0.02
0	tee, branch	FRP		40	40		0.72	17,072	38.04	4.36	0.30	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		40	40		0.19	17,072	38.04	4.36	0.30	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		40	40		0.19	17,072	38.04	4.36	0.30	150	0.00	0.06	0.06
				40	40			17,072							
				40	40										
	pipe	FRP		40	40	4		17,072	38.04	4.36	0.30	150	0.00	0.00	0.00
1	exit loss	FRP		40	40		1.00	17,072	38.04	4.36	0.30	150	0.00	0.30	0.30

Total head loss **0.61**
total minor loss **0.59**

Excavation Calculation FGD WW and Other WW Tanks

Settling Tank Depth below grade=	22	ft	
Depth Below Tank for Excavation =	4	ft	
Depth of excavation	26	ft	
Side Slope (H:V) =	1		
Tank wall thickness	2	each	
FGD WW Tank Length =	740	ft	
FGD WW Tank Width =	185	ft	
Number of FGD WW Tanks =	2		
Other WW Tank Length =	740	ft	
Other WW Tank Width =	180	ft	
Number of Other WW Tanks =	2		
Total Length of tanks with walls	744	ft	
Total Width of tanks with walls	740	ft	
Excavated tank area volume	15,335,320	cf	Trapezoidal calculation, average with of cut time average length of cut times depth
Total Excavated Volume	567,975	cy	

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
Ramps	***Access to Settling Tanks***	Number	2	2
		Length, ft	201	201
		Width, ft	30	30
		Slope, %	12%	12%
		Materials	Reinforced Concrete	Reinforced Concrete
Mix Tanks	***Tanks***	Number	2	2
		Average Flow, gpm	1,175	5,213
		Peak Flow, gpm	20,530	102,432
		Detention Time at Average Flow, min	17	20
		Detention Time at Peak Flow, min	10	3
		Dimension, ft (square)	12	24
		Wall Height, ft	20	25
		Freeboard, ft	2	2
		Side Water Depth, ft	18	23
		Volume, gal	20,530	102,432
		Materials	Reinforced Concrete	Reinforced Concrete
	Mix Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	2	10
	Mix Tank Blower	Number		2
		Type		Rotary Lobe
		Air Required, scfm		500
		Horsepower, each		20
	Dip Tubes	Number	2	2
		Diameter, in	14	40
		Head loss, ft	0.64	0.61
		Materials	FRP	FRP
FlocculationTanks	***Tanks***	Number	2	2
		Average Flow, gpm	1,175	5,213
		Peak Flow, gpm	2,053	34,144
		Detention Time at Average Flow, min	17	20
		Detention Time at Peak Flow, min	10	3
		Dimension, ft (square)	12	24
		Wall Height, ft	20	25
		Freeboard, ft	2	2
		Side Water Depth, ft	18	23
		Volume, gal	20,530	102,432
		Materials	Reinforced Concrete	Reinforced Concrete
	Flocculation Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	2	10
	Dip Tubes	Number	2	2
		Diameter, in	14	40
		Head loss, ft	0.64	0.61
		Materials	FRP	FRP
Settling Tanks	***Tanks***	Number	2	2
		Average Flow, gpm	1,175	5,213
		Peak Flow, gpm	2,053	34,144
		Solids Concentration, mg/L	20,000	100
		Average dry solids generation, lbs/day	282,562	8,639
		Solids Settled Concentration (%)	20%	5%
		Solids density, lbs/cf	80	80
		Solids Generation, cf/day	17,660	2,160
		Length, ft	740	740
		Width, ft	185	180
		Wall Height, ft	24	24
		Freeboard, ft	2	2
		Side Water Depth, ft	22	22
		Settling Depth, ft	10	10

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
		Solids Depth, ft	12	12
		Total Liquid Volume, gal per tank	22,528,264	21,919,392
		Solids Storage Design Criteria, days	90	90
		Solids Storage Volume, gal	12,288,144	11,956,032
		Solid Storage Provided per tank, days	93	740
		Average Overflow Rate, gpm/sf	0.01	0.04
		Peak Overflow Rate, gpm/sf	0.01	0.26
		Materials	Reinforced Concrete	Reinforced Concrete
Ferric Chloride Feed System	*Ferric Chloride Storage Tank*	Number	1	
		Tank Volume, gal	12,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	85	375
		Average Chemical Use, gal/d	460	
		Peak Chemical Use, gal/d	148	2,458
		Peak Chemical Use, gal/d	2,606	
		Average Use Storage, days	26	
		Peak Use Storage, days	5	
		Chemical Stored	35% Ferric Chloride	
	Ferric Chloride Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	6.2	102.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	35% Ferric Chloride	35% Ferric Chloride
Sulfuric Acid Feed System	*Sulfuric Acid Storage*	Number	1	
		Tank Volume, gal	14,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	85	375
		Average Chemical Use, gal/d	460	
		Peak Chemical Use, gal/d	148	2,458
		Peak Chemical Use, gal/d	2,606	
		Average Use Storage, days	22	
		Peak Use Storage, days	4	
		Chemical Stored	93% Sulfuric Acid	
	Sulfuric Acid Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	6.2	102.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	93% Sulfuric Acid	0
Sodium Hydroxide Feed System	*Sodium Hydroxide Storage*	Number	1	
		Tank Volume, gal	14,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	85	375
		Average Chemical Use, gal/d	460	
		Peak Chemical Use, gal/d	148	2,458
		Peak Chemical Use, gal/d	2,606	
		Average Use Storage, days	30	
		Peak Use Storage, days	5	
		Chemical Stored	25% and 50% NaOH	
	Sodium Hydroxide Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	6.2	102.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	25% and 50% NaOH	0

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
Organosulfide Feed System	***Organosulfide Tote/tank Storage***	Number	1	
		Tank Volume, gal	8,000	
		Dose, ppmv	20	20
		Average Chemical Use, gal/d	34	150
		Average Chemical Use, gal/d	184	
		Peak Chemical Use, gal/d	59	983
		Peak Chemical Use, gal/d	1,042	
		Average Use Storage, days	22	
		Peak Use Storage, days	4	
		Chemical Stored	Organosulfide	
	Organosulfide Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	2.46	41.0
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Organosulfide	Organosulfide
Polymer Feed System	***Polymer Tote Storage***	Number	4	
		Volume, gal each	265	
		Volume Storage, gal	1,060	
		Dose, ppmv	5	5
		Average Chemical Use, gal/d	8	38
		Average Chemical Use, gal/d	46	
		Peak Chemical Use, gal/d	15	246
		Peak Chemical Use, gal/d	261	
		Average Use Storage, days	23	
		Peak Use Storage, days	4	
		Chemical Stored	Anionic Emulsion Polymer	
	Polymer Blending Systems	Type	Polymer Blending System	Polymer Blending System
		Capacity, gph	0.62	10.2
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Anionic Emulsion Polymer	Anionic Emulsion Polymer

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Trimble County Station

Settling Tank-based Treatment System

Table 2. Electrical Load

Item	Location	HP	No. Provided	No. Active	Installed HP	Active HP	% of Time On	Total HP for O&M
FGD WW Teatment								
Mix Tank Mixers	TBD	2	2	1	4	2	100%	2
Floculation Tank Mixers	TBD	2	2	1	4	2	100%	2
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Other WW Teatment								
Mix Tank Mixers	TBD	10	2	1	20	10	100%	10
Floculation Tank Mixers	TBD	10	2	1	20	10	100%	10
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Mix Tank Blower	TBD	20	2	1	40	20	10%	2
Miscellaneous (bldg heating, lights, etc.)		100			100	100	30%	30
Mix Tank Blower								
Totals					208	154		66
MW								0.049764
MW-Hr/year								440

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 3. Estimated Capital Cost

Item	Value	Units	No. Provided	Unit Cost ($ ea)	Amount	Installation ($ ea)	Total Installed Cost ($)	CCR Cost	ELG Cost
FGD Treatment Tanks									
Mix Tank Mixers	2	hp	2	41,628	83,257	8,326	99,908	99,908	
Flocculation Tank Mixers	2	hp	2	41,628	83,257	8,326	99,908	99,908	
Ferric Chloride Feed Pumps	6	gph	2	6,266	12,533	1,400	15,333	15,333	
Sulfuric Acid Feed Pumps	6	gph	2	6,266	12,533	1,400	15,333	15,333	
Organosulfide Feed Pumps	2	gph	2	6,266	12,533	1,400	15,333	15,333	
Polymer Blending Systems	1	gph	2	25,000	50,000	1,700	53,400	53,400	
Sodium Hydroxide Feed Pumps	6	gph	2	6,266	12,533	1,400	15,333	15,333	
Other Wastewater Treatment Tanks									
Mix Tank Mixers	10	hp	2	44,860	89,720	8,972	107,664		107,664
Flocculation Tank Mixers	10	hp	2	44,860	89,720	8,972	107,664		107,664
Ferric Chloride Feed Pumps	102	gph	2	6,266	12,533	1,400	15,333		15,333
Sulfuric Acid Feed Pumps	102	gph	2	6,266	12,533	1,400	15,333		15,333
Organosulfide Feed Pumps	41	gph	2	6,266	12,533	1,400	15,333		15,333
Polymer Blending Systems	10	gph	2	25,000	50,000	1,700	53,400		53,400
Sodium Hydroxide Feed Pumps	102	gph	2	6,266	12,533	1,400	15,333		15,333
Mix Tank Blower	500	SCFM	2	2,850	5,700	1,140	7,980		7,980
Common Equipment									-
Ferric chloride tank	12,000	gal	1	24,918	24,918	4,984	29,901	14,951	14,951
Sulfuric Acid tank	2,606	gal	1	7,441	7,441	1,488	8,929	4,464	4,464
Organosulfide Tank	1,042	gal	1	4,531	4,531	906	5,438		5,438
Polymer feed Totes	265	gal	4		-	-	-		-
Sodium Hydroxide Tank	14,000	gal	1	28,639	28,639	5,728	34,366	17,183	17,183
Safety Shower			2	25,000	50,000	5,000	60,000	30,000	30,000
Area Labor Adjustment Factor	100.0%	applies to installation cost only							
Total Equipment Cost (TEC)							**791,000**	**381,000**	**410,000**
Area Labor Adjustment Factor									
Total Process Equipment					617,444				
Freight	4%	of Proc Equip					25,000	12,042	12,958
Purchased Equipment Cost - Delivered (PEC-D)							**816,000**	**393,042**	**422,958**
FGD Treatment Tanks									
Mix Tanks Wall Concrete	79	CY	1	650	51,414		51,414	51,414	
Mix Tanks Slab Concrete	26	CY	1	300	7,874		7,874	7,874	
Floculation Tanks Wall Concrete	79	CY	1	650	51,414		51,414	51,414	
Floculation Tanks Slab Concrete	26	CY	1	300	7,874		7,874	7,874	
Settling Tanks Wall Concrete	5280	CY	1	650	3,432,000		3,432,000	3,432,000	
Settling Tanks Slab Concrete	21,002	CY	1	300	6,300,696		6,300,696	6,300,696	
Total Ramp Concrete	514	CY	2	300	308,102		308,102	308,102	
Other Treatment Tanks									
Mix Tanks Wall Concrete	94	CY	1	650	61,148		61,148		61,148
Mix Tanks Slab Concrete	48	CY	1	300	14,315		14,315		14,315
Floculation Tanks Wall Concrete	94	CY	1	650	61,148		61,148		61,148
Floculation Tanks Slab Concrete	48	CY	1	300	14,315		14,315		14,315
Settling Tanks Wall Concrete	5,244	CY	1	650	3,408,889		3,408,889		3,408,889
Settling Tanks Slab Concrete	20,405	CY	1	300	6,121,593		6,121,593		6,121,593
Total Ramp concrete, cy	514	CY	2	300	308,102		308,102		308,102
Common Items									
Excavation - Soft	567,975	CY	1	6	3,390,810		3,390,810	1,719,849	1,670,961
Pre Engineered building	1,200	ft2	1	200	240,000		240,000	120,000	120,000
Lining Tanks	79,982	SY	1	30	2,399,472		2,399,472	1,217,034	1,182,439
Construction Material							26,179,165	13,216,257	12,962,908
State Sales Tax	1.0%	of Equipment					6,000	3,029	2,971
Total Constuction Material							**26,185,165**	**13,219,286**	**12,965,879**
Total Equipment and Construction							**27,001,165**	**13,612,328**	**13,388,837**
Electrical and I&C	5%						1,350,000	681,000	669,000
Piping	8%						2,160,000	1,089,000	1,071,000
Yard Improvements (a)	8%	of Equip + Const.					2,160,000	1,089,000	1,071,000
Metals and Finishes	3%	of Equip + Const.					810,000	408,000	402,000
Subtotal							33,481,165	16,879,328	16,601,837
Total Direct Costs (TDC)							**33,481,165**	**16,879,328**	**16,601,837**
Contractor's Field General Conditions	5%	of TDC					1,674,000	844,000	830,000
Contractor's OH&P	15%	of TDC					5,022,000	2,532,000	2,490,000
Contingency	20%	of TDC					6,696,000	3,376,000	3,320,000
Escalation Factor	0%	of TDC					0	0	0
Total Construction Cost (TCC)							**46,873,165**	**23,631,328**	**23,241,837**
Engineering, SDC[c] and Startup	15%	of TCC					7,031,000	3,545,000	3,486,000

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 3. Estimated Capital Cost

Item	Value	Units	No. Provided	Unit Cost ($ ea)	Amount	Installation ($ ea)	Total Installed Cost ($)	CCR Cost	ELG Cost
Total Estimated Order of Magnitude Capital Cost							**53,904,165**	**27,176,328**	**26,727,837**
Annual Cost of Capital (7% over 20 years)							5,088,000	$2,565,000	$2,523,000

(a) Includes fencing, grading, roads, sidewalks, and similar items.
(b) The enclosed Engineer's Estimate is only an estimate of possible construction costs. This estimate is limited to the conditions existing at its issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.
(c) SDC stands for Services During Construction (Startup, Engineer/Site Reps, etc.)

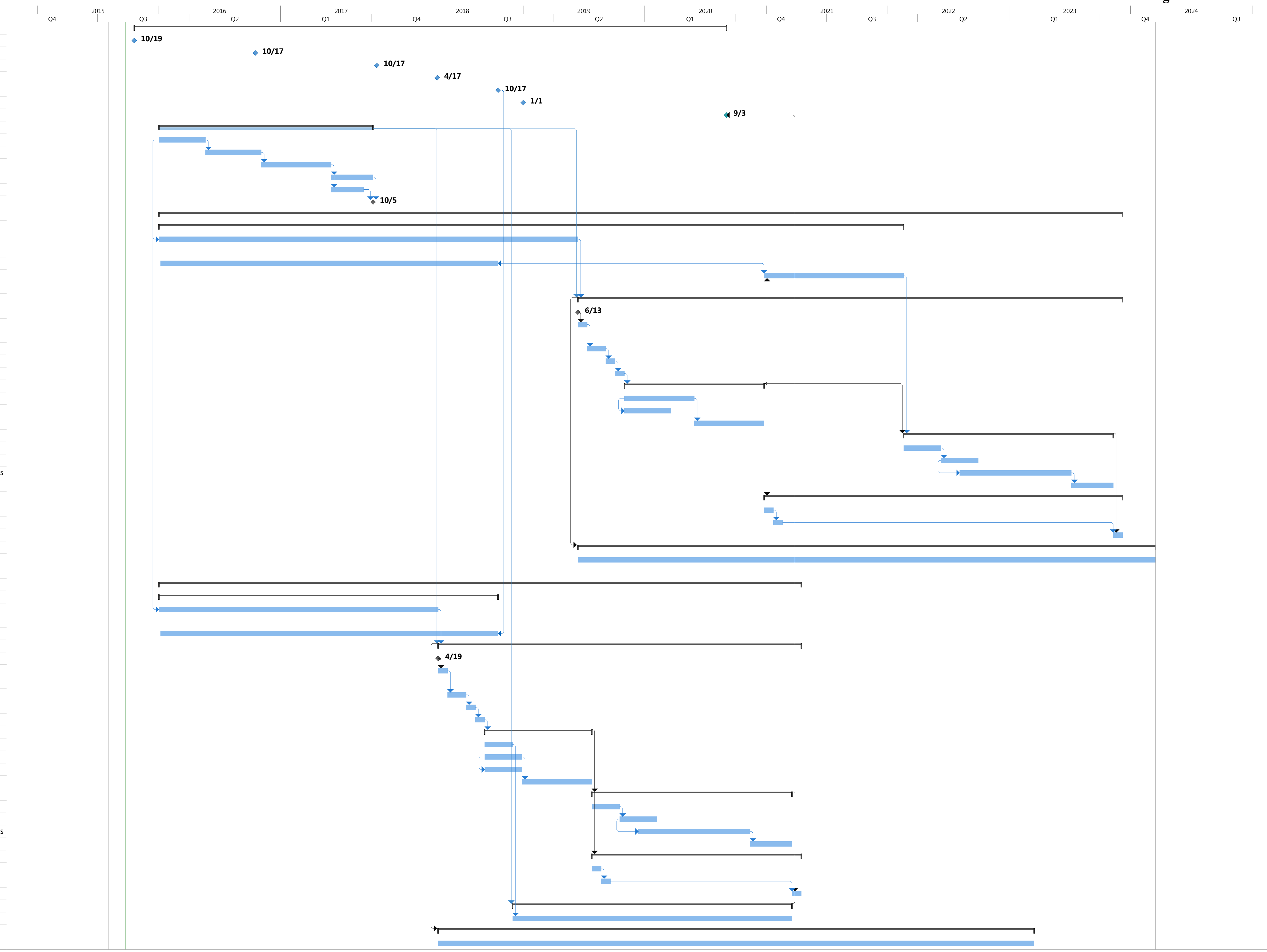
LG&E-KU

Trimble County Station
Settling Tank-based Treatment System
Table 4. Estimated O&M Cost

Item	Quantity	Units	Unit Cost	Cost
Labor	1,040	hours/yr	$30	$31,200
Maintenance (% of Purchased Equipment Cost)	816,000	$	3%	$24,480
Solids for Disposal	231,497	tons/yr	-	-
Energy	440	MW-Hr/yr	$100	$44,000
Chemicals				
Ferric Chloride	134,301	gal/yr	$2	$222,940
Acid	40,290	gal/yr	$2	$94,280
Organosulfide	53,721	gal/yr	$20	$1,074,410
Polymer	13,430	gal/yr	$8	$106,904
Caustic	134,301	gal/yr	$1	$147,731
Total Annual O&M				$1,746,000
Cost per 1000 Gallon Treated (excludes labor)				**$0.51**
Annualized Cost				$6,834,000

Attachment 3
Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Regulatory Milestones**	**1273 days**	**Mon 10/19/15**	**Thu 9/3/20**	
2		CCR Rule Effective Date	0 days	Mon 10/19/15	Mon 10/19/15	
3		Structural Integrity - Initial Assessment(s	0 days	Mon 10/17/16	Mon 10/17/16	
4		Groundwater - Background Analysis	0 days	Tue 10/17/17	Tue 10/17/17	
5		Groundwater - Detection Analysis	0 days	Tue 4/17/18	Tue 4/17/18	
6		Groundwater - Assessment Analysis	0 days	Wed 10/17/18	Wed 10/17/18	
7		Groundwater Corrective Action	0 days	Tue 1/1/19	Tue 1/1/19	
8		Divert water to Concrete pond	0 days	Thu 9/3/20	Thu 9/3/20	67FF
9		**Engineering Phase**	**460 days**	**Fri 1/1/16**	**Thu 10/5/17**	
10		Preliminary Design	100 days	Fri 1/1/16	Thu 5/19/16	
11		Final Design	120 days	Fri 5/20/16	Thu 11/3/16	10
12		KY DEP Permitting	150 days	Fri 11/4/16	Thu 6/1/17	11
13		KY PSC Rate Approval	90 days	Fri 6/2/17	Thu 10/5/17	12
14		Procurement of Contractor	70 days	Fri 6/2/17	Thu 9/7/17	12
15		Issue NtP	0 days	Thu 10/5/17	Thu 10/5/17	14,13
16		**ATB**	**2070 days**	**Fri 1/1/16**	**Thu 12/7/23**	
17		**LG&E Activities**	**1600 days**	**Fri 1/1/16**	**Thu 2/17/22**	
18		Remove and Discharge surface water	900 days	Fri 1/1/16	Thu 6/13/19	10SS
19		Accumulate CCR in 2016-2018	725 days	Wed 1/6/16	Wed 10/17/18	6FF
20		Place Beneficial Use CCR to achieve final grades	300 days	Fri 12/25/20	Thu 2/17/22	19,27
21		**Contractor Activities**	**1170 days**	**Thu 6/13/19**	**Thu 12/7/23**	**9,18**
22		Mobilize	0 days	Thu 6/13/19	Thu 6/13/19	
23		Install Sediment and Erosion Control	20 days	Fri 6/14/19	Thu 7/11/19	22
24		Site Preparation	40 days	Fri 7/12/19	Thu 9/5/19	23
25		Roads	20 days	Fri 9/6/19	Thu 10/3/19	24
26		On Site Impoundments	20 days	Fri 10/4/19	Thu 10/31/19	25
27		**Preclosure Activities**	**300 days**	**Fri 11/1/19**	**Thu 12/24/20**	**26**
28		Stabilize upper CCR surface	150 days	Fri 11/1/19	Thu 5/28/20	
29		Dewater during stabilization	100 days	Fri 11/1/19	Thu 3/19/20	28SS
30		Cut/regrade for cover subgrade/dit	150 days	Fri 5/29/20	Thu 12/24/20	28
31		**Closure Activities**	**450 days**	**Fri 2/18/22**	**Thu 11/9/23**	**27,20**
32		Shape Cover Subgrade	80 days	Fri 2/18/22	Thu 6/9/22	
33		Place FML and Geocomposite	80 days	Fri 6/10/22	Thu 9/29/22	32
34		Cover soil	240 days	Fri 8/5/22	Thu 7/6/23	33SS+40 days
35		Vegetated Cover	90 days	Fri 7/7/23	Thu 11/9/23	34
36		**Surface Water Features**	**770 days**	**Fri 12/25/20**	**Thu 12/7/23**	**27**
37		Primary Outlet Structure	20 days	Fri 12/25/20	Thu 1/21/21	
38		Emergency Outlet Structure	20 days	Fri 1/22/21	Thu 2/18/21	37
39		Surface Restoration	20 days	Fri 11/10/23	Thu 12/7/23	31,38
40		**Construction Management Services**	**1241 days**	**Fri 6/14/19**	**Fri 3/15/24**	**21SS**
41		CQA and OE services	1241 days	Fri 6/14/19	Fri 3/15/24	
42						
43		**Gypsum Storage**	**1380 days**	**Fri 1/1/16**	**Thu 4/15/21**	
44		**LG&E Activities**	**728 days**	**Fri 1/1/16**	**Wed 10/17/18**	
45		Remove and Discharge surface water	600 days	Fri 1/1/16	Thu 4/19/18	10SS
46		Accumulate CCR in 2016-2018	725 days	Wed 1/6/16	Wed 10/17/18	6FF
47		**Contractor Activities**	**780 days**	**Thu 4/19/18**	**Thu 4/15/21**	**45,9**
48		Mobilize	0 days	Thu 4/19/18	Thu 4/19/18	
49		Install Sediment and Erosion Control	20 days	Fri 4/20/18	Thu 5/17/18	48
50		Site Preparation	40 days	Fri 5/18/18	Thu 7/12/18	49
51		Roads	20 days	Fri 7/13/18	Thu 8/9/18	50
52		On Site Impoundments	20 days	Fri 8/10/18	Thu 9/6/18	51
53		**Preclosure Activities**	**230 days**	**Fri 9/7/18**	**Thu 7/25/19**	**52**
54		Diversion Dike	60 days	Fri 9/7/18	Thu 11/29/18	
55		Stabilize upper CCR surface	80 days	Fri 9/7/18	Thu 12/27/18	
56		Dewater during stabilization	80 days	Fri 9/7/18	Thu 12/27/18	55SS
57		Cut/regrade for cover subgrade/dit	150 days	Fri 12/28/18	Thu 7/25/19	55
58		**Closure Activities**	**430 days**	**Fri 7/26/19**	**Thu 3/18/21**	**53**
59		Shape Cover Subgrade	60 days	Fri 7/26/19	Thu 10/17/19	
60		Place FML and Geocomposite	80 days	Fri 10/18/19	Thu 2/6/20	59
61		Cover soil	240 days	Fri 12/13/19	Thu 11/12/20	60SS+40 days
62		Vegetated Cover	90 days	Fri 11/13/20	Thu 3/18/21	61
63		**Surface Water Features**	**450 days**	**Fri 7/26/19**	**Thu 4/15/21**	**53**
64		Primary Outlet Structure	20 days	Fri 7/26/19	Thu 8/22/19	
65		Emergency Outlet Structure	20 days	Fri 8/23/19	Thu 9/19/19	64
66		Surface Restoration	20 days	Fri 3/19/21	Thu 4/15/21	58,65
67		**Concrete Process Tank**	**600 days**	**Fri 11/30/18**	**Thu 3/18/21**	**9**
68		Construct concrete CCR process tank	600 days	Fri 11/30/18	Thu 3/18/21	54
69		**Construction Management Services**	**1280 days**	**Fri 4/20/18**	**Thu 3/16/23**	**47SS**
70		CQA and OE services	1280 days	Fri 4/20/18	Thu 3/16/23	



Project: Brown rev11
Date: Tue 9/22/15

Task	Milestone	Project Summary	Inactive Milestone	Manual Task	Manual Summary Rollup	Start-only	External Tasks	Deadline	Manual Progress
Split	Summary	Inactive Task	Inactive Summary	Duration-only	Manual Summary	Finish-only	External Milestone	Progress	

TECHNICAL MEMORANDUM

Coal Combustion Residual Evaluation: E. W. Brown Generating Station

PREPARED FOR:	Louisville Gas & Electric Company and Kentucky Utilities Company
PREPARED BY:	CH2M HILL Engineers
DATE:	September 29, 2015

1 Executive Summary

Louisville Gas & Electric Company and Kentucky Utilities Company (LG&E-KU) tasked CH2M HILL Engineers (CH2M) with performing coal combustion residuals (CCR) evaluations for seven generation stations to develop conceptual CCR ash pond closure approaches and capital cost estimates. The generating stations under evaluation are Ghent, Trimble County, Mill Creek, E. W. Brown, Green River, Tyrone, and Pineville. This report applies solely to Brown Generating Station. The following scope activities were completed:

- Review of LG&E-KU provided historical CCR information and kickoff meeting workshop (June 2015)
- Developed a CCR pond closure compliance alternative that considers regulatory, civil, geotechnical, and stormwater aspects as it relates to CCR ash ponds and associated cost estimates for the generating station. Discussion of the conceptual approach is included in Section 2, and drawings are contained in Attachment 1.
- Construct new concrete process tanks (four) for management of wastewater that can no longer be managed in the ponds that will be closed; construct dewatering facility for removing water from solids.

The estimated cost for closing the three ponds is summarized in Exhibit 1-1. Cost information is included in Attachment 2.

Proposed Conceptual Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
Auxiliary Pond Closure	\$18.1 M	\$25.9 M	\$33.6 M
Concrete Process Tanks and Dewatering Facility	\$44.0 M	\$62.9 M	\$81.8 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, process flow diagrams (PFD) for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

2 Proposed Conceptual CCR Closure

Development of Proposed Conceptual CCR Closure

The proposed conceptual CCR pond closure approach was developed based on previous work completed by CH2M and discussions with LG&E-KU during the kickoff meeting on June 23, 2015. The E. W. Brown Generating Station is an operating facility with fly ash and bottom ash wastewater being generated and discharged to the Auxiliary Pond. The following defines the considered approach for closure of this pond. Additional assumptions are summarized in Section 2.2.

Auxiliary Pond

- Completely fill with CCR material generated at the facility, regrade CCR material in pond to balance cut/fills, and install final cover. The surface water drainage channels will be sized to provide retention and the existing outlet structure would be modified or breach of the dike to regulate discharge during a storm event. Both the fly ash system and bottom ash system will be converted to a dry system along with being converted to a closed-loop system with no discharge to the pond.
- Surface water within Auxiliary Pond will be removed before closure begins to allow surface improvement and dry material placement in Auxiliary Pond. Other potential subgrade improvements are described under assumptions below.
- Auxiliary Pond will receive material from the station until airspace capacity is full. Excess CCR material will be properly disposed of in the onsite landfill. Details are located in Section 3 - Estimated Material Volumes and Areas, Table 3-1.

Regulatory Strategy

- Compliance with the Final CCR Rule.
- Closure activities will be permitted by the Kentucky Department of Environmental Protection (KYDEP).

The volume of CCR to be managed (that is, excavated, placed and regarded within the pond) was developed using AutoCAD drawings provided by LG&E-KU on June 23, 2015 and computer aided engineering (CAE) software. The proposed conceptual pond closure approach is presented in drawings provided in Attachment 1.

Design Assumptions

The design assumptions used for the proposed conceptual CCR pond closure approach is as outlined in our proposal and discussed with LG&E-KU at our kickoff meeting on June 23, 2015, and are summarized below:

- The existing conditions were established from AutoCAD files provided by LG&E-KU on June 23, 2015.

- In order to estimate the volume of CCR in the Auxiliary Pond, a surface was developed in AutoCAD based on data and elevations provided by LG&E-KU. It was determined that the ash in the Auxiliary Pond could be regraded to balance cuts/fills and closed.
- Volume calculations are based on an in-place (moist) density 1 ton per cubic yard (74 pounds per cubic foot) for all cut and placed CCR material, and does not account for shrinkage/swell during placement. Quantities do not consider settlement of in-place CCR because of dewatering or new fill/cover loads. Changes to these assumptions should be verified during design development.
- It is assumed these CCR ponds meet the structural integrity requirements, and the pond closure approaches are geotechnically stable as shown. This information will be confirmed during design development.
- Improvements to prepare a workable CCR surface include removing surface water, localized regrading to facilitate dewatering, and installing a geotextile, a layer of dry CCR, and geogrid.
- Final cover surface drainage channels are inside the perimeter dikes, and would include final cover and be lined with structural reinforcement (turf reinforcement mat, riprap etc.), as necessary.
- The dikes will be used without increasing or decreasing height. Some improvements may be required based on the U.S. Environmental Protection Agency (USEPA) dam assessment findings but are outside this project scope. The dikes may be able to be knocked down and used for final cover. However, this will need to be coordinated with the appropriate regulatory agency and therefore these volumes were not included in this evaluation.
- CCR within the pond will be regarded and used to fill the pond beneath the final cover.
- The final cover (cap) is assumed to consist of 40-mil linear low-density polyethylene liner (LLDPE) placed directly on subgrade (CCR) and covered with geocomposite, 1.5 feet of soil, and 0.5 foot of vegetated topsoil. The final cover will extend on top of the dikes due to the potential that ash may be contained within the dikes.
- A maximum of five percent slope was used for the final cover. CH2M developed closure design to reach the five percent slope or to account for beneficial reuse of CCR material until 2023.
- Modification will be required to the Kentucky Pollutant Discharge Elimination System (KPDES) discharge structure location to ensure permit compliance.
  - The CCR pond discharge structures will be modified to ensure stormwater flows to the KPDES discharge structure and permit compliance.
  - The waste material from the discharge structures will be disposed of properly.
- Material accumulated in Auxiliary Pond will include some wet discharges; but by January 2017, the CCR material sent to Auxiliary Pond (gypsum and ash) are expected to be dry. Expected CCR material discharges to Auxiliary Pond are summarized in Table 3-1. Material accumulation in Auxiliary Pond will continue until at least 2019, but could continue until 2023 or until the future fill capacity of Auxiliary Pond is maximized.
  - Auxiliary Pond to receive material from the plant through 3rd quarter of 2018. Material quantities are summarized in Table 3-2. It is anticipated that capacity for Auxiliary Pond will be achieved in the 2nd/3rd quarter of 2019, based on the projections provided by LG&E-KU. This date may change due to actual CCR generation rates.
  - Auxiliary Pond to receive beneficial use material from October 17, 2018 until December 31, 2023.
- The station will construct new concrete process tanks in a location to be determined by LG&E-KU plant personnel. There will be four concrete tanks covering approximately 3.3 acres at a depth of 24-

feet (two tanks 360-feet x 90-feet and two tanks 360-feet x 110-feet). Also within this vicinity of the concrete tanks, will be a dewatering system facility to remove water from solids.

- CH2M HILL conceptual closure approach included filling Auxiliary Pond with CCRs materials within the existing top of dike elevation and including retention and control of storm water. It is anticipated these pond closure approaches will handle the stormwater runoff, but verification will be performed in design development.
- Surface water within Auxiliary Pond will be removed before closure begins to allow surface stabilization and dry material placement.
- The top of the dike already includes an aggregate perimeter road.
- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade, and will include the components described in the assumptions below. Conceptual grades are shown in Attachment 1, Exhibit 2-1. Significant grading features include the following:
  - A perimeter drainage ditch is shown within the berm. The ditch shows a high point near the south end, dropping at approximately 0.5 percent to the northwest. One existing discharge penetration is shown through the dike leading to the KPDES permitted outfall.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 10 feet above the ditch invert or the top elevation of the berm crest, whichever is lower. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2-2 has an airspace capacity of approximately 1,233,800 cubic yards above the existing CCR surface grade.
- Airspace capacity under ATB cover could be increased (or reduced), as necessary, by approximately 53,600 cubic yards per foot by extending the 4H:1V ditch slope height to the full perimeter berm elevation, or reducing the maximum height of the mound. Capacity could be reduced by modifying the 4H:1V ditch slope height. Ditch grades should also be refined to create local low points at the perimeter drainage ditch discharge point. Such design refinements should not significantly change the estimated closure costs.
- LG&E-KU to evaluate diversion of process water flows from Auxiliary Pond.

3 Estimated Material Volumes and Areas

The volume of fly ash, bottom ash, and gypsum generated by the station and available for use as fill is summarized in Table 3-1. Total production rates by year are as communicated by LG&E-KU on June 23, 2015, and the portion sent to the ponds each year are based on the 2015 year to date production rates provided by LGE-KU on July 1, 2015.

Table 3-1. Estimated CCR Production by Year – Total and Distribution by Ponds

	Total CCR Production (Tons)				Assumed CCR Distribution (Tons)
Year	**Bot Ash**	**Fly Ash**	**Gypsum**	**TOTAL**	**Auxiliary Pond [1]**
2015	15,324	61,297	148,810	225,431	225,431
2016	17,747	70,986	153,590	242,323	242,323
2017	18,087	72,350	171,435	261,873	261,873
2018	18,856	75,426	178,725	273,007	273,007
2019	17,072	68,289	161,818	247,180	123,478[2]
2020	17,201	68,803	162,959	248,963	-
2021	15,241	60,962	144,359	220,562	-
2022	13,931	55,723	131,929	201,583	-
2023	14,191	56,766	134,439	205,396	-
		TOTAL			**1,126,111[3]**

Notes:
[1] Assumes that 100 percent of bottom ash, fly ash, and gypsum will be sent to the Auxiliary Pond through October 17, 2018, which will be the baseline for closure design.
[2] Material assumed to be sent to Auxiliary Pond until the closure airspace capacity is full, with remainder sent to landfill. Approximately 1.0 M tons of bottom ash, fly ash, and gypsum will need to be diverted to the land fill from 2019 to 2023.
[3] Final cover volume is removed from the calculation of Assumed CCR Distribution.

The proposed CCR pond closure approach was developed using CAE software and AutoCAD files provided by LG&E-KU as described under assumptions above. Summaries of the estimated material quantities are shown in Table 3-2.

Table 3-2. Proposed Conceptual Pond Closure Approach Estimated Material Quantities – Auxiliary Pond

Item	Units	Quantity
Total surface area	AC	33.2
Standing surface water (to remove)	GAL	10,727,900
Length of perimeter	LF	5,400
CUT: Existing Surface to Final Cover Subgrade		
Cut/regrade for cover subgrade/ditch	CY	11,500
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**1,137,600**
FILL SOURCES:		
From cut for final cover subgrade	CY	11,500
From CCR accumulation in ATB-1 - Jan. 2017 thru 2018	CY	1,002,600
From CCR accumulation in ATB-1 - Jan. 2019 thru 2023	CY	123,500
TOTAL POTENTIAL FILL through 2018	**CY**	**1,002,600**
TOTAL POTENTIAL FILL through 2023	**CY**	**1,123,700**
Final cover soil volume	CY	107,600
Potential Excess Fill: (to be accommodated in settlement)	**CY**	**24,700**
Potential Excess Fill: (to be sent to Landfill)	**CY**	**1,000,200**

The proposed conceptual pond closure approach shows that CCR from the Auxiliary Pond can be closed in-place. The Auxiliary Pond dikes may be able to be knocked down and used for final cover. However, this will need to be coordinated with the appropriate regulatory agency and therefore these volumes were not included in this evaluation.

4 Schedule

Exhibit 2-4 in Attachment 3 show the proposed schedule to complete the design, permitting, and construction for each of the pond closures.

5 Construction Cost Estimate

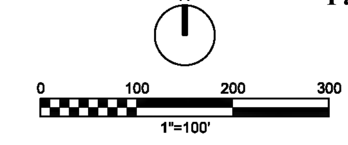
The estimated construction cost for closing the ponds as described in Section 2 is shown within Attachment 2.

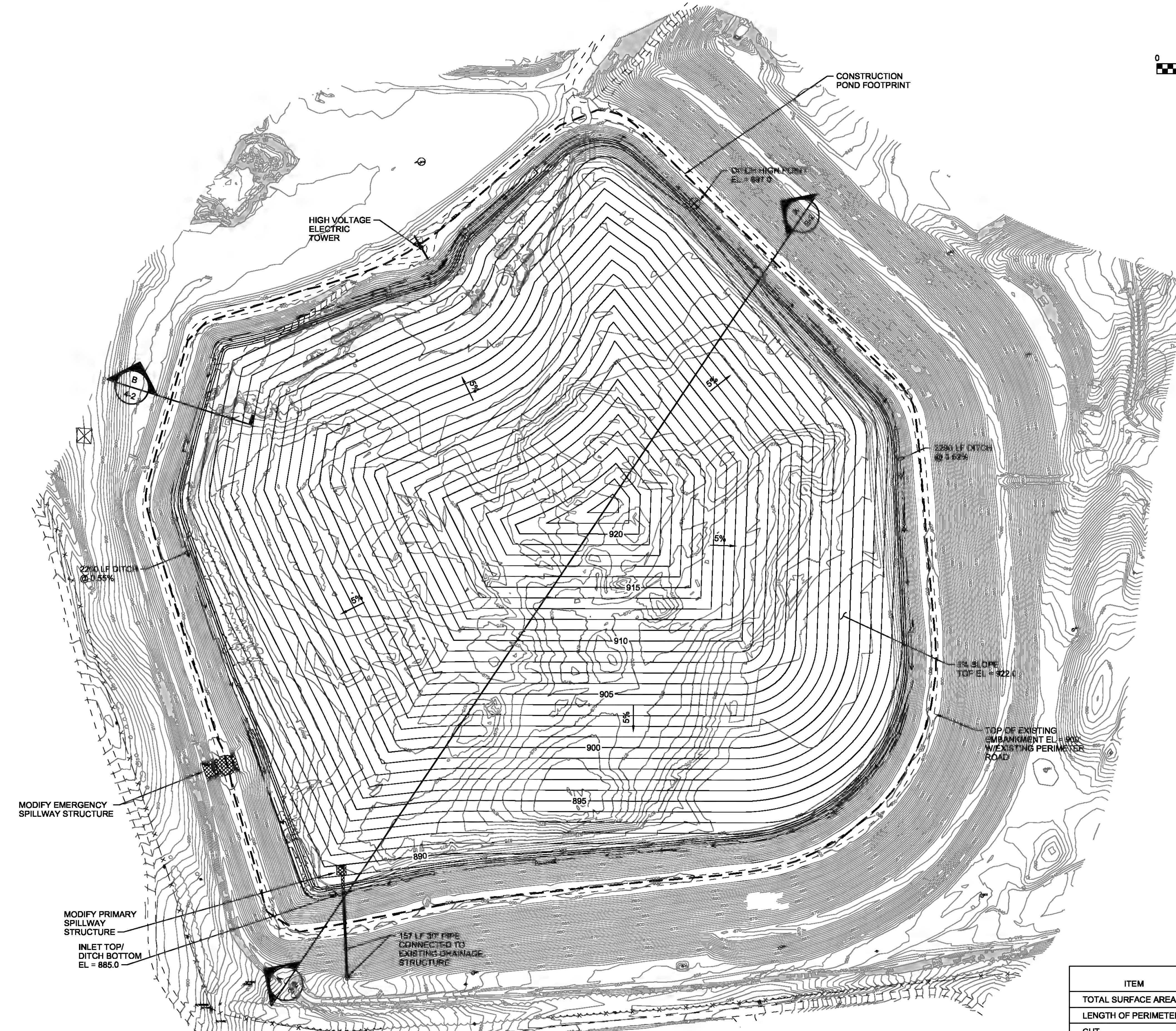
Proposed Conceptual Closure Approach1	Low (-30%)	Total Capital Cost	High (+30%)
Auxiliary Pond Closure	$18.1 M	$25.9 M	$33.6 M
Concrete Tanks	$44.0 M	$62.9 M	$81.8 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and preliminary engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

Attachment 1
Proposed Conceptual Alternative CCR Closure





ITEM	UNITS	AUXILLARY POND
TOTAL SURFACE AREA	ACRES	33.2
LENGTH OF PERIMETER	LINEAR FEET	5,400
CUT	CUBIC YARDS	11,500
FILL TO FINAL GRADE	CUBIC YARDS	1,137,600
COVER FILL TO FINAL GRADE	CUBIC YARDS	107,600
EXCESS MATERIAL	CUBIC YARDS	24,700
TOTAL AIRSPACE AVAILABLE	CUBIC YARDS	-

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD

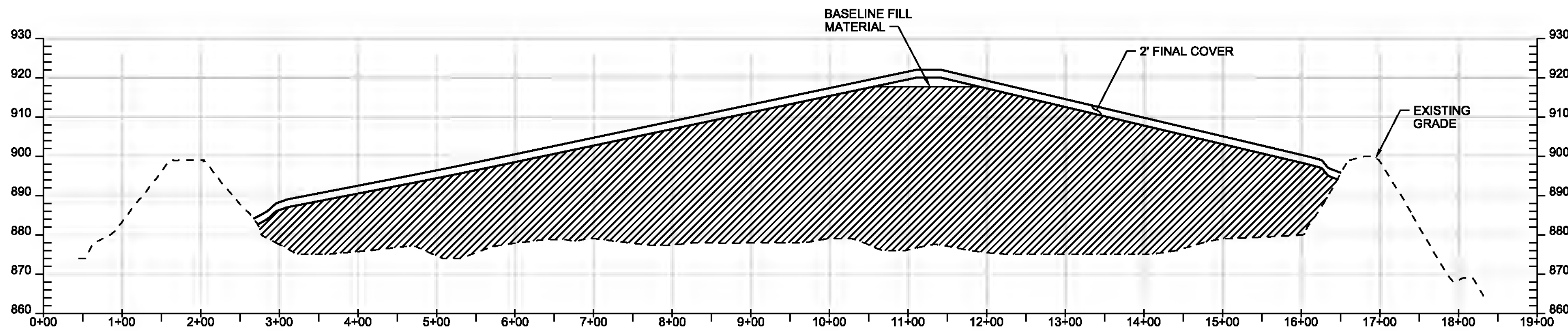
COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL®

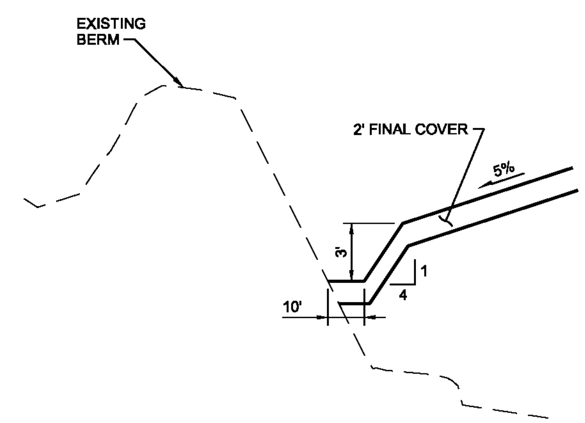
E.W. BROWN
CONCEPTUAL CLOSURE PLAN
AUXILIARY POND

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2-1
SHEET	of



A SECTION
SCALE: 1" = 100' HORIZ
1" = 20' VERT
2-1



B SECTION
NTS

NO. | DATE | REVISION | BY | APVD
DSGN | DR | CHK | APVD

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL.

E.W. BROWN
CONCEPTUAL CLOSURE SECTIONS
AUXILIARY POND

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2-2
SHEET	of

Attachment 2
Proposed Conceptual Alternative Cost Estimate

COST SUMMARY

Site:	E.W. Brown Generation Station	**Base Year:**	2015
Location:	Harrodsburg, Kentucky	**Date:**	September
Phase:	Proposed Conceptual CCR Closure	**ROM Level:**	Class 4

	Auxiliary Pond	Concrete Tanks
Remedial Technology	Fill Auxilary Pond with CCR's, install final cover and close in-place.	Installation of CCR concrete tanks
Description	Fill Auxilary Pond with CCR's generated at facility or from other LG&E-KU facilities, install final cover, stormwater control improvements and close in-place.	Installation of four new concrete treatement tanks to handle waste water associtated with CCR materials at the facility.
Impoundment Closure	$24,988,241	$0
LG&E Overhead	$874,588	$0
New Construction	$0	$60,786,678
LG&E Overhead	$0	$2,127,534
Total Initial Costs	$25,862,829	$62,914,212
Upper ROM Range	$33,621,678	$81,788,475
Lower ROM Range	$18,103,980	$44,039,948
O&M Period	0 years	0 years

This is not an offer for construction and/or project execution. Please note, these order of magnitude cost estimates are assumed to represent the actual installed cost within the range of - 30 percent to + 30 percent of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

CCR Rule - E.W. Brown Generating Station Cost Estimate - Aux Pond
24-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Proposed Conceptual Alternative CCR Closure - Auxiliary Pond	**$24,988,241**	**0%**	**3%**	**3%**	**2%**	**16%**	**14%**	**14%**	**24%**	**24%**	**100%**										
IMPOUNDMENT CLOSURE	**$19,221,724**	**0.0%**	**2.5%**	**3.4%**	**2.1%**	**16.3%**	**14.2%**	**14.4%**	**23.5%**	**23.5%**	**100%**	**$0**	**$504,400**	**$713,856**	**$449,946**	**$3,668,627**	**$3,323,167**	**$3,503,043**	**$5,945,648**	**$6,189,566**	**$24,298,253**
Mobilization/Demobilization	$100,000	0%	0%	0%	0%	80%	0%	0%	0%	20%	100%	$0	$0	$0	$0	$93,589	$0	$0	$0	$27,371	$120,960
Sediment & Erosion Control	$25,000	0%	0%	0%	0%	50%	10%	10%	10%	20%	100%	$0	$0	$0	$0	$14,623	$3,042	$3,163	$3,290	$6,843	$30,961
Site Preparation	$91,750	0%	0%	0%	0%	50%	50%	0%	0%	0%	100%	$0	$0	$0	$0	$53,667	$55,814	$0	$0	$0	$109,481
Dewatering	$214,556	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$251,001	$0	$0	$0	$0	$251,001
Repair On-Site Pond Embankments	$200,000	0%	0%	0%	0%	20%	20%	20%	20%	20%	100%	$0	$0	$0	$0	$46,794	$48,666	$50,613	$52,637	$54,743	$253,453
Utility Services	$100,000	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$116,986	$0	$0	$0	$0	$116,986
Perimeter Berm (NO COST ASSOCIATED WITH THIS STATION)	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Roads	$71,934	0%	0%	0%	0%	20%	20%	20%	20%	20%	100%	$0	$0	$0	$0	$16,831	$17,504	$18,204	$18,932	$19,689	$91,160
Pre-Closure / Preparation	$8,514,557	0%	0%	0%	0%	25%	25%	25%	25%	0%	100%	$0	$0	$0	$0	$2,490,207	$2,589,815	$2,693,408	$2,801,144	$0	$10,574,574
Closure/Final Cover	$5,094,026	0%	0%	0%	0%	0%	0%	0%	30%	70%	100%	$0	$0	$0	$0	$0	$0	$0	$2,011,017	$4,880,068	$6,891,086
Clean Closure Material (NO COST ASSOCIATED WITH THIS STATION)	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Surface Water Features	$275,000	0%	0%	0%	0%	0%	0%	0%	20%	80%	100%	$0	$0	$0	$0	$0	$0	$0	$72,376	$301,085	$373,461
Primary Outlet Structure	$150,000	0%	0%	0%	0%	0%	0%	20%	80%	0%	100%	$0	$0	$0	$0	$0	$0	$37,960	$157,912	$0	$195,871
Emergency Outlet Structure	$100,000	0%	0%	0%	0%	0%	0%	20%	80%	0%	100%	$0	$0	$0	$0	$0	$0	$25,306	$105,275	$0	$130,581
Ditches (included in Final Cover - NO COST ASSOCIATED WITH THIS STATION)	$0	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Surface Restoration	$164,900	0%	0%	0%	0%	0%	0%	20%	30%	50%	100%	$0	$0	$0	$0	$0	$0	$41,730	$65,099	$112,839	$219,668
Groundwater Monitoring	$220,000	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%	$0	$114,400	$118,976	$0	$0	$0	$0	$0	$0	$233,376
Conceptual Design	$250,000	0%	80%	20%	0%	0%	0%	0%	0%	0%	100%	$0	$208,000	$54,080	$0	$0	$0	$0	$0	$0	$262,080
Final Design and Permitting and permitting support	$1,000,000	0%	10%	50%	40%	0%	0%	0%	0%	0%	100%	$0	$104,000	$540,800	$449,946	$0	$0	$0	$0	$0	$1,094,746
PDI	$75,000	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$78,000
Construction Management including CQA and OE services	$2,500,000	0%	0%	0%	0%	20%	20%	20%	20%	20%	100%	$0	$0	$0	$0	$584,929	$608,326	$632,660	$657,966	$684,285	$3,168,166
Closure Report	$75,000	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$102,643	$102,643
Subtotal	**$19,221,724**											**$0**	**$504,400**	**$713,856**	**$449,946**	**$3,668,627**	**$3,323,167**	**$3,503,043**	**$5,945,648**	**$6,189,566**	**$24,298,253**
Contingency	$5,766,517	0%	3%	3%	2%	16%	14%	14%	24%	24%	100%	$0	$0	$0	$0	$0	$0	$0	$3,644,738	$3,644,738	$7,289,476
Subtotal with Contingency	**$24,988,241**											**$0**	**$504,400**	**$713,856**	**$449,946**	**$3,668,627**	**$3,323,167**	**$3,503,043**	**$9,590,386**	**$9,834,303**	**$31,587,729**
LG&E & KU Overheads	$874,588	0%	3%	3%	2%	16%	14%	14%	24%	24%	100%	$0	$17,654	$24,985	$15,748	$128,402	$116,311	$122,607	$335,664	$344,201	$1,105,570
TOTAL PROJECT COST	**$25,863,000**											**$0**	**$522,000**	**$739,000**	**$466,000**	**$3,797,000**	**$3,439,000**	**$3,626,000**	**$9,926,000**	**$10,179,000**	**$32,694,000**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

Notes:

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: E.W. Brown Generating Station" technical memo dated July 24, 2015

2 - Assumes the use of CCR material to create grades to support the pond cap.

3 - Assumes the use of Soil material to create pond cap or other design features.

4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.

5 -Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

CCR Rule - E.W. Brown Generating Station Cost Estimate - Concrete Tanks
24-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Proposed Conceptual Alternative CCR Closure - Auxiliary Pond	**$60,786,678**	**0%**	**20%**	**40%**	**40%**	**0%**	**0%**	**0%**	**0%**	**0%**	**100%**										
NEW CONSTRUCTION	**$46,758,983**	**0.0%**	**20.0%**	**40.0%**	**40.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100%**	**$0**	**$9,725,868**	**$20,229,806**	**$21,038,999**	**$0**	**$0**	**$0**	**$0**	**$0**	**$50,994,673**
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	$8,628,979	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$1,794,828	$3,733,242	$3,882,571	$0	$0	$0	$0	$0	$9,410,641
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cost	$10,180,004	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$2,117,441	$4,404,277	$4,580,448	$0	$0	$0	$0	$0	$11,102,165
Dewatering Facility Order of Magnitude Capital Cost	$27,200,000	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$5,657,600	$11,767,808	$12,238,520	$0	$0	$0	$0	$0	$29,663,928
Mechanical Improvements/Additions	$750,000	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$156,000	$324,480	$337,459	$0	$0	$0	$0	$0	$817,939
Subtotal	**$46,758,983**											**$0**	**$9,725,868**	**$20,229,806**	**$21,038,999**	**$0**	**$0**	**$0**	**$0**	**$0**	**$50,994,673**
Contingency	$14,027,695	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$7,649,201	$7,649,201	$0	$0	$0	$0	$0	$15,298,402
Subtotal with Contingency	**$60,786,678**											**$0**	**$9,725,868**	**$27,879,007**	**$28,688,200**	**$0**	**$0**	**$0**	**$0**	**$0**	**$66,293,075**
LG&E & KU Overheads	$2,127,534	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$340,405	$975,765	$1,004,087	$0	$0	$0	$0	$0	$2,320,258
TOTAL PROJECT COST	**$62,914,000**											**$0**	**$10,066,000**	**$28,855,000**	**$29,692,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$68,613,000**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

Notes:

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: E.W. Brown Generating Station" technical memo dated July 24, 2015

2 - Assumes the use of CCR material to create grades to support the pond cap.

3 - Assumes the use of Soil material to create pond cap or other design features.

4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.

5 -Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

E. W. Brown Generating Station — **COST ESTIMATE SUMMARY**

Site: E. W. Brown Generating Station
Location: Shakertown, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Auxiliary Pond
Base Year: 2015
Date: 9/24/2015

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$100,000.00	$100,000	
SUBTOTAL Mobilization/Demobilization				**$100,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	1	LS	$25,000.00	$25,000	allowance for BPM
SUBTOTAL Sediment & Erosion Control				**$25,000**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350.00	$51,750	Allowance - Clear & grub areas on top of berms to receive fill
Surveying	1	LS	$25,000.00	$25,000	
Utility Locating	1	EA	$15,000.00	$15,000	
SUBTOTAL Site Preparation				**$91,750**	
Dewatering					
Dewatering and discharge through NPDES permit	10,727,822	GL	$0.02	$214,556	Assumes minor treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$214,556**	
Repair On-Site Pond Embankments					
Access Modifications on existing CCR Pond embankments	1	LS	$200,000.00	$200,000	Assume embankments in good condition; cost for maintenance and is not for structural integrity
SUBTOTAL Repair On-Site Pond Embankments				**$200,000**	
Utility Services					
Utility modifications	1	LS	$100,000.00	$100,000	Allowance - LG&E-KU to complete.
Shoring for tower foundations	1	LS	$0.00	$0	Shoring assumed to not be required.
SUBTOTAL Utility Services				**$100,000**	
Perimeter Berm (NO COST ASSOCIATED WITH THIS STATION)	1	LS	$0.00	$0	
SUBTOTAL Perimeter Berm (NO COST ASSOCIATED WITH THIS STATION)				**$0**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	1,900	CY	$37.86	$71,934	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$71,934**	
Pre-Closure / Preparation					
Cut/regrade material within Aux Pond	275	CY	$8.10	$2,228	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Geotextile (as needed, assume 100% of area for filling)	192,632	SY	$2.46	$473,875	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of area for filling)	192,632	SY	$3.00	$577,896	CH2M HILL, recent quote on similar project
Excavation and Load from Stockpile (CCR from facility operations)	1,002,633	CY	$1.39	$1,393,660	1 988 RT Loader (8 CY), rent $85.95 + FOG $95.81/hr + opr $75/hr x 50 hrs/9,216 CY/week
Hauling (assume 2 mile cycle)(CCR from facility operations)	1,002,633	CY	$2.96	$2,967,794	3 each, Cat 735 off-road trucks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
Placement and Compaction (from Plant)	1,002,633	CY	$2.39	$2,396,293	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	1,002,633	CY	$0.57	$571,501	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Cut/regrade for cover subgrade/ditch	11,455	CY	$8.10	$92,786	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Finish Grading, gentle slopes (assume 100% of pond)	192,632	SY	$0.20	$38,526	RSM 31 22 16.10 3300
SUBTOTAL Pre-Closure / Preparation				**$8,514,557**	
Closure/Final Cover					
Final Cover: 40-mil Tex/smooth LLDPE	1,446,192	SF	$0.65	$940,025	
Geocomposite (includes materials and installation)	1,446,192	SF	$0.55	$795,406	
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	80,712	CY	$20.00	$1,614,240	allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	26,904	CY	$20.00	$538,080	allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	107,616	CY	$4.36	$469,206	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	107,616	CY	$2.39	$257,202	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	107,616	CY	$0.57	$61,341	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Drainage System Piping	38	AC	$10,000.00	$380,000.00	Allowance
Finish Grading, gentle slopes	192,632	SY	$0.20	$38,526	RSM 31 22 16.10 3300
SUBTOTAL Closure/Final Cover				**$5,094,026**	
Clean Closure Material (NO COST ASSOCIATED WITH THIS STATION)	1	LS	$0.00	$0	
SUBTOTAL SUBTOTAL Closure/Final Cover				**$0**	
Surface Water Features					
Physical or Chemical Treatment plus CO2 Injection System	1	LS	$125,000.00	$125,000	as needed to support dewatering operations to support NPDES requirements; May 2015 cost estimate - Green River System
Items to meet NPDES Permit requirements	1	LS	$150,000.00	$150,000	
SUBTOTAL Surface Water Features				**$275,000**	
Primary Outlet Structure					
Upgrade outlet structure	1	LS	$150,000.00	$150,000	May 2015 cost estimate - Green River System Second Outfall Structure
SUBTOTAL Primary Outlet Structure				**$150,000**	
Emergency Outlet Structure					
Modify	1	LS	$100,000.00	$100,000	Grading and additional material to incorporate with final cover
SUBTOTAL Emergency Outlet Structure				**$100,000**	
Ditches (included in Final Cover - NO COST ASSOCIATED WITH THIS STATION)	1	LS	$0.00	$0	
SUBTOTAL Ditches (included in Final Cover - NO COST ASSOCIATED WITH THIS STATION)				**$0**	
Surface Restoration					
Mechanical Seeding & Mulching	38	AC	$3,550.00	$134,900	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$30,000.00	$30,000	
SUBTOTAL Surface Restoration				**$164,900**	
Groundwater Monitoring					
New Monitoring wells, 4" diam (6,036 LF perimenter)	8	EA	$17,500.00	$140,000	assumes well spacing 1 well/750 feet; 8 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL Groundwater Monitoring				**$220,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$15,321,724**	
Design, Project & Construction Management, and Closure Report					
Conceputal Design	1	LS	$250,000.00	$250,000	LGE provided based on experience
Final Design and Permitting and permitting support	1	LS	$1,000,000.00	$1,000,000	LGE provided based on experience
PDI	1	LS	$75,000.00	$75,000	LGE provided based on experience
Construction Management including CQA and OE services	1	LS	$2,500,000.00	$2,500,000	LGE provided based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$2,500,000.00	$0	LGE provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$3,900,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$19,221,724**	
NEW CONSTRUCTION					
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	1.0	LS	$8,628,979.30	$8,628,979	2 tanks, each is 360' x 90'x 24' deep. 2 tanks (~1.5 acres) - Total CCR tanks (-Contingency)
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cost	1.0	LS	$10,180,003.63	$10,180,004	**Refer to tab "Capital Cost Estimate" shows the Order of Magnitude Cost (-Contingency), details are not reflected below**
Dewatering Facility Order of Magnitude Capital Cost	1.0	LS	$27,200,000.00	$27,200,000	**From ELG Cost Sheet (-Contingency) July 2, 2015**
FGD Treatment Tanks					Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mix Tank Mixers	1.0	LS	$41,391.34	$41,391	" "
Flocculation Tank Mixers	1.0	LS	$41,391.34	$41,391	" "
Ferric Chloride Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Sulfuric Acid Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Organosulfide Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Polyblend System	1.0	LS	$53,400.00	$53,400	" "
Sodium Hydroxide Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Common Equipment					
Ferric chloride tank	1.0	LS	$0.00	$0	" "
Sulfuric Acid tank	1.0	LS	$0.00	$0	" "
Sodium Hydroxide Tank	1.0	LS	$0.00	$0	" "
Safety Shower	1.0	LS	$30,000.00	$30,000	" "
Total Equipment Cost (TEC)	**1.0**	**LS**	**$228,000.00**	**$228,000**	" "
Freight	1.0	LS	$7,169.81	$7,170	" "
Purchased Equipment Cost - Delivered (PEC-D)	**1.0**	**LS**	**$235,169.81**	**$235,170**	" "
FGD Treatment Tanks					
Mix Tanks Wall Concrete	1.0	LS	$18,674.40	$18,674	" "
Mix Tanks Slab Concrete	1.0	LS	$2,857.37	$2,857	" "
Floculation Tanks Wall Concrete	1.0	LS	$18,674.40	$18,674	" "
Floculation Tanks Slab Concrete	1.0	LS	$2,857.37	$2,857	" "
Settling Tanks Wall Concrete	1.0	LS	$1,675,555.56	$1,675,556	" "
Settling Tanks Slab Concrete	1.0	LS	$1,548,063.04	$1,548,063	" "
Total Ramp concrete, cy	1.0	LS	$308,101.52	$308,102	" "
Common Items					
Excavation - Soft	1.0	LS	$445,125.44	$445,125	" "
Pre Engineered building	1.0	LS	$120,000.00	$120,000	" "
Lining Tanks	1.0	LS	$366,572.16	$366,572	" "
Construction Material					
Construction Material	1.0	LS	$4,506,481.26	$4,506,481	" "
State Sales Tax	1.0	LS	$2,328.22	$2,328	" "
Subtotal Construction Material	**1**	LS	$4,508,809.49	**$4,508,809**	" "
Total Equipment and Construction	**1.0**	**LS**	**$4,743,979.30**	**$4,743,979**	" " " "
Other Construction					
Electrical and I&C	1.0	LS	$474,000.00	$474,000	" "
Piping	1.0	LS	$380,000.00	$380,000	" "
Yard Improvements (a)	1.0	LS	$380,000.00	$380,000	" "
Metals and Finishes	1.0	LS	$142,000.00	$142,000	" "
Subtotal Equipment/Construction/Other	**1**	LS	$6,119,979.30	**$6,119,979**	" "
Total Direct Costs (TDC)	**1.0**	**LS**	**$6,119,979.30**	**$6,119,979**	" "
Contractor's Field General Conditions	1.0	LS	$306,000.00	$306,000	" "
Contractor's OH&P	1.0	LS	$918,000.00	$918,000	" "
Contingency	**1.0**	**LS**	**$1,224,000.00**	**$1,224,000**	" "

Site: E. W. Brown Generating Station
Location: Shakertown, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Auxiliary Pond
Base Year: 2015
Date: 9/24/2015

Escalation Factor	**1.0**	**LS**	**$0.00**	**$0**	" "
Total Construction Cost (TCC)	**1.0**	**LS**	**$8,567,979.30**	**$8,567,979**	" "
Engineering, SDCc and Startup	**1.0**	**LS**	**$1,285,000.00**	**$1,285,000**	" "
Total Estimated Order of Magnitude Capital Cost	**1.0**	**LS**	**$9,852,979.30**	**$9,852,979**	" "
Total Estimated Order of Magnitude Capital Cost (-Contingency)	**1.0**	**LS**	**$8,628,979.30**	**$8,628,979**	Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mechanical Improvements/Additions					
Piping from Ash Pond to Plant	1	LS	$500,000.00	$500,000	allowance
Piping to new concrete tank	1	LS	$250,000.00	$250,000	allowance
SUBTOTAL Mechanical Improvements/Additions				**$750,000**	
SUBTOTAL NEW CONSTRUCTION				$46,758,983	

EW Brown Facility Backup Quantities   Nathan Zink   9/24/2015

CCR Production Handling Assumptions:

CCR Production Rates

% Bot Ash Wet Sluice to ATB1:	100%
% Fly Ash Wet Sluice to ATB1:	100%
% Gypsum returned:	100%

CCR Production - 2015 Plan (tons)

	EW Brown				Accumulated Material (Tons)			
Year	Bot Ash	Fly Ash	Gypsum	TOTAL	Auxiliary Pond			
2015	15,324	61,297	148,810	225,431	76,621	148,810	baseline	
2016	17,747	70,986	153,590	242,323	88,733	153,590		1,002,633
2017	18,087	72,350	171,435	261,873	90,437	171,435	beneficial re-use	
2018	18,856	75,426	178,725	273,007	94,282	178,725		1,123,683
2019	17,072	68,289	161,818	247,180	85,362	161,818		
2020	17,201	68,803	162,959	248,963	86,004	162,959		
2021	15,241	60,962	144,359	220,562	76,203	144,359		
2022	13,931	55,723	131,929	201,583	69,654	131,929		
2023	14,191	56,766	134,439	205,396	70,957	134,439		
2024	-	-	-	-	-	-		
2025	-	-	-	-	-	-		
Total:	**Assumed Additional Accumulated Material (2015 thru closure):**				738,254	1,388,063		2,126,317

Projected Material Generation - Handling Assumptions:

A. Bottom Ash and Flyash:
- Until October 19, 2015 assume all fly ash, bottom ash, and gypsum slurried to Auxiliary Pond, and
- After October 19, 2015 all material to the Aux. Pond to be dry

B. Gypsum
- Until October 19, 2015 assume all fly ash, bottom ash, and gypsum slurried to Aux. Pond, and
- After October 19, 2015 all material to the Aux. Pond to be dry

Approximate density of CCR in-place: 1 ton/CY

Orange:	To be confirmed by CAD
Yellow:	Based on assumptions as listed

Pond Quantity Balance Estimate - By Pond:

Auxiliary Pond

Item	Units	Aux. Pond	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	33.2				
Standing Surface Water (to remove)	GAL	10,727,822	53,115 CY of Volume for the wet pond area. Confirmed with CAD.		8	ft
Length of perimeter	LF	5,426				
CUT:						
CCR cut in 2017 - for Auxiliary Pond	CY	275	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
Cut/regrade for cover subgrade/ditch	CY	11,455	Assume Trapazoidal channel 3H:1V 3-ft deep with 10-ft bottom	CAD - confirm cut to grade ditches for final cover	57	SF
FILL (to cover subgrade):						
CCR for Fill - from Baseline	CY	1,002,633				
Total Fill - Existing surface to final grade	CY	1,233,727	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Total Fill for Closure of Pond	CY	1,022,967	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	20,058				
Final Cover Soil Volume	CY	107,616	CAD to update			
Final Cover Surface Area	AC	33.2	CAD to update			
Structural Support						
Geogrid	AC	39.8	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Geofabric	AC	39.8	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Amount of CCR/import fill required to close pond [a]	CY	1,233,727	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Cut: existing surface to final grade	CY	409,085	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Fill: existing surface to final grade	CY	1,130,307	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Net: existing surface to final grade	CY	1,289,795	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			

[a] Dewatering and settlement of ash through closure activities will affect the quantities of fill material. In situ ash and geotechnical soil borings and testing are recommended to determine settlement during closure design.

[b] Represents volume of pond.

Other Key Assumptions:

LG&E-KU
Brown Station
Settling Tank-based Treatment System
Mass Balances - FGD Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	FGD Wastewater	Mix Tank Influent	Sodium Hydroxide Feed (2)	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
3-Month Average Flow											
Volumetric Flow, 3-month averag	gpm	275	275	0.01	0.01	0.01	0.14	0.014	281	26	253
Total Mass Flow	lb/hr	140,362	140,362	9	10	3	69	13	140,456	13,766	126,690
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	3	0	0	0			
Mass Flow Liquid	lb/hr	137,610	137,610	9	10	3	69	13	137,701	11,013	126,688
Mass Flow Solids	lb/hr	2,752	2,752	0	3	0	0	0	2,755	2,753	1.9
Specific Gravity		0.00	0.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	0.0	0.0	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	375	375	0.02	0.02	0.01	0.19	0.014	383	35	345
Total Mass Flow	lb/hr	191,403	191,403	12	13	4	94	13	191,530	18,759	172,772
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	4	0	0	0			
Mass Flow Liquid	lb/hr	187,650	187,650	12	13	4	94	13	187,773	15,007	172,766
Mass Flow Solids	lb/hr	3,753	3,753	0	4	0	0	0	3,757	3,752	5.2
Specific Gravity		0.00	0.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	0.0	0.0	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4

Notes:

xx	User Entered

LG&E-KU
Brown Station
Settling Tank-based Treatment System
Mass Balances - Other Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	Other Wastewater	Mix Tank Influent	Sodium Hydroxide Feed	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
DESIGN FLOW											
Volumetric Flow, 3 month ave	gpm	6,339	6,339	0.32	0.32	0.13	3.17	0.317	6,344	1	6,342
Total Mass Flow	lb/hr	3,172,353	3,172,353	203	291	75	1,586	292	3,174,507	733	3,173,774
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.0%	20%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	67	0	0	0			
Mass Flow Liquid	lb/hr	3,172,036	3,172,036	203	224	75	1,586	292	3,174,123	396	3,173,727
Mass Flow Solids	lb/hr	317	317	0	67	0	0	0	384	337	47.6
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	10,473	10,473	0.524	0.524	0.209	5.237	0.524	10,481	5	10,476
Total Mass Flow	lb/hr	5,241,213	5,241,213	335	369	124	2,620	482	5,244,773	2,388	5,242,385
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.0%	20%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	111	0	0	0			
Mass Flow Liquid	lb/hr	5,240,689	5,240,689	335	369	124	2,620	482	5,244,138	1,911	5,242,228
Mass Flow Solids	lb/hr	524	524	0	111	0	0	0	635	478	157.3
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4

Notes:

xx	User Entered

Equipment Sizing

	FGD Treatment	Other Water Treatment	Tom's comments - red = not addressed, black = addressed
Mix Tanks			
Design Flow, gpm	275	6,339	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	375	10,473	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	13.6	16.5	
HDT Peak, Min	10	10	
Mix Tank Volume, gal	3,750	104,730	
Mix Tank Volume, cf	501	14,000	
Side Water Depth, ft	10	23	
Freeboard, ft	2	2	
Wall Height, ft	12	25	
Length/width, ft	7	25	inside dimensions
Slab Area, sf	129	658	
Wall length, ft	16	51	Wall length split between Mix tanks and floc tanks
Wall Area, sf	388	1,284	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	29	95	
Slab Volume, cy	10	49	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	0.38	10.47	
Actual HP	0.5	10.0	
Number	2	2	
Outlet Pipe Nominal Diameter, in	6	24	FRP Pipe
Outlet Pipe ID, in	6	24	
Outlet Pipe Velocity, fps	4.26	3.72	Design for max 3-4 fps
Outlet Pipe Elevation, ft	98	98	
Pipe Head Loss to Floculation Tank, Ft	0.66	0.46	
Number of Dip Tubes	1	2	We will want to design 2 different size dip tubes for other wastewater, a lower one that is smaller for low flows and a larger one for high flow conditions. We need a minimum velocity to suck solids out of the tank, and max velocity to prevent shear.
Ground Elevation, ft	100	100	Assumed ground elevation
Mix Tank Top Elevation, Ft	102	102	
Mix Tank Water Elevation, Ft	100.0	100.0	
Mix Tank Bottom Elevation, Ft	90.0	77.0	

Flocculation Tanks			
Average Flow, gpm	275	6,339	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	375	10,473	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	13.6	16.5	
HDT Peak, Min	10	10	
Mix Tank Volume, gal	3,750	104,730	
Mix Tank Volume, cf	501	14,000	
Side Water Depth, ft	10	23	
Freeboard, ft	2	2	
Wall Height, ft	12.0	25.0	
Length/width, ft	7	25	inside dimensions
Slab Area, sf	129	658	
Wall length, ft	16	51	Wall length split between Mix tanks and floc tanks
Wall Area, sf	388	1,284	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	29	95	
Slab Volume, cy	10	49	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	0.38	10.5	
Actual HP	0.5	10.0	
Number	2	2	
Outlet Pipe Nominal Diameter, in	6	24	FRP
Outlet Pipe ID, in	6	24	
Outlet Pipe Velocity, fps	4.26	3.72	Design for max 3-4 fps
Outlet Pipe Elevation, ft	98	98	
Pipe Head Loss to Floculation Tank	0.66	0.46	
Number of Dip Tubes	1	2	We will want to design 2 different size dip tubes for other wastewater, a lower one that is smaller for low flows and a larger one for high flow conditions. We need a minimum velocity to suck solids out of the tank, and max velocity to prevent shear.
Mix Tank Top Elevation, Ft	102	102	
Mix Tank Water Elevation, Ft	100.0	100.0	
Mix Tank Bottom Elevation, Ft	90.0	77.0	

Settling Tanks			
Average Flow, gpm	275	6,339	Calculate overflow rate on peak flow, solids storage on average flow
Max Design Flow, gpm	375	10,473	
Design solids, mg/L	20,000	100	
Daily solids production , lbs/day	66,123	9,223	
Solids concentration (Settled solids)	20%	5%	Settled solids
Solids density, lbs/cf	80	80	dry solids
Solids generation, cf/day	4,133	2,306	
Solids Storage, days	94	206	
Solids Storage per tank, cf	388,800	475,200	< 1 yr solids capacity for Other WW ssytem.
Number of Tanks	2	2	
Tank Depth, ft	24	24	
Freeboard, ft	2	2	
Side Water Depth, ft	22	22	
Water depth above settled solids	10	10	
Solids Depth,ft	12	12	
Total Tank Volume, gal per tank	5,331,744	6,516,576	
Total Tank Volume, CF per tank	712,800	871,200	

Solids Storage Volume, gal per tank	2,908,224	3,554,496	
Solids Storage Volume, CF per tank	388,800	475,200	
Tank Width, ft	90	110	Set based on solids storage capacity for FGD WW and overflow rate for other WW Treatment
L/W Ratio	4	3.3	
Tank Length, ft	360	360	
Slab Area, sf	69,663	83,324	
Wall length, ft	1,450	1,530	
Wall Area, sf	34,800	36,720	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.0	2.0	
Wall Volume, cy	2,578	2,720	
Slab Volume, cy	5,160	6,172	
Overflow Rate Average, gpm/sf	0.0085	0.1601	
Overflow Rate peak, gpm/sf	0.0116	0.264	Want to stay at 0.26 gpm/sf
Flow capacity based on average overflow rate, gpm	300	6,300	one train
Flow capacity based on Peak overflow rate, gpm	380	10,470	One train
Settling Tank Top Elevation, Ft	100.7	101.1	
Settling Tank Water Elevation, Ft	98.7	99.1	
Setling Tank Bottom Elevation, Ft	76.7	77.1	

Access Ramp to Settling Tank			
Access Ramp Inside Settling tank Width, ft	30	30	Need two way truck traffic
Ramp Slope, %	12%	12%	
Ramp tickness, ft	1.50	1.50	Assumed.
Ramp Length, ft	201	201	
Ramp area, sf	6043	6043	
Ramp side wall area sf	2400	2400	
Ramp side wall Thickness, ft	2	2	
Sidewall concerte, cft	4800	4800	
Access Ramp concrete, cft	9065	9065	
Total Ramp concrete, ft3	13865	13865	
Total Ramp concrete, cy	514	514	Per ramp

Excavation, cy	163,742		
Liner			
Liner, ft2	111,539	129,970	
Liner, SY	12,393	14,441	

Chemical Feeds

Ferric Chloride Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	375	10,473	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	Use 50
Maximum Feed Rate, gph	1.1	31.4	
Average Flow to treat, gpm	275	6,339	
Average Feed Rate, gph	0.8	19.0	
Average Treatment Volume, MGD	0.40	9.13	
Average Usage, gpd	20	456	
Average usage of chemical for FGD WW and Other WW	476		
Max Day Treatment Volume, MG	0.54	15.1	
Normal Maximum Usage, gpd	27	754	
Max usage of chemical for FGD WW and Other WW, gpd	781		
Nominal Storage Tank Volume, gal	6,000		
Number of Tanks	1		
Total Storage Volume, gal	10,000		Includes 4000 gallon extra capacity for tank truck loading
Storage Time at normal max usage, days	13		
Storage Time at average usage, days	21		Size for ~ 21 days capacity at average usage

Sulfuric Acid Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	375	10,473	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	1	31	
Average Flow to treat, gpm	275	6,339	
Average Feed Rate, gph	0.8	19	
Average Treatment Volume, MGD	0.4	9.1	
Average Usage, gpd	20	456	
Average usage of chemical for FGD WW and Other WW	476		
Max Day Treatment Volume, MG	0.54	15.1	
Normal Maximum Usage, gpd	27	754	
Max usage of chemical for FGD WW and Other WW	781		
Nominal Storage Tamk Volume, gal	6,000		
Number of tanks	1		
Total Storage Volume, gal	10,000		Each tank. Includes 4000 gal for tanker truck.
Storage Time at normal max usage, days	13		
Storage Time at average usage, days	21		Size for ~ 21 days capacity at average usage

Sodium Hydroxide Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	375	10,473	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	1.1	31.4	
Average Flow to treat, gpm	275	6,339	
Average Feed Rate, gph	0.8	19.0	
Average Treatment Volume, MGD	0.40	9.1	
Average Usage, gpd	20	456	
Average usage of chemical for FGD WW and Other WW	476		
Max Day Treatment Volume, MG	0.54	15.1	
Normal Maximum Usage, gpd	27	754	
Max usage of chemical for FGD WW and Other WW	781		
Nominal Storage Tank Volume, gal	6,000		common Tank
Number of tanks	1		
Total Storage Volume, gal	10,000		Includes 4000 gallon extra capacity for tank truck loading
Storage Time at normal max usage, days	13		
Storage Time at average usage, days	21		Size for ~ 21 days capacity at average usage

Organosulfide Feed			
Number of pumps	2	2	
Maximum Flow to treat, gpm	375	10,473	
Dose (volume of chemical/volume of wastewater), ppmv	20	20	
Maximum Feed Rate, gph	0.45	12.6	
Average Flow to treat, gpm	275	6,339	
Average Feed Rate, gph	0.3	7.6	
Average Treatment Volume, MGD	0.40	9.1	
Average Usage, gpd	7.9	183	
Average usage of chemical for FGD WW and Other WW, gpd	190		
Max Day Treatment Volume, MG	0.54	15.1	
Normal Maximum Usage, gpd	10.8	302	
Max usage of chemical for FGD WW and Other WW, gpd	312		
Nominal Storage Tank Volume, gal	2000		
Number of tanks	1		
Total Storage Volume, gal	6000		
Storage Time at normal max usage, days	19		
Storage Time at average usage, days	31		Size for ~ 21 days capacity at average usage

Polymer Feed System			
Number of polymer blending units	2	2	
Maximum Flow to treat, gpm	375	10,473	
Dose (volume of chemical/volume of wastewater), ppmv	5	5	1:100 ratio neat polymer to water
Maximum Feed Rate, gph	0.11	3.14	
Dilution Water Feed (volume to volume of neat polymer)	100	100	
Maximum Flow of Dilution water, gph	11.3	314.2	
Average Flow to treat, gpm	275	6,339	
Average Feed Rate, gph	0.08	1.90	
Average Treatment Volume, MGD	0.40	9.13	
Average Usage, gpd	2.0	45.6	
Average usage of chemical for FGD WW and Other WW, gpd	48		
Max Day Treatment Volume, MG	0.54	15.1	
Normal Maximum Usage, gpd	2.7	75	
Max usage of chemical for FGD WW and Other WW, gpd	78		
Nominal Storage Tote Volume, gal	265		265 or 320 gallons are standard volumes/sizes for totes
Number of totes	4		
Total Storage Volume, gal	1060		
Storage Time at normal max usage, days	14		
Storage Time at average usage, days	22		Size for ~ 21 days capacity at average usage

Note: User Input

Head loss influent Mix tank to Floccuation Tank FGD Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		6	6		0.78	375	0.84	4.26	0.28	150	0.00	0.22	0.22
	pipe	FRP		6	6	10		375	0.84	4.26	0.28	150	0.09	0.00	0.09
0	tee, branch	FRP		6	6		0.72	375	0.84	4.26	0.28	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		6	6		0.19	375	0.84	4.26	0.28	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		6	6		0.19	375	0.84	4.26	0.28	150	0.00	0.05	0.05
				6	6			375							
	pipe	FRP		6	6	2		375	0.84	4.26	0.28	150	0.01	0.00	0.01
1	exit loss	FRP		6	6		1.00	375	0.84	4.26	0.28	150	0.00	0.28	0.28

Total head loss **0.66**
total minor loss **0.56**

Head loss influent Mix tank to Floccuation Tank, Other Water Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		24	24		0.78	5,237	11.67	3.71	0.22	150	0.00	0.17	0.17
	pipe	FRP		24	24	23		5,237	11.67	3.71	0.22	150	0.03	0.00	0.03
0	tee, branch	FRP		24	24		0.72	5,237	11.67	3.71	0.22	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		24	24		0.19	5,237	11.67	3.71	0.22	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		24	24		0.19	5,237	11.67	3.71	0.22	150	0.00	0.04	0.04
				24	24			5,237							
				24	24										
	pipe	FRP		24	24	2		5,237	11.67	3.71	0.22	150	0.00	0.00	0.00
1	exit loss	FRP		24	24		1.00	5,237	11.67	3.71	0.22	150	0.00	0.22	0.22

Total head loss **0.46**
total minor loss **0.42**

Excavation Calculation FGD WW and Other WW Tanks

Settling Tank Depth below grade=	22	ft	
Depth Below Tank for Excavation =	4	ft	
Depth of excavation	26	ft	
Side Slope (H:V) =	1	ft/ft	
Tank wall thickness	2	ft	
FGD WW Tank Length =	360	ft	
FGD WW Tank Width =	90	ft	
Number of FGD WW Tanks =	2		
FGD WW Tank Length =	360	ft	
FGD WW Tank Width =	110	ft	
Number of Other WW Tanks =	2		
Total Length of tanks with walls	364	ft	
Total Width of tanks with walls	410	ft	
Excavated tank area volume	4,421,040	cf	Trapezoidal calculation, average width of cut time average length of cut times depth
Total Excavated Volume	163,742	cy	

LG&E-KU
Brown Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
Ramps	*Access to Settling Tanks*	Number	2	2
		Length, ft	201	201
		Width, ft	30	30
		Slope, %	12%	12%
		Materials	Reinforced Concrete	Reinforced Concrete
Mix Tanks	*Tanks*	Number	2	2
		Average Flow, gpm	275	6,339
		Peak Flow, gpm	375	10,473
		Detention Time at Average Flow, min	14	17
		Detention Time at Peak Flow, min	10	10
		Dimension, ft (square)	7	25
		Wall Height, ft	12	25
		Freeboard, ft	2	2
		Side Water Depth, ft	10	23
		Volume, gal	3,750	104,730
		Materials	Reinforced Concrete	Reinforced Concrete
	Mix Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	0.5	10
	Mix Tank Blower	Number		2
		Type		Rotary Lobe
		Air Required, scfm		500
		Horsepower, each		20
	Dip Tubes	Number	2	2
		Diameter, in	6	24
		Head loss, ft	0.66	0.46
		Materials	FRP	FRP
FlocculationTanks	*Tanks*	Number	2	2
		Average Flow, gpm	275	6,339
		Peak Flow, gpm	375	10,473
		Detention Time at Average Flow, min	14	17
		Detention Time at Peak Flow, min	10	10
		Dimension, ft (square)	7	25
		Wall Height, ft	12	25
		Freeboard, ft	2	2
		Side Water Depth, ft	10	23
		Volume, gal	3,750	104,730
		Materials	Reinforced Concrete	Reinforced Concrete
	Flocculation Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	0.5	10
	Dip Tubes	Number	2	2
		Diameter, in	6	24
		Head loss, ft	0.66	0.46
		Materials	FRP	FRP
Settling Tanks	*Tanks*	Number	2	2
		Average Flow, gpm	275	6,339
		Peak Flow, gpm	375	10,473
		Solids Concentration, mg/L	20,000	100
		Average dry solids generation, lbs/day	66,123	9,223
		Solids Settled Concentration (%)	20%	5%
		Solids density, lbs/cf	80	80
		Solids Generation, cf/day	4,133	2,306
		Length, ft	360	360
		Width, ft	90	110
		Wall Height, ft	24	24
		Freeboard, ft	2	2
		Side Water Depth, ft	22	22
		Settling Depth, ft	10	10

LG&E-KU
Brown Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
		Solids Depth, ft	12	12
		Total Liquid Volume, gal per tank	5,331,744	6,516,576
		Solids Storage Design Criteria, days	90	90
		Solids Storage Volume, gal	2,908,224	3,554,496
		Solid Storage Provided per tank, days	94	206
		Average Overflow Rate, gpm/sf	0.01	0.16
		Peak Overflow Rate, gpm/sf	0.01	0.26
		Materials	Reinforced Concrete	Reinforced Concrete
Ferric Chloride Feed System	***Ferric Chloride Storage Tank***	Number	1	
		Tank Volume, gal	10,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	20	456
		Average Chemical Use, gal/d	476	
		Peak Chemical Use, gal/d	27	754
		Peak Chemical Use, gal/d	781	
		Average Use Storage, days	21	
		Peak Use Storage, days	13	
		Chemical Stored	35% Ferric Chloride	
	Ferric Chloride Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	1.1	31.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	35% Ferric Chloride	35% Ferric Chloride
Sulfuric Acid Feed System	***Sulfuric Acid Storage***	Number	1	
		Tank Volume, gal	10,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	20	456
		Average Chemical Use, gal/d	476	
		Peak Chemical Use, gal/d	27	754
		Peak Chemical Use, gal/d	781	
		Average Use Storage, days	21	
		Peak Use Storage, days	13	
		Chemical Stored	93% Sulfuric Acid	
	Sulfuric Acid Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	1.1	31.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	93% Sulfuric Acid	0
Sodium Hydroxide Feed System	***Sodium Hydroxide Storage***	Number	1	
		Tank Volume, gal	10,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	20	456
		Average Chemical Use, gal/d	476	
		Peak Chemical Use, gal/d	27	754
		Peak Chemical Use, gal/d	781	
		Average Use Storage, days	21	
		Peak Use Storage, days	13	
		Chemical Stored	25% and 50% NaOH	
	Sodium Hydroxide Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	1.1	31.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	25% and 50% NaOH	0
Organosulfide Feed System	***Organosulfide Tote/tank Storage***	Number	1	
		Volume Storage, gal	6,000	
		Dose, ppmv	20	20
		Average Chemical Use, gal/d	8	183
		Average Chemical Use, gal/d	190	
		Peak Chemical Use, gal/d	11	302
		Peak Chemical Use, gal/d	312	
		Average Use Storage, days	31	
		Peak Use Storage, days	19	
		Chemical Stored	Organosulfide	
		Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm

LG&E-KU
Brown Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
	Organosulfide Feed Pumps	Capacity, gph	0.45	12.6
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Organosulfide	Organosulfide
Polymer Feed System	***Polymer Tote Storage***	Number	4	
		Volume, gal each	265	
		Volume Storage, gal	1,060	
		Dose, ppmv	5	5
		Average Chemical Use, gal/d	2	46
		Average Chemical Use, gal/d	48	
		Peak Chemical Use, gal/d	3	75
		Peak Chemical Use, gal/d	78	
		Average Use Storage, days	22	
		Peak Use Storage, days	14	
		Chemical Stored	Anionic Emulsion Polymer	
	Polyblend System	Type	Polymer Blending System	Polymer Blending System
		Capacity, gph	0.11	3.1
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Anionic Emulsion Polymer	Anionic Emulsion Polymer

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Brown Station

Settling Tank-based Treatment System

Table 2. Electrical Load

Item	Location	HP	No. Provided	No. Active	Installed HP	Active HP	% of Time On	Total HP for O&M
FGD WW Teatment								
Mix Tank Mixers	TBD	1	2	1	1	1	100%	1
Floculation Tank Mixers	TBD	1	2	1	1	1	100%	1
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Other WW Teatment								
Mix Tank Mixers	TBD	10	2	1	20	10	100%	10
Floculation Tank Mixers	TBD	10	2	1	20	10	100%	10
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Mix Tank Blower	TBD	20	2	1	40	20	10%	2
Miscellaneous (bldg heating, lights, etc.)		100			100	100	30%	30
Totals					202	151		63
MW								0.047502
MW-Hr/year								420

LG&E-KU
Brown Station
Settling Tank-based Treatment System
Table 3. Estimated Capital Cost

Item	Value	Units	No. Provided	Unit Cost ($ ea)	Amount	Installation ($ ea)	Total Installed Cost ($)	CCR Cost	ELG Cost
FGD Treatment Tanks									
Mix Tank Mixers	0.5	hp	2	17,246	34,493	3,449	41,391	41,391	
Flocculation Tank Mixers	0.5	hp	2	17,246	34,493	3,449	41,391	41,391	
Ferric Chloride Feed Pumps	1.1	gph	2	6,266	12,533	1,400	15,333	15,333	
Sulfuric Acid Feed Pumps	1.1	gph	2	6,266	12,533	1,400	15,333	15,333	
Organosulfide Feed Pumps	0.5	gph	2	6,266	12,533	1,400	15,333	15,333	
Polyblend System	0.1	gph	2	25,000	50,000	1,700	53,400	53,400	
Sodium Hydroxide Feed Pumps	1.1	gph	2	6,266	12,533	1,400	15,333	15,333	
Other Wastewater Treatment Tanks									
Mix Tank Mixers	10.0	hp	2	53,356	106,712	10,671	128,055		128,055
Flocculation Tank Mixers	10.0	hp	2	53,356	106,712	10,671	128,055		128,055
Ferric Chloride Feed Pumps	31.4	gph	2	6,266	12,533	1,400	15,333		15,333
Sulfuric Acid Feed Pumps	31.4	gph	2	6,266	12,533	1,400	15,333		15,333
Organosulfide Feed Pumps	12.6	gph	2	6,266	12,533	1,400	15,333		15,333
Polyblend Unit	3.1	gph	2	25,000	50,000	1,700	53,400		53,400
Sodium Hydroxide Feed Pumps	31.4	gph	2	6,266	12,533	1,400	15,333		15,333
Mix Tank Blower	500	SCFM	2	2,850	5,700	1,140	7,980		7,980
Common Equipment									-
Ferric chloride tank	10,000	gal	0	21,197	-	4,239	-	-	-
Sulfuric Acid tank	10,000	gal	0	21,197	-	4,239	-	-	-
Organosulfide Tank	6,000	gal	0	13,755	-	2,751	-		-
Polymer feed Totes	265	gal	4		-	-	-		-
Sodium Hydroxide Tank	10,000	gal	0	21,197	-	4,239	-	-	-
Safety Shower			2	25,000	50,000	5,000	60,000	30,000	30,000
Area Labor Adjustment Factor	100.0%	applies to installation cost only							
Total Equipment Cost (TEC)							**636,000**	**228,000**	**409,000**
Area Labor Adjustment Factor									
Total Process Equipment					488,372				
Freight	4%	of Proc Equip					20,000	7,170	12,862
Purchased Equipment Cost - Delivered (PEC-D)							**656,000**	**235,170**	**421,862**
FGD Treatment Tanks									
Mix Tanks Wall Concrete	29	CY	1	650	18,674		18,674	18,674	
Mix Tanks Slab Concrete	10	CY	1	300	2,857		2,857	2,857	
Floculation Tanks Wall Concrete	29	CY	1	650	18,674		18,674	18,674	
Floculation Tanks Slab Concrete	10	CY	1	300	2,857		2,857	2,857	
Settling Tanks Wall Concrete	2578	CY	1	650	1,675,556		1,675,556	1,675,556	
Settling Tanks Slab Concrete	5,160	CY	1	300	1,548,063		1,548,063	1,548,063	
Total Ramp concrete, cy	514	CY	2	300	308,102		308,102	308,102	
Other Treatment Tanks									
Mix Tanks Wall Concrete	95	CY	1	650	61,803		61,803		61,803
Mix Tanks Slab Concrete	49	CY	1	300	14,623		14,623		14,623
Floculation Tanks Wall Concrete	95	CY	1	650	61,803		61,803		61,803
Floculation Tanks Slab Concrete	49	CY	1	300	14,623		14,623		14,623
Settling Tanks Wall Concrete	2,720	CY	1	650	1,768,000		1,768,000		1,768,000
Settling Tanks Slab Concrete	6,172	CY	1	300	1,851,642		1,851,642		1,851,642
Total Ramp concrete, cy	514	CY	2	300	308,102		308,102		308,102
Common Items									
Excavation - Soft	163,742	CY	1	6	977,541		977,541	445,125	532,416
Pre Engineered building	1,200	ft2	1	200	240,000		240,000	120,000	120,000
Lining Tanks	26,834	SY	1	30	805,030		805,030	366,572	438,458
Construction Material							9,677,951	4,506,481	5,171,470
State Sales Tax	1.0%	of Equipment					5,000	2,328	2,672
Total Constuction Material							**9,682,951**	**4,508,809**	**5,174,142**
Total Equipment and Construction							**10,338,951**	**4,743,979**	**5,596,004**
Electrical and I&C	10%						1,034,000	474,000	560,000
Piping	8%						827,000	380,000	448,000
Yard Improvements (a)	8%	of Equip + Const.					827,000	380,000	448,000
Metals and Finishes	3%	of Equip + Const.					310,000	142,000	168,000
Subtotal							13,336,951	6,119,979	7,220,004
Total Direct Costs (TDC)							**13,336,951**	**6,119,979**	**7,220,004**
Contractor's Field General Conditions	5%	of TDC					667,000	306,000	361,000
Contractor's OH&P	15%	of TDC					2,001,000	918,000	1,083,000
Contingency	20%	of TDC					2,667,000	1,224,000	1,444,000
Escalation Factor	0%	of TDC					0	0	0
Total Construction Cost (TCC)							**18,671,951**	**8,567,979**	**10,108,004**
Engineering, SDC[c] and Startup	15%	of TCC					2,801,000	1,285,000	1,516,000
Total Estimated Order of Magnitude Capital Cost							**21,472,951**	**9,852,979**	**11,624,004**
Annual Cost of Capital (7% over 20 years)							$2,027,000	$930,000	$1,097,000

LG&E-KU
Brown Station
Settling Tank-based Treatment System
Table 3. Estimated Capital Cost

Item	Value	Units	No. Provided	Unit Cost ($ ea)	Amount	Installation ($ ea)	Total Installed Cost ($)	CCR Cost	ELG Cost

(a) Includes fencing, grading, roads, sidewalks, and similar items.
(b) The enclosed Engineer's Estimate is only an estimate of possible construction costs. This estimate is limited to the conditions existing at its issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.
(c) SDC stands for Services During Construction (Startup, Engineer/Site Reps, etc.)

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Table 4. Estimated O&M Cost

Item	Quantity	Units	Unit Cost	Cost
Labor	1,040	hours/yr	$30	$31,200
Maintenance (% of Purchased Equipment Cost)	752,000	$	3%	$22,560
Solids for Disposal	47,000	tons/yr	-	-
Energy	420	MW-Hr/yr	$100	$42,000
Chemicals				
Ferric Chloride	86,908	gal/yr	$2	$144,267
Acid	26,072	gal/yr	$2	$61,009
Organosulfide	34,763	gal/yr	$20	$695,264
Polymer	8,691	gal/yr	$8	$69,179
Caustic	86,908	gal/yr	$1	$95,599
Total Annual O&M				$1,161,000
Cost per 1000 Gallon Treated (excludes labor)				**$0.33**
Annualized Cost				$3,207,000

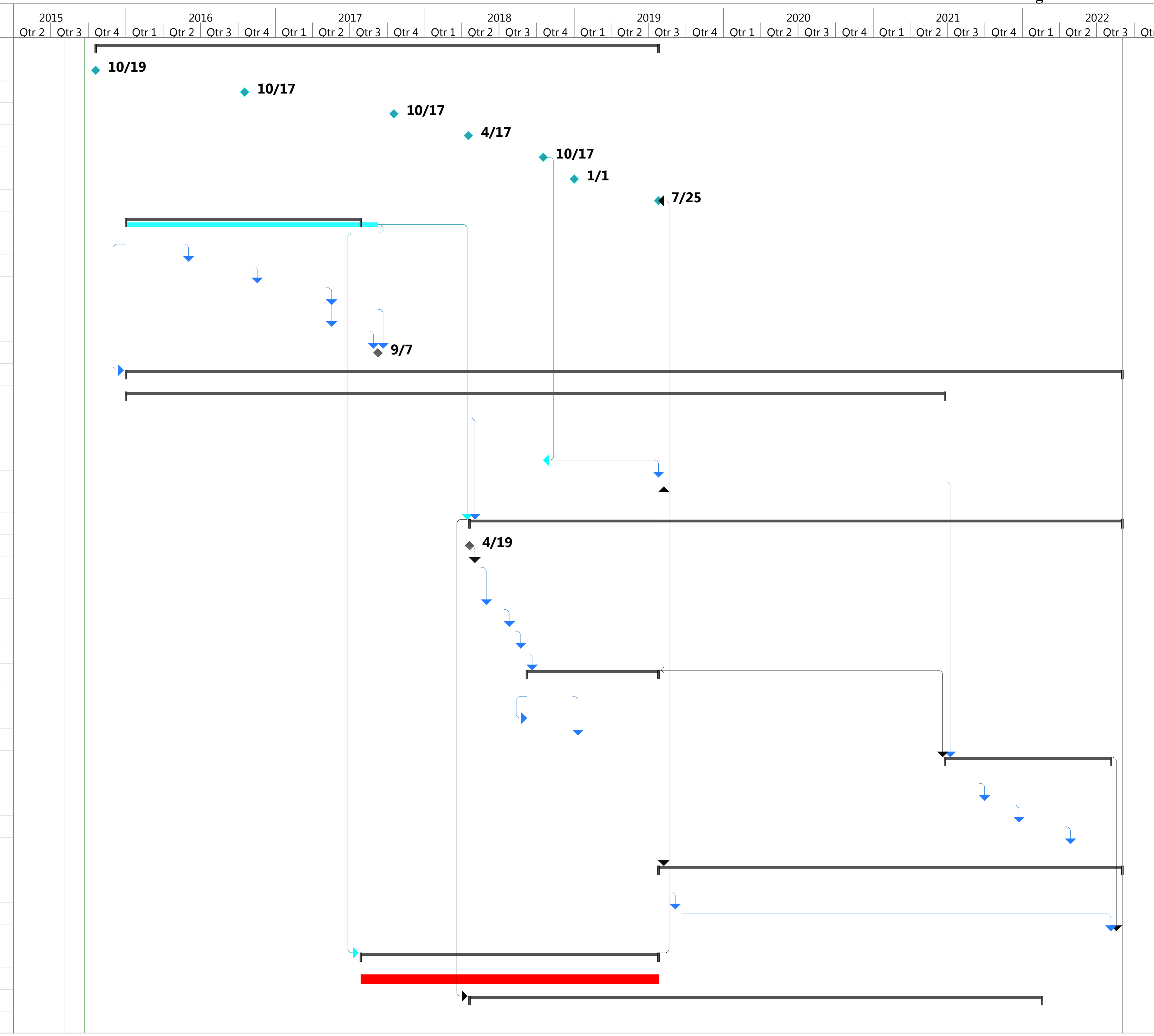
Individual Unit Cost Summary

Cost Worksheet 1 - Individual Unit Cost Line Items

Item	Unit Cost	Units	References
Mobilization/Demobilization			
Workplan, procurement, mobilization, demobilization	50,000	LS	Allowance
Sediment & Erosion Control			
Sediment and Erision Control Measures	25,000	LS	Allowance includes SWPPP and implementation and maintenance.
Transport & Disposal			
Waste Characterization	$1,500	EA	Lab Estimate for TCLP (VOA, SVOA, Pesticides/Herbicides, Metals)
T&D non-hazardous soil to off-site LF	61.1	Ton	Quote of $47 + 30% due to anticipated landfill capacity issues
T&D non-hazardous CCR to off-site LF	61.1	Ton	Quote of $47 + 30% due to anticipated landfill capacity issues
T&D non-hazardous soil to on-site LF	7.18	CY	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018)
T&D non-hazardous CCR to on-site LF	7.18	CY	Backfill Placement$1.98 (RSM 31 23 23.14 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018)
T&D non-hazardous CCR to Schahfer LF	21.4	Ton	Provided by client. Unit rate provided by client, does not include construction, post-closure care and maintenance for 20-years typical for Subtitle D landfills.
T&D non-hazardous CCR to stockpile and to on-site LF	9.03	CY	Excavator Loading $1.85 (RSM 31 23 16.42 0260) + Backfill Placement$1.98 (RSM 31 23 23.14 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018)
Transportation, Pineville to EW Brown LF	34.78	Ton	107 miles one way @ $4/loaded mile to + $2.5/empty mile return / 20 tons per truck. No disposal charge.
Transportation, Tyrone to EW Brown LF	11.05	Ton	34 miles one way @ $4/loaded mile to + $2.5/empty mile return / 20 tons per truck. No disposal charge.
Slurry Wall			
Install Slurry Wall	$0	LF	Place-holder. Included in RCRA Consultant
Repair On-Site Pond Embankments			
Geotechnical Repairs on existing CCR Pond embankments	$1,000,000	LS	Allowance. Items may include embankment soil removal/replacement; localized dewatering; stump removal; drainage improvements; Dike height adjustments, etc.
Site Preparation			
Clearing/Grubbing	$10,350	AC	Eng. Estimate
Site Debris Clean Up & Removal	$276	AC	RSM 017140300
Surveying	$10,000	LS	
Utility Locating	$5,000	LS	Allowance
Dewatering & Drying of Saturated Coal Ash	$30,000	AC	Number for site preparation in areas with high water table. Eg. Michigan City, Bailly ??? Check with Nick.
Dewatering	$50,000	LS	Allowance to pump water from ponds to on site treatment facility
Earthwork Items			
Site Work Soil			
Excavate and Temporarily Stockpile Onsite, dragline, haul (pond)	$20.81	CY	$8.35 dragline 1/2 cy cap = 30cy/hr (RSM 31 23 16.42 0950) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Excavate and load, dragline (pond)	$16.45	CY	$8.35 dragline 1/2 cy cap = 30cy/hr+no haul (RSM 31 23 16.42 0950) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Surface Grading, lagoon bottoms	$3.87	SY	RSM 31 22 16.10 3500
Excavate and load from stockpile	$6.60	CY	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
Moisture Conditioning/Dust Control	$0.57	CY	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Remove Embankment, Spread Berms	$8.94	CY	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul + $0.84 Compaction, Sheepsfoot, 6"' lift, 2 passes (RSM 31 23 23.23 5600)
Finish Grading, gentle slopes	$0.20	SY	RSM 31 22 16.10 3300
Site Work CCR			
Excavate and Temporarily Stockpile Onsite (pond)	$20.81	CY	$8.35 dragline 1/2 cy cap = 30cy/hr (RSM 31 23 16.42 0950) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Excavate and load (pond)	$16.45	CY	$8.35 dragline 1/2 cy cap = 30cy/hr+no haul (RSM 31 23 16.42 0950) + $8.10 Dozer excavation, 200 hp, common earth, 300' (RSM 31 23 16.46 5020)
Excavate and Temporarily Stockpile Onsite, excavator, haul (pond)	$9.56	CY	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Excavate and Temporarily Stockpile Onsite, excavator, no haul (pond)	$5.20	CY	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Excavation and Load from Stockpile (CCR from facility operations)	$1.39	CY	1 988 RT Loader (8 CY), rent $85.95 + FOG $95.81/hr + opr $75/hr x 50 hrs/9,216 CY/week
Hauling (assume 2 mile cycle)(CCR from facility operations)	$2.96	CY	3 each, Cat 735 off-road trcuks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
Moisture Conditioning/Dust Control	$0.57	CY	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Surface Grading, lagoon bottomns	$3.87	SY	RSM 31 22 16.10 3500
Excavate and load from stockpile (excavator)	$6.60	CY	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)
Finish Grading, gentle slopes	$0.20	SY	RSM 31 22 16.10 3300
Fill and Borrow			
Unclassified Fill, Delivered, Offsite Source, Placed	$17.82	CY	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $15/cy delivered
Topsoil, Delivered, Offsite Source, Placed	$23.95	CY	$3.95 (RSM 31 23 23.14 2420) + $20/cy delivered
Haul (2 mile cycle)	$4.36	CY	$4.36 haul; 12cy, 15mph, 2 mile, 15 minute (RS Means 31 23 23.20 1018)
Compacted Clay, 6-inch lifts, Offsite Source, Placed	$23.54	CY	$1.98 place (RSM 31 23 23.13 4220) + $1.56 compact (RSM 31 23 23.23 5640) + $20/cy delivered
Unclassified Fill, Delivered, On-site Source, Placed	$9.03	CY	Placement $1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + Excavator Loading $1.85 (RSM 31 23 16.42 0260) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)
Finish Grading, gentle slopes	$0.20	SY	RSM 31 22 16.10 3300
Site Restoration Items			
Revegetation			
Mechancial Seeding and Mulching	$3,550	AC	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Seed	$856	AC	Seeding, slope mix, 6#, tractor spreader - material only (RSM 32 92 19.14 4500)
Site Survey	$30,000	LS	
Confirmation Sample Collection	$100	EA	
Confirmation Sample Analysis	$150	EA	single metal
Sample Packaging and Shipping	$250	Event	
On-Site Landfill			
Surface Grading, lagoon bottom	$ 18,730	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500) ($430/1000 sf)
Base Liner: Soil Liner (12")	$ 23,905	AC	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $12/cy delivered
Base Liner: 60-mil HDPE	$ 39,204	AC	Price Based on $.90 SF.
Base Liner: Sand Drainage Layer (12 inches)	$ 30,653	AC	Price is based on Drainage Sand $15/BCY and placement $4/BYD
Base Liner: Geotextile	$ 11,665	AC	Geotextile, woven, 200 lb tensile (RSM 31 32 19.16 1500)
Base Liner: Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/BCY and placement $3.5/BCY
Final Cover: 40-mil Tex/smooth LLDPE	$ 28,414	AC	Price Based on $0.65 SF.
Final Cover: Sand Drainage Layer (12 inches)	$ 30,653	AC	Price is based on Drainage Sand $15/BCY and placement $4/BYD
Final Cover: Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/BCY and placement $3.5/BCY
Final Cover: Topsoil Layer (6 inches)	$ 19,352	AC	$3.95 (RSM 31 23 23.14 2420) + $20/cy delivered
Finish Grading, gentle slopes	$ 968	AC	RSM 31 22 16.10 3300 ($0.20/SY)
Leachate Collection pipes	$ 30,000	AC	Allowance
Leachate header	$ 5,000	AC	Allowance
SUBTOTAL	$ 313,564	AC	
Reconstruct and Reline On-Site Pond			
Remove overlying soils and 30 mil Hypalon liner	$ 17,000	AC	Based on a crew at $8,500/Day for two days
Regrade and Compact Subgrade	$ 17,000	AC	Based on a crew at $8,500/Day for two days
Compacted Clay (1 x 10^{-7}) Soil Liner (24 inches)	$ 96,800	AC	Price is based on Clay Fill @ $20/CY and placement @ $10/CY
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Geonet	$ 28,314	AC	$0.65/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/TCY and placement $3.5/TCY
SUBTOTAL	$ 234,958	AC	
Reconstruct and Line Pond, Install Steel Wear Plates			
Remove and stockpile 18" Coarse Graded Crushed Ballast (3/4" to 1 1/2")	$30,760	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018 = $12.71/cy
Remove 6" Sand	$ 10,250	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018 = $12.71/cy
Remove existing 30 mil Hypalon liner	$ 17,000	AC	Based on a crew at $8,500/Day for two days
Remove 6" Sand	$ 10,250	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018 = $12.71/cy
Regrade and Compact Compacted Clay Subgrade	$ 21,250	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500)($0.43/SF) + compaction, 6" lifts, 4 passes (RSM 31 23 23.23 5640)($1.56/cy(assume 1' thick))
Compacted Clay (1 x 10^{-7}) Soil Liner (24 inches)	$ 96,800	AC	Price is based on Clay Fill @ $20/CY and placement @ $10/CY
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Geonet	$ 28,314	AC	$0.65/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
18" Coarse Graded Crushed Ballast-reused (3/4" to 1 1/2" size)	$ 29,500	AC	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018) + $5/CY load = $12.18/cy
Steel Wear Plates - 3/8" - 2000 SF TOTAL for working area	$ 19,200	AC	3/8" x 2000 SF = 65 CF x 490lb/cf = 16 tons @ $1,200/ton
SUBTOTAL	$ 301,658	AC	
Reconstruct and Line Bottom Ash Storage Area			
Remove 30" Bottom Ash/Soil	$51,265	AC	dragline 1/2 cy cap = 30cy/hr+haul 12cy 15mph 2 mile (RSM 31 23 16.42 0950 + 31 23 23.20 1018) = $12.71/cy
Regrade and Compact Subgrade	$ 21,250	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500)($0.43/SF) + compaction, 6" lifts, 4 passes (RSM 31 23 23.23 5640)($1.56/cy(assume 1' thick))
Compacted Clay (1 x 10^{-7}) Soil Liner (24 inches)	$ 96,800	AC	Price is based on Clay Fill @ $20/CY and placement @ $10/CY
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
Geonet	$ 28,314	AC	$0.65/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
30-mil PVC	$ 19,167	AC	$0.44/SF w/tax, delivery and installation. Price is based on ROM from Geomembrane.com
18" Coarse Graded Crushed Ballast-reused (3/4" to 1 1/2" size)	$ 29,500	AC	$1.98 (RSM 31 23 23.13 4220) + 0.84 compaction (RSM 31 23 23.23 5640) + $4.36/cy haul 12 cy 15mph 2 mile (RSM 31 23 23.20 1018) + $5/CY load = $12.18/cy
SUBTOTAL	$ 265,463	AC	
Leachate Collection System (1 per pond)			
Final grade	$ 1,258	EA	$0.43/SF Finish grading lagoon bottoms (RSM 31 22 16.10 3500) x (45' x 65') =
Trenching	$ 1,083	EA	$3.61/LF. (RSM G1030 805 1800)
60-mil HDPE liner	$ 9,620	EA	Assume 7125 SF. Price based on .90/SF + 50% small quantity ($1.35)
HDPE geonet	$ 3,950	EA	Assume 45'x65' SF. Price based on .90/SF + 50% small quantity ($1.35)
Leak Detection Fill (25' x 45' x5' = 210 CY)	$ 3,990	EA	Price is based on Drainage Sand $15/BCY and placement $4/BYD
10-inch dia HDPE Pipe (2 each at 300')	$ 21,200	EA	$32/LF. RSM 33 11 13.35 0400 + $1,000/pipe fittings
2-inch dia PVC Pipe (1 each at 300')	$ 868	EA	$2.59/LS. RSM 33 11 13.20 1120 + $100 fittings
SUBTOTAL	$ 41,969	EA	
Cover Existing Pond			
Stabilize	$ 109,020	AC	assume 5' thick = 8,067 BCY/Acre = 12,600 tons. 3% Portland = 378 tons @ $75/ton + $10/cy handling
Final grade	$ 18,730	AC	Finish grading lagoon bottoms (RSM 31 22 16.10 3500)
40-mil Tex/smooth LLDPE	$ 28,414	AC	Price Based on $0.65 SF
Sand Drainage Layer (12 inches)	$ 30,653	AC	Price is based on Drainage Sand $15/BCY and placement $4/BYD
Protective Layer (18 inches soil)	$ 37,510	AC	Price is based on General Fill $12/BCY and placement $3.5/BCY
Topsoil Layer (6 inches)	$ 19,352	AC	$3.95 (RSM 31 23 23.14 2420) + $20/cy delivered
SUBTOTAL	$ 224,327	AC	
Periodic Cleaing of Pond			
Dredge 2' of material	$28	CY	Hydraulic dredge (pumped 1000' to shore) = 15.55 + haul 12cy 15mph 2 mile (RSM 35 20 23.23 1100 + 31 23 23.20 1018) = $12.71/cy totals $28.26/cy for 1 acre x 2' deep = 3,226.67 BCY
Excavate and load from stockpile	$6.60	CY	$2.36 1 CY excavator (RSM 31 23 16.42 0100)+ no haul + $4.24 Dozer excavation, 200 hp, common earth, 150' (RSM 31 23 16.46 4220)

Attachment 3
Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Regulatory Milestones**	**984 days**	**Mon 10/19/15**	**Thu 7/25/19**	
2	CCR Rule Effective Date	0 days	Mon 10/19/15	Mon 10/19/15	
3	Structural Integrity - Initial Assessment(s	0 days	Mon 10/17/16	Mon 10/17/16	
4	Groundwater - Background Analysis	0 days	Tue 10/17/17	Tue 10/17/17	
5	Groundwater - Detection Analysis	0 days	Tue 4/17/18	Tue 4/17/18	
6	Groundwater - Assessment Analysis	0 days	Wed 10/17/18	Wed 10/17/18	
7	Groundwater Corrective Action	0 days	Tue 1/1/19	Tue 1/1/19	
8	Divert water to Concrete pond	0 days	Thu 7/25/19	Thu 7/25/19	40FF
9	**Engineering Phase**	**410 days**	**Fri 1/1/16**	**Thu 7/27/17**	
10	Preliminary Design	100 days	Fri 1/1/16	Thu 5/19/16	
11	Final Design	120 days	Fri 5/20/16	Thu 11/3/16	10
12	KY DEP Permitting	130 days	Fri 11/4/16	Thu 5/4/17	11
13	KY PSC Rate Approval	90 days	Fri 5/5/17	Thu 9/7/17	12
14	Procurement of Contractor	70 days	Fri 5/5/17	Thu 8/10/17	12
15	Issue NtP	0 days	Thu 9/7/17	Thu 9/7/17	14,13
16	**Aux Pond**	**1740 days**	**Fri 1/1/16**	**Thu 9/1/22**	**10SS**
17	**LG&E Activities**	**1430 days**	**Fri 1/1/16**	**Thu 6/24/21**	
18	Remove and Discharge surface water	600 days	Fri 1/1/16	Thu 4/19/18	
19	Accumulate CCR in 2016-2018	725 days	Wed 1/6/16	Wed 10/17/18	6FF
20	Place Beneficial Use CCR to achieve final grades	500 days	Fri 7/26/19	Thu 6/24/21	19,27
21	**Contractor Activities**	**1140 days**	**Thu 4/19/18**	**Thu 9/1/22**	**9,18**
22	Mobilize	0 days	Thu 4/19/18	Thu 4/19/18	
23	Install Sediment and Erosion Control	20 days	Fri 4/20/18	Thu 5/17/18	22
24	Site Preparation	40 days	Fri 5/18/18	Thu 7/12/18	23
25	Roads	20 days	Fri 7/13/18	Thu 8/9/18	24
26	On Site Impoundments	20 days	Fri 8/10/18	Thu 9/6/18	25
27	**Preclosure Activities**	**230 days**	**Fri 9/7/18**	**Thu 7/25/19**	**26**
28	Stabilize upper CCR surface	80 days	Fri 9/7/18	Thu 12/27/18	
29	Dewater during stabilization	80 days	Fri 9/7/18	Thu 12/27/18	28SS
30	Cut/regrade for cover subgrade/dit	150 days	Fri 12/28/18	Thu 7/25/19	28
31	**Closure Activities**	**290 days**	**Fri 6/25/21**	**Thu 8/4/22**	**27,20**
32	Shape Cover Subgrade	60 days	Fri 6/25/21	Thu 9/16/21	
33	Place FML and Geocomposite	60 days	Fri 9/17/21	Thu 12/9/21	32
34	Cover soil	90 days	Fri 12/10/21	Thu 4/14/22	33
35	Vegetated Cover	80 days	Fri 4/15/22	Thu 8/4/22	34
36	**Surface Water Features**	**810 days**	**Fri 7/26/19**	**Thu 9/1/22**	**27**
37	Primary Outlet Structure	20 days	Fri 7/26/19	Thu 8/22/19	
38	Emergency Outlet Structure	20 days	Fri 8/23/19	Thu 9/19/19	37
39	Surface Restoration	20 days	Fri 8/5/22	Thu 9/1/22	31,38
40	**Concrete Process Tank**	**520 days**	**Fri 7/28/17**	**Thu 7/25/19**	**9**
41	Construct concrete CCR process tank	520 days	Fri 7/28/17	Thu 7/25/19	
42	**Construction Management Services**	**1000 days**	**Fri 4/20/18**	**Thu 2/17/22**	**21SS**
43	CQA and OE services	1000 days	Fri 4/20/18	Thu 2/17/22	



Project: Brown rev11
Date: Tue 9/22/15

Task	Summary	Inactive Milestone	Duration-only	Start-only	External Milestone	Manual Progress
Split	Project Summary	Inactive Summary	Manual Summary Rollup	Finish-only	Deadline	
Milestone	Inactive Task	Manual Task	Manual Summary	External Tasks	Progress	

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF KENTUCKY UTILITIES	**)**	
COMPANY FOR CERTIFICATES OF PUBLIC	**)**	
CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00026**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
R. SCOTT STRAIGHT
DIRECTOR, PROJECT ENGINEERING
KENTUCKY UTILITIES COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is R. Scott Straight. I am the Director of Project Engineering for LG&E and KU Services Company, which provides services to Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E") (collectively, "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. I have not testified at a Commission hearing, but have sponsored discovery responses in numerous cases regarding projects the Companies have undertaken, as well as having presented in numerous quarterly update meetings associated with the Commission's Construction Monitoring Review of the Companies' 2011 ECR Plans. In addition, I have provided testimony in the most recent KU rate case in Virginia.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain the need for Projects 37 and 38 in the 2016 ECR Plan ("2016 Plan"), which involves improvements to the wet flue gas desulfurization ("WFGD") technology on Ghent Unit 2 and the installation of mercury-related control technologies on all four generating units at Ghent, respectively. I am also sponsoring exhibits related to these Projects, as well. The other Projects proposed in the 2016 Plan are described in the testimony of John N. Voyles, Jr.

Q. What exhibits are you sponsoring?

A. I am sponsoring the following exhibits:

Exhibit RSS-1: MATS Rule – Mercury Control Injection Project Summary

Exhibit RSS-2: MATS Rule – Ghent Unit 2 WFGD Project Summary

<u>Project 37: Ghent Unit 2 WFGD Upgrade</u>

Q. Please provide an overview of Project 37.

A. Project 37 involves proposed improvements to the WFGD on Ghent Unit 2 in order to increase the sulfur dioxide removal efficiency of the WFGD. These improvements are necessary to comply with the Mercury and Air Toxics Standards ("MATS Rule") promulgated by the United States Environmental Protection Agency. Exhibit RSS-2 provides a further description of the project.

Q. How does the MATS Rule affect the Ghent generating station?

A. As discussed in the testimony of Gary H. Revlett, the MATS Rule requires that the Ghent generating station emit no more than 0.002 lbs/mmBtu of heat input of hydrogen chloride ("HCl"). As a surrogate for measuring HCl, sulfur dioxide (which is currently measured and reported on for all KU and LG&E generating units) can be used to calculate HCl emissions values. The surrogate sulfur dioxide emission limit for HCl is 0.2 lbs/mmBtu of heat input. While this emission rate is a station-averaged value allowed in the MATS Rule, the MATS Rule requires each unit be able to demonstrate that it can meet the 0.2 lbs/mmBtu surrogate value. Ghent Unit 2 currently cannot meet this surrogate value on a continuous basis with its WFGD that was installed in 1995. The other three units at Ghent (Units 1, 3 and 4) have WFGDs installed in 2009, 2007 and 2008, respectively that can continuously meet the MATS Rule required surrogate emission rate.

Q. Has KU previously installed MATS Rule control equipment on the Ghent units?

A. Yes, it has. Through Project 35, which was part of the 2011 Plan, KU installed particulate and mercury-related control equipment on all four units at Ghent.[1] In order to comply with the federal Clean Air Act as amended, the Cross-State Air Pollution Rule (successor to the proposed Clean Air Transport Rule), the then-proposed National Emission Standards for Hazardous Air Pollutants ("HAPS Rule"), and the National Ambient Air Quality Standard, KU obtained approval of Project 35 and installed HAPS Rule related control systems to serve each of the four Ghent units. Project 35 consisted of a pulse-jet fabric filter ("PJFF") to capture particulate matter, a powdered activated carbon injection system prior to the PJFFs to capture mercury, hydrated lime injection systems to protect the PJFF from the corrosive effects of sulfuric acid mist and to increase the activated carbon's capture of mercury (sulfuric acid mist can blind activated carbon from capturing mercury), as well as other balance-of-plant support system changes.

Project 35 also included economizer modifications to Ghent Units 1, 3 and 4 to expand the operating range of the units at which their existing Selective Catalytic Reduction ("SCR") equipment can function, thereby increasing the amount of mercury oxidized by the SCR catalyst. This increased oxidation of mercury allows for more mercury collection by the PJFF and WFGD on those

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[1] *In the Matter of: Application of Kentucky Utilities Company for Certificates of Public Convenience and Necessity of Its 2011 Compliance Plan for Recovery by Environmental Surcharge* (Case No. 2011-00161).

units because oxidized mercury is more easily captured than elemental mercury in the flue gas.

Q. Please discuss the current efficiency level of the WFGD technologies at Ghent Unit 2 as compared to the other Ghent Units.

A. Presently, the WFGD system installed on Ghent Unit 2 removes slightly over 90% of sulfur dioxide from the flue gas before it is released into the air. In order to achieve the 0.2 lbs/mmBtu of heat input of sulfur dioxide limit as a surrogate for HCl in the MATS Rule, taking into account the sulfur content of the coal expected to be burned, approximately 97% of the sulfur dioxide will need to be removed. In contrast, the other units at Ghent have much newer WFGD technology that controls sulfur dioxide to levels of removal equal to or exceeding 98%, which result in emissions less than the allowable limit in the MATS Rule.

Q. How does KU plan to increase the efficiency of the removal of sulfur dioxide from Ghent Unit 2?

A. Numerous operating variables affect the rate at which sulfur dioxide is removed during the scrubbing process. In WFGD systems, the scrubbing liquid contains an alkali reagent that enhances the absorption of sulfur dioxide. As such, the removal efficiency of sulfur dioxide is highly impacted by the ratio of liquid-to-gas contact, as well as the chemistry of the system.

KU is proposing improvements to the WFGD system on Ghent Unit 2 that cumulatively will improve the sulfur dioxide removal efficiency by increasing the effective liquid-to-gas contact. KU plans to install new technology spray nozzles that will increase the liquid-to-gas contact surface area through a finer and more concentrated spray droplet, as well as install “wall rings” which are attachments to the WFGD’s module walls near the spray nozzle and spray cone areas. The wall rings reduce “leakage” of flue gas up the module walls caused by the pressure drop of the nozzle sprays by forcing the flue gas flow through the nozzle spray cone areas. Increasing the contact area of the limestone slurry with the flue gas essentially increases the effective liquid-to-gas ratio. While currently not expected to be needed, replacing the recycle pump drive gearboxes may also be required to increase the flow of limestone slurry through the spray nozzles, thus increasing the liquid-to-gas ratio. When these improvements are complete, KU expects to be able to operate Ghent Unit 2 in continual compliance with the MATS Rule requirements for the sulfur dioxide surrogate for HCl irrespective of which other Ghent units are operating.

Q. When does KU plan to make these improvements?

A. It is anticipated that Ghent Unit 2 will be included in the MATS Rule reporting for the Ghent station in mid-year 2016, following the completion of a planned outage to finish other improvements. KU purchased some of the nozzles and installed them in late 2015 to determine their effectiveness. The purchase of the remaining nozzles and wall rings is planned for April 2016, with completion of the Project expected to occur in the summer of 2016.

Q. Are the costs of the improvements to the WFGD economical?

A. Yes, as the expected cost of the improvements are $7 million. As discussed in the testimony of Charles R. Schram, it is economical to install these upgrades versus other alternatives, including using reagents to reduce sulfur dioxide emissions, burning lower sulfur coal, and limiting the operation of Ghent 2 to keep station emissions below the 0.2 lb/mmBtu threshold.

Project 38: Mercury Injection Control Systems

Q. Please provide a summary of Project 38.

A. Project 38 involves the installation of low-cost and economical control technologies to reduce mercury re-emissions that will keep the Ghent units in compliance, and provide operational flexibility in maintaining compliance with the MATS Rule for mercury. First, KU is proposing supplemental injection control technology to inject an organo-sulfide chemical additive into the WFGD reaction tank for all units at Ghent. Second, KU plans to inject a halogenated chemical additive into the coal feeders at the Ghent units to increase mercury oxidation in the coal combustion zone, which will improve the amount of mercury oxidized and captured by the PJFFs and WFGDs. Exhibit RSS-1 provides a further description of Project 38, as well as an overview of the mercury control systems KU has installed to date at Ghent.

Q. What environmental regulation necessitates the installation of these technologies?

A. As explained in the testimony of Mr. Revlett, the MATS Rule requires the Companies to further reduce the mercury emissions associated with the production of electricity from coal. The MATS Rule requires the use of maximum achievable control technology within the electric utility industry. Although the Ghent units are presently in compliance, due to mercury re-emissions, the units have the potential to emit mercury above the allowable limits absent installation of the supplemental injection control technologies proposed in Project 38.

Q. You stated that Project 38, which is proposed in this case, is needed to ensure continuing compliance with the MATS Rule. How is that different from the HAPS Rule that was proposed when the 2011 Plan proceeding was pending?

A. As explained in Mr. Revlett's testimony, the MATS Rule is the final version of the proposed HAPS Rule. The MATS Rule sets emissions limitation standards for mercury and other air pollutants, reflecting levels achieved by the best-performing sources currently in operation. While the addition of the mercury related control equipment that was part of the 2011 ECR Plan reduced mercury emissions at the Ghent units, these units will be better equipped, and provide operating flexibility, to satisfy the mercury emission standards established in the MATS Rule in the most cost-effective manner than without the addition of these two supplemental low-capital cost control technologies proposed in Project 38.

Q. Please explain mercury re-emission and how it is related to WFGDs.

A. KU, like many other utilities that generate electricity from coal, utilizes WFGD technologies as part of its existing Air Quality Control Systems. These wet scrubber systems allow for the capture of sulfur dioxide emissions and also capture a large percent of oxidized mercury that is in the flue gas stream.

Because oxidized mercury is water soluble, oxidized mercury is captured in the wet scrubber; thereby reducing the generating unit's mercury emissions. Oxidized mercury can likewise be captured in KU's PJFFs through the injection of powdered activated carbon, as well. At times, however, the oxidized mercury in the wet scrubber slurry can de-oxidize and be released back into the flue gas stream as elemental mercury. This phenomenon, which is known as mercury re-emission, causes lower net mercury capture efficiency in the WFGDs because the elemental mercury is reemitted into the flue gas stream and then emitted through the chimney.

Q. Please explain how Project 38 seeks to address this concern.

A. The Companies conducted studies in 2013 through 2015 regarding how to best address mercury re-emission from the WFGDs. The Companies' investigation indicated that by injecting an organo-sulfide chemical additive into the WFGD reaction tank, less oxidized mercury would be reduced to elemental mercury. This allows the wet scrubber to hold the captured mercury that otherwise could be re-emitted so it could be removed through the gypsum dewatering systems. KU is proposing to have the ability to inject this additive on all units at Ghent either as a total substitute for powdered activated carbon or in combination with the carbon injection, depending on the price and effectiveness of each.

Relatedly, KU is proposing to inject a halogenated chemical additive into the coal feeders on the Ghent units. Injecting this additive before the coal is combusted increases the mercury oxidation during the combustion of coal, thus making the powdered activated carbon and WFGD removals of mercury more effective, especially on Ghent Unit 2 that does not have a SCR system and for the other three Units when their SCRs are out of service. As with the injections in the WFGD reaction tank, this will result in increased mercury capture and overall reduced mercury emissions.

Q. Are there other benefits to this Project, as well?

A. Yes. Another significant benefit to installing this supplemental injection technology is that it allows the Companies to balance the cost of powdered activated carbon against the price of the liquid chemical WFGD and coal additives, while also providing the station flexibility to use either powdered activated carbon, liquid injection or a combination of both. And lastly, the use of this supplemental technology can reduce or avoid the contamination of fly ash caused by the powdered activated carbon, thus potentially increasing each station's offsite beneficial use or reuse opportunities of CCR.

Q. How does KU plan to implement Project 38?

A. Successfully controlling mercury in an environmentally compliant manner will depend on the consistent and regulated delivery of the organo-sulfide and halogenated chemical additives. The rate at which the additives will be injected at each unit will be determined based on that unit's measured mercury emissions and WFGD process conditions, along with how much activated carbon and hydrated lime is used prior to the PJFFs.

The injection systems will require components such as long-term product storage vessels, metering pumps, piping, valves and instrumentation, electrical and control wiring, programmable logic controllers, and an enclosed climate controlled shelter for the pump skids and instrumentation and controls.

Q. When does KU propose to install the injection systems?

A. The Company proposes to fully construct and install the injection systems on all affected units during 2016.

Q. Are the costs of the injection system economical?

A. Yes. First, it should be noted that the injection systems are a low-cost manner of helping KU comply with the mercury emission standards in the MATS Rule, as the expected capital cost of the systems at Ghent totals $10.1 million. As discussed in the testimony of Mr. Schram, it is economical to install the systems because the current pricing of the liquid additives is favorable to the cost of powdered activated carbon.

Q. What is your recommendation to the Commission?

A. My recommendation is that the Commission approve Projects 37 and 38 as part of the 2016 Plan because the projects are economical, low-cost methods by which to comply with the sulfur dioxide and mercury emission limits set forth in the MATS Rule.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **R. Scott Straight**, being duly sworn, deposes and says that he is Director – Project Engineering for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

____
R. Scott Straight

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

______________________________(SEAL)
Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
~~My commission expires July 11, 2018~~
Notary ID # 512743

APPENDIX A

R. Scott Straight

Director, Project Engineering
LG&E and KU Services Company
220 West Main Street
Louisville, KY 40202
(502) 627-2701

Professional Memberships & Achievements:

KY Professional Engineer
IN Professional Engineer
Pinnacle Honor Society for Masters Degrees
Beta Sigma Gamma (National Honor Society for Business Graduates)
Member of SCOAR (Southeastern Construction Owners & Assoc. Roundtable)

Education:

B.S. Mechanical Engineering – Purdue University (1983)
M.B.A. – Indiana University (*with honors* 1993)
Steven Covey's Lessons in Leadership (1996)

Recent Responsibilities (Director of Project Engineering):

- 2011 ECR Program (LG&E and KU) including:
  - PJFFs on Ghent 1-4, E.W. Brown 3, Mill Creek 1-4 and Trimble County 1
  - WFGDs on Mill Creek 1-4
- 2009 ECR Program (LG&E and KU)
  - E.W. Brown, Trimble County and Ghent Landfills; Brown 3 SCR
- 2004 ECR Program (LG&E and KU)
  - Ghent 1, 3 and 4 WFGD, Brown Station WFGD
- 2002 ECR Program
  - Ghent 1, 3 and 4 SCRs, Mill Creek 3 and 4 SCRs, Trimble County 1 SCR
- 2010 Trimble County Unit 2 810 MW Supercritical Coal Unit
- 2015 Cane Run 7 640 MW Natural Gas Combined Cycle Unit
- 2016 E.W. Brown 10 MWe Solar Station
- Ohio Falls Hydro-Station Units 1-8 Rehabilitation

History of Positions:

Director, Project Engineering (2004-present)
Manager, NOx Compliance Program Manager (2001-2004)
Manager, Generation Services (1998-2001)
Manager, Technical Services (1995-1998)
Sr. Engineer, Environmental Affairs (focused on CAA) (1990-1995)
Mechanical Engineer, Special Construction Department (1984-1990)
Design Engineer, Boeing Military Airplane Company (1983-1984)

Project Engineering – LG&E and KU

MATS Rule – Mercury Control Injection Project Summary

January 2016

Background

LG&E and KU (collectively, the "Companies") must comply with the Mercury and Air Toxics Standards ("MATS") Rule beginning April 16, 2016 (with a 1-year extension). The MATS Rule regulates mercury and other hazardous air pollutants from fossil fuel fired steam generating units. For the Companies, this includes the Ghent, Mill Creek, Trimble County and E.W. Brown Stations. The Rule also requires the maximum achievable control technology be utilized.

Included in the Companies' 2011 Environmental Cost Recovery ("ECR") filing was the engineering and construction of pulse jet fabric filters ("PJFF") for particulate, including a powdered activated carbon injection ("PAC") system and dry sorbent injection ("DSI") of hydrated lime system prior to each PJFF for mercury and sulfuric acid control, respectively. The 2011 ECR filing included new PJFFs on the four Mill Creek units, the four Ghent Units, Trimble County Unit 1 and E.W. Brown Unit 3. A PJFF is already installed on Trimble County Unit 2. E.W. Brown Units 1 and 2 were excluded from requiring a PJFF in the 2011 ECR filing.[1] The 2011 ECR filing also included new wet flue gas desulfurization systems ("WFGD") for the four Mill Creek coal fired units.

Since the 2011 ECR filing, the Companies have continued with the construction and commissioning of the ten PJFFs in the plan and have placed nine of them into operation. These PJFFs are operating as designed relative to capturing particulate, mercury and acid gases. While the PJFFs capture up to 90-plus percent of the mercury, mercury still exist in the flue gas stream as it leaves the PJFFs. The remaining mercury exiting the PJFFs is in both the elemental and oxidized form. A large percentage of the remaining oxidized mercury that exits the PJFFs is captured in the WFGD downstream of the PJFF.

Over time, the Companies have seen episodes where the oxidized mercury that has been accumulated in the WFGD slurry can be released back into the flue gas stream through a chemical process that converts the captured oxidized mercury into elemental mercury. These intermittent episodes have the potential, under the MATS Rule, to place a coal-fired generating unit in a noncompliance period for mercury. Given this re-emission risk, the Companies have continued the testing of chemical solution injections on coal and in the WFGD wet slurry to determine their viability for capturing mercury. The details of the chemistry and process for each mercury injection system is described below. These mercury injection technologies were in their infancy at the time of the 2011 ECR filing and since have continued to gain industry experience, including the Companies' testing program on its coal-fired units, through the operation of a permanent WFGD injection system on Trimble County Unit 2, as well as testing experience from other coal-fired generators in the United States.

[1] The 2011 ECR Plan filing originally included a shared-PJFF for E.W. Brown Units 1 and 2. The parties to the unanimous stipulation approved by the PSC agreed to remove the shared-PJFF for E.W. Brown Units 1 and 2 from the 2011 ECR Plan.

To date, the Companies' testing has shown very good results of holding on to the mercury captured by the WFGD to avoid the periods of mercury re-emissions. These tests have also been described in summary form in the Companies' 2011 ECR quarterly reports to the KPSC Staff and its consultant. The Companies' latest IRP filing also included several documents describing the Companies' experience in testing these injection technologies.

Need

Due to this mercury re-emission process, the coal-fired units across the Companies' fleet have the potential to exceed current and future mercury emission limits under the MATS Rule, even with their PJFFs and WFGDs operating as designed. Mercury re-emission occurs when the Oxidation-Reduction Potential ("ORP") of a WFGD reaction tank slurry exceeds the optimal range which then converts oxidized mercury back into its elemental state. The water solubility of elemental mercury is much lower than oxidized mercury and the elemental mercury is re-emitted into the flue gas from the WFGD and then emitted out of the chimney. Studies conducted by the Companies in 2013 and 2014 indicated that injecting an organo-sulfide chemical additive into the WFGD reaction tank for a particular unit reduces ORP, mitigating mercury re-emission. The LG&E and KU units that will require WFGD chemical injection systems are Ghent Units 1-4, Mill Creek Units 1&2 combined WFGD tank, Mill Creek Unit 3, Mill Creek Unit 4, and Trimble County Unit 1. It should be noted that the Companies' newest coal-fired unit, Trimble County Unit 2, already employs this technology to remain in compliance. Process Flow Diagrams ("PFD") are shown below for the Ghent, Mill Creek, and Trimble County units in Figures 1, 2 and 3 respectively, along with a common flow diagram showing more details of the injection technologies in Figures 4 and 5.

In addition to the WFGD injection system for enhanced mercury control, an injection technology to spray on the coal prior to combustion is needed on several of the coal-fired units in the fleet. Several coal-fired units will improve their mercury capture efficiency from the coal supplemental injection technologies based on their combustion systems and air pollution control equipment configurations. In particular, the Companies coal-fired units without Selective Catalytic Reduction ("SCR") systems do not oxidize mercury to the extent that units with SCRs do. While there is some oxidation of mercury in the combustion process, the SCR catalyst is a very good oxidizer of mercury. Oxidized mercury is more water soluble than elemental mercury and is therefore captured in WFGDs whereas the remaining elemental mercury is not captured by the WFGD. Studies conducted by the Companies indicated that injecting a halogenated chemical additive into the coal feeders for a particular unit will increase mercury oxidation thus improving mercury capture. The Companies' units that will require coal feeder chemical injection systems are Ghent Units 1-4, Mill Creek Unit 1 and Mill Creek Unit 2. PFDs for Ghent and Mill Creek are shown below in Figure 1 and Figure 2, respectfully.

Scope

Mercury control is dependent on the consistent and regulated delivery of chemical additives. The chemical injection feed rate for each unit will be controlled based on measured mercury emissions and WFGD process conditions. The equipment and layout of each system will be designed by a hired engineering firm who will also have involvement in equipment procurement and will interface with a third party construction contractor. Each injection system will require the following:

- Long-term storage vessels
- Pump skids
- Stainless Steel Piping
- Valves and Instrumentation
- Electrical and Control Wiring
- Programmable Logic Controller ("PLC")
- Enclosed climate controlled shelter for pump skid and PLC

Example Piping and Instrumentation Diagrams ("P&ID") for the organo-sulfide systems and halogenated liquid systems are respectively shown in Figure 4 and Figure 5 below. The P&IDs are generic; thus the actual installed systems may vary slightly but will be similar in layout and design.

Timing

The anticipated project timeline is:

- High-Level Engineering and Cost Estimates: 4th quarter 2015
- Detailed Engineering and Construction Drawings/Technical Specs: 1st quarter 2016
- Equipment Procurement: 1st quarter 2016
- Equipment Delivery: 2nd - 4th quarter 2016
- Installation: 2nd – 4th quarter 2016

Cash Flow

The estimated costs of the Mercury Control Injection Systems Projects are $4.9 million for LG&E and $10.1 million for KU, for a total of $15 million between the Companies.

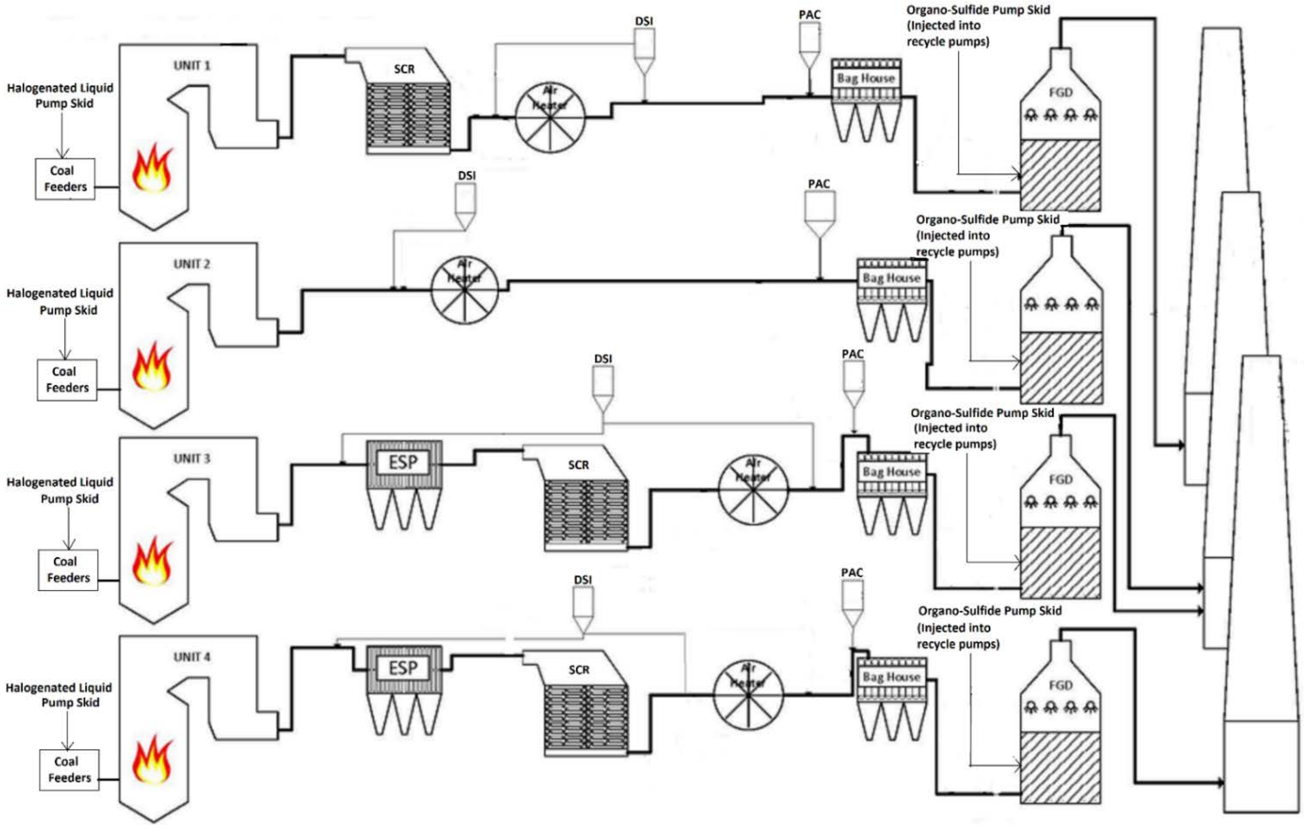

Figure 1- Ghent PFD

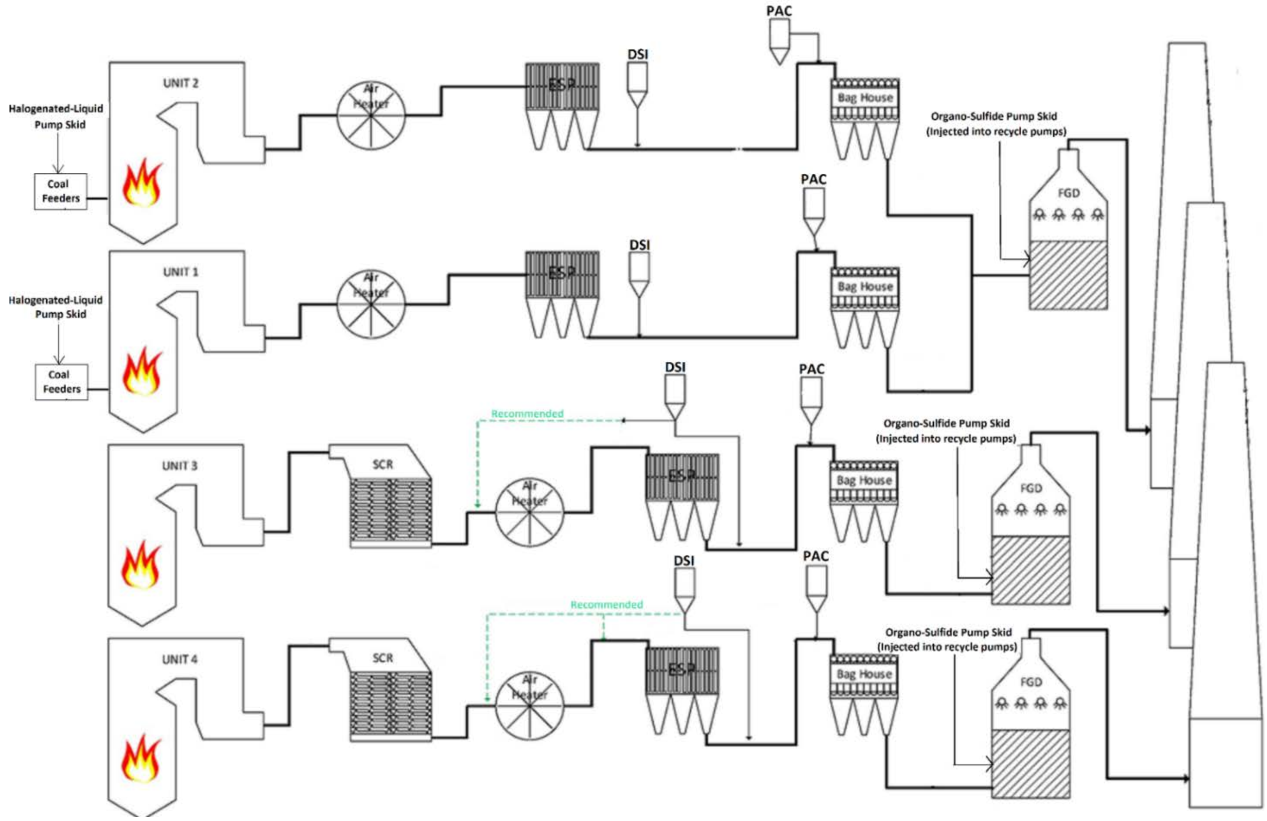

Figure 2- Mill Creek PFD

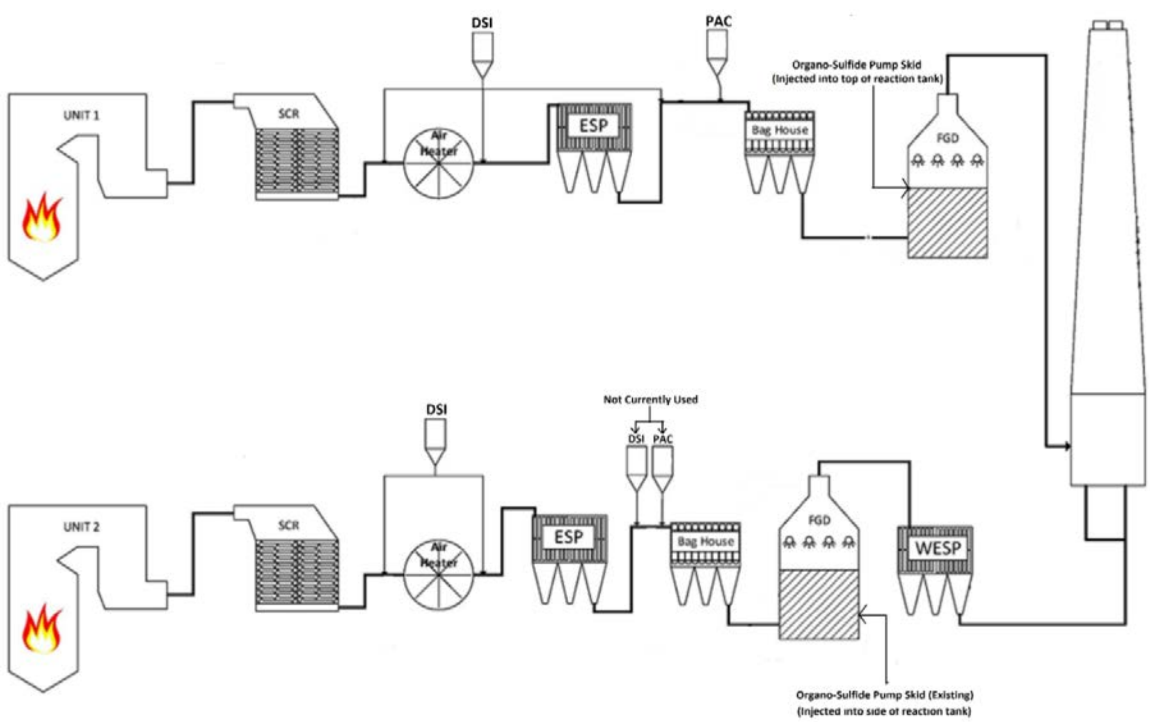

Figure 3- Trimble County PFD

NOTE: Trimble County Unit 2 is not included in the 2016 ECR Filing

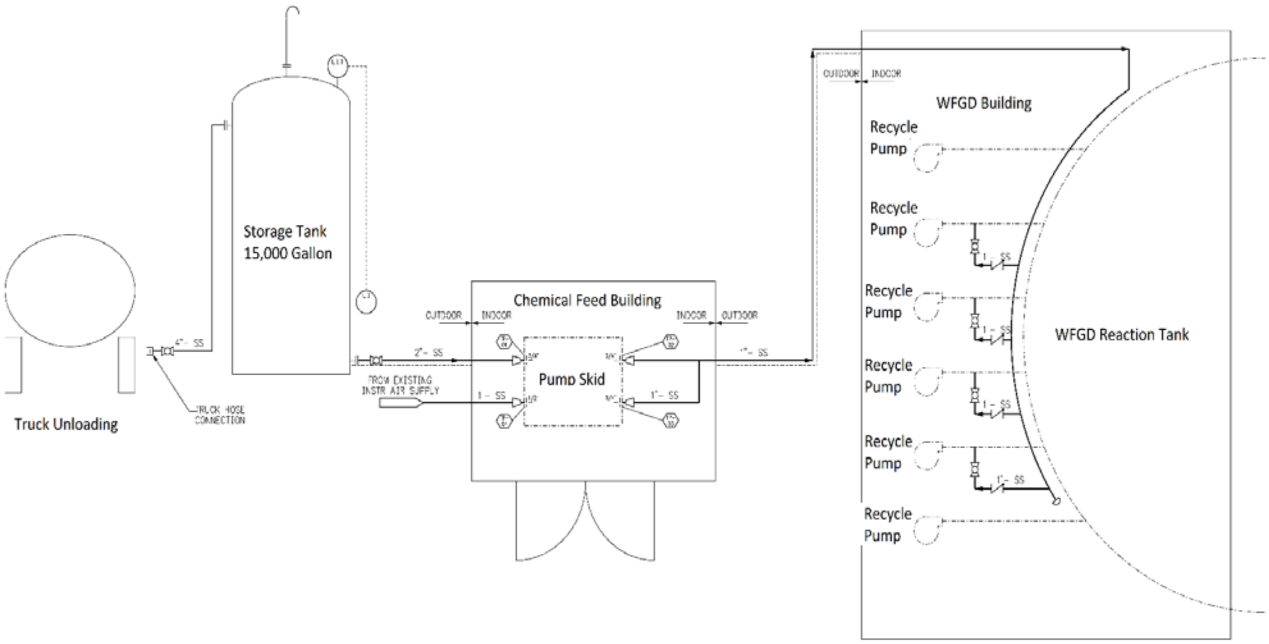

Figure 4- Example Organo-Sulfide System P&ID

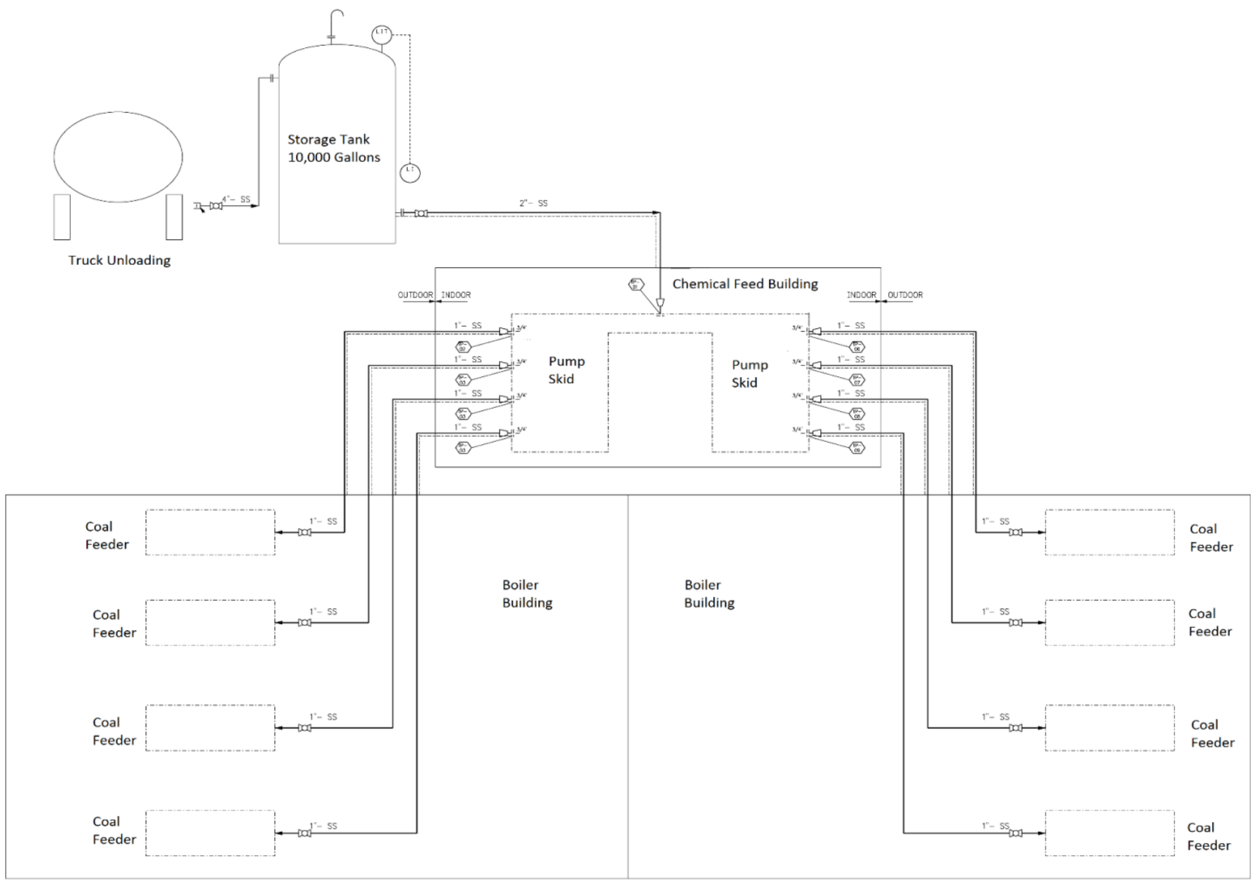

Figure 5- Example Halogenated Liquid P&ID

Project Engineering – LG&E and KU

MATS Rule – Ghent Unit 2 WFGD Project Summary

January 2016

Background

LG&E and KU (collectively, the "Companies") must comply with the Mercury and Air Toxics Standards ("MATS") Rule beginning April 16, 2016 (includes a 1-year extension). The MATS Rule regulates mercury and other hazardous air pollutants such as acid aerosols from fossil fuel fired steam generating units. For the Companies, this includes the Ghent, Mill Creek, Trimble County and E.W. Brown Stations. The Rule also requires the maximum achievable control technology be utilized.

The Companies' coal-fired units are fitted with state-of-the-art WFGD technology for controlling sulfur dioxide, with the exception of Ghent Unit 2. While the other units include WFGDs constructed or upgraded over the last ten years, Ghent Unit 2's WFGD was installed in 1995. The newer and upgraded WFGDs all have sulfur dioxide removal rates equal to or exceeding 97%, while the older Ghent Unit 2 WFGD currently does meet that removal rate. The 97% removal rate for sulfur dioxide is important due to a provision in the MATS rule that allows sulfur dioxide to be used as a surrogate for hydrogen chloride ("HCl").

With respect to HCl, the MATS Rule requires all units at Ghent to emit no more than 0.002 lbs/mmBtu of heat input. As a surrogate for measuring HCl, sulfur dioxide (which is currently measured and reported on at all KU and LG&E generating units) can be used to calculate HCl emissions values. The surrogate sulfur dioxide emission limit for HCl is 0.2 lbs/mmBtu of heat input. Based on the projected sulfur content of the coal that will be utilized at Ghent, to meet a 0.2 lbs/mmBtu of sulfur dioxide, 97% of the sulfur dioxide must be removed. Ghent Unit 2 currently cannot meet this surrogate value on a continuous basis.

Need

When the Companies obtained approval of their 2011 ECR Plan, the MATS Rule had not been finalized. The final MATS Rule includes the provision allowing a surrogate standard for HCl as described above. Presently, the WFGD system installed on Ghent Unit 2 removes slightly over 90% of sulfur dioxide from the flue gas before it is released into the air. In order to achieve the 0.2 lbs/mmBtu of heat input of sulfur dioxide limit in the MATS Rule, approximately 97% of the sulfur dioxide will need to be removed.

Numerous operating variables affect the rate at which sulfur dioxide is removed during the scrubbing process. In WFGD systems, the scrubbing liquid contains an alkali reagent that enhances the absorption of sulfur dioxide. As such, the removal efficiency of sulfur dioxide is highly impacted by the ratio of slurry liquid-to-gas contact, as well as the chemistry of the system.

KU is proposing improvements to Ghent Unit 2's WFGD system that cumulatively will improve the sulfur dioxide removal efficiency by increasing the effective liquid-to-gas contact. KU plans to install new technology spray nozzles on all spray levels with dual directional sprays on some of the spray levels. Figure 1 shows the existing type nozzles at the top and proposed advanced nozzles at the bottom that will increase the liquid-to-gas contact surface area. Implementation of these advanced nozzles result in both increased surface area of the slurry spray due to a finer spray and a concentrated spray pattern as conceptually depicted in Figure 2.

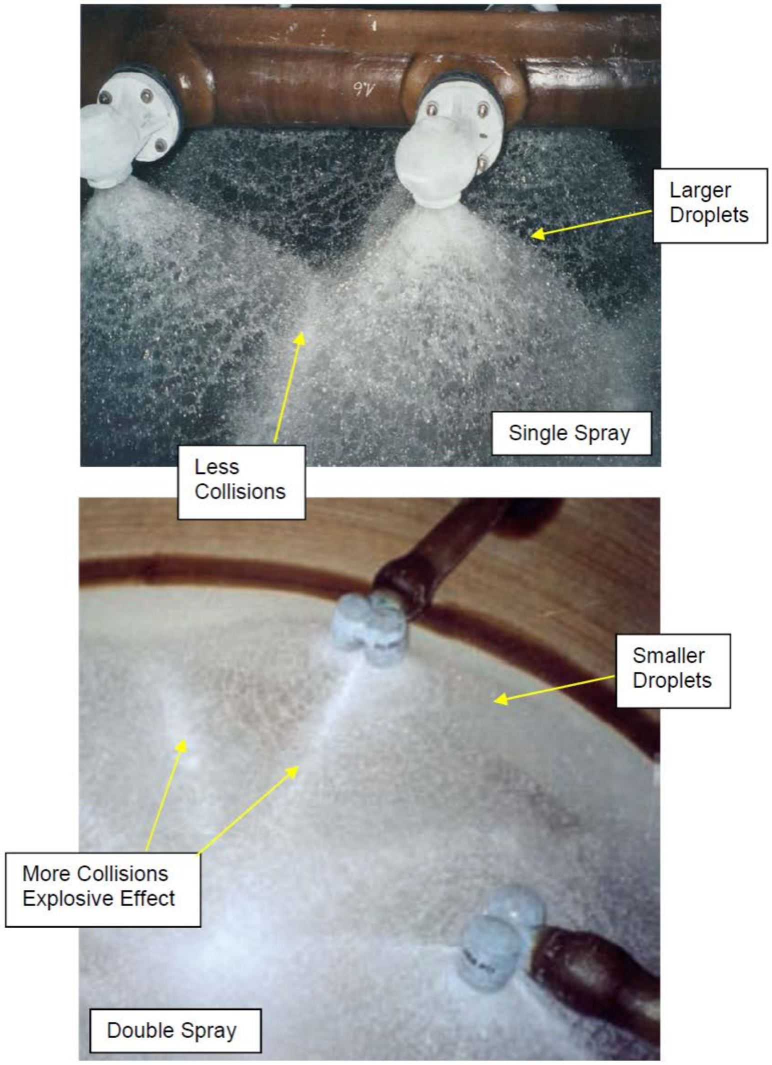

Figure 1 – Current WFGD Nozzles (upper) vs. Proposed Advanced Nozzles (lower)

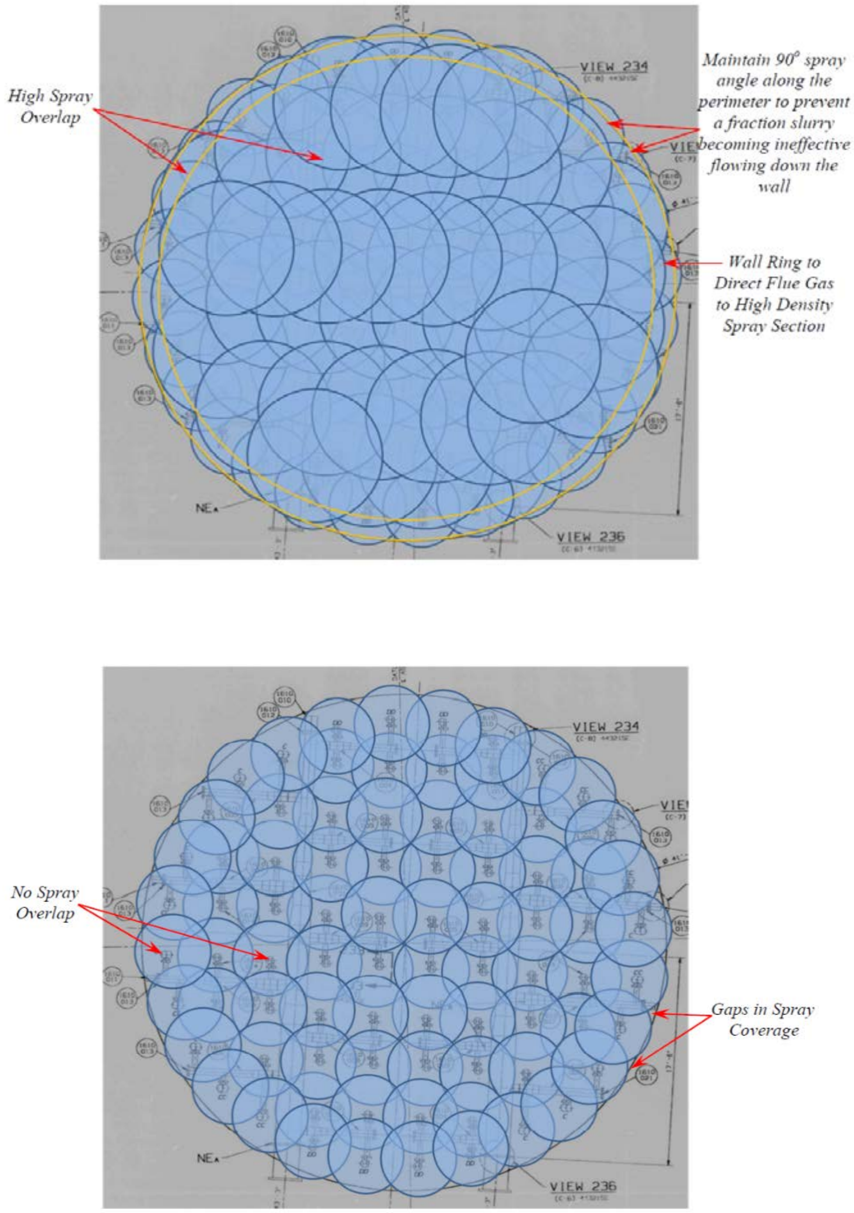

Figure 2 – Current Spray Pattern (lower) vs. Proposed Spray Pattern (upper)

In addition to the nozzles, the project includes the installation of "wall rings" (shown in Figure 3 below) which are attachments to the WFGD's module walls near the spray nozzle and spray cone areas. The wall rings reduce "leakage" of flue gas up the module walls caused by the pressure drop of the nozzle sprays by forcing the flue gas flow through the nozzle spray cone areas. While these upgrades do not increase the amount of liquid flowing through the spray headers, they do essentially increase the contact area of the limestone slurry with the flue gas by increasing surface contact of the slurry with the flue gas through finer spray droplets, concentrated spray patterns and by forcing the flue gas through the sprays by reducing the leakage of flue gas up the wall of the WFGD modules.

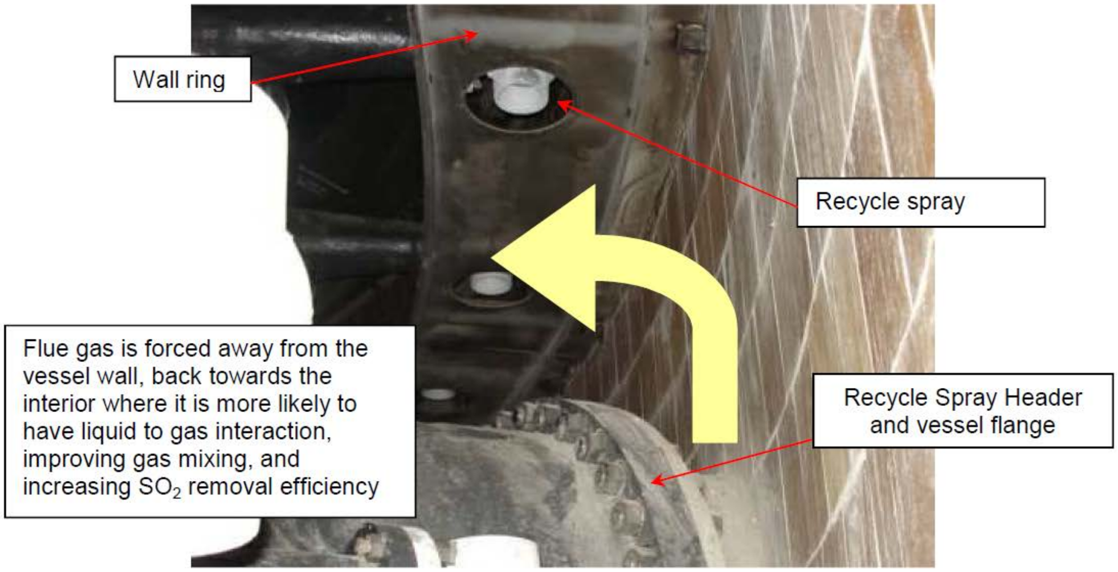

Figure 3 – Wall Ring Concept at WFGD Module Perimeter

While currently not expected to be needed, replacing the recycle pump drive gearboxes may also be required to increase the flow of limestone slurry through the spray nozzles, thus increasing the liquid-to-gas ratio. When these improvements are complete, KU expects to be able to operate Ghent Unit 2 in continual compliance with MATS Rule requirements for the sulfur dioxide surrogate irrespective of which other Ghent units are operating.

Timing

The project timeline includes award to a WFGD technology company late in the first quarter of 2016 with installation occurring later in 2016.

Cash Flow

The estimated cost of the Ghent Unit 2 WFGD upgrades is $7 million.

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF KENTUCKY UTILITIES	**)**	
COMPANY FOR CERTIFICATES OF PUBLIC	**)**	
CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00026**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
GARY H. REVLETT
DIRECTOR, ENVIRONMENTAL AFFAIRS
KENTUCKY UTILITIES COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is Gary H. Revlett. I am the Director of Environmental Affairs for LG&E and KU Services Company, which provides services to Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes, I testified before the Commission during the proceedings in the Companies' 2006 Environmental Compliance Plans (Case Nos. 2006-00206[1] (KU) and 2006-00208[2] (LG&E)). I testified in the Companies' 2011 Environmental Compliance Plans cases (Case Nos. 2011-00161[3] (KU) and 2011-00162[4] (LG&E)). I testified in Case No. 2011-00375[5] in which the Commission issued a Certificate of Public Convenience and Necessity ("CPCN") for the construction of a combined cycle combustion turbine at the Cane Run Generating Station. I testified in Case No. 2014-00002[6] in which the Commission issued a CPCN for the construction of a solar

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[1] *Application of Kentucky Utilities Company for Approval of Its 2006 Compliance Plan for Recovery by Environmental Surcharge*, Case No. 2006-00206.

[2] *Application of Louisville Gas and Electric Company for Approval of Its 2006 Compliance Plan for Recovery by Environmental Surcharge*, Case No. 2006-00208.

[3] *Application of Kentucky Utilities for Certificates for Public Convenience and Necessity and Approval of its 2011 Compliance Plan for Recovery by Environmental Surcharge*, Case Nos. 2011-00161.

[4] *Application of Louisville Gas and Electric Company for Certificates for Public Convenience and Necessity and Approval of its 2011 Compliance Plan for Recovery by Environmental Surcharge*, Case Nos. 2011-00162.

[5] *Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for a Certificate of Public Convenience and Necessity and Site Compatibility Certificate for the Construction of a Combined Cycle Combustion Turbine at the Cane Run Generating Station and the Purchase of Existing Simple Cycle Combustion Turbine Facilities From Bluegrass Generation Company, LLC in Lexington, Kentucky*.

[6] *In re the Matter of: Joint Application Of Louisville Gas And Electric Company And Kentucky Utilities Company For Certificates Of Public Convenience And Necessity For The Construction Of A Combined Cycle Combustion Turbine At The Green River Generating Station And A Solar Photovoltaic Facility At The E.W. Brown Generating Station*, Case No. 2014-00002.

photovoltaic facility at the E.W. Brown Generating Station. Finally, I testified in Case No. 2015-00194[7] in which the Commission issued its decision on December 15, 2015. In addition to testifying, I have been the responsible witness for many of the data responses the Companies have filed with the Commission in those proceedings.

Q. Are you sponsoring any exhibits?

A. Yes, I am sponsoring the following exhibits:

Exhibit GHR-1 **–** Groundwater monitoring reports

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to identify the environmental regulatory requirements that cause the need for the pollution control projects in KU's 2016 Environmental Compliance Plan ("2016 Plan") and demonstrate how those projects will allow KU to comply with these environmental regulations. (A copy of the 2016 Plan is presented in Exhibit JNV-1 to the testimony of John N. Voyles, Jr.) The projects identified in the 2016 Plan are necessary for KU's compliance with the requirements of the Clean Air Act as amended ("CAA"), Coal Combustion Residuals Final Rule ("CCR Rule"), the Mercury and Air Toxics Standards ("MATS Rule"), and other environmental regulations that apply to KU's facilities used for the production of electricity from coal, including state administrative regulations set forth in 401 KAR Chapter 45.

Q. Please describe environmental regulation as it exists today.

A. Environmental regulation and compliance is and always has been an ongoing, everyday activity at our facilities and for our operations. The passage of the initial CAA, the Clean Water Act ("CWA"), and the Resource Conservation and Recovery

[7] *Investigation of Kentucky Utilities Company's and Louisville Gas and Electric Company's Respective Need for and Cost of Multiphase Landfills at the Trimble County and Ghent Generating Stations*, Case No. 2015-00194.

Act ("RCRA), and all subsequent amendments to and revisions of these and other environmental laws and regulations have significantly increased KU's environmental compliance obligations over time. Environmental regulation has experienced even more significant change over the past several years. During this time, the number and breadth of environmental regulations has expanded such that today, environmental compliance is a complex and costly endeavor. Nonetheless, the Companies continue their culture of compliance on an everyday basis.

As a starting point, the CAA, the CWA, and the RCRA (and their amendments) are the core laws from which almost all environmental regulations have originated. The original CAA, passed in 1970, established regulatory programs to control air pollution. One such program is the National Ambient Air Quality Standards. ("NAAQS"). NAAQS sets the maximum concentration of certain pollutants allowed in ambient air. Another such program is the National Emissions Standards for Hazardous Air Pollutants ("NESHAP").[8] The NESHAP regulations establish standards for hazardous air pollutants ("HAPs") issued by stationary sources. Around the same time the CAA was passed, Congress established the United States Environmental Protection Agency ("EPA") to implement the requirements found in many of these programs.

In 1990, Congress amended the CAA in significant respects. As part of the amendments, Congress established a procedure that the EPA must follow before it determines whether to regulate power plants pursuant to the NESHAP program. Over time, the EPA has proposed and adopted a number of rules and regulations that have increased the environmental compliance requirements on the Companies and all

[8] 42 U.S.C. § 7412.

other electric utilities that generate power. The specifics of several of these rules and regulations are discussed below.

Since the Companies' 2011 Environmental Compliance Plan cases, a significant development occurred when the EPA finalized the CCR Rule. That regulation has significant impacts on the Companies' handling and storage of coal combustion residuals ("CCR").[9] EPA's development of the MATS Rule is another significant development impacting the Companies' operations and environmental compliance requirements. The CCR Rule and the MATS Rule are the main reasons behind the need for the projects at issue in this case. They create a need for significant investments to both manage the Companies' CCR and to maintain environmental pollution control equipment and facilities.

Q. Please describe the CCR Rule.

A. On April 17, 2015, the EPA published the CCR Rule in the Federal Register. The CCR Rule finalized national regulations to provide a comprehensive set of self-implementing requirements for the safe disposal of CCR from coal-fired power plants such as KU's Ghent, Trimble, and Brown power plants. The CCR Rule was the culmination of extensive study of the effects of coal combustion residuals on the environment and public health. It establishes self-implementing technical requirements for CCR landfills and surface impoundments under subtitle D of the RCRA, the nation's primary law for regulating solid waste.[10] The effective date of the rule is October 19, 2015.

[9] The CCR Rule defines CCR as "fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers." 40 CFR 257.53. This definition includes what is commonly referred to as gypsum.
[10] http://www2.epa.gov/coalash/coal-ash-rule

Q. What are some of the specific risks the CCR Rule addresses?

A. The CCR Rule establishes detailed and more stringent design, monitoring, operating, corrective action, closure, and post-closure requirements for CCR landfills and surface impoundments in order to manage environmental and safety risks associated with CCR disposal, including risks to groundwater, surface water, and ambient air, as well as to enhance the integrity of CCR impoundments. Across the industry, the CCR Rule's new performance standards for surface impoundments is expected to result in the closure of many CCR impoundments and replacement of those impoundments with landfills – a move from wet to dry handling and storage of CCR. Additionally, the rule sets out recordkeeping and reporting requirements as well as the requirement for each facility to establish and post specific information to a publicly-accessible website. Finally, the CCR Rule also supports the responsible recycling of CCR by distinguishing safe, beneficial use of CCR from actual disposal of it.[11]

Q. To what types of facilities does the CCR Rule apply?

A. The rule applies to new and existing CCR surface impoundments and new and existing CCR landfills. Inactive impoundments at active generation sites that are closed in accordance with applicable closure requirements within three years of the rule's promulgation (i.e., by April 17, 2018) are otherwise exempt from the rule. The rule also does not apply to impoundments and landfills that have already closed or inactive impoundments at plants no longer producing electricity (which, as discussed below, is relevant to the impoundments at the Companies' Green River, Tyrone, and Pineville stations). As to surface impoundments, the CCR Rule applies to new surface impoundments that are designed to hold an accumulation of CCR and liquids

[11] Id.

for purposes of treatment, storage, or disposal. The rule requires corrective action for surface impoundments that are affecting groundwater at unacceptable levels. The Companies' ash ponds are just the type of surface impoundments governed by the CCR Rule.

Q. Please summarize the key operating requirements of the new CCR Rule.

A. The key operating requirements of the CCR Rule are divided into four areas. They are: 1) structural integrity; 2) hydrologic, hydraulic and air criteria; 3) groundwater monitoring and corrective action; and 4) location standards.

The structural integrity requirements include evaluating the hazard potential classification of the dam, performing a structural stability assessment and analyzing other, new and more stringent structural Factors of Safety.

The hydrologic, hydraulic and air operating requirements include developing a Fugitive Dust Control Plan, stormwater run-on and run-off controls and an assessment of the hydrologic and hydraulic capacities.

Under the groundwater monitoring and corrective action requirements, groundwater monitoring wells must be installed around the perimeter of the CCR management facility or unit to determine if constituents attributable to CCR are present in the groundwater. The determination of whether a release has occurred is based on a statistical analysis, using first detection monitoring, then assessment monitoring if necessary. Following assessment monitoring, if CCR constituents are confirmed to be present in the groundwater at statistically significant levels exceeding groundwater protection standards established for the facility, the owner or operator must undertake corrective measures. As discussed further below, in the case of an existing unlined CCR impoundment, the detection of CCR constituents above the groundwater protection standards as a result of the groundwater monitoring required by the CCR Rule will trigger a requirement to cease placement of CCR wastestreams within six months thereafter and initiate closure of the impoundment.

The final set of key operating requirements consists of restrictions on the location of regulated management facilities.

Q. Are there dates that apply to these key operating requirements?

A. Yes. Each of the key operating requirements has an associated compliance demonstration date. For existing CCR management facilities, the structural integrity criteria must be demonstrated to be satisfied by October 17, 2016. By that same date, the Companies must prepare the initial run-on and run-off control system plan for each existing CCR landfill, demonstrate compliance with the required hydrologic and hydraulic capacities during extraordinary rainfall events for each CCR surface impoundment, and prepare an initial written closure plan for all existing CCR management facilities. The required Fugitive Dust Control Plans were completed by the rule's effective date (October 19, 2015).

For those units requiring the development of Emergency Action Plans, these plans must be finalized and ready to implement by April 17, 2017. By October 17, 2017, each regulated CCR management unit must have developed a groundwater monitoring plan, installed the groundwater monitoring wells and collected at least 8 rounds of samples for statistical comparison to background or the up-gradient wells.

Finally, the CCR Rule requires all CCR management facilities at active generating stations to be evaluated for compliance with the location criteria by

October 17, 2018. Therefore, the demonstration of acceptable operation of each management facility or unit under the new CCR Rule is determined over a 3-year period.

Q. Does the CCR Rule require groundwater monitoring of areas in close proximity to surface impoundments?

A. Yes. As summarized above, the rule requires operators of affected surface impoundments to install a groundwater monitoring system (via a system of monitoring wells), initiate a groundwater detection monitoring program, and evaluate the groundwater data to determine if statistically significant increases of CCR constituents have occurred. The operator must comply with stringent record keeping requirements for the collected data and post the data to a publicly available website titled "CCR Rule Compliance Data and Information." The installation of monitoring wells and the collection of sufficient set of samples for statistical analysis must be completed no later than October 17, 2017.[12] If, on the basis of this analysis, an unlined surface impoundment is determined to cause concentrations of CCR constituents in the groundwater that exceed groundwater protection standards, the owner or operator of the impoundment must cease placing CCR wastestreams into the impoundment and initiate closure of the impoundment within a very short time period – a mere six months. This single provision is a primary driver for the timing of the Companies' closure plans.

Q. If groundwater monitoring triggers a closure of a surface impoundment, what are the key requirements for closure and post-closure?

[12] 40 CFR 257.90(b).

A. As mentioned above, the CCR Rule requires that owners or operators cease placing CCR wastestreams in, and initiate closure of, a surface impoundment within 6 months after the analysis of data shows CCR constituents at statistically significant levels above groundwater protections standards. The rule also requires the closure process to be completed within 60 months after it is initiated. Finally, closure and post-closure plans must be prepared. Major closure options under the CCR Rule include cap and closure, clean and closure, or cleaning and lining. Post-closure cover maintenance and groundwater monitoring is required for at least 30 years.

Q. Of the closure options you list above, which is lowest reasonable cost?

A. That is a final determination the Companies will make by evaluating each surface impoundment in the context of all the surface impoundments at each generating station and the CCR Rule's specific requirements for each closure option. As Mr. Voyles describes in greater detail, the Companies currently have a plan for closing surface impoundments on a lowest-reasonable-cost basis for each generating station. That plan includes capping and closing most existing surface impoundments at generating stations with ongoing coal-fired generation by beneficially using CCR to the extent feasible in the closure process, which is lower cost than using other fill material; some remaining surface impoundments are proposed to be cleaned and closed as part of the current overall lowest-reasonable-cost plan for each generating station. But as engineering proceeds and matures for each proposed closure and the assessments of the CCR Rule's criterion for each surface impoundment's circumstances becomes clearer, the closure approach and costs for a given surface impoundment could change, perhaps significantly as described by Mr. Voyles. That is why the Companies are requesting CPCNs for their CCR Rule-related projects that authorize the construction necessary to comply with the CCR Rule, not for specific surface-impoundment-closure plans, as discussed in the testimony of Robert M. Conroy.

Q. Does the CCR Rule contemplate permits for the operation of impoundments or landfills?

A. No. The CCR Rule is "self-implementing." This means that the facilities within purview of the CCR Rule must be in compliance with the rule's standards on the dates set forth in the rule, irrespective of any state requirements or rules. If they are not in compliance, the operator of the facility is subject to citizen suits (including states acting as citizens) to enforce compliance with the rule. In those suits, the Court may award the costs of litigation, including attorney fees and expert witness fees, to the prevailing or substantially prevailing party.[13]

Q. Please describe the MATS Rule.

A. The MATS Rule regulates the emission of mercury and other HAPs from coal- and oil-fired electric utility steam generating units. The MATS Rule requires the use of maximum achievable control technology within the electric-utility industry. The MATS Rule compliance date is April 16, 2015, though state agencies were authorized to grant a one-year extension of time for compliance in certain circumstances.

Q. Please describe the history of the MATS Rule.

A. Like many other environmental regulations, the MATS Rule finds its genesis in the CAA. On December 20, 2000, the EPA decided that it was appropriate and necessary to regulate coal- and oil-fired power plants pursuant to the NESHAP program. The

[13] 42 U.S.C. § 6972(e).

EPA's initial efforts at regulation were known as the Clean Air Mercury Rule ("CAMR"). EPA promulgated CAMR in 2005, but the rule was struck down in 2008 by the United States Court of Appeals for the District of Columbia.[14]

In 2011, the EPA revisited its 2000 decision that it was "necessary and appropriate" to regulate certain power plants under the NESHAP program. The EPA reaffirmed its 2000 decision and proposed new regulations that would govern emissions from coal- and oil-fired power plants. These final regulations—the MATS Rule—were published on February 16, 2012.[15] Shortly thereafter, the MATS Rule was challenged in court. In June 2015, the United States Supreme Court ruled that the EPA acted erroneously when it issued the final MATS Rule without consideration of compliance costs.

Q. What is the current status of the MATS Rule?

A. While the Supreme Court held that the EPA erred by not considering cost in its "necessary and appropriate" finding, the MATS Rule remains in place pending EPA's response to the Supreme Court's decision.[16] In fact, the EPA has begun to address the Supreme Court's holding by publishing a proposed supplemental finding that the MATS Rule remains "necessary and appropriate" even after cost is considered.[17] This proposed supplemental finding was published on December 1, 2015, and the

[14] *See New Jersey v. EPA*, 517 F.3d 574 (D.C. Cir. 2008).
[15] *See* 77 Fed. Reg. 9,304 (Feb. 16, 2012), available at: https://www.gpo.gov/fdsys/pkg/FR-2012-02-16/pdf/2012-806.pdf.
[16] The Supreme Court remanded the case to the United States Court of Appeals for the District of Columbia. On December 4, 2015, that court heard argument on whether the MATS Rule should be vacated until the EPA has fully considered cost. No ruling has been made.
[17] 80 Fed. Reg. 75,025 (Dec. 1, 2015), available at: https://www.gpo.gov/fdsys/pkg/FR-2015-12-01/pdf/2015-30360.pdf.

EPA established January 15, 2016, as the deadline for comments. The EPA expects to finalize its proposed supplemental finding by April 2016.

Q. Do other environmental regulations exist that may affect the Companies' future operations?

A. Yes. The Companies deal on a daily basis with a complex suite of environmental regulations that affect their core business of generating safe and reliable energy for their customers. Of particular importance, the Companies anticipate that the Cross-State Air Pollution Rule ("CSAPR"), NAAQS related to ambient ozone levels, the Clean Power Plan ("CPP"), and the Effluent Limitations Guidelines ("ELG") may have an impact on future operations, and, therefore, may necessitate the addition of other environmental-control equipment.

Q. What is CSAPR?

A. CSAPR is an EPA regulation that requires significant reductions in sulfur dioxide ("SO_2") and nitrogen oxides ("NO_X") emissions. CSAPR was promulgated under the Good Neighbor Provision of the CAA, which "instructs States to prohibit in-state sources 'from emitting any air pollutant in amounts which will . . . contribute significantly' to downwind States' 'nonattainment . . . , or interfere with maintenance,' of any EPA-promulgated national air quality standard."[18] CSAPR is an attempt to bring a number of states and regions into compliance with the NAAQS for 2.5-micron particulate matter ("$PM_{2.5}$") and 2008 eight-hour ozone (smog).[19] (SO_2 is a precursor of $PM_{2.5}$, and NO_X is a precursor of $PM_{2.5}$ and ozone.) In other

[18] *EPA v. EME Homer City Generation, L.P.*, 134 S. Ct. 1584, 1593 (2014) (quoting 42 U.S.C. § 7410(a)(2)(D)(i).

[19] *See id.* at 1594, 1596 n.3.

words, CSAPR's goal is to reduce air pollution that is naturally transported from one state or area to another.

Q. Please describe the history of CSAPR.

A. CSAPR is the successor to the Clean Air Interstate Rule ("CAIR"). CAIR was an EPA regulation that was focused on the same environmental goals as CSAPR.[20] CAIR was finalized in 2005, but in 2008, the United States Court of Appeals for the District of Columbia held that CAIR was not properly promulgated.[21] The court initially vacated the entire rule, but on rehearing, it amended its decision to allow CAIR to remain in place while the EPA went about correcting the rule's deficiencies.[22]

Following the court's decision, the EPA began work on a new rule. The result of that work—CSAPR—was proposed on July 6, 2010, and finalized one year later. CSAPR was immediately challenged in court. On August 21, 2012, the U.S. Court of Appeals for the D.C. Circuit vacated CSAPR and temporarily reinstated CAIR. That decision was reversed by the Supreme Court on April 29, 2014.[23] The D.C. Circuit then held further proceedings to address issues that had not been resolved in its earlier decision.

Q. Is CSAPR currently in effect?

A. Yes, for most states, including Kentucky. Following the Supreme Court decision reversing the lower court's decision, the D.C. Circuit issued a new decision that left CSAPR in place for most states. EPA then established the effective date for Phase I

[20] *See id.* at 1596–97.
[21] *See North Carolina v. EPA*, 531 F.3d 896 (D.C. Cir. 2008).
[22] *North Carolina v. EPA*, 550 F.3d 1176 (D.C. Cir. 2008).
[23] *See EPA v. EME Homer City Generation, L.P.*, 134 S. Ct. 1584 (2014).

of CSAPR as January 1, 2015. The EPA also established the effective date for Phase II of CSAPR as January 1, 2017. The primary difference between Phase I and Phase II of CSAPR is that Phase II lowers even further the maximum permissible level of NO_X and SO_2 emissions.

Q. Has the EPA proposed updates to CSAPR related to ozone requirements?

A. Yes. On November 16, 2015, the EPA proposed the CSAPR Update Rule. The proposed CSAPR Update Rule calls for reducing the summertime emissions of NOx from power plants in the eastern half of the United States, including Kentucky. The CSAPR Update Rule has been proposed to assist with meeting the 2008 ozone standard established under NAAQs.

Q. What is the current ozone regulation under NAAQS?

A. On October 1, 2015, the EPA lowered the maximum allowable ground-level ozone concentration from 75 parts per billion to 70 parts per billion.[24] (Before March 2008, the standard was 80 parts per billion.) Several states, including Kentucky, have appealed the EPA's decision to the United States Court of Appeals for the District of Columbia.[25] A decision is not expected until at least the fall of 2016.

Q. What is the CPP?

A. The CPP is a new EPA regulation that, for the first time, establishes greenhouse gas emission guidelines for states to achieve a carbon dioxide ("CO_2") emission limit from existing power plants. The CPP is meant to reduce the emission of CO_2 from power plants. States are authorized to develop their own plans to comply with their specified emission reduction requirements using EPA issued CPP guidelines.

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[24] 80 Fed. Reg. 65,292 (Oct. 26, 2015), available at https://www.gpo.gov/fdsys/pkg/FR-2015-10-26/pdf/2015-26594.pdf.

[25] *Murray Energy Corp. v. EPA*, Case No. 15-1385 (D.C. Cir.).

Under the CPP, the EPA has established CO_2 emission requirements emanating from existing fossil-fired units statewide (rather than each power plant). These requirements are expressed in two ways, a rate-based requirement and a mass-based requirement, based on the "best system of emission reduction." The CPP requires Kentucky to reduce its CO_2 emission rate from 2,166 pounds per net MWh in 2012 to 1,286 pounds per net MWh in 2030 under the rate-based requirement or from 91,372,076 short tons in 2012 to 63,126,121 short tons in 2030 under the mass-based requirement. The CPP provides for the submittal and approval of a state plan by all states, Kentucky included, that will define how the CO_2 emission reductions will be achieved. If the state does not submit an approvable plan, the CAA provides the authority to the EPA to impose a Federal Plan that will define how the state emissions will be reduced to meet the emission requirement.

Q. What is the contemplated timing of the CPP?

A. The CPP was published on October 23, 2015, and became effective on December 22, 2015.[26] The CPP will be phased in over time. The EPA has established three interim periods within the years ranging from 2022 - 2029. Each interim period has an average performance rate or maximum emission level that must be met. The EPA has established 2030 as the first year of implementation for the final CO_2 emission requirement from existing units. The CPP has been challenged in the United States Court of Appeals for the District of Columbia by over half the states (including Kentucky), several utilities (including LG&E and KU), and numerous trade groups.[27]

[26] 80 Fed. Reg. 64,662 (Oct. 23, 2015), available at https://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf.

[27] *West Virginia v. United States EPA*, Case No. 15-1363 (D.C. Cir.). The Petition for Review was filed on October 23, 2015.

Q. Has the EPA adopted final Effluent Limitations Guidelines ("ELG") regulations?

A. Yes. Pursuant to the CWA, the EPA finalized new ELG regulations on September 30, 2015. The final ELG regulations became effective on January 4, 2016.[28] The previous ELG regulations were last revised in 1982.

Q. Please describe the new ELG regulations.

A. The new ELG regulations are extremely complex and lengthy. Speaking at a high level, the ELG regulations establish new limits for arsenic, mercury, selenium, and nitrates in flue-gas desulfurization wastewater. The ELG regulations also provide that bottom-ash transport water and fly-ash transport water cannot be discharged except for very narrow exceptions and water cannot be used to transport flue-gas mercury control waste. These new regulations are significant and are anticipated to result in additional compliance-related expenditures over the next several years.

Q. When must generating facilities begin to comply with the ELG regulations?

A. Power plants must begin to comply with the ELG regulations "as soon as possible beginning November 1, 2018, but no later than December 31, 2023."[29] Practically speaking, this means that plants must begin to comply between 2018 and 2023 depending on when the plant needs a new or renewed Kentucky Pollutant Discharge Elimination System ("KPDES") permit under the CWA.

PROPOSED CCR RULE PROJECTS

Q. Please identify the projects KU proposes for compliance with the CCR Rule.

[28] 80 Fed. Reg. 67,838 (Nov. 3, 2015), available at https://www.gpo.gov/fdsys/pkg/FR-2015-11-03/pdf/2015-25663.pdf.

[29] 40 CFR 423.13.

A. Project 36 (construction of Phase II of the Brown Landfill), and Projects 40, 41, and 42 (CCR Rule compliance construction and construction of new process water systems at Ghent, Trimble, and Brown, respectively) allow for compliance with the CCR Rule.

Q. Please describe Project 36.

Project 36 involves constructing Phase II of the Brown Landfill which is necessary to store the CCR that is produced at the Brown generating station. The genesis of Project 36 began with 2009 ECR Plan. In the 2009 ECR Plan, the Commission approved KU's proposal to increase the height and volume of the main and auxiliary surface impoundments that store CCR at Brown. In the 2011 ECR Plan, the Commission approved the conversion of the main surface impoundment to a dry landfill to comply with the anticipated federal requirements regarding CCR disposal. The new restrictions on wet CCR disposal established in EPA's final CCR Rule affirmed the Commission's decision was correct. KU began constructing Phase I of the Brown Landfill in late 2014. As Mr. Voyles explains in his testimony, when the Kentucky Division of Waste Management ("KDWM") issued a permit for the Brown Landfill, it set forth a phased approach requiring that the height of CCR disposed in each phase be no more than 10 feet higher than the adjacent phase(s) prior to proceeding with the next layer of disposal across the landfill footprint. Because of this permit condition, KU expects the usable initial 10 foot height capacity of Phase I to be exhausted by the second quarter of 2018 based on historical production rates. Adequate capacity must be ensured to avoid jeopardizing the operation of the Brown units. As Mr. Voyles describes, KU is seeking approval of Phase II at this time.

Q. Please describe Projects 40, 41, and 42.

A. Projects 40, 41, and 42 are for the closure of surface impoundments at the Ghent, Trimble, and Brown stations, respectively, as required by the CCR Rule. As described above, the CCR Rule requires that CCR surface impoundments that do not meet the new structural, groundwater, and location requirements must close as set forth in the rule. KU proposes the closure of five surface impoundments at Ghent, two surface impoundments at Trimble, and one surface impoundment at Brown by 2023.

Q. Do the surface impoundments at Ghent, Trimble and Brown trigger closure requirements under the CCR Rule?

A. At this time, no surface impoundments at those three stations have been determined to trigger closure because of failure to meet structural, groundwater, or location requirements in the CCR Rule.

Q. If the surface impoundments at Ghent, Trimble, and Brown have not triggered any closure requirement, why is KU proposing closure?

A. Although KU has not yet implemented the new groundwater monitoring and data evaluation procedures specified in the CCR Rule, existing sampling data from Ghent, Trimble, and Brown suggest that the statistical thresholds that trigger closure for unlined surface impoundments may be exceeded for the impoundments for each of these facilities. Groundwater reports containing existing sampling data have been submitted to KDWM and are attached as Exhibit GHR-1.[30] Therefore, there is a high probability that closure requirements could be triggered for surface impoundments at those stations once the groundwater monitoring program required by the CCR Rule is

[30] The data shown in Exhibit GHR-1 was filed with KDWM at various times from 2011-2015.

implemented. It is also possible that certain surface impoundments could implicate the location requirements, which are required to be evaluated after the groundwater assessment evaluation.

Prudent utility planning requires that KU start planning for the closure of those surface impoundments now. In light of the extremely short amount of time (a mere six months) the CCR Rule allows between a "triggering" event requiring the initiation of closure of a CCR surface impoundment (analysis of CCR Rule monitoring data showing CCR constituents at statistically significant levels above groundwater protection standards) and the initiation of such closure. It is prudent for KU to move forward now with its plans to close these surface impoundments and arrange for alternate means to manage CCR. Failing to do so would pose an unacceptable risk of having to cease generation at those stations due to a lack of adequate means to manage CCR.

Additionally, as part of KU's closure analysis, KU must consider the effects of other environmental regulations, including ELG, as described above. Indeed, EPA has spoken directly to the interaction between the CCR Rule and ELG:

> The proposed ELG would strengthen the existing controls on discharges to surface waters and the publicly owned treatment works from steam electric power plants including from coal ash ponds. Because these two rules affect similar units and may be met with similar compliance strategies, common sense implementation time frames were established in the CCR Rule so that utilities would not be required to make major decisions about CCR units without first understanding the implications that such decisions would have for meeting the surface water protection requirements of the final ELG rule. . . . Thus, utilities will be able to make appropriate business decisions to meet both sets of requirements.[31]

[31] http://www.epa.gov/coalash/frequent-questions-about-coal-ash-disposal-rule

While closure of surface impoundments will be required under the CCR Rule, KU's plans take into account ELG requirements and will better position KU to comply, just as EPA contemplated.

PROPOSED STATE RULE CLOSURE PROJECTS

Q. Please identify and describe the project KU proposes for the closure of surface impoundments under Kentucky state law.

A. KU proposes Project 39 for the closure of surface impoundments at Green River, Pineville, and Tyrone. KU proposes to close three impoundments at Green River, one at Pineville, and one at Tyrone. Unlike the required closures proposed at Ghent, Trimble, and Brown under the CCR Rule and ELG, the closure of impoundments at Green River, Pineville, and Tyrone would be completed in accordance only with state law for the closure of special waste landfills and not driven by the federal CCR Rule.[32] Because active generation had ceased at these stations prior to the October 19, 2015 effective date of the CCR Rule and the impoundments at these facilities are inactive (i.e., not receiving CCR), the CCR Rule does not apply. However, in an effort to: (1) minimize environmental risk; (2) avoid escalating costs for engineering, construction, and materials; (3) take advantage of economies of scale that will result if these closures are implemented along with the CCR Rule-required closures; and (4) address potential changes in state CCR law that would mandate the closure of these impoundments, it is prudent to proceed with closure.

Additionally, it is possible that compliance with ELG could lead to the mandatory closure of these impoundments under state law. Under ELG, the water in

[32] 401 KAR 45:110.

those impoundments is considered "legacy wastewater."[33] As legacy wastewater under ELG, KU will not be permitted to add to the impoundments the wastewater KU currently adds. This wastewater comes from sump pumps that are located at various locations at each generation facility. To the extent ELG prohibits that current practice, the impoundments could become "dry" under state law. If that happens, they would be regulated by KDWM instead of by the Kentucky Division of Water (which currently regulates those impoundments via the KPDES because they are "wet"). If the impoundments are regulated by KDWM, they are subject to KDWM's authority to order remedial measures.[34]

In short, closure of these surface impoundments at this time is the lowest reasonable cost option for complying with current and anticipated environmental requirements.

PROPOSED MATS RULE PROJECTS

Q. Please identify the projects KU proposes for compliance with the MATS Rule.

A. KU proposes Projects 37 and 38 for compliance and to achieve cost efficiencies under the CAA and the MATS Rule.

Q. Please describe Project 37.

A. Project 37 involves proposed improvements to the wet flue gas desulfurization ("WFGD") technologies at Ghent Unit 2 in order to increase the efficiency of the wet scrubber to allow for enhanced removal of SO_2. These improvements are necessary to comply with the MATS Rule.

Q. How does the MATS Rule require those technology improvements?

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[33] 80 Fed. Reg. 67838, 67883.
[34] KRS 224.10(5)&(18).

A. The MATS Rule established a HAP standard of 0.002 lbs./MMBtu for acid gases measured as hydrogen chloride. However, the rule allows for compliance to be demonstrated using SO_2 as a surrogate.[35] Using SO_2 as a surrogate, the rule requires that the Ghent generating station emit no more than 0.2 pounds of SO_2 per MMBTU. Ghent Unit 2 is currently emitting more than the allowed 0.2 pounds, although the other units at Ghent are within the permissible range and keep the station average compliant with the surrogate limit. Although the MATS Rule allows KU to average the SO_2 emissions of all of the Ghent units, the emissions at Ghent Unit 2 are such that unless at least two other Ghent units are running when Ghent Unit 2 is operating, Ghent Unit 2 is at risk of having to be shut down for not complying with the MATS Rule.

The WFGD system currently installed on Ghent Unit 2 removes slightly over 90% of SO_2 from the flue gas before it is released into the air. In order to achieve the 0.2 pounds of SO_2 per MMBTU limit in the MATS Rule at Ghent Unit 2, approximately 97% of the SO_2 will need to be removed. In contrast, the other units at Ghent currently emit less than the allowable limit and are of sufficient SO_2 removal efficiencies to comply with the MATS Rule. The testimony of R. Scott Straight describes the details of how Project 37 will increase the efficiency of the removal of SO_2 from Ghent Unit 2, thereby achieving compliance with the MATS Rule and allowing for the operation of Ghent Unit 2 irrespective of which other Ghent units are operating.

Q. Please describe Project 38.

[35] 80 Fed. Reg. 9369 and 40 CFR 63; Subpart UUUUU Appendix Table 2.

A. Project 38 involves the installation of low-cost and economical supplemental control technologies to reduce mercury emissions that will keep Ghent Units 1 – 4 in compliance with the MATS Rule as efficiently as possible. The project entails injecting an organo-sulfide chemical additive into the WFGD reaction tank for all units at Ghent. It also includes injecting a halogenated chemical additive into the coal feeders at the Ghent units to increase mercury oxidation, which will improve the amount of mercury captured. Mr. Straight describes Project 38 in more detail.

Q. How does MATS Rule require the improved technologies that Project 38 provides?

A. The MATS Rule requires KU to further reduce the mercury emissions associated with the production of electricity from coal. The MATS Rule requires the use of maximum achievable control technology within the electric-utility industry. Project 38 represents just such maximum achievable technology, providing KU with cost effective, supplemental control technology.

Q. How is compliance with the MATS Rule different than the HAPs Rule referenced above and in KU's 2011 ECR case?

A. The MATS Rule is the final version of the HAPs Rule. The MATS Rule sets emissions limitation standards for mercury and other hazardous air pollutants, reflecting levels achieved by the best-performing sources currently in operation. While the addition of the mercury-related control equipment that was part of the 2011 Plan reduced mercury emissions at the Ghent units, these supplemental technologies will provide operational flexibility when compared to the use of powdered activated carbon prior to the baghouses. Mr. Straight's testimony discusses these benefits in more detail.

Q. Given the state of legal proceedings surrounding the MATS Rule (the U.S. Supreme Court's holding that EPA did not properly consider cost of implementation and the resulting remand process), why would KU move forward with Projects 37 and 38 to comply with the rule?

A. The D.C. Circuit decided to remand MATS to EPA without vacating it, so the Rule remains in place and the Companies must comply with it. Moreover, prudent utility planning requires it and it also affords greater operational flexibility. There is no doubt about EPA's commitment to the MATS Rule. As described above, EPA addressed the Supreme Court's holding by publishing a proposed supplemental finding that the MATS Rule remains "necessary and appropriate" even after cost is considered.[36] This proposed supplemental finding was published on December 1, 2015, and the EPA has established January 15, 2016, as the deadline for comments. The EPA expects to finalize its proposed supplemental finding by April 2016. There is every reason to believe that EPA will affirm the MATS Rule and that it will continue to be final and binding. To assume the contrary would be an imprudent utility business practice.

Q. You have indicated that the CCR Rule, MATS Rule, and ELG require the projects being proposed in this case. Do the other regulations you discussed above (CSAPR, NAAQS, and the CPP) require any of the proposed projects?

[36] 80 Fed. Reg. 75,025 (Dec. 1, 2015), available at: https://www.gpo.gov/fdsys/pkg/FR-2015-12-01/pdf/2015-30360.pdf.

A. Not directly, but it is important to understand that all of the regulations I have discussed, when taken together, result in an increasingly complex, stringent, and expensive environmental compliance situation for KU and its customers. KU's environmental compliance efforts require prudent business planning and expertise on a daily basis. The projects proposed in this case are a result of that planning and expertise.

Q. Do you have a recommendation for the Commission?

A. Yes. I recommend approval of all projects proposed by KU in this case.

Q. Does this conclude your testimony?

A. Yes it does.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) **SS:**
COUNTY OF JEFFERSON)

The undersigned, **Gary H. Revlett**, being duly sworn, deposes and says he is the Director, Environmental Affairs for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

Gary H. Revlett
Gary H. Revlett

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
~~My commission expires July 11, 2018~~
Notary ID # 512743

APPENDIX A

Gary H. Revlett
Director, Environmental Affairs
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-4621

Education

University of Louisville, Ph.D. Analytical/Environmental Chemistry - May 1976

Murray State University, B.S. Chemistry - June 1971

OSHA Hazardous Waste Worker Training and 8-hour Refresher Courses

Previous Positions

E.ON U.S. Services Inc.

2006-2010 - Air Manager - Environmental Affairs

Tetra Tech EMI, Louisville, Kentucky

2005-2006 - Senior Air Quality Manager

Kenvirons, Inc., Frankfort, Kentucky

1994-2005 - Vice President and Treasurer
(Director of Air Services and Laboratory Services)

1985-1994 - Associate
(Manager of Testing and Air Services)

1978- 1984 - Senior Environmental Scientist
(Manager of Emission Testing and Air Modeling)

Kentucky Division of Pollution Control, Frankfort, KY

1976-1977 - Principal Chemist - Air Modeling Team

E.W. Brown Station Groundwater Reports

amec

GROUNDWATER ASSESSMENT REPORT

E.W. BROWN GENERATING STATION MERCER COUNTY, KENTUCKY

AGENCY INTEREST #3148
ACTIVITY ID No. AIN20120001

27 September 2013

Prepared For:

LG&E KU
PPL companies

LG&E and KU Services Company
815 Dix Dam Road
Harrodsburg, KY 40330

Prepared By:

AMEC Environment & Infrastructure, Inc.
11003 Bluegrass Parkway, Suite 690
Louisville, Kentucky 40299

AMEC Project No. 3143101364

GROUNDWATER ASSESSMENT REPORT

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Table 4
Dye Monitoring Results and Field Parameter Data, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temp-erature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conduc-tance (SC) (µmho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
Background Springs																
CH-052	Stonewall Spring	5/9/2011	ND/B	—	—	—	40	0.06	V	6.82	19.6	—	—	—	370	180
CH-052	Stonewall Spring	5/13/2011	ND/B	—	—	—	190	0.3	V	—	—	—	—	—	—	—
CH-052	Stonewall Spring	5/17/2011	ND/B	—	—	—	90	0.1	V	7.26	14.8	—	—	—	840	490
CH-052	Stonewall Spring	5/24/2011	ND/B	—	—	—	20	0.03	B	7.30	19.1	—	—	—	410	200
CH-052	Stonewall Spring	5/31/2011	ND/B	768.72	-0.71	768.0	—	—	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	6/7/2011	ND/B	—	—	—	5	0.007	B	7.49	23.8	—	—	—	470	230
CH-052	Stonewall Spring	6/14/2011	ND/B	—	—	—	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	6/21/2011	ND/B	—	—	—	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	6/30/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	low water	(moved Sta)	768.72	—	767.5	—	—	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	1/31/2012	—	768.53	0.04	768.6	11	0.02	B	7.63	12.9	8.31	-226.2	15	324	—
CH-052	Stonewall Spring	2/16/2012	—	768.53	0.09	768.6	4	0.006	B	8.02	10.7	9.52	-223.4	5.8	332	—
CH-052	Stonewall Spring	4/13/2012	—	768.53	0.04	768.6	1	0.001	E	8.00	22.3	—	—	7.7	560	—
CH-052	Stonewall Spring	4/26/2012	ND/B	768.53	0.00	768.5	no flow	no flow	E	—	—	—	—	—	—	—
CH-052	Stonewall Spring	5/3/2012	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	5/7/2012	ND/B	768.53	0.01	768.5	1	0.001	E	—	—	—	—	—	—	—
CH-052	Stonewall Spring	5/10/2012	ND/B	768.53	0.00	768.5	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	5/14/2012	—	768.53	0.12	768.7	18	0.03	B	7.62	15.7	1.89	-122.3	18.0	523	—
CH-052	Stonewall Spring	5/17/2012	ND/B	768.53	0.21	768.7	5	0.007	E	7.74	14.4	5.93	155.7	—	516	—
CH-052	Stonewall Spring	5/24/2012	ND/B	768.53	0.06	768.6	1	0.001	E	—	—	—	—	—	—	—
CH-052	Stonewall Spring	6/1/2012	ND/B	768.53	0.03	768.6	0.3 (low)	low flow	E	—	—	—	—	—	—	—
CH-052	Stonewall Spring	6/7/2012	ND/B	768.53	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	6/15/2012	R+?	768.53	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	6/28/2012	—	768.53	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	7/17/2012	—	768.53	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	8/2/2012	—	768.53	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	8/23/2012	—	768.53	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	9/4/2012	—	768.53	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	9/20/2012	—	768.53	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	12/18/2012	—	768.53	0.24	768.80	10	0.01	B	8.84	10.7	4.94	-184.3	22	375	—
CH-063	Rockhouse Spring	4/26/2012	ND/B	812.23	0.29	812.5	4	0.005	E	7.28	17.7	1.65	-34.9	—	534	—
CH-063	Rockhouse Spring	5/3/2012	ND/B	812.23	—	—	—	—	—	—	—	—	—	—	—	—
CH-063	Rockhouse Spring	5/7/2012	ND/B	812.23	0.27	812.5	5	0.007	E	7.18	12.6	3.04	-140.5	—	474	—
CH-063	Rockhouse Spring	5/10/2012	ND/B	812.23	0.41	812.6	3	0.004	E	7.21	13.0	—	-111.8	—	632	—
CH-063	Rockhouse Spring	5/17/2012	ND/B	812.23	0.31	812.5	7	0.01	E	7.05	12.7	2.24	-226.7	—	589	—
CH-063	Rockhouse Spring	5/21/2012	—	812.23	0.27	812.5	7	0.01	E	7.27	13.2	—	-146.3	—	617	—
CH-063	Rockhouse Spring	5/24/2012	ND/B	812.23	0.24	812.5	2	0.003	E	7.11	12.8	1.17	-119.8	—	616	—
CH-063	Rockhouse Spring	6/1/2012	ND/B	812.23	0.20	812.4	2	0.003	E	7.33	12.7	2.97	-123.7	—	605	—
CH-063	Rockhouse Spring	6/7/2012	ND/B	812.23	standing	—	low flow	low flow	—	7.85	13.1	—	-124.4	—	639	—
CH-063	Rockhouse Spring	6/15/2012	ND/B	812.23	standing	—	no flow	no flow	—	7.08	16.3	—	-123.5	—	833	—
CH-063	Rockhouse Spring	6/28/2012	—	812.23	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-063	Rockhouse Spring	7/17/2012	—	812.23	standing	—	no flow	no flow	—	—	—	—	—	—	—	—
CH-063	Rockhouse Spring	8/2/2012	ND/B	812.23	standing	—	no flow	no flow	—	7.80	15.5	6.49	92.6	—	656	—
CH-063	Rockhouse Spring	8/23/2012	ND/B	812.23	standing	—	no flow	no flow	—	7.84	15.1	6.94	108.6	—	693	—
CH-063	Rockhouse Spring	9/20/2012	ND/B	812.23	0.18	812.4	2	0.003	E	7.51	18.10	—	-178.3	—	962	—
CH-063	Rockhouse Spring	12/17/2012	—	812.23	0.26	812.5	50	0.07	V	7.78	14.4	7.43	-103.8	12	433	—
CH-063	Rockhouse Spring	1/14/2012	—	812.23	0.34	812.6	60	0.09	E	8.53	12.5	7.81	132.7	13	429	—
CH-062	Hardin Spring	4/26/2012	ND/B	834.63	—	—	—	—	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	5/3/2012	ND/B	834.63	—	—	—	—	—	—	—	—	—	—	—	—

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CH-062	Hardin Spring	5/7/2012	ND/B	834.63	0.02	834.7	low flow	low flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	5/10/2012	ND/B	834.63	0.06	834.7	low flow	low flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	5/17/2012	ND/B	834.63	0.08	834.7	0.3	0.0004	E	7.16	16.74	—	-182.40	—	631	—
CH-062	Hardin Spring	5/24/2012	ND/B	834.63	0.05	834.7	low flow	low flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	6/1/2012	ND/B	834.63	0.05	834.7	low flow	low flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	6/7/2012	S+?	834.63	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	6/15/2012	ND/B	834.63	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	6/28/2012	—	834.63	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	7/17/2012	—	834.63	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	8/2/2012	—	834.63	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	8/23/2012	—	834.63	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	9/20/2012	ND/B	834.63	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-062	Hardin Spring	12/17/2012	—	834.63	0.03	834.7	0.5	0.001	E	—	—	—	—	—	—	—
CH-062	Hardin Spring	1/14/2012	—	834.63	0.29	834.9	20	0.0300	V	8.28	14.44	8.39	132.50	8.3	257	—
Other Sampling Points - Springs and Drains																
CH-028	Webb Spring Complex	5/9/2011	ND/B	—	—	—	6	0.008	B	7.57	20.8	—	—	—	510	250
CH-028	Webb Spring Complex	5/13/2011	ND/B	—	—	—	6	0.009	B	—	—	—	—	—	—	—
CH-028	Webb Spring Complex	5/17/2011	ND/B	799.92	-0.92	799.0	9	0.01	B	7.83	15.7	—	—	—	600	290
CH-028	Webb Spring Complex	5/24/2011	ND/B	799.92	-0.83	799.1	40	0.06	B	7.58	19.2	—	—	—	580	300
CH-028	Webb Spring Complex	5/31/2011	ND/B	799.92	-0.92	799.0	4	0.006	B	7.19	21.3	—	—	—	590	290
CH-028	Webb Spring Complex	6/7/2011	ND/B	799.92	-1.08	798.8	5	0.008	B	7.52	24.5	—	—	—	690	330
CH-028	Webb Spring Complex	6/14/2011	ND/B	—	—	—	10	0.01	B	7.13	24.8	—	—	—	640	330
CH-028	Webb Spring Complex	6/21/2011	ND/B	—	—	—	7	0.01	B	7.57	22.8	8.78	—	—	660	340
CH-028	Webb Spring Complex	6/30/2011	ND/B	—	—	—	6	0.008	B	—	—	—	—	—	—	—
CH-028	Webb Spring Complex	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-028	Webb Spring Complex	low water	(moved Sta)	799.92	-1.11	798.8	—	—	—	—	—	—	—	—	—	—
CH-028	Webb Spring Complex	1/31/2012	—	794.44	0.29	794.7	260	0.4	V	7.54	12.9	8.10	-221.4	9.4	406	—
CH-028	Webb Spring Complex	2/16/2012	—	794.44	0.17	794.6	66	0.10	V	8.01	12.2	9.50	-227.3	26	457	—
CH-028	Webb Spring Complex	4/13/2012	—	794.44	0.13	794.6	15	0.02	E	7.70	21.2	—	—	4.7	1,010	—
CH-028	Webb Spring Complex	4/27/2012	ND/B	794.44	2.50	796.9	93	0.1	V	8.20	12.6	8.93	217.1	—	568	—
CH-028	Webb Spring Complex	5/3/2012	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-028	Webb Spring Complex	5/7/2012	ND/B	794.44	0.28	794.7	130	0.2	V	8.22	20.3	2.25	-157.8	—	660	—
CH-028	Webb Spring Complex	5/10/2012	ND/B	794.44	0.20	794.6	65	0.09	V	8.24	17.7	10.24	154.7	—	736	—
CH-028	Webb Spring Complex	5/14/2012	—	794.44	0.40	794.8	250	0.4	V	7.48	16.1	4.70	123.1	11.0	720	—
CH-028	Webb Spring Complex	5/17/2012	ND/B	794.44	0.29	794.7	12	0.2	V	8.28	20.1	3.01	-163.7	—	697	—
CH-028	Webb Spring Complex	5/24/2012	ND/B	794.44	0.24	794.7	103	0.1	V	8.29	22.7	3.60	-162.9	—	710	—
CH-028	Webb Spring Complex	6/1/2012	ND/B	794.44	0.26	794.7	110	0.2	V	8.10	15.1	1.38	-181.9	—	732	—
CH-028	Webb Spring Complex	6/7/2012	ND/B	794.44	0.30	794.7	13	0.02	B	8.31	18.7	9.01	-132.5	—	757	—
CH-028	Webb Spring Complex	6/15/2012	ND/B	794.44	0.21	794.6	31	0.04	V	7.52	16.6	8.76	167.9	—	832	—
CH-028	Webb Spring Complex	6/28/2012	ND/B	794.44	0.19	794.6	39	0.06	V	7.88	17.1	5.79	233.5	—	1,437	—
CH-028	Webb Spring Complex	7/17/2012	ND/B	794.44	0.17	794.6	7	0.01	B	8.18	29.8	6.29	189.4	—	829	—
CH-028	Webb Spring Complex	8/2/2012	ND/B	794.44	0.20	794.6	20	0.03	E	8.15	28.6	6.76	177.5	—	788	—
CH-028	Webb Spring Complex	8/23/2012	E+?	794.44	0.16	794.6	17	0.02	E	8.03	19.5	6.03	129.2	—	627	—
CH-028	Webb Spring Complex	9/4/2012	—	794.44	0.29	794.7	130	0.2	V	7.91	20.6	3.41	-125.4	—	840	—
CH-028	Webb Spring Complex	9/20/2012	E+++	794.44	0.26	794.7	70	0.1	V	8.15	20.0	9.11	179.1	—	833	—
CH-028	Webb Spring Complex	12/18/2012	—	794.44	0.43	794.9	263	0.4	V	8.69	12.2	6.09	-162.0	80	516	—
CH-050	Railroad Spring	5/9/2011	ND/B	—	—	—	70	0.1	V	7.74	22.4	—	—	—	740	360
CH-050	Railroad Spring	5/13/2011	ND/B	—	—	—	50	0.07	B	—	—	—	—	—	—	—
CH-050	Railroad Spring	5/17/2011	ND/B	—	—	—	40	0.06	V	7.13	15.0	—	—	—	610	290
CH-050	Railroad Spring	5/24/2011	ND/B	821.93	-1.67	820.3	120	0.2	V	7.22	19.0	—	—	—	950	470
CH-050	Railroad Spring	5/31/2011	ND/B	821.93	-1.75	820.2	—	—	—	7.26	21.2	—	—	—	710	360

Table 4
Dye Monitoring Results and Field Parameter Data, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temp-erature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conduc-tance (SC) (µmho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
CH-050	Railroad Spring	6/7/2011	ND/B	—	—	—	—	—	—	6.78	25.2	—	—	—	1,110	560
CH-050	Railroad Spring	6/14/2011	ND/B	—	—	—	—	—	—	7.13	23.1	—	—	—	620	320
CH-050	Railroad Spring	6/21/2011	ND/B	—	—	—	—	—	—	6.81	18.0	7.57	—	—	1,000	500
CH-050	Railroad Spring	6/30/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-050	Railroad Spring	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-050	Railroad Spring	low water	(moved Sta)	821.93	-1.74	820.2	—	—	—	—	—	—	—	—	—	—
CH-050	Railroad Spring	1/31/2012	—	820.61	0.17	820.8	77	0.1	V	7.46	13.4	7.18	-224.7	7.5	693	—
CH-050	Railroad Spring	2/16/2012	—	820.61	0.10	820.7	20	—	E	7.80	13.1	8.56	-214.1	7.0	905	—
CH-050	Railroad Spring	4/13/2012	—	820.61	0.02	820.6	5	0.006	E	7.60	21.8	—	—	6.2	1,480	—
CH-050	Railroad Spring	4/26/2012	ND/B	820.61	0.13	820.7	47	0.07	V	7.86	16.9	4.29	157.3	—	731	—
CH-050	Railroad Spring	5/3/2012	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-050	Railroad Spring	5/7/2012	ND/B	820.61	0.12	820.7	25	0.04	V	—	—	—	—	—	—	—
CH-050	Railroad Spring	5/10/2012	ND/B	820.61	0.13	820.7	20	0.03	E	—	—	—	—	—	—	—
CH-050	Railroad Spring	5/14/2012	—	820.61	0.27	820.9	160	0.2	V	7.61	16.5	7.95	206.1	42.0	1,079	—
CH-050	Railroad Spring	5/17/2012	ND/B	820.61	0.21	820.8	15	0.2	E	7.25	16.5	2.78	-187.3	—	1,120	—
CH-050	Railroad Spring	5/24/2012	ND/B	820.61	0.09	820.7	25	0.04	E	7.27	15.9	3.01	-152.9	—	939	—
CH-050	Railroad Spring	6/1/2012	ND/B	820.61	0.27	820.9	90	0.1	V	7.19	14.4	2.92	-173.5	—	1,097	—
CH-050	Railroad Spring	6/7/2012	ND/B	820.61	<0.1	820.7	low flow	low flow	—	7.23	16.3	10.06	-68.7	—	1,239	—
CH-050	Railroad Spring	6/15/2012	R+?	820.61	0.17 standing	820.8	no flow	no flow	—	7.03	21.8	8.36	156.5	—	1,173	—
CH-050	Railroad Spring	6/28/2012	ND/B	820.61	0.15 standing	820.8	low flow	low flow	—	6.98	22.2	4.03	121.7	—	1,618	—
CH-050	Railroad Spring	7/17/2012	ND/B	820.61	0.05	820.7	low flow	low flow	—	—	—	—	—	—	—	—
CH-050	Railroad Spring	8/2/2012	ND/B	820.61	0.09	820.7	10	0.01	E	—	—	—	—	—	—	—
CH-050	Railroad Spring	8/23/2012	ND/B	820.61	0.10	820.7	5	0.007	E	—	—	—	—	—	—	—
CH-050	Railroad Spring	9/4/2012	—	820.61	0.27	820.9	68	0.1	V	7.62	20.2	3.53	-99.8	—	1,415	—
CH-050	Railroad Spring	9/20/2012	ND/B	820.61	0.26	820.9	95	0.1	V	7.62	18.8	6.86	149.0	—	1,386	—
CH-050	Railroad Spring	12/18/2012	—	820.61	0.39	821.0	160	0.2	V	7.98	15.3	4.89	-127.6	—	2,350	—
CH-040	Dam Toe Right (Audible)	5/9/2011	ND/B	—	—	—	—	—	—	6.72	20.9	—	—	—	1,060	530
CH-040	Dam Toe Right (Audible)	5/13/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-040	Dam Toe Right (Audible)	5/17/2011	F+	—	—	—	—	—	—	7.20	15.2	—	—	—	1,070	520
CH-040	Dam Toe Right (Audible)	5/24/2011	F++	—	—	—	—	—	—	6.81	19.1	—	—	—	990	490
CH-040	Dam Toe Right (Audible)	5/31/2011	F++, S++	—	—	—	—	—	—	7.51	21.4	—	—	—	870	440
CH-040	Dam Toe Right (Audible)	6/7/2011	F+, S+	—	—	—	—	—	—	7.04	24.3	—	—	—	1,000	510
CH-040	Dam Toe Right (Audible)	6/14/2011	F+, S+	—	—	—	—	—	—	7.62	23.9	—	—	—	970	490
CH-040	Dam Toe Right (Audible)	6/21/2011	F+	—	—	—	—	—	—	6.82	17.6	1.26	—	—	900	440
CH-040	Dam Toe Right (Audible)	6/30/2011	F+	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-040	Dam Toe Right (Audible)	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-040	Dam Toe Right (Audible)	low water	(moved Sta)	754.39	-1.99	752.4	—	—	—	—	—	—	—	—	—	—
CH-040	Dam Toe Right (Audible)	1/31/2012	—	752.31	0.25	752.6	24	0.03	B	6.90	17.2	3.63	-229.9	8.6	790	—
CH-040	Dam Toe Right (Audible)	2/16/2012	—	752.31	0.19	752.5	25	0.04	E	7.27	14.9	3.99	-234	9.7	746	—
CH-040	Dam Toe Right (Audible)	4/13/2012	—	752.31	—	—	12	0.02	E	7.20	21.1	—	—	8.2	1,070	—
CH-040	Dam Toe Right (Audible)	4/27/2012	ND/B	752.31	0.25	752.6	10	0.01	E	7.42	16.8	—	209.6	—	814	—
CH-040	Dam Toe Right (Audible)	5/2/2012	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-040	Dam Toe Right (Audible)	5/7/2012	ND/B	752.31	0.27	752.6	10	0.01	E	7.06	17.7	3.86	-211.6	—	856	—
CH-040	Dam Toe Right (Audible)	5/10/2012	ND/B	752.31	0.31	752.6	5	0.007	E	7.02	18.0	3.07	-161.2	—	1,197	—
CH-040	Dam Toe Right (Audible)	5/14/2012	—	752.31	0.36	752.7	20	0.03	E	7.29	18.8	7.24	148.8	15.0	1,050	—
CH-040	Dam Toe Right (Audible)	5/17/2012	E+?	752.31	0.28	752.6	15	0.02	E	7.02	17.5	3.02	-195.5	—	1,084	—
CH-040	Dam Toe Right (Audible)	5/24/2012	R+?	752.31	0.27	752.6	15	0.02	E	6.92	18.0	2.10	-169.1	—	1,066	—
CH-040	Dam Toe Right (Audible)	6/1/2012	ND/B	752.31	0.36	752.7	20	0.03	E	7.03	17.7	2.56	-188.9	—	1,094	—
CH-040	Dam Toe Right (Audible)	6/7/2012	E++	752.31	0.30	752.6	20	0.03	E	7.04	17.7	2.56	-94.2	—	1,248	—
CH-040	Dam Toe Right (Audible)	6/15/2012	E+/ND	752.31	0.21	752.5	5	0.007	E	7.12	18.1	2.81	-112.6	—	968	—
CH-040	Dam Toe Right (Audible)	6/28/2012	E++	752.31	0.17	752.5	8	0.01	V	7.83	18.7	3.42	-178.9	—	1,289	—
CH-040	Dam Toe Right (Audible)	7/17/2012	E++	752.31	0.28	752.6	20	0.03	E	6.83	17.0	2.06	-177.0	—	971	—
CH-040	Dam Toe Right (Audible)	8/2/2012	E++	752.31	0.31	752.6	25	0.04	E	7.08	17.5	2.26	-153.3	—	1,011	—

Table 4
Dye Monitoring Results and Field Parameter Data, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temperature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conductance (SC) (µmho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
CH-040	Dam Toe Right (Audible)	8/23/2012	E++	752.31	0.31	752.6	25	0.04	E	7.24	16.1	2.61	-107.3	—	739	—
CH-040	Dam Toe Right (Audible)	9/4/2012	—	752.31	0.34	752.7	35	0.05	E	7.23	18.9	2.26	-95.7	—	995	—
CH-040	Dam Toe Right (Audible)	9/20/2012	E++	752.31	0.27	752.6	10	0.01	E	7.54	17.3	—	-214.8	—	1,012	—
CH-040	Dam Toe Right (Audible)	12/17/2012	—	752.31	0.31	752.6	5	0.007	E	7.81	14.9	5.13	-142.5	19	897	—
CH-044	Ditch Spring	5/9/2011	ND/B	—	—	—	120	0.2	V	6.67	18.3	—	—	—	920	460
CH-044	Ditch Spring	5/13/2011	ND/B	—	—	—	100	0.1	V	—	—	—	—	—	—	—
CH-044	Ditch Spring	5/17/2011	F+++	—	—	—	110	0.2	V	6.87	15.9	—	—	—	930	460
CH-044	Ditch Spring	5/24/2011	F+++; S+++	829.15	-1.50	827.6	60	0.09	V	6.67	19.5	—	—	—	1,090	540
CH-044	Ditch Spring	5/31/2011	F++, S+++	—	—	—	60	0.1	V	7.41	20.4	—	—	—	620	370
CH-044	Ditch Spring	6/7/2011	F++, S+++	—	—	—	30	0.05	V	6.88	23.7	—	—	—	820	410
CH-044	Ditch Spring	6/14/2011	F+, S++	—	—	—	60	0.08	V	7.03	23.7	—	—	—	1,250	680
CH-044	Ditch Spring	6/21/2011	F+, S++	—	—	—	100	0.1	V	6.84	16.2	3.33	—	—	870	440
CH-044	Ditch Spring	6/30/2011	F++, S+++	—	—	—	80	0.1	V	—	—	—	—	—	—	—
CH-044	Ditch Spring	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-044	Ditch Spring	low water	(moved Sta)	829.15	-1.79	827.4	—	—	—	—	—	—	—	—	—	—
CH-044	Ditch Spring	1/31/2012	—	827.18	0.25	827.4	5	0.007	V	6.95	16.2	—	—	5.1	748	—
CH-044	Ditch Spring	2/16/2012	—	827.18	0.11	827.3	15	0.02	E	7.26	13.9	4.53	-220.0	4.7	706	—
CH-044	Ditch Spring	4/13/2012	—	827.18	0.08	827.3	12	0.02	E	7.10	22.0	—	—	6.9	980	—
CH-044	Ditch Spring	4/26/2012	ND/B	827.18	0.23	—	120	0.5	V	7.12	15.8	4.02	189.5	—	795	—
CH-044	Ditch Spring	5/2/2012	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-044	Ditch Spring	5/7/2012	E+++	827.18	0.19	827.4	76	0.1	V	7.05	15.8	6.49	187.0	—	811	—
CH-044	Ditch Spring	5/10/2012	E+++	827.18	0.21	827.4	30	0.04	V	7.27	17.7	7.29	179.4	—	793	—
CH-044	Ditch Spring	5/14/2012	—	827.18	0.41	827.6	135	0.2	V	7.18	16.8	7.01	131.5	130	1,106	—
CH-044	Ditch Spring	5/17/2012	E+++	827.18	0.19	827.4	45	0.07	V	6.93	15.8	4.89	-157.2	—	995	—
CH-044	Ditch Spring	5/24/2012	E+++	827.18	0.25	827.4	—	—	—	7.01	16.3	4.33	-159.0	—	1,050	—
CH-044	Ditch Spring	6/1/2012	ND/B	827.18	0.27	827.5	55	0.08	V	7.07	15.9	4.01	-165.3	—	1,019	—
CH-044	Ditch Spring	6/7/2012	E+++	827.18	0.25	827.4	90	0.1	V	6.93	15.9	3.52	-103.8	—	1,001	—
CH-044	Ditch Spring	6/15/2012	E+++	827.18	0.17	827.3	45	0.06	V	7.05	17.3	3.27	23.0	—	962	—
CH-044	Ditch Spring	6/28/2012	E+++	827.18	0.10	827.3	22	0.03	V	7.27	17.6	2.91	108.0	—	1,172	—
CH-044	Ditch Spring	7/17/2012	E+++	827.18	0.22	827.4	7	0.01	E	7.15	16.3	2.74	-167.8	—	959	—
CH-044	Ditch Spring	8/2/2012	E+++	827.18	0.11	827.3	15	0.02	E	7.57	16.1	4.08	149.0	—	955	—
CH-044	Ditch Spring	8/23/2012	E+++	827.18	0.19	827.4	6	0.009	E	7.56	16.1	3.63	-117.5	—	959	—
CH-044	Ditch Spring	9/4/2012	—	827.18	0.21	827.4	61	0.09	V	7.40	22.3	1.88	-74.2	—	638	—
CH-044	Ditch Spring	9/20/2012	—	827.18	no access	—	—	—	—	—	—	—	—	—	—	—
CH-044	Ditch Spring	12/17/2012	—	827.18	0.33	827.5	72	0.1	V	7.52	16.5	7.60	-114.8	>1100	693	—
CH-057	Briar Patch Spring	5/9/2011	—	—	—	—	880	1.3	V	6.93	17.3	—	—	—	910	560
CH-057	Briar Patch Spring	5/13/2011	—	—	—	—	730	1.0	V	—	—	—	—	—	—	—
CH-057	Briar Patch Spring	5/17/2011	—	—	—	—	440	0.6	V	7.03	17.8	—	—	—	2,080	1,370
CH-057	Briar Patch Spring	5/24/2011	—	—	—	—	210	0.3	V	6.96	19.2	—	—	—	1,810	900
CH-057	Briar Patch Spring	5/31/2011	S++	—	—	—	380	0.6	V	7.19	21.7	—	—	—	1,290	640
CH-057	Briar Patch Spring	6/7/2011	S++	—	—	—	210	0.3	V	7.08	25.1	—	—	—	1,890	950
CH-057	Briar Patch Spring	6/14/2011	S++	779.81	-0.54	779.3	1060	1.5	V	6.83	24.6	—	—	—	1,030	560
CH-057	Briar Patch Spring	6/21/2011	E++	—	—	—	500	0.8	V	6.77	24.5	2.64	—	—	1,500	740
CH-057	Briar Patch Spring	6/30/2011	E++	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-057	Briar Patch Spring	7/14/2011	E+++	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-057	Briar Patch Spring	low water	(moved Sta)	779.81	-4.65	775.2	—	—	—	—	—	—	—	—	—	—
CH-057	Briar Patch Spring	1/31/2012	—	775.37	0.25	775.6	33	0.05	V	6.98	11.3	8.24	-166.3	5.9	1,030	—
CH-057	Briar Patch Spring	2/16/2012	—	775.37	0.09	775.5	1	0.001	E	7.70	10.2	9.45	-219.5	3.9	808	—
CH-057	Briar Patch Spring	4/13/2012	—	775.37	0.21	775.6	—	—	—	7.20	20.1	—	—	6.6	1,120	—
CH-057	Briar Patch Spring	4/27/2012	ND/B	775.37	0.50	775.9	590	0.8	V	7.34	17.5	7.29	187.6	—	1,052	—
CH-057	Briar Patch Spring	5/3/2012	ND/B	775.37	0.38	775.8	340	0.5	—	—	—	—	—	—	—	—
CH-057	Briar Patch Spring	5/7/2012	ND/B	775.37	0.49	775.9	370	0.5	—	7.29	21.6	2.09	-199.8	—	1,105	—

Table 4
Dye Monitoring Results and Field Parameter Data, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temp-erature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conduc-tance (SC) (µmho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
CH-057	Briar Patch Spring	5/10/2012	ND/B	775.37	0.93	776.3	350	0.5	V	7.23	22.8	2.48	-175.8	—	1,385	—
CH-057	Briar Patch Spring	5/14/2012	—	775.37	1.24	776.6	2,050	3.0	V	7.44	21.6	2.6	170.7	6.9	1,627	—
CH-057	Briar Patch Spring	5/17/2012	E+?	775.37	1.12	776.5	1,540	2.2	V	7.13	21.5	2.57	-202.8	—	1,723	—
CH-057	Briar Patch Spring	5/24/2012	ND/B	775.37	0.71	776.1	673	1.0	V	7.11	23.8	0.92	-253.2	—	1,542	—
CH-057	Briar Patch Spring	6/1/2012	ND/B	775.37	1.17	776.5	1,050	1.5	V	7.10	26.4	0.51	-193.2	—	1,604	—
CH-057	Briar Patch Spring	6/7/2012	E++	775.37	1.05	776.4	950	1.4	V	7.24	24.2	1.54	-174.4	—	2,121	—
CH-057	Briar Patch Spring	6/15/2012	E++	775.37	1.00	776.4	840	1.2	V	7.31	22.1	2.76	-87.6	—	1,957	—
CH-057	Briar Patch Spring	6/28/2012	E++	775.37	0.50	775.9	121	0.2	V	7.81	23.2	3.69	108.3	—	2,318	—
CH-057	Briar Patch Spring	7/17/2012	E++	775.37	0.76	776.1	50	0.07	E	7.11	28.0	0.67	-222.5	—	1,907	—
CH-057	Briar Patch Spring	8/2/2012	E+++	775.37	0.92	776.3	350	0.5	V	7.20	26.2	2.31	-175.2	—	1,584	—
CH-057	Briar Patch Spring	8/23/2012	E+++	775.37	2.03	777.4	Too high to measure		—	7.21	18.3	2.19	-185.3	—	1,492	—
CH-057	Briar Patch Spring	9/4/2012	—	775.37	1.89	777.3	Too high to measure		—	7.32	27.0	1.68	-120.7	—	1,739	—
CH-057	Briar Patch Spring	9/20/2012	E+++	775.37	2.89	778.3	Too high to measure		—	7.81	23.2	—	-174.2	—	1,615	—
CH-057	Briar Patch Spring	12/17/2012	—	775.37	—	—	—	—	—	7.67	14.7	5.94	-92.4	12.0	1,574	—
CH-041	Dam Toe Middle	3/30/2011	ND/B	747.12	—	—	—	—	—	—	—	—	—	—	—	—
CH-041	Dam Toe Middle	5/9/2011	ND/B	—	—	—	—	—	—	6.75	22.9	—	—	—	1,120	560
CH-041	Dam Toe Middle	5/13/2011	S+?	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-041	Dam Toe Middle	5/17/2011	ND/B	—	—	—	—	—	—	7.05	15.5	—	—	—	1,220	600
CH-041	Dam Toe Middle	5/24/2011	ND/B	—	—	—	—	—	—	6.77	19.2	—	—	—	1,180	550
CH-041	Dam Toe Middle	5/31/2011	ND/B	—	—	—	—	—	—	7.38	21.7	—	—	—	1,330	670
CH-041	Dam Toe Middle	6/7/2011	ND/B	—	—	—	—	—	—	6.99	24.2	—	—	—	1,080	530
CH-041	Dam Toe Middle	6/14/2011	ND/B	—	—	—	8	0.01	—	7.42	23.6	—	—	—	980	480
CH-041	Dam Toe Middle	6/21/2011	ND/B	—	—	—	220	0.3	—	7.07	19.9	7.66	—	—	1,100	550
CH-041	Dam Toe Middle	6/30/2011	ND/B	—	—	—	70	0.1	—	—	—	—	—	—	—	—
CH-041	Dam Toe Middle	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-041	Dam Toe Middle	low water	(moved Sta)	747.12	-0.66	746.5	—	—	—	—	—	—	—	—	—	—
CH-041	Dam Toe Middle	4/27/2012	ND/B	746.16	0.29	746.5	68	0.1	V	7.42	18.7	9.13	147.1	—	1,083	—
CH-041	Dam Toe Middle	5/2/2012	ND/B	746.16	—	—	—	—	—	—	—	—	—	—	—	—
CH-041	Dam Toe Middle	5/7/2012	ND/B	746.16	0.36	746.5	80	0.1	—	7.51	18.6	10.57	149.0	—	1,069	—
CH-041	Dam Toe Middle	5/10/2012	ND/B	746.16	0.62	746.8	205	0.3	V	7.50	18.3	8.12	124.7	—	1,238	—
CH-041	Dam Toe Middle	5/17/2012	ND/B	746.16	0.39	746.6	90	0.1	V	7.49	18.5	10.35	148.7	—	1,252	—
CH-041	Dam Toe Middle	5/24/2012	ND/B	746.16	0.28	746.4	—	—	—	7.44	19.4	9.60	-129.1	—	1,284	—
CH-041	Dam Toe Middle	6/1/2012	ND/B	746.16	0.28	746.4	90	0.1	V	7.43	18.2	7.42	145.2	—	1,264	—
CH-041	Dam Toe Middle	6/7/2012	ND/B	746.16	0.25	746.4	56	0.08	V	7.49	19.7	7.80	-75.5	—	1,297	—
CH-041	Dam Toe Middle	6/15/2012	ND/B	746.16	0.25	746.4	21	0.03	V	7.52	18.8	8.36	110.6	—	1,132	—
CH-041	Dam Toe Middle	6/28/2012	ND/B	746.16	0.17	746.3	13	0.02	V	7.98	19.1	6.39	128.3	—	2,375	—
CH-041	Dam Toe Middle	7/17/2012	ND/B	746.16	0.24	746.4	30	0.04	E	7.39	20.7	9.06	144.9	—	1,190	—
CH-041	Dam Toe Middle	8/2/2012	ND/B	746.16	0.21	746.4	60	0.09	V	7.52	19.1	—	-120.7	—	1,149	—
CH-041	Dam Toe Middle	8/23/2012	ND/B	746.16	0.27	746.4	36	0.05	V	7.37	19.2	2.62	-97.1	—	1,118	—
CH-041	Dam Toe Middle	9/20/2012	ND/B	746.16	0.21	746.4	20	0.03	E	7.43	19.2	—	-149.7	—	723	—
CH-042	Dam Toe Left	3/30/2011	ND/B	748.00	—	—	—	—	—	—	—	—	—	—	—	—
CH-042	Dam Toe Left	5/9/2011	ND/B	—	—	—	—	—	—	7.09	22.0	—	—	—	1,080	530
CH-042	Dam Toe Left	5/13/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-042	Dam Toe Left	5/17/2011	ND/B	—	—	—	—	—	—	7.46	15.5	—	—	—	700	350
CH-042	Dam Toe Left	5/24/2011	ND/B	—	—	—	—	—	—	7.17	19.2	—	—	—	750	370
CH-042	Dam Toe Left	5/31/2011	ND/B	—	—	—	8	0.01	—	7.31	21.7	—	—	—	940	480
CH-042	Dam Toe Left	6/7/2011	ND/B	—	—	—	9	0.01	—	7.38	23.2	—	—	—	610	310
CH-042	Dam Toe Left	6/14/2011	ND/B	—	—	—	7	0.01	—	7.31	24.1	—	—	—	1,030	570
CH-042	Dam Toe Left	6/21/2011	ND/B	—	—	—	70	0.1	—	7.24	19.7	8.52	—	—	690	330
CH-042	Dam Toe Left	6/30/2011	ND/B	—	—	—	20	0.03	—	—	—	—	—	—	—	—
CH-042	Dam Toe Left	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-042	Dam Toe Left	low water	(moved Sta)	748.00	-0.94	747.1	—	—	—	—	—	—	—	—	—	—

Table 4
Dye Monitoring Results and Field Parameter Data, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temperature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conductance (SC) (umho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
CH-042	Dam Toe Left	4/27/2012	ND/B	747.27	0.23	747.5	55	0.08	V	7.49	16.9	8.91	192.1	—	893	—
CH-042	Dam Toe Left	5/2/2012	ND/B	747.27	—	—	—	—	—	—	—	—	—	—	—	—
CH-042	Dam Toe Left	5/7/2012	ND/B	747.27	0.28	747.6	15	0.02	—	8.22	20.3	2.25	-157.8	—	660	—
CH-042	Dam Toe Left	5/10/2012	ND/B	747.27	0.22	747.5	15	0.02	E	7.88	17.8	3.51	-128.3	—	860	—
CH-042	Dam Toe Left	5/17/2012	ND/B	747.27	0.21	747.5	40	0.06	V	7.88	18.0	2.26	-152.2	—	834	—
CH-042	Dam Toe Left	5/24/2012	ND/B	747.27	0.09	747.4	20	0.03	E	7.86	18.7	10.64	-135.5	—	907	—
CH-042	Dam Toe Left	6/1/2012	ND/B	747.27	0.20	747.5	20	0.03	E	7.76	17.9	8.60	146.1	—	874	—
CH-042	Dam Toe Left	6/7/2012	ND/B	747.27	0.20	747.5	20	0.03	E	7.88	18.7	9.03	-89.5	—	885	—
CH-042	Dam Toe Left	6/15/2012	ND/B	747.27	0.19	747.5	20	0.03	V	7.67	17.7	8.23	212.8	—	793	—
CH-042	Dam Toe Left	6/28/2012	ND/B	747.27	0.17	747.4	15	0.02	V	7.87	18.4	6.78	178.6	—	1,379	—
CH-042	Dam Toe Left	7/17/2012	ND/B	747.27	0.19	747.5	10	0.01	E	7.70	19.8	9.30	145.3	—	773	—
CH-042	Dam Toe Left	8/2/2012	ND/B	747.27	0.28	747.6	35	0.05	V	7.81	18.7	9.52	125.1	—	770	—
CH-042	Dam Toe Left	8/23/2012	ND/B	747.27	0.26	747.5	25	0.04	V	7.86	18.8	2.32	-105.8	—	713	—
CH-042	Dam Toe Left	9/20/2012	ND/B	747.27	0.19	747.5	15	0.02	E	7.59	18.7	—	-198.3	—	621	—
CH-045	Beaver Dam Cave Spring	3/30/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-045	Beaver Dam Cave Spring	5/9/2011	ND/B	—	—	—	5	0.007	—	6.90	19.5	—	—	—	950	630
CH-045	Beaver Dam Cave Spring	5/13/2011	F++	—	—	—	4	0.006	—	—	—	—	—	—	—	—
CH-045	Beaver Dam Cave Spring	5/17/2011	F+++	—	—	—	20	0.03	—	6.92	16.2	—	—	—	1,120	670
CH-045	Beaver Dam Cave Spring	5/24/2011	F+++; S+++	—	—	—	5	0.007	—	6.71	19.0	—	—	—	1,070	530
CH-045	Beaver Dam Cave Spring	5/31/2011	F+++; S+++	—	—	—	10	0.01	—	7.21	21.7	—	—	—	1,030	520
CH-045	Beaver Dam Cave Spring	6/7/2011	F+++; S+++	—	—	—	10	0.01	—	7.12	24.1	—	—	—	890	430
CH-045	Beaver Dam Cave Spring	6/14/2011	F+++; S+++	—	—	—	20	0.03	—	7.42	24.1	—	—	—	1,300	660
CH-045	Beaver Dam Cave Spring	6/21/2011	F+++; S+++	—	—	—	6	0.008	—	6.69	16.4	5.35	—	—	870	420
CH-045	Beaver Dam Cave Spring	6/30/2011	F+++; S+++	—	—	—	11	0.02	—	—	—	—	—	—	—	—
CH-045	Beaver Dam Cave Spring	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-045	Beaver Dam Cave Spring	low water	(moved Sta)	824.88	-3.49	821.4	—	—	—	—	—	—	—	—	—	—
CH-045	Beaver Dam Cave Spring	4/26/2012	ND/B	823.16	0.13	823.3	10	0.01	E	7.14	16.1	8.20	158.5	—	745	—
CH-045	Beaver Dam Cave Spring	5/2/2012	ND/B	823.16	—	—	—	—	—	—	—	—	—	—	—	—
CH-045	Beaver Dam Cave Spring	5/7/2012	E+++	823.16	0.18	823.3	8	0.01	B	7.32	16.0	7.17	158.8	—	809	—
CH-045	Beaver Dam Cave Spring	5/10/2012	E+++	823.16	0.14	823.3	10	0.01	E	7.17	16.4	6.94	112.9	—	930	—
CH-045	Beaver Dam Cave Spring	5/17/2012	E+++	823.16	0.17	823.3	15	0.02	B	7.21	15.8	10.1	149.0	—	988	—
CH-045	Beaver Dam Cave Spring	5/24/2012	E+++	823.16	0.28	823.4	10	0.01	E	7.22	16.3	4.32	-138.0	—	1,066	—
CH-045	Beaver Dam Cave Spring	6/1/2012	ND/B	823.16	0.24	823.4	15	0.02	E	7.22	16.1	7.14	142.0	—	1,005	—
CH-045	Beaver Dam Cave Spring	6/7/2012	E+++	823.16	0.20	823.4	3	0.004	B	7.38	15.9	7.81	-106.9	—	977	—
CH-045	Beaver Dam Cave Spring	6/15/2012	E+++	823.16	0.13	823.3	3	0.004	B	7.21	17.3	8.36	123.4	—	873	—
CH-045	Beaver Dam Cave Spring	6/28/2012	E+++	823.16	0.10	823.3	4	0.005	V	7.81	18.1	6.78	148.7	—	1,781	—
CH-045	Beaver Dam Cave Spring	7/17/2012	E+++	823.2	0.31	823.5	15	0.02	E	7.12	17.4	6.39	168.2	—	936	—
CH-045	Beaver Dam Cave Spring	8/2/2012	E+++	823.2	0.13	823.3	11	0.02	E	7.33	16.8	6.44	-120.0	—	923	—
CH-045	Beaver Dam Cave Spring	8/23/2012	E+++	823.2	0.21	823.4	8	0.01	E	7.38	16.8	7.09	100.1	—	888	—
CH-045	Beaver Dam Cave Spring	9/20/2012	—	823.2	no access	—	—	—	—	—	—	—	—	—	—	—
CH-045	Beaver Dam Cave Spring	12/17/2012	—	823.2	—	—	2	0.003	B	6.77	15.0	3.10	-189.7	>1100	664	—
CH-045	Beaver Dam Cave Spring	1/14/2012	—	823.2	—	—	2	0.003	B	8.81	10.0	9.13	169.2	170.0	500	—
CH-046	HQ Spring	3/30/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-046	HQ Spring	5/9/2011	ND/B	—	—	—	350	0.5	—	7.34	18.2	—	—	—	1,030	410
CH-046	HQ Spring	5/13/2011	ND/B	—	—	—	250	0.4	—	—	—	—	—	—	—	—
CH-046	HQ Spring	5/17/2011	ND/B	—	—	—	580	0.8	—	7.12	16.9	—	—	—	1,630	890
CH-046	HQ Spring	5/24/2011	F+?	—	—	—	470	0.7	—	6.91	19.8	—	—	—	1,480	730
CH-046	HQ Spring	5/31/2011	E+++	—	—	—	320	0.5	—	7.07	22.1	—	—	—	1,470	740
CH-046	HQ Spring	6/7/2011	E+++	—	—	—	890	1.3	—	6.92	25.4	—	—	—	1,660	830
CH-046	HQ Spring	6/14/2011	E+++	—	—	—	240	0.3	—	6.80	29.2	—	—	—	1,610	770
CH-046	HQ Spring	6/21/2011	E+++	781.48	-2.29	779.2	500	0.7	—	6.69	20.0	4.18	—	—	1,410	700
CH-046	HQ Spring	6/30/2011	E+++	—	—	—	200	0.3	—	—	—	—	—	—	—	—

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E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temp-erature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conduc-tance (SC) (µmho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
CH-046	HQ Spring	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-046	HQ Spring	low water	(moved Sta)	781.48	-2.98	778.5	—	—	—	—	—	—	—	—	—	—
CH-046	HQ Spring	4/27/2012	ND/B	779.69	0.38	780.1	610	0.9	V	7.18	17.0	7.96	173.0	—	1,086	—
CH-046	HQ Spring	5/3/2012	ND/B	779.69	—	—	—	—	—	—	—	—	—	—	—	—
CH-046	HQ Spring	5/7/2012	ND/B	779.69	0.43	780.1	700	1.0	—	7.15	18.5	6.32	137.6	—	1,222	—
CH-046	HQ Spring	5/10/2012	ND/B	779.69	0.38	780.1	400	0.6	V	7.14	19.4	6.24	129.6	—	1,485	—
CH-046	HQ Spring	5/17/2012	ND/B	779.69	0.34	780.0	450	0.7	V	7.09	18.5	6.90	48.3	—	1,744	—
CH-046	HQ Spring	5/24/2012	E+?	779.69	0.34	780.0	—	—	V	7.26	20.8	4.43	-160.3	—	1,570	—
CH-046	HQ Spring	6/1/2012	ND/B	779.69	0.31	780.0	400	0.6	V	7.08	22.5	3.07	-140.8	—	1,560	—
CH-046	HQ Spring	6/7/2012	E+++	779.69	0.30	780.0	310	0.4	V	7.23	21.0	4.04	-145.1	—	1,904	—
CH-046	HQ Spring	6/15/2012	E+++	779.69	0.29	780.0	570	0.8	V	7.07	17.3	5.32	102.8	—	1,632	—
CH-046	HQ Spring	6/28/2012	E+++	779.69	0.21	779.9	382	0.6	V	7.61	19.8	6.18	131.9	—	1,572	—
CH-046	HQ Spring	7/17/2012	E+++	779.69	0.21	779.9	—	—	—	7.14	23.2	2.35	-178.9	—	1,715	—
CH-046	HQ Spring	8/2/2012	E+	779.69	0.32	780.0	220	0.3	V	7.11	24.0	2.19	-171.5	—	1,562	—
CH-046	HQ Spring	8/23/2012	E+	779.69	1.41	781.1	455	0.7	V	6.97	17.4	2.01	-172.8	—	1,039	—
CH-046	HQ Spring	9/20/2012	E+++	779.69	1.37	781.1	858	1.2	V	7.67	20.7	—	-186.1	—	1,673	—
CH-046	HQ Spring	12/17/2012	—	779.69	1.52	781.2	1417	2.0	V	7.69	14.8	6.07	-111.0	6.1	1,266	—
CH-046	HQ Spring	1/14/2013	—	779.69	1.41	781.1	2087	3.0	V	8.18	14.8	6.89	152.1	45.1	1,406	—
CH-048	Drain Pipe	3/30/2011	ND/B	817.90	—	—	—	—	—	—	—	—	—	—	—	—
CH-048	Drain Pipe	5/9/2011	ND/B	—	—	—	—	—	—	6.45	24.0	—	—	—	2,040	1,030
CH-048	Drain Pipe	5/13/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-048	Drain Pipe	5/17/2011	ND/B	—	—	—	—	—	—	6.41	15.4	—	—	—	2,370	1,180
CH-048	Drain Pipe	5/24/2011	ND/B	—	—	—	20	0.03	—	6.21	20.2	—	—	—	2,290	1,140
CH-048	Drain Pipe	5/31/2011	ND/B	817.90	-0.75	817.2	30	0.04	—	6.47	21.2	—	—	—	2,470	1,240
CH-048	Drain Pipe	6/7/2011	ND/B	817.90	-0.83	817.1	20	0.03	—	5.94	25.2	—	—	—	2,270	1,130
CH-048	Drain Pipe	6/14/2011	ND/B	—	—	—	20	0.03	—	8.26	24.2	—	—	—	2,190	1,080
CH-048	Drain Pipe	6/21/2011	ND/B	817.90	-0.75	817.2	25	0.04	—	6.53	21.8		—	—	2,250	1,130
CH-048	Drain Pipe	6/30/2011	ND/B	—	—	—	20	0.03	—	—	—	—	—	—	—	—
CH-048	Drain Pipe	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-048	Drain Pipe	low water	(moved Sta)	817.90	-1.17	816.7	—	—	—	—	—	—	—	—	—	—
CH-048	Drain Pipe	5/4/2012	ND/B	816.78	—	—	—	—	—	—	—	—	—	—	—	—
CH-048	Drain Pipe	5/7/2012	ND/B	816.78	0.10	816.9	60	0.09	—	6.55	19.0	10.39	210.4	—	2,037	—
CH-048	Drain Pipe	5/10/2012	ND/B	816.78	0.08	816.9	15	0.02	E	—	—	—	—	—	—	—
CH-048	Drain Pipe	5/17/2012	ND/B	816.78	0.13	816.9	10	0.01	E	7.13	18.42	7.27	195.1	—	1,739	—
CH-048	Drain Pipe	5/24/2012	ND/B	816.78	0.13	816.9	10	0.01	E	6.39	19.24	1.18	-228.1	—	2,327	—
CH-048	Drain Pipe	6/1/2012	ND/B	816.78	0.16	816.9	12	0.02	E	6.36	19.58	1.95	-196.9	—	2,381	—
CH-048	Drain Pipe	6/7/2012	ND/B	816.78	—	—	—	—	—	—	—	—	—	—	—	—
CH-048	Drain Pipe	6/15/2012	ND/B	816.78	0.13	816.9	5	0.007	E	6.57	18.21	2.37	81.9	—	1,927	—
CH-048	Drain Pipe	6/28/2012	ND/B	816.78	0.13	816.9	4	0.006	E	6.31	19.07	1.88	171.3	—	2,817	—
CH-048	Drain Pipe	7/17/2012	ND/B	816.78	0.25	817.0	15	0.02	B	6.76	20.8	1.60	-174.6	—	2,513	—
CH-048	Drain Pipe	8/2/2012	ND/B	816.78	0.23	817.0	20	0.03	B	6.87	19.3	0.86	-209.4	—	2,048	—
CH-048	Drain Pipe	8/23/2012	ND/B	816.78	0.34	817.1	20	0.03	B	6.79	18.3	0.95	-220.3	—	2,107	—
CH-048	Drain Pipe	9/20/2012	ND/B	816.78	0.17	817.0	25	0.04	E	8.62	23.2	—	-90.3	—	2,094	—
CH-061	Ison Spring	5/9/2011	ND/B	—	—	—	—	—	—	7.07	18.4	—	—	—	480	240
CH-061	Ison Spring	5/13/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-061	Ison Spring	5/17/2011	ND/B	—	—	—	—	—	—	7.07	15.5	—	—	—	490	190
CH-061	Ison Spring	5/24/2011	ND/B	—	—	—	—	—	—	7.52	18.9	—	—	—	450	210
CH-061	Ison Spring	5/31/2011	ND/B	—	—	—	—	—	—	7.04	21.1	—	—	—	480	250
CH-061	Ison Spring	6/7/2011	ND/B	—	—	—	no flow	no flow	—	—	—	—	—	—	—	—
CH-061	Ison Spring	6/14/2011	ND/B	—	—	—	no flow	no flow	—	—	—	—	—	—	—	—
CH-061	Ison Spring	6/21/2011	ND/B	—	—	—	no flow	no flow	—	—	—	—	—	—	—	—
CH-061	Ison Spring	6/30/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4
Dye Monitoring Results and Field Parameter Data, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temp-erature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conduc-tance (SC) (µmho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
CH-061	Ison Spring	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-061	Ison Spring	low water	—	550.52	approx 14	approx 565	—	—	—	—	—	—	—	—	—	—
CH-065	Hardin Spring 2	7/23/2012	—	—	—	—	1	0.001	—	6.91	15.4	7.23	129.6	—	1,763	—
CH-065	Hardin Spring 2	8/2/2012	ND/B	—	0.18	—	1	0.001	E	7.36	15.8	—	-137.3	—	1,678	—
CH-065	Hardin Spring 2	8/23/2012	ND/B	—	0.08	—	no flow	no flow	—	—	—	—	—	—	—	—
CH-065	Hardin Spring 2	9/20/2012	ND/B	—	—	—	1	0.001	E	7.92	19.4	—	-99.4	—	787	—
	Burgin Spring	5/21/2012	—	—	—	—	—	—	—	7.43	13.7	—	-164.2	—	503	—
	Burgin Spring	12/17/2012	—	—	—	—	20	0.03	E	8.24	17.7	2.88	-165.7	5.5	336	—
	Burgin Spring	1/14/2013	—	—	—	—	620	0.9	V	7.89	10.6	7.14	139.7	76.1	323	—
Other Sampling Points - Surface Water																
CH-058	HQ Stream	5/9/2011	ND/B	762.91	—	—	550	0.8	—	7.37	20.5	—	—	—	810	1,640
CH-058	HQ Stream	5/13/2011	ND/B	—	—	—	590	0.9	—	—	—	—	—	—	—	—
CH-058	HQ Stream	5/17/2011	ND/B	—	—	—	970	1.4	—	7.38	17.0	—	—	—	1,870	910
CH-058	HQ Stream	5/24/2011	F+?	762.91	-0.67	762.2	1,500	2.1	—	7.14	19.1	—	—	—	1,630	810
CH-058	HQ Stream	5/31/2011	E+++,S++	—	—	—	1,400	2.0	—	7.09	21.4	—	—	—	960	470
CH-058	HQ Stream	6/7/2011	E+++,S++	—	—	—	1,200	1.7	—	7.33	24.6	—	—	—	1,740	870
CH-058	HQ Stream	6/14/2011	E+++	—	—	—	1,550	2.2	—	6.96	23.8	—	—	—	1,140	550
CH-058	HQ Stream	6/21/2011	E+++	762.91	-0.75	762.2	710	1.0	—	7.14	23.0	8.29	—	—	1,480	730
CH-058	HQ Stream	6/30/2011	E+++	—	—	—	2,650	4.0	—	—	—	—	—	—	—	—
CH-058	HQ Stream	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-058	HQ Stream	low water	(moved Sta)	762.91	-1.63	761.3	—	—	—	—	—	—	—	—	—	—
CH-058	HQ Stream	4/27/2012	ND/B	760.55	0.25	760.8	1,016	1.5	V	7.71	17.5	9.23	172.7	—	1,076	—
CH-058	HQ Stream	5/3/2012	ND/B	760.55	0.25	760.8	810	1.2	V	7.64	18.5	8.79	164.6	—	1,003	—
CH-058	HQ Stream	5/7/2012	ND/B	760.55	0.36	760.9	990	1.4	—	7.65	19.9	10.08	148.9	—	1,170	—
CH-058	HQ Stream	5/10/2012	ND/B	760.55	0.32	760.9	770	1.1	V	7.72	21.3	10.57	130.0	—	1,437	—
CH-058	HQ Stream	5/17/2012	ND/B	760.55	0.32	760.9	1,220	1.8	—	7.58	20.5	11.08	245.4	—	1,737	—
CH-058	HQ Stream	5/24/2012	ND/B	760.55	0.28	760.8	1,193	1.7	V	7.44	23.0	9.65	134.2	—	1,562	—
CH-058	HQ Stream	6/1/2012	ND/B	760.55	0.28	760.8	1,170	1.7	V	7.51	23.6	8.71	139.5	—	1,579	—
CH-058	HQ Stream	6/15/2012	E+?	760.55	0.21	760.8	535	0.8	V	7.67	19.1	7.34	197.8	—	1,237	—
CH-058	HQ Stream	6/28/2012	E+++	760.55	0.17	760.7	382	0.6	V	7.89	21.6	5.17	151.3	—	1,761	—
CH-058	HQ Stream	7/17/2012	E+++	760.55	0.38	760.9	—	—	—	7.56	26.9	7.12	157.9	—	1,844	—
CH-058	HQ Stream	8/2/2012	E+++	760.55	0.26	760.8	450	0.6	V	7.60	26.6	7.07	154.2	—	1,583	—
CH-058	HQ Stream	8/23/2012	E+++	760.55	0.25	760.8	360	0.5	V	7.42	20.4	6.29	103.3	—	1,493	—
CH-058	HQ Stream	9/20/2012	—	760.55	0.24	760.8	1174	1.7	V	7.75	22.3	—	-144.0	—	1,610	—
CH-025	Mouth of Dix River	3/30/2011	ND/B	516.01	—	—	—	—	—	—	—	—	—	—	—	—
CH-025	Mouth of Dix River	5/9/2011	ND/B	—	—	—	—	—	—	6.71	18.6	—	—	—	250	180
CH-025	Mouth of Dix River	5/13/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-025	Mouth of Dix River	5/17/2011	ND/B	—	—	—	—	—	—	7.31	15.2	—	—	—	360	150
CH-025	Mouth of Dix River	5/24/2011	ND/B	516.01	-2.17	513.8	—	—	—	7.43	19.1	—	—	—	530	260
CH-025	Mouth of Dix River	5/31/2011	ND/B	516.01	-1.83	514.2	—	—	—	7.31	22.6	—	—	—	570	280
CH-025	Mouth of Dix River	6/7/2011	ND/B	516.01	-5.00	511.0	—	—	—	7.86	25.4	—	—	—	310	150
CH-025	Mouth of Dix River (Duplicate)	6/7/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-025	Mouth of Dix River	6/14/2011	ND/B	—	—	—	—	—	—	7.18	25.1	—	—	—	810	410
CH-025	Mouth of Dix River	6/21/2011	ND/B	—	—	—	—	—	—	7.36	25.3	7.19	—	—	310	150
CH-025	Mouth of Dix River	6/30/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-025	Mouth of Dix River	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-025	Mouth of Dix River	low water	—	516.01	-4.24	511.8	—	—	—	—	—	—	—	—	—	—
CH-059	Cedar Branch at Shaker Landing	5/9/2011	ND/B	516.05	—	—	—	—	—	7.34	20.4	—	—	—	370	180

Table 4
Dye Monitoring Results and Field Parameter Data, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temp-erature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conduc-tance (SC) (µmho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
CH-059	Cedar Branch at Shaker Landing	5/13/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-059	Cedar Branch at Shaker Landing	5/17/2011	ND/B	—	—	—	—	—	—	7.36	15.0	—	—	—	870	460
CH-059	Cedar Branch at Shaker Landing	5/24/2011	ND/B	516.05	-0.25	515.8	11,000	17	—	7.96	18.7	—	—	—	430	200
CH-059	Cedar Branch at Shaker Landing	5/31/2011	ND/B	516.05	-0.92	515.1	2,800	4.0	—	7.11	22.4	—	—	—	480	250
CH-059	Cedar Branch at Shaker Landing	6/7/2011	ND/B	516.05	-0.96	515.1	970	1.4	—	7.63	24.1	—	—	—	440	230
CH-059	Cedar Branch at Shaker Landing	6/14/2011	ND/B	—	—	—	710	1.0	—	7.21	24.7	—	—	—	920	470
CH-059	Cedar Branch at Shaker Landing	6/21/2011	ND/B	516.05	-0.17	515.9	—	—	—	7.14	24.8	6.92	—	—	140	90
CH-059	Cedar Branch at Shaker Landing	6/30/2011	ND/B	—	—	—	1,100	1.5	—	—	—	—	—	—	—	—
CH-059	Cedar Branch at Shaker Landing	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-059	Cedar Branch at Shaker Landing	low water	(moved Sta)	516.05	-0.57	515.5	—	—	—	—	—	—	—	—	—	—
CH-059	Cedar Branch at Shaker Landing	4/27/2012	ND/B	515.39	0.33	515.7	362	0.5	V	8.47	14.6	4.45	197.7	—	504	—
CH-059	Cedar Branch at Shaker Landing	5/3/2012	ND/B	515.39	0.22	515.6	240	0.3	V	8.27	17.9	8.96	176.3	—	514	—
CH-059	Cedar Branch at Shaker Landing	5/8/2012	ND/B	515.39	0.52	515.9	2,700	3.8	V	7.19	18.9	9.31	208.7	—	1,104	—
CH-059	Cedar Branch at Shaker Landing	5/10/2012	ND/B	515.39	0.69	516.1	1,800	2.6	V	8.60	17.2	9.94	158.3	—	505	—
CH-059	Cedar Branch at Shaker Landing	5/17/2012	ND/B	515.39	0.37	515.8	1,020	1.5	V	8.62	18.5	4.61	-139.1	—	547	—
CH-059	Cedar Branch at Shaker Landing	5/24/2012	ND/B	515.39	0.33	515.7	705	1.0	V	8.54	20.3	4.07	-74.1	—	482	—
CH-059	Cedar Branch at Shaker Landing	6/1/2012	ND/B	515.39	0.37	515.8	1,000	1.4	V	8.49	17.4	3.95	-163.7	—	621	—
CH-059	Cedar Branch at Shaker Landing	6/15/2012	ND/B	515.39	0.29	515.7	560	0.8	V	8.13	16.4	5.78	181.3	—	723	—
CH-059	Cedar Branch at Shaker Landing	6/28/2012	ND/B	515.39	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-059	Cedar Branch at Shaker Landing	7/17/2012	ND/B	515.39	0.13	515.5	—	—	—	—	—	—	—	—	—	—
CH-059	Cedar Branch at Shaker Landing	8/2/2012	ND/B	515.39	0.20	515.6	100	0.1	V	8.26	26.3	9.07	176.2	—	772	—
CH-059	Cedar Branch at Shaker Landing	8/23/2012	ND/B	515.39	0.24	515.6	110	0.2	V	7.99	22.4	8.49	162.7	—	638	—
CH-059	Cedar Branch at Shaker Landing	9/20/2012	ND/B	515.39	0.37	515.8	360	0.5	V	7.84	18.0	—	-173.5	—	929	—
CH-051	Cedar Branch (above KY342)	3/30/2011	ND/B	753.27	—	—	—	—	—	—	—	—	—	—	—	—
CH-051	Cedar Branch (above KY342)	5/9/2011	ND/B	—	—	—	30	0.04	—	7.24	20.1	—	—	—	980	180
CH-051	Cedar Branch (above KY342)	5/13/2011	ND/B	—	—	—	30	0.04	—	—	—	—	—	—	—	—
CH-051	Cedar Branch (above KY342)	5/17/2011	ND/B	753.27	-0.56	752.7	270	0.4	—	7.72	14.3	—	—	—	1,070	580
CH-051	Cedar Branch (above KY342)	5/24/2011	ND/B	753.27	-0.38	752.9	4,600	6.6	—	7.67	19.4	—	—	—	400	210
CH-051	Cedar Branch (above KY342)	5/31/2011	ND/B	—	—	—	1,600	2.4	—	7.16	22.1	—	—	—	590	280
CH-051	Cedar Branch (above KY342)	6/7/2011	ND/B	—	—	—	1,500	2.1	—	7.52	24.8	—	—	—	460	210
CH-051	Cedar Branch (above KY342)	6/14/2011	ND/B	—	—	—	410	0.6	—	7.29	24.3	—	—	—	620	300
CH-051	Cedar Branch (above KY342)	6/21/2011	ND/B	—	—	—	510	0.7	—	7.61	20.1	8.65	—	—	570	260
CH-051	Cedar Branch (above KY342)	6/30/2011	ND/B	—	—	—	110	0.2	—	—	—	—	—	—	—	—
CH-051	Cedar Branch (above KY342)	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-051	Cedar Branch (above KY342)	low water	—	753.27	-1.02	752.3	—	—	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	3/30/2011	ND/B	779.47	—	—	—	—	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	5/9/2011	ND/B	—	—	—	210	0.3	—	7.19	20.2	—	—	—	650	320
CH-053	Steep Tributary	5/13/2011	ND/B	—	—	—	220	0.3	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	5/17/2011	ND/B	—	—	—	440	0.6	—	6.91	14.5	—	—	—	870	520
CH-053	Steep Tributary	5/24/2011	ND/B	779.47	-4.00	775.5	530	0.8	—	7.63	19.4	—	—	—	680	330
CH-053	Steep Tributary	5/31/2011	ND/B	779.47	-4.29	775.2	230	0.3	—	7.21	21.1	—	—	—	1,070	540
CH-053	Steep Tributary	6/7/2011	ND/B	779.47	-4.50	775.0	110	0.2	—	7.21	24.1	—	—	—	1,100	530
CH-053	Steep Tributary	6/14/2011	ND/B	—	—	—	no flow	no flow	—	7.04	23.8	—	—	—	960	480
CH-053	Steep Tributary	6/21/2011	ND/B	779.47	-4.42	775.0	60	0.09	—	7.49	19.9	6.86	—	—	980	480
CH-053	Steep Tributary	6/30/2011	ND/B	—	—	—	30	0.04	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	low water	(moved Sta)	779.47	-0.82	778.7	—	—	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	4/26/2012	ND/B	780.42	0.33	780.8	4	0.010	E	7.92	16.37	9.13	207.1	—	518	—
CH-053	Steep Tributary	5/3/2012	ND/B	780.42	0.38	780.8	3	0.004	E	—	16.76	10.21	280.4	—	929	—
CH-053	Steep Tributary	5/7/2012	ND/B	780.42	0.42	780.8	10	0.014	E	7.83	19.52	9.07	193.9	—	629	—
CH-053	Steep Tributary	5/10/2012	ND/B	780.42	0.31	780.7	10	0.010	E	7.73	20.71	8.92	187.4	—	719	—
CH-053	Steep Tributary	5/17/2012	ND/B	780.42	0.32	780.7	65	0.090	V	8.30	15.0	4.94	-159.8	—	881	—

Table 4
Dye Monitoring Results and Field Parameter Data, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temp-erature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conduc-tance (SC) (µmho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
CH-053	Steep Tributary	5/24/2012	ND/B	780.42	0.37	780.8	20	0.029	B	8.21	17.2	1.03	-185.9	—	1,041	—
CH-053	Steep Tributary	6/1/2012	ND/B	780.42	0.32	780.7	15	0.022	E	8.20	15.1	1.44	-172.9	—	1,103	—
CH-053	Steep Tributary	6/7/2012	ND/B	780.42	<0.1 standing	780.5	low flow	low flow	—	8.32	16.5	11.67	-117.6	—	1,141	—
CH-053	Steep Tributary	6/15/2012	R+?	780.42	standing	—	no flow	no flow	—	8.29	17.1	9.37	183.7	—	982	—
CH-053	Steep Tributary	6/28/2012	—	780.42	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	7/17/2012	—	780.42	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	8/2/2012	—	780.42	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	8/23/2012	—	780.42	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-053	Steep Tributary	9/20/2012	ND/B	780.42	standing	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	3/30/2011	ND/B	777.88	—	—	—	—	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	5/9/2011	ND/B	—	—	—	190	0.3	—	7.62	20.2	—	—	—	380	190
CH-054	Cedar Branch Upstream	5/13/2011	F+	—	—	—	200	0.3	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	5/17/2011	F+	777.88	-1.75	776.1	180	0.3	—	7.13	14.9	—	—	—	1,030	390
CH-054	Cedar Branch Upstream	5/24/2011	ND/B	—	—	—	4,300	6.2	—	7.61	18.1	—	—	—	390	190
CH-054	Cedar Branch Upstream	5/31/2011	F+	777.88	-2.13	775.8	1,400	2.0	—	7.26	22.0	—	—	—	940	460
CH-054	Cedar Branch Upstream	6/7/2011	F++	777.88	-2.08	775.8	570	0.8	—	7.48	25.1	—	—	—	960	470
CH-054	Cedar Branch Upstream	6/14/2011	F+	—	—	—	low flow	low flow	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	6/21/2011	ND/B	—	—	—	no flow	no flow	—	7.65	24.2	7.18	—	—	450	220
CH-054	Cedar Branch Upstream	6/30/2011	ND/B	—	—	—	no flow	no flow	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	low water	(moved Sta)	777.88	-0.75	777.1	—	—	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	4/26/2012	ND/B	777.08	0.21	777.3	125	0.2	V	7.13	18.3	6.92	103.3	—	834	—
CH-054	Cedar Branch Upstream	5/3/2012	ND/B	777.08	0.19	777.3	5	0.007	E	8.56	20.2	4.14	177.1	—	351	—
CH-054	Cedar Branch Upstream	5/7/2012	ND/B	777.08	0.31	777.4	330	0.5	V	7.21	18.5	7.03	123.7	—	786	—
CH-054	Cedar Branch Upstream	5/10/2012	ND/B	777.08	0.21	777.3	130	0.2	V	7.09	21.4	7.29	122.9	—	743	—
CH-054	Cedar Branch Upstream	5/17/2012	ND/B	777.08	0.25	777.3	440	0.6	V	8.75	20.0	4.67	-163.5	—	470	—
CH-054	Cedar Branch Upstream	5/24/2012	ND/B	777.08	0.10	777.2	35	0.05	B	8.74	21.3	2.6	-193.6	—	433	—
CH-054	Cedar Branch Upstream	6/1/2012	ND/B	777.08	0.21	777.3	75	0.1	E	8.21	17.1	2.31	-180.7	—	411	—
CH-054	Cedar Branch Upstream	6/7/2012	ND/B	777.08	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	6/15/2012	R+?	777.08	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	6/28/2012	—	777.08	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	7/17/2012	—	777.08	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	8/2/2012	—	777.08	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	8/23/2012	—	777.08	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-054	Cedar Branch Upstream	9/20/2012	—	777.08	dry	dry	no flow	no flow	—	—	—	—	—	—	—	—
CH-055	Railroad Stream (upstream of 050)	3/30/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-055	Railroad Stream (upstream of 050)	5/9/2011	ND/B	—	—	—	—	—	—	7.52	20.5	—	—	—	730	360
CH-055	Railroad Stream (upstream of 050)	5/13/2011	ND/B	—	—	—	310	0.4	V	—	—	—	—	—	—	—
CH-055	Railroad Stream (upstream of 050)	5/17/2011	ND/B	—	—	—	170	0.2	V	7.42	16.1	—	—	—	830	360
CH-055	Railroad Stream (upstream of 050)	5/24/2011	ND/B	828.10	-0.75	827.4	20	0.03	B	7.54	19.2	—	—	—	1,000	490
CH-055	Railroad Stream (upstream of 050)	5/31/2011	ND/B	828.10	-1.42	826.7	10	0.02	B	7.58	22.1	—	—	—	930	470
CH-055	Railroad Stream (upstream of 050)	6/7/2011	ND/B	—	—	—	20	0.02	B	7.64	25.1	—	—	—	1,150	570
CH-055	Railroad Stream (upstream of 050)	6/14/2011	ND/B	—	—	—	30	0.04	B	7.26	23.8	—	—	—	820	420
CH-055	Railroad Stream (upstream of 050)	6/21/2011	ND/B	—	—	—	35	0.05	B	7.53	20.3	8.54	—	—	990	490
CH-055	Railroad Stream (upstream of 050)	6/30/2011	ND/B	—	—	—	30	0.04	B	—	—	—	—	—	—	—
CH-055	Railroad Stream (upstream of 050)	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-055	Railroad Stream (upstream of 050)	low water	—	828.10	-2.87	825.2	—	—	—	—	—	—	—	—	—	—
CH-056	Railroad Trib. (downstream of 050)	5/9/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-056	Railroad Trib. (downstream of 050)	5/13/2011	ND/B	—	—	—	100	0.1	V	—	—	—	—	—	—	—
CH-056	Railroad Trib. (downstream of 050)	5/17/2011	ND/B	754.35	-0.71	753.6	210	0.3	V	7.09	15.0	—	—	—	730	310
CH-056	Railroad Trib. (downstream of 050)	5/24/2011	ND/B	754.35	-0.58	753.8	20	0.02	B	7.58	18.8	—	—	—	930	450

Table 4
Dye Monitoring Results and Field Parameter Data, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Dye Results	Measuring Point Elev. (ft NAVD88)	Water Level (ft AMP)	Water Elevation (ft NAVD88)	Flow (gpm)	Flow (mgd)	Type	pH (S.U.)	Temperature (°C)	DO (mg/L)	Oxidation-Reduction Potential (ORP)** (mV)	Turbidity (NTU)	Specific Conductance (SC) (µmho/cm)	Tot. Diss. Solids (TDS) (Field) (ppm)
CH-056	Railroad Trib. (downstream of 050)	5/31/2011	ND/B	754.35	-0.71	753.6	10	0.02	B	7.24	21.0	—	—	—	850	420
CH-056	Railroad Trib. (downstream of 050)	6/7/2011	ND/B	—	—	—	8	0.01	B	7.54	23.1	—	—	—	1,040	530
CH-056	Railroad Trib. (downstream of 050)	6/14/2011	ND/B	—	—	—	6	0.009	B	7.28	24.3	—	—	—	870	490
CH-056	Railroad Trib. (downstream of 050)	6/21/2011	ND/B	—	—	—	100	0.1	V	7.45	18.9	9.48	—	—	1,010	510
CH-056	Railroad Trib. (downstream of 050)	6/30/2011	ND/B	—	—	—	40	0.06	V	—	—	—	—	—	—	—
CH-056	Railroad Trib. (downstream of 050)	7/14/2011	ND/B	—	—	—	—	—	—	—	—	—	—	—	—	—
CH-056	Railroad Trib. (downstream of 050)	low water	—	754.35	-1.80	752.6	—	—	—	—	—	—	—	—	—	—
CH-064	Storm Pond Inlet	4/26/2012	ND/B	837.72	0.58	838.3	5	0.01	E	6.74	18.70	7.05	125.7	—	1,819	—
CH-064	Storm Pond Inlet	5/3/2012	ND/B	837.72	—	—	—	—	—	—	—	—	—	—	—	—
CH-064	Storm Pond Inlet	5/7/2012	ND/B	837.72	—	—	10	0.01	E	6.89	15.94	3.81	-127.1	—	1,006	—
CH-064	Storm Pond Inlet	5/10/2012	ND/B	837.72	0.21	837.9	7	0.01	E	6.86	15.43	3.78	-125.1	—	1,249	—
CH-064	Storm Pond Inlet	5/17/2012	ND/B	837.72	0.29	838.0	35	0.05	V	6.96	15.44	4.51	-134.0	—	1,205	—
CH-064	Storm Pond Inlet	5/24/2012	ND/B	837.72	—	—	10	0.01	E	6.69	16.56	1.28	-217.8	—	2,135	—
CH-064	Storm Pond Inlet	6/1/2012	ND/B	837.72	0.30	838.0	160	0.2	V	6.87	15.23	1.41	-198.6	—	1,251	—
CH-064	Storm Pond Inlet	6/7/2012	ND/B	837.72	low flow	low flow	low flow	low flow	—	7.15	16.22	9.18	-80.4	—	1,516	—
CH-064	Storm Pond Inlet	6/15/2012	ND/B	837.72	low flow	low flow	3	0.004	E	6.73	17.36	4.31	-79.8	—	1,139	—
CH-064	Storm Pond Inlet	6/28/2012	ND/B	837.72	0.04	837.8	1	low flow	E	6.73	19.36	6.17	104.3	—	1,679	—
CH-064	Storm Pond Inlet	7/17/2012	ND/B	837.72	0.11	837.8	3	0.004	E	6.81	21.2	5.82	90.5	—	1,403	—
CH-064	Storm Pond Inlet	8/2/2012	ND/B	837.72	0.13	837.9	7	0.01	E	7.21	18.1	7.73	138.6	—	2,500	—
CH-064	Storm Pond Inlet	8/23/2012	ND/B	837.72	0.18	837.9	3	0.004	E	7.09	17.9	7.89	114.7	—	2,487	—
CH-064	Storm Pond Inlet	9/20/2012	ND/B	837.72	0.19	837.9	10	0.01	E	7.55	18.0	—	-153.9	—	1,625	—

Prepared by: CFS 4/11//2013
Checked by: TMH 4/12/2013

Notes:
--- = Not measured, not available or not established
Dye Results:
ND/B = No dectection or background level
+ = Positive detection (confirmed)
+? = Questionable detection (needs two successive detections to be confirmed)
E = Eosine
F = Fluorescein
R = Rhodamine WT
S = Sulphorhodamine B
Surveyed benchmarks (BMs) set by HDR in July 2011 and May 2012. Measuring Points (MPs) surveyed by AMEC relative to HDR BMs.
"Low water" was lowest observed water level in 2011, surveyed by AMEC relative to HDR BM on August 1, 2011.
Flow Measurement Method (Type):
B = Bucket method
V = Velocity-Area method
E = Visual estimate

Table 7
Analytical Results for Groundwater, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit:	Total Dissolved Solids (TDS) (mg/L)	Chemical Oxygen Demand (COD) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Alkalinity, Bicarbonate (mg/L)	Alkalinity, Carbonate (mg/L)	Arsenic (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Copper (mg/L)
		EPA MCL	—	—	—	—	—	*0.010*	—	*0.005*	—	—	*1.3*
		KY-SW MCL	—	—	—	—	—	*0.05*	—	*0.005*	—	—	—
Sta ID	**Station Description**	**Date**											
Background Springs													
CH-052	Stonewall Spring	5/9/2011	240	—	—	—	—	—	<0.20	—	73	6.9	—
CH-052	Stonewall Spring	5/24/2011	260	—	—	—	—	—	<0.20	—	83	5.9	—
CH-052	Stonewall Spring	6/7/2011	300	—	—	—	—	—	0.083 J	—	91	10	—
CH-052	Stonewall Spring	1/31/2012	260	<10	1.5	180	<20	<0.020	0.052 J	<0.0050	91	5.6	0.0048 J
CH-052	Second analysis	1/31/2012	—	—	—	—	—	0.0014	—	—	—	—	—
CH-052	Stonewall Spring	2/16/2012	—	—	—	—	—	<0.020	—	—	—	—	—
CH-052	Second analysis	2/16/2012	—	—	—	—	—	<0.0010	—	—	—	—	—
CH-052	Stonewall Spring	4/13/2012	290	5.6 J	1.0	180	<20	<0.020	0.12 J	<0.0050	93	9.6	0.0022 J
CH-052	Stonewall Spring	5/14/2012	330	8.4 J	2.1	220	<20	<0.020	0.17 J	<0.0050	100	7.9	0.0017 J
CH-052	Stonewall Spring	9/4/2012	—	—	—	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	12/18/2012	310	<10	2.3	180	<20	0.00095 J	0.46	<0.0050	93	8.0	<0.020
CH-063	Rockhouse Spring	5/21/2012	390	5.5 J	1.2	240	<20	<0.0010	0.060 J	<0.0050	120	5.8	<0.020
CH-063	Rockhouse Spring	12/17/2012	320	9.4 J	1.8	220	<20	<0.0010	0.16 J	<0.0050	110	4.4	<0.020
CH-063	Rockhouse Spring (Duplicate)	12/17/2012	340	9.4 J	4.4 P1	220	<20	<0.0010	0.080 J	<0.0050	110	4.1	<0.020
CH-063	Rockhouse Spring	1/14/2013	330	3.3 J	2.1	140	<20	0.0012	0.075 J	<0.0050	86	2.5	<0.020
CH-062	Hardin Spring	1/14/2012	140	<10	1.0	89	<20	0.0012	0.091	<0.0050	50	0.96	<0.020
Other Sampling Points - Springs and Drains													
CH-028	Webb Spring Complex	5/9/2011	360	—	—	—	—	—	<0.20	—	100	3.5	—
CH-028	Webb Spring Complex	5/24/2011	440	—	—	—	—	—	1.8	—	200	3.0	—
CH-028	Webb Spring Complex	6/7/2011	490	—	—	—	—	—	0.093 J	—	120	5.9	—
CH-028	Webb Spring Complex	6/21/2011	520	—	—	—	—	—	0.070 J	—	130	4.8	—
CH-028	Webb Spring Complex	1/31/2012	350	8.1 J	1.1	190	<20	<0.020	0.080 J	<0.0050	110	2.9	<0.020
CH-028	Second analysis	1/31/2012	—	—	—	—	—	0.0048	—	—	—	—	—
CH-028	Webb Spring Complex	2/16/2012	—	—	—	—	—	<0.020	—	—	—	—	—
CH-028	Second analysis	2/16/2012	—	—	—	—	—	0.00070 J	—	—	—	—	—
CH-028	Webb Spring Complex	4/13/2012	520	<10	0.57 J	200	<20	<0.020	0.099 J	<0.0050	150	5.1	<0.020
CH-028	Webb Spring Complex	5/14/2012	490	10	0.95 J	170	<20	<0.020	0.14 J	<0.0050	120	3.1	0.0069 J
CH-028	Webb Spring Complex	9/4/2012	660	<10	1.5	180	<20	<0.020	0.14 J	<0.0050	150	4.2	0.0016 J
CH-028	Webb Spring Complex	12/18/2012	430	<10	1.9	230	<200	0.00038 J	0.096 J	<0.0050	120	3.0	<0.020
CH-050	Railroad Spring	5/9/2011	540	—	—	—	—	—	<0.20	—	120	18	—
CH-050	Railroad Spring	5/24/2011	700	—	—	—	—	—	<0.20	—	160	31	—
CH-050	Railroad Spring	6/7/2011	900	—	—	—	—	—	0.24	—	180	36	—
CH-050	Railroad Spring	6/21/2011	820	—	—	—	—	—	0.22	—	180	31	—
CH-050	Railroad Spring	1/31/2012	700	<10	0.95 J,P1	170	<20	<0.020	0.20 J	<0.0050	170	19	<0.020
CH-050	Second analysis	1/31/2012	—	—	—	—	—	0.0012	—	—	—	—	—
CH-050	Railroad Spring	2/16/2012	—	—	—	—	—	<0.020	—	—	—	—	—
CH-050	Second analysis	2/16/2012	—	—	—	—	—	0.00039 J	—	—	—	—	—

Table 7
Analytical Results for Groundwater, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Iron (mg/L)	Lead (mg/L)	Magnesium (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Potassium (mg/L)	Selenium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)	Zinc (mg/L)
		EPA MCL	—	*0.015*	—	*0.002*	—	—	*0.05*	—	—	—
		KY-SW MCL	—	*0.05*	—	*0.002*	—	—	*0.05*	—	—	—
Background Springs												
CH-052	Stonewall Spring	5/9/2011	—	—	—	—	—	—	—	6.6	25	—
CH-052	Stonewall Spring	5/24/2011	—	—	—	—	—	—	—	3.9	29	—
CH-052	Stonewall Spring	6/7/2011	—	—	—	—	—	—	—	4.8	29	—
CH-052	Stonewall Spring	1/31/2012	2.0	<0.0050	5.4	<0.00020	<0.020	2.5	<0.020	3.7	29	0.056
CH-052	Second analysis	1/31/2012	—	—	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	2/16/2012	0.12	—	—	—	—	—	—	—	—	—
CH-052	Second analysis	2/16/2012	—	—	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	4/13/2012	0.11	<0.0050	5.9	<0.00020	<0.020	1.6	<0.020	5.0	36	<0.030
CH-052	Stonewall Spring	5/14/2012	0.67	0.010	5.9	<0.00020	<0.020	3.0	0.025	7.4	34	0.016 J
CH-052	Stonewall Spring	9/4/2012	—	—	—	—	—	—	—	—	—	—
CH-052	Stonewall Spring	12/18/2012	0.22	<0.0050	6.0	<0.00020	0.0049 J	2.9	<0.020	4.7	49	0.0078 J
CH-063	Rockhouse Spring	5/21/2012	0.34	<0.0050	6.9	<0.00020	0.0056 J	1.7	<0.020	3.3	68	<0.030
CH-063	Rockhouse Spring	12/17/2012	0.37	<0.0050	6.1	<0.00020	<0.020	1.9	<0.020	3.5	43	0.0072 J
CH-063	Rockhouse Spring (Duplicate)	12/17/2012	0.52	<0.0050	6.0	<0.00020	<0.020	1.9	<0.020	3.0	45	0.011 J
CH-063	Rockhouse Spring	1/14/2013	0.16	<0.0050	3.4	<0.00020	<0.020	1.7	0.0090 J	1.7	23	0.079
CH-062	Hardin Spring	1/14/2012	0.12	<0.025 O	1.9	<0.00020	<0.020	0.76	0.025	1.6	10	0.060
Other Sampling Points - Springs and Drains												
CH-028	Webb Spring Complex	5/9/2011	—	—	—	—	—	—	—	4.3	94	—
CH-028	Webb Spring Complex	5/24/2011	—	—	—	—	—	—	—	8.0	160	—
CH-028	Webb Spring Complex	6/7/2011	—	—	—	—	—	—	—	5.1	150	—
CH-028	Webb Spring Complex	6/21/2011	—	—	—	—	—	—	—	5.2	210	—
CH-028	Webb Spring Complex	1/31/2012	0.37	<0.0050	7.2	<0.00020	<0.020	1.9	<0.020	3.9	90	0.056
CH-028	Second analysis	1/31/2012	—	—	—	—	—	—	—	—	—	—
CH-028	Webb Spring Complex	2/16/2012	0.78	—	—	—	—	—	—	—	—	—
CH-028	Second analysis	2/16/2012	—	—	—	—	—	—	—	—	—	—
CH-028	Webb Spring Complex	4/13/2012	0.060 J	<0.0050	12	<0.00020	<0.020	2.2	<0.020	5.6	180	<0.030
CH-028	Webb Spring Complex	5/14/2012	0.41	0.0095	21	<0.00020	<0.020	3.7	0.019 J	4.6	200	0.020 J
CH-028	Webb Spring Complex	9/4/2012	0.14	0.0042 J	24	0.000020 J,P1	<0.020	4.1	0.015 J	5.6	280	<0.030
CH-028	Webb Spring Complex	12/18/2012	0.69	<0.0050	13	<0.00020	<0.020	2.3	0.064	3.4	160	0.050
CH-050	Railroad Spring	5/9/2011	—	—	—	—	—	—	—	13	250	—
CH-050	Railroad Spring	5/24/2011	—	—	—	—	—	—	—	24	320	—
CH-050	Railroad Spring	6/7/2011	—	—	—	—	—	—	—	27	410	—
CH-050	Railroad Spring	6/21/2011	—	—	—	—	—	—	—	25	420	—
CH-050	Railroad Spring	1/31/2012	0.32	<0.0050	29	<0.00020	<0.020	4.6	<0.020	18	350	0.074
CH-050	Second analysis	1/31/2012	—	—	—	—	—	—	—	—	—	—
CH-050	Railroad Spring	2/16/2012	0.072 J	—	—	—	—	—	—	—	—	—
CH-050	Second analysis	2/16/2012	—	—	—	—	—	—	—	—	—	—

Table 7
Analytical Results for Groundwater, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit:	Total Dissolved Solids (TDS) (mg/L)	Chemical Oxygen Demand (COD) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Alkalinity, Bicarbonate (mg/L)	Alkalinity, Carbonate (mg/L)	Arsenic (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Copper (mg/L)
		EPA MCL	—	—	—	—	—	*0.010*	—	*0.005*	—	—	*1.3*
		KY-SW MCL	—	—	—	—	—	*0.05*	—	*0.005*	—	—	—
Sta ID	**Station Description**	**Date**											
CH-050	Railroad Spring	4/13/2012	1100	7.2 J	0.88 J	190	<20	<0.020	2.1	<0.0050	240	34	<0.020
CH-050	Railroad Spring	5/14/2012	870	9.0 J	0.86 J	160	<20	<0.020	0.88	<0.0050	180	24	<0.020
CH-050	Railroad Spring	9/4/2012	1200	<10	1.1	160	<20	<0.020	5.7	<0.0050	220	30	0.0022 J
CH-050	Railroad Spring	12/18/2012	2700	38	3.2	140	<20	0.0064	42	<0.0050	360	100	<0.020
CH-040	Dam Toe Right (Audible)	5/9/2011	890	—	—	—	—	—	2.0	—	210	20	—
CH-040	Dam Toe Right (Audible)	5/24/2011	830	—	—	—	—	—	1.6	—	220	18	—
CH-040	Dam Toe Right (Audible)	6/7/2011	910	—	—	—	—	—	2.1	—	190	22	—
CH-040	Dam Toe Right (Audible)	6/21/2011	790	—	—	—	—	—	2.0	—	160	16	—
CH-040	Dam Toe Right (Audible)	1/31/2012	740	<10	0.99 J	150	<20	1.8	2.0	<0.0050	180	15	<0.020
CH-040	Second analysis	1/31/2012	—	—	—	—	—	1.7	—	—	—	—	—
CH-040	Dam Toe Right (Audible)	2/16/2012	—	—	—	—	—	0.44	—	—	—	—	—
CH-040	Second analysis	2/16/2012	—	—	—	—	—	0.44	—	—	—	—	—
CH-040	Dam Toe Right (Audible)	4/13/2012	760	7.6 J	0.94 J	140	<20	0.28	2.5	<0.0050	180	15	0.0024 J
CH-040	Dam Toe Right (Audible)	5/14/2012	850	14	1.1	120	<20	0.66	2.3	<0.0050	190	12	0.0050 J
CH-040	Dam Toe Right (Audible)	9/4/2012	840	<10	0.89 J	150	<20	0.41	2.8	<0.0050	170	14	<0.020
CH-040	Dam Toe Right (Duplicate)	9/4/2012	800	<10	0.69 J	140	<20	0.44	2.9	<0.0050	170	15	<0.020
CH-040	Dam Toe Right (Audible)	12/17/2012	730	6.0 J,P1	2.1	150	<20	0.41	2.3	<0.0050	160	17	<0.020
CH-040	Dam Toe Right (Duplicate)	12/17/2012	730	<10	2.2	150	<20	0.60	2.5	<0.0050	170	16	<0.020
CH-044	Ditch Spring	5/9/2011	780	—	—	—	—	—	2.5	—	180	12	—
CH-044	Ditch Spring	5/24/2011	960	—	—	—	—	—	1.8	—	220	9.8	—
CH-044	Ditch Spring	6/7/2011	700	—	—	—	—	—	3.1	—	150	13	—
CH-044	Ditch Spring	6/21/2011	760	—	—	—	—	—	3.3	—	160	13	—
CH-044	Ditch Spring	1/31/2012	720	<10	1.6	150	<20	0.11	3.0	<0.0050	180	16	0.0016 J
CH-044	Second analysis	1/31/2012	—	—	—	—	—	0.11	—	—	—	—	—
CH-044	Ditch Spring	2/16/2012	—	—	—	—	—	0.14	—	—	—	—	—
CH-044	Second analysis	2/16/2012	—	—	—	—	—	0.13	—	—	—	—	—
CH-044	Ditch Spring	4/13/2012	730	14	1.0	140	<20	0.11	3.4	<0.0050	160	17	0.0031 J
CH-044	Ditch Spring	5/14/2012	900	75	1.1	150	<20	0.15	2.4	0.0044 J	200	14	0.042
CH-044	Ditch Spring (Duplicate)	5/14/2012	910	68	0.93 J	150	<20	0.15	2.4	0.0037 J	200	14	0.037
CH-044	Ditch Spring	9/4/2012	510	14	0.53 J	64	<20	0.056	0.73	<0.0050	120	3.1	0.0063 J
CH-044	Ditch Spring	12/17/2012	430	200	3.9	110	<20	0.029	0.56	<0.0050	270	7.5	0.013J
CH-044	Ditch Spring	12/18/2012	—	—	—	—	—	0.014	0.79	<0.0050	210	—	<0.020
CH-044	Ditch Spring (Dissolved)	12/18/2012	—	—	—	—	—	0.0081	0.64	<0.0050	210	—	<0.020
CH-057	Briar Patch Spring	5/9/2011	1600	—	—	—	—	—	2.0	—	390	36	—
CH-057	Briar Patch Spring	5/24/2011	1700	—	—	—	—	—	2.4	—	420	54	—
CH-057	Briar Patch Spring	6/7/2011	1700	—	—	—	—	—	2.4	—	390	60	—
CH-057	Briar Patch Spring	6/21/2011	1300	—	—	—	—	—	1.9	—	300	44	—
CH-057	Briar Patch Spring	1/31/2012	1400	<10	2.2	90	<20	0.012 J	1.0	<0.0050	340	29	0.0031 J
CH-057	Second analysis	1/31/2012	—	—	—	—	—	0.012	—	—	—	—	—
CH-057	Briar Patch Spring	2/16/2012	—	—	—	—	—	0.016 J	—	—	—	—	—
CH-057	Second analysis	2/16/2012	—	—	—	—	—	0.0097	—	—	—	—	—

Table 7
Analytical Results for Groundwater, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit: / Date	Iron (mg/L)	Lead (mg/L)	Magnesium (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Potassium (mg/L)	Selenium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)	Zinc (mg/L)
		EPA MCL	—	*0.015*	—	*0.002*	—	—	*0.05*	—	—	—
		KY-SW MCL	—	*0.05*	—	*0.002*	—	—	*0.05*	—	—	—
CH-050	Railroad Spring	4/13/2012	0.12	<0.0050	49	<0.00020	<0.020	5.2	<0.020	27	570	0.011 J
CH-050	Railroad Spring	5/14/2012	0.14	0.019	34	<0.00020	<0.020	4.9	0.034	22	420	0.020 J
CH-050	Railroad Spring	9/4/2012	0.044 J	0.0034 J	60	0.000030 J	<0.020	6.0	0.022	20	570	<0.030
CH-050	Railroad Spring	12/18/2012	0.10	<0.0050	230	<0.0020	0.11 J	8.0	0.14	28	1400	0.014J
CH-040	Dam Toe Right (Audible)	5/9/2011	—	—	—	—	—	—	—	10	490	—
CH-040	Dam Toe Right (Audible)	5/24/2011	—	—	—	—	—	—	—	12	430 J6	—
CH-040	Dam Toe Right (Audible)	6/7/2011	—	—	—	—	—	—	—	9.3	430	—
CH-040	Dam Toe Right (Audible)	6/21/2011	—	—	—	—	—	—	—	11	390	—
CH-040	Dam Toe Right (Audible)	1/31/2012	6.8	<0.0050	24	<0.00020	<0.020	9.1	<0.020	10	380	0.091
CH-040	Second analysis	1/31/2012	—	—	—	—	—	—	—	—	—	—
CH-040	Dam Toe Right (Audible)	2/16/2012	1.3	—	—	—	—	—	—	—	—	—
CH-040	Second analysis	2/16/2012	—	—	—	—	—	—	—	—	—	—
CH-040	Dam Toe Right (Audible)	4/13/2012	0.89	<0.0050	25	0.000020 J	<0.020	9.7	<0.020	11	380	0.013 J
CH-040	Dam Toe Right (Audible)	5/14/2012	3.2	0.015	26	<0.00020	<0.020	8.3	0.045	9.3	440	0.029 J
CH-040	Dam Toe Right (Audible)	9/4/2012	1.9	0.0025 J	26	0.000020 J	<0.020	8.4	0.024	9.0	410	<0.030
CH-040	Dam Toe Right (Duplicate)	9/4/2012	2.0	0.0040 J	26	0.000030 J	<0.020	8.0	0.019 J	8.4	410	<0.030
CH-040	Dam Toe Right (Audible)	12/17/2012	0.95	<0.0050	23	<0.00020	0.0057 J	8.6	<0.020	11	370	0.0070 J
CH-040	Dam Toe Right (Duplicate)	12/17/2012	2.3	<0.010 O	24	<0.00020	<0.020	9.0	0.036	11	430	0.011 J
CH-044	Ditch Spring	5/9/2011	—	—	—	—	—	—	—	9.9	410	—
CH-044	Ditch Spring	5/24/2011	—	—	—	—	—	—	—	9.1	530	—
CH-044	Ditch Spring	6/7/2011	—	—	—	—	—	—	—	7.3	340	—
CH-044	Ditch Spring	6/21/2011	—	—	—	—	—	—	—	7.8	380	—
CH-044	Ditch Spring	1/31/2012	0.16	<0.0050	21	<0.00020	<0.020	5.6	<0.020	11	360	0.078
CH-044	Second analysis	1/31/2012	—	—	—	—	—	—	—	—	—	—
CH-044	Ditch Spring	2/16/2012	0.34	—	—	—	—	—	—	—	—	—
CH-044	Second analysis	2/16/2012	—	—	—	—	—	—	—	—	—	—
CH-044	Ditch Spring	4/13/2012	0.28	0.013	21	<0.00020	0.010 J	5.5	0.024	8.6	350	0.014 J
CH-044	Ditch Spring	5/14/2012	6.8	0.041	28	<0.00020	0.020 J	8.9	0.045	28	460	0.065
CH-044	Ditch Spring (Duplicate)	5/14/2012	6.0	0.036	27	<0.00020	0.015 J	9.6	0.049	14	470	0.064
CH-044	Ditch Spring	9/4/2012	0.99	0.0048 J	8.5	0.000040 J	<0.020	2.6	0.097	2.8	270	<0.030
CH-044	Ditch Spring	12/17/2012	8.5	<0.0050	15	<0.00020	0.034	6.4	<0.020	18	380	0.050
CH-044	Ditch Spring	12/18/2012	3.3	<0.0050	34	<0.00020	0.019 J	16	<0.020	78	—	0.014 J
CH-044	Ditch Spring (Dissolved)	12/18/2012	<0.10	<0.0050	33	<0.00020	<0.020	16	<0.020	81	—	0.012 J
CH-057	Briar Patch Spring	5/9/2011	—	—	—	—	—	—	—	11	1000	—
CH-057	Briar Patch Spring	5/24/2011	—	—	—	—	—	—	—	9.6	990	—
CH-057	Briar Patch Spring	6/7/2011	—	—	—	—	—	—	—	9.4	970	—
CH-057	Briar Patch Spring	6/21/2011	—	—	—	—	—	—	—	10	730	—
CH-057	Briar Patch Spring	1/31/2012	0.26	<0.0050	22	<0.00020	<0.020	5.9	<0.020	8.8	840	0.15
CH-057	Second analysis	1/31/2012	—	—	—	—	—	—	—	—	—	—
CH-057	Briar Patch Spring	2/16/2012	0.047 J	—	—	—	—	—	—	—	—	—
CH-057	Second analysis	2/16/2012	—	—	—	—	—	—	—	—	—	—

Table 7
Analytical Results for Groundwater, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Date	Total Dissolved Solids (TDS) (mg/L)	Chemical Oxygen Demand (COD) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Alkalinity, Bicarbonate (mg/L)	Alkalinity, Carbonate (mg/L)	Arsenic (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Copper (mg/L)
		EPA MCL	—	—	—	—	—	*0.010*	—	*0.005*	—	—	*1.3*
		KY-SW MCL	—	—	—	—	—	*0.05*	—	*0.005*	—	—	—
CH-057	Briar Patch Spring	4/13/2012	720	17	1.0	150	<20	0.11	3.5	<0.0050	180	17	0.0032 J
CH-057	Briar Patch Spring	5/14/2012	1500	4.2	1.8	86	<20	0.012 J	4.2	<0.0050	350	17	0.0055 J
CH-057	Briar Patch Spring	9/4/2012	1600	<10	1.4	100	<20	0.015 J	10	<0.0050	320	27	0.0026 J
CH-057	Briar Patch Spring	12/17/2012	1300	13 J3	2.0	29	<20	0.0084	5.2	<0.0050	300	19	<0.020
CH-041	Dam Toe Middle	5/9/2011	950	—	—	—	—	—	1.6	—	220	14	—
CH-041	Dam Toe Middle	5/24/2011	970	—	—	—	—	—	<0.20	—	140	14	—
CH-041	Dam Toe Middle	6/7/2011	1000	—	—	—	—	—	1.6	—	210	15	—
CH-041	Dam Toe Middle	6/21/2011	950	—	—	—	—	—	1.1	—	200	14	—
CH-042	Dam Toe Left	5/9/2011	910	—	—	—	—	—	0.64	—	200	20	—
CH-042	Dam Toe Left	5/24/2011	580	—	—	—	—	—	1.8	—	240	12	—
CH-042	Dam Toe Left	6/7/2011	510	—	—	—	—	—	0.20	—	110	14	—
CH-042	Dam Toe Left	6/21/2011	520	—	—	—	—	—	0.19 J	—	120	12	—
CH-045	Beaver Dam Cave Spring	5/9/2011	780	—	—	—	—	—	2.5	—	190	12	—
CH-045	Beaver Dam Cave Spring	5/24/2011	930	—	—	—	—	—	1.6	—	290	9.5	—
CH-045	Beaver Dam Cave Spring	6/7/2011	730	—	—	—	—	—	3.1	—	150	13	—
CH-045	Beaver Dam Cave Spring	6/21/2011	740	—	—	—	—	—	3.2	—	160	13	—
CH-045	Beaver Dam Cave Spring	12/17/2012	690	210	5.2	66	<20	0.080	0.56	<0.0050	230	13	0.012 J
CH-045	Beaver Dam Cave Spring	12/18/2012	—	—	—	—	—	0.019	0.63	<0.0050	210	—	<0.020
CH-045	Beaver Dam Cave Spring (Dissolved)	12/18/2012	—	—	—	—	—	0.012	0.58	<0.0050	210	—	<0.020
CH-045	Beaver Dam Cave Spring	1/14/2013	350	3.2 J	0.79 J	26	<20	<0.0010	0.13 J	<0.0050	80	2.0	<0.020
CH-045	Beaver Dam Cave Spring (Duplicate)	1/14/2013	260	<10	1.1	24	<20	0.00027 J	0.12 J	<0.0050	82	1.9	<0.020
CH-046	HQ Spring	5/9/2011	1400	—	—	—	—	—	1.4	—	300	37	—
CH-046	HQ Spring	5/24/2011	1300	—	—	—	—	—	1.9	—	400	28	—
CH-046	HQ Spring	6/7/2011	1500	—	—	—	—	—	1.9	—	320	38	—
CH-046	HQ Spring	6/21/2011	1300	—	—	—	—	—	1.8	—	280	29	—
CH-046	HQ Spring	12/17/2012	1400	17	1.4	110	<20	0.0063	3.6	<0.0050	290	27	<0.020
CH-046	HQ Spring	1/14/2013	1100	<10	1.2	96	<20	0.0070	1.8	<0.0050	250	14	<0.020
CH-048	Drain Pipe	5/9/2011	2000	—	—	—	—	—	1.9	—	340	32	—
CH-048	Drain Pipe	5/24/2011	2200	—	—	—	—	—	1.9	—	400	37	—
CH-048	Drain Pipe	6/7/2011	2400	—	—	—	—	—	1.7	—	400	37	—
CH-048	Drain Pipe	6/21/2011	2500	—	—	—	—	—	1.9	—	430	41	—
CH-061	Ison Spring	5/9/2011	300	—	—	—	—	—	<0.20	—	88	18	—
CH-061	Ison Spring	5/24/2011	300	—	—	—	—	—	<0.20	—	89	20	—

Table 7
Analytical Results for Groundwater, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit:	Iron (mg/L)	Lead (mg/L)	Magnesium (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Potassium (mg/L)	Selenium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)	Zinc (mg/L)
		EPA MCL	—	*0.015*	—	*0.002*	—	—	*0.05*	—	—	—
		KY-SW MCL	—	*0.05*	—	*0.002*	—	—	*0.05*	—	—	—
Sta ID	**Station Description**	**Date**										
CH-057	Briar Patch Spring	4/13/2012	**0.41**	<0.0050	**22**	<0.00020	<0.020	**5.2**	<0.020	**8.6**	**350**	**0.010 J**
CH-057	Briar Patch Spring	5/14/2012	**0.095 J**	**0.030**	**30**	<0.00020	<0.020	**9.2**	**0.070**	**14**	**890**	**0.026 J**
CH-057	Briar Patch Spring	9/4/2012	<0.10	**0.0032 J**	**57**	**0.00030 J**	**0.017 J**	**9.5**	**0.040**	**13**	**970**	<0.030
CH-057	Briar Patch Spring	12/17/2012	**0.16**	<0.0050	**34**	<0.00020	**0.0064 J**	**7.9**	<0.020	**15**	**840**	**0.0063 J**
CH-041	Dam Toe Middle	5/9/2011	—	—	—	—	—	—	—	**13**	**540**	—
CH-041	Dam Toe Middle	5/24/2011	—	—	—	—	—	—	—	**8.7**	**510**	—
CH-041	Dam Toe Middle	6/7/2011	—	—	—	—	—	—	—	**12**	**510**	—
CH-041	Dam Toe Middle	6/21/2011	—	—	—	—	—	—	—	**11**	**500**	—
CH-042	Dam Toe Left	5/9/2011	—	—	—	—	—	—	—	**14**	**490**	—
CH-042	Dam Toe Left	5/24/2011	—	—	—	—	—	—	—	**9.6**	**300**	—
CH-042	Dam Toe Left	6/7/2011	—	—	—	—	—	—	—	**9.4**	**220**	—
CH-042	Dam Toe Left	6/21/2011	—	—	—	—	—	—	—	**10**	**250**	—
CH-045	Beaver Dam Cave Spring	5/9/2011	—	—	—	—	—	—	—	**8.7**	**410**	—
CH-045	Beaver Dam Cave Spring	5/24/2011	—	—	—	—	—	—	—	**14**	**550**	—
CH-045	Beaver Dam Cave Spring	6/7/2011	—	—	—	—	—	—	—	**7.5**	**320**	—
CH-045	Beaver Dam Cave Spring	6/21/2011	—	—	—	—	—	—	—	**7.7**	**380**	—
CH-045	Beaver Dam Cave Spring	12/17/2012	**12**	<0.0050	**14**	<0.00020	**0.28**	**5.6**	<0.020	**18**	**370**	**0.044**
CH-045	Beaver Dam Cave Spring	12/18/2012	**4.7**	<0.0050	**32**	<0.00020	**0.018 J**	**16**	<0.020	**76**	—	**0.017 J**
CH-045	Beaver Dam Cave Spring (Dissolved)	12/18/2012	<0.10	<0.0050	**32**	<0.00020	<0.020	**16**	<0.020	**80**	—	**0.010 J**
CH-045	Beaver Dam Cave Spring	1/14/2013	**1.3**	<0.0050	**7.4**	<0.00020	<0.020	**3.9**	**0.039**	**11**	**210**	**0.079**
CH-045	Beaver Dam Cave Spring (Duplicate)	1/14/2013	**2.6**	<0.0050	**7.9**	<0.00020	<0.020	**4.8**	**0.036**	**12**	**200**	**0.082**
CH-046	HQ Spring	5/9/2011	—	—	—	—	—	—	—	**18**	**800**	—
CH-046	HQ Spring	5/24/2011	—	—	—	—	—	—	—	**18**	**730**	—
CH-046	HQ Spring	6/7/2011	—	—	—	—	—	—	—	**14**	**900**	—
CH-046	HQ Spring	6/21/2011	—	—	—	—	—	—	—	**14**	**740**	—
CH-046	HQ Spring	12/17/2012	**0.27**	<0.0050	**42**	<0.00020	**0.0070 J**	**9.8**	<0.020	**26**	**800**	**0.0065 J**
CH-046	HQ Spring	1/14/2013	**0.10**	<0.025 O	**44**	<0.00020	<0.10 O	**10**	**0.082**	**23**	**670**	**0.12**
CH-048	Drain Pipe	5/9/2011	—	—	—	—	—	—	—	**17 J5**	**1300**	—
CH-048	Drain Pipe	5/24/2011	—	—	—	—	—	—	—	**18**	**1500**	—
CH-048	Drain Pipe	6/7/2011	—	—	—	—	—	—	—	**18**	**1700**	—
CH-048	Drain Pipe	6/21/2011	—	—	—	—	—	—	—	**19**	**1700**	—
CH-061	Ison Spring	5/9/2011	—	—	—	—	—	—	—	**9.3**	**20**	—
CH-061	Ison Spring	5/24/2011	—	—	—	—	—	—	—	**12**	**18**	—

Table 7
Analytical Results for Groundwater, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit:	Total Dissolved Solids (TDS) (mg/L)	Chemical Oxygen Demand (COD) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Alkalinity, Bicarbonate (mg/L)	Alkalinity, Carbonate (mg/L)	Arsenic (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Copper (mg/L)
		EPA MCL	—	—	—	—	—	*0.010*	—	*0.005*	—	—	*1.3*
		KY-SW MCL	—	—	—	—	—	*0.05*	—	*0.005*	—	—	—
Sta ID	**Station Description**	**Date**											
	Burgin Spring	5/21/2012	**310**	<10	**1.3**	**200**	<20	<0.0010	**0.048 J**	<0.0050	**91**	**14**	<0.020
	Burgin Spring	12/172012	**280**	**38**	**1.8**	**170**	<20	<0.0010	**0.088 J**	<0.0050	**90**	**12**	**0.012 J**
	Burgin Spring	1/14/2013	**160**	**17**	**3.0**	**88**	<20	**0.00072 J**	**0.065 J**	<0.0050	**57**	**6.0**	<0.020

Table 7
Analytical Results for Groundwater, 2011-2013
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Parameter: / Unit / Date	Iron (mg/L)	Lead (mg/L)	Mag-nesium (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Potassium (mg/L)	Selenium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)	Zinc (mg/L)
		EPA MCL	—	*0.015*	—	*0.002*	—	—	*0.05*	—	—	—
		KY-SW MCL	—	*0.05*	—	*0.002*	—	—	*0.05*	—	—	—
	Burgin Spring	5/21/2012	**0.077 J**	<0.0050	**4.8**	<0.00020	<0.020	**1.7**	<0.020	**6.6**	**18**	<0.030
	Burgin Spring	12/172012	**0.092 J**	<0.0050	**4.6**	<0.00020	<0.020	**1.9**	<0.020	**6.3**	**23**	**0.012 J**
	Burgin Spring	1/14/2013	**0.70**	<0.0050	**3.3**	<0.00020	<0.020	**2.4**	**0.013 J**	**3.2**	**13**	**0.070**

Notes:
Detected values are shown in **bold**
— = Not measured, not available or not established
EPA MCL= USEPA Maximum Contaminant Level (or Action Level) for drinking water
KY-SW MCL= Kentucky Solid Waste Maximum Contaminant Level in 401 KAR 47:030 Section 6
Yellow highlighted values exceed the KY Solid Waste MCL in 401 KAR 47:030 Section 6.
Lab Qualifiers:
J = (EPA) Estimated value below the lowest calibration point. Confidence correlates with concentration
J3 = The associated batch QC was outside the established quality control range for precision
J5 = The sample matrix interfered with the ability to make any accurate determination; spike value is high
J6 = The sample matrix interfered with ability to make any accurate determination; spike value is low.
P1 = RPD value not applicable for sample concentrations less than 5 times the reporting limit.
B = (EPA) The indicated compound was found in the associated method blank as well as the laboratory sample.
O= Sample diluted due to matrix interference, detection limit elevated to reflect necessary dilution.

Prepared by: CFS 4/11//2013
Checked by: TMH 4/12/2013

Table 8
Analytical Results for Surface Water, 2011-2012
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Date	Total Dissolved Solids (TDS) (mg/L)	Chemical Oxygen Demand (COD) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Hardness as $CaCO_3$ (1) (mg/L)	Alkalinity, Bicarbonate (mg/L)	Alkalinity, Carbonate (mg/L)	Arsenic (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Copper (mg/L)
Herrington Lake / Curds Inlet														
	Curds Inlet (Dam End)	5/21/2012	230	9.0 J	4.7	129	69	<20	0.00051 J	0.22	<0.0050	38	7.4	<0.020
	Curds Inlet (Lake End)	5/21/2012	210	12	4.6	123	62	<20	0.00044 J	0.20	<0.0050	35	7.3	0.0043 JP1
	Lake (Near Intake)	5/21/2012	220	12	4.7	123	67	<20	0.00049 J	0.19 J	<0.0050	36	7.3	<0.020
	Lake Center	5/21/2012	220	13	4.7	123	58	<20	0.00042 J	0.19 J	<0.0050	36	7.4	<0.020
	Plant Lake Intake	5/21/2012	210	<10	2.9	145	110	<20	0.00047 J	0.078 J	<0.0050	46	7.5	<0.020
Other Sampling Points - Surface Water														
CH-025	Mouth of Dix River	5/9/2011	170	—	—	—	—	—	—	<0.20	—	39	9.5	—
CH-025	Mouth of Dix River	5/24/2011	270	—	—	—	—	—	—	<0.20	—	120	8.3	—
CH-025	Mouth of Dix River	6/7/2011	210	—	—	—	—	—	—	0.045 J	—	30	5.8	—
CH-025	Mouth of Dix River (Duplicate)	6/7/2011	210	—	—	—	—	—	—	0.058 J	—	30	5.5	—
CH-025	Mouth of Dix River	6/21/2011	260	—	—	—	—	—	—	0.043 J	—	34	8.7	—
CH-059	Cedar Branch at Shaker Landing	5/9/2011	250	—	—	—	—	—	—	<0.20	—	74	7.3	—
CH-059	Cedar Branch at Shaker Landing	5/24/2011	290	—	—	—	—	—	—	<0.20	—	84	8.7	—
CH-059	Cedar Branch at Shaker Landing	6/7/2011	280	—	—	—	—	—	—	0.10 J	—	83	10	—
CH-059	Cedar Branch at Shaker Landing	6/21/2011	270	—	—	—	—	—	—	0.066 J	—	41	9.0	—
CH-051	Cedar Branch (above KY 342)	5/9/2011	240	—	—	—	—	—	—	<0.20	—	71	7.4	—
CH-051	Cedar Branch (above KY 342)	5/24/2011	280	—	—	—	—	—	—	<0.20	—	85	6.4	—
CH-051	Cedar Branch (above KY 342)	6/7/2011	300	—	—	—	—	—	—	0.095 J	—	92	10	—
CH-051	Cedar Branch (above KY 342)	6/21/2011	400	—	—	—	—	—	—	0.10 J	—	98	15	—
CH-054	Cedar Branch Upstream	5/9/2011	240	—	—	—	—	—	—	<0.20	—	73	7.6	—
CH-054	Cedar Branch Upstream	5/24/2011	240	—	—	—	—	—	—	<0.20	—	78	6.2	—
CH-054	Cedar Branch Upstream	6/7/2011	300	—	—	—	—	—	—	0.053 J	—	89	11	—
CH-054	Cedar Branch Upstream	6/21/2011	280	—	—	—	—	—	—	0.061 J	—	84	15	—
CH-053	Steep Tributary	5/9/2011	470	—	—	—	—	—	—	<0.20	—	130	9.6	—
CH-053	Steep Tributary	5/24/2011	500	—	—	—	—	—	—	<0.20	—	150	11	—
CH-053	Steep Tributary	6/7/2011	580	—	—	—	—	—	—	0.19 J	—	160	10	—
CH-053	Steep Tributary	6/21/2011	760	—	—	—	—	—	—	0.72	—	200	29	—
CH-055	Railroad Stream (upstream of 050)	5/9/2011	520	—	—	—	—	—	—	<0.20	—	110	17	—
CH-055	Railroad Stream (upstream of 050)	5/24/2011	780	—	—	—	—	—	—	<0.20	—	170	23	—
CH-055	Railroad Stream (upstream of 050)	6/7/2011	960	—	—	—	—	—	—	0.17 J	—	190	31	—
CH-055	Railroad Stream (upstream of 050)	6/21/2011	820	—	—	—	—	—	—	0.20 J	—	160	27	—

Table 8
Analytical Results for Surface Water, 2011-2012
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Date	Iron (mg/L)	Lead (mg/L)	Magnesium (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Potassium (mg/L)	Selenium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)	Zinc (mg/L)
Herrington Lake / Curds Inlet												
	Curds Inlet (Dam End)	5/21/2012	**0.037 J**	<0.0050	**8.2**	<0.00020	<0.020	**2.6**	<0.020	**4.8**	**54**	<0.030
	Curds Inlet (Lake End)	5/21/2012	**0.046 JP1**	**0.0035 JP1**	**8.5**	<0.00020	<0.020	**3.2**	**0.022**	**4.9**	**49**	**0.011 JP1**
	Lake (Near Intake)	5/21/2012	**0.036 J**	<0.0050	**8.1**	<0.00020	<0.020	**2.8**	**0.019 J**	**5.1 B**	**51**	<0.030
	Lake Center	5/21/2012	**0.066 J**	<0.0050	**8.1**	<0.00020	<0.020	**2.7**	**0.031**	**5.0 B**	**51**	**0.010 J**
	Plant Lake Intake	5/21/2012	**0.027 J**	<0.0050	**7.3**	<0.00020	<0.020	**2.8**	<0.020	**4.5**	**28**	<0.030
Other Sampling Points - Surface Water												
CH-025	Mouth of Dix River	5/9/2011	—	—	—	—	—	—	—	**5.3**	**20**	—
CH-025	Mouth of Dix River	5/24/2011	—	—	—	—	—	—	—	**3.8**	**110**	—
CH-025	Mouth of Dix River	6/7/2011	—	—	—	—	—	—	—	**9.6**	**71**	—
CH-025	Mouth of Dix River (Duplicate)	6/7/2011	—	—	—	—	—	—	—	**9.3**	**69**	—
CH-025	Mouth of Dix River	6/21/2011	—	—	—	—	—	—	—	**11**	**71**	—
CH-059	Cedar Branch at Shaker Landing	5/9/2011	—	—	—	—	—	—	—	**5.7**	**36**	—
CH-059	Cedar Branch at Shaker Landing	5/24/2011	—	—	—	—	—	—	—	**5.9**	**48**	—
CH-059	Cedar Branch at Shaker Landing	6/7/2011	—	—	—	—	—	—	—	**7.0**	**50**	—
CH-059	Cedar Branch at Shaker Landing	6/21/2011	—	—	—	—	—	—	—	**10**	**70**	—
CH-051	Cedar Branch (above KY 342)	5/9/2011	—	—	—	—	—	—	—	**4.1**	**26**	—
CH-051	Cedar Branch (above KY 342)	5/24/2011	—	—	—	—	—	—	—	**4.1**	**25**	—
CH-051	Cedar Branch (above KY 342)	6/7/2011	—	—	—	—	—	—	—	**5.0**	**30**	—
CH-051	Cedar Branch (above KY 342)	6/21/2011	—	—	—	—	—	—	—	**6.6**	**52**	—
CH-054	Cedar Branch Upstream	5/9/2011	—	—	—	—	—	—	—	**4.3**	**27**	—
CH-054	Cedar Branch Upstream	5/24/2011	—	—	—	—	—	—	—	**3.4**	**13**	—
CH-054	Cedar Branch Upstream	6/7/2011	—	—	—	—	—	—	—	**4.6**	**14**	—
CH-054	Cedar Branch Upstream	6/21/2011	—	—	—	—	—	—	—	**6.2**	**18**	—
CH-053	Steep Tributary	5/9/2011	—	—	—	—	—	—	—	**9.7**	**160**	—
CH-053	Steep Tributary	5/24/2011	—	—	—	—	—	—	—	**11**	**200**	—
CH-053	Steep Tributary	6/7/2011	—	—	—	—	—	—	—	**11**	**220**	—
CH-053	Steep Tributary	6/21/2011	—	—	—	—	—	—	—	**16**	**340**	—
CH-055	Railroad Stream (upstream of 050)	5/9/2011	—	—	—	—	—	—	—	**15**	**240**	—
CH-055	Railroad Stream (upstream of 050)	5/24/2011	—	—	—	—	—	—	—	**19**	**400**	—
CH-055	Railroad Stream (upstream of 050)	6/7/2011	—	—	—	—	—	—	—	**26**	**450**	—
CH-055	Railroad Stream (upstream of 050)	6/21/2011	—	—	—	—	—	—	—	**23**	**440**	—

Table 8
Analytical Results for Surface Water, 2011-2012
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Date	Total Dissolved Solids (TDS) (mg/L)	Chemical Oxygen Demand (COD) (mg/L)	Total Organic Carbon (TOC) (mg/L)	Hardness as $CaCO_3$ (1) (mg/L)	Alkalinity, Bicarbonate (mg/L)	Alkalinity, Carbonate (mg/L)	Arsenic (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Copper (mg/L)
CH-056	Railroad Trib. (downstream of 050)	5/24/2011	740	—	—	—	—	—	—	<0.20	—	160	26	—
CH-056	Railroad Trib. (downstream of 050)	6/7/2011	870	—	—	—	—	—	—	0.17 J	—	220	35	—
CH-056	Railroad Trib. (downstream of 050)	6/21/2011	820	—	—	—	—	—	—	0.21	—	170	31	—
CH-058	HQ Stream	5/9/2011	1500	—	—	—	—	—	—	1.7	—	350	37	—
CH-058	HQ Stream	5/24/2011	1400	—	—	—	—	—	—	2.0	—	350	41	—
CH-058	HQ Stream	6/7/2011	1600	—	—	—	—	—	—	2.2	—	360	50	—
CH-058	HQ Stream	6/21/2011	1300	—	—	—	—	—	—	1.9	—	290	37	—

Table 8
Analytical Results for Surface Water, 2011-2012
E.W. Brown Generating Station, Mercer County, Kentucky
AMEC Project No. 3143101364

Sta ID	Station Description	Date	Iron (mg/L)	Lead (mg/L)	Magnesium (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Potassium (mg/L)	Selenium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)	Zinc (mg/L)
CH-056	Railroad Trib. (downstream of 050)	5/24/2011	—	—	—	—	—	—	—	**21**	**340**	—
CH-056	Railroad Trib. (downstream of 050)	6/7/2011	—	—	—	—	—	—	—	**27**	**400**	—
CH-056	Railroad Trib. (downstream of 050)	6/21/2011	—	—	—	—	—	—	—	**24**	**390**	—
CH-058	HQ Stream	5/9/2011	—	—	—	—	—	—	—	**19**	**900**	—
CH-058	HQ Stream	5/24/2011	—	—	—	—	—	—	—	**12**	**840**	—
CH-058	HQ Stream	6/7/2011	—	—	—	—	—	—	—	**12**	**920**	—
CH-058	HQ Stream	6/21/2011	—	—	—	—	—	—	—	**12**	**740**	—

Notes:
Detected values are shown in **bold**
— = Not measured, not available or not established
(1) Hardness calculated according the the following formula: Hardness = 2.50 Ca + 4.12 Mg
Lab Qualifiers:
J = (EPA) Estimated value below the lowest calibration point. Confidence correlates with concentration
P1 = RPD value not applicable for sample concentrations less than 5 times the reporting limit.

Prepared by: CFS 4/11//2013
Checked by: TMH 4/12/2013

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GROUNDWATER ASSESSMENT REPORT UPDATE

E.W. BROWN GENERATING STATION
MERCER COUNTY, KENTUCKY

AGENCY INTEREST No. 3148
SOLID WASTE PERMIT No. SW8400010

2 June 2015

Prepared For:

KU Kentucky Utilities Company
Generation Services

Kentucky Utilities Company
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Harrodsburg, KY 40330

Prepared By:

Amec Foster Wheeler Environment & Infrastructure, Inc.
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Project No. 567530023

APPENDIX E

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS BY SAMPLING POINT

CH-028
WEBB SPRING COMPLEX
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028
			Station Name	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB
			Lab ID	L515479-03	—	L517576-02	—	L520030-02	—	L522574-02
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	799	799.1	799	798.8	—	—
Flow	—	—	gpm	6	9	40	4	5	10	7
Flow	—	—	mgd	0.008	0.01	0.06	0.006	0.008	0.01	0.01
Temperature	—	—	°C	20.8	15.7	19.2	21.3	24.5	24.8	22.8
pH (field)	—	—	S.U.	7.57	7.83	7.58	7.19	7.52	7.13	7.57
Specific Conductance	—	*840*	µS/cm	510	600	580	590	690	640	660
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	8.78
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	360	—	440	—	490	—	520
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	100	—	200	—	120	—	130
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	4.3	—	8.0	—	5.1	—	5.2
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	94	—	160	—	150	—	210
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	3.5	—	3.0	—	5.9	—	4.8
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-028
WEBB SPRING COMPLEX
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028
			Station Name	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB
			Lab ID	L515479-03	—	L517576-02	—	L520030-02	—	L522574-02
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	MCL	UPL	Units							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	<0.20	—	1.8	—	0.093 J	—	0.070 J
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-028
WEBB SPRING COMPLEX
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028
			Station Name	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB
			Lab ID	L558290-04	L560970-01	L570058-04	—	—	—	L575196-01
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/27/2012	5/7/2012	5/10/2012	5/14/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	794.7	794.6	794.6	796.9	794.7	794.6	794.8
Flow	—	—	gpm	260	66	15	93	130	65	250
Flow	—	—	mgd	0.4	0.1	0.02	0.1	0.2	0.09	0.4
Temperature	—	—	°C	12.87	12.2	21.2	12.58	20.25	17.71	16.07
pH (field)	—	—	S.U.	7.54	8.01	7.7	8.2	8.22	8.24	7.48
Specific Conductance	—	*840*	µS/cm	406	457	1,010	568	660	736	720
Ox-Red Potential (ORP)	—	—	mV	-221.4	-227.3	—	217.1	-157.8	154.7	123.1
Dissolved Oxygen (DO)	—	—	mg/L	8.1	9.5	—	8.93	2.25	10.24	4.7
Turbidity (field)	—	—	NTU	9.4	26	4.7	—	—	—	11
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	350	—	520	—	—	—	490
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	8.1 J	—	<10	—	—	—	10
Total Organic Carbon (TOC)	—	*3.8*	mg/L	1.1	—	0.57 J	—	—	—	0.95 J
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	110	—	150	—	—	—	120
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	7.2	—	12	—	—	—	21
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	1.9	—	2.2	—	—	—	3.7
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	3.9	—	5.6	—	—	—	4.6
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	190	—	200	—	—	—	170
Alkalinity,Carbonate	—	*<20*	mg/L	<20	—	<20	—	—	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	90	—	180	—	—	—	200
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	2.9	—	5.1	—	—	—	3.1
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

			Station Number	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028
			Station Name	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB
			Lab ID	L558290-04	L560970-01	L570058-04	—	—	—	L575196-01
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/27/2012	5/7/2012	5/10/2012	5/14/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	**0.37**	**0.78**	**0.060 J**	—	—	—	**0.41**
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	**0.0048**	**0.00070**	<0.020	—	—	—	<0.020
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	**0.080 J**	—	**0.099 J**	—	—	—	**0.14 J**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	<0.0050	—	<0.0050	—	—	—	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	<0.020	—	<0.020	—	—	—	**0.0069 J**
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	<0.0050	—	<0.0050	—	—	—	**0.0095**
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	<0.00020	—	<0.00020	—	—	—	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	<0.020	—	<0.020	—	—	—	<0.020
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	<0.020	—	<0.020	—	—	—	**0.019 J**
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	**0.056**	—	<0.030	—	—	—	**0.020 J**
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-028
WEBB SPRING COMPLEX
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028
			Station Name	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB
			Lab ID	—	—	—	—	—	—	—
			Collection Date	5/17/2012	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012	7/17/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	794.7	794.7	794.7	794.7	794.6	794.6	794.6
Flow	—	—	gpm	12	103	110	13	31	39	7
Flow	—	—	mgd	0.2	0.1	0.2	0.02	0.04	0.06	0.01
Temperature	—	—	°C	20.13	22.7	15.05	18.73	16.56	17.12	29.84
pH (field)	—	—	S.U.	8.28	8.29	8.1	8.31	7.52	7.88	8.18
Specific Conductance	—	*840*	µS/cm	697	710	732	757	832	1,437	829
Ox-Red Potential (ORP)	—	—	mV	-163.7	-162.9	-181.9	-132.5	167.9	233.5	189.4
Dissolved Oxygen (DO)	—	—	mg/L	3.01	3.6	1.38	9.01	8.76	5.79	6.29
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	—	—
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	—	—	—	—	—
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	—	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	—	—	—	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-028
WEBB SPRING COMPLEX
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028
			Station Name	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB
			Lab ID	—	—	—	—	—	—	—
			Collection Date	5/17/2012	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012	7/17/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	—	—	—	—	—
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-028
WEBB SPRING COMPLEX
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028
			Station Name	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB
			Lab ID	—	—	L593301-01	—	L612149-01	L713403-01	L729333-01
			Collection Date	8/2/2012	8/23/2012	9/4/2012	9/20/2012	12/18/2012	7/31/2014	10/22/2014
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	794.6	794.6	794.7	794.7	794.9	—	—
Flow	—	—	gpm	20	17	130	70	263	30	6
Flow	—	—	mgd	0.03	0.02	0.2	0.1	0.4	0.04	0.009
Temperature	—	—	°C	28.63	19.49	20.55	20.03	12.16	21.83	19.72
pH (field)	—	—	S.U.	8.15	8.03	7.91	8.15	8.69	8.15	7.95
Specific Conductance	—	*840*	µS/cm	788	627	840	833	516	786	892
Ox-Red Potential (ORP)	—	—	mV	177.5	129.2	-125.4	179.1	-162	-87.1	165
Dissolved Oxygen (DO)	—	—	mg/L	6.76	6.03	3.41	9.11	6.09	7.02	4.8
Turbidity (field)	—	—	NTU	—	—	—	—	80	6.93	5.8
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	660	—	430	590	610
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	<10	—	<10	12 P1	<10
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	1.5	—	1.9	2.2	1.0
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	150	—	120	160	160
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	170
Magnesium	—	*8.8*	mg/L	—	—	24	—	13	17	17
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	16
Potassium	—	*3.4*	mg/L	—	—	4.1	—	2.3	3.4	3.9
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	2.9
Sodium	—	*7.2*	mg/L	—	—	5.6	—	3.4	5.2	30
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	5.6
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	220
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	180	—	230	200	190
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	<20	—	<200	<20	25
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	280	—	160	220	240
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	4.2	—	3.0	5.1	4.7
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-028
WEBB SPRING COMPLEX
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028	CH-028
			Station Name	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB	WEBB
			Lab ID	—	—	L593301-01	—	L612149-01	L713403-01	L729333-01
			Collection Date	8/2/2012	8/23/2012	9/4/2012	9/20/2012	12/18/2012	7/31/2014	10/22/2014
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	**0.14**	—	**0.69**	**0.39**	**0.24**
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	**0.13**	**0.11**
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	<0.020	—	**0.00038 J**	**0.00034 J**	**0.00052 J**
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	**0.00033 J**	<0.0010
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	**0.14 J**	—	**0.096 J**	**0.090 J**	**0.22**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	**0.088 J**	**0.072 J**
Cadmium	*0.005*	—	mg/L	—	—	<0.0050	—	<0.0050	<0.00050	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	**0.00017 J**	<0.0050
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	**0.0016 J**	—	<0.020	<0.0020	<0.020
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	<0.0020	**0.020 J**
Lead	*0.015*	—	mg/L	—	—	**0.0042 J**	—	<0.0050	**0.00031 J**	<0.0050
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	**0.00043 J**	<0.0050
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	**0.000020 J, P1**	—	<0.00020	<0.00020	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	<0.00020	<0.00020
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	<0.020	—	<0.020	**0.0026**	<0.020
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	**0.0026**	<0.020
Selenium	*0.05*	—	mg/L	—	—	**0.015 J**	—	**0.064**	**0.00038 J**	<0.020
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	<0.010	<0.020
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	<0.030	—	**0.050**	**0.0068 J**	<0.050
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	<0.010	<0.050

CH-040
DAM TOE RIGHT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	L515479-04	—	L517576-03	—	L520030-03	—	L522574-03
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	MCL	UPL	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	—	—	—	—	—
Flow	—	—	gpm	—	—	—	—	—	—	—
Flow	—	—	mgd	—	—	—	—	—	—	—
Temperature	—	—	°C	20.9	15.2	19.1	21.4	24.3	23.9	17.6
pH (field)	—	—	S.U.	6.72	7.2	6.81	7.51	7.04	7.62	6.82
Specific Conductance	—	840	µS/cm	1,060	1,070	990	870	1,000	970	900
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	1.26
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	890	—	830	—	910	—	790
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	3.8	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	130	mg/L	210	—	220	—	190	—	160
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—	—
Potassium	—	3.4	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—	—
Sodium	—	7.2	mg/L	10	—	12	—	9.3	—	11
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	<20	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	65	mg/L	490	—	430 J6	—	430	—	390
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	13	mg/L	20	—	18	—	22	—	16
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-040
DAM TOE RIGHT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	L515479-04	—	L517576-03	—	L520030-03	—	L522574-03
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	**2.0**	—	**1.6**	—	**2.1**	—	**2.0**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-040
DAM TOE RIGHT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	L558290-03	L560970-02	L570058-03	—	—	—	L575196-02
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/27/2012	5/7/2012	5/10/2012	5/14/2012
Parameter	MCL	UPL	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	752.6	752.5	—	752.6	752.6	752.6	752.7
Flow	—	—	gpm	24	25	12	10	10	5	20
Flow	—	—	mgd	0.03	0.04	0.02	0.01	0.01	0.007	0.03
Temperature	—	—	°C	17.2	14.9	21.1	16.76	17.74	17.96	18.77
pH (field)	—	—	S.U.	6.9	7.27	7.2	7.42	7.06	7.02	7.29
Specific Conductance	—	840	µS/cm	790	746	1,070	814	856	1,197	1,050
Ox-Red Potential (ORP)	—	—	mV	-229.9	-234	—	209.6	-211.6	-161.2	148.8
Dissolved Oxygen (DO)	—	—	mg/L	3.63	3.99	—	—	3.86	3.07	7.24
Turbidity (field)	—	—	NTU	8.6	9.7	8.2	—	—	—	15
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	740	—	760	—	—	—	850
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	<10	—	7.6 J	—	—	—	14
Total Organic Carbon (TOC)	—	3.8	mg/L	0.99 J	—	0.94 J	—	—	—	1.1
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	130	mg/L	180	—	180	—	—	—	190
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	24	—	25	—	—	—	26
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—	—
Potassium	—	3.4	mg/L	9.1	—	9.7	—	—	—	8.3
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—	—
Sodium	—	7.2	mg/L	10	—	11	—	—	—	9.3
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	150	—	140	—	—	—	120
Alkalinity,Carbonate	—	<20	mg/L	<20	—	<20	—	—	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	65	mg/L	380	—	380	—	—	—	440
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	13	mg/L	15	—	15	—	—	—	12
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-040
DAM TOE RIGHT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	L558290-03	L560970-02	L570058-03	—	—	—	L575196-02
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/27/2012	5/7/2012	5/10/2012	5/14/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	**6.8**	**1.3**	**0.89**	—	—	—	**3.2**
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	**1.7**	**0.44**	**0.28**	—	—	—	**0.66**
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	**2.0**	—	**2.5**	—	—	—	**2.3**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	<0.0050	—	<0.0050	—	—	—	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	<0.020	—	**0.0024 J**	—	—	—	**0.0050 J**
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	<0.0050	—	<0.0050	—	—	—	**0.015**
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	<0.00020	—	**0.000020 J**	—	—	—	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	<0.020	—	<0.020	—	—	—	<0.020
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	<0.020	—	<0.020	—	—	—	**0.045**
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	**0.091**	—	**0.013 J**	—	—	—	**0.029 J**
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-040
DAM TOE RIGHT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	—	—	—	—	—	—	—
			Collection Date	5/17/2012	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012	7/17/2012
Parameter	MCL	UPL	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	752.6	752.6	752.7	752.6	752.5	752.5	752.6
Flow	—	—	gpm	15	15	20	20	5	4	20
Flow	—	—	mgd	0.02	0.02	0.03	0.03	0.007	0.006	0.03
Temperature	—	—	°C	17.49	17.99	17.71	17.71	18.11	18.66	16.96
pH (field)	—	—	S.U.	7.02	6.92	7.03	7.04	7.12	7.83	6.83
Specific Conductance	—	840	µS/cm	1,084	1,066	1,094	1,248	968	1,289	971
Ox-Red Potential (ORP)	—	—	mV	-195.5	-169.1	-188.9	-94.2	-112.6	-178.9	-177
Dissolved Oxygen (DO)	—	—	mg/L	3.02	2.1	2.56	2.56	2.81	3.42	2.06
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	—	—	—	—	—	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	3.8	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	130	mg/L	—	—	—	—	—	—	—
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—	—
Potassium	—	3.4	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—	—
Sodium	—	7.2	mg/L	—	—	—	—	—	—	—
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	<20	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	65	mg/L	—	—	—	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	13	mg/L	—	—	—	—	—	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-040
DAM TOE RIGHT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	—	—	—	—	—	—	—
			Collection Date	5/17/2012	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012	7/17/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	—	—	—	—	—
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-040
DAM TOE RIGHT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	—	—	L593301-02	L593301-02	—	L611710-01	L611710-04
			Collection Date	8/2/2012	8/23/2012	9/4/2012	9/4/2012	9/20/2012	12/17/2012	12/17/2012
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	752.6	752.6	752.7	752.7	752.6	752.6	752.6
Flow	—	—	gpm	25	25	35	35	10	5	5
Flow	—	—	mgd	0.04	0.04	0.05	0.05	0.01	0.007	0.007
Temperature	—	—	°C	17.54	16.09	18.9	—	17.27	14.91	—
pH (field)	—	—	S.U.	7.08	7.24	7.23	—	7.54	7.81	—
Specific Conductance	—	*840*	µS/cm	1,011	739	995	—	1,012	897	—
Ox-Red Potential (ORP)	—	—	mV	-153.3	-107.3	-95.7	—	-214.8	-142.5	—
Dissolved Oxygen (DO)	—	—	mg/L	2.26	2.61	2.26	—	—	5.13	—
Turbidity (field)	—	—	NTU	—	—	—	—	—	19	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	840	800	—	730	730
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	<10	<10	—	6.0 J, P1	<10
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	0.89 J	0.69 J	—	2.1	2.2
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	170	170	—	160	170
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	26	26	—	23	24
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	8.4	8.0	—	8.6	9.0
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	9.0	8.4	—	11	11
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	150	140	—	150	150
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	<20	<20	—	<20	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	410	410	—	370	430
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	14	15	—	17	16
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-040
DAM TOE RIGHT
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EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	—	—	L593301-02	L593301-02	—	L611710-01	L611710-04
			Collection Date	8/2/2012	8/23/2012	9/4/2012	9/4/2012	9/20/2012	12/17/2012	12/17/2012
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	**1.9**	**2.0**	—	**0.95**	**2.3**
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	**0.41**	**0.44**	—	**0.41**	**0.60**
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	**2.8**	**2.9**	—	**2.3**	**2.5**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	<0.0050	<0.0050	—	<0.0050	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	<0.020	<0.020	—	<0.020	<0.020
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	**0.0025 J**	**0.0040 J**	—	<0.0050	<0.010 O
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	**0.000020 J**	**0.000030 J**	—	<0.00020	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	<0.020	<0.020	—	**0.0057 J**	<0.020
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	**0.024**	**0.019 J**	—	<0.020	**0.036**
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	<0.030	<0.030	—	**0.0070 J**	**0.011 J**
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-040
DAM TOE RIGHT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	L713424-01	L719267-04	L728124-01
			Collection Date	7/31/2014	8/29/2014	10/16/2014
Parameter	MCL	UPL	Units			
Field Parameters						
Water Level Elevation	—	—	ft NAVD88	—	—	—
Flow	—	—	gpm	30	20	—
Flow	—	—	mgd	0.04	0.03	—
Temperature	—	—	°C	16.2	16.24	16.34
pH (field)	—	—	S.U.	7.95	7.3	7.55
Specific Conductance	—	840	µS/cm	1,478	1,510	1,501
Ox-Red Potential (ORP)	—	—	mV	-72.7	-92.3	-4.5
Dissolved Oxygen (DO)	—	—	mg/L	1.55	1.87	3.15
Turbidity (field)	—	—	NTU	7.2	4	5.1
Indicator Parameters						
pH (lab)	—	—	S.U.	—	7.5 T8	6.8 T8
Dissolved Solids	—	420	mg/L	1,300	1,300	1,200
Suspended Solids	—	—	mg/L	—	12	8.0 P1
Turbidity (lab)	—	—	NTU	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	9.8 J	6.4 J	<10
Total Organic Carbon (TOC)	—	3.8	mg/L	0.92 J	1.1	1.1
Acidity	—	—	mg/L	—	<10	<10
Free Carbon Dioxide	—	—	mg/L	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	890	970
Major Cations						
Calcium	—	130	mg/L	260	280	260
Calcium,Dissolved	—	130	mg/L	—	260	270
Magnesium	—	8.8	mg/L	53	55	57
Magnesium,Dissolved	—	8.8	mg/L	—	56	57
Potassium	—	3.4	mg/L	11	12	12
Potassium,Dissolved	—	3.4	mg/L	—	11	12
Sodium	—	7.2	mg/L	12	13	12
Sodium,Dissolved	—	7.2	mg/L	—	13	12
Ammonia Nitrogen	—	—	mg/L	—	0.74	0.51
Major Anions						
Alkalinity, Total	—	—	mg/L	—	160	150
Alkalinity,Bicarbonate	—	290	mg/L	150	160	150
Alkalinity,Carbonate	—	<20	mg/L	<20	<20	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	0.22	—
Nitrate, as N	10	—	mg/L	—	—	<0.10
Nitrite, as N	1	—	mg/L	—	—	<0.10
Sulfate	—	65	mg/L	590	550	620
Sulfide	—	—	mg/L	—	<0.050	<0.050
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	<25	<25
Bromide	—	—	mg/L	—	0.55 J	<1.0
Fluoride	—	—	mg/L	—	0.95	0.74
Chloride	—	13	mg/L	94	93	93
Silica	—	—	mg/L	—	8.8	9.3
Silicon	—	—	mg/L	—	4.1	4.3
Silicon,Dissolved	—	—	mg/L	—	4.3	4.2

CH-040
DAM TOE RIGHT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-040	CH-040	CH-040
			Station Name	DAM TOE RIGHT	DAM TOE RIGHT	DAM TOE RIGHT
			Lab ID	L713424-01	L719267-04	L728124-01
			Collection Date	7/31/2014	8/29/2014	10/16/2014
Parameter	*MCL*	*UPL*	Units			
Trace Metals						
Iron	—	*1.3*	mg/L	**4.2**	**3.8**	**3.4**
Iron,Dissolved	—	*1.3*	mg/L	**0.035 J**	**2.1**	<0.10
Ferrous Iron	—	—	mg/L	—	**3.4 T8**	**3.2 T8**
Ferric Iron	—	—	mg/L	—	**0.38**	**0.25 J**
Aluminum	—	—	mg/L	—	<0.10	<0.10
Aluminum,Dissolved	—	—	mg/L	—	<0.10	<0.10
Antimony	*0.006*	—	mg/L	—	**0.00048 J**	**0.00033 J**
Antimony,Dissolved	*0.006*	—	mg/L	—	**0.00021 J**	**0.00083 J**
Arsenic	*0.01*	—	mg/L	**0.72 O1**	**0.67**	**0.60**
Arsenic,Dissolved	*0.01*	—	mg/L	**0.0012**	**0.47**	**0.038**
Barium	*2*	—	mg/L	—	**0.096**	**0.087**
Barium,Dissolved	*2*	—	mg/L	—	**0.11**	**0.089**
Beryllium	*0.004*	—	mg/L	—	<0.0010	<0.0010
Beryllium,Dissolved	*0.004*	—	mg/L	—	<0.0010	**0.00012 J**
Boron	—	*0.3*	mg/L	**4.6**	**5.1**	**4.6**
Boron,Dissolved	—	*0.3*	mg/L	**4.7**	**4.9**	**4.6**
Cadmium	*0.005*	—	mg/L	**0.00061**	**0.00087**	<0.00050
Cadmium,Dissolved	*0.005*	—	mg/L	**0.00068**	**0.00022 J**	**0.0014**
Chromium	*0.1*	—	mg/L	—	<0.0020	**0.0017 J, B**
Chromium,Dissolved	*0.1*	—	mg/L	—	<0.0020	<0.0020
Cobalt	—	—	mg/L	—	**0.00072 J**	**0.00072 J**
Cobalt,Dissolved	—	—	mg/L	—	**0.0012**	**0.0015**
Copper	*1.3*	—	mg/L	<0.0020	<0.0020	**0.00055 J**
Copper,Dissolved	*1.3*	—	mg/L	**0.00075 J**	**0.0021**	**0.00095 J**
Lead	*0.015*	—	mg/L	<0.0010 O1	<0.0010	<0.0010
Lead,Dissolved	*0.015*	—	mg/L	**0.00036 J**	**0.0071**	<0.0010
Manganese	—	—	mg/L	—	**1.8**	**2.0**
Manganese,Dissolved	—	—	mg/L	—	**2.0**	**2.0**
Mercury	*0.002*	—	mg/L	<0.00020	<0.00020	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	<0.00020	<0.00020	<0.00020
Molybdenum	—	—	mg/L	—	**0.32**	**0.28**
Molybdenum,Dissolved	—	—	mg/L	—	**0.34**	**0.29**
Nickel	—	*0.0085*	mg/L	**0.0052**	**0.0054**	**0.0019**
Nickel,Dissolved	—	*0.0085*	mg/L	**0.0039**	**0.0068**	**0.0066**
Selenium	*0.05*	—	mg/L	**0.0035**	**0.0031**	**0.0016**
Selenium,Dissolved	*0.05*	—	mg/L	**0.0058**	**0.0027**	**0.0035**
Silver	—	—	mg/L	—	<0.0010	<0.0010
Silver,Dissolved	—	—	mg/L	—	<0.0010	<0.0010
Thallium	*0.002*	—	mg/L	—	**0.00030 J**	**0.00022 J**
Thallium,Dissolved	*0.002*	—	mg/L	—	**0.00050 J**	<0.0010
Vanadium	—	—	mg/L	—	**0.00044 J**	**0.00025 J**
Vanadium,Dissolved	—	—	mg/L	—	**0.00028 J**	**0.0013 J**
Zinc	—	*0.18*	mg/L	**0.0074 J**	**0.0085 J**	**0.0073 J**
Zinc,Dissolved	—	*0.18*	mg/L	<0.010	**0.012**	<0.050

CH-041
DAM TOE MIDDLE
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041
			Station Name	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE
			Lab ID	L515479-05	—	L517576-04	—	L520030-04	—	L522574-04
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	MCL	UPL	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	—	—	—	—	—
Flow	—	—	gpm	—	—	—	—	—	8	220
Flow	—	—	mgd	—	—	—	—	—	0.01	0.3
Temperature	—	—	°C	22.9	15.5	19.2	21.7	24.2	23.6	19.9
pH (field)	—	—	S.U.	6.75	7.05	6.77	7.38	6.99	7.42	7.07
Specific Conductance	—	840	µS/cm	1,120	1,220	1,180	1,330	1,080	980	1,100
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	7.66
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	950	—	970	—	1,000	—	950
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	3.8	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	130	mg/L	220	—	140	—	210	—	200
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—	—
Potassium	—	3.4	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—	—
Sodium	—	7.2	mg/L	13	—	8.7	—	12	—	11
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	<20	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	65	mg/L	540	—	510	—	510	—	500
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	13	mg/L	14	—	14	—	15	—	14
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-041
DAM TOE MIDDLE
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041
			Station Name	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE
			Lab ID	L515479-05	—	L517576-04	—	L520030-04	—	L522574-04
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	**1.6**	—	<0.20	—	**1.6**	—	**1.1**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-041
DAM TOE MIDDLE
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041
			Station Name	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE
			Lab ID	—	—	—	—	—	—	—
			Collection Date	4/27/2012	5/7/2012	5/10/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	746.5	746.5	746.8	746.6	746.4	746.4	746.4
Flow	—	—	gpm	68	80	205	90	—	90	56
Flow	—	—	mgd	0.1	0.1	0.3	0.1	—	0.13	0.08
Temperature	—	—	°C	18.65	18.63	18.34	18.45	19.35	18.2	19.72
pH (field)	—	—	S.U.	7.42	7.51	7.5	7.49	7.44	7.43	7.49
Specific Conductance	—	*840*	µS/cm	1,083	1,069	1,238	1,252	1,284	1,264	1,297
Ox-Red Potential (ORP)	—	—	mV	147.1	149	124.7	148.7	-129.1	145.2	-75.5
Dissolved Oxygen (DO)	—	—	mg/L	9.13	10.57	8.12	10.35	9.6	7.42	7.8
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	—	—
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	—	—	—	—	—
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	—	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	—	—	—	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-041
DAM TOE MIDDLE
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041
			Station Name	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE
			Lab ID	—	—	—	—	—	—	—
			Collection Date	4/27/2012	5/7/2012	5/10/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012
Parameter	MCL	UPL	Units							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	—	—	—	—	—	—	—
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-041
DAM TOE MIDDLE
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041
			Station Name	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE
			Lab ID	—	—	—	—	—	—	L728124-02
			Collection Date	6/15/2012	6/28/2012	7/17/2012	8/2/2012	8/23/2012	9/20/2012	10/16/2014
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	746.4	746.3	746.4	746.4	746.4	746.4	—
Flow	—	—	gpm	21	13	30	60	36	20	15
Flow	—	—	mgd	0.03	0.02	0.04	0.09	0.05	0.03	0.0216
Temperature	—	—	°C	18.76	19.13	20.71	19.14	19.19	19.2	19.33
pH (field)	—	—	S.U.	7.52	7.98	7.39	7.52	7.37	7.43	7.5
Specific Conductance	—	*840*	µS/cm	1,132	2,375	1,190	1,149	1,118	723	990
Ox-Red Potential (ORP)	—	—	mV	110.6	128.3	144.9	-120.7	-97.1	-149.7	12.3
Dissolved Oxygen (DO)	—	—	mg/L	8.36	6.39	9.06	—	2.62	—	6.14
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	0.91
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	6.9 T8
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	—	700
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	7.7
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	<10
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	1.5
Acidity	—	—	mg/L	—	—	—	—	—	—	<10
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	600
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	—	170
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	180
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	31
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	31
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	6.9
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	7.1
Sodium	—	*7.2*	mg/L	—	—	—	—	—	—	9.1
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	9.3
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	<0.25
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	140
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	140
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	0.99
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	<0.10
Sulfate	—	*65*	mg/L	—	—	—	—	—	—	360
Sulfide	—	—	mg/L	—	—	—	—	—	—	<0.050
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	<25
Bromide	—	—	mg/L	—	—	—	—	—	—	<1.0
Fluoride	—	—	mg/L	—	—	—	—	—	—	0.31
Chloride	—	*13*	mg/L	—	—	—	—	—	—	24
Silica	—	—	mg/L	—	—	—	—	—	—	7.3
Silicon	—	—	mg/L	—	—	—	—	—	—	3.4
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	3.4

CH-041
DAM TOE MIDDLE
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041	CH-041
			Station Name	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE	DAM TOE MIDDLE
			Lab ID	—	—	—	—	—	—	L728124-02
			Collection Date	6/15/2012	6/28/2012	7/17/2012	8/2/2012	8/23/2012	9/20/2012	10/16/2014
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	<0.10
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	<0.10
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	<0.050 T8
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	<0.10
Aluminum	—	—	mg/L	—	—	—	—	—	—	<0.10
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	<0.10
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	**0.00024 J**
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	**0.00082 J**
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	**0.0063**
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	**0.0062**
Barium	*2*	—	mg/L	—	—	—	—	—	—	**0.020**
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	**0.020**
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	<0.0010
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	<0.0010
Boron	—	*0.3*	mg/L	—	—	—	—	—	—	**0.76**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	**0.76**
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	<0.00050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	**0.00029 J**
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	**0.0018 J, B**
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	<0.0020
Cobalt	—	—	mg/L	—	—	—	—	—	—	<0.0010
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.00097 J**
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	**0.00076 J**
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	**0.0012 J**
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	<0.0010
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	<0.0010
Manganese	—	—	mg/L	—	—	—	—	—	—	**0.017**
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.011**
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	<0.00020
Molybdenum	—	—	mg/L	—	—	—	—	—	—	**0.012**
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.011**
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	**0.0014**
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	**0.0048**
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	**0.0015**
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	**0.0025**
Silver	—	—	mg/L	—	—	—	—	—	—	<0.0010
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	<0.0010
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	<0.0010
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	<0.0010
Vanadium	—	—	mg/L	—	—	—	—	—	—	<0.0020
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.0011 J**
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	<0.050
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	<0.050

CH-042
DAM TOE LEFT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042
			Station Name	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT
			Lab ID	L515479-06	—	L517576-05	—	L520030-05	—	L522574-05
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	MCL	UPL	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	—	—	—	—	—
Flow	—	—	gpm	—	—	—	8	9	7	70
Flow	—	—	mgd	—	—	—	0.01	0.01	0.01	0.1
Temperature	—	—	°C	22	15.5	19.2	21.7	23.2	24.1	19.7
pH (field)	—	—	S.U.	7.09	7.46	7.17	7.31	7.38	7.31	7.24
Specific Conductance	—	840	µS/cm	1,080	700	750	940	610	1,030	690
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	8.52
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	910	—	580	—	510	—	520
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	3.8	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	130	mg/L	200	—	240	—	110	—	120
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—	—
Potassium	—	3.4	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—	—
Sodium	—	7.2	mg/L	14	—	9.6	—	9.4	—	10
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	<20	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	65	mg/L	490	—	300	—	220	—	250
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	13	mg/L	20	—	12	—	14	—	12
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-042
DAM TOE LEFT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042
			Station Name	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT
			Lab ID	L515479-06	—	L517576-05	—	L520030-05	—	L522574-05
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	**0.64**	—	**1.8**	—	**0.20**	—	**0.19 J**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-042
DAM TOE LEFT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042
			Station Name	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT
			Lab ID	—	—	—	—	—	—	—
			Collection Date	4/27/2012	5/7/2012	5/10/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	747.5	747.6	747.5	747.5	747.4	747.5	747.5
Flow	—	—	gpm	55	15	15	40	20	20	20
Flow	—	—	mgd	0.08	0.02	0.02	0.06	0.03	0.03	0.03
Temperature	—	—	°C	16.93	20.25	17.79	17.97	18.67	17.93	18.72
pH (field)	—	—	S.U.	7.49	8.22	7.88	7.88	7.86	7.76	7.88
Specific Conductance	—	*840*	µS/cm	893	660	860	834	907	874	885
Ox-Red Potential (ORP)	—	—	mV	192.1	-157.8	-128.3	-152.2	-135.5	146.1	-89.5
Dissolved Oxygen (DO)	—	—	mg/L	8.91	2.25	3.51	2.26	10.64	8.6	9.03
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	—	—
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	—	—	—	—	—
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	—	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	—	—	—	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-042
DAM TOE LEFT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042
			Station Name	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT
			Lab ID	—	—	—	—	—	—	—
			Collection Date	4/27/2012	5/7/2012	5/10/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012
Parameter	MCL	UPL	Units							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	—	—	—	—	—	—	—
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-042
DAM TOE LEFT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042
			Station Name	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT
			Lab ID	—	—	—	—	—	—	L728124-03
			Collection Date	6/15/2012	6/28/2012	7/17/2012	8/2/2012	8/23/2012	9/20/2012	10/16/2014
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	747.5	747.4	747.5	747.6	747.5	747.5	—
Flow	—	—	gpm	20	15	10	35	25	15	20
Flow	—	—	mgd	0.03	0.02	0.01	0.05	0.04	0.02	0.0288
Temperature	—	—	°C	17.69	18.37	19.78	18.66	18.76	18.74	19.49
pH (field)	—	—	S.U.	7.67	7.87	7.7	7.81	7.86	7.59	7.89
Specific Conductance	—	*840*	µS/cm	793	1,379	773	770	713	621	767
Ox-Red Potential (ORP)	—	—	mV	212.8	178.6	145.3	125.1	-105.8	-198.3	8.1
Dissolved Oxygen (DO)	—	—	mg/L	8.23	6.78	9.3	9.52	2.32	—	6.89
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	2.84
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	7.0 T8
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	—	540
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	28
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	<10
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	1.0
Acidity	—	—	mg/L	—	—	—	—	—	—	<10
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	470
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	—	140
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	140
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	24
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	23
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	4.5
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	4.2
Sodium	—	*7.2*	mg/L	—	—	—	—	—	—	8.6
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	8.1
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	<0.25
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	120
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	120
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	1.2
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	<0.10
Sulfate	—	*65*	mg/L	—	—	—	—	—	—	270
Sulfide	—	—	mg/L	—	—	—	—	—	—	<0.050
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	<25
Bromide	—	—	mg/L	—	—	—	—	—	—	<1.0
Fluoride	—	—	mg/L	—	—	—	—	—	—	0.29
Chloride	—	*13*	mg/L	—	—	—	—	—	—	14
Silica	—	—	mg/L	—	—	—	—	—	—	6.0
Silicon	—	—	mg/L	—	—	—	—	—	—	2.8
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	2.5

CH-042
DAM TOE LEFT
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042	CH-042
			Station Name	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT	DAM TOE LEFT
			Lab ID	—	—	—	—	—	—	L728124-03
			Collection Date	6/15/2012	6/28/2012	7/17/2012	8/2/2012	8/23/2012	9/20/2012	10/16/2014
Parameter	MCL	UPL	Units							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	**0.16**
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	<0.10
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	**0.022 J, T8**
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	**0.14**
Aluminum	—	—	mg/L	—	—	—	—	—	—	**0.077 J**
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	<0.10
Antimony	0.006	—	mg/L	—	—	—	—	—	—	**0.00026 J**
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	**0.00097 J**
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	**0.0018**
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	**0.0018**
Barium	2	—	mg/L	—	—	—	—	—	—	**0.020**
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	**0.017**
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	<0.0010
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	<0.0010
Boron	—	0.3	mg/L	—	—	—	—	—	—	**0.30**
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	**0.27**
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	<0.00050
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	**0.00029 J**
Chromium	0.1	—	mg/L	—	—	—	—	—	—	**0.0020 J, B**
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	<0.0020
Cobalt	—	—	mg/L	—	—	—	—	—	—	<0.0010
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.00096 J**
Copper	1.3	—	mg/L	—	—	—	—	—	—	**0.0017 J**
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	**0.0013 J**
Lead	0.015	—	mg/L	—	—	—	—	—	—	**0.00036 J**
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	<0.0010
Manganese	—	—	mg/L	—	—	—	—	—	—	**0.018**
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	<0.010
Mercury	0.002	—	mg/L	—	—	—	—	—	—	<0.00020
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	<0.00020
Molybdenum	—	—	mg/L	—	—	—	—	—	—	**0.0090**
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.0088**
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	**0.0016**
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	**0.0041**
Selenium	0.05	—	mg/L	—	—	—	—	—	—	**0.0013**
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	**0.0025**
Silver	—	—	mg/L	—	—	—	—	—	—	<0.0010
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.00038 J**
Thallium	0.002	—	mg/L	—	—	—	—	—	—	<0.0010
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	**0.00045 J**
Vanadium	—	—	mg/L	—	—	—	—	—	—	**0.00020 J**
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.0012 J**
Zinc	—	0.18	mg/L	—	—	—	—	—	—	<0.050
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	<0.050

CH-044
DITCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044
			Station Name	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING
			Lab ID	L515479-07	—	L517576-06	—	L520030-06	—	L522574-06
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	827.6	—	—	—	—
Flow	—	—	gpm	120	110	60	60	30	60	100
Flow	—	—	mgd	0.2	0.2	0.09	0.1	0.05	0.08	0.1
Temperature	—	—	°C	18.3	15.9	19.5	20.4	23.7	23.7	16.2
pH (field)	—	—	S.U.	6.67	6.87	6.67	7.41	6.88	7.03	6.84
Specific Conductance	—	*840*	µS/cm	920	930	1,090	620	820	1,250	870
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	3.33
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	780	—	960	—	700	—	760
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	180	—	220	—	150	—	160
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	9.9	—	9.1	—	7.3	—	7.8
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	410	—	530	—	340	—	380
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	12	—	9.8	—	13	—	13
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-044
DITCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044
			Station Name	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING
			Lab ID	L515479-07	—	L517576-06	—	L520030-06	—	L522574-06
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	2.5	—	1.8	—	3.1	—	3.3
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-044
DITCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044
			Station Name	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING
			Lab ID	L558290-02	L560970-03	L570058-01	—	—	—	L575196-03
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/26/2012	5/7/2012	5/10/2012	5/14/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	827.4	827.3	827.3	—	827.4	827.4	827.6
Flow	—	—	gpm	5	15	12	120	76	30	135
Flow	—	—	mgd	0.007	0.02	0.02	0.5	0.1	0.04	0.2
Temperature	—	—	°C	16.15	13.93	22	15.83	15.84	17.73	16.79
pH (field)	—	—	S.U.	6.95	7.26	7.1	7.12	7.05	7.27	7.18
Specific Conductance	—	*840*	µS/cm	748	706	980	795	811	793	1,106
Ox-Red Potential (ORP)	—	—	mV	—	-220	—	189.5	187	179.4	131.5
Dissolved Oxygen (DO)	—	—	mg/L	—	4.53	—	4.02	6.49	7.29	7.01
Turbidity (field)	—	—	NTU	5.1	4.7	6.9	—	—	—	130
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	720	—	730	—	—	—	900
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	<10	—	14	—	—	—	75
Total Organic Carbon (TOC)	—	*3.8*	mg/L	1.6	—	1.0	—	—	—	1.1
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	180	—	160	—	—	—	200
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	21	—	21	—	—	—	28
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	5.6	—	5.5	—	—	—	8.9
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	11	—	8.6	—	—	—	28
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	150	—	140	—	—	—	150
Alkalinity,Carbonate	—	*<20*	mg/L	<20	—	<20	—	—	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	360	—	350	—	—	—	460
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	16	—	17	—	—	—	14
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

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DITCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044
			Station Name	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING
			Lab ID	L558290-02	L560970-03	L570058-01	—	—	—	L575196-03
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/26/2012	5/7/2012	5/10/2012	5/14/2012
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	1.3	mg/L	0.16	0.34	0.28	—	—	—	6.8
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	0.11	0.13	0.11	—	—	—	0.15
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	3.0	—	3.4	—	—	—	2.4
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	<0.0050	—	<0.0050	—	—	—	0.0044 J
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	0.0016 J	—	0.0031 J	—	—	—	0.042
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	<0.0050	—	0.013	—	—	—	0.041
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	<0.00020	—	<0.00020	—	—	—	<0.00020
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	<0.020	—	0.010 J	—	—	—	0.020 J
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	<0.020	—	0.024	—	—	—	0.045
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	0.078	—	0.014 J	—	—	—	0.065
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

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Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

Parameter	MCL	UPL	Units							
			Station Number	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044
			Station Name	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING
			Lab ID	L575196-07	—	—	—	—	—	—
			Collection Date	5/14/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	827.6	827.4	827.4	827.5	827.4	827.3	827.3
Flow	—	—	gpm	135	45	—	55	90	45	22
Flow	—	—	mgd	0.2	0.07	—	0.1	0.1	0.06	0.03
Temperature	—	—	°C	—	15.82	16.32	15.88	15.88	17.32	17.61
pH (field)	—	—	S.U.	—	6.93	7.01	7.07	6.93	7.05	7.27
Specific Conductance	—	*840*	µS/cm	—	995	1,050	1,019	1,001	962	1,172
Ox-Red Potential (ORP)	—	—	mV	—	-157.2	-159	-165.3	-103.8	23	108
Dissolved Oxygen (DO)	—	—	mg/L	—	4.89	4.33	4.01	3.52	3.27	2.91
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	910	—	—	—	—	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	68	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	0.93 J	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	200	—	—	—	—	—	—
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	27	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	9.6	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	14	—	—	—	—	—	—
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	150	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	<20	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	470	—	—	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	14	—	—	—	—	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

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			Station Number	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044
			Station Name	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING
			Lab ID	L575196-07	—	—	—	—	—	—
			Collection Date	5/14/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	**6.0**	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	**0.15**	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	**2.4**	—	—	—	—	—	—
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	**0.0037 J**	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	**0.037**	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	**0.036**	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	<0.00020	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	**0.015 J**	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	**0.049**	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	**0.064**	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

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AMEC Project No. 567530023

			Station Number	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044
			Station Name	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING
			Lab ID	—	—	—	L593301-03	L611710-02	L612149-04	L728124-06
			Collection Date	7/17/2012	8/2/2012	8/23/2012	9/4/2012	12/17/2012	12/18/2012	10/16/2014
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	827.4	827.3	827.4	827.4	827.5	—	—
Flow	—	—	gpm	7	15	6	61	72	—	5
Flow	—	—	mgd	0.01	0.02	0.009	0.09	0.1	—	0.0072
Temperature	—	—	°C	16.28	16.12	16.07	22.34	16.54	—	15.97
pH (field)	—	—	S.U.	7.15	7.57	7.56	7.4	7.52	—	8.29
Specific Conductance	—	*840*	µS/cm	959	955	959	638	693	—	1,344
Ox-Red Potential (ORP)	—	—	mV	-167.8	149	-117.5	-74.2	-114.8	—	28.1
Dissolved Oxygen (DO)	—	—	mg/L	2.74	4.08	3.63	1.88	7.6	—	5.58
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	4.68
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	7.2 T8
Dissolved Solids	—	*420*	mg/L	—	—	—	510	430	—	1,100
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	62
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	14	200	—	12
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	0.53 J	3.9	—	0.80 J
Acidity	—	—	mg/L	—	—	—	—	—	—	<10
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	870
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	120	270	210	260
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	210	260
Magnesium	—	*8.8*	mg/L	—	—	—	8.5	15	34	40
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	33	41
Potassium	—	*3.4*	mg/L	—	—	—	2.6	6.4	16	9.0
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	16	8.7
Sodium	—	*7.2*	mg/L	—	—	—	2.8	18	78	17
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	81	16
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	<0.25
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	130
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	64	110	—	130
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	<20	<20	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	0.45
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	<0.10
Sulfate	—	*65*	mg/L	—	—	—	270	380	—	540
Sulfide	—	—	mg/L	—	—	—	—	—	—	<0.050
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	<25
Bromide	—	—	mg/L	—	—	—	—	—	—	<1.0
Fluoride	—	—	mg/L	—	—	—	—	—	—	0.59
Chloride	—	*13*	mg/L	—	—	—	3.1	7.5	—	9.8
Silica	—	—	mg/L	—	—	—	—	—	—	6.7
Silicon	—	—	mg/L	—	—	—	—	—	—	3.1
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	2.9

CH-044
DITCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044	CH-044
			Station Name	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING	DITCH SPRING
			Lab ID	—	—	—	L593301-03	L611710-02	L612149-04	L728124-06
			Collection Date	7/17/2012	8/2/2012	8/23/2012	9/4/2012	12/17/2012	12/18/2012	10/16/2014
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	**0.99**	**8.5**	**3.3**	**0.27**
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	<0.10	**0.037 J**
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	**0.070 T8**
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	**0.20**
Aluminum	—	—	mg/L	—	—	—	—	—	—	**0.22**
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.040 J**
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	**0.00070 J**
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	**0.0012**
Arsenic	*0.01*	—	mg/L	—	—	—	**0.056**	**0.029**	**0.014**	**0.076**
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	**0.0081**	**0.061**
Barium	*2*	—	mg/L	—	—	—	—	—	—	**0.050**
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	**0.042**
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	<0.0010
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	<0.0010
Boron	—	*0.3*	mg/L	—	—	—	**0.73**	**0.56**	**0.79**	**1.3**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	**0.64**	**1.3**
Cadmium	*0.005*	—	mg/L	—	—	—	<0.0050	<0.0050	<0.0050	<0.00050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	<0.0050	**0.00096**
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	**0.0024 B**
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	<0.0020
Cobalt	—	—	mg/L	—	—	—	—	—	—	**0.00075 J**
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.0012**
Copper	*1.3*	—	mg/L	—	—	—	**0.0063 J**	**0.013 J**	<0.020	**0.0022**
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	<0.020	**0.0016 J**
Lead	*0.015*	—	mg/L	—	—	—	**0.0048 J**	<0.0050	<0.0050	**0.00082 J**
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	<0.0050	<0.0010
Manganese	—	—	mg/L	—	—	—	—	—	—	**2.7**
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	**2.6**
Mercury	*0.002*	—	mg/L	—	—	—	**0.000040 J**	<0.00020	<0.00020	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	<0.00020	<0.00020
Molybdenum	—	—	mg/L	—	—	—	—	—	—	**0.15**
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.15**
Nickel	—	*0.0085*	mg/L	—	—	—	<0.020	**0.034**	**0.019 J**	**0.0025**
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	<0.020	**0.0071**
Selenium	*0.05*	—	mg/L	—	—	—	**0.097**	<0.020	<0.020	**0.0077**
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	<0.020	**0.0087**
Silver	—	—	mg/L	—	—	—	—	—	—	<0.0010
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	<0.0010
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	**0.00045 J**
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	**0.00039 J**
Vanadium	—	—	mg/L	—	—	—	—	—	—	**0.0039**
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	**0.0029**
Zinc	—	*0.18*	mg/L	—	—	—	<0.030	**0.050**	**0.014 J**	<0.050
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	**0.012 J**	<0.050

CH-045
BEAVER DAM CAVE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045
			Station Name	BDC	BDC	BDC	BDC	BDC	BDC	BDC
			Lab ID	L515479-08	—	L517576-07	—	L520030-07	—	L522574-07
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	—	—	—	—	—
Flow	—	—	gpm	**5**	**20**	**5**	**10**	**10**	**20**	**6**
Flow	—	—	mgd	**0.007**	**0.03**	**0.007**	**0.01**	**0.01**	**0.03**	**0.008**
Temperature	—	—	°C	**19.5**	**16.2**	**19**	**21.7**	**24.1**	**24.1**	**16.4**
pH (field)	—	—	S.U.	**6.9**	**6.92**	**6.71**	**7.21**	**7.12**	**7.42**	**6.69**
Specific Conductance	—	*840*	µS/cm	**950**	**1,120**	**1,070**	**1,030**	**890**	**1,300**	**870**
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	**5.35**
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	**780**	—	**930**	—	**730**	—	**740**
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	**190**	—	**290**	—	**150**	—	**160**
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	**8.7**	—	**14**	—	**7.5**	—	**7.7**
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	**410**	—	**550**	—	**320**	—	**380**
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	**12**	—	**9.5**	—	**13**	—	**13**
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-045
BEAVER DAM CAVE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045
			Station Name	BDC	BDC	BDC	BDC	BDC	BDC	BDC
			Lab ID	L515479-08	—	L517576-07	—	L520030-07	—	L522574-07
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	MCL	UPL	Units							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	2.5	—	1.6	—	3.1	—	3.2
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-045
BEAVER DAM CAVE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045
			Station Name	BDC	BDC	BDC	BDC	BDC	BDC	BDC
			Lab ID	—	—	—	—	—	—	—
			Collection Date	4/26/2012	5/7/2012	5/10/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	823.3	823.3	823.3	823.3	823.4	823.4	823.4
Flow	—	—	gpm	10	8	10	15	10	15	3
Flow	—	—	mgd	0.01	0.01	0.01	0.02	0.01	0.02	0.004
Temperature	—	—	°C	16.12	15.98	16.42	15.75	16.32	16.07	15.94
pH (field)	—	—	S.U.	7.14	7.32	7.17	7.21	7.22	7.22	7.38
Specific Conductance	—	*840*	µS/cm	745	809	930	988	1,066	1,005	977
Ox-Red Potential (ORP)	—	—	mV	158.5	158.8	112.9	149	-138	142	-106.9
Dissolved Oxygen (DO)	—	—	mg/L	8.2	7.17	6.94	10.1	4.32	7.14	7.81
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	—	—
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	—	—	—	—	—
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	—	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	—	—	—	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-045
BEAVER DAM CAVE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045
			Station Name	BDC	BDC	BDC	BDC	BDC	BDC	BDC
			Lab ID	—	—	—	—	—	—	—
			Collection Date	4/26/2012	5/7/2012	5/10/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	—	—	—	—	—
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-045
BEAVER DAM CAVE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045
			Station Name	BDC	BDC	BDC	BDC	BDC	BDC	BDC
			Lab ID	—	—	—	—	—	L611707-01	L612145-01
			Collection Date	6/15/2012	6/28/2012	7/17/2012	8/2/2012	8/23/2012	12/17/2012	12/18/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	823.3	823.3	823.5	823.3	823.4	—	—
Flow	—	—	gpm	3	4	15	11	8	2	—
Flow	—	—	mgd	0.004	0.006	0.02	0.02	0.01	0.003	—
Temperature	—	—	°C	17.29	18.13	17.41	16.75	16.83	14.95	—
pH (field)	—	—	S.U.	7.21	7.81	7.12	7.33	7.38	6.77	—
Specific Conductance	—	*840*	µS/cm	873	1,781	936	923	888	664	—
Ox-Red Potential (ORP)	—	—	mV	123.4	148.7	168.2	-120	100.1	-189.7	—
Dissolved Oxygen (DO)	—	—	mg/L	8.36	6.78	6.39	6.44	7.09	3.1	—
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	690	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	210	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	5.2	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	230	210
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	210
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	14	32
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	32
Potassium	—	*3.4*	mg/L	—	—	—	—	—	5.6	16
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	16
Sodium	—	*7.2*	mg/L	—	—	—	—	—	18	76
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	80
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	66	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	<20	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	—	—	—	370	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	—	—	—	13	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-045
BEAVER DAM CAVE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045	CH-045
			Station Name	BDC	BDC	BDC	BDC	BDC	BDC	BDC
			Lab ID	—	—	—	—	—	L611707-01	L612145-01
			Collection Date	6/15/2012	6/28/2012	7/17/2012	8/2/2012	8/23/2012	12/17/2012	12/18/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	**12**	**4.7**
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	<0.10
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	**0.080**	**0.019**
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	**0.012**
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	—	—	—	**0.56**	**0.63**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	**0.58**
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	<0.0050	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	<0.0050
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	0.012 J	<0.020
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	<0.020
Lead	*0.015*	—	mg/L	—	—	—	—	—	<0.0050	<0.0050
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	<0.0050
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	<0.00020	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	<0.00020
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	**0.028**	**0.018 J**
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	<0.020
Selenium	*0.05*	—	mg/L	—	—	—	—	—	<0.020	<0.020
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	<0.020
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	**0.044**	**0.017 J**
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	**0.010 J**

CH-045
BEAVER DAM CAVE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-045	CH-045	CH-045
			Station Name	BDC	BDC	BDC
			Lab ID	L615509-04	L615509-06	L728124-05
			Collection Date	1/14/2013	1/14/2013	10/16/2014
Parameter	MCL	UPL	Units			
Field Parameters						
Water Level Elevation	—	—	ft NAVD88	—	—	—
Flow	—	—	gpm	2	2	12
Flow	—	—	mgd	0.003	0.003	0.02
Temperature	—	—	°C	9.98	—	15.95
pH (field)	—	—	S.U.	8.81	—	8.23
Specific Conductance	—	840	µS/cm	500	—	1,324
Ox-Red Potential (ORP)	—	—	mV	169.2	—	17.7 R
Dissolved Oxygen (DO)	—	—	mg/L	9.13	—	6.69 R
Turbidity (field)	—	—	NTU	170	—	4.8
Indicator Parameters						
pH (lab)	—	—	S.U.	—	—	7.1 T8
Dissolved Solids	—	420	mg/L	350	260	1,100
Suspended Solids	—	—	mg/L	—	—	23
Turbidity (lab)	—	—	NTU	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	3.2 J	<10	13 P1
Total Organic Carbon (TOC)	—	3.8	mg/L	0.79 J	1.1	0.91 J
Acidity	—	—	mg/L	—	—	<10
Free Carbon Dioxide	—	—	mg/L	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	860
Major Cations						
Calcium	—	130	mg/L	80	82	260
Calcium,Dissolved	—	130	mg/L	—	—	260
Magnesium	—	8.8	mg/L	7.4	7.9	40
Magnesium,Dissolved	—	8.8	mg/L	—	—	40
Potassium	—	3.4	mg/L	3.9	4.8	8.6
Potassium,Dissolved	—	3.4	mg/L	—	—	8.5
Sodium	—	7.2	mg/L	11	12	16
Sodium,Dissolved	—	7.2	mg/L	—	—	16
Ammonia Nitrogen	—	—	mg/L	—	—	<0.25
Major Anions						
Alkalinity, Total	—	—	mg/L	—	—	130
Alkalinity,Bicarbonate	—	290	mg/L	26	24	130
Alkalinity,Carbonate	—	<20	mg/L	<20	<20	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—
Nitrate, as N	10	—	mg/L	—	—	0.44
Nitrite, as N	1	—	mg/L	—	—	<0.10
Sulfate	—	65	mg/L	210	200	690
Sulfide	—	—	mg/L	—	—	<0.050
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	<25
Bromide	—	—	mg/L	—	—	<1.0
Fluoride	—	—	mg/L	—	—	0.59
Chloride	—	13	mg/L	2.0	1.9	9.5
Silica	—	—	mg/L	—	—	7.0
Silicon	—	—	mg/L	—	—	3.2
Silicon,Dissolved	—	—	mg/L	—	—	2.9

CH-045
BEAVER DAM CAVE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-045	CH-045	CH-045
			Station Name	BDC	BDC	BDC
			Lab ID	L615509-04	L615509-06	L728124-05
			Collection Date	1/14/2013	1/14/2013	10/16/2014
Parameter	MCL	UPL	Units			
Trace Metals						
Iron	—	1.3	mg/L	**1.3**	**2.6**	**0.19**
Iron,Dissolved	—	1.3	mg/L	—	—	<0.10
Ferrous Iron	—	—	mg/L	—	—	<0.050 T8
Ferric Iron	—	—	mg/L	—	—	**0.19**
Aluminum	—	—	mg/L	—	—	**0.20**
Aluminum,Dissolved	—	—	mg/L	—	—	<0.10
Antimony	0.006	—	mg/L	—	—	**0.00067 J**
Antimony,Dissolved	0.006	—	mg/L	—	—	**0.0012**
Arsenic	0.01	—	mg/L	<0.0010	**0.00027 J**	**0.065**
Arsenic,Dissolved	0.01	—	mg/L	—	—	**0.059**
Barium	2	—	mg/L	—	—	**0.043**
Barium,Dissolved	2	—	mg/L	—	—	**0.037**
Beryllium	0.004	—	mg/L	—	—	<0.0010
Beryllium,Dissolved	0.004	—	mg/L	—	—	**0.00012 J**
Boron	—	0.3	mg/L	**0.13 J**	**0.12 J**	**1.3**
Boron,Dissolved	—	0.3	mg/L	—	—	**1.3**
Cadmium	0.005	—	mg/L	<0.0050	<0.0050	<0.00050
Cadmium,Dissolved	0.005	—	mg/L	—	—	**0.00091**
Chromium	0.1	—	mg/L	—	—	**0.0024 B**
Chromium,Dissolved	0.1	—	mg/L	—	—	<0.0020
Cobalt	—	—	mg/L	—	—	**0.00054 J**
Cobalt,Dissolved	—	—	mg/L	—	—	**0.0012**
Copper	1.3	—	mg/L	<0.020	<0.020	**0.0016 J**
Copper,Dissolved	1.3	—	mg/L	—	—	**0.00082 J**
Lead	0.015	—	mg/L	<0.0050	<0.0050	**0.00058 J**
Lead,Dissolved	0.015	—	mg/L	—	—	<0.0010
Manganese	—	—	mg/L	—	—	**2.1**
Manganese,Dissolved	—	—	mg/L	—	—	**2.0**
Mercury	0.002	—	mg/L	<0.00020	<0.00020	<0.00020
Mercury,Dissolved	0.002	—	mg/L	—	—	<0.00020
Molybdenum	—	—	mg/L	—	—	**0.15**
Molybdenum,Dissolved	—	—	mg/L	—	—	**0.15**
Nickel	—	0.0085	mg/L	<0.020	<0.020	**0.0020**
Nickel,Dissolved	—	0.0085	mg/L	—	—	**0.0070**
Selenium	0.05	—	mg/L	**0.039**	**0.036**	**0.0061**
Selenium,Dissolved	0.05	—	mg/L	—	—	**0.0085**
Silver	—	—	mg/L	—	—	<0.0010
Silver,Dissolved	—	—	mg/L	—	—	<0.0010
Thallium	0.002	—	mg/L	—	—	**0.00034 J**
Thallium,Dissolved	0.002	—	mg/L	—	—	**0.00019 J**
Vanadium	—	—	mg/L	—	—	**0.0038**
Vanadium,Dissolved	—	—	mg/L	—	—	**0.0031**
Zinc	—	0.18	mg/L	**0.079**	**0.082**	<0.050
Zinc,Dissolved	—	0.18	mg/L	—	—	<0.050

CH-046
HQ SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046
			Station Name	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING
			Lab ID	L515479-09	—	L517576-08	—	L520030-08	—	L522574-08
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	—	—	—	—	779.2
Flow	—	—	gpm	350	580	470	320	890	240	500
Flow	—	—	mgd	0.5	0.8	0.7	0.5	1.3	0.3	0.7
Temperature	—	—	°C	18.2	16.9	19.8	22.1	25.4	29.2	20
pH (field)	—	—	S.U.	7.34	7.12	6.91	7.07	6.92	6.8	6.69
Specific Conductance	—	*840*	µS/cm	1,030	1,630	1,480	1,470	1,660	1,610	1,410
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	4.18
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	1,400	—	1,300	—	1,500	—	1,300
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	300	—	400	—	320	—	280
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	18	—	18	—	14	—	14
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	800	—	730	—	900	—	740
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	37	—	28	—	38	—	29
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-046
HQ SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046
			Station Name	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING
			Lab ID	L515479-09	—	L517576-08	—	L520030-08	—	L522574-08
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	MCL	UPL	Units							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	1.4	—	1.9	—	1.9	—	1.8
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-046
HQ SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046
			Station Name	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING
			Lab ID	—	—	—	—	—	—	—
			Collection Date	4/27/2012	5/7/2012	5/10/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	780.1	780.1	780.1	780	780	780	780
Flow	—	—	gpm	610	700	400	450	—	400	310
Flow	—	—	mgd	0.9	1	0.6	0.7	—	0.6	0.4
Temperature	—	—	°C	17	18.52	19.35	18.52	20.79	22.54	20.97
pH (field)	—	—	S.U.	7.18	7.15	7.14	7.09	7.26	7.08	7.23
Specific Conductance	—	*840*	µS/cm	1,086	1,222	1,485	1,744	1,570	1,560	1,904
Ox-Red Potential (ORP)	—	—	mV	173	137.6	129.6	48.3	-160.3	-140.8	-145.1
Dissolved Oxygen (DO)	—	—	mg/L	7.96	6.32	6.24	6.9	4.43	3.07	4.04
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	—	—
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	—	—	—	—	—
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	—	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	—	—	—	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-046
HQ SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046
			Station Name	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING
			Lab ID	—	—	—	—	—	—	—
			Collection Date	4/27/2012	5/7/2012	5/10/2012	5/17/2012	5/24/2012	6/1/2012	6/7/2012
Parameter	MCL	UPL	Units							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	—	—	—	—	—	—	—
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-046
HQ SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046
			Station Name	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING
			Lab ID	—	—	—	—	—	—	L611707-02
			Collection Date	6/15/2012	6/28/2012	7/17/2012	8/2/2012	8/23/2012	9/20/2012	12/17/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	780	779.9	779.9	780	781.1	781.1	781.2
Flow	—	—	gpm	570	462	35	220	455	858	1417
Flow	—	—	mgd	0.8	0.7	0.1	0.3	0.7	1.2	2
Temperature	—	—	°C	17.29	19.81	23.16	23.99	17.43	20.69	14.76
pH (field)	—	—	S.U.	7.07	7.61	7.14	7.11	6.97	7.67	7.69
Specific Conductance	—	*840*	µS/cm	1,632	1,572	1,715	1,562	1,039	1,673	1,266
Ox-Red Potential (ORP)	—	—	mV	102.8	131.9	-178.9	-171.5	-172.8	-186.1	-111
Dissolved Oxygen (DO)	—	—	mg/L	5.32	6.18	2.35	2.19	2.01	—	6.07
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	6.1
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	—	1,400
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	17
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	1.4
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	—	290
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	42
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	9.8
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	—	—	—	—	26
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	110
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	—	—	—	—	800
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	—	—	—	—	27
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

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HQ SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046	CH-046
			Station Name	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING
			Lab ID	—	—	—	—	—	—	L611707-02
			Collection Date	6/15/2012	6/28/2012	7/17/2012	8/2/2012	8/23/2012	9/20/2012	12/17/2012
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	**0.27**
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	**0.0063**
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	—	—	—	—	**3.6**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	<0.020
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	<0.0050
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	**0.0070 J**
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	<0.020
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	**0.0065 J**
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-046
HQ SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-046	CH-046	CH-046	CH-046
			Station Name	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING
			Lab ID	L615509-01	L713403-02	L719267-05	L728124-07
			Collection Date	1/14/2013	7/31/2014	8/29/2014	10/16/2014
Parameter	*MCL*	*UPL*	**Units**				
Field Parameters							
Water Level Elevation	—	—	ft NAVD88	781.1	—	—	—
Flow	—	—	gpm	2087	150	300	1.4
Flow	—	—	mgd	3	0.22	0.4	0.002
Temperature	—	—	°C	14.76	22.25	25.25	17.55
pH (field)	—	—	S.U.	8.18	7.37	6.32	7.95
Specific Conductance	—	*840*	µS/cm	1,406	1,471	1,432	1,776
Ox-Red Potential (ORP)	—	—	mV	152.1	81.7	-34.4	38.5
Dissolved Oxygen (DO)	—	—	mg/L	6.89	2.16	1.18	3.86
Turbidity (field)	—	—	NTU	45.1	12.1	5	2.43
Indicator Parameters							
pH (lab)	—	—	S.U.	—	—	7.2 T8	7.1 T8
Dissolved Solids	—	*420*	mg/L	1,100	1,300	1,300	1,600
Suspended Solids	—	—	mg/L	—	—	0.60 J	1.8 J, T4
Turbidity (lab)	—	—	NTU	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	<10	14	<10	<10
Total Organic Carbon (TOC)	—	*3.8*	mg/L	1.2	1.3	0.96 J	0.82 J
Acidity	—	—	mg/L	—	—	<10	<10
Free Carbon Dioxide	—	—	mg/L	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	860	1,300
Major Cations							
Calcium	—	*130*	mg/L	250	240	250	320 O1, V
Calcium,Dissolved	—	*130*	mg/L	—	—	240	330
Magnesium	—	*8.8*	mg/L	44	66	67	83
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	69	85
Potassium	—	*3.4*	mg/L	10	11	12	13
Potassium,Dissolved	—	*3.4*	mg/L	—	—	12	14
Sodium	—	*7.2*	mg/L	23	18	21	24
Sodium,Dissolved	—	*7.2*	mg/L	—	—	20	26
Ammonia Nitrogen	—	—	mg/L	—	—	0.15 J	<0.25
Major Anions							
Alkalinity, Total	—	—	mg/L	—	—	130	140
Alkalinity,Bicarbonate	—	*290*	mg/L	96	140	130	140
Alkalinity,Carbonate	—	*<20*	mg/L	<20	<20	<20	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	2.4	—
Nitrate, as N	*10*	—	mg/L	—	—	—	1.6
Nitrite, as N	*1*	—	mg/L	—	—	—	<0.10
Sulfate	—	*65*	mg/L	670	670	610	980
Sulfide	—	—	mg/L	—	—	<0.050	<0.050
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	<25	<25
Bromide	—	—	mg/L	—	—	<1.0	<1.0
Fluoride	—	—	mg/L	—	—	1.9	1.2
Chloride	—	*13*	mg/L	14	36	47	20
Silica	—	—	mg/L	—	—	6.0	6.0
Silicon	—	—	mg/L	—	—	2.8	2.8
Silicon,Dissolved	—	—	mg/L	—	—	3.0	2.8

CH-046
HQ SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-046	CH-046	CH-046	CH-046
			Station Name	HQ SPRING	HQ SPRING	HQ SPRING	HQ SPRING
			Lab ID	L615509-01	L713403-02	L719267-05	L728124-07
			Collection Date	1/14/2013	7/31/2014	8/29/2014	10/16/2014
Parameter	MCL	UPL	Units				
Trace Metals							
Iron	—	1.3	mg/L	0.10	1.1	0.022 J	<0.10
Iron,Dissolved	—	1.3	mg/L	—	0.34	<0.10	<0.10
Ferrous Iron	—	—	mg/L	—	—	0.033 J, T8	<0.050 T8
Ferric Iron	—	—	mg/L	—	—	<0.10	<0.10
Aluminum	—	—	mg/L	—	—	<0.10	<0.10
Aluminum,Dissolved	—	—	mg/L	—	—	<0.10	<0.10
Antimony	0.006	—	mg/L	—	—	0.0062 O1, J5	0.0018
Antimony,Dissolved	0.006	—	mg/L	—	—	0.0060	0.0026
Arsenic	0.01	—	mg/L	0.0070	0.010	0.0098	0.0071
Arsenic,Dissolved	0.01	—	mg/L	—	0.0094 O1	0.012	0.0073
Barium	2	—	mg/L	—	—	0.063 J5	0.037
Barium,Dissolved	2	—	mg/L	—	—	0.055	0.041
Beryllium	0.004	—	mg/L	—	—	<0.0010	<0.0010
Beryllium,Dissolved	0.004	—	mg/L	—	—	<0.0010	<0.0010
Boron	—	0.3	mg/L	1.8	6.1	6.3	3.4
Boron,Dissolved	—	0.3	mg/L	—	5.8	6.3	3.5
Cadmium	0.005	—	mg/L	<0.0050	0.00068	0.00024 J	<0.00050
Cadmium,Dissolved	0.005	—	mg/L	—	0.00052	0.00022 J	0.00083
Chromium	0.1	—	mg/L	—	—	<0.0020 O1, J6	0.0023 B
Chromium,Dissolved	0.1	—	mg/L	—	—	<0.010	<0.0020
Cobalt	—	—	mg/L	—	—	<0.0010 O1, J6	<0.0010
Cobalt,Dissolved	—	—	mg/L	—	—	<0.0050	0.0011
Copper	1.3	—	mg/L	<0.020	<0.010 O	<0.0020 O1, J6	0.0013 J
Copper,Dissolved	1.3	—	mg/L	—	<0.010 O, O1	<0.010	0.0013 J
Lead	0.015	—	mg/L	<0.025 O	0.00067 J	0.0020 J	<0.0010
Lead,Dissolved	0.015	—	mg/L	—	0.00034 J	0.0016	<0.0010
Manganese	—	—	mg/L	—	—	0.21	0.0036 J
Manganese,Dissolved	—	—	mg/L	—	—	0.22	0.0041 J
Mercury	0.002	—	mg/L	<0.00020	<0.00020	<0.00020	<0.00020
Mercury,Dissolved	0.002	—	mg/L	—	<0.00020	<0.00020	<0.00020
Molybdenum	—	—	mg/L	—	—	0.28 O1, V	0.10
Molybdenum,Dissolved	—	—	mg/L	—	—	0.28	0.095
Nickel	—	0.0085	mg/L	<0.10 O	0.0092	0.0068 O1, J6	0.0041
Nickel,Dissolved	—	0.0085	mg/L	—	0.0095 O1	0.010	0.010
Selenium	0.05	—	mg/L	0.082	0.026	0.022	0.010
Selenium,Dissolved	0.05	—	mg/L	—	0.025 O1	0.024	0.015
Silver	—	—	mg/L	—	—	0.0014	<0.0010
Silver,Dissolved	—	—	mg/L	—	—	<0.0010	<0.0010
Thallium	0.002	—	mg/L	—	—	0.0023 J	0.00064 J
Thallium,Dissolved	0.002	—	mg/L	—	—	0.0019	0.00048 J
Vanadium	—	—	mg/L	—	—	0.0026 O1, J6	0.0020
Vanadium,Dissolved	—	—	mg/L	—	—	0.0040 J	0.0023
Zinc	—	0.18	mg/L	0.12	<0.050 O	<0.010	0.0062 J
Zinc,Dissolved	—	0.18	mg/L	—	<0.050 O, O1	0.018 J	0.0071 J

CH-048
ORANGE DRAIN
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-048	CH-048	CH-048	CH-048	CH-048	CH-048	CH-048
			Station Name	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN
			Lab ID	L515479-20	L517576-09	L517576-09	—	L520030-09	—	L522574-09
			Collection Date	5/9/2011	5/24/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	—	817.2	817.1	—	817.2
Flow	—	—	gpm	—	20	20	30	20	20	25
Flow	—	—	mgd	—	0.03	0.03	0.04	0.03	0.03	0.04
Temperature	—	—	°C	24	15.4	20.2	21.2	25.2	24.2	21.8
pH (field)	—	—	S.U.	6.45	6.41	6.21	6.47	5.94	8.26	6.53
Specific Conductance	—	*840*	µS/cm	2,040	2,370	2,290	2,470	2,270	2,190	2,250
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	2,000	2,200	—	—	2,400	—	2,500
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	340	400	—	—	400	—	430
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	17 J5	18	—	—	18	—	19
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	1,300	1,500	—	—	1,700	—	1,700
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	32	37	—	—	37	—	41
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-048
ORANGE DRAIN
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-048	CH-048	CH-048	CH-048	CH-048	CH-048	CH-048
			Station Name	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN
			Lab ID	L515479-20	L517576-09	L517576-09	—	L520030-09	—	L522574-09
			Collection Date	5/9/2011	5/24/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	1.9	1.9	—	—	1.7	—	1.9
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-048
ORANGE DRAIN
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-048	CH-048	CH-048	CH-048	CH-048	CH-048	CH-048
			Station Name	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN
			Lab ID	—	—	—	—	—	—	—
			Collection Date	5/7/2012	5/17/2012	5/24/2012	6/1/2012	6/15/2012	6/28/2012	7/17/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	816.9	816.9	816.9	816.9	816.9	816.9	817
Flow	—	—	gpm	60	10	10	12	5	4	15
Flow	—	—	mgd	0.09	0.01	0.01	0.02	0.01	0.01	0.02
Temperature	—	—	°C	18.95	18.42	19.24	19.58	18.21	19.07	20.84
pH (field)	—	—	S.U.	6.55	7.13	6.39	6.36	6.57	6.31	6.76
Specific Conductance	—	*840*	µS/cm	2,037	1,739	2,327	2,381	1,927	2,817	2,513
Ox-Red Potential (ORP)	—	—	mV	210.4	195.1	-228.1	-196.9	81.9	171.3	-174.6
Dissolved Oxygen (DO)	—	—	mg/L	10.39	7.27	1.18	1.95	2.37	1.88	1.6
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	—	—	—	—	—	—	—
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	—	—	—	—	—
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	—	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	—	—	—	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-048
ORANGE DRAIN
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-048	CH-048	CH-048	CH-048	CH-048	CH-048	CH-048
			Station Name	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN
			Lab ID	—	—	—	—	—	—	—
			Collection Date	5/7/2012	5/17/2012	5/24/2012	6/1/2012	6/15/2012	6/28/2012	7/17/2012
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	—	—	—	—	—	—	—
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-048
ORANGE DRAIN
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-048	CH-048	CH-048	CH-048
			Station Name	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN
			Lab ID	—	—	—	L689251-01
			Collection Date	8/2/2012	8/23/2012	9/20/2012	3/20/2014
Parameter	MCL	UPL	Units				
Field Parameters							
Water Level Elevation	—	—	ft NAVD88	817	817.1	817	—
Flow	—	—	gpm	20	20	25	—
Flow	—	—	mgd	0.03	0.03	0.04	—
Temperature	—	—	°C	19.27	18.33	23.17	17.51
pH (field)	—	—	S.U.	6.87	6.79	8.62	5.71
Specific Conductance	—	840	µS/cm	2,048	2,107	2,094	1,286
Ox-Red Potential (ORP)	—	—	mV	-209.4	-220.3	-90.3	-57.5
Dissolved Oxygen (DO)	—	—	mg/L	0.86	0.95	—	1.47
Turbidity (field)	—	—	NTU	—	—	—	—
Indicator Parameters							
pH (lab)	—	—	S.U.	—	—	—	—
Dissolved Solids	—	420	mg/L	—	—	—	1,900
Suspended Solids	—	—	mg/L	—	—	—	92
Turbidity (lab)	—	—	NTU	—	—	—	290
Chemical Oxygen Demand (COD)	—	11	mg/L	—	—	—	—
Total Organic Carbon (TOC)	—	3.8	mg/L	—	—	—	—
Acidity	—	—	mg/L	—	—	—	<10
Free Carbon Dioxide	—	—	mg/L	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	1,300
Major Cations							
Calcium	—	130	mg/L	—	—	—	440
Calcium,Dissolved	—	130	mg/L	—	—	—	—
Magnesium	—	8.8	mg/L	—	—	—	57
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—
Potassium	—	3.4	mg/L	—	—	—	21
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—
Sodium	—	7.2	mg/L	—	—	—	21
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—
Major Anions							
Alkalinity, Total	—	—	mg/L	—	—	—	160
Alkalinity,Bicarbonate	—	290	mg/L	—	—	—	—
Alkalinity,Carbonate	—	<20	mg/L	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—
Sulfate	—	65	mg/L	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—
Chloride	—	13	mg/L	—	—	—	—
Silica	—	—	mg/L	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—

CH-048
ORANGE DRAIN
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-048	CH-048	CH-048	CH-048
			Station Name	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN	ORANGE DRAIN
			Lab ID	—	—	—	L689251-01
			Collection Date	8/2/2012	8/23/2012	9/20/2012	3/20/2014
Parameter	*MCL*	*UPL*	**Units**				
Trace Metals							
Iron	—	1.3	mg/L	—	—	—	140
Iron,Dissolved	—	1.3	mg/L	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	110 T8
Ferric Iron	—	—	mg/L	—	—	—	22
Aluminum	—	—	mg/L	—	—	—	<0.10
Aluminum,Dissolved	—	—	mg/L	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	0.00022 J
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	0.15
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—
Barium	2	—	mg/L	—	—	—	0.032
Barium,Dissolved	2	—	mg/L	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	<0.0020
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—
Boron	—	0.3	mg/L	—	—	—	—
Boron,Dissolved	—	0.3	mg/L	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	<0.0050
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	0.0026 J
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	0.025
Cobalt,Dissolved	—	—	mg/L	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	<0.020
Copper,Dissolved	1.3	—	mg/L	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	0.00066 J
Lead,Dissolved	0.015	—	mg/L	—	—	—	—
Manganese	—	—	mg/L	—	—	—	23
Manganese,Dissolved	—	—	mg/L	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	<0.00020
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	0.017 J
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	<0.020
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—
Silver	—	—	mg/L	—	—	—	0.0083 J
Silver,Dissolved	—	—	mg/L	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	<0.0010
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	<0.010
Vanadium,Dissolved	—	—	mg/L	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	0.0066 J
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—

CH-050
RAILROAD SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-050	CH-050	CH-050	CH-050	CH-050	CH-050	CH-050
			Station Name	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING
			Lab ID	L515479-10	—	L517576-10	—	L520030-10	—	L522574-10
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	820.3	820.2	—	—	—
Flow	—	—	gpm	70	40	120	—	—	—	—
Flow	—	—	mgd	0.1	0.06	0.2	—	—	—	—
Temperature	—	—	°C	22.4	15	19	21.2	25.2	23.1	18
pH (field)	—	—	S.U.	7.74	7.13	7.22	7.26	6.78	7.13	6.81
Specific Conductance	—	*840*	µS/cm	740	610	950	710	1,110	620	1,000
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	7.57
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	540	—	700	—	900	—	820
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	120	—	160	—	180	—	180
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	13	—	24	—	27	—	25
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	250	—	320	—	410	—	420
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	18	—	31	—	36	—	31
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-050
RAILROAD SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-050	CH-050	CH-050	CH-050	CH-050	CH-050	CH-050
			Station Name	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING
			Lab ID	L515479-10	—	L517576-10	—	L520030-10	—	L522574-10
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	**Units**							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	<0.20	—	<0.20	—	**0.24**	—	**0.22**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-050
RAILROAD SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-050	CH-050	CH-050	CH-050	CH-050	CH-050
			Station Name	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING
			Lab ID	L558290-05	L560970-04	L570058-05	—	L575196-04	—
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/26/2012	5/14/2012	5/17/2012
Parameter	*MCL*	*UPL*	**Units**						
Field Parameters									
Water Level Elevation	—	—	ft NAVD88	820.8	820.7	820.6	820.7	820.9	820.8
Flow	—	—	gpm	77	20	5	47	160	15
Flow	—	—	mgd	0.1	—	0.006	0.07	0.2	0.2
Temperature	—	—	°C	13.44	13.1	21.8	16.91	16.53	16.54
pH (field)	—	—	S.U.	7.46	7.8	7.6	7.86	7.61	7.25
Specific Conductance	—	840	µS/cm	693	905	1,480	731	1,079	1,120
Ox-Red Potential (ORP)	—	—	mV	-224.7	-214.1	—	157.3	206.1	-187.3
Dissolved Oxygen (DO)	—	—	mg/L	7.18	8.56	—	4.29	7.95	2.78
Turbidity (field)	—	—	NTU	7.5	7	6.2	—	42	—
Indicator Parameters									
pH (lab)	—	—	S.U.	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	700	—	1,100	—	870	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	<10	—	7.2 J	—	9.0 J	—
Total Organic Carbon (TOC)	—	3.8	mg/L	0.95 J, P1	—	0.88 J	—	0.86 J	—
Acidity	—	—	mg/L	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—
Major Cations									
Calcium	—	130	mg/L	170	—	240	—	180	—
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	29	—	49	—	34	—
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—
Potassium	—	3.4	mg/L	4.6	—	5.2	—	4.9	—
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—
Sodium	—	7.2	mg/L	18	—	27	—	22	—
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—
Major Anions									
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	170	—	190	—	160	—
Alkalinity,Carbonate	—	<20	mg/L	<20	—	<20	—	<20	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—
Sulfate	—	65	mg/L	350	—	570	—	420	—
Sulfide	—	—	mg/L	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—
Chloride	—	13	mg/L	19	—	34	—	24	—
Silica	—	—	mg/L	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—

CH-050
RAILROAD SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-050	CH-050	CH-050	CH-050	CH-050	CH-050
			Station Name	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING
			Lab ID	L558290-05	L560970-04	L570058-05	—	L575196-04	—
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/26/2012	5/14/2012	5/17/2012
Parameter	*MCL*	*UPL*	Units						
Trace Metals									
Iron	—	1.3	mg/L	**0.32**	**0.072 J**	**0.12**	—	**0.14**	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	**0.0012**	**0.00039 J**	<0.020	—	<0.020	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—
Boron	—	0.3	mg/L	**0.20 J**	—	**2.1**	—	**0.88**	—
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	<0.0050	—	<0.0050	—	<0.0050	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—
Copper	1.3	—	mg/L	<0.020	—	<0.020	—	<0.020	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—
Lead	0.015	—	mg/L	<0.0050	—	<0.0050	—	**0.019**	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—
Mercury	0.002	—	mg/L	<0.00020	—	<0.00020	—	<0.00020	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	<0.020	—	<0.020	—	<0.020	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—
Selenium	0.05	—	mg/L	<0.020	—	<0.020	—	**0.034**	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—
Zinc	—	0.18	mg/L	**0.074**	—	**0.011 J**	—	**0.020 J**	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—

CH-050
RAILROAD SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-050	CH-050	CH-050	CH-050	CH-050	CH-050
			Station Name	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING
			Lab ID	—	—	—	—	—	L593301-04
			Collection Date	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012	9/4/2012
Parameter	*MCL*	*UPL*	Units						
Field Parameters									
Water Level Elevation	—	—	ft NAVD88	820.7	820.9	820.7	820.8	820.8	820.9
Flow	—	—	gpm	25	90	IF	NF	NF	68
Flow	—	—	mgd	0.04	0.1	IF	NF	NF	0.1
Temperature	—	—	°C	15.92	14.38	16.34	21.76	22.17	20.17
pH (field)	—	—	S.U.	7.27	7.19	7.23	7.03	6.98	7.62
Specific Conductance	—	*840*	µS/cm	939	1,097	1,239	1,173	1,618	1,415
Ox-Red Potential (ORP)	—	—	mV	-152.9	-173.5	-68.7	156.5	121.7	-99.8
Dissolved Oxygen (DO)	—	—	mg/L	3.01	2.92	10.06	8.36	4.03	3.53
Turbidity (field)	—	—	NTU	—	—	—	—	—	—
Indicator Parameters									
pH (lab)	—	—	S.U.	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	—	—	—	1,200
Suspended Solids	—	—	mg/L	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	<10
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	1.1
Acidity	—	—	mg/L	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—
Major Cations									
Calcium	—	*130*	mg/L	—	—	—	—	—	220
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	60
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	6.0
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	—	—	—	20
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—
Major Anions									
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	160
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	—	—	—	570
Sulfide	—	—	mg/L	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	—	—	—	30
Silica	—	—	mg/L	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—

CH-050
RAILROAD SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-050	CH-050	CH-050	CH-050	CH-050	CH-050
			Station Name	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING
			Lab ID	—	—	—	—	—	L593301-04
			Collection Date	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012	9/4/2012
Parameter	MCL	UPL	Units						
Trace Metals									
Iron	—	1.3	mg/L	—	—	—	—	—	0.044 J
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	<0.020
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—
Boron	—	0.3	mg/L	—	—	—	—	—	5.7
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	<0.0050
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	0.0022 J
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	0.0034 J
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	0.000030 J
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	<0.020
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	0.022
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	<0.030
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—

CH-050
RAILROAD SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

Parameter	MCL	UPL	Units	CH-050	CH-050	CH-050
			Station Name	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING
			Lab ID	—	L612149-02	L728978-01
			Collection Date	9/20/2012	12/18/2012	10/21/2014
Field Parameters						
Water Level Elevation	—	—	ft NAVD88	820.9	821	—
Flow	—	—	gpm	95	160	5
Flow	—	—	mgd	0.1	0.2	0.007
Temperature	—	—	°C	18.83	15.31	16.96
pH (field)	—	—	S.U.	7.62	7.98	8.64
Specific Conductance	—	840	µS/cm	1,386	2,350	1,099
Ox-Red Potential (ORP)	—	—	mV	149	-127.6	15
Dissolved Oxygen (DO)	—	—	mg/L	6.86	4.89	6.51
Turbidity (field)	—	—	NTU	—	—	0 R
Indicator Parameters						
pH (lab)	—	—	S.U.	—	—	—
Dissolved Solids	—	420	mg/L	—	2,700	820
Suspended Solids	—	—	mg/L	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	38	5.2 J
Total Organic Carbon (TOC)	—	3.8	mg/L	—	3.2	1.8
Acidity	—	—	mg/L	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—
Major Cations						
Calcium	—	130	mg/L	—	360	180
Calcium,Dissolved	—	130	mg/L	—	—	180
Magnesium	—	8.8	mg/L	—	230	47
Magnesium,Dissolved	—	8.8	mg/L	—	—	45
Potassium	—	3.4	mg/L	—	8.0	5.1
Potassium,Dissolved	—	3.4	mg/L	—	—	5.0
Sodium	—	7.2	mg/L	—	28	20
Sodium,Dissolved	—	7.2	mg/L	—	—	20
Ammonia Nitrogen	—	—	mg/L	—	—	—
Major Anions						
Alkalinity, Total	—	—	mg/L	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	140	180
Alkalinity,Carbonate	—	<20	mg/L	—	<20	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—
Sulfate	—	65	mg/L	—	1,400	350
Sulfide	—	—	mg/L	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—
Bromide	—	—	mg/L	—	—	—
Fluoride	—	—	mg/L	—	—	—
Chloride	—	13	mg/L	—	100	24
Silica	—	—	mg/L	—	—	—
Silicon	—	—	mg/L	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—

CH-050
RAILROAD SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

Parameter	MCL	UPL	Units			
			Station Number	CH-050	CH-050	CH-050
			Station Name	RAILROAD SPRING	RAILROAD SPRING	RAILROAD SPRING
			Lab ID	—	L612149-02	L728978-01
			Collection Date	9/20/2012	12/18/2012	10/21/2014
Trace Metals						
Iron	—	1.3	mg/L	—	**0.10**	**0.028 J**
Iron,Dissolved	—	1.3	mg/L	—	—	<0.10
Ferrous Iron	—	—	mg/L	—	—	—
Ferric Iron	—	—	mg/L	—	—	—
Aluminum	—	—	mg/L	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—
Antimony	0.006	—	mg/L	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—
Arsenic	0.01	—	mg/L	—	**0.0064**	**0.00045 J**
Arsenic,Dissolved	0.01	—	mg/L	—	—	<0.0010
Barium	2	—	mg/L	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—
Beryllium	0.004	—	mg/L	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—
Boron	—	0.3	mg/L	—	**42**	**1.4**
Boron,Dissolved	—	0.3	mg/L	—	—	**1.5**
Cadmium	0.005	—	mg/L	—	<0.0050	<0.00050
Cadmium,Dissolved	0.005	—	mg/L	—	—	<0.00050
Chromium	0.1	—	mg/L	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—
Cobalt	—	—	mg/L	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—
Copper	1.3	—	mg/L	—	<0.020	**0.0010 J**
Copper,Dissolved	1.3	—	mg/L	—	—	<0.0020
Lead	0.015	—	mg/L	—	<0.0050	<0.0010
Lead,Dissolved	0.015	—	mg/L	—	—	<0.0010
Manganese	—	—	mg/L	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—
Mercury	0.002	—	mg/L	—	<0.00020	<0.00020
Mercury,Dissolved	0.002	—	mg/L	—	—	<0.00020
Molybdenum	—	—	mg/L	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—
Nickel	—	0.0085	mg/L	—	**0.011 J**	**0.0033**
Nickel,Dissolved	—	0.0085	mg/L	—	—	**0.0024**
Selenium	0.05	—	mg/L	—	**0.14**	**0.0020**
Selenium,Dissolved	0.05	—	mg/L	—	—	**0.0024**
Silver	—	—	mg/L	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—
Thallium	0.002	—	mg/L	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—
Vanadium	—	—	mg/L	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—
Zinc	—	0.18	mg/L	—	**0.014 J**	**0.0077 J**
Zinc,Dissolved	—	0.18	mg/L	—	—	**0.0055 J**

CH-052
STONEWALL SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-052	CH-052	CH-052	CH-052	CH-052	CH-052	CH-052
			Station Name	STONEWALL	STONEWALL	STONEWALL	STONEWALL	STONEWALL	STONEWALL	STONEWALL
			Lab ID	L515479-12	—	L517576-12	L520030-12	L558290-06	L560970-05	L570058-06
			Collection Date	5/9/2011	5/17/2011	5/24/2011	6/7/2011	1/31/2012	2/16/2012	4/13/2012
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	—	—	768.6	768.6	768.6
Flow	—	—	gpm	40	90	20	5	11	4	1
Flow	—	—	mgd	0.06	0.1	0.03	0.007	0.02	0.006	0.001
Temperature	—	—	°C	19.6	14.8	19.1	23.8	12.93	10.71	22.3
pH (field)	—	—	S.U.	6.82	7.26	7.3	7.49	7.63	8.02	8
Specific Conductance	—	*840*	µS/cm	370	840	410	470	324	332	560
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	-226.2	-223.4	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	8.31	9.52	—
Turbidity (field)	—	—	NTU	—	—	—	—	15	5.8	7.7
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	240	—	260	300	260	—	290
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	<10	—	5.6 J
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	1.5	—	1.0
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	73	—	83	91	91	—	93
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	5.4	—	5.9
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	2.5	—	1.6
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	6.6	—	3.9	4.8	3.7	—	5.0
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	180	—	180
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	<20	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	25	—	29	29	29	—	36
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	6.9	—	5.9	10	5.6	—	9.6
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-052
STONEWALL SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-052	CH-052	CH-052	CH-052	CH-052	CH-052	CH-052
			Station Name	STONEWALL	STONEWALL	STONEWALL	STONEWALL	STONEWALL	STONEWALL	STONEWALL
			Lab ID	L515479-12	—	L517576-12	L520030-12	L558290-06	L560970-05	L570058-06
			Collection Date	5/9/2011	5/17/2011	5/24/2011	6/7/2011	1/31/2012	2/16/2012	4/13/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	**2.0**	**0.12**	**0.11**
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	**0.0014**	<0.0010	<0.020
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	<0.20	—	<0.20	**0.083 J**	**0.052 J**	—	**0.12 J**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	<0.0050	—	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	**0.0048 J**	—	**0.0022 J**
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	<0.0050	—	<0.0050
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	<0.00020	—	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	<0.020	—	<0.020
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	<0.020	—	<0.020
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	**0.056**	—	<0.030
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-052
STONEWALL SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-052	CH-052	CH-052	CH-052
			Station Name	STONEWALL	STONEWALL	STONEWALL	STONEWALL
			Lab ID	L575196-05	—	L612149-03	L729376-01
			Collection Date	5/14/2012	5/17/2012	12/18/2012	10/22/2014
Parameter	MCL	UPL	Units				
Field Parameters							
Water Level Elevation	—	—	ft NAVD88	768.7	768.7	768.8	—
Flow	—	—	gpm	18	5	10	5
Flow	—	—	mgd	0.03	0.007	0.01	0.007
Temperature	—	—	°C	15.74	14.44	10.73	15.8
pH (field)	—	—	S.U.	7.62	7.74	8.84	7.86
Specific Conductance	—	840	µS/cm	523	516	375	682
Ox-Red Potential (ORP)	—	—	mV	-122.3	155.7	-184.3	-152.6
Dissolved Oxygen (DO)	—	—	mg/L	1.89	5.93	4.94	3.08
Turbidity (field)	—	—	NTU	18	—	22	3
Indicator Parameters							
pH (lab)	—	—	S.U.	—	—	—	—
Dissolved Solids	—	420	mg/L	330	—	310	500
Suspended Solids	—	—	mg/L	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	8.4 J	—	<10	<10
Total Organic Carbon (TOC)	—	3.8	mg/L	2.1	—	2.3	2.1
Acidity	—	—	mg/L	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—
Major Cations							
Calcium	—	130	mg/L	100	—	93	140
Calcium,Dissolved	—	130	mg/L	—	—	—	150
Magnesium	—	8.8	mg/L	5.9	—	6.0	11
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	11
Potassium	—	3.4	mg/L	3.0	—	2.9	6.2
Potassium,Dissolved	—	3.4	mg/L	—	—	—	5.8
Sodium	—	7.2	mg/L	7.4	—	4.7	12
Sodium,Dissolved	—	7.2	mg/L	—	—	—	12
Ammonia Nitrogen	—	—	mg/L	—	—	—	—
Major Anions							
Alkalinity, Total	—	—	mg/L	—	—	—	240
Alkalinity,Bicarbonate	—	290	mg/L	220	—	180	240
Alkalinity,Carbonate	—	<20	mg/L	<20	—	<20	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—
Sulfate	—	65	mg/L	34	—	49	120
Sulfide	—	—	mg/L	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—
Chloride	—	13	mg/L	7.9	—	8.0	31
Silica	—	—	mg/L	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—

CH-052
STONEWALL SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-052	CH-052	CH-052	CH-052
			Station Name	STONEWALL	STONEWALL	STONEWALL	STONEWALL
			Lab ID	L575196-05	—	L612149-03	L729376-01
			Collection Date	5/14/2012	5/17/2012	12/18/2012	10/22/2014
Parameter	MCL	UPL	Units				
Trace Metals							
Iron	—	1.3	mg/L	0.67	—	0.22	0.095 J
Iron,Dissolved	—	1.3	mg/L	—	—	—	<0.10
Ferrous Iron	—	—	mg/L	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—
Arsenic	0.01	—	mg/L	<0.020	—	0.00095 J	0.00066 J
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	0.00063 J
Barium	2	—	mg/L	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—
Boron	—	0.3	mg/L	0.17 J	—	0.46	0.17 J
Boron,Dissolved	—	0.3	mg/L	—	—	—	0.12 J
Cadmium	0.005	—	mg/L	<0.0050	—	<0.0050	<0.00050
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	<0.00050
Chromium	0.1	—	mg/L	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—
Copper	1.3	—	mg/L	0.0017 J	—	<0.020	0.0010 J
Copper,Dissolved	1.3	—	mg/L	—	—	—	<0.0020
Lead	0.015	—	mg/L	0.01	—	<0.0050	0.00036 J
Lead,Dissolved	0.015	—	mg/L	—	—	—	<0.0010
Manganese	—	—	mg/L	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—
Mercury	0.002	—	mg/L	<0.00020	—	<0.00020	<0.00020
Mercury,Dissolved	0.002	—	mg/L	—	—	—	<0.00020
Molybdenum	—	—	mg/L	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—
Nickel	—	0.0085	mg/L	<0.020	—	0.0049 J	0.0024
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	0.0023
Selenium	0.05	—	mg/L	0.025	—	<0.020	<0.0010
Selenium,Dissolved	0.05	—	mg/L	—	—	—	0.00074 J
Silver	—	—	mg/L	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—
Zinc	—	0.18	mg/L	0.016 J	—	0.0078 J	0.0046 J
Zinc,Dissolved	—	0.18	mg/L	—	—	—	0.019

CH-057
BRIAR PATCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057
			Station Name	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH
			Lab ID	L515479-16	—	L517576-17	—	L520030-17	—	L522574-16
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	*MCL*	*UPL*	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	—	—	—	779.3	—
Flow	—	—	gpm	880	440	210	380	210	1060	500
Flow	—	—	mgd	1.3	0.6	0.3	0.6	0.3	1.5	0.8
Temperature	—	—	°C	17.3	17.8	19.2	21.7	25.1	24.6	24.5
pH (field)	—	—	S.U.	6.93	7.03	6.96	7.19	7.08	6.83	6.77
Specific Conductance	—	*840*	µS/cm	910	2,080	1,810	1,290	1,890	1,030	1,500
Ox-Red Potential (ORP)	—	—	mV	—	—	—	—	—	—	—
Dissolved Oxygen (DO)	—	—	mg/L	—	—	—	—	—	—	2.64
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	1,600	—	1,700	—	1,700	—	1,300
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	*130*	mg/L	390	—	420	—	390	—	300
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—	—	—
Sodium	—	*7.2*	mg/L	11	—	9.6	—	9.4	—	10
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	*65*	mg/L	1,000	—	990	—	970	—	730
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	*13*	mg/L	36	—	54	—	60	—	44
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-057
BRIAR PATCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057
			Station Name	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH
			Lab ID	L515479-16	—	L517576-17	—	L520030-17	—	L522574-16
			Collection Date	5/9/2011	5/17/2011	5/24/2011	5/31/2011	6/7/2011	6/14/2011	6/21/2011
Parameter	MCL	UPL	Units							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	2.0	—	2.4	—	2.4	—	1.9
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-057
BRIAR PATCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057
			Station Name	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH
			Lab ID	L558290-01	L560970-06	L570058-02	—	—	—	L575196-06
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/27/2012	5/7/2012	5/10/2012	5/14/2012
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	775.6	775.5	775.6	775.9	775.9	776.3	776.6
Flow	—	—	gpm	33	1	—	590	370	350	2050
Flow	—	—	mgd	0.05	0.001	—	0.8	0.5	0.5	3
Temperature	—	—	°C	11.28	10.2	20.1	17.53	21.64	22.82	21.57
pH (field)	—	—	S.U.	6.98	7.7	7.2	7.34	7.29	7.23	7.44
Specific Conductance	—	840	µS/cm	1,030	808	1,120	1,052	1,105	1,385	1,627
Ox-Red Potential (ORP)	—	—	mV	-166.3	-219.5	—	187.6	-199.8	-175.8	170.7
Dissolved Oxygen (DO)	—	—	mg/L	8.24	9.45	—	7.29	2.09	2.48	2.6
Turbidity (field)	—	—	NTU	5.9	3.9	6.6	—	—	—	6.9
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	1,400	—	720	—	—	—	1,500
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	<10	—	17	—	—	—	4.2 J, P1
Total Organic Carbon (TOC)	—	3.8	mg/L	2.2	—	1.0	—	—	—	1.8
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	130	mg/L	340	—	180	—	—	—	350
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	22	—	22	—	—	—	30
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—	—
Potassium	—	3.4	mg/L	5.9	—	5.2	—	—	—	9.2
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—	—
Sodium	—	7.2	mg/L	8.8	—	8.6	—	—	—	14
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	90	—	150	—	—	—	86
Alkalinity,Carbonate	—	<20	mg/L	<20	—	<20	—	—	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	65	mg/L	840	—	350	—	—	—	890
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	13	mg/L	29	—	17	—	—	—	17
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-057
BRIAR PATCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057
			Station Name	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH
			Lab ID	L558290-01	L560970-06	L570058-02	—	—	—	L575196-06
			Collection Date	1/31/2012	2/16/2012	4/13/2012	4/27/2012	5/7/2012	5/10/2012	5/14/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	1.3	mg/L	0.26	0.047 J	0.41	—	—	—	0.095 J
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	0.012	0.0097	0.11	—	—	—	0.012 J
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	1.0	—	3.5	—	—	—	4.2
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	<0.0050	—	<0.0050	—	—	—	<0.0050
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	0.0031 J	—	0.0032 J	—	—	—	0.0055 J
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	<0.0050	—	<0.0050	—	—	—	0.030
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	<0.00020	—	<0.00020	—	—	—	<0.00020
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	<0.020	—	<0.020	—	—	—	<0.020
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	<0.020	—	<0.020	—	—	—	0.070
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	0.15	—	0.01 J	—	—	—	0.026 J
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-057
BRIAR PATCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057
			Station Name	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH
			Lab ID	—	—	—	—	—	—	—
			Collection Date	5/17/2012	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012	7/17/2012
Parameter	MCL	UPL	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	776.5	776.1	776.5	776.4	776.4	775.9	776.1
Flow	—	—	gpm	1540	673	1050	950	840	121	50
Flow	—	—	mgd	2.2	1	1.5	1.4	1.2	0.2	0.1
Temperature	—	—	°C	21.52	23.83	26.44	24.21	22.05	23.17	27.97
pH (field)	—	—	S.U.	7.13	7.11	7.1	7.24	7.31	7.81	7.11
Specific Conductance	—	840	µS/cm	1,723	1,542	1,604	2,121	1,957	2,318	1,907
Ox-Red Potential (ORP)	—	—	mV	-202.8	-253.2	-193.2	-174.4	-87.6	108.3	-222.5
Dissolved Oxygen (DO)	—	—	mg/L	2.57	0.92	0.51	1.54	2.76	3.69	0.67
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	—	—	—	—	—	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	—	—	—	—	—	—
Total Organic Carbon (TOC)	—	3.8	mg/L	—	—	—	—	—	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	130	mg/L	—	—	—	—	—	—	—
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	—	—	—	—	—	—	—
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—	—
Potassium	—	3.4	mg/L	—	—	—	—	—	—	—
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—	—
Sodium	—	7.2	mg/L	—	—	—	—	—	—	—
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	—	—	—	—	—	—
Alkalinity,Carbonate	—	<20	mg/L	—	—	—	—	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	65	mg/L	—	—	—	—	—	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	13	mg/L	—	—	—	—	—	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-057
BRIAR PATCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057	CH-057
			Station Name	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH
			Lab ID	—	—	—	—	—	—	—
			Collection Date	5/17/2012	5/24/2012	6/1/2012	6/7/2012	6/15/2012	6/28/2012	7/17/2012
Parameter	MCL	UPL	Units							
Trace Metals										
Iron	—	1.3	mg/L	—	—	—	—	—	—	—
Iron,Dissolved	—	1.3	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	0.006	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	0.006	—	mg/L	—	—	—	—	—	—	—
Arsenic	0.01	—	mg/L	—	—	—	—	—	—	—
Arsenic,Dissolved	0.01	—	mg/L	—	—	—	—	—	—	—
Barium	2	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	2	—	mg/L	—	—	—	—	—	—	—
Beryllium	0.004	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	0.004	—	mg/L	—	—	—	—	—	—	—
Boron	—	0.3	mg/L	—	—	—	—	—	—	—
Boron,Dissolved	—	0.3	mg/L	—	—	—	—	—	—	—
Cadmium	0.005	—	mg/L	—	—	—	—	—	—	—
Cadmium,Dissolved	0.005	—	mg/L	—	—	—	—	—	—	—
Chromium	0.1	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	0.1	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	1.3	—	mg/L	—	—	—	—	—	—	—
Copper,Dissolved	1.3	—	mg/L	—	—	—	—	—	—	—
Lead	0.015	—	mg/L	—	—	—	—	—	—	—
Lead,Dissolved	0.015	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	0.002	—	mg/L	—	—	—	—	—	—	—
Mercury,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	0.0085	mg/L	—	—	—	—	—	—	—
Nickel,Dissolved	—	0.0085	mg/L	—	—	—	—	—	—	—
Selenium	0.05	—	mg/L	—	—	—	—	—	—	—
Selenium,Dissolved	0.05	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	0.002	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	0.002	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	0.18	mg/L	—	—	—	—	—	—	—
Zinc,Dissolved	—	0.18	mg/L	—	—	—	—	—	—	—

CH-057
BRIAR PATCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-057	CH-057	CH-057	CH-057	CH-057
			Station Name	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH
			Lab ID	—	—	L593301-05	—	L611710-03
			Collection Date	8/2/2012	8/23/2012	9/4/2012	9/20/2012	12/17/2012
Parameter	*MCL*	*UPL*	**Units**					
Field Parameters								
Water Level Elevation	—	—	ft NAVD88	776.3	777.4	777.3	778.3	—
Flow	—	—	gpm	350	TH	TH	TH	—
Flow	—	—	mgd	0.5	—	—	—	—
Temperature	—	—	°C	26.15	18.31	27	23.16	14.74
pH (field)	—	—	S.U.	7.2	7.21	7.32	7.81	7.67
Specific Conductance	—	*840*	µS/cm	1,584	1,492	1,739	1,615	1,574
Ox-Red Potential (ORP)	—	—	mV	-175.2	-185.3	-120.7	-174.2	-92.4
Dissolved Oxygen (DO)	—	—	mg/L	2.31	2.19	1.68	—	5.94
Turbidity (field)	—	—	NTU	—	—	—	—	12
Indicator Parameters								
pH (lab)	—	—	S.U.	—	—	—	—	—
Dissolved Solids	—	*420*	mg/L	—	—	1,600	—	1,300
Suspended Solids	—	—	mg/L	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	—	—	<10	—	13 J3
Total Organic Carbon (TOC)	—	*3.8*	mg/L	—	—	1.4	—	2.0
Acidity	—	—	mg/L	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—
Major Cations								
Calcium	—	*130*	mg/L	—	—	320	—	300
Calcium,Dissolved	—	*130*	mg/L	—	—	—	—	—
Magnesium	—	*8.8*	mg/L	—	—	57	—	34
Magnesium,Dissolved	—	*8.8*	mg/L	—	—	—	—	—
Potassium	—	*3.4*	mg/L	—	—	9.5	—	7.9
Potassium,Dissolved	—	*3.4*	mg/L	—	—	—	—	—
Sodium	—	*7.2*	mg/L	—	—	13	—	15
Sodium,Dissolved	—	*7.2*	mg/L	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—
Major Anions								
Alkalinity, Total	—	—	mg/L	—	—	—	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	—	—	100	—	29
Alkalinity,Carbonate	—	*<20*	mg/L	—	—	<20	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—
Nitrate, as N	*10*	—	mg/L	—	—	—	—	—
Nitrite, as N	*1*	—	mg/L	—	—	—	—	—
Sulfate	—	*65*	mg/L	—	—	970	—	840
Sulfide	—	—	mg/L	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—
Chloride	—	*13*	mg/L	—	—	27	—	19
Silica	—	—	mg/L	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—

CH-057
BRIAR PATCH SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-057	CH-057	CH-057	CH-057	CH-057
			Station Name	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH	BRIAR PATCH
			Lab ID	—	—	L593301-05	—	L611710-03
			Collection Date	8/2/2012	8/23/2012	9/4/2012	9/20/2012	12/17/2012
Parameter	*MCL*	*UPL*	Units					
Trace Metals								
Iron	—	*1.3*	mg/L	—	—	<0.10	—	0.16
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	0.015 J	—	0.0084
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	10	—	5.2
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	<0.0050	—	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	0.0026 J	—	<0.020
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	0.0032 J	—	<0.0050
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	0.000030 J	—	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	0.017 J	—	0.0064 J
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	0.040	—	<0.020
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	<0.030	—	0.0063 J
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—

CH-062
HARDIN SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-062	CH-062
			Station Name	HARDIN SPRING	HARDIN SPRING
			Lab ID	—	L615509-02
			Collection Date	5/17/2012	1/14/2013
Parameter	*MCL*	*UPL*	**Units**		
Field Parameters					
Water Level Elevation	—	—	ft NAVD88	834.7	834.9
Flow	—	—	gpm	0.3	20
Flow	—	—	mgd	0.0004	0.03
Temperature	—	—	°C	16.74	14.44
pH (field)	—	—	S.U.	7.16	8.28
Specific Conductance	—	840	µS/cm	631	257
Ox-Red Potential (ORP)	—	—	mV	-182.4	132.5
Dissolved Oxygen (DO)	—	—	mg/L	—	8.39
Turbidity (field)	—	—	NTU	—	8.3
Indicator Parameters					
pH (lab)	—	—	S.U.	—	—
Dissolved Solids	—	420	mg/L	—	140
Suspended Solids	—	—	mg/L	—	—
Turbidity (lab)	—	—	NTU	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	<10
Total Organic Carbon (TOC)	—	3.8	mg/L	—	1.0
Acidity	—	—	mg/L	—	—
Free Carbon Dioxide	—	—	mg/L	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—
Major Cations					
Calcium	—	130	mg/L	—	50
Calcium,Dissolved	—	130	mg/L	—	—
Magnesium	—	8.8	mg/L	—	1.9
Magnesium,Dissolved	—	8.8	mg/L	—	—
Potassium	—	3.4	mg/L	—	0.76
Potassium,Dissolved	—	3.4	mg/L	—	—
Sodium	—	7.2	mg/L	—	1.6
Sodium,Dissolved	—	7.2	mg/L	—	—
Ammonia Nitrogen	—	—	mg/L	—	—
Major Anions					
Alkalinity, Total	—	—	mg/L	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	89
Alkalinity,Carbonate	—	<20	mg/L	—	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—
Nitrate, as N	10	—	mg/L	—	—
Nitrite, as N	1	—	mg/L	—	—
Sulfate	—	65	mg/L	—	10
Sulfide	—	—	mg/L	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—
Bromide	—	—	mg/L	—	—
Fluoride	—	—	mg/L	—	—
Chloride	—	13	mg/L	—	0.96 J
Silica	—	—	mg/L	—	—
Silicon	—	—	mg/L	—	—
Silicon,Dissolved	—	—	mg/L	—	—

CH-062
HARDIN SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-062	CH-062
			Station Name	HARDIN SPRING	HARDIN SPRING
			Lab ID	—	L615509-02
			Collection Date	5/17/2012	1/14/2013
Parameter	*MCL*	*UPL*	**Units**		
Trace Metals					
Iron	—	*1.3*	mg/L	—	**0.12**
Iron,Dissolved	—	*1.3*	mg/L	—	—
Ferrous Iron	—	—	mg/L	—	—
Ferric Iron	—	—	mg/L	—	—
Aluminum	—	—	mg/L	—	—
Aluminum,Dissolved	—	—	mg/L	—	—
Antimony	*0.006*	—	mg/L	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—
Arsenic	*0.01*	—	mg/L	—	**0.0012**
Arsenic,Dissolved	*0.01*	—	mg/L	—	—
Barium	*2*	—	mg/L	—	—
Barium,Dissolved	*2*	—	mg/L	—	—
Beryllium	*0.004*	—	mg/L	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—
Boron	—	*0.3*	mg/L	—	**0.091 J**
Boron,Dissolved	—	*0.3*	mg/L	—	—
Cadmium	*0.005*	—	mg/L	—	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—
Chromium	*0.1*	—	mg/L	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—
Cobalt	—	—	mg/L	—	—
Cobalt,Dissolved	—	—	mg/L	—	—
Copper	*1.3*	—	mg/L	—	<0.020
Copper,Dissolved	*1.3*	—	mg/L	—	—
Lead	*0.015*	—	mg/L	—	<0.025 O
Lead,Dissolved	*0.015*	—	mg/L	—	—
Manganese	—	—	mg/L	—	—
Manganese,Dissolved	—	—	mg/L	—	—
Mercury	*0.002*	—	mg/L	—	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—
Molybdenum	—	—	mg/L	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—
Nickel	—	*0.0085*	mg/L	—	<0.020
Nickel,Dissolved	—	*0.0085*	mg/L	—	—
Selenium	*0.05*	—	mg/L	—	**0.025**
Selenium,Dissolved	*0.05*	—	mg/L	—	—
Silver	—	—	mg/L	—	—
Silver,Dissolved	—	—	mg/L	—	—
Thallium	*0.002*	—	mg/L	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—
Vanadium	—	—	mg/L	—	—
Vanadium,Dissolved	—	—	mg/L	—	—
Zinc	—	*0.18*	mg/L	—	**0.060**
Zinc,Dissolved	—	*0.18*	mg/L	—	—

CH-063
ROCKHOUSE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-063	CH-063	CH-063	CH-063	CH-063	CH-063	CH-063
			Station Name	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE
			Lab ID	—	—	—	—	L576419-05	—	—
			Collection Date	4/26/2012	5/7/2012	5/10/2012	5/17/2012	5/21/2012	5/24/2012	6/1/2012
Parameter	MCL	UPL	Units							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	812.5	812.5	812.6	812.5	812.5	812.5	812.4
Flow	—	—	gpm	4	5	3	7	7	2	2
Flow	—	—	mgd	0.005	0.007	0.004	0.01	0.01	0.003	0.003
Temperature	—	—	°C	17.69	12.64	12.96	12.7	13.17	12.83	12.73
pH (field)	—	—	S.U.	7.28	7.18	7.21	7.05	7.27	7.11	7.33
Specific Conductance	—	840	µS/cm	534	474	632	589	617	616	605
Ox-Red Potential (ORP)	—	—	mV	-34.9	-140.5	-111.8	-226.7	-146.3	-119.8	-123.7
Dissolved Oxygen (DO)	—	—	mg/L	1.65	3.04	10.83 R	2.24	14.7 R	1.17	2.97
Turbidity (field)	—	—	NTU	—	—	—	—	—	—	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	—	—	—	—	390	—	—
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	—	—	—	5.5 J	—	—
Total Organic Carbon (TOC)	—	3.8	mg/L	—	—	—	—	1.2	—	—
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	130	mg/L	—	—	—	—	120	—	—
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	—	—	—	—	6.9	—	—
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—	—
Potassium	—	3.4	mg/L	—	—	—	—	1.7	—	—
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—	—
Sodium	—	7.2	mg/L	—	—	—	—	3.3	—	—
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	—	—	—	240	—	—
Alkalinity,Carbonate	—	<20	mg/L	—	—	—	—	<20	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	65	mg/L	—	—	—	—	68	—	—
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	13	mg/L	—	—	—	—	5.8	—	—
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-063
ROCKHOUSE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-063	CH-063	CH-063	CH-063	CH-063	CH-063	CH-063
			Station Name	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE
			Lab ID	—	—	—	—	L576419-05	—	—
			Collection Date	4/26/2012	5/7/2012	5/10/2012	5/17/2012	5/21/2012	5/24/2012	6/1/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	**0.34**	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	<0.0010	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	—	—	**0.060 J**	—	—
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	<0.0050	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	<0.020	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	<0.0050	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	<0.00020	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	**0.0056 J**	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	<0.020	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	<0.030	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-063
ROCKHOUSE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-063	CH-063	CH-063	CH-063	CH-063	CH-063	CH-063
			Station Name	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE
			Lab ID	—	—	—	—	—	L611707-03	L611707-03
			Collection Date	6/7/2012	6/15/2012	8/2/2012	8/23/2012	9/20/2012	12/17/2012	12/17/2012
Parameter	*MCL*	*UPL*	**Units**							
Field Parameters										
Water Level Elevation	—	—	ft NAVD88	—	—	—	—	812.4	812.5	812.5
Flow	—	—	gpm	IF	NF	NF	NF	2	50	50
Flow	—	—	mgd	IF	NF	NF	NF	0.003	0.072	0.07
Temperature	—	—	°C	13.12	16.31	15.52	15.09	18.1	14.43	—
pH (field)	—	—	S.U.	7.85	7.08	7.8	7.84	7.51	7.78	—
Specific Conductance	—	840	µS/cm	639	833	656	693	962	433	—
Ox-Red Potential (ORP)	—	—	mV	-124.4	-123.5	92.6	108.6	-178.3	-103.8	—
Dissolved Oxygen (DO)	—	—	mg/L	—	8.93 R	6.49	6.94	—	7.43	—
Turbidity (field)	—	—	NTU	—	—	—	—	—	12	—
Indicator Parameters										
pH (lab)	—	—	S.U.	—	—	—	—	—	—	—
Dissolved Solids	—	420	mg/L	—	—	—	—	—	320	340
Suspended Solids	—	—	mg/L	—	—	—	—	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—	—	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	—	—	—	—	9.4 J	9.4 J
Total Organic Carbon (TOC)	—	3.8	mg/L	—	—	—	—	—	1.8	4.4 P1
Acidity	—	—	mg/L	—	—	—	—	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—	—	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—	—	—	—	—
Major Cations										
Calcium	—	130	mg/L	—	—	—	—	—	110	110
Calcium,Dissolved	—	130	mg/L	—	—	—	—	—	—	—
Magnesium	—	8.8	mg/L	—	—	—	—	—	6.1	6.0
Magnesium,Dissolved	—	8.8	mg/L	—	—	—	—	—	—	—
Potassium	—	3.4	mg/L	—	—	—	—	—	1.9	1.9
Potassium,Dissolved	—	3.4	mg/L	—	—	—	—	—	—	—
Sodium	—	7.2	mg/L	—	—	—	—	—	3.5	3.0
Sodium,Dissolved	—	7.2	mg/L	—	—	—	—	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—	—	—	—	—
Major Anions										
Alkalinity, Total	—	—	mg/L	—	—	—	—	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	—	—	—	—	220	220
Alkalinity,Carbonate	—	<20	mg/L	—	—	—	—	—	<20	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—	—	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—	—	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—	—	—	—	—
Sulfate	—	65	mg/L	—	—	—	—	—	43	45
Sulfide	—	—	mg/L	—	—	—	—	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—	—	—	—	—
Bromide	—	—	mg/L	—	—	—	—	—	—	—
Fluoride	—	—	mg/L	—	—	—	—	—	—	—
Chloride	—	13	mg/L	—	—	—	—	—	4.4	4.1
Silica	—	—	mg/L	—	—	—	—	—	—	—
Silicon	—	—	mg/L	—	—	—	—	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—	—	—	—	—

CH-063
ROCKHOUSE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-063	CH-063	CH-063	CH-063	CH-063	CH-063	CH-063
			Station Name	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE	ROCKHOUSE
			Lab ID	—	—	—	—	—	L611707-03	L611707-03
			Collection Date	6/7/2012	6/15/2012	8/2/2012	8/23/2012	9/20/2012	12/17/2012	12/17/2012
Parameter	*MCL*	*UPL*	Units							
Trace Metals										
Iron	—	*1.3*	mg/L	—	—	—	—	—	**0.37**	**0.52**
Iron,Dissolved	—	*1.3*	mg/L	—	—	—	—	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—	—	—	—	—
Ferric Iron	—	—	mg/L	—	—	—	—	—	—	—
Aluminum	—	—	mg/L	—	—	—	—	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—	—	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—	—	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—	—	—	<0.0010	<0.0010
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—	—	—	—	—
Barium	*2*	—	mg/L	—	—	—	—	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—	—	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—	—	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—	—	—	—	—
Boron	—	*0.3*	mg/L	—	—	—	—	—	**0.16 J**	**0.080 J**
Boron,Dissolved	—	*0.3*	mg/L	—	—	—	—	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—	—	—	<0.0050	<0.0050
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—	—	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—	—	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—	—	—	—	—
Cobalt	—	—	mg/L	—	—	—	—	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Copper	*1.3*	—	mg/L	—	—	—	—	—	<0.020	<0.020
Copper,Dissolved	*1.3*	—	mg/L	—	—	—	—	—	—	—
Lead	*0.015*	—	mg/L	—	—	—	—	—	<0.0050	<0.0050
Lead,Dissolved	*0.015*	—	mg/L	—	—	—	—	—	—	—
Manganese	—	—	mg/L	—	—	—	—	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—	—	—	<0.00020	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Molybdenum	—	—	mg/L	—	—	—	—	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—	—	—	<0.020	<0.020
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—	—	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—	—	—	<0.020	<0.020
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—	—	—	—	—
Silver	—	—	mg/L	—	—	—	—	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—	—	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—	—	—	—	—
Vanadium	—	—	mg/L	—	—	—	—	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—	—	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—	—	—	**0.0072 J**	**0.011 J**
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—	—	—	—	—

CH-063
ROCKHOUSE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-063	CH-063
			Station Name	ROCKHOUSE	ROCKHOUSE
			Lab ID	L615509-03	L728970-01
			Collection Date	1/14/2013	10/21/2014
Parameter	*MCL*	*UPL*	Units		
Field Parameters					
Water Level Elevation	—	—	ft NAVD88	812.6	—
Flow	—	—	gpm	60	IF
Flow	—	—	mgd	0.09	IF
Temperature	—	—	°C	12.49	13.64
pH (field)	—	—	S.U.	8.53	9.29
Specific Conductance	—	*840*	µS/cm	429	633
Ox-Red Potential (ORP)	—	—	mV	132.7	1.5
Dissolved Oxygen (DO)	—	—	mg/L	7.81	7.78
Turbidity (field)	—	—	NTU	12.9	0 R
Indicator Parameters					
pH (lab)	—	—	S.U.	—	—
Dissolved Solids	—	*420*	mg/L	330	390
Suspended Solids	—	—	mg/L	—	—
Turbidity (lab)	—	—	NTU	—	—
Chemical Oxygen Demand (COD)	—	*11*	mg/L	3.3 J	<10
Total Organic Carbon (TOC)	—	*3.8*	mg/L	2.1	1.8
Acidity	—	—	mg/L	—	—
Free Carbon Dioxide	—	—	mg/L	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—
Major Cations					
Calcium	—	*130*	mg/L	86	130
Calcium,Dissolved	—	*130*	mg/L	—	130 V
Magnesium	—	*8.8*	mg/L	3.4	7.8
Magnesium,Dissolved	—	*8.8*	mg/L	—	7.2
Potassium	—	*3.4*	mg/L	1.7	2.7
Potassium,Dissolved	—	*3.4*	mg/L	—	2.5
Sodium	—	*7.2*	mg/L	1.7	4.4
Sodium,Dissolved	—	*7.2*	mg/L	—	4.1
Ammonia Nitrogen	—	—	mg/L	—	—
Major Anions					
Alkalinity, Total	—	—	mg/L	—	—
Alkalinity,Bicarbonate	—	*290*	mg/L	140	250
Alkalinity,Carbonate	—	*<20*	mg/L	<20	<20
Nitrate-Nitrite, as N	—	—	mg/L	—	—
Nitrate, as N	*10*	—	mg/L	—	—
Nitrite, as N	*1*	—	mg/L	—	—
Sulfate	—	*65*	mg/L	23	55
Sulfide	—	—	mg/L	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—
Bromide	—	—	mg/L	—	—
Fluoride	—	—	mg/L	—	—
Chloride	—	*13*	mg/L	2.5	15
Silica	—	—	mg/L	—	—
Silicon	—	—	mg/L	—	—
Silicon,Dissolved	—	—	mg/L	—	—

CH-063
ROCKHOUSE SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-063	CH-063
			Station Name	ROCKHOUSE	ROCKHOUSE
			Lab ID	L615509-03	L728970-01
			Collection Date	1/14/2013	10/21/2014
Parameter	*MCL*	*UPL*	Units		
Trace Metals					
Iron	—	*1.3*	mg/L	**0.16**	**0.22**
Iron,Dissolved	—	*1.3*	mg/L	—	<0.10
Ferrous Iron	—	—	mg/L	—	—
Ferric Iron	—	—	mg/L	—	—
Aluminum	—	—	mg/L	—	—
Aluminum,Dissolved	—	—	mg/L	—	—
Antimony	*0.006*	—	mg/L	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—
Arsenic	*0.01*	—	mg/L	**0.0012**	**0.00033 J**
Arsenic,Dissolved	*0.01*	—	mg/L	—	<0.0010
Barium	*2*	—	mg/L	—	—
Barium,Dissolved	*2*	—	mg/L	—	—
Beryllium	*0.004*	—	mg/L	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—
Boron	—	*0.3*	mg/L	**0.075 J**	**0.068 J**
Boron,Dissolved	—	*0.3*	mg/L	—	**0.034 J**
Cadmium	*0.005*	—	mg/L	<0.0050	<0.00050
Cadmium,Dissolved	*0.005*	—	mg/L	—	<0.00050
Chromium	*0.1*	—	mg/L	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—
Cobalt	—	—	mg/L	—	—
Cobalt,Dissolved	—	—	mg/L	—	—
Copper	*1.3*	—	mg/L	<0.020	**0.00066 J**
Copper,Dissolved	*1.3*	—	mg/L	—	<0.0020
Lead	*0.015*	—	mg/L	<0.0050	**0.00039 J**
Lead,Dissolved	*0.015*	—	mg/L	—	<0.0010
Manganese	—	—	mg/L	—	—
Manganese,Dissolved	—	—	mg/L	—	—
Mercury	*0.002*	—	mg/L	<0.00020	<0.00020
Mercury,Dissolved	*0.002*	—	mg/L	—	<0.00020
Molybdenum	—	—	mg/L	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—
Nickel	—	*0.0085*	mg/L	<0.020	**0.0022**
Nickel,Dissolved	—	*0.0085*	mg/L	—	**0.0013**
Selenium	*0.05*	—	mg/L	**0.0090 J**	**0.00073 J**
Selenium,Dissolved	*0.05*	—	mg/L	—	<0.0010
Silver	—	—	mg/L	—	—
Silver,Dissolved	—	—	mg/L	—	—
Thallium	*0.002*	—	mg/L	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—
Vanadium	—	—	mg/L	—	—
Vanadium,Dissolved	—	—	mg/L	—	—
Zinc	—	*0.18*	mg/L	**0.079**	**0.0028 J**
Zinc,Dissolved	—	*0.18*	mg/L	—	**0.0027 J**

CH-065
HARDIN 2 SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-065	CH-065	CH-065
			Station Name	HARDIN 2 SPRING	HARDIN 2 SPRING	HARDIN 2 SPRING
			Lab ID	—	—	—
			Collection Date	7/23/2012	8/2/2012	9/20/2012
Parameter	*MCL*	*UPL*	**Units**			
Field Parameters						
Water Level Elevation	—	—	ft NAVD88	—	—	—
Flow	—	—	gpm	1	1	1
Flow	—	—	mgd	0.001	0.001	0.001
Temperature	—	—	°C	15.37	15.76	19.41
pH (field)	—	—	S.U.	6.91	7.36	7.92
Specific Conductance	—	840	µS/cm	1,763	1,678	787
Ox-Red Potential (ORP)	—	—	mV	129.6	-137.3	-99.4
Dissolved Oxygen (DO)	—	—	mg/L	7.23	9.74 R	—
Turbidity (field)	—	—	NTU	—	—	—
Indicator Parameters						
pH (lab)	—	—	S.U.	—	—	—
Dissolved Solids	—	420	mg/L	—	—	—
Suspended Solids	—	—	mg/L	—	—	—
Turbidity (lab)	—	—	NTU	—	—	—
Chemical Oxygen Demand (COD)	—	11	mg/L	—	—	—
Total Organic Carbon (TOC)	—	3.8	mg/L	—	—	—
Acidity	—	—	mg/L	—	—	—
Free Carbon Dioxide	—	—	mg/L	—	—	—
Hardness, Total (mg/L as CaCO3)	—	—	mg/L	—	—	—
Major Cations						
Calcium	—	130	mg/L	—	—	—
Calcium,Dissolved	—	130	mg/L	—	—	—
Magnesium	—	8.8	mg/L	—	—	—
Magnesium,Dissolved	—	8.8	mg/L	—	—	—
Potassium	—	3.4	mg/L	—	—	—
Potassium,Dissolved	—	3.4	mg/L	—	—	—
Sodium	—	7.2	mg/L	—	—	—
Sodium,Dissolved	—	7.2	mg/L	—	—	—
Ammonia Nitrogen	—	—	mg/L	—	—	—
Major Anions						
Alkalinity, Total	—	—	mg/L	—	—	—
Alkalinity,Bicarbonate	—	290	mg/L	—	—	—
Alkalinity,Carbonate	—	<20	mg/L	—	—	—
Nitrate-Nitrite, as N	—	—	mg/L	—	—	—
Nitrate, as N	10	—	mg/L	—	—	—
Nitrite, as N	1	—	mg/L	—	—	—
Sulfate	—	65	mg/L	—	—	—
Sulfide	—	—	mg/L	—	—	—
Reactive Sulf.(SW846 7.3.4.1)	—	—	mg/L	—	—	—
Bromide	—	—	mg/L	—	—	—
Fluoride	—	—	mg/L	—	—	—
Chloride	—	13	mg/L	—	—	—
Silica	—	—	mg/L	—	—	—
Silicon	—	—	mg/L	—	—	—
Silicon,Dissolved	—	—	mg/L	—	—	—

CH-065
HARDIN 2 SPRING
Summary of Groundwater Analytical Results
EW Brown, Harrodsburg, Kentucky
AMEC Project No. 567530023

			Station Number	CH-065	CH-065	CH-065
			Station Name	HARDIN 2 SPRING	HARDIN 2 SPRING	HARDIN 2 SPRING
			Lab ID	—	—	—
			Collection Date	7/23/2012	8/2/2012	9/20/2012
Parameter	*MCL*	*UPL*	Units			
Trace Metals						
Iron	—	*1.3*	mg/L	—	—	—
Iron,Dissolved	—	*1.3*	mg/L	—	—	—
Ferrous Iron	—	—	mg/L	—	—	—
Ferric Iron	—	—	mg/L	—	—	—
Aluminum	—	—	mg/L	—	—	—
Aluminum,Dissolved	—	—	mg/L	—	—	—
Antimony	*0.006*	—	mg/L	—	—	—
Antimony,Dissolved	*0.006*	—	mg/L	—	—	—
Arsenic	*0.01*	—	mg/L	—	—	—
Arsenic,Dissolved	*0.01*	—	mg/L	—	—	—
Barium	*2*	—	mg/L	—	—	—
Barium,Dissolved	*2*	—	mg/L	—	—	—
Beryllium	*0.004*	—	mg/L	—	—	—
Beryllium,Dissolved	*0.004*	—	mg/L	—	—	—
Boron	—	*0.3*	mg/L	—	—	—
Boron,Dissolved	—	*0.3*	mg/L	—	—	—
Cadmium	*0.005*	—	mg/L	—	—	—
Cadmium,Dissolved	*0.005*	—	mg/L	—	—	—
Chromium	*0.1*	—	mg/L	—	—	—
Chromium,Dissolved	*0.1*	—	mg/L	—	—	—
Cobalt	—	—	mg/L	—	—	—
Cobalt,Dissolved	—	—	mg/L	—	—	—
Copper	*1.3*	—	mg/L	—	—	—
Copper,Dissolved	*1.3*	—	mg/L	—	—	—
Lead	*0.015*	—	mg/L	—	—	—
Lead,Dissolved	*0.015*	—	mg/L	—	—	—
Manganese	—	—	mg/L	—	—	—
Manganese,Dissolved	—	—	mg/L	—	—	—
Mercury	*0.002*	—	mg/L	—	—	—
Mercury,Dissolved	*0.002*	—	mg/L	—	—	—
Molybdenum	—	—	mg/L	—	—	—
Molybdenum,Dissolved	—	—	mg/L	—	—	—
Nickel	—	*0.0085*	mg/L	—	—	—
Nickel,Dissolved	—	*0.0085*	mg/L	—	—	—
Selenium	*0.05*	—	mg/L	—	—	—
Selenium,Dissolved	*0.05*	—	mg/L	—	—	—
Silver	—	—	mg/L	—	—	—
Silver,Dissolved	—	—	mg/L	—	—	—
Thallium	*0.002*	—	mg/L	—	—	—
Thallium,Dissolved	*0.002*	—	mg/L	—	—	—
Vanadium	—	—	mg/L	—	—	—
Vanadium,Dissolved	—	—	mg/L	—	—	—
Zinc	—	*0.18*	mg/L	—	—	—
Zinc,Dissolved	—	*0.18*	mg/L	—	—	—

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *E.W. Brown Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *084-00010* **Finds/Unit No.**_______ **Quarter & Year** *4th 2014*

Please check only ONE of the following:

___**Characterization** ___**Quarterly** *X* **Semi-Annual** ___**Annual** ___**Assessment**

Please check applicable submittal: *X* **Groundwater** ___**Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

SIGNATURE DATE 8-17-15

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *10/21-22/2014* County: *Mercer* Permit No.: *084-00010*

Facility Name: *Kentucky Utilities Co. E.W. Brown Station (contact: Angela Zeveli)*
(As officially shown on DWM Permit Face)

Mailing Address: *815 Dix Dam Road* *Harrodsburg* *40330*
Street City Zip

Phone No.: *(859) 748-4414* Latitude *N 37.787°* Longitude *W 84.721°*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *W. Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* *Louisville* *40232*
Street City Zip

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *AMEC-Foster Wheeler Consultants (formerly MACTEC)*

Contact Person: *Alison L. Dunn* Phone No.: *(859) 566-3729*

Mailing Address: *2456 Fortune Drive, Suite 100* *Lexington* *40509*
Street City Zip

LABORATORY RECORD #1

Laboratory: *ESC Lab Sciences* Lab ID No.: ______

Contact Person: *Leslie Newton* Phone No.: *(615) 758-5858*

Mailing Address: *12065 Lebanon Road* *Mt. Juliet, TN.* *37122*
Street City Zip

LABORATORY RECORD #2

Laboratory: ______ Lab ID No.: ______

Contact Person: ______ Phone No.: ( )

Mailing Address: ______
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT: ______/ 1
LAB ID: ____________

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number				
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	Stonewall Spr.	Dam Toe Right	Ditch Spring	Briar Patch Spr.
Sample Sequence #	6	1	2	-
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	10/22/14 11:45	10/16/14 10:15	10/16/14 12:57	Not Sampled
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	10/24-11/7/14	10/17-24/14	10/17-24/15	-
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UP	DOWN	DOWN	DOWN

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE ŸR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	-		-		-		-	
S0296- -	0	pH		units	Fld. Meas.	7.86		7.6		8.3		-	
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	682		1,501		1,344		-	
S0145- -	1	Temperature		°C	Fld. Meas.	15.8		16.34		15.97		-	
16887-00-6	2	Chloride(s)	T	MG/L	9056A	31		93		9.8		-	
18785-72-3	0	Sulfate	T	MG/L	9056A	120		620		540		-	
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	500		1,200		1,100		-	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<3.0		<3.0		12		-	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number													
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						Stonewall Spr.		Dam Toe Right		Ditch Spring		Briar Patch Spr.	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	2.10		1.10		0.80		-	
7440-42-8		Boron	T	MG/L	6010C	0.17		4.6		1.3		-	
7440-59-4		Calcium	T	MG/L	6010C	140		260		260		-	
7440-50-8	0	Copper	T	MG/L	6010C	0.0010		0.00055		0.0022		-	
7440-23-5	0	Sodium	T	MG/L	6010C	12		12		17		-	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT: ______/ 1
LAB ID: ______

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	9000-1873	9000-1872		
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	Webb Spr. Cplx.	Railroad Spring	Rock House Spr.	
Sample Sequence #	5	4	3	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	10/22/14 10:30	10/21/14 16:25	10/21/14 15:50	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	10/24-11/7/14	10/23-11/10/14	10/23-11/10/14	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UNKNOWN	UNKNOWN	UP	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	-		-		-			
S0296- -	0	pH		units	Fld. Meas.	7.95		8.64		9.29			
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	892		1,099		633			
S0145- -	1	Temperature		°C	Fld. Meas.	19.7		17.0		13.6			
16887-00-6	2	Chloride(s)	T	MG/L	9056A	4.7		24		15			
18785-72-3	0	Sulfate	T	MG/L	9056A	240		350		55			
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	610		820		390			
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<3.0		5.2		<3.0			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						9000-1873		9000-1872					
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						Webb Spr. Cplx.		Railroad Spring		Rock House Spr.			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	1.00		1.80		1.80			
7440-42-8		Boron	T	MG/L	6010C	0.22		1.4		0.068			
7440-59-4		Calcium	T	MG/L	6010C	160		180		130			
7440-50-8	0	Copper	T	MG/L	6010C	<0.0053		0.001		0.00066			
7440-23-5	0	Sodium	T	MG/L	6010C	30		20		4.4			

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *E.W. Brown Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *084-00010* **Finds/Unit No.**________ **Quarter & Year** *1st 2015*

Please check only ONE of the following:

___**Characterization** ___**Quarterly** *X* **Semi-Annual** ___**Annual** ___**Assessment**

Please check applicable submittal: *X* **Groundwater** ___**Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

SIGNATURE 9-9-15
DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *3/11/2015* County: *Mercer* Permit No.: *084-00010*

Facility Name: *Kentucky Utilities Co. E.W. Brown Station (contact: Angela Zeveli)*
(As officially shown on DWM Permit Face)

Mailing Address: *815 Dix Dam Road* *Harrodsburg* *40330*
Street City Zip

Phone No.: *(859) 748-4414* Latitude *N 37.787°* Longitude *W 84.721°*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *W. Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* *Louisville* *40232*
Street City Zip

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *AMEC-Foster Wheeler Consultants (formerly MACTEC)*

Contact Person: *Alison L. Dunn* Phone No.: *(859) 566-3729*

Mailing Address: *2456 Fortune Drive, Suite 100* *Lexington* *40509*
Street City Zip

LABORATORY RECORD #1

Laboratory: *ESC Lab Sciences* Lab ID No.: ________

Contact Person: *Leslie Newton* Phone No.: *(615) 758-5858*

Mailing Address: *12065 Lebanon Road* *Mt. Juliet, TN.* *37122*
Street City Zip

LABORATORY RECORD #2

Laboratory: ________ Lab ID No.: ________

Contact Person: ________ Phone No.: ( )

Mailing Address: ________
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT:______/ 1
LAB ID:__________

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number				
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	Stonewall Spr.	Dam Toe Right	Ditch Spring	Briar Patch Spr.
Sample Sequence #	7	2	1	-
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	3/11/15 16:10	3/11/15 11:20	3/11/15 9:25	Not Sampled
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	3/11-20/15	3/11-20/15	3/11-20/15	3/11-20/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UP	DOWN	DOWN	DOWN

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	-		-		-		-	
S0296- -	0	pH		units	Fld. Meas.	7.39		6.91		7.28		-	
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	337		1,156		676		-	
S0145- -	1	Temperature		°C	Fld. Meas.	8.5		14.5		7.95		-	
16887-00-6	2	Chloride(s)	T	MG/L	9056A	4.6		55		0.63		-	
18785-72-3	0	Sulfate	T	MG/L	9056A	21		470		320		-	
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	210		900		520		-	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	4.7		<3.0		4.4		-	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number: 084-00010

FINDS/UNIT: ______ / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number													
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						Stonewall Spr.		Dam Toe Right		Ditch Spring		Briar Patch Spr.	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	1.6		1.2		0.89		-	
7440-42-8		Boron	T	MG/L	6010C	0.046		2.9		0.19		-	
7440-59-4		Calcium	T	MG/L	6010C	72		230		140		-	
7440-50-8	0	Copper	T	MG/L	6010C	<0.00052		<0.00052		0.00091		-	
7440-23-5	0	Sodium	T	MG/L	6010C	2.6		8.2		2.7		-	
	0												

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT: _______/ 1
LAB ID: _______________

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER¹, Facility Well/Spring Number	9000-1873	9000-1872		
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	Webb Spr. Cplx.	Railroad Spring	Rock House Spr.	Hardin Spring
Sample Sequence #	5	6	4	3
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	3/11/15 15:00	3/11/15 15:35	3/11/15 14:30	3/11/15 13:35
Duplicate ("Y" or "N")²	No	No	No	No
Split ("Y" or "N")³	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	3/11-20/15	3/11-20/15	3/11-20/15	3/11-20/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UNKNOWN	UNKNOWN	UP	UP

CAS RN⁴		CONSTITUENT	T D⁵	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL⁶	FLAGS	DETECTED VALUE OR PQL⁶	FLAGS	DETECTED VALUE OR PQL⁶	FLAGS	DETECTED VALUE OR PQL⁶	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	-		-		-		-	
S0296- -	0	pH		units	Fld. Meas.	7.66		6.99		6.97		6.93	
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	507		895		390		239	
S0145- -	1	Temperature		°C	Fld. Meas.	12.2		10.8		10.8		12.5	
16887-00-6	2	Chloride(s)	T	MG/L	9056A	3.0		38		2.5		4.4	
18785-72-3	0	Sulfate	T	MG/L	9056A	100		290		26		44	
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	340		700		240		220	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<3.0		3.7		<3.0		<3.0	

¹AKGWA # is 0000-0000 for any type of blank.
²Respond "Y" if the sample was a duplicate of another sample in this report.
³Respond "Y" if the sample was split and analyzed by separate laboratories.
⁴Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
⁵"T" = Total; "D" = Dissolved
⁶"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number: 084-00010

FINDS/UNIT: / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						9000-1873		9000-1872					
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						Webb Spr. Cplx.		Railroad Spring		Rock House Spr.		Hardin Spring	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	2.6		1.5		2.2		1.1	
7440-42-8		Boron	T	MG/L	6010C	0.044		0.90		0.042		0.17	
7440-59-4		Calcium	T	MG/L	6010C	100		150		86		75	
7440-50-8	0	Copper	T	MG/L	6010C	0.00078		<0.00052		<0.00052		<0.00052	
7440-23-5	0	Sodium	T	MG/L	6010C	2.9		22		1.7		3.9	

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *E.W. Brown Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *084-00010* **Finds/Unit No.**______ **Quarter & Year** *4th 2015*

Please check only ONE of the following:

___Characterization **_X_ Quarterly** **___Semi-Annual** **___Annual** **___Assessment**

Please check applicable submittal: **_X_ Groundwater** **___Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

SIGNATURE 11-16-15
DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *10/2/2015* County: *Mercer* Permit No.: *084-00010*

Facility Name: *Kentucky Utilities Co. E.W. Brown Station (contact: Angela Zeveli)*
(As officially shown on DWM Permit Face)

Mailing Address: *815 Dix Dam Road* (Street) *Harrodsburg* (City) *40330* (Zip)

Phone No.: *(859) 748-4414* Latitude *N 37.787°* Longitude *W 84.721°*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *W. Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL
(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *AMEC-Foster Wheeler Consultants (formerly MACTEC)*

Contact Person: *Alison L. Dunn* Phone No.: *(859) 566-3729*

Mailing Address: *2456 Fortune Drive, Suite 100* (Street) *Lexington* (City) *40509* (Zip)

LABORATORY RECORD #1

Laboratory: *ESC Lab Sciences* Lab ID No.: ______

Contact Person: *Leslie Newton* Phone No.: *(615) 758-5858*

Mailing Address: *12065 Lebanon Road* (Street) *Mt. Juliet, TN.* (City) *37122* (Zip)

LABORATORY RECORD #2

Laboratory: ______ Lab ID No.: ______

Contact Person: ______ Phone No.: ( )

Mailing Address: ______
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT: ______/ 1
LAB ID: ______

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number				
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	Stonewall Spr.	Dam Toe Right	Ditch Spring	Briar Patch Spr.
Sample Sequence #	-	1	2	-
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	Not Sampled	10/2/15 8:30	10/2/15 9:35	Not Sampled
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	L792432-01	L792432-02	Not Applicable
Date of Analysis (Month/Day/Year)	-	10/2-12/15	10/2-12/15	-
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UP	DOWN	DOWN	DOWN

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	-		-		-		-	
S0296- -	0	pH		units	Fld. Meas.	-		6.55		9.97		-	
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	-		1,665		492		-	
S0145- -	1	Temperature		°C	Fld. Meas.	-		15.94		13.70		-	
16887-00-6	2	Chloride(s)	T	MG/L	9056A	-		113		6.58		-	
18785-72-3	0	Sulfate	T	MG/L	9056A	-		668		46.3		-	
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	-		1,480		530		-	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	-		15.8		41.7		-	

[1]AKGWA # is 0000-0000 for any type of blank.
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STANDARD FLAGS:
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D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number: 084-00010

FINDS/UNIT: ______________ / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number													
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						Stonewall Spr.		Dam Toe Right		Ditch Spring		Briar Patch Spr.	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	-		1.28		5.67		-	
7440-42-8		Boron	T	MG/L	6010C	-		5.78		0.356		-	
7440-59-4		Calcium	T	MG/L	6010C	-		288		17.2		-	
7440-50-8	0	Copper	T	MG/L	6010C	-		<0.000520		0.01070		-	
7440-23-5	0	Sodium	T	MG/L	6010C	-		12.4		33.8		-	
7440-38-2	0	Arsenic	T	MG/L	6020A	-		0.451		0.0285		-	
7440-43-9	0	Cadmium	T	MG/L	6020	-		<0.000160		<0.000160		-	
7439-89-6	0	Iron	T	MG/L	6010B	-		2.19		1.24		-	
7439-92-1	0	Lead	T	MG/L	6020	-		0.000288		0.000898		-	
7439-95-4	0	Magnesium	T	MG/L	6010B	-		65.2		1.33		-	
7439-97-6	0	Mercury	T	MG/L	7470A	-		<0.0000490		<0.0000490		-	
7440-02-0	0	Nickel	T	MG/L	6020	-		0.00205		0.00604		-	
7440-09-7	0	Potassium	T	MG/L	6010C	-		13.8		94.8		-	
7782-49-2	0	Selenium	T	MG/L	6020	-		0.00182		0.00303		-	
7440-66-6	0	Zinc	T	MG/L	6020	-		0.00581		0.00487		-	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT: ______/ 1
LAB ID: ______________

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	9000-1873	9000-1872		
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	Webb Spr. Cplx.	Railroad Spring	Rock House Spr.	Hardin Spring
Sample Sequence #	3	4	-	-
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	10/2/15 13:45	10/2/15 14:35	Not Sampled	Not Sampled
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	L792440-01	L792440-03	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	10/2-12/15	10/2-12/15	-	-
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UNKNOWN	UNKNOWN	UP	UP

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	-		-		-		-	
S0296- -	0	pH		units	Fld. Meas.	8.00		7.25		-		-	
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	699		796		-		-	
S0145- -	1	Temperature		°C	Fld. Meas.	14.9		17.0		-		-	
16887-00-6	2	Chloride(s)	T	MG/L	9056A	2.64		10.9		-		-	
18785-72-3	0	Sulfate	T	MG/L	9056A	194		264		-		-	
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	537		689		-		-	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	12.5		10.0		-		-	

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SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number: 084-00010

FINDS/UNIT: / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						9000-1873		9000-1872					
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						Webb Spr. Cplx.		Railroad Spring		Rock House Spr.		Hardin Spring	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	2.09		1.49		-		-	
7440-42-8		Boron	T	MG/L	6010C	0.111		0.622		-		-	
7440-59-4		Calcium	T	MG/L	6010C	128		143		-		-	
7440-50-8	0	Copper	T	MG/L	6010C	0.00226		0.00183		-		-	
7440-23-5	0	Sodium	T	MG/L	6010C	3.88		12.1		-		-	
7440-38-2		Arsenic	T	MG/L	6020A	0.000496		0.00107		-		-	
7440-43-9		Cadmium	T	MG/L	6020	<0.000160		<0.000160		-		-	
7439-89-6		Iron	T	MG/L	6010B	0.200		0.824		-		-	
7439-92-1		Lead	T	MG/L	6020	0.000724		0.00206		-		-	
7439-95-4		Magnesium	T	MG/L	6010B	16.6		23.1		-		-	
7439-97-6		Mercury	T	MG/L	7470A	<0.0000490		<0.0000490		-		-	
7440-02-0		Nickel	T	MG/L	6020	0.000670		0.00181		-		-	
7440-09-7		Potassium	T	MG/L	6010C	3.98		3.90		-		-	
7782-49-2		Selenium	T	MG/L	6020	<0.000380		0.00238		-		-	
7440-66-6		Zinc	T	MG/L	6020	0.00276		0.00899		-		-	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT: ______/ 1
LAB ID: ____________

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number				
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	HQ Spring			
Sample Sequence #	3			
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable			
Sample Date and Time (Month/Day/Year hour:minutes)	10/2/15 11:00			
Duplicate ("Y" or "N")[2]	No			
Split ("Y" or "N")[3]	No			
Facility Sample ID Number (if applicable)	Not Applicable			
Laboratory Sample ID Number (if applicable)	L792440-02			
Date of Analysis (Month/Day/Year)	10/2-12/16			
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	DOWN			

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	-							
S0296- -	0	pH		units	Fld. Meas.	7.28							
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	1,249							
S0145- -	1	Temperature		°C	Fld. Meas.	18.1							
16887-00-6	2	Chloride(s)	T	MG/L	9056A	11.7							
18785-72-3	0	Sulfate	T	MG/L	9056A	590							
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	1,110							
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	7.7							

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SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number: 084-00010

FINDS/UNIT: ______ / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number														
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						HQ Spring								
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	1.04								
7440-42-8		Boron	T	MG/L	6010C	2.75								
7440-59-4		Calcium	T	MG/L	6010C	206								
7440-50-8	0	Copper	T	MG/L	6010C	0.000901								
7440-23-5	0	Sodium	T	MG/L	6010C	15.3								
7440-38-2		Arsenic	T	MG/L	6020A	0.008260								
7440-43-9		Cadmium	T	MG/L	6020	<0.000160								
7439-89-6		Iron	T	MG/L	6010B	0.200								
7439-92-1		Lead	T	MG/L	6020	0.000828								
7439-95-4		Magnesium	T	MG/L	6010B	48								
7439-97-6		Mercury	T	MG/L	7470A	<0.0000490								
7440-02-0		Nickel	T	MG/L	6020	0.00332								
7440-09-7		Potassium	T	MG/L	6010C	18.8								
7782-49-2		Selenium	T	MG/L	6020	0.00997								
7440-66-6		Zinc	T	MG/L	6020	<0.00256								

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *E.W. Brown Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *084-00010* **Finds/Unit No.**________ **Quarter & Year** *4th 2015*

Please check only ONE of the following:

___**Characterization** *X* **Quarterly** ___**Semi-Annual** ___**Annual** ___**Assessment**

Please check applicable submittal: *X* **Groundwater** ___**Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 1-22-16
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *12/22//2015* County: *Mercer* Permit No.: *084-00010*

Facility Name: *Kentucky Utilities Co. E.W. Brown Station (contact: Angela Zeveli)*
(As officially shown on DWM Permit Face)

Mailing Address: *815 Dix Dam Road* (Street) *Harrodsburg* (City) *40330* (Zip)

Phone No.: *(859) 748-4414* Latitude *N 37.787°* Longitude *W 84.721°*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *W. Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL
(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *AMEC-Foster Wheeler Consultants (formerly MACTEC)*

Contact Person: *Alison L. Dunn* Phone No.: *(859) 566-3729*

Mailing Address: *2456 Fortune Drive, Suite 100* (Street) *Lexington* (City) *40509* (Zip)

LABORATORY RECORD #1

Laboratory: *ESC Lab Sciences* Lab ID No.: ____

Contact Person: *Leslie Newton* Phone No.: *(615) 758-5858*

Mailing Address: *12065 Lebanon Road* (Street) *Mt. Juliet, TN.* (City) *37122* (Zip)

LABORATORY RECORD #2

Laboratory: ____ Lab ID No.: ____

Contact Person: ____ Phone No.: *( )*

Mailing Address: ____
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT:______/ 1
LAB ID:_________
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number				
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	Stonewall Spr.	DUP-01	Ditch Spring	HQ Spring
Sample Sequence #	9	10	4	5
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/22/15 14:25	12/22/15 0:00	12/22/15 11:05	12/22/15 11:40
Duplicate ("Y" or "N")[2]	No	Yes	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	L808729-04	L808729-10	L808729-02	L808729-03
Date of Analysis (Month/Day/Year)	12/22-30/15	12/22-20/15	12/22-30/15	12/22-30/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UP		DOWN	DOWN

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow		Gal/Min	Fld. Meas.	25		-		341		365	
S0145- -		Specific Conductance		UHMS/CM	Fld. Meas.	467.0		-		2,053		1,630	
S0296- -		pH		units	Fld. Meas.	7.65		-		7.87		7.41	
S0266- -		Total Dissolved Solids	T	MG/L	2540C	307		271		1,750		1,450	
S0130- -		Chemical Oxygen Demand	T	MG/L	410.4	<3.00		21.7		<3.00		<3.00	
S0268- -		Total Organic Carbon	T	MG/L	9060A	1.75		1.89		2.72		1.04	
16887-00-6		Chloride(s)	T	MG/L	9056A	4.18		3.95		59.9		27.9	
S0145- -		Temperature		°C	Fld. Meas.	11.65		-		11.25		15.17	

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SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number: 084-00010

FINDS/UNIT: ________ / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number														
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						Stonewall Spr.		Stonewall (DUP)		Ditch Spring		HQ Spring		
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	
7439-89-6		Iron	T	MG/L	6010B	0.814		0.865		2.87		0.430		
7440-23-5		Sodium	T	MG/L	6010B	2.79		2.74		45.1		20.2		
18785-72-3		Sulfate	T	MG/L	9056A	22.0		20.5		1,270		899		
7440-38-2		Arsenic	T	MG/L	6020	0.00116		0.00114		0.0123		0.00613		
7440-42-8		Boron	T	MG/L	6010B	0.0684		0.0669		7.83		3.52		
7440-59-4		Calcium	T	MG/L	6010B	95.7		95.1		357		288		
7440-50-8		Copper	T	MG/L	6020	0.00463		0.00401		0.00906		0.00470		

Division of Waste Management
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SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT:______/__1
LAB ID:____________

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number		9000-1873	9000-1872	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	Briar Patch Spr.	Webb Spr. Cplx.	Railroad Spring	Hardin Spring
Sample Sequence #	6	7	8	2
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/22/15 11:55	12/22/15 13:25	12/22/15 13:50	12/22/15 9:25
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	L808729-07	L808729-01	L808729-05	L808729-06
Date of Analysis (Month/Day/Year)	12/22-30/15	12/22-30/15	12/22-30/15	12/22-30/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	DOWN	UNKNOWN	UNKNOWN	UP

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow		Gal/Min	Fld. Meas.	61		790		240		148	
S0145- -		Specific Conductance		UHMS/CM	Fld. Meas.	1,453		597		927		676	
S0296- -		pH		units	Fld. Meas.	7.28		8.17		7.49		6.51	
S0266- -		Total Dissolved Solids	T	MG/L	2540C	1,100		410		673		436	
S0130- -		Chemical Oxygen Demand	T	MG/L	410.4	<3.00		7.63		3.08		<3.00	
S0268- -		Total Organic Carbon	T	MG/L	9060A	1.21		1.4		0.87		0.89	
16887-00-6		Chloride(s)	T	MG/L	9056A	24.7		1.72		10.8		29.3	
S0145- -		Temperature		°C	Fld. Meas.	15.60		14.06		14.48		14.62	

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SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number: 084-00010

FINDS/UNIT: / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number								9000-1873		9000-1872			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						Briar Patch Spr.		Webb Spr. Cplx.		Railroad Spring		Hardin Spring	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7439-89-6		Iron	T	MG/L	6010B	0.623		0.875		0.124		0.440	
7440-23-5		Sodium	T	MG/L	6010B	16.3		2.85		13.6		10.4	
18785-72-3		Sulfate	T	MG/L	9056A	641		121		265		122	
7440-38-2		Arsenic	T	MG/L	6020	0.00820		0.00100		0.00088		0.00251	
7440-42-8		Boron	T	MG/L	6010B	3.34		0.065		0.684		0.071	
7440-59-4		Calcium	T	MG/L	6010B	259		117		149		128	
7440-50-8		Copper	T	MG/L	6020	0.00346		0.00475		0.004		0.00387	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU E.W. Brown Special Waste Landfill
Permit Number:084-00010

FINDS/UNIT: ______/ 1
LAB ID: ____________

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number				
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	Rock House Spr.	Hardin Spring 2		
Sample Sequence #	3	1		
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable		
Sample Date and Time (Month/Day/Year hour:minutes)	12/22/15 9:45	12/22/15 9:05		
Duplicate ("Y" or "N")[2]	No	No		
Split ("Y" or "N")[3]	No	No		
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable		
Laboratory Sample ID Number (if applicable)	L808729-08	L808729-09		
Date of Analysis (Month/Day/Year)	12/22-30/15	12/22-30/15		
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UP	UP		

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow		Gal/Min	Fld. Meas.	1,666		101					
S0145- -		Specific Conductance		UHMS/CM	Fld. Meas.	416		585					
S0296- -		pH		units	Fld. Meas.	6.68		6.75					
S0266- -		Total Dissolved Solids	T	MG/L	2540C	272		365					
S0130- -		Chemical Oxygen Demand	T	MG/L	410.4	28.7		19.2					
S0268- -		Total Organic Carbon	T	MG/L	9060A	3.6		1.70					
16887-00-6		Chloride(s)	T	MG/L	9056A	2.76		6.17					
S0145- -		Temperature		°C	Fld. Meas.	13.03		14.13					

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number													
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						Rock House Spr.		Hardin Spring 2					
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7439-89-6		Iron	T	MG/L	6010B	0.803		0.679					
7440-23-5		Sodium	T	MG/L	6010B	1.41		6.31					
18785-72-3		Sulfate	T	MG/L	9056A	15.0		100					
7440-38-2		Arsenic	T	MG/L	6020	0.00105		0.00126					
7440-42-8		Boron	T	MG/L	6010B	0.058		0.381					
7440-59-4		Calcium	T	MG/L	6010B	84.2		110					
7440-50-8		Copper	T	MG/L	6020	0.00385		0.00365					

Ghent Station Groundwater Reports

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name Ghent Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. Pending **Finds/Unit No.** not known **Quarter & Year** All Qtrs-2011

Please check only ONE of the following:

_X_ Characterization ___Quarterly ___Semi-Annual ___Annual ___Assessment

Please check applicable submittal: **_X_ Groundwater ___Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 1-20-12
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 3/17/11; 6/23/11; 9/28/11; 11/17/11 County: Carroll Permit No.: Not Known

Facility Name: Kentucky Utilities Corporation-Ghent Station
(As officially shown on DWM Permit Face)

Mailing Address: 9485 U.S. Highway 42E, Box 338 (Street) Ghent (City) 41045 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 43' 27.5" Longitude W 85° 00' 33.4"

OWNER INFORMATION

Facility Owner: LG&E and KU Energy Corporation Phone No.: (502) 627-4659

Contact Person: Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr Engineer, Environmental Affairs Department, LG&E and KU

Mailing Address: P.O. Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: GAI Consultants, Inc.

Contact Person: Robert J. Turka Phone No.: (724) 387-2170 ext. 2737

Mailing Address: 4101 Triangle Lane (Street) Export, PA (City) 15632-1358 (Zip)

LABORATORY RECORD #1

Laboratory: Microbac Laboratories, Inc. Lab ID No.: ____

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Blvd. (Street) Louisville, KY (City) 40213 (Zip)

LABORATORY RECORD #2

Laboratory: ____ Lab ID No.: ____

Contact Person: ____ Phone No.: ____

Mailing Address: ____ (Street) (City) (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BACKGROUND QUARTERLY SAMPLING - 1st
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ____________/ 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	8004-6807
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	GWMP-3D
Sample Sequence #	1	3	2	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	3/17/11 09:38	3/17/11 12:10	3/17/11 10:39	3/24/11 09:22
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	3/17-3/24/11	3/17-3/24/11	3/17-3/24/11	3/28/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)				

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	666.90		694.17		657.68		662.06	
S0907- -		Temperature	T	°C	Fld. Meas.	-		-		-		19.8	
16887-00-6		Chloride(s)	T	MG/L	846 9056A	140		140		-		-	
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<10		<10		-		-	
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	720		860		-		-	
S0268- -		Total Organic Carbon	T	MG/L	5310C	<1		<1		-		-	
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	1100		1500		-		-	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

BACKGROUND - QUARTERLY SAMPLING - 1st
Facility: KU Ghent Special Waste Landfill FINDS/UNIT: ______/ 1
Permit Number: Pending LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807		8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3D		GWMP-3D	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- -		pH	T	units	Fld. Meas.	7.14		7.36		7.25		7.8	
14808-79-8		Sulfate	T	MG/L	846 9056a	88		180		-		-	
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	280		410		-		-	
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	<5		<5		-		-	
7440-38-2		Arsenic, dissolved	D	MG/L	846 6010C	<0.10		<0.10		<0.10		<0.10	
7440-39-3		Barium, dissolved	D	MG/L	846 6010C	0.060		0.026		0.20		0.14	
7440-42-8		Boron, dissolved	D	MG/L	846 6010C	1.2		1.1		5.5		5.3	
7440-43-9		Cadmium, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7440-70-2		Calcium, dissolved	D	MG/L	846 6010C	89		83		450		310	
7440-47-3		Chromium, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7440-50-8		Copper, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7439-89-6		Iron, dissolved	D	MG/L	846 6010C	0.034		0.040		0.032		0.045	
7439-92-1		Lead, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7439-95-4		Magnesium, dissolved	D	MG/L	846 6010C	34		51		200		140	
7439-97-6		Mercury, dissolved	D	MG/L	846 7470A	<0.0002		<0.0002		<0.0002		<0.0002	
7440-02-0		Nickel, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.020		0.019	
7440-09-7		Potassium, dissolved	D	MG/L	846 6010C	9.1		17		95		70	
7782-49-2		Selenium, dissolved	D	MG/L	846 6010C	<0.10		<0.10		<0.10		<0.10	
7440-23-5		Sodium, dissolved	D	MG/L	846 6010C	97		160		2800		2400	
7440-66-6		Zinc, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6807	8004-6807	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-3D	GWMP-3D	GWMP-3D	
Sample Sequence #	5	6	7	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	4/28/11 09:45	5/19/11 09:30	5/26/11 09:15	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	5/2-5/6/2011	5/23-5/24/2011	5/31-6/2/2011	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)				

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	662.87		658.76		663.81			
S0907- -		Temperature	T	°C	Fld. Meas.	-		-		-			
16887-00-6		Chloride(s)	T	MG/L	846 9056A	-		-		-			
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	-		-		-			
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	-		-		-			
S0268- -		Total Organic Carbon	T	MG/L	5310C	-		-		-			
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	-		-		-			

[1]AKGWA # is 0000-0000 for any type of blank.
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[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Facility: KU Ghent Special Waste Landfill
FINDS/UNIT: ____/ 1
Permit Number: Pending
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6807		8004-6807		8004-6807			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-3D		GWMP-3D		GWMP-3D			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- -		pH	T	units	Fld. Meas.	-		-		-			
14808-79-8		Sulfate	T	MG/L	846 9056a	-		-		-			
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	-		-		-			
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	-		-		-			
7440-38-2		Arsenic, dissolved	D	MG/L	846 6010C	<0.10		<0.10		<0.10			
7440-39-3		Barium, dissolved	D	MG/L	846 6010C	0.12		0.11		0.12			
7440-42-8		Boron, dissolved	D	MG/L	846 6010C	4.6		5.8		4.2			
7440-43-9		Cadmium, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010			
7440-70-2		Calcium, dissolved	D	MG/L	846 6010C	230		290		250			
7440-47-3		Chromium, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010			
7440-50-8		Copper, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010			
7439-89-6		Iron, dissolved	D	MG/L	846 6010C	0.045		0.055		0.050			
7439-92-1		Lead, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010			
7439-95-4		Magnesium, dissolved	D	MG/L	846 6010C	100		120		110			
7439-97-6		Mercury, dissolved	D	MG/L	846 7470A	<0.0002		<0.0002		<0.0002			
7440-02-0		Nickel, dissolved	D	MG/L	846 6010C	0.014		0.01		<0.010			
7440-09-7		Potassium, dissolved	D	MG/L	846 6010C	54		57		54			
7782-49-2		Selenium, dissolved	D	MG/L	846 6010C	<0.050		<0.050		<0.050			
7440-23-5		Sodium, dissolved	D	MG/L	846 6010C	1700		1700		1500			
7440-66-6		Zinc, dissolved	D	MG/L	846 6010C	0.012		0.013		0.010			

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BACKGROUND QUARTERLY SAMPLING - 2nd
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ____________/ 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	8004-6807
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	GWMP-3D
Sample Sequence #	1	3	2	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	6/23/11 14:15	6/23/11 16:00	6/23/11 15:10	6/30/11 10:58
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/23-7/5/11	6/23-7/5/11	6/23-7/5/11	6/30-7/12/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)				

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	666.80		690.93		659.86		665.34	
S0907- -		Temperature	T	°C	Fld. Meas.	-		-		-		19.8	
16887-00-6		Chloride	T	MG/L	846 9056A	120		150		3600		-	
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<10		<10		46		-	
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	580		910		6200		-	
S0268- -		Total Organic Carbon	T	MG/L	5310C	<1.0		1.3		<1.0		-	
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	1000		1600		12000		-	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

BACKGROUND - QUARTERLY SAMPLING - 2nd
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ______/ 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807		8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3D		GWMP-3D	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- -		pH	T	units	Fld. Meas.	7.19		7.41		7.0		7.09	
14808-79-8		Sulfate	T	MG/L	846 9056a	81		190		120		-	
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	250		400		260		-	
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	<5		<5		<5		-	
7440-38-2		Arsenic, dissolved	D	MG/L	846 6010C	<0.10		<0.10		<0.10		<0.10	
7440-39-3		Barium, dissolved	D	MG/L	846 6010C	0.056		0.026		0.12		0.18	
7440-42-8		Boron, dissolved	D	MG/L	846 6010C	1.3		1.0		3.2		9.2	
7440-43-9		Cadmium, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7440-70-2		Calcium, dissolved	D	MG/L	846 6010C	72		78		300		270	
7440-47-3		Chromium, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7440-50-8		Copper, dissolved	D	MG/L	846 6010C	<0.020		<0.020		<0.020		<0.50	
7439-89-6		Iron, dissolved	D	MG/L	846 6010C	0.030		0.041		0.037		0.058	
7439-92-1		Lead, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7439-95-4		Magnesium, dissolved	D	MG/L	846 6010C	28		48		130		130	
7439-97-6		Mercury, dissolved	D	MG/L	846 7470A	<0.0002		<0.0002		<0.0002		<0.0002	
7440-02-0		Nickel, dissolved	D	MG/L	846 6010C	<0.020		<0.020		<0.020		<0.020	
7440-09-7		Potassium, dissolved	D	MG/L	846 6010C	9.7		16		57		48	
7782-49-2		Selenium, dissolved	D	MG/L	846 6010C	<0.050		<0.050		<0.050		<0.050	
7440-23-5		Sodium, dissolved	D	MG/L	846 6010C	90		180		2200		1500	
7440-66-6		Zinc, dissolved	D	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BACKGROUND QUARTERLY SAMPLING - 3rd
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ____________/ 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	
Sample Sequence #	1	3	2	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	9/28/11 14:47	9/28/11 14:47	9/28/11 14:47	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	9/28-10/13/11	9/28-10/13/11	9/28-10/13/11	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)				

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	666.69		693.64		661.61			
S0907- -		Temperature	T	°C	Fld. Meas.	-		-		13.6			
16887-00-6		Chloride	T	MG/L	846 9056A	140		150		4000			
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<10		<10		97			
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	610		910		7100			
S0268- -		Total Organic Carbon	T	MG/L	5310C	<1.0		1.1		<1.0			
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	1100		1600		14000			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

BACKGROUND - QUARTERLY SAMPLING - 3rd
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ______/ 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3D		GWMP-3D	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- -		pH	T	units	Fld. Meas.	7.14		7.33		7.13			
14808-79-8		Sulfate	T	MG/L	846 9056a	72		200		160			
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	260		410		290			
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	<5		<5		<5			
7440-38-2		Arsenic	T	MG/L	846 6010C	<0.10		<0.10		<0.10			
7440-39-3		Barium	T	MG/L	846 6010C	0.055		0.024		0.21			
7440-42-8		Boron	T	MG/L	846 6010C	1.6		1.1		5.2			
7440-43-9		Cadmium	T	MG/L	846 6010C	<0.010		<0.010		<0.010			
7440-70-2		Calcium	T	MG/L	846 6010C	59		74		230			
7440-47-3		Chromium	T	MG/L	846 6010C	<0.010		<0.010		<0.010			
7440-50-8		Copper	T	MG/L	846 6010C	<0.020		<0.020		<0.020			
7439-89-6		Iron	T	MG/L	846 6010C	0.24		0.48		0.87			
7439-92-1		Lead	T	MG/L	846 6010C	<0.010		<0.010		<0.010			
7439-95-4		Magnesium	T	MG/L	846 6010C	24		44		110			
7439-97-6		Mercury	T	MG/L	846 7470A	<0.0002		<0.0002		<0.0002			
7440-02-0		Nickel	T	MG/L	846 6010C	<0.020		<0.020		<0.020			
7440-09-7		Potassium	T	MG/L	846 6010C	10		15		48			
7782-49-2		Selenium	T	MG/L	846 6010C	<0.050		<0.050		<0.050			
7440-23-5		Sodium	T	MG/L	846 6010C	100		160		1600			
7440-66-6		Zinc	T	MG/L	846 6010C	<0.010		<0.010		0.013			

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BACKGROUND QUARTERLY SAMPLING - 4th
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ____________/ 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	
Sample Sequence #	1	3	2	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	11/17/11 08:39	11/17/11 10:05	11/17/11 09:15	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	11/17-12/2/11	11/17-12/2/11	11/17-12/2/11	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)				

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	667.14		690.11		660.81			
S0907- -		Temperature	T	°C	Fld. Meas.	10.6		9.8		9.4			
16887-00-6		Chloride(s)	T	MG/L	846 9056A	100		120		4200			
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<10		<10		84			
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	560		840		8700			
S0268- -		Total Organic Carbon	T	MG/L	5310C	<1.0		<1.0		<1.0			
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	1000		1600		26000			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Facility: KU Ghent Special Waste Landfill FINDS/UNIT: ______/ 1

Permit Number: Pending LAB ID:

For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- -		pH	T	units	Fld. Meas.	6.99		7.19		6.99			
14808-79-8		Sulfate	T	MG/L	846 9056a	62		150		78			
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	280		390		220			
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	<5		<5		<5			
7440-38-2		Arsenic	T	MG/L	846 6010C	<0.10		<0.10		<0.10			
7440-39-3		Barium	T	MG/L	846 6010C	0.056		0.025		0.35			
7440-42-8		Boron	T	MG/L	846 6010C	1.6		1.1		4.7			
7440-43-9		Cadmium	T	MG/L	846 6010C	<0.010		<0.010		<0.010			
7440-70-2		Calcium	T	MG/L	846 6010C	140		160		330			
7440-47-3		Chromium	T	MG/L	846 6010C	<0.010		<0.010		<0.010			
7440-50-8		Copper	T	MG/L	846 6010C	<0.020		<0.020		<0.020			
7439-89-6		Iron	T	MG/L	846 6010C	0.14		0.13		0.38			
7439-92-1		Lead	T	MG/L	846 6010C	<0.010		<0.010		<0.010			
7439-95-4		Magnesium	T	MG/L	846 6010C	50		92		150			
7439-97-6		Mercury	T	MG/L	846 7470A	<0.0002		<0.0002		<0.0002			
7440-02-0		Nickel	T	MG/L	846 6010C	<0.020		<0.020		<0.020			
7440-09-7		Potassium	T	MG/L	846 6010C	10		14		50			
7782-49-2		Selenium	T	MG/L	846 6010C	<0.050		<0.050		<0.050			
7440-23-5		Sodium	T	MG/L	846 6010C	180		300		1900			
7440-66-6		Zinc	T	MG/L	846 6010C	<0.010		<0.010		<0.010			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *KU Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**________ **Quarter & Year** *2nd-2013*

Please check only ONE of the following:

X **Characterization** ___**Quarterly** ___**Semi-Annual** ~~X~~ **Annual** ___**Assessment**
WR

Please check applicable submittal: X **Groundwater** ~~X~~ **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

SIGNATURE DATE 4-1-14

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *5/28/2013* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 627-4659* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Sr Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *Mr. Eric Ferguson-Lab Technician* Phone No.: *(502) 347-4135*

Mailing Address: *9485 U.S. Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Generation Services Laboratory* Lab ID No.: ______

Contact Person: *Mr. Matthew Woodson-Scientist* Phone No.: *(502) 347-4189*

Mailing Address: *P.O. Box 437, 8815 U.S. Highway 42* (Street) *Ghent, KY* (City) *41045* (Zip)

LABORATORY RECORD #2

Laboratory: *Microbac Laboratories, Inc.* Lab ID No.: ______

Contact Person: *Ms. Laura Revlett* Phone No.: *(502) 962-6400*

Mailing Address: *3323 Gilmore Industrial Blvd.* (Street) *Louisville, KY* (City) *40213* (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING - 1st
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

Exhibit GHR-1
FINDS/UNIT: ~~Page 162 of 300~~ / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	
Sample Sequence #	3	2	1	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	5/8/13 14:10	5/8/13 13:30	5/8/13 11:31	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	5/8-5/20/13	5/8-5/20/13	5/8-5/20/13	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)				

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	663.50		695.25		698.27			
S0907- -		Temperature	T	°C	Fld. Meas.	13.9		15.9		15.7			
16887-00-6		Chloride(s)	T	MG/L	846 9056A	62.4		156		5,264			
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	6		27		524			
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	996		934		9,918			
S0268- -		Total Organic Carbon	T	MG/L	5310C	<5.00		<5.00		<5.00			
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	1,457		1,594		1,704			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING – 1st
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ____________/ 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- -		pH	T	units	Fld. Meas.	7.12		7.32		7.10			
14808-79-8		Sulfate	T	MG/L	846 9056a	343		196		70.9			
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	256		365		267			
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	<5		<5		<5			
7440-38-2		Arsenic	T	MG/L	846 6010C	<0.001		<0.001		0.001			
7440-42-8		Boron	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-43-9		Cadmium	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-70-2		Calcium	T	MG/L	846 6010C	182		93.9		462			
7440-47-3		Chromium	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-50-8		Copper	T	MG/L	846 6010C	0.002		<0.001		<0.001			
7439-89-6		Iron	T	MG/L	846 6010C	0.018		0.142		0.021			
7439-92-1		Lead	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7439-95-4		Magnesium	T	MG/L	846 6010C	74.8		52.2		185			
7439-97-6		Mercury	T	MG/L	846 7470A	0.0000069		0.0000167		0.0000041			
7440-02-0		Nickel	T	MG/L	846 6010C	<0.001		0.003		0.003			
7440-09-7		Potassium	T	MG/L	846 6010C	4.60		14.6		53.9			
7782-49-2		Selenium	T	MG/L	846 6010C	0.001		0.078		0.079			
7440-23-5		Sodium	T	MG/L	846 6010C	58.2		201		3,138			
7440-66-6		Zinc	T	MG/L	846 6010C	0.005		0.004		0.004			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *KU Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**________ **Quarter & Year** *3rd-2013*

Please check only ONE of the following:

X **Characterization** ___ **Quarterly** ___ **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: X **Groundwater** ~~X~~ wd **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler ____________________ 4-1-14
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *8/27/2013* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 627-4659* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Sr Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *Mr. Eric Ferguson-Lab Technician* Phone No.: *(502) 347-4135*

Mailing Address: *9485 U.S. Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Generation Services Laboratory* Lab ID No.: ______

Contact Person: *Mr. Matthew Woodson-Scientist* Phone No.: *(502) 347-4189*

Mailing Address: *P.O. Box 437, 8815 U.S. Highway 42* (Street) *Ghent, KY* (City) *41045* (Zip)

LABORATORY RECORD #2

Laboratory: *Microbac Laboratories, Inc.* Lab ID No.: ______

Contact Person: *Ms. Laura Revlett* Phone No.: *(502) 962-6400*

Mailing Address: *3323 Gilmore Industrial Blvd.* (Street) *Louisville, KY* (City) *40213* (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING - 3rd
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

Exhibit GHR-1
FINDS/UNIT: ~~Page 166 of 300~~ / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	
Sample Sequence #	2	3	1	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	8/27/13 11:08	8/27/13 11:44	8/27/13 10:33	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	8/27-9/11/13	8/27-9/11/13	8/27-9/11/13	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)				

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	664.35		694.38		696.97			
S0907- -		Temperature	T	°C	Fld. Meas.	15.6		14.8		15.5			
16887-00-6		Chloride(s)	T	MG/L	846 9056A	43.2		156		2,477			
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<25		<25		146			
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	926		1,020		4,956			
S0268- -		Total Organic Carbon	T	MG/L	5310C	<5.00		<5.00		<5.00			
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	1,400		1,700		895			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING – 3rd
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ____________/__1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- –		pH	T	units	Fld. Meas.	6.97		7.45		7.14			
14808-79-8		Sulfate	T	MG/L	846 9056a	280		197		79.4			
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	400		432		390			
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	<5		<5		<5			
7440-38-2		Arsenic	T	MG/L	846 6010C	<0.001		0.002		<0.001			
7440-42-8		Boron	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-43-9		Cadmium	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-70-2		Calcium	T	MG/L	846 6010C	183		89.0		197			
7440-47-3		Chromium	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-50-8		Copper	T	MG/L	846 6010C	0.001		<0.001		<0.001			
7439-89-6		Iron	T	MG/L	846 6010C	0.016		0.224		0.059			
7439-92-1		Lead	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7439-95-4		Magnesium	T	MG/L	846 6010C	73.1		48.1		78.7			
7439-97-6		Mercury	T	MG/L	846 7470A	0.0000064		0.0000121		0.0000047			
7440-02-0		Nickel	T	MG/L	846 6010C	<0.001		<0.001		0.002			
7440-09-7		Potassium	T	MG/L	846 6010C	4.80		14.3		34.4			
7782-49-2		Selenium	T	MG/L	846 6010C	<0.001		0.002		0.036			
7440-23-5		Sodium	T	MG/L	846 6010C	39.6		228		1,710			
7440-66-6		Zinc	T	MG/L	846 6010C	0.009		0.008		0.010			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *KU Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**______ **Quarter & Year** *4th-2013*

Please check only ONE of the following:

X **Characterization** ___**Quarterly** ___**Semi-Annual** ___**Annual** ___**Assessment**

Please check applicable submittal: X **Groundwater** ~~X~~ WMP **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 4-1-14
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *12/20/2013* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 627-4659* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Sr Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *Mr. Eric Ferguson-Lab Technician* Phone No.: *(502) 347-4135*

Mailing Address: *9485 U.S. Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Generation Services Laboratory* Lab ID No.: ____

Contact Person: *Mr. Matthew Woodson-Scientist* Phone No.: *(502) 347-4189*

Mailing Address: *P.O. Box 437, 8815 U.S. Highway 42* (Street) *Ghent, KY* (City) *41045* (Zip)

LABORATORY RECORD #2

Laboratory: *Microbac Laboratories, Inc.* Lab ID No.: ____

Contact Person: *Ms. Laura Revlett* Phone No.: *(502) 962-6400*

Mailing Address: *3323 Gilmore Industrial Blvd.* (Street) *Louisville, KY* (City) *40213* (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING - 4th
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

Exhibit GHR-1

FINDS/UNIT: / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	
Sample Sequence #	1	3	2	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	12/20/13 13:30	12/20/13 14:00	12/20/13 12:48	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	1/10-3/13/14	1/10-3/13/14	1/10-3/13/14	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)				

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	664.28		695.15		700.15			
S0907- -		Temperature	T	°C	Fld. Meas.	14.1		13.5		14.7			
16887-00-6		Chloride(s)	T	MG/L	846 9056A	40.6		166		3,951			
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<25		<25		143			
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	854		988		7,382			
S0268- -		Total Organic Carbon	T	MG/L	5310C	<5.00		5.63		<5.00			
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	1,390		1,691		1,304			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING - 4th
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ____________/ 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- -		pH	T	units	Fld. Meas.	7.04		7.33		7.13			
14808-79-8		Sulfate	T	MG/L	846 9056a	296		161		54.6			
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	416		444		368			
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	<5		<5		<5			
7440-38-2		Arsenic	T	MG/L	846 6010C	0.001		0.002		0.009			
7440-42-8		Boron	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-43-9		Cadmium	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-70-2		Calcium	T	MG/L	846 6010C	160		79.2		263			
7440-47-3		Chromium	T	MG/L	846 6010C	0.001		0.001		<0.001			
7440-50-8		Copper	T	MG/L	846 6010C	0.003		0.006		0.228			
7439-89-6		Iron	T	MG/L	846 6010C	0.016		0.642		0.018			
7439-92-1		Lead	T	MG/L	846 6010C	0.002		0.001		0.002			
7439-95-4		Magnesium	T	MG/L	846 6010C	67.9		44.9		117			
7439-97-6		Mercury	T	MG/L	846 7470A	0.0000014		0.0000013		0.0000012			
7440-02-0		Nickel	T	MG/L	846 6010C	0.006		0.002		0.009			
7440-09-7		Potassium	T	MG/L	846 6010C	1.00		17.8		48.5			
7782-49-2		Selenium	T	MG/L	846 6010C	<0.001		0.002		0.013			
7440-23-5		Sodium	T	MG/L	846 6010C	27.3		215		1,660			
7440-66-6		Zinc	T	MG/L	846 6010C	0.009		0.009		0.013			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**________ **Quarter & Year** *1st 2014*

Please check only ONE of the following:

X **Characterization** ___**Quarterly** ___**Semi-Annual** ___**Annual** ___**Assessment**

Please check applicable submittal: *X* **Groundwater** ___**Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 4-29-15
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *3/28/14* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station (contact: Dave Smith)*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 347-4145* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *W. Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *David Valkovci* Phone No.: *(502) 347-4134*

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Generation Service System Laboratory* Lab ID No.: ________

Contact Person: *Mr. Ed Raker* Phone No.: *(502) 347-4187*

Mailing Address: *8815 U.S. Highway 42* (Street) *Ghent, KY* (City) *401045* (Zip)

LABORATORY RECORD #2

Laboratory: *Beckmar Environmental Laboratory* Lab ID No.: ________

Contact Person: *Ms. Kimberly Fallon* Phone No.: *(502) 266-6533*

Mailing Address: *3251 Ruckriegel Parkway* (Street) *Jeffersontown* (City) *40299* (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING – 1st
Facility: KU Ghent Special Waste Landfill
Permit Number: 021-00024

FINDS/UNIT: **Exhibit GHR-1**/ 1
LAB ID: **Page 174 of 300**
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	
Sample Sequence #	2	3	1	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	3/28/14 13:02	3/28/14 13:25	3/28/14 12:35	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	3/28-4/29/14	3/28-4/29/14	3/28-4/29/14	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UP/DOWN	UP/DOWN	UP	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	664.19		694.88		698.37			
S0907- -		Temperature	T	°C	Fld. Meas.	12.0		17.5		13.4			
16887-00-6		Chloride(s)	T	MG/L	846 9056A	21.1		144.8		4,136			
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	28		44		177			
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	880		980		7,454			
S0268- -		Total Organic Carbon	T	MG/L	5310C	1.10		14.0		1.70			
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	1,411		1,649		1,335			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING – 4th
Facility: KU Ghent Special Waste Landfill
Permit Number: 021-00024

Exhibit GHR-1
FINDS/UNIT: ~~Page 175 of 300~~ / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807D			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- -		pH	T	units	Fld. Meas.	7.34		7.53		7.29			
14808-79-8		Sulfate	T	MG/L	846 9056a	261.5		213.2		64.0			
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	442		424		344			
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	<1		<1		<1			
7440-38-2		Arsenic	T	MG/L	846 6010C	0.001		0.005		<0.001			
7440-42-8		Boron	T	MG/L	846 6010C	0.800		1.567		4.026			
7440-43-9		Cadmium	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-70-2		Calcium	T	MG/L	846 6010C	156		81.9		339			
7440-50-8		Copper	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7439-89-6		Iron	T	MG/L	846 6010C	0.072		0.472		0.017			
7439-92-1		Lead	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7439-95-4		Magnesium	T	MG/L	846 6010C	64.9		34.5		114			
7439-97-6		Mercury	T	MG/L	846 7470A	0.0000026		0.0000094		0.0000025			
7440-02-0		Nickel	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-09-7		Potassium	T	MG/L	846 6010C	5.50		13.9		42.6			
7782-49-2		Selenium	T	MG/L	846 6010C	0.001		0.003		0.007			
7440-23-5		Sodium	T	MG/L	846 6010C	26.3		214		2,161			
7440-66-6		Zinc	T	MG/L	846 6010C	0.014		0.009		0.002			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**________ **Quarter & Year** *4th, 2014*

Please check only ONE of the following:

___**Characterization** ___**Quarterly** *X* **Semi-Annual** ___**Annual** ___**Assessment**

Please check applicable submittal: *X* **Groundwater** ___**Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler
SIGNATURE

4-24-15
DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *12/16/2014* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station (contact: Dave Smith)*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 347-4145* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *W. Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *David Valkovci* Phone No.: *(502) 347-4134*

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Generation Services System Laboratory* Lab ID No.: ________

Contact Person: *Mr. Ed Raker* Phone No.: *(502) 347-4187*

Mailing Address: *8815 U.S. Highway 42* (Street) *Ghent, KY* (City) *40145* (Zip)

LABORATORY RECORD #2

Laboratory: *Beckmar Environmental Laboratory* Lab ID No.: ________

Contact Person: *Kimberly Fallon* Phone No.: *(502) 266-6533*

Mailing Address: *3251 Ruckriegel Parkway* (Street) *Jeffersontown* (City) *40299* (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU Ghent Special Waste Landfill
Permit Number:021-00024

LAB ID:

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	
Sample Sequence #	2	3	1	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	12/16/14 11:15	12/16/14 11:55	12/16/14 10:40	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	12/16-1/27	12/16-1/27	12/16-1/27	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UP/DOWN	UP/DOWN	UP	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	664.88		695.22		699.97			
S0296- -	0	pH		units	Fld. Meas.	7.20		7.38		7.30			
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	1,259		1,942		1,090			
S0145- -	1	Temperature		°C	Fld. Meas.	12.9		12.8		12.2			
16887-00-6	2	Chloride(s)	T	MG/L	9056A	15		163		3,455			
18785-72-3	0	Sulfate	T	MG/L	9056A	181		178		66.4			
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	730		1,078		6,360			
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	53.0		141		433			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU Ghent Special Waste Landfill
Permit Number: 021-00024

FINDS/UNIT: / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3D			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	25.7		36.7		<5.00			
7440-42-8		Boron	T	MG/L	6010C	<0.001		0.001		0.002			
7440-59-4		Calcium	T	MG/L	6010C	137		110		547			
7440-50-8	0	Copper	T	MG/L	6010C	<0.001		<0.001		0.002			
7440-23-5	0	Sodium	T	MG/L	6010C	24.0		238		2,035			

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**______ **Quarter & Year** *2nd 2015*

Please check only ONE of the following:

___**Characterization** ___**Quarterly** *X* **Semi-Annual** ___**Annual** ___**Assessment**

Please check applicable submittal: *X* **Groundwater** ___**Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler — 8-3-15
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU Ghent Special Waste Landfill
Permit Number:021-00024

FINDS/UNIT:______/ 1
LAB ID:__________

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6810	8004-6809	8004-6807
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-1 (DUP)	GWMP-2	GWMP-3D
Sample Sequence #	2	3	4	1
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	5/28/15 10:00	5/28/15 10:01	5/28/15 10:20	5/28/15 9:30
Duplicate ("Y" or "N")[2]	No	Yes	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	5/28-6/29/15	5/28-6/29/15	5/28-6/29/15	5/28-6/29/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UP/DOWN	UP/DOWN	UP/DOWN	UP

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	665.61				695.00		698.74	
S0296- -	0	pH		units	Fld. Meas.	7.30		7.30		7.80		7.40	
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	1,170				1,196		1,198	
S0145- -	1	Temperature		°C	Fld. Meas.	12.5		12.7		13.0		12.1	
16887-00-6	2	Chloride(s)	T	MG/L	9056A	12.1		12.0		63.9		4,065.4	
18785-72-3	0	Sulfate	T	MG/L	9056A	189.8		186.9		89.5		71.1	
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	813		762		774		6,797	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	26		47		72		148	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

FACILITY INFORMATION SHEET

Sampling Date: *5/28/2015* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station (contact: Dave Smith)*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 347-4145* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *W. Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *David Valkovci* Phone No.: *(502) 347-4134*

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Beckmar Environmental Laboratory* Lab ID No.: ________

Contact Person: *Kimberly Fallon* Phone No.: *(502) 266-6533*

Mailing Address: *3251 Ruckriegel Parkway* (Street) *Jeffersontown, KY* (City) *40299* (Zip)

LABORATORY RECORD #2

Laboratory: *Fouser Environmental Laboratory* Lab ID No.: ________

Contact Person: *Christina Thomas* Phone No.: *(859) 873-6211*

Mailing Address: *165 Camden Avenue* (Street) *Versailles, KY* (City) *40383* (Zip)

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU Ghent Special Waste Landfill
Permit Number: 021-00024

FINDS/UNIT: / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6810		8004-6809		8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-1		GWMP-2		GWMP-3D	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	1.4		1.4		17		2.5	
7440-42-8		Boron	T	MG/L	6010C	0.20		0.23		0.86		3.33	
7440-59-4		Calcium	T	MG/L	6010C	293.330		225.875		55.791		343.014	
7440-50-8	0	Copper	T	MG/L	6010C	<0.020		<0.020		<0.020		<0.020	
7440-23-5	0	Sodium	T	MG/L	6010C	18.846		18.493		215.860		2,240.847	

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *Ghent Station* Activity *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* Finds/Unit No.________ Quarter & Year *4th 2015*

Please check only ONE of the following:

___Characterization ___Quarterly *X* Semi-Annual ___Annual ___Assessment

Please check applicable submittal: *X* Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

SIGNATURE 1-7-16
DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *11/5/2015* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station (contact: Dave Smith)*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 347-4145* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *W. Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *Eric Ferguson* Phone No.: *(502) 347-4134*

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Beckmar Environmental Laboratory* Lab ID No.: ______

Contact Person: *Kimberly Fallon* Phone No.: *(502) 266-6533*

Mailing Address: *3251 Ruckriegel Parkway* (Street) *Jeffersontown, KY* (City) *40299* (Zip)

LABORATORY RECORD #2

Laboratory: *Alloway Laboratories* Lab ID No.: *90018*

Contact Person: *Erin L. Hohman* Phone No.: *(800) 873-2835*

Mailing Address: *1776 Marion-Waldo Road* (Street) *Marion, OH* (City) *43302* (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: KU Ghent Special Waste Landfill
Permit Number:021-00024

FINDS/UNIT: ______/ 1
LAB ID: ________

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	
Sample Sequence #	2	3	1	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	11/5/15 14:31	11/5/15 15:10	11/5/15 13:28	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	11/19-12/4/15	11/19-12/4/15	11/19-12/4/15	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	UP/DOWN	UP/DOWN	UP	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	665.69		694.54		697.97			
S0296- -	0	pH		units	Fld. Meas.	7.40		7.60		7.00			
S0145- -	1	Specific Conductance		UHMS/CM	Fld. Meas.	1,352		2,040		>2,000			
S0145- -	1	Temperature		°C	Fld. Meas.	16.5		14.3		15.5			
16887-00-6	2	Chloride(s)	T	MG/L	9056A	23.7		150		213			
18785-72-3	0	Sulfate	T	MG/L	9056A	190		98		146			
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	796		1,193		28,203			
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	50		230		743			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: KU Ghent Special Waste Landfill
Permit Number: 021-00024

FINDS/UNIT: ______ / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8004-6810		8004-6809		8004-6807			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						GWMP-1		GWMP-2		GWMP-3D			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	1.1		52		1.5			
7440-42-8		Boron	T	MG/L	6010C	<0.50		2.4		4.1			
7440-59-4		Calcium	T	MG/L	6010C	155		79.9		520			
7440-50-8	0	Copper	T	MG/L	6010C	0.002		0.002		<0.001			
7440-23-5	0	Sodium	T	MG/L	6010C	46.2		378		2,620			

Ghent Station
Surface Water Reports

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**____ **Quarter & Year** *Various-2011 & 2013*

Please check only ONE of the following:

X **Characterization** ___ **Quarterly** ___ **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: ~~X~~ **Groundwater** X **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler — 11-27-13
SIGNATURE — DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *6/23/11; 9/27/11; 11/16/11 & 7/3/13* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 627-4659* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Sr Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL
(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *David Valkovci* Phone No.: *(502) 347-4134*

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Microbac Laboratories, Inc.* Lab ID No.: ____________

Contact Person: *Ms. Laura Revlett* Phone No.: *(502) 962-6400*

Mailing Address: *3323 Gilmore Industrial Blvd.* (Street) *Louisville, KY* (City) *40213* (Zip)

LABORATORY RECORD #2

Laboratory: ______________________ Lab ID No.: ________

Contact Person: ______________________ Phone No.: ____________

Mailing Address: ______________________
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BACKGROUND QUARTERLY SAMPLING - 1st Event
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

Exhibit GHR-1
FINDS/UNIT: ~~Page 191 of 300~~
LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	UPSTREAM	DOWNSTREAM	UPSTREAM	DOWNSTREAM
Sample Sequence #	2	1	3	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	6/23/11 12:00	6/23/11 10:15	6/23/11 12:46	6/23/2011 13:25
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	SWMP-01-N	SWMP-02-N	SWMP-01-S	SWMP-02-S
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/27-7/5/11	6/27-7/5/11	6/27-7/5/11	6/27-7/5/11

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow	T	Gal./Min.	Fld. Meas.	80		300		30		2,950	
16887-00-6		Chloride(s)	T	MG/L	300.0	32		14		6.8		8.6	
14808-79-8		Sulfate	T	MG/L	300.0	33		36		18		17	
7439-89-6		Iron	T	MG/L	200.7	0.59		1.8		7.0		8.9	
7440-23-5		Sodium	T	MG/L	200.7	14		6.0		7.1		6.2	
S0268- -		Organic Carbon	T	MG/L	5310C	2.3		5.7		8.4		5.9	
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<10		18		28		17	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

BACKGROUND – QUARTERLY SAMPLING – 1st Event
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

SURFACE WATER SAMPLE ANALYSIS – (Cont.)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")						UPSTREAM		DOWNSTREAM		UPSTREAM		DOWNSTREAM	
Facility Sample ID Number (if applicable)						SWMP-01-N		SWMP-02-N		SWMP-01-S		SWMP-02-S	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	600		480		350		350	
S0270- -		Total Suspended Solids	T	MG/L	I-3765-85	22		43		210		200	
S0266- -		Total Dissolved Solids	T	MG/L	2540C	350		320		250		300	
S0269- -		Total Solids	T	MG/L	I-3750-85	380		360		460		450	
S0296- -		pH	T	units	Fld. Meas.	8.01		8.27		7.82		8.15	
S0907- -		Temperature	T	°C	Fld. Meas.	19.8		19.4		19.6		21.4	
7440-38-2		Arsenic	T	MG/L	200.7	<0.10		<0.10		<0.10		<0.10	
7440-42-8		Boron	T	MG/L	200.7	<0.5		<0.5		<0.5		<0.5	
7440-43-9		Cadmium	T	MG/L	200.7	<0.010		<0.010		<0.010		<0.010	
7440-70-2		Calcium	T	MG/L	200.7	100		80		53		56	
7440-50-8		Copper	T	MG/L	200.7	<0.020		<0.020		<0.020		<0.020	
7439-92-1		Lead	T	MG/L	200.7	<0.010		<0.010		<0.010		<0.010	
7439-97-6		Mercury	T	MG/L	245.1	<0.0002		<0.0002		<0.0002		<0.0002	
7440-02-0		Nickel	T	MG/L	200.7	<0.020		<0.020		<0.020		<0.020	
7782-49-2		Selenium	T	MG/L	200.7	<0.050		<0.050		<0.050		<0.050	
7440-66-6		Zinc	T	MG/L	200.7	<0.010		<0.010		0.017		0.020	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BACKGROUND QUARTERLY SAMPLING – 1st Event
Facility: KU Ghent Special Waste Landfill
Permit Number: 021-00024

FINDS/UNIT: ____________/ 1
LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	-			
Sample Sequence #	5			
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	F			
Sample Date and Time (Month/Day/Year hour:minutes)	6/23/11 13:50			
Duplicate ("Y" or "N")[2]	No			
Split ("Y" or "N")[3]	No			
Facility Sample ID Number (if applicable)	FIELD BLANK			
Laboratory Sample ID Number (if applicable)	Not Applicable			
Date of Analysis (Month/Day/Year)	6/27-7/5/11			

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow	T	Gal./Min.	Fld. Meas.	-							
16887-00-6		Chloride(s)	T	MG/L	300.0	<0.50							
14808-79-8		Sulfate	T	MG/L	300.0	<0.50							
7439-89-6		Iron	T	MG/L	200.7	<0.010							
7440-23-5		Sodium	T	MG/L	200.7	<2.0							
S0268- -		Organic Carbon	T	MG/L	5310C	<0.5							
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<10							

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

BACKGROUND – QUARTERLY SAMPLING – 1st Event
Facility: KU Ghent Special Waste Landfill
Permit Number: 021-00024

FINDS/UNIT: ____/ 1
LAB ID:
For official Use only

SURFACE WATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number					-							
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)					FIELD BLANK							
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	<0.50							
S0270- -		Total Suspended Solids	T	MG/L	I-3765-85	<0.50							
S0266- -		Total Dissolved Solids	T	MG/L	2540C	<0.5							
S0269- -		Total Solids	T	MG/L	I-3750-85	<0.10							
S0296- -		pH	T	units	Fld. Meas.	-							
S0907- -		Temperature	T	°C	Fld. Meas.	-							
7440-38-2		Arsenic	T	MG/L	200.7	<0.50							
7440-42-8		Boron	T	MG/L	200.7	<0.020							
7440-43-9		Cadmium	T	MG/L	200.7	<0.010							
7440-70-2		Calcium	T	MG/L	200.7	<0.010							
7440-50-8		Copper	T	MG/L	200.7	<0.0002							
7439-92-1		Lead	T	MG/L	200.7	<0.020							
7439-97-6		Mercury	T	MG/L	245.1	<0.050							
7440-02-0		Nickel	T	MG/L	200.7	<2.0							
7782-49-2		Selenium	T	MG/L	200.7	<0.010							

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BACKGROUND QUARTERLY SAMPLING – 2nd Event
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

Exhibit GHR-1
FINDS/UNIT: ~~Page 195 of 300~~/ 1
LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	UPSTREAM	DOWNSTREAM	DOWNSTREAM	-
Sample Sequence #	2	1	3	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Field
Sample Date and Time (Month/Day/Year hour:minutes)	9/27/11 14:05	9/27/11 11:30	9/27/11 15:25	9/27/2011 16:23
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	SWMP-01-N	SWMP-02-N	SWMP-02-S	BLANK
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	9/27-10/6/11	9/27-10/6/11	9/27-10/6/11	9/30-10/6/11

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow	T	Gal./Min.	Fld. Meas.	110		130		940		-	
16887-00-6		Chloride(s)	T	MG/L	300.0	29		17		10		<0.5	
14808-79-8		Sulfate	T	MG/L	300.0	30		42		29		<0.5	
7439-89-6		Iron	T	MG/L	200.7	0.70		1.2		0.78		<0.050	
7440-23-5		Sodium	T	MG/L	200.7	9.5		6.7		6.7		<0.50	
S0268- -		Organic Carbon	T	MG/L	5310C	3.7		3.9		4.3		<0.5	
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<10		<10		<10		11	

[1]AKGWA # is 0000-0000 for any type of blank.
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[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

BACKGROUND – QUARTERLY SAMPLING – 2nd Event
Facility: KU Ghent Special Waste Landfill
Permit Number: 021-00024

FINDS/UNIT: ______/ 1
LAB ID:
For official Use only

SURFACE WATER SAMPLE ANALYSIS – (Cont.)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")						UPSTREAM		DOWNSTREAM		DOWNSTREAM		-	
Facility Sample ID Number (if applicable)						SWMP-01-N		SWMP-02-N		SWMP-01-S		BLANK	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0145- –		Specific Conductance	T	UHMS/CM	Fld. Meas.	470		470		380		1.9	
S0270- –		Total Suspended Solids	T	MG/L	I-3765-85	20		20		6		<5	
S0266- –		Total Dissolved Solids	T	MG/L	2540C	300		310		230		<50	
S0269- –		Total Solids	T	MG/L	I-3750-85	320		320		250		20	
S0296- –		pH	T	units	Fld. Meas.	6.96		7.01		7.74		-	
S0907- –		Temperature	T	°C	Fld. Meas.	16.0		15.8		15.8		-	
7440-38-2		Arsenic	T	MG/L	200.7	<0.10		<0.10		<0.10		<0.10	
7440-42-8		Boron	T	MG/L	200.7	<0.5		<0.5		<0.5		<0.5	
7440-43-9		Cadmium	T	MG/L	200.7	<0.010		<0.010		<0.010		<0.010	
7440-70-2		Calcium	T	MG/L	200.7	78		84		64		<0.50	
7440-50-8		Copper	T	MG/L	200.7	<0.020		<0.020		<0.020		<0.020	
7439-92-1		Lead	T	MG/L	200.7	<0.010		<0.010		<0.010		<0.010	
7439-97-6		Mercury	T	MG/L	245.1	<0.0002		<0.0002		<0.0002		<0.0002	
7440-02-0		Nickel	T	MG/L	200.7	<0.020		<0.020		<0.020		<0.020	
7782-49-2		Selenium	T	MG/L	200.7	<0.050		<0.050		<0.050		<0.050	
7440-66-6		Zinc	T	MG/L	200.7	<0.010		<0.010		<0.010		<0.010	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BACKGROUND QUARTERLY SAMPLING - 3rd Event
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

Exhibit GHR-1
FINDS/UNIT: ~~Page 197 of 300~~/ 1
LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	UPSTREAM	DOWNSTREAM	UPSTREAM	DOWNSTREAM
Sample Sequence #	3	1	4	5
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/16/11 11:15	11/16/11 10:33	11/16/11 13:51	11/16/2011 14:18
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	SWMP-01-N	SWMP-02-N	SWMP-01-S	SWMP-02-S
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/16-12/2/11	11/16-12/2/11	11/16-12/2/11	11/16-12/2/11

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow	T	Gal./Min.	Fld. Meas.	561		2,100		200		17,107	
16887-00-6		Chloride	T	MG/L	846 9056A	5.4		5.9		5.3		13	
14808-79-8		Sulfate	T	MG/L	846 9056a	14		23		14		18	
7439-89-6		Iron	T	MG/L	846 6010C	6.0		4.7		4.7		4.7	
7440-23-5		Sodium	T	MG/L	846 6010C	5.4		3.9		4.3		8.1	
S0268- -		Organic Carbon	T	MG/L	5310C	8.2		6.5		6.5		5.7	
S0130- -		Chemical Oxygen Demand		MG/L	5220D	36		31		30		34	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

BACKGROUND - QUARTERLY SAMPLING - 3rd Event
Facility: KU Ghent Special Waste Landfill
Permit Number: 021-00024

FINDS/UNIT: ______/ 1
LAB ID:
For official Use only

SURFACE

~~GROUNDWATER~~ SAMPLE ANALYSIS - (Cont.)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")						UPSTREAM		DOWNSTREAM		UPSTREAM		DOWNSTREAM	
Facility Sample ID Number (if applicable)						SWMP-01-N		SWMP-02-N		SWMP-01-S		SWMP-02-S	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	240		360		390		390	
S0270- -		Total Suspended Solids	T	MG/L	I-3765-85	26		48		39		61	
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	240		220		290		290	
S0269- -		Total Solids	T	MG/L	I-3750-85	220		290		220		340	
S0296- -		pH	T	units	Fld. Meas.	7.60		7.47		7.27		7.30	
S0907- -		Temperature	T	°C	Fld. Meas.	11.8		11.4		11.6		11.4	
7440-38-2		Arsenic	T	MG/L	846 6010C	<0.10		<0.10		<0.10		<0.10	
7440-42-8		Boron	T	MG/L	846 6010C	<0.5		<0.5		<0.5		<0.5	
7440-43-9		Cadmium	T	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7440-70-2		Calcium	T	MG/L	846 6010C	35		59		45		66	
7440-50-8		Copper	T	MG/L	846 6010C	<0.020		<0.020		<0.020		<0.020	
7439-92-1		Lead	T	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7439-97-6		Mercury	T	MG/L	846 7470A	<0.0002		<0.0002		<0.0002		<0.0002	
7440-02-0		Nickel	T	MG/L	846 6010C	<0.020		<0.020		<0.020		<0.020	
7782-49-2		Selenium	T	MG/L	846 6010C	<0.050		<0.050		<0.050		<0.050	
7440-66-6		Zinc	T	MG/L	846 6010C	0.018		0.016		0.015		0.031	

BACKGROUND QUARTERLY SAMPLING – 4th Event
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

FINDS/UNIT: ______ / 1
LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	DOWNSTREAM			
Sample Sequence #	2			
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable			
Sample Date and Time (Month/Day/Year hour:minutes)	11/16/11 11:15			
Duplicate ("Y" or "N")[2]	Yes			
Split ("Y" or "N")[3]	No			
Facility Sample ID Number (if applicable)	SWMP-02-ND			
Laboratory Sample ID Number (if applicable)	Not Applicable			
Date of Analysis (Month/Day/Year)	11/16-12/2/11			

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow	T	Gal./Min.	Fld. Meas.	204							
16887-00-6		Chloride	T	MG/L	300.0	5.6							
14808-79-8		Sulfate	T	MG/L	300.0	22							
7439-89-6		Iron	T	MG/L	200.7	4.7							
7440-23-5		Sodium	T	MG/L	200.7	4.0							
S0268- -		Organic Carbon	T	MG/L	5310C	6.5							
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	29							

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

BACKGROUND – QUARTERLY SAMPLING – 4^{th} Event
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

FINDS/UNIT: ______/ 1
LAB ID:
For official Use only

SURFACE WATER SAMPLE ANALYSIS - (Cont.)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	DOWNSTREAM			
Facility Sample ID Number (if applicable)	SWMP-02-ND			

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	360							
S0270- -		Total Suspended Solids	T	MG/L	I-3765-85	48							
S0266- -		Total Dissolved Solids	T	MG/L	2540C	270							
S0267- -		Total Solids	T	MG/L	I-3750-85	310							
S0296- -		pH	T	units	Fld. Meas.	7.47							
S0907- -		Temperature	T	°C	Fld. Meas.	11.4							
7440-38-2		Arsenic	T	MG/L	200.7	<0.10							
7440-42-8		Boron	T	MG/L	200.7	<0.5							
7440-43-9		Cadmium	T	MG/L	200.7	<0.010							
7440-70-2		Calcium	T	MG/L	200.7	60							
7440-50-8		Copper	T	MG/L	200.7	<0.020							
7439-92-1		Lead	T	MG/L	200.7	<0.010							
7439-97-6		Mercury	T	MG/L	245.1	<0.0002							
7440-02-0		Nickel	T	MG/L	200.7	<0.020							
7782-49-2		Selenium	T	MG/L	200.7	<0.020							
7440-66-6		Zinc	T	MG/L	200.7	0.016							

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BACKGROUND QUARTERLY SAMPLING - 4th Event
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

Exhibit GHR-1
~~Page 201 of 300~~
FINDS/UNIT: / 1
LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	UPSTREAM	DOWNSTREAM	DOWNSTREAM	-
Sample Sequence #	3	2	1	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	(F)
Sample Date and Time (Month/Day/Year hour:minutes)	7/3/13 12:35	7/3/13 12:04	7/3/13 11:13	7/3/13 14:00
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	SWMP-01-N	SWMP-02-N	SWMP-02-S	Field Blank
Laboratory Sample ID Number (if applicable)	1	2	3	4
Date of Analysis (Month/Day/Year)	7/3-12/13	7/3-12/13	7/3-12/13	7/3-12/13

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow	T	Gal./Min.	Fld. Meas.	90		204		172		-	
16887-00-6		Chloride	T	MG/L	846 9056A	37		18		16		<0.50	
14808-79-8		Sulfate	T	MG/L	846 9056a	41		300		57		<0.50	
7439-89-6		Iron	T	MG/L	846 6010C	0.74		3.2		1.3		<0.0050	
7440-23-5		Sodium	T	MG/L	846 6010C	13		12		11		<0.25	
S0268- -		Organic Carbon	T	MG/L	5310C	2.3		3.7		2.9		0.6	
S0130- -		Chemical Oxygen Demand		MG/L	5220D	<10		<10		<10		<10	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

BACKGROUND - QUARTERLY SAMPLING - 4th Event
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

FINDS/UNIT: ______/ 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")						UPSTREAM		DOWNSTREAM		DOWNSTREAM		-	
Facility Sample ID Number (if applicable)						SWMP-01-N		SWMP-02-N		SWMP-02-S		Field Blank	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	742		942		577		<10	
S0270- -		Total Suspended Solids	T	MG/L	I-3765-85	120		81		27		<5	
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	420		660		340		<50	
S0269- -		Total Solids	T	MG/L	I-3750-85	580		750		380		<50	
S0296- -		pH	T	units	Fld. Meas.	7.80		7.81		8.16		6.72	
S0907- -		Temperature	T	°C	Fld. Meas.	18.9		16.9		20.8		-	
7440-38-2		Arsenic	T	MG/L	846 6010C	<0.050		<0.050		<0.050		<0.050	
7440-42-8		Boron	T	MG/L	846 6010C	<1.0		<1.0		<1.0		<0.25	
7440-43-9		Cadmium	T	MG/L	846 6010C	<0.0050		<0.0050		<0.0050		<0.0050	
7440-70-2		Calcium	T	MG/L	846 6010C	120		160		88		<0.25	
7440-50-8		Copper	T	MG/L	846 6010C	<0.010		<0.010		<0.010		<0.010	
7439-92-1		Lead	T	MG/L	846 6010C	<0.0050		<0.0050		<0.0050		<0.0050	
7439-97-6		Mercury	T	MG/L	846 7470A	<0.00020		<0.00020		<0.00020		<0.00020	
7440-02-0		Nickel	T	MG/L	846 6010C	<0.0050		<0.0050		<0.0050		<0.0050	
7782-49-2		Selenium	T	MG/L	846 6010C	<0.025		<0.025		<0.025		<0.025	
7440-66-6		Zinc	T	MG/L	846 6010C	<0.0050		0.0074		<0.0050		<0.0050	

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *KU Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**________ **Quarter & Year** *3rd-2013*

Please check only ONE of the following:

X **Characterization** ___**Quarterly** ___**Semi-Annual** ___**Annual** ___**Assessment**

Please check applicable submittal: ___**Groundwater** *X* **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

SIGNATURE 4-1-14 DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *8/27/2013* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 627-4659* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Sr Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL
(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *Mr. Eric Ferguson-Lab Technician* Phone No.: *(502) 347-4135*

Mailing Address: *9485 U.S. Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Generation Services Laboratory* Lab ID No.: ______

Contact Person: *Mr. Matthew Woodson-Scientist* Phone No.: *(502) 347-4189*

Mailing Address: *P.O. Box 437, 8815 U.S. Highway 42* (Street) *Ghent, KY* (City) *41045* (Zip)

LABORATORY RECORD #2

Laboratory: *Microbac Laboratories, Inc.* Lab ID No.: ______

Contact Person: *Ms. Laura Revlett* Phone No.: *(502) 962-6400*

Mailing Address: *3323 Gilmore Industrial Blvd.* (Street) *Louisville, KY* (City) *40213* (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING - 3rd
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3D	
Sample Sequence #	2	3	1	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	8/27/13 11:08	8/27/13 11:44	8/27/13 10:33	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	8/27-9/11/13	8/27-9/11/13	8/27-9/11/13	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)				

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906- -		Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	664.35		694.38		696.97			
S0907- -		Temperature	T	°C	Fld. Meas.	15.6		14.8		15.5			
16887-00-6		Chloride(s)	T	MG/L	846 9056A	43.2		156		2,477			
S0130- -		Chemical Oxygen Demand	T	MG/L	5220D	<25		<25		146			
S0266- -		Total Dissolved Solids	T	MG/L	I-1750-85	926		1,020		4,956			
S0268- -		Total Organic Carbon	T	MG/L	5310C	<5.00		<5.00		<5.00			
S0145- -		Specific Conductance	T	UHMS/CM	Fld. Meas.	1,400		1,700		895			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

BASELINE/BACKGROUND QUARTERLY SAMPLING - 3rd
Facility: KU Ghent Special Waste Landfill
Permit Number: Pending

FINDS/UNIT: ____________/ 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number	8004-6810	8004-6809	8004-6807	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	GWMP-1	GWMP-2	GWMP-3	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0296- -		pH	T	units	Fld. Meas.	6.97		7.45		7.14			
14808-79-8		Sulfate	T	MG/L	846 9056a	280		197		79.4			
71-52-3		Alkalinity, Bicarbonate	T	MG/L	2320B	400		432		390			
3812-32-6		Alkalinity, Carbonate	T	MG/L	2320B	<5		<5		<5			
7440-38-2		Arsenic	T	MG/L	846 6010C	<0.001		0.002		<0.001			
7440-42-8		Boron	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-43-9		Cadmium	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-70-2		Calcium	T	MG/L	846 6010C	183		89.0		197			
7440-47-3		Chromium	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7440-50-8		Copper	T	MG/L	846 6010C	0.001		<0.001		<0.001			
7439-89-6		Iron	T	MG/L	846 6010C	0.016		0.224		0.059			
7439-92-1		Lead	T	MG/L	846 6010C	<0.001		<0.001		<0.001			
7439-95-4		Magnesium	T	MG/L	846 6010C	73.1		48.1		78.7			
7439-97-6		Mercury	T	MG/L	846 7470A	0.0000064		0.0000121		0.0000047			
7440-02-0		Nickel	T	MG/L	846 6010C	<0.001		<0.001		0.002			
7440-09-7		Potassium	T	MG/L	846 6010C	4.80		14.3		34.4			
7782-49-2		Selenium	T	MG/L	846 6010C	<0.001		0.002		0.036			
7440-23-5		Sodium	T	MG/L	846 6010C	39.6		228		1,710			
7440-66-6		Zinc	T	MG/L	846 6010C	0.009		0.008		0.010			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name ___*KU Ghent Station*___ Activity ___*Special Waste Landfill*___
(As officially shown on DWM Permit Face)

Permit No. ___*021-00024*___ Finds/Unit No. ______ Quarter & Year ___~~*2nd*~~ 3RD *-2014*___ WMP

Please check only ONE of the following:

_*X*_ Characterization ___Quarterly ___Semi-Annual ___Annual ___Assessment

Please check applicable submittal: ___Groundwater _*X*_ Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler ______ 1-12-16
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *7/28/14* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* *Ghent* *41045*
Street City Zip

Phone No.: *(502) 627-4659* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* *Louisville* *40232*
Street City Zip

SAMPLING PERSONNEL
(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *David Valkovci* Phone No.: *(502) 347-4134*

Mailing Address: *9485 US Highway 42E* *Ghent* *41045*
Street City Zip

LABORATORY RECORD #1

Laboratory: *Generation Services System Laboratory* Lab ID No.: ________

Contact Person: *Mr. Edgar Raker* Phone No.: *(502) 347-4187*

Mailing Address: *8815 U.S. Highway 42* *Ghent, KY* *41045*
Street City Zip

LABORATORY RECORD #2

Laboratory: ______________________ Lab ID No.: ________

Contact Person: ______________________ Phone No.: ________

Mailing Address: ______________________
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

OPERATIONAL SEMI-ANNUAL SAMPLING
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

FINDS/UNIT: 1
LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	UPSTREAM	DOWNSTREAM	DOWNSTREAM	UPSTREAM
Sample Sequence #	1	2	3	-
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	7/28/14 12:55	7/28/14 13:20	7/28/14 13:45	-
Duplicate ("Y" or "N")[2]	No	No	No	-
Split ("Y" or "N")[3]	No	No	No	-
Facility Sample ID Number (if applicable)	SWMP-01-N	SWMP-02-N	SWMP-02-S	SWMP-01-S
Laboratory Sample ID Number (if applicable)	-	-	-	-
Date of Analysis (Month/Day/Year)	7/28 - 9/19/14	7/28 - 9/19/14	7/28 - 9/19/14	-

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow	T	Gal./Min.	Fld. Meas.	486		1,868		4,894		0	
S0145- -		Specific Conductance	T	umhos /cm	SM 2510B	594		749		802		-	
S0296- -		pH	T	STD unit	Fld. Meas.	8.00		8.30		8.20		-	
S0266- -		Total Dissolved Solids	D	MG/L	SM 2540C	346		544		870		-	
16887-00-6		Chloride	T	MG/L	EPA 300.0	35.6		9.70		10.8		-	
7440-23-5		Sodium	T	MG/L	EPA 200.7	-		-		-		-	
14808-79-8		Sulfates	T	MG/L	EPA 300.0	31.5		287		515		-	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

OPERATIONAL SEMI-ANNUAL SAMPLING
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

FINDS/UNIT: ____________/ 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")						UPSTREAM		DOWNSTREAM		DOWNSTREAM		UPSTREAM	
Facility Sample ID Number (if applicable)						SWMP-01-N		SWMP-02-N		SWMP-02-S		SWMP-01-S	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2		Calcium	T	MG/L	EPA 200.7	91.6		126		204		-	
7440-50-8		Copper	T	MG/L	EPA 200.7	<0.001		<0.001		<0.001		-	

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *KU Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**______ **Quarter & Year** *2nd 2015*

Please check only ONE of the following:

X **Characterization** ___**Quarterly** ___**Semi-Annual** ___**Annual** ___**Assessment**

Please check applicable submittal: ___**Groundwater** *X* **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 8-3-15
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *5/29/15* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 627-4659* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *David Valkovci* Phone No.: *(502) 347-4134*

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Beckmar Environmental Laboratory* Lab ID No.: ______

Contact Person: *Ms. Kimberly Fallon* Phone No.: *(502) 266-6533*

Mailing Address: *3251 Ruckreigel Parkway* (Street) *Jeffersontown, KY* (City) *40299* (Zip)

LABORATORY RECORD #2

Laboratory: ______ Lab ID No.: ______

Contact Person: ______ Phone No.: ______

Mailing Address: ______ (Street) (City) (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

OPERATIONAL SEMI-ANNUAL SAMPLING
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

FINDS/UNIT: / 1
LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

	UPSTREAM	DOWNSTREAM	DOWNSTREAM	DOWNSTREAM
Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	UPSTREAM	DOWNSTREAM	DOWNSTREAM	DOWNSTREAM
Sample Sequence #	1	2	-	3
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	-	-	-	-
Sample Date and Time (Month/Day/Year hour:minutes)	5/29/15 8:00	5/29/15 8:30	DNS	5/29/15 8:35
Duplicate ("Y" or "N")[2]	N	N	N	N
Split ("Y" or "N")[3]	N	N	N	N
Facility Sample ID Number (if applicable)	SWMP-01-N	SWMP-02-N	SWMP-01-S	SWMP-02-S
Laboratory Sample ID Number (if applicable)	BMSG150529-011	BMSG150529-012	-	BMSG1505029-013
Date of Analysis (Month/Day/Year)	5/29-6/3/15	5/29-6/3/15	-	5/29-6/3/15

CAS RN[4]		CONSTITUENT	T D[5]	UNIT OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow		Gal./Min.	Fld. Meas.	<5		<5		No Flow		635	
16887-00-6		Chloride	T	MG/L	846 9056A	29.0		29.1		DNS		11.1	
7439-89-6		Iron	T	MG/L	846 6010C	0.338		10.394		DNS		0.976	
S0296- -		pH		units	Fld. Meas.	7.70		8.00		DNS		8.20	
7440-23-5		Sodium	T	MG/L	846 6010C	13.058		20.326		DNS		10.791	
S0145- -		Specific Conductance		UHMS/CM	Fld. Meas.	691		1,260		DNS		516	
14808-79-8		Sulfate	T	MG/L	846 9056A	44.3		561.4		DNS		71.2	
S0907- -		Temperature		°C	Fld. Meas.	16.4		13.0		DNS		19.9	
S0266- -		Total Dissolved Solids	T	MG/L	I-3765-85	412		1,035		DNS		303	
S0270- -		Total Suspended Solids	T	MG/L	I-1750-85	13		122		DNS		26	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

OPERATIONAL SEMI-ANNUAL SAMPLING
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	DOWNSTREAM			
Sample Sequence #	3			
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	-			
Sample Date and Time (Month/Day/Year hour:minutes)	5/29/15 8:35			
Duplicate ("Y" or "N")[2]	Y			
Split ("Y" or "N")[3]	N			
Facility Sample ID Number (if applicable)	SWMP-02-S (DUP)			
Laboratory Sample ID Number (if applicable)	BMSG150529-014			
Date of Analysis (Month/Day/Year)	5/29-6/3/15			

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow		Gal./Min.	Fld. Meas.	635							
16887-00-6		Chloride	T	MG/L	846 9056A	11.3							
7439-89-6		Iron	T	MG/L	846 6010C	0.974							
S0296- -		pH		units	Fld. Meas.	8.20							
7440-23-5		Sodium	T	MG/L	846 6010C	10.724							
S0145- -		Specific Conductance		UHMS/CM	Fld. Meas.	516							
14808-79-8		Sulfate	T	MG/L	846 9056A	69.5							
S0907- -		Temperature		°C	Fld. Meas.	19.9							
S0266- -		Total Dissolved Solids	T	MG/L	I-3765-85	296							
S0270- -		Total Suspended Solids	T	MG/L	I-1750-85	26							

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS DRIVE
FRANKFORT, KY 40601

Facility Name *KU Ghent Station* **Activity** *Special Waste Landfill*
(As officially shown on DWM Permit Face)

Permit No. *021-00024* **Finds/Unit No.**__________ **Quarter & Year** *4th 2015*

Please check only ONE of the following:

___Characterization ___Quarterly *X* Semi-Annual ___Annual ___Assessment

Please check applicable submittal: ___Groundwater *X* Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 1-7-16
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: *10/21/15* County: *Carroll* Permit No.: *021-00024*

Facility Name: *Kentucky Utilities Company Ghent Station*
(As officially shown on DWM Permit Face)

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

Phone No.: *(502) 627-4659* Latitude *N 38° 43' 27.5"* Longitude *W 85° 00' 33.4"*

OWNER INFORMATION

Facility Owner: *Kentucky Utilities Company* Phone No.: *(502) 627-4659*

Contact Person: *Paul Puckett* Phone No.: *(502) 627-4659*

Contact Person Title: *Engineer, Environmental Affairs Department, LG&E and KU*

Mailing Address: *P.O. Box 32010* (Street) *Louisville* (City) *40232* (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: *Kentucky Utilities Company Ghent Station Laboratory*

Contact Person: *Eric Ferguson* Phone No.: *(502) 347-4134*

Mailing Address: *9485 US Highway 42E* (Street) *Ghent* (City) *41045* (Zip)

LABORATORY RECORD #1

Laboratory: *Beckmar Environmental Laboratory* Lab ID No.: ________

Contact Person: *Ms. Kimberly Fallon* Phone No.: *(502) 266-6533*

Mailing Address: *3251 Ruckreigel Parkway* (Street) *Jeffersontown, KY* (City) *40299* (Zip)

LABORATORY RECORD #2

Laboratory: ________ Lab ID No.: ________

Contact Person: ________ Phone No.: ________

Mailing Address: ________
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

OPERATIONAL SEMI-ANNUAL SAMPLING
Permit Number: 021-00024
Facility: KU Ghent Special Waste Landfill

FINDS/UNIT: / 1
LAB ID:
For Official Use Only

SURFACE WATER SAMPLE ANALYSIS (W)

Monitoring Point (KPDES Discharge Number, or "UPSTREAM", or "DOWNSTREAM")	UPSTREAM	DOWNSTREAM	DOWNSTREAM	DOWNSTREAM
Sample Sequence #	2	1	-	3
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	-	-	-	-
Sample Date and Time (Month/Day/Year hour:minutes)	10/21/15 10:26	10/21/15 10:05	DNS	10/21/15 12:40
Duplicate ("Y" or "N")[2]	N	N	N	N
Split ("Y" or "N")[3]	N	N	N	N
Facility Sample ID Number (if applicable)	SWMP-01-N	SWMP-02-N	SWMP-01-S	SWMP-02-S
Laboratory Sample ID Number (if applicable)	151027-001C&D	151027-001A&B	-	151027-001-E&F
Date of Analysis (Month/Day/Year)	10/21-12/3/15	10/21-12/3/15	-	10/21-12/3/15

CAS RN[4]		CONSTITUENT	T D[5]	UNIT OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
A200-00-0		Flow		Gal./Min.	Fld. Meas.	<5		<5		No Flow		<5	
16887-00-6		Chloride	T	MG/L	846 9056A	25.2		58.0		DNS		15.7	
7439-89-6		Iron	T	MG/L	846 6010C	0.134		0.664		DNS		0.687	
S0296- -		pH		units	Fld. Meas.	8.00		7.60		DNS		8.20	
7440-23-5		Sodium	T	MG/L	846 6010C	11.6		38.6		DNS		15.9	
S0145- -		Specific Conductance		UHMS/CM	Fld. Meas.	801		2,230		DNS		670	
14808-79-8		Sulfate	T	MG/L	846 9056A	39.1		1,185		DNS		84.5	
S0907- -		Temperature		°C	Fld. Meas.	9.2		13.3		DNS		12.5	
S0266- -		Total Dissolved Solids	T	MG/L	I-3765-85	500		2,053		DNS		438	
S0270- -		Total Suspended Solids	T	MG/L	I-1750-85	<6		20		DNS		16	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Trimble County Station Groundwater Reports

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
14 REILLY ROAD
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** 1st 2011

Please check only ONE of the following:

___Characterization ___Quarterly X Semi-Annual ___Annual ___Assessment

Please check applicable submittal: X Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 8-8-11

SIGNATURE DATE

W. Michael Winkler-Manager of Environmental Programs

NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 6/14-16/2011 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Diana Freibert Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: Generation Services System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-8481

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	1	2	4	3
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	6/14/11 14:28	6/14/11 15:26	6/14/11 18:04	6/14/11 17:27
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/14-7/25/11	6/14-7/25/11	6/14-7/25/11	6/14-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.90		413.11		421.75		420.69	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<3.0		8.0		<3.0		26	
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	<1.0		3.4		1.3		1.1	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	17.3		7.40		9.70		511	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	472		370		478		4,658	
S0296- -	0	pH	T	units	150.1	7.10		6.59		6.60		6.59	
7440-50-8	0	Copper	T	MG/L	200.7	<0.001		0.002		<0.001		0.027	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-39-3		Boron	T	MG/L	200.7	0.038		0.042		0.066		51.0	
7440-70-2		Calcium	T	MG/L	200.7	130		102		139		769	
7440-23-5	0	Sodium	T	MG/L	200.7	5.98		9.48		7.71		20.4	
18785-72-3	0	Sulfate	T	MG/L	300.0	31.8		48.7		67.9		2,154	

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	5	6	7	8
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	6/16/11 8:51	6/16/11 9:25	6/16/11 9:52	6/16/11 10:13
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.54		420.42		422.19		422.16	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	3.0		<3.0		<3.0		<3.0	
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	1.8		1.8		1.9		2.2	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	129		56.4		25.2		258	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,126		528		612		2,390	
S0296- -	0	pH	T	units	150.1	6.97		7.02		7.09		6.87	
7440-50-8	0	Copper	T	MG/L	200.7	0.012		0.006		0.015		0.014	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-39-3		Boron	T	MG/L	200.7	11.9		0.590		0.350		22.9	
7440-70-2		Calcium	T	MG/L	200.7	228		146		156		445	
7440-23-5	0	Sodium	T	MG/L	200.7	34.4		5.50		9.16		9.61	
18785-72-3	0	Sulfate	T	MG/L	300.0	344		62.6		111		979	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Drive, 2nd Floor
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	9	10	11	13
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	6/16/11 11:35	6/16/11 13:34	6/16/11 14:24	6/16/11 16:40
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	423.89		424.02		423.57		424.06	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<3.0		<3.0		<3.0		<3.0	
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	2.2		2.1		2.3		1.8	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	5.6		31.8		35.7		28.7	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	392		520		1,280		676	
S0296- -	0	pH	T	units	150.1	7.24		7.17		7.07		7.00	
7440-50-8	0	Copper	T	MG/L	200.7	0.006		0.013		0.007		0.004	

STANDARD FLAGS:

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B = Analyte found in blank
A = Average value
N = Presumptive ID
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GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-39-3		Boron	T	MG/L	200.7	0.790		0.760		2.02		1.78	
7440-70-2		Calcium	T	MG/L	200.7	108		151		279		170	
7440-23-5	0	Sodium	T	MG/L	200.7	4.31		9.93		31.9		11.4	
18785-72-3	0	Sulfate	T	MG/L	300.0	43.5		84.7		550		175	

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
14 REILLY ROAD
FRANKFORT, KY 40601

Facility Name **Trimble County Station** **Activity** **Ash Pond**
(As officially shown on DWM Permit Face)

Permit No. **112-00003** **Finds/Unit No.**________ **Quarter & Year** **2nd 2011**

Please check only ONE of the following:

___ **Characterization** ___ **Quarterly** **X** **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: **X** **Groundwater** ___ **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 1-13-12

SIGNATURE DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 12/7-8/2011 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	12	11	10	9
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/8/11 12:33	12/8/11 11:03	12/8/11 10:36	12/8/11 9:55
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/14-7/25/11	6/14-7/25/11	6/14-7/25/11	6/14-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	431.73		434.27		431.96		431.94	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7		11		<7		9	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		2.2		1.2		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	26.2		8.40		11.9		548	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	416		384		508		4,750	
S0296- -	0	pH	T	units	150.1	7.53		7.16		7.36		6.81	
7440-50-8	0	Copper	D	MG/L	200.7	<0.001		0.005		<0.001		0.001	

[1]AKGWA # is 0000-0000 for any type of blank.
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[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.275		0.704		2.20		56.5	
7440-70-2	0	Calcium	T	MG/L	200.7	104		98		118		666	
7440-23-5	0	Sodium	T	MG/L	200.7	9.92		8.51		5.96		98.2	
	0	Sulfate	T	MG/L	300.0	35.8		58.6		74.3		2,006	

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	13	4	6	7
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/8/11 13:04	12/7/11 13:26	12/7/11 13:50	12/7/11 14:14
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	432.82		432.36		431.69		431.61	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	12		<7		<7		8	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	142		108.3		42.0		335	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,028		640		658		2,848	
S0296- -	0	pH	T	units	150.1	7.22		7.10		7.14		6.80	
7440-50-8	0	Copper	D	MG/L	200.7	0.003		0.004		0.015		0.003	

[1]AKGWA # is 0000-0000 for any type of blank.
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STANDARD FLAGS:
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B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	12.2		0.937		0.627		27.6	
7440-70-2	0	Calcium	T	MG/L	200.7	196		154		165		415	
7440-23-5	0	Sodium	T	MG/L	200.7	30.9		5.46		9.01		46.3	
	0	Sulfate	T	MG/L	300.0	396		94.4		139		1,222	

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	8	3	2	5
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/7/11 14:35	12/7/11 10:35	12/7/11 9:46	12/7/11 13:45
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	430.42		427.97		430.26		428.65	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7		<7		<7		<7	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	7.4		51.6		61.6		24.4	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	422		756		1,700		688	
S0296- -	0	pH	T	units	150.1	7.30		7.08		6.84		6.78	
7440-50-8	0	Copper	D	MG/L	200.7	0.004		0.015		0.004		0.004	

STANDARD FLAGS:

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B = Analyte found in blank
A = Average value
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D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.854		1.98		2.99		1.86	
7440-70-2	0	Calcium	T	MG/L	200.7	105		174		336		152	
7440-23-5	0	Sodium	T	MG/L	200.7	3.62		10.5		33.7		9.51	
	0	Sulfate	T	MG/L	300.0	48.9		162		851		163	

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
14 REILLY ROAD
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** 2nd 2012

Please check only ONE of the following:

___Characterization ___Quarterly X Semi-Annual ___Annual ___Assessment

Please check applicable submittal: X Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler (signature) 9-10-12
SIGNATURE DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 4/10-12/2012 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	1	2	3	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	4/10/12 14:38	4/10/12 15:06	4/10/12 15:46	4/10/12 16:11
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	4/10-5/22/12	4/10-5/22/12	4/10-5/22/11	4/10-5/22/12
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.63		423.76		421.85		421.97	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	7		<7		<7		14.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		2.2		1.2		1.1	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	21.4		5.20		14.8		721	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	446		378		496		4,708	
S0296- -	0	pH	T	units	150.1	7.39		7.13		7.26		7.11	
7440-50-8	0	Copper	D	MG/L	200.7	0.006		0.013		0.006		0.009	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.039		<0.001		2.264		100	
7440-70-2	0	Calcium	T	MG/L	200.7	123		35.6		42.1		790	
7440-23-5	0	Sodium	T	MG/L	200.7	8.85		11.2		9.43		125	
	0	Sulfate	T	MG/L	300.0	36.4		12.0		64.8		2,219	

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	5	6	7	8
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	4/11/12 10:44	4/11/12 11:12	4/11/12 13:08	4/11/12 13:27
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	4/11-5/22/12	4/11-5/22/12	4/11-5/22/12	4/11-5/22/12
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	422.20		422.45		423.26		423.25	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7		<7		<7		<7	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	138		49.9		62.1		341	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,104		544		754		2,694	
S0296- -	0	pH	T	units	150.1	7.27		7.54		7.56		7.27	
7440-50-8	0	Copper	D	MG/L	200.7	0.012		0.011		0.019		0.009	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	19.7		1.70		0.989		41.73	
7440-70-2	0	Calcium	T	MG/L	200.7	195		53.4		117		417	
7440-23-5	0	Sodium	T	MG/L	200.7	39.1		7.66		13.8		57.6	
	0	Sulfate	T	MG/L	300.0	419		82.3		196		1,355	

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	9	10	11	12
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	4/11/12 13:50	4/11/12 14:17	4/12/12 10:50	4/12/12 11:19
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	4/11-5/22/12	4/11-5/22/12	4/12-5/22/12	4/12-5/22/12
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	424.58		424.88		423.56		425.73	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7		<7		<7		15	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	7.30		34.6		50.2		23.5	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	414		520		1,656		656	
S0296- -	0	pH	T	units	150.1	7.55		7.44		7.11		7.27	
7440-50-8	0	Copper	D	MG/L	200.7	0.013		0.037		0.021		0.013	

STANDARD FLAGS:

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[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
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A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

Facility: LG&E Trimble County Station
FINDS/UNIT: Not Applicable
Permit Number:
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	1.26		1.39		2.68		2.31	
7440-70-2	0	Calcium	T	MG/L	200.7	29.9		45.9		264		63.5	
7440-23-5	0	Sodium	T	MG/L	200.7	5.82		13.2		38.7		12.5	
	0	Sulfate	T	MG/L	300.0	54.6		77.7		839		152	

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.** ________ **Quarter & Year** 4th 2012

Please check only ONE of the following:

___Characterization ___Quarterly _X_Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 1-24-13
SIGNATURE DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 11/13-14/2012 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	6	8	10	11
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/14/12 9:13	11/14/12 9:33	11/14/12 10:02	11/14/12 10:15
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/14/12-1/2/13	11/14/12-1/2/13	11/14/12-1/2/13	11/14/12-1/2/13
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	420.98		422.50		421.05		421.12	
S0145- -	1	Specific Conductance	T	MG/L	120.1	606		616		597		4,110	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<3.0		<3.0		<3.0		8.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		2.2		1.1		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	22.4		5.20		10.5		593	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	452		428		460		4,772	
S0296- -	0	pH	T	units	150.1	7.06		6.97		6.95		6.65	
7440-50-8	0	Copper	D	MG/L	200.7	<0.001		<0.001		<0.001		<0.001	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.233		0.238		2.32		83.7	
7440-70-2	0	Calcium	T	MG/L	200.7	126		110		71.7		779	
7440-23-5	0	Sodium	T	MG/L	200.7	16.9		15.2		10.6		170	
	0	Sulfate	T	MG/L	300.0	36.8		21.7		65.0		2,325	

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	9	3	4	5
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/14/12 9:45	11/13/12 10:09	11/13/12 10:35	11/13/12 10:51
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/14/12-1/2/13	11/13/12-1/2/13	11/13/12-1/2/13	11/13/12-1/2/13
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.55		421.15		416.47		419.45	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,248		664		964		2,630	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	9.0		<3.0		4.0		<3.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	135		30.6		78.1		338	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,136		506		870		2,946	
S0296- -	0	pH	T	units	150.1	6.98		7.11		7.01		6.75	
7440-50-8	0	Copper	D	MG/L	200.7	0.006		<0.001		0.008		<0.001	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	14.8		1.57		1.86		44.7	
7440-70-2	0	Calcium	T	MG/L	200.7	216		81.9		184		473	
7440-23-5	0	Sodium	T	MG/L	200.7	47.0		9.60		20.6		87.6	
	0	Sulfate	T	MG/L	300.0	353		64.0		252		1,271	

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	1	2	12	6
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/13/12 1:07	11/13/12 1:34	11/14/12 10:42	11/14/12 9:13
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/13/12-1/2/13	11/13/12-1/2/13	11/14/12-1/2/13	11/14/12-1/2/13
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.40		421.23		421.00		421.23	
S0145- -	1	Specific Conductance	T	MG/L	120.1	644		924		1,610		768	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<3.0		<3.0		<3.0		<3.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	10.6		47.0		57.0		22.0	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	436		696		1,622		572	
S0296- -	0	pH	T	units	150.1	7.51		6.92		6.87		7.12	
7440-50-8	0	Copper	D	MG/L	200.7	0.004		0.007		<0.001		<0.001	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	1.54		1.22		3.19		1.65	
7440-70-2	0	Calcium	T	MG/L	200.7	120		141		338		120	
7440-23-5	0	Sodium	T	MG/L	200.7	8.40		18.8		50.0		14.6	
	0	Sulfate	T	MG/L	300.0	75.6		115		697		131	

GROUNDWATER ASSESSMENT REPORT

PPL companies

LOUISVILLE GAS & ELECTRIC

TRIMBLE COUNTY GENERATING STATION
BEDFORD, TRIMBLE COUNTY, KENTUCKY

Prepared for:

LG&E and KU Services Company

October 31, 2013

Prepared by:

Linebach • Funkhouser, Inc.
environmental compliance & consulting

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification — Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-1	05/19/09	—	—	—	84.60	0.0020	—	—	—	—	—	—	—	6.46	—
	10/01/09	—	—	—	92.80	0.0030	—	—	—	—	—	—	—	7.19	—
	06/21/10	—	—	—	75.60	0.0030	—	—	—	—	—	—	—	2.73	—
	10/12/10	—	—	—	82.60	0.0050	—	—	—	—	—	—	—	5.39	—
	06/14/11	—	—	—	130.00	<0.00100	—	—	—	—	—	—	—	5.98	—
	12/08/11	—	—	—	104.00	<0.00100	—	—	—	—	—	—	—	9.92	—
	04/10/12	—	—	—	123.00	0.0060	—	—	—	—	—	—	—	8.85	—
	11/14/12	—	—	—	126.00	<0.00100	—	—	—	—	—	—	—	16.90	—
	06/25/13	26.0	0.00044(J)	<0.00016	110.00	0.00110(J)	0.200	0.00077(J)	29.000	<0.000049	<0.0049	4.30	0.00081(J)	9.50	<0.0026
	08/28/13	26.0	<0.00025	<0.00016	91.00	0.00073(J)	0.310	0.00032(J)	24.000	<0.000049	<0.0049	1.50	<0.00038	6.60	<0.0026
	Statistical Computations	Minimum	<0.00025	<0.00016	75.60	<0.00100	0.200	0.00032	24.000	<0.000049	<0.0049	1.50	<0.00038	2.73	<0.0026
		Maximum	0.00044	<0.00016	130.00	0.0060	0.310	0.00077	29.000	<0.000049	<0.0049	4.30	0.00081	16.90	<0.0026
		Median	0.00028	<0.00016	98.40	0.0016	0.255	0.00055	26.500	<0.000049	<0.0049	2.90	0.00050	6.90	<0.0026
		Average	0.00028	<0.00016	101.96	0.0022	0.255	0.00055	26.500	<0.000049	<0.0049	2.90	0.00050	7.95	<0.0026

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification — Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-2	05/19/09	—	—	—	222.00	0.0020	—	—	—	—	—	—	—	14.20	—
	10/01/09	—	—	—	205.00	0.0020	—	—	—	—	—	—	—	15.20	—
	06/21/10	—	—	—	160.70	0.0050	—	—	—	—	—	—	—	13.60	—
MW-2R	10/15/10	—	—	—	81.50	0.0050	—	—	—	—	—	—	—	9.10	—
	06/14/11	—	—	—	102.34	0.0020	—	—	—	—	—	—	—	9.48	—
	12/08/11	—	—	—	98.00	0.0050	—	—	—	—	—	—	—	8.51	—
	04/10/12	—	—	—	35.60	0.0130	—	—	—	—	—	—	—	11.20	—
	11/14/12	—	—	—	110.00	<0.00100	—	—	—	—	—	—	—	15.20	—
	06/26/13	35.0	0.02400	<0.00016	93.00	<0.00052	11.000	0.00037(J)	35.000	<0.000049	<0.0049	0.81	0.00120	8.20	<0.0026
	08/29/13	29.2	0.02200	<0.00016	88.00	0.00160(J)	11.000	0.00089(J)	34.000	<0.000049	<0.0049	0.70	<0.00038	7.80	0.0028(J)
MW-2/MW-2R	Statistical Computations	Minimum	0.02200	<0.00016	35.60	<0.00052	11.000	0.00037	34.000	<0.000049	<0.0049	0.70	<0.00038	7.80	<0.0026
		Maximum	0.02400	<0.00016	222.00	0.01300	11.000	0.00089	35.000	<0.000049	<0.0049	0.81	0.00120	15.20	0.0028
		Median	0.02300	<0.00016	100.17	0.00200	11.000	0.00063	34.500	<0.000049	<0.0049	0.76	0.00070	10.34	0.0021
		Average	0.02300	<0.00016	119.61	0.00364	11.000	0.00063	34.500	<0.000049	<0.0049	0.76	0.00070	11.25	0.0021

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-3	05/19/09	—	—	—	149.00	0.0040	—	—	—	—	—	—	—	7.65	—
	10/01/09	—	—	—	110.00	0.0020	—	—	—	—	—	—	—	7.40	—
	06/21/10	—	—	—	121.20	0.0080	—	—	—	—	—	—	—	5.82	—
	10/12/10	—	—	—	100.90	0.0070	—	—	—	—	—	—	—	7.71	—
	06/14/11	—	—	—	138.83	<0.00100	—	—	—	—	—	—	—	7.71	—
	12/08/11	—	—	—	118.00	<0.00100	—	—	—	—	—	—	—	5.96	—
	04/10/12	—	—	—	42.10	0.0060	—	—	—	—	—	—	—	9.43	—
	11/14/12	—	—	—	71.70	<0.00100	—	—	—	—	—	—	—	10.60	—
	06/25/13	31.0	0.00082(J)	<0.00016	140.00	0.0028	0.290	0.00260	35.000	<0.000049	<0.0049	1.60	0.00130	5.90	0.0043(J)
	06/25/13(DUP)	31.0	0.00150	<0.00016	140.00	0.0210	1.600	0.01600	36.000	<0.000049	<0.0049	1.40	0.00120	5.90	0.0200
	08/29/13	31.0	0.00060(J)	<0.00016	130.00	0.0120	0.650	0.00740	33.000	<0.000049	<0.0049	1.20	<0.00038	6.20	0.0049(J)
	08/29/13(DUP)*	31.0	0.00084(J)	<0.00016	140.00	0.00130(J)	0.260	0.00031(J)	34.000	<0.000049	0.0110(J)	1.10	0.00120	6.40	0.0036(J)
	Statistical Computations	Minimum	0.00060	<0.00016	42.10	<0.0010	0.260	0.00031	33.000	<0.000049	<0.0049	1.10	<0.00038	5.82	0.0036
		Maximum	0.00150	<0.00016	149.00	0.0210	1.600	0.01600	36.000	<0.000049	0.0110	1.60	0.00130	10.60	0.0200
		Median	0.00083	<0.00016	125.60	0.0034	0.470	0.00500	34.500	<0.000049	0.0025	1.30	0.00120	6.90	0.0046
		Average	0.00094	<0.00016	116.81	0.0055	0.700	0.00658	34.500	<0.000049	0.0046	1.33	0.00097	7.22	0.0082

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION   487 CORN CREEK ROAD   BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-4	05/19/09	—	—	—	668.00	0.0030	—	—	—	—	—	—	—	72.60	—
	10/01/09	—	—	—	699.80	0.0130	—	—	—	—	—	—	—	86.20	—
	06/21/10	—	—	—	590.00	0.0040	—	—	—	—	—	—	—	87.70	—
	10/12/10	—	—	—	694.50	0.0050	—	—	—	—	—	—	—	85.70	—
	06/14/11	—	—	—	768.66	0.0270	—	—	—	—	—	—	—	20.39	—
	12/08/11	—	—	—	666.00	0.0010	—	—	—	—	—	—	—	98.20	—
	04/10/12	—	—	—	790.00	0.0090	—	—	—	—	—	—	—	125.00	—
	11/14/12	—	—	—	779.00	<0.00100	—	—	—	—	—	—	—	170.00	—
	06/25/13	66.0	0.00230	<0.00016	640.00	0.00140(J)	<0.014	0.00024(J)	370.000	<0.000049	<0.0049	12.00	0.01200	95.00	<0.0026
	06/25/13(DUP)*		0.00160	<0.00016	600.00	0.00140(J)	0.032	<0.00024	380.000	<0.000049	<0.0049	11.00	0.00890	93.00	<0.0026
	08/29/13	66.0	0.00520	<0.00016	600.00	0.0022	0.025(J)	<0.00024	360.000	<0.000049	<0.0049	10.00	0.01900	93.00	<0.0026
	08/29/13(DUP)	66.0	0.00870	<0.00016	600.00	0.00120(J)	0.290	0.00280	360.000	<0.000049	0.0050(J)	10.00	0.02100	91.00	0.0039(J)
	Statistical Computations	Minimum	0.00160	<0.00016	590.00	<0.00100	<0.014	<0.00024	360.000	<0.000049	<0.0049	10.00	0.00890	20.39	<0.0026
		Maximum	0.00870	<0.00016	790.00	0.0270	0.290	0.00280	380.000	<0.000049	0.0050	12.00	0.02100	170.00	0.0039
		Median	0.00375	<0.00016	667.00	0.0026	0.029	0.00018	365.000	<0.000049	0.0025	10.50	0.01550	92.00	0.0013
		Average	0.00445	<0.00016	674.66	0.0057	0.089	0.00082	367.500	<0.000049	0.0031	10.75	0.01523	93.15	0.0020

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-5	05/19/09	—	—	—	189.00	0.0050	—	—	—	—	—	—	—	25.400	—
	10/01/09	—	—	—	194.40	0.0060	—	—	—	—	—	—	—	31.800	—
	06/22/10	—	—	—	164.20	0.0080	—	—	—	—	—	—	—	29.200	—
	10/12/10	—	—	—	186.80	0.0080	—	—	—	—	—	—	—	27.740	—
	06/16/11	—	—	—	227.71	0.0120	—	—	—	—	—	—	—	34.428	—
	12/07/11	—	—	—	196.00	0.0030	—	—	—	—	—	—	—	30.900	—
	04/11/13	—	—	—	195.00	0.0120	—	—	—	—	—	—	—	39.100	—
	11/14/12	—	—	—	216.00	0.0060	—	—	—	—	—	—	—	47.000	—
	06/25/13	58.0	0.00120	<0.00016	210.00	0.00970(J)	<0.014	0.00055(J)	73.000	<0.000049	<0.0049	5.30	0.00500	28.000	0.0066(J)
	08/29/13	58.0	0.00190	<0.00016	190.00	0.0100	0.019(J)	0.00029(J)	71.000	<0.000049	<0.0049	4.60	0.00250	26.000	0.0064(J)
	Statistical Computations	Minimum	0.00120	<0.00016	164.20	0.0030	<0.014	0.00029	71.000	<0.000049	<0.0049	4.60	0.00250	25.400	0.0064
		Maximum	0.00190	<0.00016	227.71	0.0120	0.019	0.00055	73.000	<0.000049	<0.0049	5.30	0.00500	47.000	0.0066
		Median	0.00155	<0.00016	194.70	0.0080	0.013	0.00042	72.000	<0.000049	<0.0049	4.95	0.00375	30.050	0.0065
		Average	0.00155	<0.00016	196.91	0.0080	0.013	0.00042	72.000	<0.000049	<0.0049	4.95	0.00375	31.957	0.0065

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION   487 CORN CREEK ROAD   BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			**0.01000**	**0.005**	**—**	**1.3**	**—**	**0.015**	**—**	**0.002**	**0.10**	**—**	**0.050**	**—**	**—**
MW-6	05/19/09	—	—	—	104.00	0.0050	—	—	—	—	—	—	—	3.37	—
	10/01/09	—	—	—	104.00	0.0030	—	—	—	—	—	—	—	4.25	—
	06/22/10	—	—	—	91.30	0.0190	—	—	—	—	—	—	—	2.28	—
	10/12/10	—	—	—	82.40	0.0040	—	—	—	—	—	—	—	4.84	—
	06/16/11	—	—	—	145.60	0.0060	—	—	—	—	—	—	—	5.50	—
	12/07/11	—	—	—	154.00	0.0040	—	—	—	—	—	—	—	5.46	—
	04/10/13	—	—	—	53.40	0.0110	—	—	—	—	—	—	—	7.66	—
	11/13/12	—	—	—	81.90	<0.00100	—	—	—	—	—	—	—	9.60	—
	06/25/13	58.0	0.00050(J)	<0.00016	120.00	0.0070	<0.014	0.00084(J)	37.000	<0.000049	<0.0049	2.00	0.00160	4.80	0.0066(J)
	08/30/13	58.0	0.00071(J)	<0.00016	110.00	0.0058	<0.014	0.00037(J)	34.000	<0.000049	<0.0049	1.60	0.00180	4.60	0.0048(J)
	Statistical Computations	Minimum	0.00050	<0.00016	53.40	<0.00100	0.007	0.00037	34.000	<0.000049	<0.0049	1.60	0.00160	2.28	0.0048
		Maximum	0.00071	<0.00016	154.00	0.0190	0.007	0.00084	37.000	<0.000049	<0.0049	2.00	0.00180	9.60	0.0066
		Median	0.00061	<0.00016	104.00	0.0054	0.007	0.00061	35.500	<0.000049	<0.0049	1.80	0.00170	4.82	0.0057
		Average	0.00061	<0.00016	104.66	0.0065	0.007	0.00061	35.500	<0.000049	<0.0049	1.80	0.00170	5.24	0.0057

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION   487 CORN CREEK ROAD   BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-7	05/19/09	—	—	—	121.00	0.0170	—	—	—	—	—	—	—	6.85	—
	10/02/09	—	—	—	78.10	0.0010	—	—	—	—	—	—	—	5.90	—
	06/22/10	—	—	—	115.00	0.0330	—	—	—	—	—	—	—	6.46	—
	10/12/10	—	—	—	125.40	0.0060	—	—	—	—	—	—	—	8.62	—
	06/16/11	—	—	—	155.53	0.0150	—	—	—	—	—	—	—	9.16	—
	12/07/11	—	—	—	165.00	0.0150	—	—	—	—	—	—	—	9.01	—
	04/11/12	—	—	—	117.00	0.0190	—	—	—	—	—	—	—	13.80	—
	11/13/12	—	—	—	184.00	0.0080	—	—	—	—	—	—	—	20.60	—
	06/26/13	62.0	0.00150	0.00048(J)	240.00	0.0280	0.017(J)	0.00072(J)	56.000	<0.000049	<0.0049	4.10	0.00670	14.00	0.0300
	06/26/13(DUP)*		0.00180	<0.00016	250.00	0.0270	<0.014	0.00031(J)	60.000	<0.000049	<0.0049	3.50	0.00920	14.00	0.0310
	08/30/13	62.0	0.00300	<0.00016	250.00	0.0270	<0.014	<0.00024	59.000	<0.000049	<0.0049	3.60	0.00700	15.00	0.0340
	08/30/13(DUP)	62.0	0.00320	<0.00016	250.00	0.0290	<0.014	0.00041(J)	60.000	<0.000049	<0.0049	3.80	0.00780	15.00	0.0380
	Statistical Computations	Minimum	0.00150	<0.00016	78.10	0.0010	0.007	<0.00024	56.000	<0.000049	<0.0049	3.50	0.00670	5.90	0.0300
		Maximum	0.00320	0.00048	250.00	0.0330	0.017	0.00072	60.000	<0.000049	<0.0049	4.10	0.00920	20.60	0.0380
		Median	0.00240	0.00008	160.26	0.0180	0.007	0.00036	59.500	<0.000049	<0.0049	3.70	0.00740	11.48	0.0325
		Average	0.00238	0.00018	170.92	0.0188	0.010	0.00039	58.750	<0.000049	<0.0049	3.75	0.00768	11.53	0.0333

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification — Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			**0.01000**	**0.005**	**—**	**1.3**	**—**	**0.015**	**—**	**0.002**	**0.10**	**—**	**0.050**	**—**	**—**
MW-8	05/19/09	—	—	—	586.00	0.0050	—	—	—	—	—	—	—	47.90	—
	10/02/09	—	—	—	546.00	0.0100	—	—	—	—	—	—	—	53.80	—
	06/22/10	—	—	—	443.60	0.0050	—	—	—	—	—	—	—	46.70	—
	10/12/10	—	—	—	493.70	0.0050	—	—	—	—	—	—	—	54.96	—
	06/16/11	—	—	—	445.17	0.0140	—	—	—	—	—	—	—	9.61	—
	12/07/11	—	—	—	415.00	0.0030	—	—	—	—	—	—	—	46.30	—
	04/11/12	—	—	—	417.00	0.0090	—	—	—	—	—	—	—	57.60	—
	11/13/12	—	—	—	473.00	<0.00100	—	—	—	—	—	—	—	87.60	—
	06/24/13	96.0	0.00260	<0.00016	410.00	0.0025	<0.014	0.00031	240.000	<0.000049	<0.0049	5.60	0.01000	49.00	<0.0026
	06/24/13(DUP)	96.0	0.00220	<0.00016	400.00	0.0029	0.230	0.00160	230.000	<0.000049	<0.0049	5.60	0.01100	49.00	0.0028
	08/30/13	96.0	0.00680	<0.00016	390.00	0.0028	<0.014	<0.00024	240.000	<0.000049	<0.0049	4.90	0.01200	48.00	0.0038(J)
	08/30/13(DUP*)		0.00510	<0.00016	410.00	0.0029	<0.014	<0.00024	250.000	<0.000049	0.0140(J)	5.10	0.00900	48.00	0.0038(J)
	Statistical Computations	Minimum	0.00220	<0.00016	390.00	<0.0010	0.007	0.00012	230.000	<0.000049	0.0025	4.90	0.00900	9.61	<0.0026
		Maximum	0.00680	<0.00016	586.00	0.0140	0.230	0.00160	250.000	<0.000049	0.0140	5.60	0.01200	87.60	0.0038
		Median	0.00385	<0.00016	430.30	0.0040	0.007	0.00022	240.000	<0.000049	0.0025	5.35	0.01050	48.50	0.0033
		Average	0.00418	<0.00016	452.46	0.0052	0.063	0.00054	240.000	<0.000049	0.0053	5.30	0.01050	49.87	0.0029

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification — Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-9	05/20/09	—	—	—	106.00	0.0070	—	—	—	—	—	—	—	3.29	—
	10/02/09	—	—	—	102.60	0.0020	—	—	—	—	—	—	—	3.05	—
	06/22/10	—	—	—	97.20	0.0150	—	—	—	—	—	—	—	2.01	—
	10/12/10	—	—	—	100.60	0.0060	—	—	—	—	—	—	—	4.90	—
	06/16/11	—	—	—	108.21	0.0060	—	—	—	—	—	—	—	4.31	—
	12/07/11	—	—	—	105.00	0.0040	—	—	—	—	—	—	—	3.62	—
	04/11/12	—	—	—	29.90	0.0130	—	—	—	—	—	—	—	5.82	—
	11/13/12	—	—	—	120.00	0.0040	—	—	—	—	—	—	—	8.40	—
	06/26/13	96.0	0.00058	<0.00016	120.00	0.0069	0.037	0.00140	35.000	<0.000049	<0.0049	2.10	0.00074	4.00	0.0062
	08/30/13	96.0	0.00068(J)	<0.00016	110.00	0.0076	<0.014	0.00048(J)	34.000	<0.000049	<0.0049	1.70	0.00130	3.80	0.0057(J)
	Statistical Computations	Minimum	0.00058	<0.00016	29.90	0.0020	<0.014	0.00048	34.000	<0.000049	<0.0049	1.70	0.00074	2.01	0.0057
		Maximum	0.00068	<0.00016	120.00	0.0150	0.037	0.00140	35.000	<0.000049	<0.0049	2.10	0.00130	8.40	0.0062
		Median	0.00063	<0.00016	105.50	0.0065	0.022	0.00094	34.500	<0.000049	<0.0049	1.90	0.00102	3.90	0.0060
		Average	0.00063	<0.00016	99.95	0.0072	0.022	0.00094	34.500	<0.000049	<0.0049	1.90	0.00102	4.32	0.0060

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-10	05/20/09	—	—	—	173.00	0.0200	—	—	—	—	—	—	—	9.42	—
	10/02/09	—	—	—	120.00	0.0030	—	—	—	—	—	—	—	6.57	—
	06/22/10	—	—	—	103.60	0.0340	—	—	—	—	—	—	—	6.73	—
	10/13/10	—	—	—	108.70	0.0090	—	—	—	—	—	—	—	9.43	—
	06/16/11	—	—	—	151.38	0.0130	—	—	—	—	—	—	—	9.93	—
	12/07/13	—	—	—	174.00	0.0150	—	—	—	—	—	—	—	10.50	—
	04/11/12	—	—	—	45.90	0.0370	—	—	—	—	—	—	—	13.20	—
	11/13/12	—	—	—	141.00	0.0070	—	—	—	—	—	—	—	18.80	—
	06/26/13	71.0	<0.00025	<0.00016	130.00	0.0240	0.036	0.00130	35.000	<0.000049	<0.0049	2.20	0.00042	9.60	0.0210
	08/29/13	71.0	<0.00025	<0.00016	120.00	0.0240	<0.014	0.00071(J)	33.000	<0.000049	<0.0049	1.50	0.00120	9.30	0.0230
	Statistical Computations	Minimum	<0.00025	<0.00016	45.90	0.0030	<0.014	0.00071	33.000	<0.000049	<0.0049	1.50	0.00042	6.57	0.0210
		Maximum	<0.00025	<0.00016	174.00	0.0370	0.036	0.00130	35.000	<0.000049	<0.0049	2.20	0.00120	18.80	0.0230
		Median	<0.00025	<0.00016	125.00	0.0175	0.022	0.00101	34.000	<0.000049	<0.0049	1.85	0.00081	9.52	0.0220
		Average	<0.00025	<0.00016	126.76	0.0186	0.022	0.00101	34.000	<0.000049	<0.0049	1.85	0.00081	10.35	0.0220

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification / Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-11	05/20/09	—	—	—	296.00	0.0060	—	—	—	—	—	—	—	16.40	—
	10/02/09	—	—	—	261.60	0.0070	—	—	—	—	—	—	—	17.50	—
	06/22/10	—	—	—	249.00	0.0100	—	—	—	—	—	—	—	26.20	—
	10/13/10	—	—	—	275.10	0.0050	—	—	—	—	—	—	—	24.97	—
	06/16/11	—	—	—	279.43	0.0070	—	—	—	—	—	—	—	31.86	—
	12/07/13	—	—	—	336.00	0.0040	—	—	—	—	—	—	—	33.70	—
	04/12/12	—	—	—	264.00	0.0210	—	—	—	—	—	—	—	38.70	—
	11/14/12	—	—	—	338.00	<0.00100	—	—	—	—	—	—	—	50.00	—
	06/27/13	66.0	0.00067	<0.00016	300.00	0.0039	0.021	0.00065	93.000	<0.000049	<0.0049	3.90	0.00740	27.00	0.0050
	08/28/13	66.0	0.00096(J)	<0.00016	290.00	0.0044	<0.014	0.00047(J)	93.000	<0.000049	<0.0049	3.30	0.00750	28.00	0.0078(J)
	Statistical Computations	Minimum	0.00067	<0.00016	249.00	<0.0010	<0.014	0.00047	93.000	<0.000049	<0.0049	3.30	0.00740	16.40	0.0050
		Maximum	0.00096	<0.00016	338.00	0.0210	0.021	0.00065	93.000	<0.000049	<0.0049	3.90	0.00750	50.00	0.0078
		Median	0.00082	<0.00016	284.72	0.0055	0.014	0.00056	93.000	<0.000049	<0.0049	3.60	0.00745	27.50	0.0064
		Average	0.00082	<0.00016	288.91	0.0069	0.014	0.00056	93.000	<0.000049	<0.0049	3.60	0.00745	29.43	0.0064

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------ Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-12	05/20/09	—	—	—	243.00	0.0100	—	—	—	—	—	—	—	6.15	—
	10/02/09	—	—	—	218.00	0.0010	—	—	—	—	—	—	—	6.91	—
	06/22/10	—	—	—	189.00	0.0160	—	—	—	—	—	—	—	8.50	—
	10/13/10	—	—	—	187.00	0.0040	—	—	—	—	—	—	—	7.92	—
	06/14/11	—	—	—	170.00	0.0040	—	—	—	—	—	—	—	11.43	—
	12/07/11	—	—	—	152.00	0.0040	—	—	—	—	—	—	—	9.51	—
	04/12/12	—	—	—	63.50	0.0130	—	—	—	—	—	—	—	12.50	—
	11/14/12	—	—	—	120.00	<0.0010	—	—	—	—	—	—	—	14.60	—
	06/27/13	67.0	<0.00025	<0.00016	140.00	0.0035	0.031	0.00450	41.000	<0.000049	<0.0049	1.90	<0.00038	7.40	0.0055
	08/29/13	67.0	<0.00025	<0.00016	130.00	0.0046	<0.014	0.00079(J)	42.000	<0.000049	<0.0049	1.10	0.00085(J)	6.60	0.0028(J)
	Statistical Computations	Minimum	<0.00025	<0.00016	63.50	<0.00100	<0.014	0.00079	41.000	<0.000049	<0.0049	1.10	<0.00038	6.15	0.0028
		Maximum	<0.00025	<0.00016	243.00	0.0160	0.031	0.00450	42.000	<0.000049	<0.0049	1.90	0.00085	14.60	0.0055
		Median	<0.00025	<0.00016	161.00	0.0040	0.019	0.00265	41.500	<0.000049	<0.0049	1.50	0.00052	8.21	0.0042
		Average	<0.00025	<0.00016	161.25	0.0061	0.019	0.00265	41.500	<0.000049	<0.0049	1.50	0.00052	9.15	0.0042

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-13	09/29/09	—	—	—	122.00	—	—	—	—	—	—	—	—	4.91	—
	06/23/10	—	—	—	114.80	—	—	—	—	—	—	—	—	2.44	—
	06/14/11	—	—	—	130.38	—	—	—	—	—	—	—	—	5.24	—
	04/10/12	—	—	—	29.20	0.0060	—	—	—	—	—	—	—	6.54	—
	06/24/13	105.5	<0.00025	<0.00016	140.00	0.0016	0.067	0.00082	43.000	<0.000049	<0.0049	2.10	<0.00038	4.60	<0.0026
	08/28/13	105.5	<0.00025	<0.00016	130.00	<0.00052	0.014(J)	<0.00024	42.000	<0.000049	<0.0049	1.10	0.00048(J)	3.80	<0.0026
	Statistical Computations	Minimum	<0.00025	<0.00016	29.20	<0.00052	0.014	<0.00024	42.000	<0.000049	<0.0049	1.10	<0.00038	2.44	<0.0026
		Maximum	<0.00025	<0.00016	140.00	0.0060	0.067	0.00082	43.000	<0.000049	<0.0049	2.10	0.00048	6.54	<0.0026
		Median	<0.00025	<0.00016	126.00	0.0016	0.041	0.00047	42.500	<0.000049	<0.0049	1.60	0.00034	4.76	<0.0026
		Average	<0.00025	<0.00016	111.06	0.0026	0.041	0.00047	42.500	<0.000049	<0.0049	1.60	0.00034	4.59	<0.0026
MW-14	09/30/09	—	—	—	129.00	—	—	—	—	—	—	—	—	3.85	—
	06/23/10	—	—	—	116.20	—	—	—	—	—	—	—	—	2.58	—
	06/14/11	—	—	—	149.23	—	—	—	—	—	—	—	—	4.95	—
	04/10/12	—	—	—	31.80	0.0050	—	—	—	—	—	—	—	6.60	—
	06/24/13	95.5	0.00025	<0.00016	140.00	<0.00052	0.080	<0.00024	42.000	<0.000049	<0.0049	1.90	<0.00038	4.40	<0.0026
	08/28/13	95.5	<0.00025	<0.00016	130.00	<0.00052	0.037(J)	<0.00024	41.000	<0.000049	<0.0049	1.00	<0.00038	3.70	<0.0026
	Statistical Computations	Minimum	<0.00025	<0.00016	31.80	<0.00052	0.037	<0.00024	41.000	<0.000049	<0.0049	1.00	<0.00038	2.58	<0.0026
		Maximum	0.00250	<0.00016	149.23	0.0050	0.080	<0.00024	42.000	<0.000049	<0.0049	1.90	<0.00038	6.60	<0.0026
		Median	0.00131	<0.00016	129.50	0.0003	0.059	<0.00024	41.500	<0.000049	<0.0049	1.45	<0.00038	4.13	<0.0026
		Average	0.00131	<0.00016	116.04	0.0018	0.059	<0.00024	41.500	<0.000049	<0.0049	1.45	<0.00038	4.35	<0.0026

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-15	09/30/09	—	—	—	750.00	—	—	—	—	—	—	—	—	64.40	—
	06/23/10	—	—	—	400.10	—	—	—	—	—	—	—	—	40.60	—
	06/14/11	—	—	—	873.08	—	—	—	—	—	—	—	—	15.35	—
	04/10/12	—	—	—	710.00	0.0060	—	—	—	—	—	—	—	68.80	—
	06/25/13	120.5	0.00270	<0.00016	720.00	0.0013	0.046	0.00049	360.000	<0.000049	<0.0049	7.60	0.01200	72.00	<0.0026
	08/28/13	120.5	0.00940	0.00037(J)	720.00	0.00140(J)	0.092(J)	0.00077(J)	380.000	<0.000049	<0.0049	6.60	0.01400	73.00	0.0033(J)
	Statistical Computations	Minimum	0.00270	<0.00016	400.10	0.0013	0.046	0.00049	360.000	<0.000049	<0.0049	6.60	0.01200	15.35	<0.0026
		Maximum	0.00940	0.00037	873.08	0.0060	0.092	0.00077	380.000	<0.000049	<0.0049	7.60	0.01400	73.00	0.0033
		Median	0.00605	0.00023	720.00	0.0014	0.069	0.00063	370.000	<0.000049	<0.0049	7.10	0.01300	66.60	0.0023
		Average	0.00605	0.00023	695.53	0.0029	0.069	0.00063	370.000	<0.000049	<0.0049	7.10	0.01300	55.69	0.0023
MW-16	09/30/09	—	—	—	266.40	—	—	—	—	—	—	—	—	8.27	—
	06/23/10	—	—	—	273.30	—	—	—	—	—	—	—	—	8.27	—
	06/14/11	—	—	—	430.29	—	—	—	—	—	—	—	—	12.63	—
	04/11/12	—	—	—	447.00	0.0070	—	—	—	—	—	—	—	17.50	—
	06/26/13	105.5	0.00170	<0.00016	440.00	<0.00052	0.072	<0.00024	120.000	<0.000049	<0.0049	2.70	0.00590	13.00	<0.0026
	08/28/13	105.5	0.00230	0.00035(J)	430.00	0.00053(J)	<0.014	0.00050(J)	110.000	<0.000049	<0.0049	2.30	0.00510	13.00	0.0039(J)
	Statistical Computations	Minimum	0.00170	<0.00016	266.40	<0.00052	<0.014	<0.00024	110.000	<0.000049	<0.0049	2.30	0.00510	8.27	<0.0026
		Maximum	0.00230	0.00035	447.00	0.0070	0.072	0.00050	120.000	<0.000049	<0.0049	2.70	0.00590	17.50	0.0039
		Median	0.00200	0.00022	430.14	0.0005	0.040	0.00031	115.000	<0.000049	<0.0049	2.50	0.00550	12.81	0.0026
		Average	0.00200	0.00022	381.16	0.0026	0.040	0.00031	115.000	<0.000049	<0.0049	2.50	0.00550	12.11	0.0026

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------ Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-17	09/30/09	—	—	—	386.90	—	—	—	—	—	—	—	—	28.00	—
	06/23/10	—	—	—	339.60	—	—	—	—	—	—	—	—	28.40	—
	06/16/11	—	—	—	532.50	—	—	—	—	—	—	—	—	9.30	—
	04/12/12	—	—	—	377.00	0.0110	—	—	—	—	—	—	—	49.20	—
	06/26/13	139.9	0.00090	<0.00016	390.00	0.0013	0.810	0.00053	120.000	<0.000049	0.0093	2.80	0.00540	37.00	0.0038
	08/28/13	139.9	0.00150	0.00039(J)	380.00	0.00075(J)	0.600	0.00050(J)	120.000	<0.000049	<0.0049	2.70	0.00460	38.00	0.0049(J)
	Statistical Computations	Minimum	0.00090	<0.00016	339.60	0.0008	0.600	0.00050	120.000	<0.000049	<0.0049	2.70	0.00460	9.30	0.0038
		Maximum	0.00150	0.00039	532.50	0.0110	0.810	0.00053	120.000	<0.000049	0.0093	2.80	0.00540	49.20	0.0049
		Median	0.00120	0.00024	383.45	0.0013	0.705	0.00052	120.000	<0.000049	0.0059	2.75	0.00500	32.70	0.0044
		Average	0.00120	0.00024	401.00	0.0044	0.705	0.00052	120.000	<0.000049	0.0059	2.75	0.00500	31.65	0.0044
MW-18	09/30/09	—	—	—	82.00	—	—	—	—	—	—	—	—	9.93	—
	06/23/10	—	—	—	70.40	—	—	—	—	—	—	—	—	6.16	—
	06/16/11	—	—	—	96.20	—	—	—	—	—	—	—	—	9.95	—
	04/12/12	—	—	—	49.00	0.0080	—	—	—	—	—	—	—	13.70	—
	06/26/13	127.5	0.00063	<0.00016	76.00	<0.00052	0.750	<0.00024	18.000	<0.000049	<0.0049	1.40	0.00056	7.60	<0.0026
	08/29/13	127.5	0.00090(J)	0.00038(J)	74.00	0.00057(J)	0.680	0.00047(J)	18.000	<0.000049	<0.0049	1.10	0.00100	7.40	<0.0026
	Statistical Computations	Minimum	0.00063	<0.00016	49.00	<0.00052	0.680	<0.00024	18.000	<0.000049	<0.0049	1.10	0.00056	6.16	<0.0026
		Maximum	0.00090	0.00038	96.20	0.0080	0.750	0.00047	18.000	<0.000049	<0.0049	1.40	0.00100	13.70	<0.0026
		Median	0.00077	0.00023	75.00	0.0006	0.715	0.00030	18.000	<0.000049	<0.0049	1.25	0.00078	8.77	<0.0026
		Average	0.00077	0.00023	74.60	0.0029	0.715	0.00030	18.000	<0.000049	<0.0049	1.25	0.00078	9.12	<0.0026

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification — Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	---	1.3	---	0.015	---	0.002	0.10	---	0.050	---	---
MW-19	09/30/09	—	—	—	66.20	—	—	—	—	—	—	—	—	5.04	—
	06/23/10	—	—	—	59.50	—	—	—	—	—	—	—	—	3.00	—
	06/16/11	—	—	—	82.46	—	—	—	—	—	—	—	—	6.31	—
	04/12/12	—	—	—	38.20	0.0070	—	—	—	—	—	—	—	8.67	—
	06/25/13	119.0	0.00044(J)	<0.00016	69.00	0.00100(J)	0.090(J)	0.00066(J)	21.000	<0.000049	<0.0049	2.20	<0.00038	5.30	<0.0026
	08/29/13	119.0	0.00072(J)	0.00036(J)	68.00	0.00110(J)	0.041(J)	0.00063(J)	20.000	<0.000049	<0.0049	1.90	0.00077(J)	5.50	<0.0026
	Statistical Computations	Minimum	0.00044	<0.00016	38.20	0.0010	0.041	0.00063	20.000	<0.000049	<0.0049	1.90	<0.00038	3.00	<0.0026
		Maximum	0.00072	0.00036	82.46	0.0070	0.090	0.00066	21.000	<0.000049	<0.0049	2.20	0.00077	8.67	<0.0026
		Median	0.00058	0.00022	67.10	0.0011	0.066	0.00065	20.500	<0.000049	<0.0049	2.05	0.00048	5.40	<0.0026
		Average	0.00058	0.00022	63.89	0.0030	0.066	0.00065	20.500	<0.000049	<0.0049	2.05	0.00048	5.64	<0.0026

Notes:

All units reported as milligrams per liter (mg/L), unless otherwise noted.

--- = No Data or value reported

USEPA MCLs = USEPA Maximum Contaminant Levels for Drinking Water.

ft btoc = feet below top of casing.

DUP = Duplicate sample.

SW846 6010B = USEPA SW846 Method 6010B laboratory analyses for metals.

SW846 6020 = USEPA SW846 Method 6020 laboratory analyses for metals.

SW846 7470A = USEPA SW846 Method 7470A laboratory analyses for Mercury.

Sample collection depth varied per well per sampling event due to changes in water table elevation relative to the screened interval of each well.

(J) = Estimated value. Result is > than Method Detection Limit (MDL) but < Reporting Detection Limit (RDL).

(*) Denotes field filtered sample analyzed for dissolved fraction constituents.

Bold and Highlighted values exceed USEPA MCLs

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** 2nd 2014

Please check only ONE of the following:

___Characterization ___Quarterly X Semi-Annual ___Annual ___Assessment

Please check applicable submittal: **X Groundwater ___Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler
SIGNATURE

11-12-14
DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 7/15-17, 8/15/2014 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	1	2	3	13
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	7/15/14 11:11	7/15/14 13:09	7/15/14 13:41	8/6/14 11:12
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	7/15-28/14	7/15-28/14	7/15-28/14	8/6-9/15/14
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	420.68		421.90		420.95		420.92	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<25		<25		<25		DNS	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.7		2.1		1.7		DNS	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	25.4		6.70		29.9		726	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	436		350		608		4,517	
S0296- -	0	pH	T	units	150.1	7.19		7.13		7.09		7.04	
7440-50-8	0	Copper	D	MG/L	200.7	0.001		0.001		0.006		<0.001	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.038		0.386		1.24		113	
7440-70-2	0	Calcium	T	MG/L	200.7	99.7		91.7		164		663	
7440-23-5	0	Sodium	T	MG/L	200.7	9.0		7.6		5.9		104	
	0	Sulfate	T	MG/L	300.0	33.3		20.0		141		2,011	

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	4	5	6	7
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	7/16/14 10:56	7/16/14 11:20	7/16/14 13:13	7/16/14 13:33
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	7/16-28/14	7/16-28/14	7/16-28/14	7/16-28/14
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.30		421.10		421.58		421.75	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<25		<25		<25		<25	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.6		0.6		0.7		0.6	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	191		27.6		143		324	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,216		504		1,052		2,496	
S0296- -	0	pH	T	units	150.1	7.43		7.24		7.23		7.09	
7440-50-8	0	Copper	D	MG/L	200.7	0.007		0.007		0.016		0.003	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	10.8		0.660		5.20		21.7	
7440-70-2	0	Calcium	T	MG/L	200.7	202		105		203		393	
7440-23-5	0	Sodium	T	MG/L	200.7	26.8		5.30		12.5		38.3	
	0	Sulfate	T	MG/L	300.0	391		65.5		250		1,136	

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	8	9	10	11
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	7/16/14 13:56	7/17/14 9:57	7/17/14 10:31	7/17/14 11:04
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	7/16-28/14	7/17-28/14	7/17-28/14	7/17-28/14
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	422.18		422.53		421.90		422.53	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<25		<25		<25		<25	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.8		0.6		0.7		0.6	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	52.8		69.2		55.4		33.3	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	468		583		1,404		560	
S0296- -	0	pH	T	units	150.1	7.42		7.12		7.09		7.26	
7440-50-8	0	Copper	D	MG/L	200.7	0.010		0.011		0.003		0.004	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	1.11		0.363		1.7		0.720	
7440-70-2	0	Calcium	T	MG/L	200.7	130		133		254		124	
7440-23-5	0	Sodium	T	MG/L	200.7	4.9		9.1		21.4		6.9	
	0	Sulfate	T	MG/L	300.0	141		82.9		629		127	

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.** ______ **Quarter & Year** ~~2nd~~ 4TH QTR 2014

Please check only ONE of the following:

___Characterization ___Quarterly _X_ Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_ Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

[signature] 3-27-15
SIGNATURE DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 7/15-17, 8/15/2014 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	9	7	8	13
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/10/14 10:00	12/9/14 13:05	12/9/14 13:30	12/11/14 13:15
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	12/10/14-3/17/15	12/9/14-3/17/15	12/9/14-3/17/15	12/11/14-3/17/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	426.99		428.79		426.74		426.77	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<8.0		<8.0		<8.0		<8.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.69		2.2		1.4		0.76	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	26.7		5.50		29.8		655	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	418		412		652		4,452	
S0296- -	0	pH	T	units	150.1	7.34		7.09		7.09		7.09	
7440-50-8	0	Copper	D	MG/L	200.8	0.001		<0.001		0.003		0.001	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2R		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	<0.001		0.014		0.002		0.018	
7440-42-8	0	Boron	T	MG/L	200.8	0.053		0.062		1.87		3.80	
7440-70-2	0	Calcium	T	MG/L	200.8	75.0		83.0		122		592	
7440-23-5	0	Sodium	T	MG/L	200.8	12.0		9.00		6.00		80.0	
	0	Sulfate	T	MG/L	300.0	40.90		13.80		155.3		2,260	

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	5	4	3	2
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/9/14 10:55	12/9/14 10:35	12/9/14 10:10	12/9/14 9:50
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	12/9/14-3/17/15	12/9/14-3/17/15	12/9/14-3/17/15	12/9/14-3/17/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	425.04		424.15		423.10		423.24	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<8.0		<8.0		<8.0		<8.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	1.0		1.3		1.0		0.73	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	212		206		193		422	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,232		1,284		1,071		2,880	
S0296- -	0	pH	T	units	150.1	7.17		7.07		7.10		7.00	
7440-50-8	0	Copper	D	MG/L	200.8	0.006		0.009		0.012		0.002	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.010		0.007		0.007		0.011	
7440-42-8	0	Boron	T	MG/L	200.8	9.70		11.5		9.80		25.1	
7440-70-2	0	Calcium	T	MG/L	200.8	201		170		161		358	
7440-23-5	0	Sodium	T	MG/L	200.8	30.0		26.0		18.0		44.0	
	0	Sulfate	T	MG/L	300.0	432.8		411.6		295.7		1,313	

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable/ 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	1	10	11	6
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/9/14 8:55	12/10/14 10:40	12/10/14 13:20	12/9/14 11:25
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	12/9/14-3/17/15	12/10/14-3/17/15	12/10/14-3/17/15	12/9/14-3/17/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	422.30		421.67		424.28		422.27	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<8.0		<8.0		<8.0		<8.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.69		0.77		0.72		0.62	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	67.3		91.1		69.2		38.6	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	720		710		1,542		656	
S0296- -	0	pH	T	units	150.1	7.21		7.38		7.04		7.18	
7440-50-8	0	Copper	D	MG/L	200.8	0.004		0.009		0.002		0.002	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
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J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.006		0.006		0.004		0.001	
7440-42-8	0	Boron	T	MG/L	200.8	2.10		1.40		2.20		1.00	
7440-70-2	0	Calcium	T	MG/L	200.8	124		130		242		96.0	
7440-23-5	0	Sodium	T	MG/L	200.8	5.00		13.0		29.0		8.00	
	0	Sulfate	T	MG/L	300.0	200.9		110.4		707.8		149.7	

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** 3rd 2015

Please check only ONE of the following:

___Characterization ___Quarterly X Semi-Annual ___Annual ___Assessment

Please check applicable submittal: X Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler — 9-24-15
SIGNATURE — DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 8/6/2015 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	3	4	1	2
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	8/5/15 8:16	8/5/15 8:40	8/4/15 13:28	8/4/15 13:49
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	8/5-20/15	8/5-20/15	8/4-20/15	8/4-20/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.05		422.53		421.41		421.41	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		5.6		<4.4		10	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.81		2.0		1.3		1.2	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	29.4		6.40		22.1		715	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	406		380		556		4,556	
S0296- -	0	pH	T	units	150.1	7.31		7.10		7.04		7.03	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2R		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	<0.001		0.015		<0.001		0.003	
7440-42-8	0	Boron	T	MG/L	200.8	<0.500		<0.500		1.60		96	
7440-70-2	0	Calcium	T	MG/L	200.8	120		100		150		700	
7440-23-5	0	Sodium	T	MG/L	200.8	8.7		7.5		4.8		84	
	0	Sulfate	T	MG/L	300.0	36.9		4.10		127		2,216	

Division of Waste Management
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SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	6	7	8	9
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	8/5/15 10:39	8/5/15 11:00	8/5/15 11:20	8/5/15 11:41
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	8/5-20/15	8/5-20/15	8/5-20/15	8/5-20/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.98		422.21		423.29		423.35	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		<4.4		10		<4.4	
S0268- -	0	Organic Carbon	T	MG/L	415.1	2.3		1.0		0.71		0.73	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	240		168.9		67.1		294	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,346		1,090		866		2,280	
S0296- -	0	pH	T	units	150.1	7.14		7.08		7.13		7.05	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
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N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.0025		0.0023		<0.001		0.0024	
7440-42-8	0	Boron	T	MG/L	200.8	49		14		8.0		22	
7440-70-2	0	Calcium	T	MG/L	200.8	260		230		200		270	
7440-23-5	0	Sodium	T	MG/L	200.8	25		13		11		25	
	0	Sulfate	T	MG/L	300.0	442		353		243		982	

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SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	10	5	11	12
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	8/6/15 8:40	8/5/15 9:41	8/6/15 10:04	8/6/15 10:21
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	8/6-20/15	8/5-20/15	8/6-15/20	8/6-20/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	424.39		426.13		423.86		426.30	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	11		<4.4		6.3		4.9	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.76		0.58		0.57		<0.50	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	136		81.2		60.4		43.8	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	869		678		1,346		626	
S0296- -	0	pH	T	units	150.1	7.18		7.08		7.08		7.30	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
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J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.0013		<0.001		<0.001		<0.001	
7440-42-8	0	Boron	T	MG/L	200.8	2.1		1.2		6.2		1.1	
7440-70-2	0	Calcium	T	MG/L	200.8	200		170		300		150	
7440-23-5	0	Sodium	T	MG/L	200.8	5.6		8.9		22		6.5	
	0	Sulfate	T	MG/L	300.0	233		128		1,290		151	

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.** ________ **Quarter & Year** 4^{th} 2015

Please check only ONE of the following:

___Characterization ___Quarterly X Semi-Annual ___Annual ___Assessment

Please check applicable submittal: **X Groundwater ___Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

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

W. Michael Winkler 12-9-15

SIGNATURE DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 11/11-12/2015 County: Trimble Permit No.: 112-00003

Facility Name: LG&E - Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: LG&E Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: LG&E - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number: 112-00003

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	1	2	3	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/11/15 14:03	11/11/15 14:21	11/11/15 14:45	11/11/15 15:00
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/11-30/15	11/11-30/15	11/11-30/15	11/11-30/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.05		422.50		421.06		420.84	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		7.7		6.0		6.3	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.63		1.8		1.1		2.9	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	26.8		4.90		20.2		733	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	380		326		526		4,724	
S0296- -	0	pH	T	units	150.1	7.32		6.98		7.10		7.05	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

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2Respond "Y" if the sample was a duplicate of another sample in this report.
3Respond "Y" if the sample was split and analyzed by separate laboratories.
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2R		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	<0.001		0.021		<0.001		0.008	
7440-42-8	0	Boron	T	MG/L	200.8	<0.50		<0.50		2.0		65	
7440-70-2	0	Calcium	T	MG/L	200.8	110		97		140		700	
7440-23-5	0	Sodium	T	MG/L	200.8	9.5		8.6		6.5		100	
	0	Sulfate	T	MG/L	300.0	33.1		5.70		113		2,261	

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SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number: 112-00003

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	5	6	7	8
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/11/15 15:20	11/12/15 8:05	11/12/15 8:30	11/12/15 8:45
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/11-30/15	11/12-30/15	11/12-12/2/15	11/12-12/2/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	420.72		420.82		421.22		421.16	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		<4.4		<4.4		<4.4	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.96		0.58		0.74		0.98	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	226		76.1		126		352	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,346		526		1,032		2,604	
S0296- -	0	pH	T	units	150.1	7.16		7.18		7.06		7.01	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
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D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number: 112-00003

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.0030		<0.001		<0.001		0.0040	
7440-42-8	0	Boron	T	MG/L	200.8	13		2.1		7.3		50	
7440-70-2	0	Calcium	T	MG/L	200.8	270		160		240		360	
7440-23-5	0	Sodium	T	MG/L	200.8	27		8.0		14		35	
	0	Sulfate	T	MG/L	300.0	418		116		338		1,134	

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
/ 1
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number: 112-00003

FINDS/UNIT: Not Applicable

LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	9	10	11	12
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/12/15 10:05	11/12/15 10:32	11/12/15 10:54	11/12/15 13:18
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/12-12/2/15	11/12-12/2/15	11/12-12/2/15	11/12-12/2/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.40		421.14		421.11		421.38	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		<4.4		<4.4		<4.4	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.60		0.50		<0.50		4.6	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	90.8		57.0		42.8		34.0	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	778		578		1,214		577	
S0296- -	0	pH	T	units	150.1	7.16		7.07		6.89		7.09	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		0.021		<0.020	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
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GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.0010		<0.001		<0.001		<0.001	
7440-42-8	0	Boron	T	MG/L	200.8	2.0		1.1		2.5		1.3	
7440-70-2	0	Calcium	T	MG/L	200.8	170		140		250		130	
7440-23-5	0	Sodium	T	MG/L	200.8	5.7		11		18		7.6	
	0	Sulfate	T	MG/L	300.0	202		78.7		482		130	

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF KENTUCKY UTILITIES	**)**	
COMPANY FOR CERTIFICATES OF PUBLIC	**)**	
CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00026**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
CHARLES R. SCHRAM
DIRECTOR, ENERGY PLANNING, ANALYSIS, AND FORECASTING
KENTUCKY UTILITIES COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is Charles R. Schram. I am the Director – Energy Planning, Analysis & Forecasting for Kentucky Utilities Company ("KU" or "Company") and an employee of LG&E and KU Services Company, which provides services to KU and Louisville Gas and Electric Company ("LG&E") (collectively "Companies"). My business address is 220 West Main Street, Louisville, Kentucky 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Please describe your current job responsibilities.

A. I am responsible for developing the Companies' load forecast, market analysis, and long-term planning of utility generation. As it pertains to this proceeding, the Generation Planning & Analysis group performed the analyses discussed below under my direction.

Q. Have you previously testified before this Commission?

A. Yes. I have previously testified before this Commission on several occasions, including in the Companies' most recent environmental cost recovery proceedings (Case Nos. 2011-00161 (KU) and 2011-00162 (LG&E)).

Q. What are the purposes of your testimony?

A. The purposes of my testimony are to explain the methods by which KU analyzed the projects included in its 2016 Environmental Compliance Plan ("2016 Plan"), present the analyses, and recommend Commission approval of the 2016 Plan and related certificates of public convenience and necessity ("CPCNs") and environmental cost recovery ("ECR") because the projects in the 2016 Plan are the most economical methods of complying with applicable environmental laws and regulations.

Q. What is the nature of the projects in KU's 2016 Plan?

A. KU's 2016 Plan consists of (1) constructing Phase II of the coal combustion residuals ("CCR") landfill at the E.W. Brown Generating Station ("Brown"); (2) making improvements to the wet flue gas desulfurization ("WFGD") equipment serving Unit 2 at the Ghent Generating Station ("Ghent"); (3) adding supplemental mercury-control equipment to serve all four of the Ghent coal-fired generating units; and (4) closing CCR surface impoundments at the Brown, Ghent, Trimble County, Green River, Pineville, and Tyrone Generating Stations, along with related construction of process-water systems at Brown, Ghent, and Trimble County.[1] These projects are explained in more detail in the testimonies of John N. Voyles, Jr. and R. Scott Straight. The testimony of Gary H. Revlett explains the various environmental requirements that necessitate these projects.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

- Exhibit CRS-1: Analysis of 2016 ECR Projects E.W. Brown Generating Station
- Exhibit CRS-2: Analysis of 2016 ECR Projects Ghent Generating Station
- Exhibit CRS-3: Analysis of 2016 ECR Projects Trimble County Generating Station

Analytical Approach

Q. What are the goals of the Companies' resource planning activities?

[1] The CCR Rule defines CCR as "fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers." 40 CFR 257.53. This definition includes what is commonly referred to as gypsum.

A. Resource planning starts with reliability as its objective and seeks to ensure reliability at the lowest reasonable cost and risk. Decisions about unit retirements require both compelling economics and a clear understanding of how reliability will be ensured.

Q. Please describe the analytical approach the Companies used to evaluate the projects in KU's 2016 Plan.

A. As Mr. Revlett explains in his testimony, there are two recently finalized federal environmental regulations that could significantly affect the Companies' coal-fired generating fleet beginning in 2022, namely the Clean Power Plan ("CPP") and the Effluent Limit Guidelines ("ELG").[2] The Companies will continue to work to understand the cost of complying with these regulations over the next 1-2 years, but today the precise means and costs of complying with the CPP and ELG are unknown.

What is known, as Mr. Revlett further explains, is that it is prudent for KU to begin to close all of its currently active surface impoundments (i.e., those at Ghent, Trimble County, and Brown), and to complete those closures by the end of the year 2023, to comply with the federal Coal Combustion Residuals Final Rule ("CCR Rule"), even though no surface impoundments at Ghent, Trimble County, or Brown have been determined to trigger closure requirements under the CCR Rule.[3] Furthermore, for the coal-fired units to continue to operate at the generating stations in which KU has an ownership interest (Brown, Ghent, and Trimble County), the Companies will have to complete construction of process-water systems at those stations by 2019 for the reasons Mr. Voyles describes in his testimony.[4]

[2] Revlett Testimony at 14-16.
[3] Revlett Testimony at 18-19.
[4] Voyles Testimony at 24-27.

For the Brown and Ghent stations, to avoid speculation regarding CPP and ELG compliance costs, as well as to account for the known need for process-water systems to be in place by 2019, the Companies chose to perform the cost-benefit analyses presented in this proceeding to determine if the proposed projects were economical through 2021. If the Companies determine that complying with the CPP and ELG is more costly than retiring coal units and replacing the capacity, they can likely operate the units through 2021 without incurring any CPP and ELG compliance costs. This approach differs from the Companies' typical approach of evaluating whether proposed investments are economical over a longer period, usually 30 years. In other words, the Companies' analyses show that constructing the proposed projects—even if the affected coal-fired units were retired in 2022—is economically superior to retiring the affected coal-fired units in 2019 and replacing their capacity through the end of 2021.

For Trimble County, the analysis of the process-water system is considered in the context of the longer-term outlook for the station. The Companies are planning to invest $277 million from 2016 through 2021 for a new special waste landfill, including a coal combustion residuals treatment facility ("CCRT"), in addition to the investments required for the 2016 Plan projects. While the relative benefits of these long-term investments will greatly exceed their cost, the point at which their benefits exceed their cost will occur after 2021. As a result, the Companies evaluated these projects over the Companies' standard 30-year analysis period with high-level estimates for CPP and ELG compliance costs. As discussed below, the cost of environmental compliance at Trimble County is clearly justified by the significant benefits of continuing to operate the Trimble County coal units, even when facing uncertainty about the cost of future environmental compliance.

Q. For the 30-year analysis of the Trimble County ECR projects, how did you assess CPP compliance costs?

A. For the reasons discussed in Exhibit CRS-3, the Trimble County coal units would be the last coal units the Companies would retire in a CPP compliance plan. If – at a cost of more than $3.5 billion – the Companies' Brown, Ghent, and Mill Creek coal units were retired and replaced with renewable or new natural gas-fired generation with CO_2 emissions ranging from 0 lb/MWh to approximately 1,000 lb/MWh, the Companies' generating portfolio would over-comply with any interpretation of the CPP – even if the Trimble County coal units operated at full capacity.[5] For this reason, the 30-year retirement analysis assumed no incremental cost for CPP compliance at Trimble County.

Q. When analyzing projects for which a retirement analysis was necessary, how did the Companies choose a replacement capacity cost?

A. Because the Companies could not design and construct suitable replacement capacity for any of its coal-fired units prior to 2021 or 2022, the analysis includes the purchase of replacement capacity based on the estimated cost of applicable replacement units, for the period 2019-2021. For each station, the replacement capacity portfolios were developed using resources evaluated in the Companies' 2014 Integrated Resource Plan ("IRP") to meet the Companies' target reserve margin range (16% to 21%) in 2019 through 2021. In addition, the costs of the IRP resources were used to develop

[5] The federal new source performance standard for carbon-dioxide emissions from natural-gas fired electric generating units is 1,000 lb/MWh. 80 Fed. Reg. 64,658 (Oct. 23, 2015).

the cost of the power purchase agreement for each portfolio. The analysis also includes costs for firm transmission and firm gas transportation services.

After purchasing replacement capacity through 2021, the retirement alternative in the 30-year Trimble County analysis assumes natural gas combined-cycle ("NGCC") capacity is commissioned at Trimble County in 2022 as a lowest reasonable cost resource for capacity and energy. The cost of this capacity is also taken from the Companies' 2014 IRP.

Q. For your analysis of the 2016 Plan projects for Brown and Ghent, why was it appropriate to analyze the projects through the end of 2021 rather than over a longer timeframe, as you did when analyzing the projects for Trimble County?

A. It was actually conservative to evaluate the 2016 Plan projects for Brown and Ghent only through the end of 2021. Analyzing these long-lived investments over a short timeframe ensures that the investments are economical by the end of 2021 (relative to the cost of retiring the coal-fired units in 2019). The Companies characterize this as a "no-regrets" approach because it ensures that even if KU determines in the next 1-2 years that retiring the units in 2022 is a lower cost alternative than the costs of ELG and CPP compliance, the investments proposed for Brown and Ghent in the 2016 Plan will have been economical relative to having retired the units in 2019.

To be clear, using this analytical approach is neither a commitment nor a prediction that KU will retire any or all of the coal-fired units at Brown or Ghent in early 2022 or later; indeed, at this time, KU does not have sufficient information about ELG and CPP compliance options and costs to make definitive decisions about whether or when KU might retire any or all of the coal-fired units at Brown and

Ghent. But one of the advantages of this analytical approach is that it provides assurance to the Commission, KU, and its customers that investments in the 2016 Plan projects for Brown and Ghent will be money well spent regardless of whether the coal-fired units ultimately retire in 2022 or later.

Q. When analyzing the projects through 2021, are any revenue requirements considered after 2021?

A. Yes. The revenue requirements for capital costs incurred through 2021 extend through the remaining book life of the generating unit. These revenue requirements are included in the calculation of the present value of revenue requirements ("PVRR") in determining whether the projects are economical for operation of the units through 2021. However, no other production costs or other investments subsequent to 2021 are considered in the evaluation.

Q. You note in your analysis of the 2016 Plan projects for Brown and Ghent that all of the scenarios you analyzed involved retiring the coal-fired units, regardless of whether those retirements occurred in 2019 or 2022. You further noted that your analysis reduced capital and O&M spending at Brown and Ghent in anticipation of those unit retirements beginning in 2017 for 2019 retirements and beginning in 2018 for 2022 retirements. If KU isn't willing to commit to retire any of these units in 2022, why is your analysis valid when it assumes they will indeed retire and tapers capital and O&M spending accordingly?

A. The validity of the approach hinges on KU's ability to make better-informed retire-or-continue-operation decisions after completing ongoing efforts to gather information and understand the costs of ELG and CPP compliance in the next 1-2 years. As the question indicates, at first glance the analytical approach might appear to undervalue retiring the units in 2019 because the other scenarios taper off capital and O&M spending beginning in 2018 on the assumption the units will retire in 2022. But if the units do not retire in 2022, presumably KU would continue to make the capital and O&M expenditures necessary for ongoing operations, which would increase the cost of any non-2019-retirement scenario, in turn increasing the relative value of retiring the units in 2019. One might therefore object that KU's analysis is invalid for not taking into account the full amount of capital and O&M costs necessary for the units to operate in 2022 and beyond.

In fairness, that would be a valid objection to this analytical approach if KU were not going to have better information about ELG and CPP compliance options and costs before 2018, when the modeled capital and O&M tapering begins. But KU will indeed have more information about such options and costs by 2018, and should be in a better position to determine whether or when to retire the coal-fired units. Therefore, if KU's analyses over the next 1-2 years show that retiring any or all of the coal-fired units in early 2022 would be more economical than incurring the costs of ELG and CPP compliance, then KU would be able to begin tapering capital and O&M spending as this analysis reflects. On the other hand, if KU's analyses over the next 1-2 years show it would be more economical to incur ELG and CPP compliance costs—in addition to ongoing capital and O&M spending at non-tapered levels—to keep the units operating beyond 2021, then KU would continue to operate the units, seeking any necessary Commission approvals for ongoing coal-fired operations (e.g., for any additional ECR projects). Therefore, the analytical approach for Brown and

Ghent truly is a no-regrets approach, and accords all due value to the option of retiring units in 2019.

Brown Projects

Q. What projects are included in the 2016 Plan for Brown?

A. The 2016 Plan includes the following projects for the Brown Station:

- Project 36 – Brown Landfill Phase II
- Project 42 – CCR Rule Compliance Construction and Construction of New Process-Water Systems at Brown

Q. Please describe KU Project 36.

A. KU Project 36 includes the costs to design and construct Phase II of the Brown landfill. The costs of this project are summarized in Table 1. Table 1 includes the total cost of the project and not only the portion being recovered through the ECR mechanism.

Table 1 – KU Project 36 Costs ($M, As-Spent Dollars)

	2015	2016	2017	Total
Landfill Phase II	0.1	0.0	11.7	11.9

Q. How much CCR does the Brown station produce?

A. From 2012 to 2014, the Brown coal units operated at a 44 percent capacity factor and produced an average of 331 thousand tons of CCR per year. In 2015, with lower gas prices and the addition of Cane Run 7 in June 2015, the Brown coal units operated at a 34 percent capacity factor and produced approximately 280 thousand tons of CCR. Based on the forecast for continued low natural gas prices and year-round Cane Run 7 operation, the Brown coal units are forecast on average to operate at a 25 percent capacity factor and to produce 198 thousand tons of CCR annually from 2016 to 2021.

Q. How many tons of CCR can be stored in a cubic yard of landfill space?

A. Approximately 1.18 tons of CCR can be stored in one cubic yard of landfill space. The Brown coal units are forecast to produce 198 thousand tons of CCR from 2016 to 2021. This equates to approximately 167 thousand cubic yards.

Q. Where is the CCR currently stored?

A. The Brown Station currently has two CCR storage facilities (the Auxiliary Pond and the new special waste landfill). Fly ash from Brown Unit 3 as well as bottom ash and gypsum from all three Brown coal units are currently stored in the Auxiliary Pond until Phase I of the special waste landfill goes into service this year. Because Brown Units 1 and 2 do not have dry handling systems for their fly ash, fly ash from Brown Units 1 and 2 is sluiced to the Auxiliary Pond.

Q. What is the capacity of Phase I of the landfill, and when will additional CCR storage capacity be needed?

A. Phase I of the Brown landfill will be placed in service in 2016. When the landfill was permitted, the Kentucky Division of Waste Management included a restriction in the landfill permit that limits the elevation difference between landfill phases to ten feet. As a result, the station can only store up to ten feet of CCR in Phase I of the landfill before additional CCR storage is needed to continue operating the Brown coal units. Ten feet of CCR storage capacity in Phase I equates to approximately 540 thousand cubic yards. Table 2 contains a detailed summary of the Brown CCR forecast through 2021. Based on the cumulative total of CCR stored in the landfill, the capacity of Phase I will be depleted in 2019. To account for potential construction delays, KU is seeking authorization to construct Phase II of the landfill by 2018. Ten feet of CCR storage capacity in Phase II of the landfill equates to approximately 490 thousand cubic yards.

Table 2 - Detailed Brown CCR Forecast (2016 Plan, Thousand Cubic Yards)

	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**Total 2016-2021**
Auxiliary Pond							
Brown 1-2 Fly Ash	16	17	20	0	0	0	53
Cumulative Total	16	33	53	53	53	53	53
Landfill							
Brown 1-2 Fly Ash	0	0	0	20	20	23	64
Brown 3 Fly Ash	24	26	34	35	29	36	185
Brown 1-3 Bottom Ash	9	9	11	12	11	13	65
Brown 1-3 Gypsum	94	102	103	113	102	121	635
Annual Total	127	137	149	180	162	193	949
Cumulative Total	127	264	413	593	756	949	949
Total CCR	143	154	169	180	162	193	1,002

Q. What alternatives did you consider in your analysis of Project 42?

A. The Companies evaluated the following alternatives:

- Construct Phase II of Brown Landfill
- Transport CCR to Beneficial Use Markets
- Transport CCR to Municipal Landfill (permitted for CCR materials)

A summary of these alternatives is included in the attached Exhibit CRS-1. For the reasons discussed in the exhibit, the alternative to transport CCR to beneficial use markets is not a viable alternative due to the quality of CCR produced at the Brown station compared to the quality of CCR produced at other stations and challenges associated with transporting the CCR to beneficial use markets.

Q. What are the results of your analysis?

A. The results of KU's analysis are summarized in Table 3. Compared to transporting CCR to a municipal landfill, constructing Phase II of the Brown landfill is lower cost.

Table 3 - Project 36 Analysis Results (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)

Gas Price	Alternative	Capital	CCR Handling Costs	Total	Difference from Best
Low	Landfill Phase II	13.8	5.9	19.7	0
	Municipal Landfill	0	24.2	24.2	4.5
Mid	Landfill Phase II	13.8	6.7	20.5	0
	Municipal Landfill	0	25.0	25.0	4.5
High	Landfill Phase II	13.8	7.8	21.6	0
	Municipal Landfill	0	26.1	26.1	4.5

Q. What cost did you assume for hauling and placing CCR in the municipal landfill?

A. The total cost of the municipal landfill tipping fee along with the associated CCR handling and transportation costs is assumed to be $38.21/ton. This cost of trucking CCR a shorter distance (about 14 miles) from the Trimble County Station to the Valley View Municipal Solid Waste Landfill was included in Case No. 2015-000194. While the Companies continue to look for opportunities for off-site disposal and beneficial use, the cost to transport CCR to a municipal landfill along with the associated tipping fee would have to drop below [redacted] before the municipal landfill alternative would be lower cost.

Q. Please describe Project 42.

A. For the purposes of the analysis, KU assumed that the Brown Auxiliary Pond must be capped and closed to comply with the CCR Rule. Based on that assumption, it would be necessary to install a new process-water system at Brown. Project 42 includes the costs associated with these activities.

Q. How did you evaluate the cost of Project 42?

A. KU evaluated the costs of Project 42 along with the costs of Project 36. Table 4 contains a summary of these costs.

Table 4 – Brown ECR Project Costs ($M, As-Spent Dollars)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cap and Closure	0.0	0.5	0.7	0.5	3.8	3.4	3.6	9.9	10.2	32.7
Process-Water System	0.0	0.5	33.0	35.1	0.0	0.0	0.0	0.0	0.0	68.6
Total CCR Ruling Compliance	0.0	1.0	33.7	35.6	3.8	3.4	3.6	9.9	10.2	101.3
Landfill Phase II	0.1	0.0	11.7	0.0	0.0	0.0	0.0	0.0	0.0	11.9
Total Brown ECR Project Costs	0.1	1.0	45.5	35.6	3.8	3.4	3.6	9.9	10.2	113.2

Q. What alternatives did you consider in your analysis of Projects 36 and 42?

A. KU evaluated the following alternatives:

1. Continue operating the Brown coal units through 2021 ("Operate through 2021").

2. Retire the Brown coal units in 2019 and purchase replacement capacity through 2021. The analysis evaluated power purchase agreements for two replacement capacity portfolios:

   A. Two 201 MW SCCT units (402 MW in total) ("Retire in 2019: SCCT").

   B. One 368 MW natural gas combined cycle ("NGCC") unit and one 201 MW simple cycle combustion turbine ("SCCT") unit (569 MW in total) ("Retire in 2019: NGCC/SCCT").

2. Convert the Brown coal units to operate on natural gas beginning in 2019 and operate on natural gas from 2019 to 2021 ("Natural Gas Conversion").

Q. Why did you evaluate two replacement alternatives for the Brown coal units?

A. Since the Brown coal units have the lowest capacity factors of any coal units in the system, the Companies wanted to consider a range of potential replacement alternatives. The 402 MW replacement with two simple cycle combustion turbines results in a reserve margin that is slightly below the Companies' 16 percent to 21 percent range by 2021, while the 569 MW combined cycle plus simple cycle replacement alternative results in a slightly higher reserve margin for enhanced reliability. The 569 MW alternative also includes a combined cycle unit, recognizing that the Brown coal units are forecast to produce more energy than might typically be produced by simple cycle turbines. Considering both alternatives allowed the Companies to evaluate a range of results.

Q. What are the results of your analysis?

A. The results of the Companies' analysis are summarized in Table 5. Each alternative was evaluated over three gas price scenarios. Compared to the retirement and natural gas conversion alternatives, continuing to operate the Brown coal units through 2021 is $153 million favorable to $5 million unfavorable. Only one out of twelve results favor 2019 retirement: the 402 MW replacement alternative is slightly favorable under low gas prices, but unfavorable under mid and high gas prices. The 569 MW replacement alternative, as well as the natural gas conversion alternative, are unfavorable under all three gas prices.

Table 5 – Brown Analysis Results (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)*

Gas Price	Alternative	System Production Costs	Other Capital and FOM	ECR Project Costs	Replacement Capacity Costs	NG Conversion	Trans. System Upgrade	Total	Diff from Best
Low	Operate through 2021	4,896	204	105	0	0	17	5,222	5
	Retire in 2019: NGCC/SCCT	4,876	114	13	216	0	57	5,276	58
	Retire in 2019: SCCT	4,913	114	13	120	0	57	5,217	0
	Natural Gas Conversion	4,902	201	13	0	172	17	5,306	88
Mid	Operate through 2021	4,993	204	105	0	0	17	5,320	0
	Retire in 2019: NGCC/SCCT	4,996	114	13	216	0	57	5,396	76
	Retire in 2019: SCCT	5,031	114	13	120	0	57	5,335	16
	Natural Gas Conversion	5,024	201	13	0	172	17	5,427	108
High	Operate through 2021	5,131	204	105	0	0	17	5,457	0
	Retire in 2019: NGCC/SCCT	5,176	114	13	216	0	57	5,576	119
	Retire in 2019: SCCT	5,210	114	13	120	0	57	5,514	57
	Natural Gas Conversion	5,207	201	13	0	172	17	5,610	153

*The landfill and process water systems in the 2016 Plan are included in the "Operate through 2021" alternative.

Q. Since one of the six results for the replacement alternative was comparable to operating the units through 2021, did you perform any other evaluation?

A. Yes. KU also considered a three year recovery of the revenue requirements associated with the landfill and process water systems to further assess how customers would be affected by the proposed projects.

Q. What did the three year analysis show?

A. As seen below in Table 6, even if customers paid the full revenue requirements for the landfill and process water systems in only a three year period (2019-2021), the revenue requirements of some of the retire/replace alternatives in certain scenarios are still not materially favorable.

Table 6 – Brown ECR Project Results (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars, 3 Year Book Life for ECR Capital)*

Gas Price	Alternative	System Production Costs	Other Capital and FOM	ECR Project Costs	Replacement Capacity Costs	NG Conversion	Trans. System Upgrade	Total	Diff from Best
Low	Operate through 2021	4,896	204	106	0	0	17	5,223	6
	Retire in 2019: NGCC/SCCT	4,876	114	13	216	0	57	5,276	58
	Retire in 2019: SCCT	4,913	114	13	120	0	57	5,217	0
	Natural Gas Conversion	4,902	201	13	0	174	17	5,308	90
Mid	Operate through 2021	4,993	204	106	0	0	17	5,321	0
	Retire in 2019: NGCC/SCCT	4,996	114	13	216	0	57	5,396	75
	Retire in 2019: SCCT	5,031	114	13	120	0	57	5,335	14
	Natural Gas Conversion	5,024	201	13	0	174	17	5,429	109
High	Operate through 2021	5,131	204	106	0	0	17	5,458	0
	Retire in 2019: NGCC/SCCT	5,176	114	13	216	0	57	5,576	118
	Retire in 2019: SCCT	5,210	114	13	120	0	57	5,514	55
	Natural Gas Conversion	5,207	201	13	0	174	17	5,612	154

*The landfill and process water systems in the 2016 Plan are included in the "Operate through 2021" alternative.

Q. Based on all of the analysis for the Brown projects, what do you recommend?

A. Constructing Phase II of the Brown landfill, building the process-water system, and operating the Brown units through at least 2021 is the lowest reasonable cost alternative. As discussed earlier in my testimony, decisions to retire generating units require both compelling economics and a clear understanding of how reliability will be ensured. Neither requirement is satisfied by the results of the analysis for the Brown coal units. The range of results for the replacement alternatives do not provide compelling evidence of a clear and likely economic advantage to retiring the Brown units in 2019 and replacing the capacity. Furthermore, it is not clear how reliability would be ensured during this period. Customers are much better off from a reliability perspective with the Brown units, since there is no assurance that 400+ MW of replacement capacity and associated transmission can be obtained.

Ghent Projects

Q. What projects are included in the 2016 Plan for Ghent?

A. The 2016 Plan includes the following projects for the Ghent Station:

- Project 37 – Wet Flue-Gas Desulfurization ("WFGD") Improvements at Ghent 2
- Project 38 – Supplemental Mercury Control Injection Systems at Ghent 1-4
- Project 40 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Ghent

Q. Please describe Project 37.

A. As discussed in Mr. Revlett's testimony, by the summer of 2016, the 30-day rolling generation-weighted average SO_2 emission rate ("SO_2 emission rate") for the Ghent station must remain below 0.2 lb/mmBtu to demonstrate compliance with the federal Mercury and Air Toxics Standards ("MATS") limit for acid gases measured as hydrogen chloride ("HCl"). Ghent Unit 2 currently has an SO_2 removal rate of 90.0 percent compared to 98.5 percent for the other three units. Project 37 improves the Ghent Unit 2 SO_2 removal rate to 97 percent to ensure compliance with MATS. Table 7 contains a summary of these costs.

Table 7 –Project 37 Costs ($M, As-Spent Dollars)

	2015	**2016**	**Total**
WFGD Modifications	1.0	6.0	7.0

Q. In your analysis of Project 37, what alternatives did you consider for meeting the MATS HCl limits?

A. KU evaluated the following alternatives:

- Do nothing (comply using dispatch modifications only)
- Modify the Ghent 2 FGD to improve its SO_2 removal rate ("Modify Ghent 2 FGD")
- Use reagent to improve SO_2 removal rate ("Reagent")
- Burn lower sulfur coal in Ghent 2 ("Burn Lower Sulfur Coal")

A summary of these alternatives is included in the attached Exhibit CRS-2.

Q. Were all of the alternatives evaluated in the same way?

A. No. An extended analysis was used to evaluate the Modify Ghent 2 WFGD, Reagent, and Burn Lower Sulfur Coal alternatives to assess the impact of these alternatives' tradeoffs between O&M and capital costs in the longer-term. Then, the lowest cost of these alternatives was compared to the cost of the "Do Nothing" alternative. The results of the extended analysis are summarized in Table 8. Modifying the Ghent 2 WFGD is clearly the lowest-cost alternative. The additional capital costs associated with the WFGD modification project are more than offset by the higher O&M or fuel costs associated with the other alternatives.

Table 8 - Project 37: 30-Year Analysis (PVRR, 2016-2045, $M, 2016 Dollars)

Alternative	Capital Cost	O&M Impact	Fuel Impact	Total PVRR	Difference from Best
Modify Ghent 2 FGD	8.8	0.0	0.0	8.8	0.0
Reagent	1.8	20.6	0.0	22.4	13.6
Burn Lower Sulfur Coal	0.0	0.0	174.4	174.4	165.6

Q. What are the results of your analysis after comparing the Ghent 2 WFGD modification to the "Do Nothing" alternative?

A. The results of this analysis are summarized in Table 9. Modifying the Ghent 2 WFGD is the lowest reasonable cost alternative for complying with the MATS HCl limits.

Table 9 –Project 37 Results (PVRR, 2016-2021, $M, 2016 Dollars)

Gas Price	Alternative	System Production Costs	ECR Project Costs	Total	Diff from Best
Low	Do Nothing	4,942	0	4,942	37
	Modify Ghent 2 WFGD	4,896	8.8	4,905	0
Mid	Do Nothing	5,050	0	5,050	48
	Modify Ghent 2 WFGD	4,993	8.8	5,002	0
High	Do Nothing	5,208	0	5,208	68
	Modify Ghent 2 WFGD	5,131	8.8	5,140	0

Q. Describe Project 38.

A. Each of the four Ghent units uses a baghouse and powdered activated carbon ("PAC") to reduce mercury to comply with MATS. As a supplemental alternative to using PAC for capturing mercury in the baghouse, coal and FGD additives can be used to capture mercury in the station's gypsum. This alternative approach would require a $10 million investment in supplemental equipment to store and inject the additives ("mercury control injection system"). Based on the Companies' experience at the Trimble County Station, the cost of these additives is lower than the cost of PAC.

Q. How did you analyze the economics of Project 38?

A. Based on the Companies' test results at Trimble County Unit 1, the cost of the coal and FGD additives for mercury control will be approximately $0.30/MWh lower than the cost of PAC. The analysis compared the capital investment required to implement this lower O&M cost solution to the continued cost of PAC.

Q. Based on a $0.30/MWh lower cost compared to PAC, what is the result of your analysis?

A. As seen below in Table 10, the O&M savings associated with the coal and FGD additives more than offset the revenue requirements associated with the cost of the mercury control injection system. Making the capital investment to enable the use of coal and FGD additives reduces revenue requirements by approximately $7 million over the 2016-2021 period. The payback period for the project is approximately three to five years.

Table 10 - Mercury Control System (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)

	PVRR ($M)	Payback Period (years)
Ghent 1	(1.6)	3.9
Ghent 2	(1.0)	4.6
Ghent 3	(1.8)	3.8
Ghent 4	(2.3)	3.0
Total	(6.7)	

Q. Please describe Project 40.

A. For the purposes of the analysis, KU assumed that (a) the Gypsum Stack, Secondary Pond, and Reclaim Pond must be cleaned and closed and (b) Ash Treatment Basin #1 and Ash Treatment Basin #2 must be capped and closed to comply with the CCR

Rule. Based on that assumption, it would be necessary to install a new process-water system at Ghent. Project 40 includes the costs associated with these activities.

Q. How did you evaluate the costs of Project 40?

A. KU evaluated the costs of Project 40 along with the costs of Projects 37 and 38. The alternative to each of these projects is retiring the Ghent units in 2019 and replacing the capacity. Table 11 contains a summary of the costs in Projects 37, 38, and 40.

Table 11 – Ghent ECR Project Costs ($M, As-Spent Dollars)

	2015	2016	2017	2018	2019	2020	2021	2022	Total
Closure Construction									
ATB #1 Capping	1.0	3.3	4.0	1.3	6.2	5.4	25.9	22.3	69.5
ATB #2 Capping	0.0	6.7	10.3	9.8	7.0	21.5	26.5	11.1	92.9
Gypsum Stack	0.0	8.3	20.7	16.2	23.7	9.9	0.0	0.0	78.7
Secondary Pond Cleanout	0.0	0.4	0.3	0.6	2.1	0.0	0.0	0.0	3.4
Reclaim Pond Cleanout	0.0	0.5	0.5	0.3	2.8	0.6	0.6	0.0	5.4
Total Closure Construction	1.0	19.2	35.8	28.3	41.7	37.4	53.0	33.4	249.9
Process-Water System	0.0	15.3	48.0	50.9	0.0	0.0	0.0	0.0	114.3
Total CCR Ruling Compliance	1.0	34.6	83.9	79.2	41.7	37.4	53.0	33.4	364.2
WFGD Modifications	1.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
Mercury Control System	0.1	10.0	0.0	0.0	0.0	0.0	0.0	0.0	10.1
Total Ghent ECR Projects	2.1	50.5	83.9	79.2	41.7	37.4	53.0	33.4	381.2

Q. What are the results of your analysis?

A. The results of the analysis are summarized in Table 12. Each alternative was evaluated over three gas price scenarios. Compared to the retirement alternative, the PVRR associated with operating the Ghent units with the proposed capital projects through 2021 is $278 million to $574 million lower. In other words, even if the Ghent units are assumed to cease operation after 2021, the proposed capital projects are the lowest reasonable cost.

Table 12 – Ghent Retirement Analysis (PVRR, 2016-2021, $M, 2016 Dollars)*

Gas Price	Alternative	Production Costs	Other Capital and FOM	ECR Project Costs	Replace-ment Capacity Costs	Total
Low	Retirement	4,896	271	232	683	6,082
	Operate through 2021	4,896	523	386	0	5,805
	Operate through 2021 Less Retire in 2019	(0)	252	154	(683)	(278)
Mid	Retirement	5,116	271	232	683	6,303
	Operate through 2021	4,993	523	386	0	5,903
	Operate through 2021 Less Retire in 2019	(123)	252	154	(683)	(400)
High	Retirement	5,428	271	232	683	6,614
	Operate through 2021	5,131	523	386	0	6,040
	Operate through 2021 Less Retire in 2019	(297)	252	154	(683)	(574)

*The WFGD modifications, mercury control system, and process-water systems in the 2016 Plan are included in the "Operate through 2021" alternative.

Trimble County Project

Q. What projects are included in the 2016 Plan for Trimble County?

A. The 2016 Plan includes the following project for the Trimble County Station:

- Project 41 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Trimble County

Q. Please describe Project 41.

A. For the purposes of the analysis, KU assumed that the cap and closure of the Trimble County surface impoundments must begin by 2019. Based on that assumption, it would be necessary to install a new process-water system at Trimble County. KU Project 41 and LG&E Project 30 include the costs associated with these activities.

Q. How did you analyze KU Project 41 and LG&E Project 30?

A. The Companies evaluated the costs of these projects along with the cost of LG&E Project 28 over a 30-year analysis period. Table 13 contains a summary of the Trimble County ECR project costs.

Table 13 – Trimble County ECR Project Costs ($M, As-Spent Dollars, Reflecting Companies' 75% Ownership Share)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cap and Closure										
Ash Pond	1.7	1.0	2.2	6.8	7.7	20.1	15.3	24.8	22.1	101.7
Gypsum Pond	0.0	0.9	1.4	2.9	16.4	7.3	0.0	0.0	0.0	28.9
Total Cap and Closure	1.7	1.9	3.6	9.7	24.1	27.4	15.3	24.8	22.1	130.6
Process-Water System	0.0	0.0	43.7	45.0	0.0	0.0	0.0	0.0	0.0	88.7
Total CCR Ruling Compliance	1.7	1.9	47.3	54.8	24.1	27.4	15.3	24.8	22.1	219.4
Mercury Control System	0.02	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Total Trimble County ECR Projects	1.7	2.5	47.3	54.8	24.1	27.4	15.3	24.8	22.1	219.9

Q. What alternatives did you consider in your analysis of the Trimble County projects?

A. The Companies evaluated the following alternatives:

1. Continue operating the Trimble County coal units ("Long Term Operation").
2. Retire the Trimble County coal units in 2019 and replace the capacity ("Retire TC Coal Units").
3. Convert the Trimble County coal units to operate on natural gas ("Natural Gas Conversion").

Q. What costs did you assume for the Trimble County landfill and ELG compliance in the alternative to continue operating the Trimble County coal units?

A. Over the 30-year analysis period, the analysis includes $414 million for the Trimble County landfill and $143 million for ELG compliance. Both values are quoted in as-spent dollars. A complete summary of cost assumptions for the 30-year analysis is included in Appendix A of Exhibit CRS-3.

Q. What are the results of your analysis?

A. The results of the analysis are summarized in Table 14. Each alternative was evaluated over three gas price scenarios. Clearly, continuing to operating the Trimble County coal units with the proposed investments is least-cost. The PVRR of continuing to operate the Trimble County coal units is $495 million to $2.9 billion favorable to retiring the units and replacing the capacity. Furthermore, even with no cost included for the modifying the Trimble County burners and building a new gas pipeline, continuing to operate the Trimble County coal units is $478 million to $4.0 billion favorable to converting the units to burn natural gas.

Table 14 – Trimble County Retirement Analysis Results (PVRR, 2016-2045, $M, Reflecting Companies' 75% Ownership Share, 2016 Dollars)*

Gas Price	Alternative	System Prod Costs	Landfill and CCRT	Other Capital and FOM	ECR Project Costs	Replace-ment Capacity Costs	NGCC Capital	NGCC FOM	NG Convers-ion	Total	Diff from Best
Low	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	2,946	116	141	116	367	944	364	0	4,994	495
	Natural Gas Conversion	3,796	116	949	116	0	0	0	0	4,976	478
Mid	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	4,112	116	141	116	367	944	364	0	6,160	1,661
	Natural Gas Conversion	5,546	116	949	116	0	0	0	0	6,727	2,228
High	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	5,312	116	141	116	367	944	364	0	7,360	2,861
	Natural Gas Conversion	7,346	116	949	116	0	0	0	0	8,527	4,028

*The mercury control system and process-water systems in the 2016 Plan are included in the "Long Term Operation" alternative.

Q. How would you assess the uncertainty in CPP and ELG Compliance costs?

A. Because (a) the Trimble County coal units would be the last coal units that the Companies would retire in a CPP compliance plan and (b) the Companies' generating portfolio would over-comply with any interpretation of the CPP if the Companies' Brown, Ghent, and Mill Creek coal units were retired and replaced with renewable or natural gas-fired generation, it is appropriate to assume no cost for Trimble County's CPP compliance when evaluating the retirement of the Trimble County coal units. Therefore, the Companies would associate little to no uncertainty associated with the CPP as it relates specifically to the Trimble County coal units.

As it relates to the ELG, the analysis includes $143 million for ELG compliance. Even in the Low gas price scenario, if ELG compliance is two to three times this amount, continuing to operating the Trimble County coal units with the proposed investments is least-cost. With a full suite of emissions reduction equipment, the Trimble County coal units are well positioned to operate economically past 2030. It would be difficult to envision the retirement of the Trimble County coal units in the absence of a mandate to retire all coal units.

Q. What is your conclusion about the cost-effectiveness of the projects proposed in KU's 2016 Plan?

A. Based on the Companies' analyses, I conclude the projects KU proposes in its 2016 Plan are economical. I therefore recommend that the Commission approve the proposed projects and KU's requested CPCNs and cost recovery.

VERIFICATION

COMMONWEALTH OF KENTUCKY	)	
	)	**SS:**
COUNTY OF JEFFERSON	)	

The undersigned, **Charles R. Schram**, being duly sworn, deposes and says that he is Director – Energy Planning, Analysis and Forecasting for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Charles R Schram

Charles R. Schram

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)

Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
~~My commission expires July 11, 2018~~
Notary ID # 512743

APPENDIX A

Charles R. Schram

Director, Energy Planning, Analysis and Forecasting
LG&E and KU Services Company
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Louisville, Kentucky 40202
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Education

Master of Business Administration
University of Louisville, 1995
Bachelor of Science – Electrical Engineering
University of Louisville, 1984
E.ON Academy General Management Program: 2002-2003
Center for Creative Leadership, Leadership Development Program: 1998

Professional Experience

LG&E and KU

Director, Energy Planning, Analysis & Forecasting	2008 – Present
Manager, Transmission Protection & Substations	2006 – 2008
Manager, Business Development	2005 – 2006
Manager, Strategic Planning	2001 – 2005
Manager, Distribution System Planning & Eng.	2000 – 2001
Manager, Electric Metering	1997 – 2000
Information Technology Analyst	1995 – 1997

U.S. Department of Defense – Naval Ordnance Station

Manager, Software Integration	1993 – 1995
Electronics Engineer	1984 – 1993

Analysis of 2016 ECR Projects
E.W. Brown Generating Station

PPL companies

Generation Planning & Analysis
January 2016

Table of Contents

1 Introduction

The 2016 Environmental Compliance Plan (“2016 Plan”) for Kentucky Utilities Company (“KU”) includes the following projects for the E.W. Brown Generating Station (“Brown”):

1. Project 36 – Brown Landfill Phase II
2. Project 42 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Brown

Project 36 includes the costs to construct Phase II of the Brown landfill to address Brown’s need for additional CCR storage capacity. Project 42 enables Brown to comply with the final federal rule concerning disposal of coal combustion residuals (“CCR”) from electric utilities (“CCR Rule”) and this analysis includes costs to cap and close the Brown Auxiliary Pond and install a new process-water system at the station. The cap and closure costs are unavoidable, but the new process-water system is required in 2019 to continue operating the Brown coal units. This analysis evaluates Projects 36 and 42 along with alternatives to these projects, and ultimately concludes that constructing Phase II of the Brown landfill along with the new process-water system is (a) the lowest reasonable cost alternative for operating Brown through 2021 and (b) lower cost than retiring the Brown coal units prior to 2021.

2 Analysis Methodology

In October 2015 and November 2015, respectively, the U.S. Environmental Protection Agency (“EPA”) published the final versions of the Clean Power Plan (“CPP”) and Effluent Limitation Guidelines (“ELG”). Much uncertainty exists regarding the costs to comply with these regulations; KU and its sister utility, Louisville Gas and Electric Company (collectively, “Companies”) must comply with the CPP and ELG by 2022 and will continue to work to understand these costs over the next 1-2 years. If the Companies determine that complying with these regulations is more costly than retiring the Brown coal units and replacing their capacity, KU can likely operate the units through 2021 without incurring any CPP and ELG compliance costs.

To avoid speculation regarding CPP and ELG compliance costs, Projects 36 and 42 were evaluated based only on costs incurred and benefits produced through 2021. The analysis period is consistent with the assumed 2022 CPP and ELG compliance timelines. This approach ensures that the investments associated with the proposed projects are lowest reasonable cost even if the Brown units cease to operate after 2021. Revenue requirements for capital costs incurred through 2021 extend through the remaining book life of the generating unit. These revenue requirements are included in the calculation of the present value of revenue requirements (“PVRR”) to ensure that the full impact of any capital costs incurred through 2021 is considered in determining whether the proposed projects are economical for operation of the units through 2021. In addition, the retirement alternatives considered in this analysis accelerate the need for transmission system upgrades that are currently planned for implementation after 2021. The analysis captures the impact of accelerating these projects.

It is important to note that choosing this analytical approach does not reflect a decision to retire the Brown coal units or any judgment on the likelihood of retiring the units. Instead, the Companies have adopted this analytical methodology to eliminate any potential concerns due to the uncertainty associated with the CPP and ELG rules and their cost, as well as any other future environmental regulations not yet promulgated.

Each of the projects at Brown is supported with a separate economic analysis and is discussed in the following sections.

3 Project 36 – Brown Landfill Phase II

3.1 Background

Brown has three coal-fired generating units with a combined summer net generating capacity of 679 megawatts. From 2012 to 2014, the Brown coal units operated at a 44 percent capacity factor and produced an average of 331 thousand tons of CCR per year. In 2015, with lower gas prices and the addition of the Cane Run 7 natural gas combined cycle ("NGCC") unit in June 2015, the Brown coal units operated at a 34 percent capacity factor and produced approximately 280 thousand tons of CCR. Based on the forecast for continued low natural gas prices and year-round Cane Run 7 operation, the Brown coal units on average are forecast to operate at a 25 percent capacity factor and produce 198 thousand tons of CCR annually from 2016 to 2021. Table 1 contains the most recent forecast of CCR production for Brown.

Table 1 – Brown CCR Forecast (Mid Gas Price Scenario)

	2016	2017	2018	2019	2020	2021	Annual Average	Total 2016-2021
CCR Production (thousand tons)	169	182	198	214	194	230	198	1,186
CCR Production (thousand cubic yards)	143	154	169	180	162	193	167	1,002

Brown currently has two CCR storage facilities (the Auxiliary Pond and the new special waste Landfill). All CCR from the Brown coal units is currently stored in the Auxiliary Pond. When Phase I of the special waste landfill goes into service later this year, fly ash from Brown Unit 3 as well as bottom ash and gypsum from all three Brown coal units will be stored in it. Because Brown Units 1 and 2 do not have dry handling systems for their fly ash, fly ash from Brown Units 1 and 2 will continue to be sluiced to the Auxiliary Pond. In addition to storing CCR from Brown Units 1 and 2, the Auxiliary Pond serves as a process-water system for all three of the Brown coal units.

When the special waste landfill was permitted, the Kentucky Division of Waste Management included a restriction in the landfill permit that limits the elevation difference between landfill phases to ten feet. As a result, the station can only store up to ten feet of CCR in phase I of the landfill before additional CCR storage is needed to continue operating the Brown coal units. Ten feet of CCR storage capacity equates to approximately 540 thousand cubic yards of capacity.

Table 2 contains a detailed summary of the Brown CCR forecast through 2021. Based on the cumulative total of CCR stored in the landfill, the capacity of phase 1 will be depleted in 2019.[1] To account for potential construction delays, KU is seeking authorization to construct phase II of the landfill by 2018. Ten feet of CCR storage capacity in phase II of the landfill will create approximately 490 thousand cubic yards of capacity.

[1] The capacity of phase 1 of the landfill is 540 thousand cubic yards; the cumulative total of CCR stored in the landfill through 2019 is 613 thousand cubic yards.

Table 2 – Detailed Brown CCR Forecast (Mid Gas Price Scenario, Thousand Cubic Yards)

	2016	2017	2018	2019	2020	2021	Total 2016-2021
Auxiliary Pond							
Brown 1-2 Fly Ash	16	17	20	0	0	0	53
Cumulative Total	16	33	53	53	53	53	53
Landfill							
Brown 1-2 Fly Ash	0	0	0	20	20	23	64
Brown 3 Fly Ash	24	26	34	35	29	36	185
Brown 1-3 Bottom Ash	9	9	11	12	11	13	65
Brown 1-3 Gypsum	94	102	103	113	102	121	635
Annual Total	127	137	149	180	162	193	949
Cumulative Total	127	264	413	593	756	949	949
Total CCR	143	154	169	180	162	193	1,002

3.2 Alternatives

KU considered several alternatives for complying with the CCR Rule and addressing the need for additional CCR storage capacity at Brown. Each of these alternatives is discussed in the following sections.

3.2.1 Construct Phase II of Brown Landfill

The Brown landfill design includes three phases. Due to the restriction in KU's landfill permit that limits the elevation difference between landfill phases to ten feet, the capacity of phase II of the landfill is approximately 490 thousand cubic yards. The total cost of phase II of the landfill in as-spent dollars is $11.7 million. The assumed cost to store CCR in the landfill is [redacted] in 2016 dollars. Phase II of the landfill will provide CCR storage capacity through 2021.[2]

3.2.2 Transport CCR to Beneficial Use Markets

KU considered transporting CCR to beneficial use markets as an alternative to building additional on-site landfill capacity. To eliminate the need for additional on-site landfill capacity through 2021, KU would have to transport offsite at least 600 thousand tons (approximately 500 thousand cubic yards) of Brown's CCR. For the following reasons, transporting Brown's CCR to beneficial use markets is not currently a viable option.

- Brown fly ash and bottom ash have unburned carbon levels, measured as loss on ignition ("LOI"), that exceed beneficial use market limits. Beneficial use markets for fly ash and bottom ash have an LOI limit of two to four percent compared to the Brown LOI level of approximately

[2] Note that Phases I and II of the Brown landfill will provide significant additional CCR disposal capacity if Phase III of the landfill is built (as KU currently expects it will be). When all three phases are in operation, the 10-foot-height-differential limitation in the landfill's sold-waste permit will no longer constrain the total amount of CCR KU can place in the landfill; instead, KU will be able to fill each phase within the 10-foot limit, then place additional CCR in an adjoining phase to the 10-foot limit, and continue that pattern sequentially without additional landfill construction until the entire landfill reaches capacity.

eight percent. Given the availability of fly ash and bottom ash from other sources with acceptable LOI levels, Brown's fly ash and bottom ash are not currently marketable.[3]

- Gypsum moisture levels exceed beneficial use market limits. A key factor in determining the marketability of gypsum is its moisture content. The gypsum moisture content at Brown is 15%, but it must be less than 10% to be marketable.[4] Given the availability of gypsum from other sources with acceptable levels of moisture, Brown's higher-moisture gypsum is not currently marketable.
- Brown is farther from known beneficial-use opportunities and does not have access to barge transportation. The Companies' other stations are closer to beneficial-use opportunities and have access to barge transportation. Even if KU installed equipment to address the LOI levels and gypsum moisture content issues, the marketability of the station's CCR would be limited by transportation logistics (related to the inability to barge CCR) and high transportation costs to beneficial use markets.

3.2.3 Transport CCR to Municipal Landfill

As a second alternative to building additional on-site landfill capacity, KU considered trucking CCR to a municipal landfill. The nearest municipal landfill to Brown is approximately 29 miles from the station. KU does not have a negotiated contract for storing CCR in a municipal landfill. Instead, for the purpose of this analysis, the total cost of the municipal landfill tipping fee along with the associated CCR handling and transportation costs is assumed to be $38.21/ton. This cost was the assumed cost of trucking CCR a shorter distance (about 14 miles) from the Trimble County Station to the Valley View Municipal Solid Waste Landfill in Case No. 2015-000194. To eliminate the need through 2021 for additional on-site landfill capacity, KU would have to transport offsite at least 600 thousand tons (500 thousand cubic yards) of Brown's CCR.

3.3 Analysis

The present value of revenue requirements ("PVRR") for constructing phase II of the Brown landfill ("Landfill Phase II") and transporting CCR to a municipal landfill ("Municipal Landfill") are summarized in Table 3.[5] The capital PVRR value for phase II of the landfill includes the entire stream of capital revenue requirements, which extends through the remaining book life of Brown 3 (23 years). The PVRR values for CCR handing costs include CCR handling costs for each alternative through 2021.

Table 3 – Project 36 Analysis Results (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)

Gas Price	Alternative	Capital	CCR Handling Costs	Total	Difference from Best
Low	Landfill Phase II	13.8	5.9	19.7	0.0
	Municipal Landfill	0.0	23.8	23.8	4.2
Mid	Landfill Phase II	13.8	6.7	20.4	0.0
	Municipal Landfill	0.0	25.0	25.0	4.5
High	Landfill Phase II	13.8	7.8	21.6	0.0
	Municipal Landfill	0.0	26.1	26.1	4.5

[3] LOI at the Companies' Mill Creek, Trimble County, and Ghent stations is in the two to four percent range.
[4] Lower moisture contents reduce the cost of processing the gypsum for beneficial use.
[5] The alternative to transport CCR to beneficial use markets is excluded because it is not a viable alternative.

Compared to transporting CCR to a municipal landfill, constructing phase II of the Brown landfill is lower cost. The cost to transport CCR to a municipal landfill along with the associated tipping fee would have to drop below [redacted] before the municipal landfill alternative would be lower cost.

4 Project 42 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Brown

4.1 Background

In April 2015, the U.S. Environmental Protection Agency ("EPA") issued the final CCR Rule. To comply with this rule, the analysis assumes KU will have to construct a new process-water system for the station by 2019 and begin cap and closure activities at the Brown Auxiliary Pond in the same year under Project 42. Whatever KU ultimately must do to comply with the CCR Rule, the costs of such compliance will be unavoidable; retiring the coal units at Brown—even retiring them today—would not allow KU to avoid those costs. However, the new process-water system is required only if the Brown coal units continue to operate past 2018. Table 4 summarizes the Project 42 costs along with the costs of phase II of the landfill.

Table 4 – Brown ECR Project Costs ($M, As-Spent Dollars)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cap and Closure	0.0	0.5	0.7	0.5	3.8	3.4	3.6	9.9	10.2	32.7
Process-Water System	0.0	0.5	33.0	35.1	0.0	0.0	0.0	0.0	0.0	68.6
Total CCR Ruling Compliance	0.0	1.0	33.7	35.6	3.8	3.4	3.6	9.9	10.2	101.3
Landfill Phase II	0.1	0.0	11.7	0.0	0.0	0.0	0.0	0.0	0.0	11.9
Total Brown ECR Project Costs	0.1	1.0	45.5	35.6	3.8	3.4	3.6	9.9	10.2	113.2

4.2 Alternatives

KU evaluated the following alternatives to constructing the new process-water system and Phase II of the landfill:

1. Retire the Brown coal units in 2019 and purchase replacement capacity through 2021 ("Retire in 2019").
2. Convert the Brown coal units to operate on natural gas beginning in 2019 and operate on natural gas from 2019 to 2021 ("Natural Gas Conversion").

Both alternatives are compared to a scenario where the Brown coal units are assumed to retire at the beginning of 2022 ("Operate through 2021").[6] This analytical approach—comparing retiring the coal-fired units at the beginning of 2019 versus retiring the units at the beginning of 2022—is a conservative approach to evaluating whether it is economical to proceed with the proposed projects and keep the units operating through the end of 2021. Analyzing the 2016 Plan's long-lived investments over a short timeframe requires the investments to be economical by the end of 2021 (relative to the cost of retiring the units in 2019). In other words, this no-regrets analytical approach ensures that even if KU determines in the next 1-2 years that retiring the units in 2022 is more economical than incurring the

[6] The 2016-2021 analysis period is consistent with the assumed 2022 CPP and ELG compliance timelines. As stated previously, using this analytical approach is neither a commitment nor a prediction that KU will retire any or all of the coal-fired units at Brown in early 2022 or at any other time.

costs of ELG or CPP compliance, the investments proposed for Brown in the 2016 Plan will have been economical relative to having retired the units in 2019.

A decision to retire the Brown coal units in either 2019 or 2022 would result in reduced maintenance spending in the years prior to retirement. By recognizing this fact, it is important to note that this approach—again, comparing retiring the units in 2019 to retiring the units in 2022—does not undervalue retiring the units in 2019 even though KU is not committing to retire the units in 2022 or later. At first glance, this approach might appear to undervalue the 2019 retirement scenario because the 2022 retirement scenario reduces capital and O&M spending for the units beginning in 2018 as the units prepare for retirement; but if the units do not retire in 2022, presumably KU would continue to make the capital and O&M expenditures necessary for ongoing operations, which would relatively increase the value of retiring the units in 2019. This would be a valid analytical concern if KU were not going to have better information about ELG and CPP compliance options and costs before 2018, when the modeled capital and O&M tapering begins. But KU will indeed have more information about such options and costs by 2018 and will be better positioned to determine whether or when to retire any coal-fired units.

If KU's analyses over the next 1-2 years show that retiring Brown's coal-fired units in early 2022 would be more economical than incurring the costs of ELG and CPP compliance, then KU would be able to begin tapering capital and O&M spending at Brown as this analysis reflects. On the other hand, if KU's analyses over the next 1-2 years show it would be more economical to incur ELG and CPP compliance costs—in addition to ongoing capital and O&M spending at non-tapered levels—to keep the units operating beyond 2021, then KU would seek any necessary Commission approvals for ongoing coal-fired operations. Therefore, this analytical approach is indeed a no-regrets approach.

The "Retire in 2019" and "Natural Gas Conversion" alternatives are discussed further in the following sections. A complete summary of costs for each alternative is included in Appendix A – Cost Assumptions.

4.2.1 Retire Brown Coal Units in 2019 and Replace Capacity

In addition to eliminating all maintenance and operating costs after the units are retired, a decision to retire the Brown coal units would result in reduced maintenance spending in the years prior to retirement. Furthermore, KU would avoid the cost of the process-water system needed to continue operating the coal units.

In the "Retire in 2019" alternative, the Brown coal units (679 MW) are assumed to be retired at the beginning of 2019 and replaced by a three-year power purchase agreement. The analysis evaluated power purchase agreements for two generation portfolios:

A. Two 201 MW SCCT units (402 MW in total).
B. One 368 MW NGCC unit and one 201 MW simple cycle combustion turbine ("SCCT") unit (569 MW in total).

The replacement capacity portfolios were developed using resources evaluated in the Companies' 2014 Integrated Resource Plan ("IRP") to minimally comply with the Companies' target reserve margin range (16% to 21%) in 2019 through 2021. This analysis does not account for additional reliability risks and costs associated with operating at a lower reserve margin. In addition, the costs of the IRP resources were used to develop the cost of the power purchase agreement for each portfolio.[7] Table 5 summarizes the impact of each of the replacement capacity portfolios on the Companies' reserve margin. With the Brown coal units, the Companies' reserve margin in 2019 to 2021 ranges from 19% to 20%. With the SCCT replacement capacity portfolio, the Companies' reserve margin would drop to 15% to 16%. Because (a) the SCCT replacement capacity portfolio causes the Companies' reserve margin to drop below the minimum of the target range and (b) the Brown units produce more energy than SCCT units typically produce, the Companies also evaluated a replacement capacity portfolio consisting of NGCC and SCCT units. With the NGCC and SCCT replacement capacity portfolio, the reserve margin ranges from 18% to 19%.

Table 5 – LG&E/KU Resource Summary (MW)

	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Forecasted Peak Load	7,314	7,395	7,448	7,225	7,244	7,266
Demand Side Management	(366)	(407)	(444)	(481)	(490)	(480)
Net Peak Load	6,948	6,988	7,004	6,744	6,754	6,786
Operate through 2021						
Existing Resources	7,974	7,976	7,986	7,821	7,822	7,823
Firm Purchases (OVEC)	152	152	152	152	152	152
Curtailable Load	136	136	136	136	136	136
Total Supply	8,262	8,264	8,274	8,109	8,110	8,111
Reserve Margin ("RM")	18.9%	18.3%	18.1%	20.2%	20.1%	19.5%
Retire in 2019: SCCT						
Existing Resources	7,974	7,976	7,986	7,821	7,822	7,823
Firm Purchases (OVEC)	152	152	152	152	152	152
Curtailable Load	136	136	136	136	136	136
Brown Units 1-3 Retirement	0	0	0	(679)	(679)	(679)
New SCCT Capacity	0	0	0	402	402	402
Total Supply	8,262	8,264	8,274	7,832	7,833	7,834
Reserve Margin ("RM")	18.9%	18.3%	18.1%	16.1%	16.0%	15.4%
Retire in 2019: NGCC/SCCT						
Existing Resources	7,974	7,976	7,986	7,821	7,822	7,823
Firm Purchases (OVEC)	152	152	152	152	152	152
Curtailable Load	136	136	136	136	136	136
Brown Units 1-3 Retirement	0	0	0	(679)	(679)	(679)
New NGCC/SCCT Capacity	0	0	0	569	569	569
Total Supply	8,262	8,264	8,274	7,999	8,000	8,001
Reserve Margin ("RM")	18.9%	18.3%	18.1%	18.6%	18.4%	17.9%

[7] The 368 MW NGCC unit evaluated in the IRP is a G- or H-class NGCC unit with a 1x1 configuration. The 201 MW SCCT unit is an F-class SCCT unit. Additional information regarding replacement capacity costs is included in Appendix A – Cost Assumptions.

Because replacement capacity cannot be constructed at Brown by 2019, this alternative includes an estimated $62 million in transmission system upgrades to maintain grid stability and reliability; as currently configured, having significant generating capacity available at Brown is vital to maintaining grid stability and reliability in central Kentucky, so significant transmission upgrades would be necessary if the coal units were retired without replacement generation at the Brown site. Approximately $24 million of the transmission system upgrade cost is for projects that are currently planned for implementation after 2021 with the assumption that generating capacity will remain at the Brown station; a decision to retire the Brown units in 2019 and purchase replacement capacity would accelerate the need for these projects. The analysis captures the impact of accelerating these projects.

4.2.2 Convert the Brown Coal Units to Burn Natural Gas

KU can avoid constructing phase II of the landfill by converting the Brown coal units to burn natural gas instead of coal. This project would require burner modifications to the units as well as an additional 12-mile natural gas pipeline from the TETCO and Tennessee pipelines to the station. In 2013, Black and Veatch estimated the cost of converting Brown Units 1 and 2 to burn natural gas to be $120 million (in 2013 dollars). The estimated cost of converting all three coal units is estimated to be $146 million (in 2013 dollars). The analysis assumes the efficiency of the units would be unchanged.

4.3 Analysis

The results of this analysis are summarized in Table 6. Each alternative was evaluated over three gas price scenarios.[8] Constructing the projects that will enable the Brown units to operate through 2021 is $153 million favorable to $5 million unfavorable to retiring the units in 2019 or converting the units to burn natural gas. Operating the Brown coal units at least through 2021 is least cost in eleven of the twelve results. In the Low gas price scenario, the PVRR of the “Operate through 2021” alternative is only $5 million higher than the alternative where the Brown coal units are replaced with 402 MW of SCCT capacity. In all gas price scenarios, the “Natural Gas Conversion” alternative has the highest PVRR.[9]

[8] Tables of the gas prices and financial inputs are included in Appendix B – Other Inputs.

[9] The cost of the “Natural Gas Conversion” alternative includes $35 million for a natural gas pipeline that would be needed if the Brown coal units were replaced by NGCC capacity. If this cost is included in 2022 in the other alternatives, the PVRR of the “Natural Gas Conversion” alternative becomes $32 million less unfavorable in all gas price scenarios.

Table 6 – Brown Analysis Results (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)[10]

Gas Price	Alternative	System Production Costs	Other Capital and FOM	ECR Project Costs	Replacement Capacity Costs	NG Conversion	Trans. System Upgrade	Total	Diff from Best
Low	Operate through 2021	4,896	204	105	0	0	17	5,222	5
	Retire in 2019: NGCC/SCCT	4,876	114	13	216	0	57	5,276	58
	Retire in 2019: SCCT	4,913	114	13	120	0	57	5,217	0
	Natural Gas Conversion	4,902	201	13	0	172	17	5,306	88
Mid	Operate through 2021	4,993	204	105	0	0	17	5,320	0
	Retire in 2019: NGCC/SCCT	4,996	114	13	216	0	57	5,396	76
	Retire in 2019: SCCT	5,031	114	13	120	0	57	5,335	16
	Natural Gas Conversion	5,024	201	13	0	172	17	5,427	108
High	Operate through 2021	5,131	204	105	0	0	17	5,457	0
	Retire in 2019: NGCC/SCCT	5,176	114	13	216	0	57	5,576	119
	Retire in 2019: SCCT	5,210	114	13	120	0	57	5,514	57
	Natural Gas Conversion	5,207	201	13	0	172	17	5,610	153

4.3.1 Accelerated Recovery

Because the PVRRs of the “Operate through 2021” and “Retire in 2019: SCCT” alternatives are comparable in the Low gas price scenario, KU also evaluated the “Operate through 2021” alternative with the assumption that the costs for the process-water system and phase II of the landfill would be recovered over three years instead of the remaining book life of Brown 3 (23 years). The results of this analysis are summarized in Table 8. The assumed book life of a project has very little impact on the project’s PVRR. When the cost of the process-water system and phase II of the landfill are assumed to be recovered over three years, the PVRR difference between the “Operate through 2021” and “Retire in 2019: SCCT” alternatives remains small.

[10] A decision to retire the Brown units in 2019 and purchase replacement capacity would accelerate the need for transmission system upgrades that are currently planned for implementation after 2021. The analysis captures the impact of accelerating these projects.

Table 7 – Brown Analysis Results (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars, 3 Year Book Life for Process-Water Systems and Phase II Landfill)[11]

Gas Price	Alternative	System Production Costs	Other Capital and FOM	ECR Project Costs	Replacement Capacity Costs	NG Conversion	Trans. System Upgrade	Total	Diff from Best
Low	Operate through 2021	4,896	204	106	0	0	17	5,223	6
	Retire in 2019: NGCC/SCCT	4,876	114	13	216	0	57	5,276	58
	Retire in 2019: SCCT	4,913	114	13	120	0	57	5,217	0
	Natural Gas Conversion	4,902	201	13	0	174	17	5,308	90
Mid	Operate through 2021	4,993	204	106	0	0	17	5,321	0
	Retire in 2019: NGCC/SCCT	4,996	114	13	216	0	57	5,396	75
	Retire in 2019: SCCT	5,031	114	13	120	0	57	5,335	14
	Natural Gas Conversion	5,024	201	13	0	174	17	5,429	109
High	Operate through 2021	5,131	204	106	0	0	17	5,458	0
	Retire in 2019: NGCC/SCCT	5,176	114	13	216	0	57	5,576	118
	Retire in 2019: SCCT	5,210	114	13	120	0	57	5,514	55
	Natural Gas Conversion	5,207	201	13	0	174	17	5,612	154

5 Conclusion

The analyses summarized in Sections 3 and 4 result in the following conclusions:

1. Even if the Brown coal units cease operation after 2021, constructing phase II of the landfill is lower cost than transporting CCR to a municipal landfill.
2. Even if the Brown coal units cease operation after 2021, constructing phase II of the landfill along with the process water system is the lowest reasonable cost alternative. The fact that only a single scenario for replacement of the units in 2019 is comparable to operating through 2021 is not compelling economic evidence that the retire/replace alternative is preferable. Furthermore, from a reliability perspective, customers are better served with the Brown units versus the risk of finding replacement capacity. It is not clear that 400+ MW of capacity and import transmission will be available to ensure reliability.

[11] A decision to retire the Brown units in 2019 and purchase replacement capacity would accelerate the need for transmission system upgrades that are currently planned for implementation after 2021. The analysis captures the impact of accelerating these projects.

6 Appendix A – Cost Assumptions

Table 8 – Capital and Fixed O&M Assumptions for Brown Analysis ($M, As-Spent Dollars)

	2016	2017	2018	2019	2020	2021	Total
2016 Plan with Updated ECR Costs							
Coal Unit Fixed O&M	29	28	35	31	38	32	193
Ongoing Capital	20	5	14	12	21	9	81
Cap and Closure Costs	1	1	0	4	3	4	13
Process-Water System	1	33	35	0	0	0	69
Landfill Phases II and III	0	12	0	16	0	0	28
ELG Costs	2	0	8	51	40	42	143
Total	52	78	92	115	102	86	526
Operate through 2021							
Coal Unit Fixed O&M[12]	29	28	31	30	31	30	178
Ongoing Capital[12]	20	5	7	3	5	2	42
Cap and Closure Costs	1	1	0	4	3	4	13
Process-Water System	1	33	35	0	0	0	69
Landfill Phase II	0	12	0	0	0	0	12
ELG Costs	2	0	0	0	0	0	2
Total	52	78	74	36	40	35	315
Retire in 2019: SCCT							
Coal Unit Fixed O&M[12]	29	27	29	1	0	0	86
Ongoing Capital[12]	20	1	3	0	0	0	25
Cap and Closure Costs	1	1	0	4	3	4	13
Process-Water System	0	0	0	0	0	0	0
Landfill Phase II	0	0	0	0	0	0	0
Replacement Capacity Cost[13]	0	0	0	49	50	50	149
ELG Costs	2	0	0	0	0	0	2
Transmission Upgrades	0	0	0	35	10	17	62
Total	51	29	33	89	63	71	336
Retire in 2019: NGCC/SCCT							
Coal Unit Fixed O&M[12]	29	27	29	1	0	0	86
Ongoing Capital[12]	20	1	3	0	0	0	25
Cap and Closure Costs	1	1	0	4	3	4	13
Process-Water System	0	0	0	0	0	0	0
Landfill Phase II	0	0	0	0	0	0	0
Replacement Capacity Cost[13]	0	0	0	88	89	90	267
ELG Costs	2	0	0	0	0	0	2
Transmission Upgrades	0	0	0	35	10	17	62
Total	51	29	33	129	102	111	454

[12] Reduced capital and O&M expenditures in the years leading up to a unit's retirement are consistent with the Companies' recent experience at the Cane Run Generating Station.
[13] See Table 10 for a summary of the costs included in Replacement Capacity Cost.

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	2016	2017	2018	2019	2020	2021	Total
Natural Gas Conversion							
Coal Unit Fixed O&M	29	28	31	28	30	28	174
Ongoing Capital	20	5	7	3	5	2	42
Cap and Closure Costs	1	1	0	4	3	4	13
Process-Water System	0	0	0	0	0	0	0
Landfill Phase II	0	0	0	0	0	0	0
New Pipeline and Burner Mods	0	0	0	164	0	0	164
ELG Costs	2	0	0	0	0	0	2
Total	51	34	38	199	38	34	395

Table 9 – Transmission Costs ($M)

Year	Operate through 2021	Retire in 2019: SCCT	Retire in 2019: NGCC/SCCT	Natural Gas Conversion
2016	0	0	0	0
2017	0	0	0	0
2018	0	0	0	0
2019	0	35	35	0
2020	0	10	10	0
2021	0	17	17	0
2022	8	0	0	8
2023	8	0	0	8
2024	0	0	0	0
2025	0	0	0	0
2026	4	0	0	4
2027	3	0	0	3
2028	0	0	0	0
2029	1	0	0	1
Total	24	62	62	24

Table 10 – Replacement Capacity Costs

Cost Item	1x1 NGCC	SCCT
Replacement Capacity ($/kW, 2013 Dollars)[14]	[redacted]	
Average Annual Capacity (MW)	398	211
Fixed Charge Rate	9.5%	9.2%
Book Life (Years)	40	30
Fixed O&M ($/kW-year, 2013 Dollars)	[redacted]	
Firm Gas Transport ($/kW-year, 2013 Dollars)[15]	20.3	20.7
Firm Transmission Service ($/kW-year, 2015 Dollars)[16]	22.5	22.5
Escalation Rate	2.0%	2.0%

[14] Replacement capacity costs reflect capacity costs from the Companies' 2014 Integrated Resource Plan.
[15] Firm gas transportation costs were taken from the 2014 Integrated Resource Plan and are based on the firm gas transportation rates for Cane Run 7.
[16] PJM tariff for firm transmission service, effective June 1, 2015.

6.1 PPA Financing Costs

When rating agencies assess a utility's debt rating, they impute debt on the utility's balance sheet to reflect the fixed financial obligations associated with PPAs. As a result, when utilities enter into a PPA, they must increase the equity share of their capital structure to offset the imputed debt and maintain their debt rating.[17]

To calculate the amount of imputed debt, rating agencies compute the net present value ("NPV") of future fixed payments associated with the PPA (e.g., capacity payments) using a discount rate equivalent to the company's average cost of debt. Then, a risk factor is applied to reflect the benefits of regulatory or legislative cost recovery mechanisms. In the Companies' business environment, where regulators use a utility's rate case to establish base rates that provide for the recovery of the fixed costs created by PPAs, a risk factor of 50% is applied to the NPV. This product is then multiplied by the utilities' target share of debt financing to calculate the amount of imputed debt associated with a PPA.[18] This process is consistent with the process used to address capitalization issues in the Companies' last rate case before the KPSC.

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[17] A utility's debt rating is a function of its capital structure.

[18] A complete summary of the methodology Standard & Poor's uses to calculate imputed debt for U.S. utilities' PPAs is available at http://www.psc.utah.gov/utilities/electric/09docs/0903523/062309ExhibitE.pdf.

7 Appendix B – Other Inputs

The Henry Hub ("HH") natural gas price scenarios considered in this analysis are listed in Table 11. The Mid natural gas price forecast is based on market prices for the short term and the Energy Information Administration's ("EIA") 2015 Annual Energy Outlook ("AEO") for the long term.[19] Prices in 2016-2017 were taken from the Companies' 2016 Business Plan and reflect NYMEX HH monthly forward prices as of 6/18/2015. Prices in 2018-2020 reflect a blend of market prices and a midpoint average curve between the annual HH prices from two EIA AEO 2015 scenarios: "High Oil Price" (a proxy for high gas price) and "High Oil and Gas Resource" (a proxy for low gas price). Blending is 75% market in 2018, 50% market in 2019, and 25% market in 2020. Prices in 2021 reflect the midpoint average curve between the annual HH prices from the "High Oil Price" and "High Oil-Gas Resource" scenarios. Monthly prices after 2017 are calculated using average monthly shape indices derived from the market forwards for 2016-2020. The Low natural gas price forecast is based on EIA's 2015 AEO "High Oil and Gas Resource" scenario. To maintain a consistent spread between the Low and Mid natural gas price scenarios, years 2016-2018 in the Low scenario were adjusted to reflect the 2019 percentage difference between the Low and Mid scenarios. The High natural gas price forecast is based on EIA's 2015 AEO "High Oil Price" scenario.

Table 11 – Natural Gas Prices (Nominal Henry Hub $/MMBtu)

Year	Low	Mid	High
2016	2.93	3.17	3.53
2017	3.08	3.34	3.89
2018	3.27	3.54	4.30
2019	3.49	3.78	4.67
2020	3.51	4.16	5.18
2021	3.69	4.72	5.76

Table 12 – Financial Inputs

Input	Value
Return on Equity	10.0%
Cost of Debt	4.21%
Capital Structure	
Debt	47.0%
Equity	53.0%
Tax Rate	38.9%
Revenue Requirement Discount Rate	6.51%

[19] The EIA's 2015 AEO was published in April 2015. For the AEO data tables, see http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2015&subject=0-AEO2015&table=1-AEO2015&region=0-0&cases=ref2015-d021915a. For the AEO report, see http://www.eia.gov/forecasts/aeo/.

Analysis of 2016 ECR Projects
Ghent Generating Station

PPL companies

Generation Planning & Analysis
January 2016

Table of Contents

1 Introduction

The 2016 Environmental Compliance Plan ("2016 Plan") for Kentucky Utilities Company ("KU") includes the following projects for the Ghent Generating Station ("Ghent"):

1. Project 37 – Wet Flue-Gas Desulfurization ("WFGD") Improvements at Ghent 2
2. Project 38 – Supplemental Mercury Control Injection Systems at Ghent 1-4
3. Project 40 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Ghent

This analysis evaluates these projects along with alternatives to these projects and ultimately concludes the following:

1. The proposed WFGD improvements at Ghent 2 are the least-cost way to comply with the U.S. Environmental Protection Agency's ("EPA's") Mercury and Air Toxics Standards ("MATS Rule") for acid gases measured as hydrogen chloride ("HCl").
2. Based on the projected O&M savings, the proposed mercury control injection systems have a favorable impact on revenue requirements.
3. The cost of the new process-water systems required to continue operating the Ghent units, along with the WFGD improvements and mercury control injection systems, are least-cost – even if the Ghent units only operate through 2021.

2 Analysis Methodology

In October 2015 and November 2015, respectively, the U.S. Environmental Protection Agency ("EPA") published the final versions of the Clean Power Plan ("CPP") and Effluent Limit Guidelines ("ELG"). Much uncertainty exists regarding the costs to comply with these regulations; KU and its sister utility, Louisville Gas and Electric Company (collectively, "Companies") must comply with the CPP and ELG by 2022 and will continue to work to understand these costs over the next 1-2 years. If the Companies determine that complying with these regulations is more costly than retiring the Ghent coal units and replacing their capacity, KU can likely operate the units through 2021 without incurring any CPP and ELG compliance costs.

In this analysis, Projects 37 and 38 were initially evaluated over a 30-year analysis period to assess the longer-term impacts of tradeoffs between O&M and capital spending in specific alternatives. Then, to avoid speculation regarding CPP and ELG compliance costs, all of the proposed projects were evaluated based only on costs incurred and benefits produced through 2021. This analysis period is consistent with the assumed 2022 CPP and ELG compliance timelines. This approach ensures that the investments associated with the proposed projects are lowest reasonable cost even if the Ghent units cease to operate after 2021. Revenue requirements for capital costs incurred through 2021 extend through the remaining book life of the generating unit. These revenue requirements are included in the calculation of the present value of revenue requirements ("PVRR") to ensure that the full impact of any capital costs incurred through 2021 is considered in determining whether the proposed projects are economical for operation of the units through 2021.

It is important to note that choosing this analytical approach does not reflect a decision to retire the Ghent coal units or any judgment on the likelihood of retiring the units. Instead, the Companies have adopted this analytical methodology to eliminate any potential concerns due to the uncertainty associated with the CPP and ELG rules and their cost, as well as any other future environmental regulations not yet promulgated.

Each of the projects at Ghent is supported with a separate economic analysis and is discussed in the following sections.

3 Project 37 – WFGD Improvements at Ghent 2

3.1 Background

Ghent has four coal-fired generating units with a combined summer net generating capacity of 1,917 megawatts. The Ghent units have very similar capacities and operating costs. All four units are equipped with flue gas desulfurization ("FGD") equipment for the reduction of sulfur dioxide ("SO_2") emissions. Table 1 contains a listing of the Ghent coal units along with their net summer ratings and SO_2 removal rates.

Table 1 – Ghent Generating Units

Unit	Net Summer Rating (MW)	SO_2 Removal Rate
Ghent 1	474	98.5%
Ghent 2	493	90.0%
Ghent 3	485	98.5%
Ghent 4	465	98.5%

The amount of SO_2 produced during the combustion of coal varies based on the sulfur content of the coal. Coal with a higher sulfur content is generally less expensive than coal with a lower sulfur content. At Ghent, using Illinois Basin coal, the amount of SO_2 produced during the combustion process ranges between 5.5 and 6.5 pounds per mmBtu of coal burned ("lb/mmBtu"). Based on this range and the SO_2 removal rates listed in Table 1, Ghent Units 1, 3, and 4 emit between 0.0825 and 0.0975 lb/mmBtu. Because the older FGD equipment on Ghent 2 has a lower SO_2 removal rate, Ghent 2 emits between 0.55 and 0.65 lb/mmBtu.

By the summer of 2016, the 30-day rolling generation-weighted average SO_2 emission rate ("SO_2 emission rate") for Ghent must remain below 0.2 lb/mmBtu to demonstrate compliance with the MATS Rule for acid gases measured as HCl.[1] Table 2 lists Ghent's SO_2 emission rate over a range of generation levels for Ghent 2, where generation for Ghent 2 is expressed as a percentage of the station's total generation. During 30-day periods with no planned maintenance outages, Ghent 2 would be expected to produce approximately one-fourth (25%) of the station's total generation. When one or two of the other Ghent units are offline for four weeks of planned maintenance, Ghent 2 would be expected to produce between one-third (33%) and one-half (50%) of the station's total generation. Based on the information in Table 2, the station's SO_2 emission rate would exceed the 0.2 lb/mmBtu threshold in all of these scenarios.

[1] The SO_2 emission rate is a surrogate for demonstrating compliance with the MATS Rule for HCl emissions.

Table 2 – Ghent SO_2 Emission Rates

Ghent 2 Generation as Percentage of Station's Total Generation	SO2 Emission Rate[2] (lb/mmBtu)*
0%	0.09
10%	0.14
15%	0.17
16%	0.17
17%	0.18
18%	0.18
19%	0.19
20%	0.19
25%	0.22
30%	0.24
33%	0.26
40%	0.29
50%	0.35
60%	0.40
70%	0.45
80%	0.50
90%	0.55
100%	0.60

*Highlighted cells denote SO_2 emission rates that exceed the 0.2 lb/mmBtu MATS Rule threshold.

3.2 Alternatives

KU considered several alternatives for complying with the MATS Rule for acid gases measured as HCl at Ghent. Each of these alternatives is discussed in the following sections.

3.2.1 Do Nothing (Comply Using Dispatch Modifications Only)

Without taking action to reduce Ghent's SO_2 emission rate, the Ghent station cannot comply with the MATS Rule for acid gases measured as HCl when Ghent 2's generation exceeds 20% of the station's total generation (see Table 2). This alternative includes the costs of modifying Ghent 2's dispatch so that it does not produce more than 20% of the station's total generation, effectively reducing Ghent 2's capacity by approximately 110 MW when the other three Ghent units are operating at full load. These costs include increased production costs as well as increased reliability costs. For the purpose of this analysis, reliability cost impacts are ignored.

3.2.2 Modify the Ghent 2 WFGD to Improve Its SO_2 Removal Rate

At an estimated cost of $7 million (spent in 2016), KU can modify the Ghent 2 WFGD to increase its SO_2 removal rate from 90% to 97%. The cost of this project includes the addition of new nozzles and/or wall rings to improve gas-to-liquid contact, new tray plugs to increase pressure drop, and a new recycle pump and gearbox modifications to increase the liquid-to-gas ratio.

[2] SO_2 emission rates are computed based on the assumption that the amount of SO_2 produced during coal combustion is 6 lb/mmBtu.

3.2.3 Use Reagent to Improve SO_2 Removal Rate

As an alternative to the WFGD modifications, KU can increase the SO_2 removal rate for Ghent 2 from 90% to 95% by injecting a reagent into the unit's scrubber liquor. The estimated cost of the equipment to store and inject the reagent is $1.4 million (spent in 2016). The estimated annual cost of the reagent is approximately $1.3 million and is assumed to escalate at 2% per year.

3.2.4 Burn Lower Sulfur Coal in Ghent 2

Currently, the amount of SO_2 produced by any Ghent unit during the combustion process ranges between 5.5 and 6.5 lb/mmBtu, depending on the amount of sulfur in the coal. By switching Ghent 2 to coal with a lower sulfur content, the station can reduce the amount of SO_2 produced by Ghent 2 to approximately 3.5 lb/mmBtu. As a result, the rate of SO_2 emissions for Ghent 2 would decrease by 35 to 45 percent.

The most cost-effective way to implement this alternative would be to maintain two coal piles at Ghent: one lower sulfur pile for Ghent 2 and one higher sulfur for Ghent 1, 3, and 4. Compared to the higher sulfur coal that is currently burned at Ghent, lower sulfur coal is $8/ton to $10/ton more expensive. Based on the Companies' 2016 Plan, Ghent 2 is expected to burn an average of approximately 1,400,000 tons of coal per year over the next 10 years. If coal costs increase by $8/ton, the annual fuel expense will increase by approximately $11 million.

3.3 Analysis

Table 3 summarizes the impact of each of the alternatives on Ghent's SO_2 emission rates. In Table 3, Ghent's SO_2 emission rates are listed over a range of generation levels for Ghent 2 where generation for Ghent 2 is expressed as a percentage of the station's total generation. Highlighted cells in Table 3 denote SO_2 emission rates that exceed the 0.2 lb/mmBtu MATS Rule threshold. To comply with MATS Rule in the "Do Nothing" alternative, for example, the Companies would have to modify Ghent 2's dispatch so that Ghent 2 does not produce more than 20% of the station's total generation. In the "Modify Ghent 2 WFGD" alternative, Ghent 2 can produce more than 60% of the station's generation and still comply with MATS Rule.

Table 3 – Impact of Alternatives on Ghent SO_2 Emission Rates

Ghent 2 Generation as Percentage of Station's Total Generation	SO2 Emission Rate[3] (lb/mmBtu)			
	Do Nothing	Modify Ghent 2 WFGD	Reagent	Burn Lower Sulfur Coal
0%	0.09	0.09	0.09	0.09
10%	0.14	0.10	0.11	0.12
15%	0.17	0.10	0.12	0.13
16%	0.17	0.10	0.12	0.13
17%	0.18	0.11	0.13	0.13
18%	0.18	0.11	0.13	0.14
19%	0.19	0.11	0.13	0.14
20%	0.19	0.11	0.13	0.14
25%	0.22	0.11	0.14	0.16
30%	0.24	0.12	0.15	0.17
33%	0.26	0.12	0.16	0.18
40%	0.29	0.13	0.17	0.19
50%	0.35	0.14	0.20	0.22
60%	0.40	0.14	0.22	0.25
70%	0.45	0.15	0.24	0.27
80%	0.50	0.16	0.26	0.30
90%	0.55	0.17	0.28	0.32
100%	0.60	0.18	0.30	0.35

*Highlighted cells denote SO_2 emission rates that exceed the 0.2 lb/mmBtu MATS Rule threshold.

When Ghent 2 is operating and one of the remaining three units is offline for the 30-day period, Ghent 2 would ordinarily produce approximately one-third (33%) of the station's generation. In all but the "Do Nothing" alternative, no dispatch modifications would be required to comply with MATS Rule in this operating scenario. When Ghent 2 is operating and two of the remaining three units are offline for the 30-day period, Ghent 2 would ordinarily produce approximately one-half (50%) of the station's generation. In this operating scenario, the station can comply with MATS Rule with no dispatch modifications in only the "Modify Ghent 2 WFGD" alternative.

The analysis of these alternatives was completed in two steps. First, revenue requirements for the "Modify Ghent 2 FGD," "Reagent," and "Burn Lower Sulfur Coal" alternatives were computed over 30 years to determine which of these alternatives is least-cost in the longer-term. This step is necessary to assess the impact of the first three alternatives' tradeoffs between O&M and capital costs in the longer-term. Then, the least-cost of these alternatives was compared to the cost of the "Do Nothing" alternative based on operations through 2021.

Table 4 contains the results of the 30-year revenue requirements analysis. Over a 30-year analysis period, modifying the WFGD is clearly the least-cost alternative. The additional capital costs associated with the WFGD modification project are more than offset by the higher O&M or fuel costs associated with the other alternatives.

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[3] SO_2 emission rates are computed based on the assumption that the amount of SO_2 produced during coal combustion is 6 lb/mmBtu.

Table 4 – Project 37: 30-Year Analysis (PVRR, 2016-2045, $M, 2016 Dollars)

Alternative	Capital Cost	O&M Impact	Fuel Impact	Total PVRR	Difference from Best
Modify Ghent 2 WFGD	8.8	0.0	0.0	8.8	0.0
Reagent	1.8	20.6	0.0	22.4	13.6
Burn Lower Sulfur Coal	0.0	0.0	174.4	174.4	165.6

Table 5 compares the PVRR of these alternatives for costs incurred through 2021. Due to the shorter analysis period, the O&M and fuel-related PVRR values in Table 5 are much lower than the O&M and fuel-related PVRR values in Table 4. However, because the revenue requirements for capital costs incurred through 2021 extend through the remaining book life of the generating unit, the capital-related PVRR values in Table 5 are still computed over the 30-year analysis period. As a result, the capital-related PVRR values in Table 5 are the same as the capital-related PVRR values in Table 4.

Table 5 – PVRR of Costs Incurred from 2016 to 2021 ($M, 2016 Dollars)

Alternative	Capital Cost	O&M Impact	Fuel Impact	Total PVRR	Difference from Best
Modify Ghent 2 WFGD	8.8	0.0	0.0	8.8	1.4
Reagent	1.8	5.6	0.0	7.4	0.0
Burn Lower Sulfur Coal	0.0	0.0	47.5	47.5	40.1

As mentioned previously, the WFGD modification alternative has higher capital costs and lower O&M costs than the reagent alternative. Despite the shorter period over which the O&M savings are realized, the PVRR of costs incurred between 2016 and 2021 for the WFGD modification alternative is only $1.4 million higher than the same value for the reagent alternative. Based on this small difference and the fact that the Reagent alternative does not enable the Companies to comply with the MATS Rule when two of the remaining three Ghent units are offline, the WFGD modification alternative is preferred as the lowest reasonable cost alternative even if Ghent 2 ceases to operate after 2021.[4]

In Table 6, the PVRR of the WFGD modification alternative is compared to the PVRR of the "Do Nothing" alternative. These alternatives were evaluated based only on costs incurred through 2021 to avoid speculation regarding CPP and ELG compliance costs. This analysis period is consistent with the assumed 2022 CPP and ELG compliance deadlines. Based on the results in Table 6, proceeding with the WFGD modifications is the lowest reasonable cost alternative – even if Ghent 2 ceases to operate after 2021.

[4] The unfavorable PVRR difference in Table 5 for the "Modify Ghent 2 WFGD" alternative would be recouped in O&M savings after only two additional years of operation.

Table 6 – Project 37: WFGD Modification Versus Retire/Replace (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)

Gas Price	Alternative	System Production Costs	ECR Project Costs	Total	Diff from Best
Low	Do Nothing	4,942	0	4,942	37
	Modify Ghent 2 WFGD	4,896	8.8	4,905	0
Mid	Do Nothing	5,050	0	5,050	48
	Modify Ghent 2 WFGD	4,993	8.8	5,002	0
High	Do Nothing	5,208	0	5,208	68
	Modify Ghent 2 WFGD	5,131	8.8	5,140	0

4 Project 38 – Supplemental Mercury Control Injection Systems at Ghent 1-4

4.1 Background

KU installed baghouses at each of the Ghent units to limit particulate emissions and comply with the National Ambient Air Quality Standards for 2.5 micron particulate matter and the MATS Rule for mercury emissions. To comply with the MATS Rule for mercury emissions, the station is planning to use powdered activated carbon ("PAC") to oxidize mercury in the flue gas so that it can be captured by the baghouse in the station's fly ash. As an alternative to this approach for capturing mercury and to minimize the risk of mercury reemission that can occur in wet FGDs, coal and FGD additives can be used to capture mercury in the station's gypsum. This alternative approach would require a $10 million investment in equipment to store and inject the additives ("mercury control injection system"), but based on the Companies' experience at the Trimble County Station, the cost of these additives is lower than the cost of PAC.

In addition to potential cost reductions, the addition of a mercury control injection system will support the Companies' beneficial use initiatives for CCR. The option to use PAC or coal and FGD additives will enable the Companies' to have greater control over where mercury is captured – either in the unit's fly ash or gypsum. As a result, the Companies will be better able to serve beneficial use markets that are sensitive to mercury levels.

Also, Ghent is planning to spend $7-8 million per year on PAC. Small changes in the cost of PAC will have a significant impact on production costs. The option to use PAC or the coal and FGD additives could potentially improve the Companies' bargaining position in procuring these commodities and better enable the Companies to control these costs.

The cost of the supplemental mercury control injection system is summarized by unit in Table 7.

Table 7 – Supplemental Mercury Control Injection Equipment ($000s, As-Spent Dollars)

Unit	2015	2016	Total
Ghent 1	25.5	2,560.8	2,586.3
Ghent 2	25.5	2,679.2	2,704.7
Ghent 3	25.5	2,679.2	2,704.7
Ghent 4	25.5	2,049.9	2,075.3
Total	102.0	9,969.0	10,071.0

4.2 Analysis

Based on test results at Trimble County 1, the cost of the coal and FGD additives for mercury control is approximately $0.30/MWh lower than the cost of PAC. Table 8 summarizes the PVRR of these projects for each of the Ghent units.

Table 8 – Supplemental Mercury Control System (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)

	PVRR ($M)	Payback Period (years)
Ghent 1	(1.6)	3.9
Ghent 2	(1.0)	4.6
Ghent 3	(1.8)	3.8
Ghent 4	(2.3)	3.0
Total	(6.7)	

As seen in the results in Table 8, the O&M savings associated with the coal/FGD additives more than offsets the revenue requirements associated with the cost of the mercury control injection system. Considering the current spread between the cost of PAC and the cost of coal/FGD additives ($0.30/MWh), the use of coal and FGD additives reduces revenue requirements by approximately $7 million over the 2016-2021 period. Furthermore, at this cost difference, the payback period for the project is only three to five years.[5]

5 Project 40 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Ghent

5.1 Background

In April 2015, the EPA issued its final rule concerning disposal of CCR from electric utilities ("CCR Rule"). To comply with this rule at Ghent, the analysis assumes KU will have to begin clean closure activities at the Gypsum Stack in late 2016, begin cap and closure activities at Ash Treatment Basin # 1 and Ash Treatment Basin # 2 in late 2016, begin clean closure activities at the Secondary and Reclaim Ponds in 2019 and complete the construction of a new process-water system by 2019 under Project 40. Whatever KU ultimately must do to comply with the CCR Rule, the costs of such compliance will be unavoidable; retiring the coal units at Ghent—even retiring them today—would not allow KU to avoid those costs. A new process-water system is required if the Ghent units continue to operate past 2018. Table 9 summarizes the Project 40 costs along with the cost of the WFGD modifications and the supplemental mercury control injection system.

[5] The payback period is the time required for the present value of the O&M savings to fully offset the PVRR associated with the capital cost of the mercury control injection system.

Table 9 – Ghent ECR Project Costs ($M, As-Spent Dollars)

	2015	2016	2017	2018	2019	2020	2021	2022	Total
Closure Construction									
ATB #1 Capping	1.0	3.3	4.0	1.3	6.2	5.4	25.9	22.3	69.5
ATB #2 Capping	0.0	6.7	10.3	9.8	7.0	21.5	26.5	11.1	92.9
Gypsum Stack Cleanout	0.0	8.3	20.7	16.2	23.7	9.9	0.0	0.0	78.7
Secondary Pond Cleanout	0.0	0.4	0.3	0.6	2.1	0.0	0.0	0.0	3.4
Reclaim Pond Cleanout	0.0	0.5	0.5	0.3	2.8	0.6	0.6	0.0	5.4
Total Closure Construction	1.0	19.2	35.8	28.3	41.7	37.4	53.0	33.4	249.9
Process-Water System	0.0	15.3	48.0	50.9	0.0	0.0	0.0	0.0	114.3
Total CCR Ruling Compliance	1.0	34.6	83.9	79.2	41.7	37.4	53.0	33.4	364.2
WFGD Modifications	1.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
Mercury Control System	0.1	10.0	0.0	0.0	0.0	0.0	0.0	0.0	10.1
Total Ghent ECR Projects	2.1	50.5	83.9	79.2	41.7	37.4	53.0	33.4	381.2

5.2 Analysis

An alternative to the new process-water system, along with the Ghent 2 WFGD modifications, and the supplemental mercury control injection systems, is retiring the Ghent units and purchasing replacement capacity. Therefore, this analysis compares the costs of continuing to operate the Ghent units through 2021 ("Operate through 2021") to the cost of retiring the Ghent units in 2019 and purchasing replacement capacity ("Retire in 2019").[6] Both alternatives include the costs in Table 9 to cap and close the surface impoundments. The cost of the process-water system, the Ghent 2 WFGD modifications, and the supplemental mercury control injection systems is excluded in the "Retire in 2019" alternative. A complete summary of costs for each alternative is included in Appendix A – Cost Assumptions.

In the "Retire in 2019" alternative, the Ghent units (1,917 MW) are assumed to be retired at the beginning of 2019 and replaced by a three-year power purchase agreement for four 368 MW natural gas combined cycle ("NGCC") units and one 201 MW simple cycle combustion turbine ("SCCT") unit (1,673 MW in total). The replacement capacity portfolio was developed using resources evaluated in the Companies' 2014 Integrated Resource Plan ("IRP") to minimally comply with the Companies' target reserve margin range (16% to 21%) in 2019 through 2021. In addition, the costs of the IRP resources were used to develop the cost of the power purchase agreement for each portfolio.[7] Table 10 summarizes the impact of the replacement capacity portfolio on the Companies' reserve margin. With the Ghent units, the Companies' reserve margin in 2019 to 2021 ranges from 19% to 20%. With the replacement capacity, the reserve margin ranges from 16% to 17%. This analysis does not account for the additional reliability risks and costs associated with operating at a lower reserve margin.

[6] Only the cost of the process-water system is included in this analysis for Project 40. The remaining costs must be incurred to close the surface impoundments regardless of whether the units continue to operate.
[7] The 368 MW NGCC unit evaluated in the IRP is a G- or H-class NGCC unit with a 1x1 configuration. The 201 MW SCCT unit is an F-class SCCT unit. Additional information regarding replacement capacity costs is included in Appendix A – Cost Assumptions.

Table 10 – LG&E/KU Resource Summary (MW)

	2016	2017	2018	2019	2020	2021
Forecasted Peak Load	7,314	7,395	7,448	7,225	7,244	7,266
Demand Side Management	(366)	(407)	(444)	(481)	(490)	(480)
Net Peak Load	6,948	6,988	7,004	6,744	6,754	6,786
Operate through 2021						
Existing Resources	7,974	7,976	7,986	7,821	7,822	7,823
Firm Purchases (OVEC)	152	152	152	152	152	152
Curtailable Load	136	136	136	136	136	136
Total Supply	8,262	8,264	8,274	8,109	8,110	8,111
Reserve Margin	18.9%	18.3%	18.1%	20.2%	20.1%	19.5%
Retire in 2019						
Existing Resources	7,974	7,976	7,986	7,821	7,822	7,823
Firm Purchases (OVEC)	152	152	152	152	152	152
Curtailable Load	136	136	136	136	136	136
Ghent Units 1-4 Retirement	0	0	0	(1,917)	(1,917)	(1,917)
Replacement Capacity	0	0	0	1,673	1,673	1,673
Total Supply	8,262	8,264	8,274	7,865	7,866	7,867
Reserve Margin	18.9%	18.3%	18.1%	16.6%	16.5%	15.9%

In the "Operate through 2021" alternative, for the purpose of this analysis, the Ghent coal units are assumed to retire at the beginning of 2022.[8] This analytical approach—comparing retiring the coal-fired units at the beginning of 2019 versus retiring the units at the beginning of 2022—is a conservative approach to evaluating whether it is economical to proceed with the proposed projects and keep the units operating through the end of 2021. Analyzing the 2016 Plan's long-lived investments over a short timeframe requires the investments to be economical by the end of 2021 (relative to the cost of retiring the units in 2019). In other words, this no-regrets analytical approach ensures that even if KU determines in the next 1-2 years that retiring the units in 2022 is more economical than incurring the costs of ELG or CPP compliance, the investments proposed for Ghent in the 2016 Plan will have been economical relative to having retired the units in 2019.

A decision to retire the Ghent units in either 2019 or 2022 would result in reduced maintenance spending in the years prior to retirement. By recognizing this fact, it is important to note that this approach—again, comparing retiring the units in 2019 to retiring the units in 2022—does not undervalue retiring the units in 2019 even though KU is not committing to retire the units in 2022 or later. At first glance, this approach might appear to undervalue the 2019 retirement scenario because the 2022 retirement scenario reduces capital and O&M spending for the units beginning in 2018 as the units prepare for retirement; but if the units do not retire in 2022, presumably KU would continue to make the capital and O&M expenditures necessary for ongoing operations, which would relatively increase the value of retiring the units in 2019. This would be a valid analytical concern if KU were not going to have better information about ELG and CPP compliance options and costs before 2018, when

[8] As stated previously, using this analytical approach is neither a commitment nor a prediction that KU will retire any or all of the units at Ghent in early 2022 or at any other time.

the modeled capital and O&M tapering begins. But KU will indeed have more information about such options and costs by 2018 and will be better positioned to determine whether or when to retire any coal-fired units.

If KU's analyses over the next 1-2 years show that retiring Ghent's coal-fired units in early 2022 would be more economical than incurring the costs of ELG and CPP compliance, then KU would be able to begin tapering capital and O&M spending at Ghent as this analysis reflects. On the other hand, if KU's analyses over the next 1-2 years show it would be more economical to incur ELG and CPP compliance costs—in addition to ongoing capital and O&M spending at non-tapered levels—to keep the units operating beyond 2021, then KU would seek any necessary Commission approvals for ongoing coal-fired operations. Therefore, this analytical approach is indeed a no-regrets approach.

The results of this analysis are summarized in Table 11. Each alternative was evaluated over three gas price scenarios.[9] Even if the Ghent units are assumed to cease operation after 2021, the proposed capital projects are least-cost.

Table 11 – Project 40: Analysis Results (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)

Gas Price	Alternative	System Production Costs	Other Capital and FOM	ECR Project Costs	Replacement Capacity Costs	Total
Low	Retire in 2019	4,896	271	232	683	6,082
	Operate through 2021	4,896	523	386	0	5,805
	Operate through 2021 Less Retire in 2019	(0)	252	154	(683)	(278)
Mid	Retire in 2019	5,116	271	232	683	6,303
	Operate through 2021	4,993	523	386	0	5,903
	Operate through 2021 Less Retire in 2019	(123)	252	154	(683)	(400)
High	Retire in 2019	5,428	271	232	683	6,614
	Operate through 2021	5,131	523	386	0	6,040
	Operate through 2021 Less Retire in 2019	(297)	252	154	(683)	(574)

6 Conclusion

The analyses summarized in Sections 3, 4, and 5 result in the following conclusions:

1. Even if Ghent 2 ceases to operate after 2021, the Ghent 2 WFGD modifications are the least-cost way to comply with the MATS Rule for acid gases measured as HCl.
2. At the current spread between the cost of PAC and the cost of coal and FGD additives ($0.30/MWh), the use of coal and FGD additives has a favorable impact revenue requirements. The payback periods for the mercury control injection systems are three to five years.
3. Even if all of the Ghent units cease operation after 2021, the process water system, the Ghent 2 WFGD modifications, and the supplemental mercury control injection system are least-cost.

[9] Tables of the gas prices and financial inputs are included in Appendix B – Other Inputs.

7 Appendix A – Cost Assumptions

Table 12 – Capital and Fixed O&M Cost Assumptions for Retirement Analysis ($M, As-Spent Dollars)

	2016	2017	2018	2019	2020	2021	Total
2016 Plan with Updated ECR Costs							
Coal Unit Fixed O&M	67	66	78	82	82	95	469
On-Going Capital	47	37	50	28	47	61	269
Cap and Closure Costs	20	36	28	42	37	53	217
Process-Water System	15	48	51	0	0	0	114
WFGD Modifications	7	0	0	0	0	0	7
Mercury Control System	10	0	0	0	0	0	10
ELG Costs	3	0	9	36	56	51	155
Total	169	187	217	188	221	260	1,241
Operate through 2021							
Coal Unit Fixed O&M[10]	67	66	70	71	68	73	415
On-Going Capital[10]	47	37	25	7	12	15	143
Cap and Closure Costs	20	36	28	42	37	53	217
Process-Water System	15	48	51	0	0	0	114
WFGD Modifications	7	0	0	0	0	0	7
Mercury Control System	10	0	0	0	0	0	10
ELG Costs	3	0	0	0	0	0	3
Total	169	187	174	120	117	141	909
Retire in 2019							
Coal Unit Fixed O&M[10]	67	60	66	3	0	0	195
On-Going Capital[10]	47	9	12	0	0	0	68
Cap and Closure Costs	20	36	28	42	37	53	217
Process-Water System	0	0	0	0	0	0	0
WFGD Modifications	0	0	0	0	0	0	0
Mercury Control System	0	0	0	0	0	0	0
Replacement Capacity Cost[11]	0	0	0	280	282	284	846
ELG Costs	3	0	0	0	0	0	3
Total	137	105	107	324	319	337	1,329

[10] Reduced capital and O&M expenditures in the years leading up to a unit's retirement are consistent with the Companies' recent experience at the Cane Run Generating Station.
[11] See Table 13 for a summary of the costs included in Replacement Capacity Cost.

Table 13 – Replacement Capacity Costs

Cost Item	1x1 NGCC	SCCT
Replacement Capacity ($/kW, 2013 Dollars)[12]	[redacted]	
Average Annual Capacity (MW)	398	211
Fixed Charge Rate	9.5%	9.2%
Book Life (Years)	40	30
Fixed O&M ($/kW-year, 2013 Dollars)	[redacted]	
Firm Gas Transport ($/kW-year, 2013 Dollars)[13]	20.3	20.7
Firm Transmission Service ($/kW-year, 2015 Dollars)[14]	22.5	22.5
Escalation Rate	2.0%	2.0%

7.1 PPA Financing Costs

When rating agencies assess a utility's debt rating, they impute debt on the utility's balance sheet to reflect the fixed financial obligations associated with PPAs. As a result, when utilities enter into a PPA, they must increase the equity share of their capital structure to offset the imputed debt and maintain their debt rating.[15]

To calculate the amount of imputed debt, rating agencies compute the net present value ("NPV") of future fixed payments associated with the PPA (e.g., capacity payments) using a discount rate equivalent to the company's average cost of debt. Then, a risk factor is applied to reflect the benefits of regulatory or legislative cost recovery mechanisms. In the Companies' business environment, where regulators use a utility's rate case to establish base rates that provide for the recovery of the fixed costs created by PPAs, a risk factor of 50% is applied to the NPV. This product is then multiplied by the utilities' target share of debt financing to calculate the amount of imputed debt associated with a PPA.[16] This process is consistent with the process used to address capitalization issues in the Companies' last rate case before the KPSC.

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[12] Replacement capacity costs reflect capacity costs from the Companies' 2014 Integrated Resource Plan.
[13] Firm gas transportation costs were taken from the 2014 Integrated Resource Plan and are based on the firm gas transportation rates for Cane Run 7.
[14] PJM tariff for firm transmission service, effective June 1, 2015.
[15] A utility's debt rating is a function of its capital structure.
[16] A complete summary of the methodology Standard & Poor's uses to calculate imputed debt for U.S. utilities' PPAs is available at http://www.psc.utah.gov/utilities/electric/09docs/0903523/062309ExhibitE.pdf.

8 Appendix B – Other Inputs

The Henry Hub ("HH") natural gas price scenarios considered in this analysis are listed in Table 14. The Mid natural gas price forecast is based on market prices for the short term and the Energy Information Administration's ("EIA") 2015 Annual Energy Outlook ("AEO") for the long term.[17] Prices in 2016-2017 were taken from the Companies' 2016 Business Plan and reflect NYMEX HH monthly forward prices as of 6/18/2015. Prices in 2018-2020 reflect a blend of market prices and a midpoint average curve between the annual HH prices from two EIA AEO 2015 scenarios: "High Oil Price" (a proxy for high gas price) and "High Oil and Gas Resource" (a proxy for low gas price). Blending is 75% market in 2018, 50% market in 2019, and 25% market in 2020. Prices in 2021 reflect the midpoint average curve between the annual HH prices from the "High Oil Price" and "High Oil-Gas Resource" scenarios. Monthly prices after 2017 are calculated using average monthly shape indices derived from the market forwards for 2016-2020. The Low natural gas price forecast is based on EIA's 2015 AEO "High Oil and Gas Resource" scenario. To maintain a consistent spread between the Low and Mid natural gas price scenarios, years 2016-2018 in the Low scenario were adjusted to reflect the 2019 percentage difference between the Low and Mid scenarios. The High natural gas price forecast is based on EIA's 2015 AEO "High Oil Price" scenario.

Table 14 – Natural Gas Prices (Nominal Henry Hub $/MMBtu)

Year	Low	Mid	High
2016	2.93	3.17	3.53
2017	3.08	3.34	3.89
2018	3.27	3.54	4.30
2019	3.49	3.78	4.67
2020	3.51	4.16	5.18
2021	3.69	4.72	5.76

Table 15 – Financial Inputs

Input	Value
Return on Equity	10.0%
Cost of Debt	4.21%
Capital Structure	
Debt	47.0%
Equity	53.0%
Tax Rate	38.9%
Revenue Requirement Discount Rate	6.51%

[17] The EIA's 2015 AEO was published in April 2015. For the AEO data tables, see http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2015&subject=0-AEO2015&table=1-AEO2015&region=0-0&cases=ref2015-d021915a. For the AEO report, see http://www.eia.gov/forecasts/aeo/.

Analysis of 2016 ECR Projects
Trimble County Generating Station

PPL companies

Generation Planning & Analysis
January 2016

Table of Contents

1 Introduction

The 2016 Environmental Compliance Plans ("2016 Plans") for Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E") (collectively, "Companies") include the following projects for the Trimble County Generating Station ("Trimble County"):

1. LG&E Project 28 – Mill Creek & Trimble County Unit 1 Supplemental Mercury Control Injection Systems
2. LG&E Project 30 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Trimble County
3. KU Project 41 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Trimble County

This analysis evaluates these projects along with alternatives to these projects and ultimately demonstrates the following:

1. Based on the projected O&M savings, the proposed supplemental mercury control injection system for Trimble County Unit 1 has a favorable impact on revenue requirements.
2. The Trimble County ECR projects are least-cost.

2 Analysis Methodology

In October 2015 and November 2015, respectively, the U.S. Environmental Protection Agency ("EPA") promulgated the final versions of the Clean Power Plan ("CPP") and Effluent Limitation Guidelines ("ELG"). Much uncertainty exists regarding the costs to comply with these regulations; the Companies must comply with the CPP and ELG by 2022 and will be working to understand these costs over the next 1-2 years.

The estimated cost of the projects proposed for Trimble County in the 2016 Plans is $220 million.[1] An alternative to proceeding with these projects is retiring the Trimble County coal units in 2019 and replacing the capacity. Based on the uncertainty of CPP and ELG compliance costs, projects in the 2016 Plans at other generating stations were evaluated based only on costs incurred through 2021.[2] However, at Trimble County, in addition to the investments required for the 2016 Plan projects, the Companies are already proceeding with spending $277 million from 2016 through 2021 for a new landfill and coal combustion residuals treatment facility ("CCRT"). While the relative benefits from these significant long-term investments will greatly exceed their cost, the point at which their benefits exceed their cost will occur after 2021. As a result, the Companies evaluated the retirement of the Trimble County coal units over the Companies' standard 30-year analysis period with high-level estimates for CPP and ELG compliance costs.

In the 30-year analysis, ELG capital costs for Trimble County are assumed to be $143 million. For the reasons discussed below, the incremental cost associated with CPP compliance—specifically for the Trimble County Station—was assumed to be zero.

Table 1 includes the emission controls, commissioning date, summer net capacity, summer net heat rate, CO_2 emission rate, and dispatch cost for each of the Companies' coal units. Compared to the average age of the Trimble County coal units (15 years), the average age of coal units at other stations is 22 to 37 years older. Considering the units with flue-gas desulfurization ("FGD"), selective catalytic

[1] All cost estimates reflect the Companies' 75% ownership share of Trimble County Units 1 and 2.

[2] This analysis period is consistent with the assumed 2022 CPP and ELG compliance deadline.

reduction ("SCR"), and baghouses, the Trimble County coal units have among the lowest dispatch costs. Trimble County Unit 2 has the lowest CO_2 emissions rate among the Companies' coal units, about 10% below the next unit. Assuming an 80% capacity factor, Trimble County Unit 2's annual CO_2 emissions would be approximately 400,000 tons lower than CO_2 emissions from an equal amount of capacity from the Companies' other coal units. The favorable efficiency would also result in an annual coal expense about $10 million less than other units. For these reasons, the Trimble County coal units would likely be the last coal units to retire as part of a potential CPP compliance plan.

Table 1 – LG&E and KU Coal Units

Emission Controls as of June 2016	Coal Unit	Commission Date	Net Summer Capacity (MW)	Summer Net Heat Rate (Max Load, mmBtu/MWh)	CO_2 Emission Rate (Max Load, lb/MWh)	Average Dispatch Cost ($/MWh)
FGD	Brown 1	5/1/1957	106	10.4	2,128	[redacted]
	Brown 2	6/1/1963	166	10.3	2,110	
FGD, Baghouse	Ghent 2	4/20/1977	493	10.7	2,187	
	Mill Creek 1	7/11/1972	300	10.4	2,142	
	Mill Creek 2	6/11/1974	297	10.6	2,177	
FGD, SCR, Baghouse	Brown 3	7/19/1971	407	10.9	2,241	
	Ghent 1	2/19/1974	474	10.9	2,228	
	Ghent 3	5/31/1981	485	11.0	2,263	
	Ghent 4	8/18/1984	465	11.0	2,248	
	Mill Creek 3	6/28/1978	385	10.7	2,195	
	Mill Creek 4	7/15/1982	477	10.7	2,203	
	Trimble 1	12/23/1990	379	10.7	2,195	
	Trimble 2	1/22/2011	549	9.3	1,899	

If the Trimble County coal units were the last coal units considered for retirement and – at a cost of more than $3.5 billion[3] – the Companies' Brown, Ghent, and Mill Creek coal units were already retired and replaced with renewable or natural gas-fired generation with CO_2 emissions ranging from 0 lb/MWh to approximately 1,000 lb/MWh, the Companies' generating portfolio would already over-comply with the CPP – even if the Trimble County coal units operated at full capacity.[4] Therefore, the 30-year retirement analysis assumed no incremental cost for future CPP compliance for Trimble County.

The analyses supporting these projects are discussed in the following sections.

[3] Assuming a replacement capacity cost of [redacted], the total cost to replace the Brown, Ghent, and Mill Creek coal units (4,051 MW) is [redacted].

[4] Over the next 30 years, the Trimble County coal units are expected to operate at 70-80% capacity factors and produce 5,900-6,400 GWh per year. From 2022 to 2030, the Companies' total energy requirements are approximately 35,000 GWh per year. If the Companies' other coal units were replaced with natural gas combined-cycle ("NGCC") units with CO_2 emissions of approximately 900 lb/MWh, the average CO_2 emission rate for the balance of the fleet – after factoring in the 1,200 lb/MWh emission rate of the Companies' simple-cycle combustion turbines – would be less than 950 lb/MWh. Even if the Trimble County coal units operated at a 90% capacity factor and produced 7,400 GWh per year, the Companies' system CO_2 emission rate would be less than 1,200 lb/MWh ([7,400 GWh * 2,050 lb CO_2/MWh + 27,600 GWh * 950 lb CO_2/MWh]/[7,400 GWh+27,600 GWh] = 1,183 lb/MWh).

3 Project 28 – Supplemental Mercury Control Injection Systems for Trimble County Unit 1

3.1 Background

The Companies installed a baghouse at Trimble County Unit 1 to limit particulate emissions and comply with the National Ambient Air Quality Standards for 2.5 micron particulate matter and the Mercury and Air Toxics Standards ("MATS Rule") for mercury emissions. To comply with the MATS Rule for mercury emissions, the station is planning to use powdered activated carbon ("PAC") to oxidize mercury in the flue gas so that it can be captured by the baghouse in the station's fly ash. As an alternative to this approach for capturing mercury and to minimize the risk of mercury reemission that can occur in wet FGDs, coal and FGD additives can be used to capture mercury in the station's gypsum. This alternative approach would require an investment in equipment to store and inject the additives ("mercury control system"), but the cost of these additives is lower than the cost of PAC.

In addition to potential cost reductions, the addition of a mercury control injection system will support the Companies' beneficial use initiatives for CCR. The option to use PAC or coal and FGD additives will enable the Companies' to have greater control over where mercury is captured – either in the unit's fly ash or gypsum. As a result, the Companies will be better able to serve beneficial use markets that are sensitive to mercury levels.

Also, LG&E is planning to spend approximately $3-4 million per year on PAC for the Trimble County Unit 1. Small changes in the cost of PAC will have a significant impact on production costs. The option to use PAC or the coal and FGD additives could potentially improve the Companies' bargaining position in procuring these commodities and better enable the Companies to control these costs.

The Companies' 75% share of the cost of the supplemental mercury control injection system is summarized by unit in Table 2.

Table 2 – Trimble County Unit 1 Supplemental Mercury Control Injection System (Capital Cost, $000s, As-Spent Dollars, Reflecting Companies' 75% Ownership Share)

Unit	2015	2016	Total
Trimble County Unit 1	22.9	531.3	554.2

3.2 Analysis

Based on test results at Trimble County Unit 1, the cost of the coal and FGD additives for mercury control is approximately $0.30/MWh lower than the cost of PAC. Table 3 summarizes the PVRR of this project based on costs incurred through 2021.[5]

Table 3 – Trimble County Unit 1 Supplemental Mercury Control Injection System (PVRR of Costs Incurred from 2016 to 2021, $M, Reflecting Companies' 75% Ownership Share, 2016 Dollars)

	PVRR ($M)	Payback Period (years)
Trimble County Unit 1	(3.0)	1.0

[5] This analysis period is consistent with the analysis period used to evaluate supplemental mercury control injection systems at other stations.

Based on the results in Table 3, the O&M savings associated with the coal and FGD additives more than offset the revenue requirements associated with the cost of the mercury control system. At the current spread between the cost of PAC and the cost of coal and FGD additives ($0.30/MWh), the payback period for this project is only one year.[6]

4 LG&E Project 30 and KU Project 41 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Trimble County

4.1 Background

In April 2015, the EPA issued its final rule concerning disposal of CCR from electric utilities ("CCR Rule"). To comply with this rule at Trimble County, our analysis assumes the Companies will have to (a) begin cap and closure of the Bottom Ash Pond ("BAP") and the Gypsum Storage Pond ("GSP") in 2016 under LG&E Project 30 and KU Project 41. Whatever the Companies ultimately must do to comply with the CCR Rule, the costs of such compliance will be unavoidable; retiring the Trimble County units – even retiring them today – would not allow the Companies to avoid those costs. A new process-water system is required only if the Trimble County coal units continue to operate past 2018. Table 4 summarizes the costs for these projects along with the cost of the supplemental mercury control injection system.

Table 4 – Trimble County 2016 ECR Capital Costs ($M, As-Spent Dollars, Reflecting Companies' 75% Ownership Share)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cap and Closure										
BAP	1.7	1.0	2.2	6.8	7.7	20.1	15.3	24.8	22.1	101.7
GSP	0.0	0.9	1.4	2.9	16.4	7.3	0.0	0.0	0.0	28.9
Total Cap and Closure	1.7	1.9	3.6	9.7	24.1	27.4	15.3	24.8	22.1	130.6
Process-Water System	0.0	0.0	43.7	45.0	0.0	0.0	0.0	0.0	0.0	88.7
Total CCR Rule Compliance	1.7	1.9	47.3	54.8	24.1	27.4	15.3	24.8	22.1	219.4
Mercury Control System	0.02	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Total Trimble County ECR Projects	1.7	2.5	47.3	54.8	24.1	27.4	15.3	24.8	22.1	219.9

4.2 Alternatives

As an alternative to constructing the process-water system and supplemental mercury control injection system, the Companies evaluated the following alternatives:

1. Retire the Trimble County coal units in 2019 and purchase replacement capacity ("Retire TC Coal Units").
2. Convert the Trimble County coal units to operate on natural gas ("Natural Gas Conversion").

A complete summary of costs for this analysis is included in Appendix A – Cost Assumptions. All alternatives include the costs in Table 4 to cap and close the ponds. In addition to costs for the process-water system and supplemental mercury control injection system, the "Long Term Operation" alternative includes costs for the landfill and CCRT as well as an estimated $143 million cost for ELG compliance. In the Retire TC Coal Units and Natural Gas Conversion alternatives, all costs for the

[6] The payback period is the time required for the present value of the O&M savings to fully offset the PVRR associated with the capital cost of the mercury control injection system.

process-water system and the supplemental mercury control injection system are avoided and all costs after 2016 for the landfill/CCRT and ELG compliance are avoided. These alternatives are discussed further in the following sections.

4.2.1 Retire Trimble County Coal Units and Replace Capacity

In the "Retire TC Coal Units" alternative, the Trimble County coal units are retired at the beginning of 2019 and replaced by purchased NGCC capacity through 2021.[7] Then, the retirement alternative assumes that NGCC capacity commissioned at Trimble County in 2022 will be a least-cost resource. The amount of capacity purchased in 2019 and commissioned at Trimble County in 2022 is equal to the capacity of Trimble County Units 1 and 2. In addition to cost savings associated with the process-water system, mercury control system, landfill, CCRT, and ELG compliance, a decision to retire the Trimble County coal units in 2019 would result in reduced maintenance spending in the years prior to retirement.

4.2.2 Convert the Trimble County Coal Units to Burn Natural Gas

In the Natural Gas Conversion alternative, the cost savings associated with the process-water system, mercury control system, landfill, CCRT, and ELG compliance are assumed to be the same as these savings in the Retire TC Coal Units alternative. In addition, if the Trimble County units are converted to burn natural gas, the Companies can avoid the cost of replacing the capacity of the Trimble County coal units. This project would require burner modifications to the units as well as an additional natural gas pipeline to the station. Because cost estimates have not been developed for this project, the analysis was conducted to determine the project's maximum cost for it to be economical.

4.3 Analysis

The results of this analysis are summarized in Table 5. Each alternative was evaluated over three gas price scenarios.[8] For the reasons discussed in Section 2, the analysis assumed no incremental cost for CPP compliance for Trimble County. The PVRR of continuing to operate the Trimble County coal units is $495 million to $2.9 billion favorable to retiring the units and replacing the capacity. Furthermore, even with no cost included for the modifying the Trimble County burners and building a new gas pipeline, continuing to operate the Trimble County coal units is $478 million to $4.0 billion favorable to converting the units to burn natural gas.

[7] The Retirement alternative does not account for the cost of transmission system upgrades that would likely be required to account for the 932 MW reduction in generating capacity at Trimble County between 2019 and 2021.

[8] Tables of the gas prices and financial inputs are included in Appendix B – Other Inputs.

Table 5 – Trimble County Retirement Analysis Results (PVRR, 2016-2045, $M, Reflecting Companies' 75% Ownership Share)

Gas Price	Alternative	Prod Costs	Landfill and CCRT	Other Capital and FOM	ECR Project Costs	Replace-ment Capacity Costs	NGCC Capital	NGCC FOM	NG Conversion	Total	Diff from Best
Low	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	2,946	116	141	116	367	944	364	0	4,994	495
	Natural Gas Conversion	3,796	116	949	116	0	0	0	0	4,976	478
Mid	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	4,112	116	141	116	367	944	364	0	6,160	1,661
	Natural Gas Conversion	5,546	116	949	116	0	0	0	0	6,727	2,228
High	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	5,312	116	141	116	367	944	364	0	7,360	2,861
	Natural Gas Conversion	7,346	116	949	116	0	0	0	0	8,527	4,028

5 Conclusion

The analyses summarized in Sections 3 and 4 result in the following conclusions:

1. The Trimble County Unit 1 mercury control system reduces revenue requirements. At the current spread between the cost of PAC and the cost of coal and FGD additives ($0.30/MWh), the payback period for the supplemental mercury control injection system is only one year.
2. Continuing to operating the Trimble County coal units with the proposed investments for process-water systems and supplemental mercury control injection is least-cost.

6 Appendix A – Cost Assumptions

Table 6 – Capital and Fixed O&M Cost Assumptions for Retirement Analysis ($000s, As-Spent Dollars, Reflecting Companies' 75% Ownership Share)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Total
2016 Plan with Updated ECR Costs (Long Term Operation)																															
Coal Unit Fixed O&M	30	35	40	39	40	45	47	47	49	54	56	52	53	54	55	57	58	67	68	62	64	65	67	68	70	80	81	75	77	78	1,733
On-Going Capital	29	28	25	17	14	26	72	20	10	37	25	19	19	20	20	21	21	54	30	22	23	23	24	24	25	63	35	26	27	27	825
CCR Treatment Facility	47	49	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128
CCR Transport Facility	5	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
Landfill	43	30	38	9	13	1	21	6	7	1	1	0	0	0	34	8	1	1	1	1	1	1	1	44	2	1	1	1	1	1	271
Cap and Closure Costs	4	4	10	24	27	15	25	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131
Process-Water System	0	44	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89
Mercury Control System	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ELG Costs	2	0	18	66	34	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143
Total	161	195	213	155	128	110	165	95	66	92	83	71	72	74	109	85	80	122	98	85	87	89	91	136	97	144	117	102	104	106	3,335
Retire TC Coal Units																															
Coal Unit Fixed O&M[9]	30	29	33	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94
On-Going Capital[9]	29	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
CCR Treatment Facility	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
CCR Transport Facility	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Landfill	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
Cap and Closure Costs	4	4	10	24	27	15	25	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131
Process-Water System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury Control System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement Capacity Cost[10]	0	0	0	151	152	153	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	455
ELG Costs	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
NGCC Capital	0	0	0	192	700	123	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,029
NGCC Fixed O&M	0	0	0	0	0	0	35	35	36	37	38	38	39	40	41	42	42	43	44	45	46	47	48	49	50	51	52	53	54	55	1,059
Total	161	40	49	368	879	292	73	58	36	37	38	38	39	40	41	42	42	43	44	45	46	47	48	49	50	51	52	53	54	55	2,907
Natural Gas Conversion																															
Fixed O&M	30	35	39	37	37	36	38	38	39	45	47	42	43	44	45	46	47	56	57	51	52	53	54	56	57	68	68	61	63	65	1,450
On-Going Capital	29	28	25	17	14	26	22	20	10	37	25	19	19	20	20	21	21	54	30	22	23	23	24	24	25	63	35	26	27	27	775
CCR Treatment Facility	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
CCR Transport Facility	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Landfill	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
Cap and Closure Costs	4	4	10	24	27	15	25	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131
Process-Water System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury Control System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ELG Costs	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
New Pipeline and Burner Mods	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	161	67	74	78	79	78	85	81	49	82	72	61	62	64	65	67	68	110	86	73	75	76	78	80	82	130	103	88	90	92	2,453

[9] Reduced capital and O&M expenditures in the years leading up to a unit's retirement are consistent with the Companies' recent experience at the Cane Run Generating Station.

[10] See Table 7 for a summary of the costs included in Replacement Capacity Cost.

Table 7 – Replacement Capacity Costs

Cost Item	1x1 NGCC
Replacement Capacity ($/kW, 2013 Dollars)[11]	[redacted]
Fixed Charge Rate	9.5%
Book Life (Years)	40
Fixed O&M ($/kW-year, 2013 Dollars)	[redacted]
Firm Gas Transport ($/kW-year, 2013 Dollars)[12]	20.3
Firm Transmission Service ($/kW-year, 2015 Dollars)[13]	22.5
Escalation Rate	2.0%

6.1 PPA Financing Costs

When rating agencies assess a utility's debt rating, they impute debt on the utility's balance sheet to reflect the fixed financial obligations associated with PPAs. As a result, when utilities enter into a PPA, they must increase the equity share of their capital structure to offset the imputed debt and maintain their debt rating.[14]

To calculate the amount of imputed debt, rating agencies compute the net present value ("NPV") of future fixed payments associated with the PPA (e.g., capacity payments) using a discount rate equivalent to the company's average cost of debt. Then, a risk factor is applied to reflect the benefits of regulatory or legislative cost recovery mechanisms. In the Companies' business environment, where regulators use a utility's rate case to establish base rates that provide for the recovery of the fixed costs created by PPAs, a risk factor of 50% is applied to the NPV. This product is then multiplied by the utilities' target share of debt financing to calculate the amount of imputed debt associated with a PPA.[15] This process is consistent with the process used to address capitalization issues in the Companies' last rate case before the KPSC.

[11] Replacement capacity costs reflect capacity costs from the Companies' 2014 Integrated Resource Plan.
[12] Firm gas transportation costs were taken from the 2014 Integrated Resource Plan and are based on the firm gas transportation rates for Cane Run 7.
[13] PJM tariff for firm transmission service, effective June 1, 2015.
[14] A utility's debt rating is a function of its capital structure.
[15] A complete summary of the methodology Standard & Poor's uses to calculate imputed debt for U.S. utilities' PPAs is available at http://www.psc.utah.gov/utilities/electric/09docs/0903523/062309ExhibitE.pdf.

7 Appendix B – Other Inputs

The Henry Hub ("HH") natural gas price scenarios considered in this analysis are listed in Table 8. The Mid natural gas price forecast is based on market prices for the short term and the Energy Information Administration's ("EIA") 2015 Annual Energy Outlook ("AEO") for the long term.[16] Prices in 2016-2017 were taken from the Companies' 2016 Business Plan and reflect NYMEX HH monthly forward prices as of 6/18/2015. Prices in 2018-2020 reflect a blend of market prices and a midpoint average curve between the annual HH prices from two EIA AEO 2015 scenarios: "High Oil Price" (a proxy for high gas price) and "High Oil and Gas Resource" (a proxy for low gas price). Blending is 75% market in 2018, 50% market in 2019, and 25% market in 2020. Prices in 2021-2037 reflect the midpoint average curve between the annual HH prices from the "High Oil Price" and "High Oil-Gas Resource" scenarios ("Midpoint"). Prices in 2038-2045 are escalated annually at the 2027-2037 compound annual growth rate of the Midpoint forecast (4.4%) from the 2037 Midpoint forecast prices. Monthly prices after 2017 are calculated using average monthly shape indices derived from the market forwards for 2016-2020. The Low natural gas price forecast is based on EIA's 2015 AEO "High Oil and Gas Resource" scenario. To maintain a consistent spread between the Low and Mid natural gas price scenarios, years 2016-2018 in the Low scenario were adjusted to reflect the 2019 percentage difference between the Low and Mid scenarios. The High natural gas price forecast is based on EIA's 2015 AEO "High Oil Price" scenario.

[16] The EIA's 2015 AEO was published in April 2015. For the AEO data tables, see http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2015&subject=0-AEO2015&table=1-AEO2015&region=0-0&cases=ref2015-d021915a. For the AEO report, see http://www.eia.gov/forecasts/aeo/.

Table 8 – Natural Gas Prices (Nominal Henry Hub $/MMBtu)

Year	Low	Mid	High
2016	2.93	3.17	3.53
2017	3.08	3.34	3.89
2018	3.27	3.54	4.30
2019	3.49	3.78	4.67
2020	3.51	4.16	5.18
2021	3.69	4.72	5.76
2022	3.75	5.01	6.26
2023	3.89	5.49	7.09
2024	3.96	5.81	7.66
2025	4.09	6.14	8.19
2026	4.21	6.51	8.80
2027	4.39	6.78	9.18
2028	4.61	7.04	9.47
2029	4.67	7.38	10.09
2030	4.76	7.74	10.72
2031	4.94	8.23	11.52
2032	5.18	8.62	12.07
2033	5.42	8.86	12.31
2034	5.69	9.24	12.79
2035	5.94	9.58	13.22
2036	6.14	9.97	13.80
2037	6.42	10.45	14.49
2038	6.67	10.91	15.16
2039	6.92	11.40	15.87
2040	7.19	11.90	16.62
2041	7.47	12.43	17.39
2042	7.76	12.98	18.20
2043	8.06	13.55	19.06
2044	8.37	14.15	19.95
2045	8.70	14.77	20.88

Table 9 – Financial Inputs

Input	Value
Return on Equity	10.0%
Cost of Debt	4.21%
Capital Structure	
Debt	47.0%
Equity	53.0%
Tax Rate	38.9%
Revenue Requirement Discount Rate	6.51%

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF KENTUCKY UTILITIES COMPANY FOR CERTIFICATES OF PUBLIC CONVENIENCE AND NECESSITY AND APPROVAL OF ITS 2016 COMPLIANCE PLAN FOR RECOVERY BY ENVIRONMENTAL SURCHARGE	))))))	**CASE NO. 2016-00026**

DIRECT TESTIMONY OF
DEREK A. RAHN
MANAGER, REVENUE REQUIREMENT
KENTUCKY UTILITIES COMPANY

Filed: January 29, 2016

Q. Please state your name, position, and business address.

A. My name is Derek A. Rahn. I am the Manager, Revenue Requirement for Kentucky Utilities Company ("KU" or "Company") and Louisville Gas and Electric Company ("LG&E") and an employee of LG&E and KU Services Company, which provides services to LG&E and KU (collectively "Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes. I testified before this Commission in the Companies' most recent environmental cost recovery six-month review proceedings (Case Nos. 2015-00411 (KU) and 2015-00412 (LG&E)).

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring five exhibits, identified as Exhibits DAR-1, DAR-2, DAR-3, DAR-4, and DAR-5. These exhibits are:

Exhibit DAR-1	Proposed ECR Tariff
Exhibit DAR-2	Proposed ECR Tariff - Redline
Exhibit DAR-3	Current KU Environmental Surcharge Monthly Reports
Exhibit DAR-4	Proposed KU Environmental Surcharge Monthly Reports
Exhibit DAR-5	2016 Plan Customer Bill Impact

Q. What are the purposes of your testimony?

A. My testimony addresses how the environmental surcharge under KU's Environmental Cost Recovery ("ECR") Surcharge tariff provisions will be calculated to include the costs of KU's 2016 Environmental Compliance Plan ("2016 Plan"), presents the revisions to the monthly ECR reporting forms ("ES Forms") that KU proposes and explains why the revisions to the forms are appropriate, and discusses the bill impact on KU's customers.

Q. Is KU proposing any changes to its Environmental Cost Recovery Surcharge tariff sheets?

A. KU is not proposing to make any changes to its Environmental Cost Recovery Surcharge tariff sheets other than to change their issue and effective dates to reflect KU's Application in this proceeding. The proposed ECR Tariff is attached as Exhibit DAR-1 and a redline version comparing the proposed ECR Tariff to the existing tariff is attached as Exhibit DAR-2. The ECR tariff has an issue date of January 29, 2016, and is proposed to be effective on July 29, 2016. Therefore, bills reflecting the expense month of July 2016 will reflect the revised environmental surcharge.

Q. Will the methodologies for calculating the environmental surcharge change if the Commission approves recovery of KU's 2016 Plan?

A. No. KU will use the currently approved methodologies for calculating the environmental surcharge, including the revenue allocation discussed in Robert M. Conroy's testimony. The proposed calculation of the monthly Environmental Surcharge billing factor will continue to consolidate the 2009 Plan and the 2011 Plan and will add the proposed 2016 Plan.

Q. Will the monthly reporting forms used for calculating the environmental surcharge change if the Commission approves recovery of KU's 2016 Plan?

A. Yes. KU is proposing to revise several of its monthly reporting forms to reflect the recovery of the costs associated with the 2016 Plan. Exhibit DAR-3 contains KU's current monthly ES Forms; Exhibit DAR-4 contains KU's proposed monthly ES Forms.

Q. Please describe the monthly-reporting-form modifications that KU is proposing as a result of the 2016 Plan.

A. The calculation of the monthly billing factor for recovery of the cost of KU's 2016 Plan will be consistent with the current methodology approved by the Commission and used to calculate the recovery of the cost of KU's current Environmental Compliance Plans. ES Form 1.00 will continue to show the calculation of the Jurisdictional Environmental Surcharge Billing Factor using the same methodology previously approved by the Commission.

Determination of the Environmental Compliance Rate Base is based on combining all ECR-approved expenditures and calculating the rate base according to the methodologies ordered in the previous Compliance Plan cases.

KU proposes to modify ES Form 2.00 (Revenue Requirements of Environmental Compliance Costs) to account for the impact of surface-impoundment-related construction on environmental compliance rate base of construction related to compliance with the federal Coal Combustion Residuals ("CCR") Rule and to change various references to other ES Forms to track the proposed ES Form changes discussed below.

The plant, construction work in progress, and depreciation expenses for the 2009 and 2011 Plans are currently reported on ES Form 2.10. This form is being expanded to include the 2016 Plan projects for which KU is seeking cost recovery, including two rows for each of Projects 40 through 42 to show separately the costs of CCR Rule compliance construction and the costs of process water system construction for each project. Also, KU proposes to add a column called "CCR Rule

Compliance Construction Costs" to ES Form 2.10, which will apply to Projects 39 through 42.

KU proposes to modify current ES Forms 2.30 through 2.33 to reflect changes associated with the implementation of the Cross-State Air Pollution Rule ("CSAPR") in January 2015. As KU noted in its February 20, 2015 submittal letter to the Commission providing KU's Monthly Environmental Surcharge Report for the expense month of January 2015, it was necessary at that time to provide the Commission supplemental schedules to ES Form 2.31 to differentiate between SO_2 allowances under the Clean Air Interstate Rule ("CAIR") and CSAPR. KU now proposes to make those supplemental forms a permanent part of KU's monthly reporting by modifying ES Forms 2.30 through 2.33 as follows:

- ES Form 2.30 will be modified to allow for the differentiation of SO_2 allowances between CAIR and CSAPR allowances. This is being done by including two additional columns to display the differentiation.
- Current ES Form 2.31 will be removed as redundant relative to the renamed ES Forms 2.31 and 2.32 (currently Supplemental ES Form 2.31 CAIR and Supplemental ES Form 2.31 CSAPR).
- The current Supplemental ES Form 2.31 CAIR will be renamed ES Form 2.31 – Inventory of CAIR Emission Allowances (SO_2) - Current Vintage Year.
- The current Supplemental ES Form 2.31 CSAPR will be renamed ES Form 2.32 - Inventory of CSAPR Emission Allowances (SO_2) - Current Vintage Year.
- The current ES Form 2.32 will be renamed ES Form 2.33 - Inventory of Emission Allowances (NOx) - Ozone Season Allowance Allocation.

- The current ES Form 2.33 will be renamed ES Form 2.34 - Inventory of Emission Allowances (NOx) - Annual Allowance Allocation.

The pollution control equipment operating and maintenance ("O&M") expenses for the 2009 and 2011 Plans are currently reported on ES Form 2.50. This form is being expanded to include the O&M expenses associated with Project 38. KU is not proposing to recover O&M expenses through the ECR mechanism for the other projects in the 2016 Plan.

ES Form 3.00 will be modified to change the name of column (4) from "Fuel Clause Revenues," to "Fuel Clause Revenues Including Off-System Sales Tracker." Similarly, ES Form 3.10 Item (2) "Fuel Adjustment Clause" is being renamed "Fuel Adjustment Clause including Off System Sales Tracker." These changes reflect the settlement agreement in KU's 2014 base-rate case (Case No. 2014-00371), which implemented the off-system sales adjustment clause factor as a credit to customers through the Fuel Adjustment Clause.

Q. Has KU estimated the impact of the new projects on the Environmental Cost Recovery Surcharge?

A. Yes. The table below shows the estimated annual impact on Total E(m), Jurisdictional E(m), and the incremental billing factor associated with the projects contained in the 2016 Plan. As shown in the table, the estimated impact on a customer is an increase of 2.06% initially in 2016 and increasing to a maximum of 3.35% in 2019. For a residential customer using an average of 1,146 kWh per month, the initial monthly increase is expected to be $2.16 in 2016, upon approval by the Commission. It is estimated that this amount will increase to a maximum of $3.52

per month in 2019. Exhibit DAR-5 shows the details of the impact on the calculation of the environmental surcharge and a residential customer for 2016 through 2024.

Environmental Cost Recovery Surcharge Summary

	2016	2017	2018	2019	2020
Total E(m) - ($000)	$35,178	$47,402	$57,456	$63,533	$53,645
12 Month Average Jurisdictional Ratio	87.10%	87.10%	87.10%	87.10%	87.10%
Jurisdictional E(m) - ($000)	$30,640	$41,286	$50,044	$55,336	$46,724
Forecasted Jurisdictional R(m) - (million)	1,487	1,538	1,580	1,650	1,693
Incremental Billing Factor	2.06%	2.68%	3.17%	3.35%	2.76%
Residential Customer Impact					
Monthly bill (1,146 kWh per month)	$2.16	$2.82	$3.32	$3.52	$2.90

Conclusion and Recommendation

Q. What are your conclusion and recommendation to the Commission?

A. I recommend that the Commission approve KU's 2016 Plan and application for cost recovery of its compliance costs through the Rate Schedule ECR tariff, as well as the proposed changes to KU's Rate Schedule ECR tariff and monthly ES Forms beginning with the expense month of July 2016.

Q. Does this conclude your testimony?

A. Yes, it does.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Derek A. Rahn**, being duly sworn, deposes and says that he is Manager - Revenue Requirement for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Derek A. Rahn

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

Derek A. Rahn
Manager, Revenue Requirement
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-4127

<u>Education</u>

Masters of Business Administration,
Bellarmine University, July 2010.
Bachelor of Science in Electrical Engineering,
University of Kentucky, December 2003.

Training: Managing People & Processes (2014), IUS Leadership Program (2007-2008), Professional Development Program (2007-2008), Global Leadership Summit (2013 & 2015), Mentoring Program (2008, 2014, & 2015), Project Management (2006), Microsoft Project (2005), Advanced Operator (2008), Basic Shaft Alignment (2006).

<u>Previous Positions</u>

Manager, Transmission Policy & Tariffs	Sept. 2010 – Oct. 2015
Group Leader, Transmission Operations Engineering	Dec. 2008 – Sept. 2010
Supervisor, Operations (Ghent Power Station)	Dec. 2007 – Dec. 2008
Electrical Engineer II (Ghent Power Station)	Jul. 2005 – Dec. 2007
Project Engineer (TubeMaster, Inc.)	Dec 2003 – Jul. 2005

Kentucky Utilities Company

P.S.C. No. 17, Second Revision of Original Sheet No. 87
Canceling P.S.C. No. 17, First Revision of Original Sheet No. 87

Adjustment Clause **ECR**
Environmental Cost Recovery Surcharge

APPLICABLE

In all territory served.

AVAILABILITY OF SERVICE

This schedule is mandatory to all Standard Electric Rate Schedules listed in Section 1 of the General Index except CTAC and Special Charges, all Pilot Programs listed in Section 3 of the General Index, and the FAC (including the Off-System Sales Tracker) and DSM Adjustment Clauses. Standard Electric Rate Schedules subject to this schedule are divided into Group 1 or Group 2 as follows:

Group 1: Rate Schedules RS; RTOD-Energy; RTOD-Demand; VFD; AES; LS; RLS; LE; and TE.
Group 2: Rate Schedules GS; PS; TODS; TODP; RTS; and FLS.

RATE

The monthly billing amount under each of the schedules to which this mechanism is applicable, shall be increased or decreased by a percentage factor calculated in accordance with the following formula.

Group Environmental Surcharge Billing Factor = Group E(m) / Group R(m)

As set forth below, Group E(m) is the sum of Jurisdictional E(m) of each approved environmental compliance plan revenue requirement of environmental compliance costs for the current expense month allocated to each of Group 1 and Group 2. Group R(m) for Group 1 is the 12-month average revenue for the current expense month and for Group 2 it is the 12-month average non-fuel revenue for the current expense month.

DEFINITIONS

1) For all Plans, E(m) = [(RB/12) (ROR + (ROR – DR) (TR / (1 – TR))] + OE – EAS + BR
   a) RB is the Total Environmental Compliance Rate Base.
   b) ROR is the Rate of Return on Environmental Compliance Rate Base, designated as the overall rate of return [cost of short-term debt, long-term debt, preferred stock, and common equity].
   c) DR is the Debt Rate [cost of short-term debt, and long-term debt].
   d) TR is the Composite Federal and State Income Tax Rate.
   e) OE is the Operating Expenses. OE includes operation and maintenance expense recovery authorized by the K.P.S.C. in all approved ECR Plan proceedings.
   f) EAS is the total proceeds from emission allowance sales.
   g) BR is the operation and maintenance expenses, and/or revenues if applicable, associated with Beneficial Reuse.
   h) Plans are the environmental surcharge compliance plans submitted to and approved by the Kentucky Public Service Commission pursuant to KRS 278.183.

DATE OF ISSUE: January 29, 2016

DATE EFFECTIVE: July 29, 2016

ISSUED BY: /s/ Edwin R. Staton, Vice President
State Regulation and Rates
Lexington, Kentucky

Issued by Authority of an Order of the Public Service Commission in Case No. 2016-00026 dated _______, 20_____

Kentucky Utilities Company

P.S.C. No. 17, First Revision of Original Sheet No. 87.1
Canceling P.S.C. No. 17, Original Sheet No. 87.1

Adjustment Clause **ECR**
Environmental Cost Recovery Surcharge

DEFINITIONS (continued)

2) Total E(m) (sum of each approved environmental compliance plan revenue requirement) is multiplied by the Jurisdictional Allocation Factor. Jurisdictional E(m) is adjusted for any (Over)/Under collection or prior period adjustment and by the subtraction of the Revenue Collected through Base Rates for the Current Expense month to arrive at Adjusted Net Jurisdictional E(m). Adjusted Net Jurisdictional E(m) is allocated to Group 1 and Group 2 on the basis of Revenue as a Percentage of Total Revenue for the 12 months ending with the Current Month to arrive at Group 1 E(m) and Group 2 E(m).

3) The Group 1 R(m) is the average of total Group 1 monthly base revenue for the 12 months ending with the current expense month. Base revenue includes the customer, energy, and lighting charges for each rate schedule included in Group 1 to which this mechanism is applicable and automatic adjustment clause revenues for the Fuel Adjustment Clause and the Demand-Side Management Cost Recovery Mechanism as applicable for each rate schedule in Group 1.

4) The Group 2 R(m) is the average of total Group 2 monthly base non-fuel revenue for the 12 months ending with the current expense month. Base non-fuel revenue includes the customer, non-fuel energy, and demand charges for each rate schedule included in Group 2 to which this mechanism is applicable and automatic adjustment clause revenues for the Demand-Side Management Cost Recovery Mechanism as applicable for each rate schedule in Group 2. Non-fuel energy is equal to the tariff energy rate for each rate schedule included in Group 2 less the base fuel factor as defined on Sheet No. 85.1, Paragraph 6.

5) Current expense month (m) shall be the second month preceding the month in which the Environmental Surcharge is billed.

DATE OF ISSUE: January 29, 2016

DATE EFFECTIVE: July 29, 2016

ISSUED BY: ***/s/*** Edwin R. Staton, Vice President
State Regulation and Rates
Lexington, Kentucky

Issued by Authority of an Order of the
Public Service Commission in Case No.
2016-00026 dated ______, 20____

Kentucky Utilities Company

P.S.C. No. 17, Second~~First~~ Revision of Original Sheet No. 87
Canceling P.S.C. No. 17, First Revision of Original Sheet No. 87

Adjustment Clause **ECR**
Environmental Cost Recovery Surcharge

APPLICABLE

In all territory served.

AVAILABILITY OF SERVICE

This schedule is mandatory to all Standard Electric Rate Schedules listed in Section 1 of the General Index except CTAC and Special Charges, all Pilot Programs listed in Section 3 of the General Index, and the FAC (including the Off-System Sales Tracker) and DSM Adjustment Clauses. Standard Electric Rate Schedules subject to this schedule are divided into Group 1 or Group 2 as follows:

Group 1: Rate Schedules RS; RTOD-Energy; RTOD-Demand; VFD; AES; LS; RLS; LE; and TE.
Group 2: Rate Schedules GS; PS; TODS; TODP; RTS; and FLS.

RATE

The monthly billing amount under each of the schedules to which this mechanism is applicable, shall be increased or decreased by a percentage factor calculated in accordance with the following formula.

Group Environmental Surcharge Billing Factor = Group E(m) / Group R(m)

As set forth below, Group E(m) is the sum of Jurisdictional E(m) of each approved environmental compliance plan revenue requirement of environmental compliance costs for the current expense month allocated to each of Group 1 and Group 2. Group R(m) for Group 1 is the 12-month average revenue for the current expense month and for Group 2 it is the 12-month average non-fuel revenue for the current expense month.

DEFINITIONS

1) For all Plans, E(m) = [(RB/12) (ROR + (ROR – DR) (TR / (1 – TR))] + OE – EAS + BR
   a) RB is the Total Environmental Compliance Rate Base.
   b) ROR is the Rate of Return on Environmental Compliance Rate Base, designated as the overall rate of return [cost of short-term debt, long-term debt, preferred stock, and common equity].
   c) DR is the Debt Rate [cost of short-term debt, and long-term debt].
   d) TR is the Composite Federal and State Income Tax Rate.
   e) OE is the Operating Expenses. OE includes operation and maintenance expense recovery authorized by the K.P.S.C. in all approved ECR Plan proceedings.
   f) EAS is the total proceeds from emission allowance sales.
   g) BR is the operation and maintenance expenses, and/or revenues if applicable, associated with Beneficial Reuse.
   h) Plans are the environmental surcharge compliance plans submitted to and approved by the Kentucky Public Service Commission pursuant to KRS 278.183.

DATE OF ISSUE: January 29, 2016~~December 16, 2015~~

DATE EFFECTIVE: July 29, 2016~~December 7, 2015~~

ISSUED BY: /s/ Edwin R. Staton, Vice President
State Regulation and Rates
Lexington, Kentucky

Issued by Authority of an Order of the Public Service Commission in Case No. 2016-00026~~2015-00221~~ dated _______, 20_____~~December 7, 2015~~

Kentucky Utilities Company

P.S.C. No. 17, First Revision of Original Sheet No. 87.1
Canceling P.S.C. No. 17, Original Sheet No. 87.1

Adjustment Clause **ECR**
Environmental Cost Recovery Surcharge

DEFINITIONS (continued)

2) Total E(m) (sum of each approved environmental compliance plan revenue requirement) is multiplied by the Jurisdictional Allocation Factor. Jurisdictional E(m) is adjusted for any (Over)/Under collection or prior period adjustment and by the subtraction of the Revenue Collected through Base Rates for the Current Expense month to arrive at Adjusted Net Jurisdictional E(m). Adjusted Net Jurisdictional E(m) is allocated to Group 1 and Group 2 on the basis of Revenue as a Percentage of Total Revenue for the 12 months ending with the Current Month to arrive at Group 1 E(m) and Group 2 E(m).

3) The Group 1 R(m) is the average of total Group 1 monthly base revenue for the 12 months ending with the current expense month. Base revenue includes the customer, energy, and lighting charges for each rate schedule included in Group 1 to which this mechanism is applicable and automatic adjustment clause revenues for the Fuel Adjustment Clause and the Demand-Side Management Cost Recovery Mechanism as applicable for each rate schedule in Group 1.

4) The Group 2 R(m) is the average of total Group 2 monthly base non-fuel revenue for the 12 months ending with the current expense month. Base non-fuel revenue includes the customer, non-fuel energy, and demand charges for each rate schedule included in Group 2 to which this mechanism is applicable and automatic adjustment clause revenues for the Demand-Side Management Cost Recovery Mechanism as applicable for each rate schedule in Group 2. Non-fuel energy is equal to the tariff energy rate for each rate schedule included in Group 2 less the base fuel factor as defined on Sheet No. 85.1, Paragraph 6.

5) Current expense month (m) shall be the second month preceding the month in which the Environmental Surcharge is billed.

DATE OF ISSUE: January 29, 2016~~July 10, 2015~~

DATE EFFECTIVE: July 29~~1~~, 2016~~, 2015~~

ISSUED BY: ***/s/*** Edwin R. Staton, Vice President
State Regulation and Rates
Lexington, Kentucky

Issued by Authority of an Order of the Public Service Commission in Case No. 2016-00026~~2014-00371~~ dated ______, 20____ ~~June 30, 2015~~

ES FORM 1.00

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Net Jurisdictional E(m) and
Jurisdictional Environmental Surcharge Billing Factor
For the Expense Month of

GROUP 1 (Total Revenue)

Group 1 E(m) -- ES Form 1.10, line 15	=
Group 1 ES Billing Factor -- ES Form 1.10, line 17	=

GROUP 2 (Net Revenue)

Group 2 E(m) -- ES Form 1.10, line 15	=
Group 2 ES Billing Factor -- ES Form 1.10, line 17	=

Effective Date for Billing:

Submitted by: ______________________________

Title: Manager - Revenue Requirement

Date Submitted:

ES FORM 1.10

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Calculation of Total E(m) and
Jurisdictional Surcharge Billing Factor

For the Expense Month of

Calculation of Total E(m)

E(m) = [(RB / 12) (ROR+(ROR -DR)(TR/(1-TR)))] + OE - BAS + BR, where

RB	=	Environmental Compliance Rate Base
ROR	=	Rate of Return on the Environmental Compliance Rate Base
DR	=	Debt Rate (both short-term and long-term debt)
TR	=	Composite Federal & State Income Tax Rate
OE	=	Pollution Control Operating Expenses
BAS	=	Total Proceeds from By-Product and Allowance Sales
BR	=	Beneficial Reuse Operating Expenses

				Environmental Compliance Plans
(1)	RB		=	
(2)	RB / 12		=	
(3)	(ROR + (ROR - DR) (TR / (1 - TR)))		=	
(4)	OE		=	
(5)	BAS		=	
(6)	BR		=	
(7)	E(m)	(2) x (3) + (4) - (5) + (6)	=	

Calculation of Adjusted Net Jurisdictional E(m)

(8)	Jurisdictional Allocation Ratio for Expense Month -- ES Form 3.10	=	
(9)	Jurisdictional E(m) = Total E(m) x Jurisdictional Allocation Ratio [(7) x (8)]	=	
(10)	Adjustment for (Over)/Under-collection pursuant to Case No. 2015-00020	=	
(11)	Prior Period Adjustment (if necessary)	=	
(12)	Revenue Collected through Base Rates	=	
(13)	Adjusted Net Jurisdictional E(m) [(9) + (10) + (11) - (12)]	=	

Calculation of Group Environmental Surcharge Billing Factors

			GROUP 1 (Total Revenue)	GROUP 2 (Net Revenue)
(14)	Revenue as a Percentage of 12-month Total Revenue ending with the Current Month -- ES Form 3.00	=		
(15)	Group E(m) [(13) x (14)]	=		
(16)	Group R(m) = Average Monthly Group Revenue for the 12 Months Ending with the Current Expense Month -- ES Form 3.00	=		
(17)	Group Environmental Surcharge Billing Factors [(15) ÷ (16)]	=		

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Revenue Requirements of Environmental Compliance Costs
For the Expense Month of

Determination of Environmental Compliance Rate Base

	Enviromental Compliance Plan	
Eligible Pollution Control Plant		
Eligible Pollution CWIP Excluding AFUDC		
Subtotal		
Additions:		
Inventory - Emission Allowances per ES Form 2.31, 2.32 and 2.33		
Less: Allowance Inventory Baseline		
Net Emission Allowance Inventory		
Cash Working Capital Allowance		
Subtotal		
Deductions:		
Accumulated Depreciation on Eligible Pollution Control Plant		
Pollution Control Deferred Income Taxes		
Pollution Control Deferred Investment Tax Credit		
Subtotal		
Environmental Compliance Rate Base		

Determination of Pollution Control Operating Expenses

	Enviromental Compliance Plan	
Monthly Operations & Maintenance Expense		
Monthly Depreciation & Amortization Expense		
Monthly Taxes Other Than Income Taxes		
Monthly Emission Allowance Expense from ES Form 2.31, 2.32 and 2.33		
Add KU Current Month TC2 Emission Allowance Expense reported on ES Form 2.31, 2.32 and 2.33		
Less Monthly Emission Allowance Expense in base rates		
Net Recoverable Emission Allowance Expense		
Monthly Surcharge Consultant Fee		
Construction Monitoring Consultant Fee		
Total Pollution Control Operations Expense		

Determination of Beneficial Reuse Operating Expenses

	Environmental Compliance Plan
Total Monthly Beneficial Reuse Expense	
Adjustment for Beneficial Reuse in Base Rates (from ES Form 2.61)	
Net Beneficial Reuse Operations Expense	

Proceeds From By-Product and Allowance Sales

	Total Proceeds	Amount in Base Rates	Net Proceeds
	(1)	(2)	(1) - (2)
Allowance Sales			
Scrubber By-Products Sales			
Total Proceeds from Sales			

ES FORM 2.10

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Plant, CWIP & Depreciation Expense

For the Month Ended:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Description	Eligible Plant In Service	Eligible Accumulated Depreciation	CWIP Amount Excluding AFUDC	Eligible Net Plant In Service	Unamortized ITC as of 12/31/2015	Deferred Tax Balance as of 12/31/2015	Monthly Depreciation Expense	Monthly Property Tax Expense
				(2)-(3)+(4)				
2009 Plan:								
Project 28 - Brown 3 SCR								
Project 29 - ATB Expansion at E.W. Brown Station (Phase II)								
Project 30 - Ghent CCP Storage (Landfill- Phase I)								
Project 31 - Trimble County Ash Treatment Basin (BAP/GSP)								
Project 32 - Trimble County CCP Storage (Landfill - Phase I)								
Project 33 - Beneficial Reuse								
Subtotal								
Less Retirements and Replacement resulting from implementation of 2009 Plan								
Net Total - 2009 Plan:								
2011 Plan:								
Project 29 - Brown Landfill (Phase I)								
Project 34 - E.W. Brown Station Air Compliance								
Project 35 - Ghent Station Air Compliance								
Subtotal								
Less Retirements and Replacement resulting from implementation of 2011 Plan								
Net Total - 2011 Plan:								
Net Total - All Plans:								

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%
Note 2: Project 29 as approved in the 2009 ECR Plan recovers costs associated with the Brown Aux Pond (Phase II). In the 2011 Plan, Project 29 was amended to recover costs associated with the conversion of the Brown Main Ash Pond to the Brown Landfill (Phase I)

ES FORM 2.30

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances

For the Month Ended:

Vintage Year	Number of Allowances			Total Dollar Value Of Vintage Year			Comments and Explanations
	SO_2 (Note 1)	NOx Annual	NOx Ozone Season	SO_2 (Note 2)	NOx Annual	NOx Ozone Season	
Current Year							
2016							
2017							
2018							
2019							
2020							
2021							
2022							
2023							
2024							
2025							
2026							
2027							
2028							
2029							
2030							
2031							
2032							
2033							
2034							
2035 - 2044							

Note 1: Includes CAIR allowances of 222,364 for the current year and 77,535 for years 2016 through 2044.
Note 2: Total Dollar Value of Vintage Year for SO_2 allowances are associated with CAIR allowances only. EPA allotment of CSAPR allowances have $0 value when received.

In the "Comments and Explanation" Column, describe any allowance inventory adjustment other than the assignment of allowances by EPA. Inventory adjustments include, but are not limited to, purchases, allowances acquired as part of other purchases, and the sale of allowances.

ES FORM 2.31

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From LG&E							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

SUPPLEMENTAL ES FORM 2.31 - SUPPORT SCHEDULE

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of CAIR Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From LG&E							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

SUPPLEMENTAL ES FORM 2.31 - SUPPORT SCHEDULE

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of CSAPR Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From LG&E							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

ES FORM 2.32

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances (NOx) - Ozone Season Allowance Allocation

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From LG&E:							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor.

ES FORM 2.33

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances (NOx) - Annual Allowance Allocation

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From LG&E:							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor.

ES FORM 2.40

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
O&M Expenses and Determination of Cash Working Capital Allowance

For the Month Ended:

Environmental Compliance Plan	
O&M Expenses	Amount
11th Previous Month	
10th Previous Month	
9th Previous Month	
8th Previous Month	
7th Previous Month	
6th Previous Month	
5th Previous Month	
4th Previous Month	
3rd Previous Month	
2nd Previous Month	
Previous Month	
Current Month	
Total 12 Month O&M	

Determination of Working Capital Allowance	
12 Months O&M Expenses	
One Eighth (1/8) of 12 Month O&M Expenses	1/8
Pollution Control Cash Working Capital Allowance	

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Pollution Control - Operations & Maintenance Expenses

For the Month Ended:

O&M Expense Account	E. W. Brown	Ghent	Trimble County	Total
2009 Plan				
506154 - ECR NOx Operation -- Consumables				
506155 - ECR NOx Operation -- Labor and Other				
512151 - ECR NOx Maintenance				
506159 - ECR Sorbent Injection Operation				
506152 - ECR Sorbent Reactant - Reagent Only				
512152 - ECR Sorbent Injection Maintenance				
502013 - ECR Landfill Operations				
512107 - ECR Landfill Maintenance				
Adjustment for CCP Disposal in Base Rates (ES Form 2.51)				
Total 2009 Plan O&M Expenses				
2011 Plan				
506159 - ECR Sorbent Injection Operation				
506152 - ECR Sorbent Reactant - Reagent Only				
512152 - ECR Sorbent Injection Maintenance				
506156 - ECR Baghouse Operations				
512156 - ECR Baghouse Maintenance				
506151 - ECR Activated Carbon				
502013 - ECR Landfill Operations				
512107 - ECR Landfill Maintenance				
Total 2011 Plan O&M Expenses				
Current Month O&M Expense for All Plans				

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

ES FORM 2.51

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
CCP Disposal Facilities Expenses
For the Month Ended:

	On-Site CCP Disposal O&M Expense	Ghent	Trimble County
	Existing CCP Disposal Facilities (Pre 2009 Plan Project)		
(1)	12 Months Ending with Expense Month		
(2)	Monthly Amount [(1) / 12]		
	2009 Plan Project		
(3)	Monthly Expense		
	Total Generating Station		
(4)	Monthly Expense [(2) + (3)]		
	Base Rates		
(5)	Annual Expense Amount (12 Mo Ending with Last Test Year)		
(6)	Monthly Expense Amount [(5) / 12]		
(7)	Total Generating Station Less Base Rates [(4) - (6)]		
(8)	Less 2009 Plan Project [(7) - (3)]		
	If Line (8) Greater than Zero, No Adjustment		
	If Line (8) Less than Zero, Adjustment for Base Rates		
Adjustment for Base Rate Amount (to ES Form 2.50)			

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

Note 2: ES Form 2.51 will not be utilized until O&M costs associated with the 2009 Plan are incurred.

ES FORM 2.60

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Beneficial Reuse - Operations & Maintenance Expenses
For the Month Ended:

Third Party	O&M Expense Account	Plant	Total O&M
Total Monthly Beneficial Reuse Expense			
Adjustment for Beneficial Reuse in Base Rates (from ES Form 2.61)			
Net Beneficial Reuse O&M Expense			

ES FORM 2.61

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Beneficial Reuse Opportunities
For the Month Ended:

	On-Site CCP Disposal O&M Expense	E. W. Brown	Ghent	Trimble County	Total
	Existing Beneficial Reuse Opportunities (Pre 2009 Plan Project)				
(1)	12 Months Ending with Expense Month				
(2)	Monthly Amount [(1) / 12]				
	2009 Plan Project 33				
(3)	Monthly Amount (Expense/Revenue)				
	Total Beneficial Reuse - Generating Station				
(4)	Monthly Expense [(2) + (3)]				
	Beneficial Reuse in Base Rates				
(5)	Annual Expense Amount (12 Mo Ending with Last Test Year)				
(6)	Monthly Expense Amount [(5) / 12]				
(7)	Total Generating Station Less Base Rates [(4) - (6)]				
(8)	Less 2009 Plan Project 33 [(7) - (3)]				
	If Line (8) Greater than Zero, No Adjustment				
	If Line (8) Less than Zero, Adjustment for Base Rates				
	Adjustment for Base Rate Amount (to ES Form 2.60)				

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

ES FORM 3.00

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Monthly Average Revenue Computation of R (m) for GROUP 1 AND GROUP 2

For the Month Ended:

	GROUP 1 (Total Revenues) - Kentucky Jurisdictional Revenues						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Month	Non-fuel Base Rate Revenues	Base Rate Fuel Component	Fuel Clause Revenues	DSM Revenues	Environmental Surcharge Revenues	Total (2)+(3)+(4)+(5)+(6)	Total Excluding Environmental Surcharge (7)-(6)
Average Monthly Jurisdictional Revenues, Excluding Environmental Surcharge, for 12 Months Ending Current Expense Month.							
Average Kentucky Jurisdictional Revenues excluding Environmental Surcharge for 12-months ending with Current Month =							
GROUP 1 Revenues as a Percentage of Total Revenues for 12-months ending with the Current Month							

	GROUP 2 (Net Revenues) - Kentucky Jurisdictional Revenues							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Month	Non-fuel Base Rate Revenues	Base Rate Fuel Component	Fuel Clause Revenues	DSM Revenues	Environmental Surcharge Revenues	Total (2)+(3)+(4)+(5)+(6)	Total Excluding Environmental Surcharge (7)-(6)	Total Non-Fuel Revenues plus DSM (2)+(5)
Average Monthly Jurisdictional Revenues, Excluding Environmental Surcharge and Fuel, for 12 Months Ending Current Expense Month.								
Average Kentucky Jurisdictional Revenues excluding Environmental Surcharge for 12-months ending with Current Month =								
GROUP 2 Revenues as a Percentage of Total Revenues for 12-months ending with the Current Month								

ES FORM 3.10

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Reconciliation of Reported Revenues

For the Month Ended:

	Revenues per Form 3.00	Revenues per Income Statement
Kentucky Retail Revenues		
(1) Base Rates (Customer Charge, Energy Charge, Demand Charge)		
(2) Fuel Adjustment Clause		
(3) DSM		
(4) Environmental Surcharge		
(5) CSR Credits		
(6) Total Kentucky Jurisdictional Revenues for Environmental Surcharge Purposes =		
Non -Jurisdictional Revenues		
(7) Tennessee Retail		
(8) Virginia Retail		
(9) Wholesale		
(10) InterSystem (Total Less Transmission Portion Booked in Account 447)		
(11) Total Non-Jurisdictional Revenues for Environmental Surcharge Purposes =		
(12) Total Company Revenues for Environmental Surcharge Purposes =		
Jurisdictional Allocation Ratio for Current Month [(6) / (12)] =		
Reconciling Revenues		
(13) Brokered		
(14) InterSystem (Transmission Portion Booked in Account 447)		
(15) Unbilled		
(16) Provision for Refund		
(17) Miscellaneous		
(18) Total Company Revenues per Income Statement =		

ES FORM 1.00

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Net Jurisdictional E(m) and
Jurisdictional Environmental Surcharge Billing Factor
For the Expense Month of

GROUP 1 (Total Revenue)

Group 1 E(m) -- ES Form 1.10, line 15	=
Group 1 ES Billing Factor -- ES Form 1.10, line 17	=

GROUP 2 (Net Revenue)

Group 2 E(m) -- ES Form 1.10, line 15	=
Group 2 ES Billing Factor -- ES Form 1.10, line 17	=

Effective Date for Billing:

Submitted by: ______________________________

Title: Manager, Revenue Requirements

Date Submitted:

ES FORM 1.10

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Calculation of Total E(m) and
Jurisdictional Surcharge Billing Factor

For the Expense Month of

Calculation of Total E(m)

E(m) = [(RB / 12) (ROR+(ROR -DR)(TR/(1-TR)))] + OE - BAS + BR, where

RB	=	Environmental Compliance Rate Base
ROR	=	Rate of Return on the Environmental Compliance Rate Base
DR	=	Debt Rate (both short-term and long-term debt)
TR	=	Composite Federal & State Income Tax Rate
OE	=	Pollution Control Operating Expenses
BAS	=	Total Proceeds from By-Product and Allowance Sales
BR	=	Beneficial Reuse Operating Expenses

				Environmental Compliance Plans
(1)	RB		=	
(2)	RB / 12		=	
(3)	(ROR + (ROR - DR) (TR / (1 - TR)))		=	
(4)	OE		=	
(5)	BAS		=	
(6)	BR		=	
(7)	E(m)	(2) x (3) + (4) - (5) + (6)	=	

Calculation of Adjusted Net Jurisdictional E(m)

(8)	Jurisdictional Allocation Ratio for Expense Month -- ES Form 3.10	=	
(9)	Jurisdictional E(m) = Total E(m) x Jurisdictional Allocation Ratio [(7) x (8)]	=	
(10)	Adjustment for (Over)/Under-collection pursuant to Case No.	=	
(11)	Prior Period Adjustment (if necessary)	=	
(12)	Revenue Collected through Base Rates	=	
(13)	Adjusted Net Jurisdictional E(m) [(9) + (10) + (11) - (12)]	=	

Calculation of Group Environmental Surcharge Billing Factors

			GROUP 1 (Total Revenue)	GROUP 2 (Net Revenue)
(14)	Revenue as a Percentage of 12-month Total Revenue ending with the Current Month -- ES Form 3.00	=		
(15)	Group E(m) [(13) x (14)]	=		
(16)	Group R(m) = Average Monthly Group Revenue for the 12 Months Ending with the Current Expense Month -- ES Form 3.00	=		
(17)	Group Environmental Surcharge Billing Factors [(15) ÷ (16)]	=		

ES FORM 2.00

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Revenue Requirements of Environmental Compliance Costs
For the Expense Month of

Determination of Environmental Compliance Rate Base

	Enviromental Compliance Plan	
Eligible Pollution Control Plant		
Eligible Pollution CWIP Excluding AFUDC		
Eligible CCR Rule Compliance Construction Costs		
Subtotal		
Additions:		
Inventory - Emission Allowances per ES Forms 2.31, 2.32, 2.33 and 2.34		
Less: Allowance Inventory Baseline		
Net Emission Allowance Inventory		
Cash Working Capital Allowance		
Subtotal		
Deductions:		
Accumulated Depreciation on Eligible Pollution Control Plant		
Pollution Control Deferred Income Taxes		
Pollution Control Deferred Investment Tax Credit		
Subtotal		
Environmental Compliance Rate Base		

Determination of Pollution Control Operating Expenses

	Enviromental Compliance Plan	
Monthly Operations & Maintenance Expense		
Monthly Depreciation & Amortization Expense		
Monthly Taxes Other Than Income Taxes		
Monthly Emission Allowance Expense from ES Forms 2.31, 2.32, 2.33 amd 2.34		
Add KU Current Month TC2 Emission Allowance Expense reported on ES Form 2.31, 2.32, 2.33 and 2.34		
Less Monthly Emission Allowance Expense in base rates		
Net Recoverable Emission Allowance Expense		
Monthly Surcharge Consultant Fee		
Construction Monitoring Consultant Fee		
Total Pollution Control Operations Expense		

Determination of Beneficial Reuse Operating Expenses

	Environmental Compliance Plan
Total Monthly Beneficial Reuse Expense	
Adjustment for Beneficial Reuse in Base Rates (from ES Form 2.61)	
Net Beneficial Reuse Operations Expense	

Proceeds From By-Product and Allowance Sales

	Total Proceeds	Amount in Base Rates	Net Proceeds
	(1)	(2)	(1) - (2)
Allowance Sales			
Scrubber By-Products Sales			
Total Proceeds from Sales			

ES FORM 2.10

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Plant, CWIP & Depreciation Expense

For the Month Ended:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Description	Eligible Plant In Service	Eligible Accumulated Depreciation	CWIP Amount Excluding AFUDC	CCR Rule Compliance Construction Costs	Eligible Net Plant In Service	Unamortized ITC as of	Deferred Tax Balance as of	Monthly Depreciation Expense	Monthly Property Tax Expense
					(2)-(3)+(4)+(5)				
2009 Plan:									
Project 28 - Brown 3 SCR									
Project 29 - ATB Expansion at E.W. Brown Station (Phase II)									
Project 30 - Ghent CCP Storage (Landfill- Phase I)									
Project 31 - Trimble County Ash Treatment Basin (BAP/GSP)									
Project 32 - Trimble County CCP Storage (Landfill - Phase I)									
Project 33 - Beneficial Reuse									
Subtotal									
Less Retirements and Replacement resulting from implementation of 2009 Plan									
Net Total - 2009 Plan:									
2011 Plan:									
Project 29 - Brown Landfill (Phase I)									
Project 34 - E.W. Brown Station Air Compliance									
Project 35 - Ghent Station Air Compliance									
Subtotal									
Less Retirements and Replacement resulting from implementation of 2011 Plan									
Net Total - 2011 Plan:									
2016 Plan:									
Project 36 - Brown Landfill (Phase II)									
Project 37 - Ghent 2 WFGD Improvements									
Project 38 - Supplemental Mercury Control									
Project 39 - Surface Impoundment Closure (Retired Plants)									
Project 40 - Ghent CCR Rule Compliance Construction									
Project 40 - Ghent New Process Water Systems									
Project 41 - Trimble County CCR Rule Compliance Construction									
Project 41 - Trimble County New Process Water Systems									
Project 42 - Brown CCR Rule Compliance Construction									
Project 42 - Brown New Process Water Systems									
Subtotal									
Less Retirements and Replacement resulting from implementation of 2016 Plan									
Net Total - 2016 Plan:									
Net Total - All Plans:									

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%
Note 2: Project 29 as approved in the 2009 ECR Plan recovers costs associated with the Brown Aux Pond (Phase II). In the 2011 Plan, Project 29 was amended to recover costs associated with the conversion of the Brown Main Ash Pond to the Brown Landfill (Phase I)

ES FORM 2.30

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances

For the Month Ended:

Vintage Year	Number of Allowances				Total Dollar Value Of Vintage Year				Comments and Explanations
	SO_2 CAIR	SO_2 CSAPR	NOx Ozone Season	NOx Annual	SO_2 CAIR	SO_2 CSAPR	NOx Ozone Season	NOx Annual	
Current Year									
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									
2025									
2026									
2027									
2028									
2029									
2030									
2031									
2032									
2033									
2034									
2035									
2036 - 2045									

In the "Comments and Explanation" Column, describe any allowance inventory adjustment other than the assignment of allowances by EPA. Inventory adjustments include, but are not limited to, purchases, allowances acquired as part of other purchases, and the sale of allowances.

ES FORM 2.31

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of CAIR Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From LG&E							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

ES FORM 2.32

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of CSAPR Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From LG&E							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

ES FORM 2.33

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances (NOx) - Ozone Season Allowance Allocation

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From LG&E:							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor.

ES FORM 2.34

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances (NOx) - Annual Allowance Allocation

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From LG&E:							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor.

ES FORM 2.40

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
O&M Expenses and Determination of Cash Working Capital Allowance

For the Month Ended:

Environmental Compliance Plan	
O&M Expenses	Amount
11th Previous Month	
10th Previous Month	
9th Previous Month	
8th Previous Month	
7th Previous Month	
6th Previous Month	
5th Previous Month	
4th Previous Month	
3rd Previous Month	
2nd Previous Month	
Previous Month	
Current Month	
Total 12 Month O&M	

Determination of Working Capital Allowance	
12 Months O&M Expenses	
One Eighth (1/8) of 12 Month O&M Expenses	1/8
Pollution Control Cash Working Capital Allowance	

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Pollution Control - Operations & Maintenance Expenses

For the Month Ended:

O&M Expense Account	E. W. Brown	Ghent	Trimble County	Total
2009 Plan				
506154 - ECR NOx Operation -- Consumables				
506155 - ECR NOx Operation -- Labor and Other				
512151 - ECR NOx Maintenance				
506159 - ECR Sorbent Injection Operation				
506152 - ECR Sorbent Reactant - Reagent Only				
512152 - ECR Sorbent Injection Maintenance				
502013 - ECR Landfill Operations				
512107 - ECR Landfill Maintenance				
Adjustment for CCP Disposal in Base Rates (ES Form 2.51)				
Total 2009 Plan O&M Expenses				
2011 Plan				
506159 - ECR Sorbent Injection Operation				
506152 - ECR Sorbent Reactant - Reagent Only				
512152 - ECR Sorbent Injection Maintenance				
506156 - ECR Baghouse Operations				
512156 - ECR Baghouse Maintenance				
506151 - ECR Activated Carbon				
502013 - ECR Landfill Operations				
512107 - ECR Landfill Maintenance				
Total 2011 Plan O&M Expenses				
2016 Plan				
506153 - ECR Liquid Injection - Reagent Only				
Total 2016 Plan O&M Expenses				
Current Month O&M Expense for All Plans				

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

ES FORM 2.51

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
CCP Disposal Facilities Expenses
For the Month Ended:

	On-Site CCP Disposal O&M Expense	Ghent	Trimble County
	Existing CCP Disposal Facilities (Pre 2009 Plan Project)		
(1)	12 Months Ending with Expense Month		
(2)	Monthly Amount [(1) / 12]		
	2009 Plan Project		
(3)	Monthly Expense		
	Total Generating Station		
(4)	Monthly Expense [(2) + (3)]		
	Base Rates		
(5)	Annual Expense Amount (12 Mo Ending with Last Test Year)		
(6)	Monthly Expense Amount [(5) / 12]		
(7)	Total Generating Station Less Base Rates [(4) - (6)]		
(8)	Less 2009 Plan Project [(7) - (3)]		
	If Line (8) Greater than Zero, No Adjustment		
	If Line (8) Less than Zero, Adjustment for Base Rates		
Adjustment for Base Rate Amount (to ES Form 2.50)			

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

Note 2: ES Form 2.51 will not be utilized until O&M costs associated with the 2009 Plan are incurred.

ES FORM 2.60

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Beneficial Reuse - Operations & Maintenance Expenses
For the Month Ended:

Third Party	O&M Expense Account	Plant	Total O&M
Total Monthly Beneficial Reuse Expense			
Adjustment for Beneficial Reuse in Base Rates (from ES Form 2.61)			
Net Beneficial Reuse O&M Expense			

ES FORM 2.61

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Beneficial Reuse Opportunities
For the Month Ended:

	On-Site CCP Disposal O&M Expense	E. W. Brown	Ghent	Trimble County	Total
	Existing Beneficial Reuse Opportunities (Pre 2009 Plan Project)				
(1)	12 Months Ending with Expense Month				
(2)	Monthly Amount [(1) / 12]				
	2009 Plan Project 33				
(3)	Monthly Amount (Expense/Revenue)				
	Total Beneficial Reuse - Generating Station				
(4)	Monthly Expense [(2) + (3)]				
	Beneficial Reuse in Base Rates				
(5)	Annual Expense Amount (12 Mo Ending with Last Test Year)				
(6)	Monthly Expense Amount [(5) / 12]				
(7)	Total Generating Station Less Base Rates [(4) - (6)]				
(8)	Less 2009 Plan Project 33 [(7) - (3)]				
	If Line (8) Greater than Zero, No Adjustment				
	If Line (8) Less than Zero, Adjustment for Base Rates				
	Adjustment for Base Rate Amount (to ES Form 2.60)				

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Monthly Average Revenue Computation of R (m) for GROUP 1 AND GROUP 2

For the Month Ended:

	GROUP 1 (Total Revenues) - Kentucky Jurisdictional Revenues						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Month	Non-fuel Base Rate Revenues	Base Rate Fuel Component	Fuel Clause Revenues Including Off-System Sales Tracker	DSM Revenues	Environmental Surcharge Revenues	Total (2)+(3)+(4)+(5)+(6)	Total Excluding Environmental Surcharge (7)-(6)
Average Monthly Jurisdictional Revenues, Excluding Environmental Surcharge, for 12 Months Ending Current Expense Month.							
Average Kentucky Jurisdictional Revenues excluding Environmental Surcharge for 12-months ending with Current Month =							
GROUP 1 Revenues as a Percentage of Total Revenues for 12-months ending with the Current Month							

	GROUP 2 (Net Revenues) - Kentucky Jurisdictional Revenues							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Month	Non-fuel Base Rate Revenues	Base Rate Fuel Component	Fuel Clause Revenues Including Off-System Sales Tracker	DSM Revenues	Environmental Surcharge Revenues	Total (2)+(3)+(4)+(5)+(6)	Total Excluding Environmental Surcharge (7)-(6)	Total Non-Fuel Revenues plus DSM (2)+(5)
Average Monthly Jurisdictional Revenues, Excluding Environmental Surcharge and Fuel, for 12 Months Ending Current Expense Month.								
Average Kentucky Jurisdictional Revenues excluding Environmental Surcharge for 12-months ending with Current Month =								
GROUP 2 Revenues as a Percentage of Total Revenues for 12-months ending with the Current Month								

ES FORM 3.10

KENTUCKY UTILITIES COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Reconciliation of Reported Revenues

For the Month Ended:

	Revenues per Form 3.00	Revenues per Income Statement
Kentucky Retail Revenues		
(1) Base Rates (Customer Charge, Energy Charge, Demand Charge)		
(2) Fuel Adjustment Clause including Off System Sales Tracker		
(3) DSM		
(4) Environmental Surcharge		
(5) CSR Credits		
(6) Total Kentucky Jurisdictional Revenues for Environmental Surcharge Purposes =		
Non -Jurisdictional Revenues		
(7) Tennessee Retail		
(8) Virginia Retail		
(9) Wholesale		
(10) InterSystem (Total Less Transmission Portion Booked in Account 447)		
(11) Total Non-Jurisdictional Revenues for Environmental Surcharge Purposes =		
(12) Total Company Revenues for Environmental Surcharge Purposes =		
Jurisdictional Allocation Ratio for Current Month [(6) / (12)] =		
Reconciling Revenues		
(13) Brokered		
(14) InterSystem (Transmission Portion Booked in Account 447)		
(15) Unbilled		
(16) Provision for Refund		
(17) Miscellaneous		
(18) Total Company Revenues per Income Statement =		

Kentucky Utilities Company

Environmental Cost Recovery Surcharge Summary

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total E(m) - ($000)	$35,178	$47,402	$57,456	$63,533	$53,645	$56,142	$58,023	$57,805	$56,381
12 Month Average Jurisdictional Ratio	87.10%	87.10%	87.10%	87.10%	87.10%	87.10%	87.10%	87.10%	87.10%
Jurisdictional E(m) - ($000)	$30,640	$41,286	$50,044	$55,336	$46,724	$48,898	$50,537	$50,347	$49,107
Forecasted Jurisdictional R(m) - (million)	1,487	1,538	1,580	1,650	1,693	1,784	1,849	1,899	1,948
Incremental Billing Factor	2.06%	2.68%	3.17%	3.35%	2.76%	2.74%	2.73%	2.65%	2.52%
Residential Customer Impact									
Monthly bill (1,146 kWh per month)	$2.16	$2.82	$3.32	$3.52	$2.90	$2.88	$2.87	$2.78	$2.65

Revenue Requirements Summary
2016 Amended Plan - KU

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 36	**Brown Landfill - Phase II**										
	Revenue Requirement										
	Eligible Plant	0	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	0	(118,293)	(241,730)	(365,167)	(488,604)	(612,040)	(735,477)	(858,914)	(982,350)	(1,105,787)
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	0	(1,007,832)	(1,033,412)	(1,053,488)	(1,068,487)	(1,078,774)	(1,084,714)	(1,086,623)	(1,084,816)	(1,082,399)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	0	4,126,500	3,977,483	3,833,970	3,695,535	3,561,811	3,432,434	3,307,088	3,185,459	3,064,439
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$0	$412,292	$397,404	$383,065	$369,233	$355,872	$342,946	$330,422	$318,270	$306,178
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	0	118,293	123,437	123,437	123,437	123,437	123,437	123,437	123,437	123,437
	Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Annual Property Tax expense	0	0	7,701	7,516	7,331	7,146	6,961	6,776	6,591	6,405
	Total OE	$0	$118,293	$131,138	$130,953	$130,768	$130,583	$130,398	$130,212	$130,027	$129,842
	Total E(m)	0	530,586	528,542	514,018	500,001	486,455	473,343	460,635	448,297	436,020

Revenue Requirements Summary
2016 Amended Plan - KU

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 37	**Ghent Unit 2 WFGD Improvements**										
	Revenue Requirement										
	Eligible Plant	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	(6,154)	(153,854)	(301,554)	(449,254)	(596,954)	(744,654)	(892,354)	(1,040,054)	(1,187,754)	(1,335,454)
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	(1,401,680)	(1,442,265)	(1,475,516)	(1,502,000)	(1,522,205)	(1,536,618)	(1,545,658)	(1,549,745)	(1,553,020)	(1,556,282)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	5,592,166	5,403,881	5,222,930	5,048,745	4,880,840	4,718,728	4,561,988	4,410,201	4,259,226	4,108,264
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$558,732	$539,920	$521,840	$504,437	$487,661	$471,464	$455,803	$440,638	$425,553	$410,470
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	6,154	147,700	147,700	147,700	147,700	147,700	147,700	147,700	147,700	147,700
	Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Annual Property Tax expense	0	10,491	10,269	10,048	9,826	9,605	9,383	9,161	8,940	8,718
	Total OE	$6,154	$158,191	$157,969	$157,748	$157,526	$157,305	$157,083	$156,861	$156,640	$156,418
	Total E(m)	564,886	698,110	679,810	662,185	645,187	628,768	612,886	597,499	582,193	566,889

Revenue Requirements Summary
2016 Amended Plan - KU

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 38	**Supplemental Mercury Control Systems**										
	Revenue Requirement										
	Eligible Plant	10,071,005	10,071,005	10,071,005	10,071,005	10,071,005	10,071,005	10,071,005	10,071,005	10,071,005	10,071,005
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	(43,493)	(252,259)	(461,025)	(669,791)	(878,557)	(1,087,323)	(1,296,089)	(1,504,855)	(1,713,621)	(1,922,387)
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	(2,003,224)	(2,063,058)	(2,112,340)	(2,151,886)	(2,182,398)	(2,204,577)	(2,219,027)	(2,226,350)	(2,232,505)	(2,238,640)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	8,024,288	7,755,687	7,497,640	7,249,327	7,010,049	6,779,104	6,555,889	6,339,800	6,124,879	5,909,978
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$801,733	$774,897	$749,114	$724,304	$700,397	$677,323	$655,021	$633,431	$611,957	$590,486
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	43,493	208,766	208,766	208,766	208,766	208,766	208,766	208,766	208,766	208,766
	Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Annual Property Tax expense	0	15,041	14,728	14,415	14,102	13,789	13,476	13,162	12,849	12,536
	Total OE	$43,493	$223,807	$223,494	$223,181	$222,868	$222,555	$222,242	$221,928	$221,615	$221,302
	Total E(m)	845,226	998,704	972,608	947,485	923,265	899,878	877,262	855,359	833,572	811,788

Revenue Requirements Summary
2016 Amended Plan - KU

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 39	**Surface Impoundment Closure (Retired Plants)**										
	Revenue Requirement										
	Eligible Plant	4,972,500	27,533,500	68,209,500	77,522,500	77,522,500	77,522,500	77,522,500	77,522,500	77,522,500	77,522,500
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	(19,349,526)	(38,699,053)	(58,048,579)	(77,398,106)	0	0	0	0	0	0
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	5,559,021	4,317,273	(3,928,822)	(48,098)	(48,098)	(48,098)	(48,098)	(48,098)	(48,098)	(48,098)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	(8,818,005)	(6,848,280)	6,232,099	76,296	77,474,402	77,474,402	77,474,402	77,474,402	77,474,402	77,474,402
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$(881,036)	$(684,234)	$622,670	$7,623	$7,740,725	$7,740,725	$7,740,725	$7,740,725	$7,740,725	$7,740,725
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense on CCR Project	19,349,526	19,349,526	19,349,526	19,349,526	0	0	0	0	0	0
	Annual Property Tax expense	0	(21,566)	(16,748)	15,241	187	116,284	116,284	116,284	116,284	116,284
	Total OE	$19,349,526	$19,327,961	$19,332,778	$19,364,768	$187	$116,284	$116,284	$116,284	$116,284	$116,284
	Total E(m)	18,468,490	18,643,726	19,955,448	19,372,391	7,740,912	7,857,009	7,857,009	7,857,009	7,857,009	7,857,009

Revenue Requirements Summary
2016 Amended Plan - KU

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 40	**CCR Rule Compliance Construction and Construction of New Process Water Systems for Ghent**										
	Revenue Requirement										
	Eligible Plant	11,344,470	95,211,470	174,424,470	216,171,470	253,545,470	306,550,470	339,926,470	339,926,470	339,926,470	339,926,470
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	(11,314,841)	(22,629,681)	(34,044,610)	(47,761,560)	(61,478,510)	(75,195,461)	(88,912,411)	(102,629,361)	(116,346,312)	(130,063,262)
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	1,935,159	(7,551,219)	(31,059,283)	(43,638,941)	(54,396,980)	(71,078,279)	(80,057,889)	(76,029,082)	(71,904,500)	(67,691,621)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	1,964,788	65,030,570	109,320,578	124,770,969	137,669,979	160,276,731	170,956,170	161,268,027	151,675,659	142,171,587
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$196,309	$6,497,421	$10,922,583	$12,466,283	$13,755,066	$16,013,782	$17,080,800	$16,112,826	$15,154,420	$14,204,837
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	0	0	100,088	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110
	Annual Depreciation expense on CCR Project	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841
	Annual Property Tax expense	0	44	108,873	210,570	252,615	288,100	347,033	376,521	355,946	335,370
	Total OE	$11,314,841	$11,314,885	$11,523,801	$13,927,520	$13,969,565	$14,005,051	$14,063,983	$14,093,471	$14,072,896	$14,052,321
	Total E(m)	11,511,149	17,812,306	22,446,384	26,393,803	27,724,631	30,018,833	31,144,783	30,206,297	29,227,316	28,257,157

Revenue Requirements Summary
2016 Amended Plan - KU

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 41	**CCR Rule Compliance Construction and Construction of New Process Water Systems for Trimble County (Net, 48%)**										
	Revenue Requirement										
	Eligible Plant	0	21,073,752	47,355,912	58,919,472	72,055,872	79,421,472	91,328,472	101,940,192	101,940,192	101,940,192
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	(1,189,321)	(2,378,642)	(3,603,917)	(5,656,137)	(7,708,357)	(9,760,577)	(11,812,796)	(13,865,016)	(15,917,236)	(17,969,455)
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	459,863	300,273	(7,741,816)	(12,107,644)	(17,029,959)	(19,673,272)	(24,028,331)	(27,841,757)	(27,514,209)	(27,151,772)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	(729,458)	18,995,383	36,010,179	41,155,691	47,317,556	49,987,623	55,487,345	60,233,419	58,508,747	56,818,965
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$(72,883)	$1,897,892	$3,597,897	$4,112,002	$4,727,655	$4,994,430	$5,543,925	$6,018,122	$5,845,804	$5,676,972
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	0	0	35,954	862,899	862,899	862,899	862,899	862,899	862,899	862,899
	Annual Depreciation expense on CCR Project	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321
	Annual Property Tax expense	0	(1,784)	28,043	65,628	79,895	96,521	104,491	119,274	132,113	129,034
	Total OE	$1,189,321	$1,187,537	$1,253,318	$2,117,848	$2,132,115	$2,148,741	$2,156,711	$2,171,493	$2,184,333	$2,181,254
	Total E(m)	1,116,438	3,085,429	4,851,215	6,229,850	6,859,769	7,143,171	7,700,637	8,189,615	8,030,136	7,858,226

Revenue Requirements Summary
2016 Amended Plan - KU

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 42	**CCR Rule Compliance Construction and Construction of New Process Water Systems for Brown**										
	Revenue Requirement										
	Eligible Plant	0	31,695,300	67,297,300	71,094,300	74,533,300	78,159,300	88,085,300	98,264,300	98,264,300	98,264,300
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	(2,846,392)	(5,692,784)	(8,603,935)	(13,004,535)	(17,405,136)	(21,805,736)	(26,206,337)	(30,606,937)	(33,386,894)	(36,166,852)
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	1,100,586	1,932,532	(7,926,344)	(8,800,597)	(9,453,264)	(10,101,519)	(13,114,539)	(16,159,715)	(15,834,802)	(15,453,733)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	(1,745,806)	27,935,048	50,767,021	49,289,168	47,674,900	46,252,044	48,764,424	51,497,648	49,042,603	46,643,715
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$(174,429)	$2,791,084	$5,072,302	$4,924,645	$4,763,358	$4,621,196	$4,872,216	$5,145,302	$4,900,010	$4,660,329
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	0	0	64,759	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208
	Annual Depreciation expense on CCR Project	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392
	Annual Property Tax expense	0	(4,270)	39,004	88,040	87,135	85,692	84,530	92,818	101,486	97,316
	Total OE	$2,846,392	$2,842,122	$2,950,155	$4,488,641	$4,487,735	$4,486,293	$4,485,131	$4,493,419	$4,502,087	$4,497,917
	Total E(m)	2,671,963	5,633,206	8,022,457	9,413,285	9,251,093	9,107,488	9,357,347	9,638,720	9,402,096	9,158,246

Revenue Requirements Summary
2016 Amended Plan - KU

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	Total E(m) - All KU Projects	35,178,153	47,402,068	57,456,463	63,533,017	53,644,859	56,141,602	58,023,268	57,805,134	56,380,621	54,945,335
	Total Revenue Requirements										
	Project 36	0	530,586	528,542	514,018	500,001	486,455	473,343	460,635	448,297	436,020
	Project 37	564,886	698,110	679,810	662,185	645,187	628,768	612,886	597,499	582,193	566,889
	Project 38	845,226	998,704	972,608	947,485	923,265	899,878	877,262	855,359	833,572	811,788
	Project 39	18,468,490	18,643,726	19,955,448	19,372,391	7,740,912	7,857,009	7,857,009	7,857,009	7,857,009	7,857,009
	Project 40	11,511,149	17,812,306	22,446,384	26,393,803	27,724,631	30,018,833	31,144,783	30,206,297	29,227,316	28,257,157
	Project 41	1,116,438	3,085,429	4,851,215	6,229,850	6,859,769	7,143,171	7,700,637	8,189,615	8,030,136	7,858,226
	Project 42	2,671,963	5,633,206	8,022,457	9,413,285	9,251,093	9,107,488	9,357,347	9,638,720	9,402,096	9,158,246
	Total	35,178,153	47,402,068	57,456,463	63,533,017	53,644,859	56,141,602	58,023,268	57,805,134	56,380,621	54,945,335
	12 Month Average Jurisdictional Ratio	87.10%	87.10%	87.10%	87.10%	87.10%	87.10%	87.10%	87.10%	87.10%	87.10%
	Jurisdictional Allocation	30,639,585	41,286,411	50,043,622	55,336,199	46,723,778	48,898,400	50,537,299	50,347,309	49,106,581	47,856,471
	Forecasted 12-Month Retail Revenue	1,486,563,168	1,537,679,572	1,580,101,378	1,649,609,037	1,693,096,210	1,783,919,326	1,848,889,897	1,899,431,631	1,947,690,996	2,009,227,982
	Billing Factor	2.06%	2.68%	3.17%	3.35%	2.76%	2.74%	2.73%	2.65%	2.52%	2.38%
	KU Residential Bill Impact										
	Customer Charge	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75
1146	Energy - 1146 kWh @ $0.08508	$97.50	$97.50	$97.50	$97.50	$97.50	$97.50	$97.50	$97.50	$97.50	$97.50
	FAC billings (Nov 15 factor - $-0.00586/kWh)	-$6.72	-$6.72	-$6.72	-$6.72	-$6.72	-$6.72	-$6.72	-$6.72	-$6.72	-$6.72
	DSM billings (Nov 15 factor - $0.00298/kWh)	$3.42	$3.42	$3.42	$3.42	$3.42	$3.42	$3.42	$3.42	$3.42	$3.42
	ECR billings (Nov 15 factor: 6.09%)	$6.39	$6.39	$6.39	$6.39	$6.39	$6.39	$6.39	$6.39	$6.39	$6.39
	Additional ECR factor	$2.16	$2.82	$3.32	$3.52	$2.90	$2.88	$2.87	$2.78	$2.65	$2.50

Revenue Requirements
Project 36 - KU

		January								
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service		1	2	3	4	5	6	7	8	9
Brown 3										
Project 36 - Brown Landfill Phase II	$0	$5,252,625	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$0	$5,252,625	$5,252,625	$5,252,625	$5,252,625	$5,252,625	$5,252,625	$5,252,625	$5,252,625	$5,252,625
Book Depreciation rate, per year	0.000%	2.350%	2.350%	2.350%	2.350%	2.350%	2.350%	2.350%	2.350%	2.350%
Tax Depreciation rate, per year	0.000%	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	0	1,007,832	1,033,412	1,053,488	1,068,487	1,078,774	1,084,714	1,086,623	1,084,816	1,082,399
Book Accumulated Depreciation Balance	0	118,293	241,730	365,167	488,604	612,040	735,477	858,914	982,350	1,105,787
Unrecovered Investment -- Book	0	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625
Book Depreciation	0	118,293	123,437	123,437	123,437	123,437	123,437	123,437	123,437	123,437
Unrecovered Investment -- Tax total	0	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625
Bonus Tax Depreciation	0	2,626,313	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	0	98,487	189,593	175,359	162,227	150,041	138,801	128,374	118,762	117,186
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	118,293	123,437	123,437	123,437	123,437	123,437	123,437	123,437	123,437
Tax expense total	0	2,724,799	189,593	175,359	162,227	150,041	138,801	128,374	118,762	117,186
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	0	1,007,832	25,580	20,076	14,999	10,287	5,941	1,909	(1,808)	(2,417)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	0	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625	5,252,625
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	(118,293)	(241,730)	(365,167)	(488,604)	(612,040)	(735,477)	(858,914)	(982,350)	(1,105,787)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	0	(1,007,832)	(1,033,412)	(1,053,488)	(1,068,487)	(1,078,774)	(1,084,714)	(1,086,623)	(1,084,816)	(1,082,399)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	0	4,126,500	3,977,483	3,833,970	3,695,535	3,561,811	3,432,434	3,307,088	3,185,459	3,064,439
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$0	$412,292	$397,404	$383,065	$369,233	$355,872	$342,946	$330,422	$318,270	$306,178
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	118,293	123,437	123,437	123,437	123,437	123,437	123,437	123,437	123,437
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	0	7,701	7,516	7,331	7,146	6,961	6,776	6,591	6,405
Total OE	$0	$118,293	$131,138	$130,953	$130,768	$130,583	$130,398	$130,212	$130,027	$129,842
Total E(m) - Project	0	530,586	528,542	514,018	500,001	486,455	473,343	460,635	448,297	436,020

Revenue Requirements
Project 37 - KU

	December									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent 2PC										
Project 37 - Ghent Unit 2 WFGD Improvements	$7,000,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$7,000,000	$7,000,000	$7,000,000	$7,000,000	$7,000,000	$7,000,000	$7,000,000	$7,000,000	$7,000,000	$7,000,000
Book Depreciation rate, per year	2.110%	2.110%	2.110%	2.110%	2.110%	2.110%	2.110%	2.110%	2.110%	2.110%
Tax Depreciation rate, per year	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	1,401,680	1,442,265	1,475,516	1,502,000	1,522,205	1,536,618	1,545,658	1,549,745	1,553,020	1,556,282
Book Accumulated Depreciation Balance	6,154	153,854	301,554	449,254	596,954	744,654	892,354	1,040,054	1,187,754	1,335,454
Unrecovered Investment -- Book	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000
Book Depreciation	6,154	147,700	147,700	147,700	147,700	147,700	147,700	147,700	147,700	147,700
Unrecovered Investment -- Tax total	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000
Bonus Tax Depreciation	3,500,000	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	131,250	252,665	233,695	216,195	199,955	184,975	171,080	158,270	156,170	156,135
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	6,154	147,700	147,700	147,700	147,700	147,700	147,700	147,700	147,700	147,700
Tax expense total	3,631,250	252,665	233,695	216,195	199,955	184,975	171,080	158,270	156,170	156,135
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	1,401,680	40,586	33,251	26,484	20,205	14,413	9,040	4,087	3,275	3,261
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(6,154)	(153,854)	(301,554)	(449,254)	(596,954)	(744,654)	(892,354)	(1,040,054)	(1,187,754)	(1,335,454)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(1,401,680)	(1,442,265)	(1,475,516)	(1,502,000)	(1,522,205)	(1,536,618)	(1,545,658)	(1,549,745)	(1,553,020)	(1,556,282)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	5,592,166	5,403,881	5,222,930	5,048,745	4,880,840	4,718,728	4,561,988	4,410,201	4,259,226	4,108,264
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$558,732	$539,920	$521,840	$504,437	$487,661	$471,464	$455,803	$440,638	$425,553	$410,470
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	6,154	147,700	147,700	147,700	147,700	147,700	147,700	147,700	147,700	147,700
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	10,491	10,269	10,048	9,826	9,605	9,383	9,161	8,940	8,718
Total OE	$6,154	$158,191	$157,969	$157,748	$157,526	$157,305	$157,083	$156,861	$156,640	$156,418
Total E(m) - Project	564,886	698,110	679,810	662,185	645,187	628,768	612,886	597,499	582,193	566,889

Revenue Requirements
Project 38 - KU

	October 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent 1										
Project 38 - Supplemental Mercury Control (Ghent 1)	$2,586,300	$0	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$2,586,300	$2,586,300	$2,586,300	$2,586,300	$2,586,300	$2,586,300	$2,586,300	$2,586,300	$2,586,300	$2,586,300
Book Depreciation rate, per year	2.600%	2.600%	2.600%	2.600%	2.600%	2.600%	2.600%	2.600%	2.600%	2.600%
Tax Depreciation rate, per year	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	513,343	523,438	530,823	535,708	538,273	538,698	537,138	533,748	530,058	526,363
Book Accumulated Depreciation Balance	14,009	81,253	148,497	215,741	282,984	350,228	417,472	484,716	551,960	619,203
Unrecovered Investment -- Book	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300
Book Depreciation	14,009	67,244	67,244	67,244	67,244	67,244	67,244	67,244	67,244	67,244
Unrecovered Investment -- Tax total	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300
Bonus Tax Depreciation	1,293,150	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	48,493	93,352	86,344	79,878	73,878	68,343	63,209	58,476	57,700	57,687
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	14,009	67,244	67,244	67,244	67,244	67,244	67,244	67,244	67,244	67,244
Tax expense total	1,341,643	93,352	86,344	79,878	73,878	68,343	63,209	58,476	57,700	57,687
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	513,343	10,095	7,385	4,885	2,565	425	(1,560)	(3,390)	(3,690)	(3,695)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300	2,586,300
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(14,009)	(81,253)	(148,497)	(215,741)	(282,984)	(350,228)	(417,472)	(484,716)	(551,960)	(619,203)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(513,343)	(523,438)	(530,823)	(535,708)	(538,273)	(538,698)	(537,138)	(533,748)	(530,058)	(526,363)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	2,058,948	1,981,609	1,906,980	1,834,851	1,765,042	1,697,373	1,631,690	1,567,836	1,504,282	1,440,733
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$205,716	$197,989	$190,533	$183,326	$176,351	$169,590	$163,028	$156,648	$150,298	$143,948
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	14,009	67,244	67,244	67,244	67,244	67,244	67,244	67,244	67,244	67,244
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	3,858	3,758	3,657	3,556	3,455	3,354	3,253	3,152	3,052
Total OE	$14,009	$71,102	$71,001	$70,901	$70,800	$70,699	$70,598	$70,497	$70,396	$70,295
Total E(m) - Project	219,725	269,091	261,534	254,227	247,151	240,289	233,625	227,145	220,694	214,244

Revenue Requirements
Project 38 - KU

	October 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent 2										
Project 38 - Supplemental Mercury Control (Ghent 2)	$2,704,694	$0	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694
Book Depreciation rate, per year	1.460%	1.460%	1.460%	1.460%	1.460%	1.460%	1.460%	1.460%	1.460%	1.460%
Tax Depreciation rate, per year	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	539,326	561,806	581,451	598,482	613,086	625,453	635,744	644,120	652,183	660,241
Book Accumulated Depreciation Balance	8,227	47,715	87,204	126,692	166,181	205,669	245,158	284,647	324,135	363,624
Unrecovered Investment -- Book	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694
Book Depreciation	8,227	39,489	39,489	39,489	39,489	39,489	39,489	39,489	39,489	39,489
Unrecovered Investment -- Tax total	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694
Bonus Tax Depreciation	1,352,347	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	50,713	97,626	90,296	83,534	77,260	71,472	66,103	61,153	60,342	60,328
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	8,227	39,489	39,489	39,489	39,489	39,489	39,489	39,489	39,489	39,489
Tax expense total	1,403,060	97,626	90,296	83,534	77,260	71,472	66,103	61,153	60,342	60,328
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	539,326	22,479	19,645	17,031	14,605	12,367	10,291	8,377	8,063	8,058
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(8,227)	(47,715)	(87,204)	(126,692)	(166,181)	(205,669)	(245,158)	(284,647)	(324,135)	(363,624)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(539,326)	(561,806)	(581,451)	(598,482)	(613,086)	(625,453)	(635,744)	(644,120)	(652,183)	(660,241)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	2,157,141	2,095,173	2,036,039	1,979,520	1,925,427	1,873,572	1,823,793	1,775,927	1,728,376	1,680,829
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$215,527	$209,336	$203,427	$197,780	$192,376	$187,195	$182,221	$177,439	$172,688	$167,937
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	8,227	39,489	39,489	39,489	39,489	39,489	39,489	39,489	39,489	39,489
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	4,045	3,985	3,926	3,867	3,808	3,749	3,689	3,630	3,571
Total OE	$8,227	$43,533	$43,474	$43,415	$43,356	$43,296	$43,237	$43,178	$43,119	$43,059
Total E(m) - Project	223,754	252,869	246,901	241,195	235,731	230,491	225,458	220,617	215,806	210,997

Revenue Requirements
Project 38 - KU

	October 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent 3										
Project 38 - Supplemental Mercury Control (Ghent 3)	$2,704,694	$0	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694	$2,704,694
Book Depreciation rate, per year	2.000%	2.000%	2.000%	2.000%	2.000%	2.000%	2.000%	2.000%	2.000%	2.000%
Tax Depreciation rate, per year	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	538,150	554,982	568,980	580,363	589,321	596,040	600,683	603,413	605,828	608,239
Book Accumulated Depreciation Balance	11,270	65,363	119,457	173,551	227,645	281,739	335,833	389,927	444,021	498,115
Unrecovered Investment -- Book	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694
Book Depreciation	11,270	54,094	54,094	54,094	54,094	54,094	54,094	54,094	54,094	54,094
Unrecovered Investment -- Tax total	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694
Bonus Tax Depreciation	1,352,347	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	50,713	97,626	90,296	83,534	77,260	71,472	66,103	61,153	60,342	60,328
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	11,270	54,094	54,094	54,094	54,094	54,094	54,094	54,094	54,094	54,094
Tax expense total	1,403,060	97,626	90,296	83,534	77,260	71,472	66,103	61,153	60,342	60,328
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	538,150	16,832	13,998	11,384	8,957	6,719	4,643	2,730	2,416	2,411
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694	2,704,694
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(11,270)	(65,363)	(119,457)	(173,551)	(227,645)	(281,739)	(335,833)	(389,927)	(444,021)	(498,115)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(538,150)	(554,982)	(568,980)	(580,363)	(589,321)	(596,040)	(600,683)	(603,413)	(605,828)	(608,239)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	2,155,275	2,084,349	2,016,257	1,950,780	1,887,728	1,826,915	1,768,178	1,711,355	1,654,845	1,598,341
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$215,341	$208,254	$201,451	$194,909	$188,609	$182,533	$176,665	$170,987	$165,341	$159,696
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	11,270	54,094	54,094	54,094	54,094	54,094	54,094	54,094	54,094	54,094
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	4,040	3,959	3,878	3,797	3,716	3,634	3,553	3,472	3,391
Total OE	$11,270	$58,134	$58,053	$57,972	$57,891	$57,809	$57,728	$57,647	$57,566	$57,485
Total E(m) - Project	226,610	266,388	259,504	252,881	246,500	240,343	234,393	228,634	222,907	217,180

Revenue Requirements
Project 38 - KU

	October									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent 4										
Project 38 - Supplemental Mercury Control (Ghent 4)	$2,075,317	$0	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$2,075,317	$2,075,317	$2,075,317	$2,075,317	$2,075,317	$2,075,317	$2,075,317	$2,075,317	$2,075,317	$2,075,317
Book Depreciation rate, per year	2.310%	2.310%	2.310%	2.310%	2.310%	2.310%	2.310%	2.310%	2.310%	2.310%
Tax Depreciation rate, per year	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	412,405	422,833	431,086	437,333	441,718	444,386	445,462	445,068	444,434	443,796
Book Accumulated Depreciation Balance	9,987	57,927	105,867	153,807	201,747	249,687	297,626	345,566	393,506	441,446
Unrecovered Investment -- Book	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317
Book Depreciation	9,987	47,940	47,940	47,940	47,940	47,940	47,940	47,940	47,940	47,940
Unrecovered Investment -- Tax total	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317
Bonus Tax Depreciation	1,037,658	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	38,912	74,909	69,284	64,096	59,281	54,840	50,721	46,923	46,300	46,290
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	9,987	47,940	47,940	47,940	47,940	47,940	47,940	47,940	47,940	47,940
Tax expense total	1,076,570	74,909	69,284	64,096	59,281	54,840	50,721	46,923	46,300	46,290
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	412,405	10,428	8,253	6,247	4,385	2,668	1,075	(393)	(634)	(638)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317	2,075,317
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(9,987)	(57,927)	(105,867)	(153,807)	(201,747)	(249,687)	(297,626)	(345,566)	(393,506)	(441,446)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(412,405)	(422,833)	(431,086)	(437,333)	(441,718)	(444,386)	(445,462)	(445,068)	(444,434)	(443,796)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	1,652,924	1,594,557	1,538,364	1,484,177	1,431,852	1,381,244	1,332,229	1,284,682	1,237,376	1,190,074
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$165,149	$159,317	$153,703	$148,289	$143,061	$138,005	$133,107	$128,357	$123,630	$118,904
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	9,987	47,940	47,940	47,940	47,940	47,940	47,940	47,940	47,940	47,940
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	3,098	3,026	2,954	2,882	2,810	2,738	2,667	2,595	2,523
Total OE	$9,987	$51,038	$50,966	$50,894	$50,822	$50,750	$50,678	$50,606	$50,534	$50,463
Total E(m) - Project	175,137	210,355	204,669	199,183	193,883	188,755	183,786	178,963	174,165	169,367

Revenue Requirements
Project 39 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Green River CCR										
Project 39 - Surface Impoundment Closure (Green River Main Ash Pond Cap	$1,159,500	$7,979,000	$10,647,000	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$1,159,500	$9,138,500	$19,785,500	$19,785,500	$19,785,500	$19,785,500	$19,785,500	$19,785,500	$19,785,500	$19,785,500
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	(5,005,803)	(7,374,779)	(8,712,145)	(14,166,281)	(14,166,281)	(14,166,281)	(14,166,281)	(14,166,281)	(14,166,281)	(14,166,281)
Book Accumulated Depreciation Balance	14,105,766	28,211,532	42,317,298	56,423,064						
Unrecovered Investment -- Book										
Book Depreciation	14,105,766	14,105,766	14,105,766	14,105,766						
Unrecovered Investment -- Tax total	1,159,500	9,138,500	19,785,500	19,785,500	19,785,500	19,785,500	19,785,500	19,785,500	19,785,500	19,785,500
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	14,105,766	14,105,766	14,105,766	14,105,766	0	0	0	0	0	0
Tax expense total	1,159,500	7,979,000	10,647,000	0	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	(5,005,803)	(2,368,975)	(1,337,366)	(5,454,135)	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	1,159,500	9,138,500	19,785,500	19,785,500	19,785,500	19,785,500	19,785,500	19,785,500	19,785,500	19,785,500
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(14,105,766)	(28,211,532)	(42,317,298)	(56,423,064)	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	5,005,803	7,374,779	8,712,145	14,166,281	14,166,281	14,166,281	14,166,281	14,166,281	14,166,281	14,166,281
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	(7,940,463)	(11,698,253)	(13,819,653)	(22,471,284)	33,951,781	33,951,781	33,951,781	33,951,781	33,951,781	33,951,781
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$(793,358)	$(1,168,811)	$(1,380,768)	$(2,245,181)	$3,392,235	$3,392,235	$3,392,235	$3,392,235	$3,392,235	$3,392,235
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	14,105,766	14,105,766	14,105,766	14,105,766	0	0	0	0	0	0
Annual Property Tax expense	0	(19,419)	(28,610)	(33,798)	(54,956)	29,678	29,678	29,678	29,678	29,678
Total OE	$14,105,766	$14,086,347	$14,077,156	$14,071,968	$(54,956)	$29,678	$29,678	$29,678	$29,678	$29,678
Total E(m) - Project	13,312,408	12,917,535	12,696,389	11,826,788	3,337,279	3,421,914	3,421,914	3,421,914	3,421,914	3,421,914

Revenue Requirements
Project 39 - KU

	January									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Green River CCR										
Project 39 - Surface Impoundment Closure (Green River ATB #2 Capping)	$1,698,000	$8,854,000	$10,884,000	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$1,698,000	$10,552,000	$21,436,000	$21,436,000	$21,436,000	$21,436,000	$21,436,000	$21,436,000	$21,436,000	$21,436,000
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	656,549	4,080,036	8,288,444	8,288,444	8,288,444	8,288,444	8,288,444	8,288,444	8,288,444	8,288,444
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	1,698,000	10,552,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	1,698,000	10,552,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	1,698,000	8,854,000	10,884,000	0	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	656,549	3,423,488	4,208,407	0	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	1,698,000	10,552,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000	21,436,000
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(656,549)	(4,080,036)	(8,288,444)	(8,288,444)	(8,288,444)	(8,288,444)	(8,288,444)	(8,288,444)	(8,288,444)	(8,288,444)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	1,041,451	6,471,964	13,147,556	13,147,556	13,147,556	13,147,556	13,147,556	13,147,556	13,147,556	13,147,556
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$104,055	$646,635	$1,313,616	$1,313,616	$1,313,616	$1,313,616	$1,313,616	$1,313,616	$1,313,616	$1,313,616
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	2,547	15,828	32,154	32,154	32,154	32,154	32,154	32,154	32,154
Total OE	$0	$2,547	$15,828	$32,154	$32,154	$32,154	$32,154	$32,154	$32,154	$32,154
Total E(m) - Project	104,055	649,182	1,329,444	1,345,770	1,345,770	1,345,770	1,345,770	1,345,770	1,345,770	1,345,770

Revenue Requirements
Project 39 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Green River CCR										
Project 39 - Surface Impoundment Closure (Green River SO2 Pond)	$872,000	$5,170,000	$9,147,000	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$872,000	$6,042,000	$15,189,000	$15,189,000	$15,189,000	$15,189,000	$15,189,000	$15,189,000	$15,189,000	$15,189,000
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	337,168	2,336,200	5,872,979	5,872,979	5,872,979	5,872,979	5,872,979	5,872,979	5,872,979	5,872,979
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	872,000	6,042,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	872,000	6,042,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	872,000	5,170,000	9,147,000	0	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	337,168	1,999,032	3,536,779	0	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	872,000	6,042,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000	15,189,000
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(337,168)	(2,336,200)	(5,872,979)	(5,872,979)	(5,872,979)	(5,872,979)	(5,872,979)	(5,872,979)	(5,872,979)	(5,872,979)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	534,832	3,705,800	9,316,021	9,316,021	9,316,021	9,316,021	9,316,021	9,316,021	9,316,021	9,316,021
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$53,437	$370,259	$930,795	$930,795	$930,795	$930,795	$930,795	$930,795	$930,795	$930,795
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	1,308	9,063	22,784	22,784	22,784	22,784	22,784	22,784	22,784
Total OE	$0	$1,308	$9,063	$22,784	$22,784	$22,784	$22,784	$22,784	$22,784	$22,784
Total E(m) - Project	53,437	371,567	939,858	953,578	953,578	953,578	953,578	953,578	953,578	953,578

Revenue Requirements
Project 39 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Pineville CCR										
Project 39 - Surface Impoundment Closure (Pineville Ash Pond Capping)	$323,000	$155,000	$2,705,000	$4,826,000	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$323,000	$478,000	$3,183,000	$8,009,000	$8,009,000	$8,009,000	$8,009,000	$8,009,000	$8,009,000	$8,009,000
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	(649,299)	(1,363,556)	(1,091,831)	0	(0)	(0)	(0)	(0)	(0)	(0)
Book Accumulated Depreciation Balance	2,002,250	4,004,500	6,006,750	8,009,000						
Unrecovered Investment -- Book										
Book Depreciation	2,002,250	2,002,250	2,002,250	2,002,250						
Unrecovered Investment -- Tax total	323,000	478,000	3,183,000	8,009,000	8,009,000	8,009,000	8,009,000	8,009,000	8,009,000	8,009,000
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	2,002,250	2,002,250	2,002,250	2,002,250	0	0	0	0	0	0
Tax expense total	323,000	155,000	2,705,000	4,826,000	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	(649,299)	(714,258)	271,725	1,091,831	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	323,000	478,000	3,183,000	8,009,000	8,009,000	8,009,000	8,009,000	8,009,000	8,009,000	8,009,000
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(2,002,250)	(4,004,500)	(6,006,750)	(8,009,000)	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	649,299	1,363,556	1,091,831	0	0	0	0	0	0	0
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	(1,029,951)	(2,162,944)	(1,731,919)	(0)	8,009,000	8,009,000	8,009,000	8,009,000	8,009,000	8,009,000
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$(102,906)	$(216,107)	$(173,042)	$(0)	$800,206	$800,206	$800,206	$800,206	$800,206	$800,206
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	2,002,250	2,002,250	2,002,250	2,002,250	0	0	0	0	0	0
Annual Property Tax expense	0	(2,519)	(5,290)	(4,236)	(0)	12,014	12,014	12,014	12,014	12,014
Total OE	$2,002,250	$1,999,731	$1,996,960	$1,998,014	$(0)	$12,014	$12,014	$12,014	$12,014	$12,014
Total E(m) - Project	1,899,344	1,783,624	1,823,918	1,998,014	800,206	812,219	812,219	812,219	812,219	812,219

Revenue Requirements
Project 39 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Tyrone CCR										
Project 39 - Surface Impoundment Closure (Tyrone Ash Pond Capping)	$920,000	$403,000	$7,293,000	$4,487,000	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$920,000	$1,323,000	$8,616,000	$13,103,000	$13,103,000	$13,103,000	$13,103,000	$13,103,000	$13,103,000	$13,103,000
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	(897,635)	(1,995,174)	(428,625)	52,956	52,956	52,956	52,956	52,956	52,956	52,956
Book Accumulated Depreciation Balance	3,241,510	6,483,021	9,724,531	12,966,042						
Unrecovered Investment -- Book										
Book Depreciation	3,241,510	3,241,510	3,241,510	3,241,510						
Unrecovered Investment -- Tax total	920,000	1,323,000	8,616,000	13,103,000	13,103,000	13,103,000	13,103,000	13,103,000	13,103,000	13,103,000
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	3,241,510	3,241,510	3,241,510	3,241,510	0	0	0	0	0	0
Tax expense total	920,000	403,000	7,293,000	4,487,000	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	(897,635)	(1,097,538)	1,566,549	481,581	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	920,000	1,323,000	8,616,000	13,103,000	13,103,000	13,103,000	13,103,000	13,103,000	13,103,000	13,103,000
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(3,241,510)	(6,483,021)	(9,724,531)	(12,966,042)	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	897,635	1,995,174	428,625	(52,956)	(52,956)	(52,956)	(52,956)	(52,956)	(52,956)	(52,956)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	(1,423,875)	(3,164,847)	(679,906)	84,002	13,050,044	13,050,044	13,050,044	13,050,044	13,050,044	13,050,044
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$(142,264)	$(316,210)	$(67,932)	$8,393	$1,303,873	$1,303,873	$1,303,873	$1,303,873	$1,303,873	$1,303,873
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	3,241,510	3,241,510	3,241,510	3,241,510	0	0	0	0	0	0
Annual Property Tax expense	0	(3,482)	(7,740)	(1,663)	205	19,655	19,655	19,655	19,655	19,655
Total OE	$3,241,510	$3,238,028	$3,233,770	$3,239,848	$205	$19,655	$19,655	$19,655	$19,655	$19,655
Total E(m) - Project	3,099,246	2,921,818	3,165,839	3,248,241	1,304,079	1,323,528	1,323,528	1,323,528	1,323,528	1,323,528

Revenue Requirements
Project 40 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent CCR										
Project 40 - CCR Rule Compliance Construction (ATB #1 Capping)	$1,089,476	$4,025,000	$1,329,000	$6,160,000	$5,402,000	$25,909,000	$22,277,000	$0	$0	$0
Accumulated Expenditures	$1,089,476	$5,114,476	$6,443,476	$12,603,476	$18,005,476	$43,914,476	$66,191,476	$66,191,476	$66,191,476	$66,191,476
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	(3,953,739)	(6,772,429)	(10,633,554)	(12,626,725)	(14,912,984)	(9,270,006)	(5,031,378)	(9,406,374)	(13,781,370)	(18,156,366)
Book Accumulated Depreciation Balance	11,314,841	22,629,681	33,944,522	45,259,362	56,574,203	67,889,043	79,203,884	90,518,724	101,833,565	113,148,406
Unrecovered Investment -- Book										
Book Depreciation	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841
Unrecovered Investment -- Tax total	1,089,476	5,114,476	6,443,476	12,603,476	18,005,476	43,914,476	66,191,476	66,191,476	66,191,476	66,191,476
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841
Tax expense total	1,089,476	4,025,000	1,329,000	6,160,000	5,402,000	25,909,000	22,277,000	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	(3,953,739)	(2,818,690)	(3,861,125)	(1,993,171)	(2,286,259)	5,642,978	4,238,629	(4,374,996)	(4,374,996)	(4,374,996)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	1,089,476	5,114,476	6,443,476	12,603,476	18,005,476	43,914,476	66,191,476	66,191,476	66,191,476	66,191,476
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(11,314,841)	(22,629,681)	(33,944,522)	(45,259,362)	(56,574,203)	(67,889,043)	(79,203,884)	(90,518,724)	(101,833,565)	(113,148,406)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	3,953,739	6,772,429	10,633,554	12,626,725	14,912,984	9,270,006	5,031,378	9,406,374	13,781,370	18,156,366
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	(6,271,625)	(10,742,776)	(16,867,491)	(20,029,161)	(23,655,743)	(14,704,561)	(7,981,030)	(14,920,874)	(21,860,719)	(28,800,563)
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$(626,619)	$(1,073,347)	$(1,685,287)	$(2,001,180)	$(2,363,524)	$(1,469,182)	$(797,411)	$(1,490,794)	$(2,184,177)	$(2,877,560)
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841	11,314,841
Annual Property Tax expense	0	(15,338)	(26,273)	(41,252)	(48,984)	(57,853)	(35,962)	(19,519)	(36,491)	(53,463)
Total OE	$11,314,841	$11,299,503	$11,288,568	$11,273,589	$11,265,857	$11,256,987	$11,278,879	$11,295,322	$11,278,350	$11,261,377
Total E(m) - Project	10,688,222	10,226,156	9,603,281	9,272,409	8,902,333	9,787,806	10,481,467	9,804,528	9,094,172	8,383,817

Revenue Requirements
Project 40 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent CCR										
Project 40 - CCR Rule Compliance Construction (ATB #2 Capping)	$2,191,098	$10,327,000	$9,843,000	$7,020,000	$21,478,000	$26,476,000	$11,099,000	$0	$0	$0
Accumulated Expenditures	$2,191,098	$12,518,098	$22,361,098	$29,381,098	$50,859,098	$77,335,098	$88,434,098	$88,434,098	$88,434,098	$88,434,098
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	847,210	4,840,248	8,646,142	11,360,495	19,665,179	29,902,389	34,193,928	34,193,928	34,193,928	34,193,928
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	2,191,098	12,518,098	22,361,098	29,381,098	50,859,098	77,335,098	88,434,098	88,434,098	88,434,098	88,434,098
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	2,191,098	12,518,098	22,361,098	29,381,098	50,859,098	77,335,098	88,434,098	88,434,098	88,434,098	88,434,098
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	2,191,098	10,327,000	9,843,000	7,020,000	21,478,000	26,476,000	11,099,000	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	847,210	3,993,038	3,805,894	2,714,353	8,304,683	10,237,210	4,291,539	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	2,191,098	12,518,098	22,361,098	29,381,098	50,859,098	77,335,098	88,434,098	88,434,098	88,434,098	88,434,098
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(847,210)	(4,840,248)	(8,646,142)	(11,360,495)	(19,665,179)	(29,902,389)	(34,193,928)	(34,193,928)	(34,193,928)	(34,193,928)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	1,343,888	7,677,850	13,714,956	18,020,602	31,193,919	47,432,709	54,240,170	54,240,170	54,240,170	54,240,170
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$134,272	$767,120	$1,370,307	$1,800,498	$3,116,688	$4,739,160	$5,419,316	$5,419,316	$5,419,316	$5,419,316
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	3,287	18,777	33,542	44,072	76,289	116,003	132,651	132,651	132,651
Total OE	$0	$3,287	$18,777	$33,542	$44,072	$76,289	$116,003	$132,651	$132,651	$132,651
Total E(m) - Project	134,272	770,406	1,389,084	1,834,040	3,160,760	4,815,449	5,535,319	5,551,967	5,551,967	5,551,967

Revenue Requirements
Project 40 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent CCR										
Project 40 - CCR Rule Compliance Construction (Gypsum Stack)	$2,718,274	$20,663,000	$16,221,000	$23,675,000	$9,874,000	$0	$0	$0	$0	$0
Accumulated Expenditures	$2,718,274	$23,381,274	$39,602,274	$63,277,274	$73,151,274	$73,151,274	$73,151,274	$73,151,274	$73,151,274	$73,151,274
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	1,051,048	9,040,603	15,312,615	24,466,791	28,284,672	28,284,672	28,284,672	28,284,672	28,284,672	28,284,672
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	2,718,274	23,381,274	39,602,274	63,277,274	73,151,274	73,151,274	73,151,274	73,151,274	73,151,274	73,151,274
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	2,718,274	23,381,274	39,602,274	63,277,274	73,151,274	73,151,274	73,151,274	73,151,274	73,151,274	73,151,274
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	2,718,274	20,663,000	16,221,000	23,675,000	9,874,000	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	1,051,048	7,989,556	6,272,012	9,154,176	3,817,881	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	2,718,274	23,381,274	39,602,274	63,277,274	73,151,274	73,151,274	73,151,274	73,151,274	73,151,274	73,151,274
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(1,051,048)	(9,040,603)	(15,312,615)	(24,466,791)	(28,284,672)	(28,284,672)	(28,284,672)	(28,284,672)	(28,284,672)	(28,284,672)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	1,667,226	14,340,671	24,289,659	38,810,483	44,866,603	44,866,603	44,866,603	44,866,603	44,866,603	44,866,603
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$166,578	$1,432,824	$2,426,861	$3,877,685	$4,482,772	$4,482,772	$4,482,772	$4,482,772	$4,482,772	$4,482,772
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	4,077	35,072	59,403	94,916	109,727	109,727	109,727	109,727	109,727
Total OE	$0	$4,077	$35,072	$59,403	$94,916	$109,727	$109,727	$109,727	$109,727	$109,727
Total E(m) - Project	166,578	1,436,902	2,461,933	3,937,088	4,577,688	4,592,499	4,592,499	4,592,499	4,592,499	4,592,499

Revenue Requirements
Project 40 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent CCR										
Project 40 - CCR Rule Compliance Construction (Secondary Pond Cleanout)	$132,615	$347,000	$582,000	$2,092,000	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$132,615	$479,615	$1,061,615	$3,153,615	$3,153,615	$3,153,615	$3,153,615	$3,153,615	$3,153,615	$3,153,615
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	51,277	185,448	410,484	1,219,377	1,219,377	1,219,377	1,219,377	1,219,377	1,219,377	1,219,377
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	132,615	479,615	1,061,615	3,153,615	3,153,615	3,153,615	3,153,615	3,153,615	3,153,615	3,153,615
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	132,615	479,615	1,061,615	3,153,615	3,153,615	3,153,615	3,153,615	3,153,615	3,153,615	3,153,615
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	132,615	347,000	582,000	2,092,000	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	51,277	134,171	225,036	808,893	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	132,615	479,615	1,061,615	3,153,615	3,153,615	3,153,615	3,153,615	3,153,615	3,153,615	3,153,615
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(51,277)	(185,448)	(410,484)	(1,219,377)	(1,219,377)	(1,219,377)	(1,219,377)	(1,219,377)	(1,219,377)	(1,219,377)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	81,338	294,167	651,131	1,934,238	1,934,238	1,934,238	1,934,238	1,934,238	1,934,238	1,934,238
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$8,127	$29,391	$65,057	$193,256	$193,256	$193,256	$193,256	$193,256	$193,256	$193,256
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	199	719	1,592	4,730	4,730	4,730	4,730	4,730	4,730
Total OE	$0	$199	$719	$1,592	$4,730	$4,730	$4,730	$4,730	$4,730	$4,730
Total E(m) - Project	8,127	29,590	65,776	194,849	197,987	197,987	197,987	197,987	197,987	197,987

Revenue Requirements
Project 40 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Ghent CCR										
Project 40 - CCR Rule Compliance Construction (Reclaim Pond Cleanout)	$178,570	$487,000	$303,000	$2,800,000	$620,000	$620,000	$0	$0	$0	$0
Accumulated Expenditures	$178,570	$665,570	$968,570	$3,768,570	$4,388,570	$5,008,570	$5,008,570	$5,008,570	$5,008,570	$5,008,570
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	69,046	257,349	374,507	1,457,155	1,696,885	1,936,614	1,936,614	1,936,614	1,936,614	1,936,614
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	178,570	665,570	968,570	3,768,570	4,388,570	5,008,570	5,008,570	5,008,570	5,008,570	5,008,570
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	178,570	665,570	968,570	3,768,570	4,388,570	5,008,570	5,008,570	5,008,570	5,008,570	5,008,570
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	178,570	487,000	303,000	2,800,000	620,000	620,000	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	69,046	188,303	117,158	1,082,648	239,729	239,729	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	178,570	665,570	968,570	3,768,570	4,388,570	5,008,570	5,008,570	5,008,570	5,008,570	5,008,570
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(69,046)	(257,349)	(374,507)	(1,457,155)	(1,696,885)	(1,936,614)	(1,936,614)	(1,936,614)	(1,936,614)	(1,936,614)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	109,524	408,221	594,063	2,311,415	2,691,686	3,071,957	3,071,957	3,071,957	3,071,957	3,071,957
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$10,943	$40,787	$59,355	$230,941	$268,935	$306,929	$306,929	$306,929	$306,929	$306,929
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	268	998	1,453	5,653	6,583	7,513	7,513	7,513	7,513
Total OE	$0	$268	$998	$1,453	$5,653	$6,583	$7,513	$7,513	$7,513	$7,513
Total E(m) - Project	10,943	41,055	60,353	232,394	274,588	313,512	314,442	314,442	314,442	314,442

Revenue Requirements
Project 40 - KU

			December							
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service			1	2	3	4	5	6	7	8
Ghent 4										
Project 40 - Construction of New Process Water Systems	$5,034,437	$48,018,000	$50,935,000	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$5,034,437	$53,052,437	$103,987,437	$103,987,437	$103,987,437	$103,987,437	$103,987,437	$103,987,437	$103,987,437	$103,987,437
Book Depreciation rate, per year	0.000%	0.000%	2.310%	2.310%	2.310%	2.310%	2.310%	2.310%	2.310%	2.310%
Tax Depreciation rate, per year	0.000%	0.000%	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	0	0	16,949,088	17,761,848	18,443,853	19,005,234	19,454,676	19,800,865	20,051,279	20,213,397
Book Accumulated Depreciation Balance	0	0	100,088	2,502,198	4,904,307	7,306,417	9,708,527	12,110,637	14,512,747	16,914,856
Unrecovered Investment -- Book	5,034,437	53,052,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437
Book Depreciation	0	0	100,088	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110
Unrecovered Investment -- Tax total	5,034,437	53,052,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437
Bonus Tax Depreciation	0	0	41,594,975	0	0	0	0	0	0	0
MACRS Tax Depreciation	0	0	2,339,717	4,504,112	4,165,945	3,853,982	3,564,481	3,297,442	3,049,744	2,821,387
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	100,088	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110
Tax expense total	0	0	43,934,692	4,504,112	4,165,945	3,853,982	3,564,481	3,297,442	3,049,744	2,821,387
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	0	0	16,949,088	812,760	682,004	561,381	449,443	346,189	250,414	162,118
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	5,034,437	53,052,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437	103,987,437
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	(100,088)	(2,502,198)	(4,904,307)	(7,306,417)	(9,708,527)	(12,110,637)	(14,512,747)	(16,914,856)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	0	0	(16,949,088)	(17,761,848)	(18,443,853)	(19,005,234)	(19,454,676)	(19,800,865)	(20,051,279)	(20,213,397)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	5,034,437	53,052,437	86,938,261	83,723,391	80,639,277	77,675,786	74,824,234	72,075,935	69,423,411	66,859,183
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$503,007	$5,300,646	$8,686,291	$8,365,083	$8,056,939	$7,760,846	$7,475,938	$7,201,347	$6,936,324	$6,680,124
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	100,088	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110	2,402,110
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	7,552	79,579	155,831	152,228	148,625	145,022	141,418	137,815	134,212
Total OE	$0	$7,552	$179,667	$2,557,941	$2,554,338	$2,550,734	$2,547,131	$2,543,528	$2,539,925	$2,536,322
Total E(m) - Project	503,007	5,308,197	8,865,958	10,923,024	10,611,276	10,311,581	10,023,070	9,744,875	9,476,249	9,216,445

Revenue Requirements
Project 41 - KU

	January									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Trimble CCR KU										
Project 41 - CCR Rule Compliance Construction (Ash Pond Capping - Net, 48	$0	$979,149	$3,278,520	$3,709,440	$9,631,080	$7,365,600	$11,907,000	$10,611,720	$0	$0
Accumulated Expenditures	$0	$979,149	$4,257,669	$7,967,109	$17,598,189	$24,963,789	$36,870,789	$47,482,509	$47,482,509	$47,482,509
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	(459,863)	(541,128)	266,681	1,241,111	4,505,201	6,893,321	11,037,419	14,680,684	14,220,821	13,760,958
Book Accumulated Depreciation Balance	1,189,321	2,378,642	3,567,963	4,757,284	5,946,605	7,135,927	8,325,248	9,514,569	10,703,890	11,893,211
Unrecovered Investment -- Book										
Book Depreciation	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321
Unrecovered Investment -- Tax total	0	979,149	4,257,669	7,967,109	17,598,189	24,963,789	36,870,789	47,482,509	47,482,509	47,482,509
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321
Tax expense total	0	979,149	3,278,520	3,709,440	9,631,080	7,365,600	11,907,000	10,611,720	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	(459,863)	(81,265)	807,810	974,429	3,264,091	2,388,120	4,144,098	3,643,265	(459,863)	(459,863)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	0	979,149	4,257,669	7,967,109	17,598,189	24,963,789	36,870,789	47,482,509	47,482,509	47,482,509
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(1,189,321)	(2,378,642)	(3,567,963)	(4,757,284)	(5,946,605)	(7,135,927)	(8,325,248)	(9,514,569)	(10,703,890)	(11,893,211)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	459,863	541,128	(266,681)	(1,241,111)	(4,505,201)	(6,893,321)	(11,037,419)	(14,680,684)	(14,220,821)	(13,760,958)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	(729,458)	(858,365)	423,024	1,968,714	7,146,382	10,934,541	17,508,122	23,287,256	22,557,798	21,828,340
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$(72,883)	$(85,762)	$42,266	$196,701	$714,019	$1,092,506	$1,749,295	$2,326,707	$2,253,825	$2,180,942
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321	1,189,321
Annual Property Tax expense	0	(1,784)	(2,099)	1,035	4,815	17,477	26,742	42,818	56,952	55,168
Total OE	$1,189,321	$1,187,537	$1,187,222	$1,190,356	$1,194,136	$1,206,798	$1,216,063	$1,232,139	$1,246,273	$1,244,489
Total E(m) - Project	1,116,438	1,101,775	1,229,488	1,387,056	1,908,155	2,299,305	2,965,358	3,558,847	3,500,098	3,425,431

Revenue Requirements
Project 41 - KU

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Trimble CCR KU										
Project 41 - CCR Rule Compliance Construction (Gypsum Pond Capping - Ne	$0	$622,912	$1,384,920	$7,854,120	$3,505,320	$0	$0	$0	$0	$0
Accumulated Expenditures	$0	$622,912	$2,007,832	$9,861,952	$13,367,272	$13,367,272	$13,367,272	$13,367,272	$13,367,272	$13,367,272
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	0	240,855	776,348	3,813,222	5,168,590	5,168,590	5,168,590	5,168,590	5,168,590	5,168,590
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	0	622,912	2,007,832	9,861,952	13,367,272	13,367,272	13,367,272	13,367,272	13,367,272	13,367,272
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	0	622,912	2,007,832	9,861,952	13,367,272	13,367,272	13,367,272	13,367,272	13,367,272	13,367,272
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	0	622,912	1,384,920	7,854,120	3,505,320	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	0	240,855	535,493	3,036,874	1,355,367	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	0	622,912	2,007,832	9,861,952	13,367,272	13,367,272	13,367,272	13,367,272	13,367,272	13,367,272
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	0	(240,855)	(776,348)	(3,813,222)	(5,168,590)	(5,168,590)	(5,168,590)	(5,168,590)	(5,168,590)	(5,168,590)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	0	382,057	1,231,484	6,048,730	8,198,683	8,198,683	8,198,683	8,198,683	8,198,683	8,198,683
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$0	$38,173	$123,042	$604,349	$819,158	$819,158	$819,158	$819,158	$819,158	$819,158
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	0	934	3,012	14,793	20,051	20,051	20,051	20,051	20,051
Total OE	$0	$0	$934	$3,012	$14,793	$20,051	$20,051	$20,051	$20,051	$20,051
Total E(m) - Project	0	38,173	123,976	607,361	833,951	839,209	839,209	839,209	839,209	839,209

Revenue Requirements
Project 41 - KU

			December							
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service			1	2	3	4	5	6	7	8
Trimble 2NPC KU										
Project 41 - Construction of New Process Water Systems (Net, 48%)	$0	$19,471,691	$21,618,720	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$0	$19,471,691	$41,090,411	$41,090,411	$41,090,411	$41,090,411	$41,090,411	$41,090,411	$41,090,411	$41,090,411
Book Depreciation rate, per year	0.000%	0.000%	2.100%	2.100%	2.100%	2.100%	2.100%	2.100%	2.100%	2.100%
Tax Depreciation rate, per year	0.000%	0.000%	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	0	0	6,698,786	7,053,311	7,356,168	7,611,362	7,822,323	7,992,484	8,124,799	8,222,224
Book Accumulated Depreciation Balance	0	0	35,954	898,853	1,761,751	2,624,650	3,487,549	4,350,447	5,213,346	6,076,245
Unrecovered Investment -- Book	0	19,471,691	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411
Book Depreciation	0	0	35,954	862,899	862,899	862,899	862,899	862,899	862,899	862,899
Unrecovered Investment -- Tax total	0	19,471,691	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411
Bonus Tax Depreciation	0	0	16,436,164	0	0	0	0	0	0	0
MACRS Tax Depreciation	0	0	924,534	1,779,790	1,646,164	1,522,893	1,408,497	1,302,977	1,205,100	1,114,865
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	35,954	862,899	862,899	862,899	862,899	862,899	862,899	862,899
Tax expense total	0	0	17,360,699	1,779,790	1,646,164	1,522,893	1,408,497	1,302,977	1,205,100	1,114,865
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	0	0	6,698,786	354,525	302,857	255,193	210,961	170,161	132,315	97,425
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	0	19,471,691	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411	41,090,411
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	(35,954)	(898,853)	(1,761,751)	(2,624,650)	(3,487,549)	(4,350,447)	(5,213,346)	(6,076,245)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	0	0	(6,698,786)	(7,053,311)	(7,356,168)	(7,611,362)	(7,822,323)	(7,992,484)	(8,124,799)	(8,222,224)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	0	19,471,691	34,355,671	33,138,247	31,972,491	30,854,399	29,780,540	28,747,480	27,752,266	26,791,942
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$0	$1,945,481	$3,432,590	$3,310,953	$3,194,478	$3,082,766	$2,975,473	$2,872,256	$2,772,821	$2,676,872
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	35,954	862,899	862,899	862,899	862,899	862,899	862,899	862,899
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	0	29,208	61,582	60,287	58,993	57,699	56,404	55,110	53,816
Total OE	$0	$0	$65,162	$924,480	$923,186	$921,892	$920,597	$919,303	$918,009	$916,714
Total E(m) - Project	0	1,945,481	3,497,751	4,235,433	4,117,664	4,004,657	3,896,070	3,791,559	3,690,830	3,593,586

Revenue Requirements
Project 42 - KU

	January									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Brown CCR										
Project 42 - CCR Rule Compliance Construction (Aux Pond Capping)	$0	$694,771	$466,000	$3,797,000	$3,439,000	$3,626,000	$9,926,000	$10,179,000	$0	$0
Accumulated Expenditures	$0	$694,771	$1,160,771	$4,957,771	$8,396,771	$12,022,771	$21,948,771	$32,127,771	$32,127,771	$32,127,771
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	(1,100,586)	(1,932,532)	(2,852,934)	(2,485,372)	(2,256,234)	(1,954,791)	782,610	3,617,836	3,143,888	2,669,940
Book Accumulated Depreciation Balance	2,846,392	5,692,784	8,539,176	11,385,568	14,231,960	17,078,352	19,924,744	22,771,136	23,996,885	25,222,634
Unrecovered Investment -- Book										
Book Depreciation	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	1,225,749	1,225,749
Unrecovered Investment -- Tax total	0	694,771	1,160,771	4,957,771	8,396,771	12,022,771	21,948,771	32,127,771	32,127,771	32,127,771
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	1,225,749	1,225,749
Tax expense total	0	694,771	466,000	3,797,000	3,439,000	3,626,000	9,926,000	10,179,000	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	(1,100,586)	(831,946)	(920,402)	367,562	229,138	301,443	2,737,401	2,835,226	(473,948)	(473,948)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	0	694,771	1,160,771	4,957,771	8,396,771	12,022,771	21,948,771	32,127,771	32,127,771	32,127,771
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(2,846,392)	(5,692,784)	(8,539,176)	(11,385,568)	(14,231,960)	(17,078,352)	(19,924,744)	(22,771,136)	(23,996,885)	(25,222,634)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	1,100,586	1,932,532	2,852,934	2,485,372	2,256,234	1,954,791	(782,610)	(3,617,836)	(3,143,888)	(2,669,940)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	(1,745,806)	(3,065,481)	(4,525,471)	(3,942,425)	(3,578,955)	(3,100,790)	1,241,417	5,738,799	4,986,998	4,235,197
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$(174,429)	$(306,282)	$(452,155)	$(393,901)	$(357,585)	$(309,810)	$124,034	$573,382	$498,268	$423,153
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392	2,846,392
Annual Property Tax expense	0	(4,270)	(7,497)	(11,068)	(9,642)	(8,753)	(7,583)	3,036	14,035	12,196
Total OE	$2,846,392	$2,842,122	$2,838,895	$2,835,324	$2,836,750	$2,837,639	$2,838,809	$2,849,428	$2,860,427	$2,858,588
Total E(m) - Project	2,671,963	2,535,840	2,386,740	2,441,424	2,479,165	2,527,829	2,962,843	3,422,811	3,358,695	3,281,741

Revenue Requirements
Project 42 - KU

	2016	2017	December 2018	2019	2020	2021	2022	2023	2024	2025
In-Service			1	2	3	4	5	6	7	8
Brown 3										
Project 42 - Construction of New Process Water Systems	$0	$31,000,529	$35,136,000	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$0	$31,000,529	$66,136,529	$66,136,529	$66,136,529	$66,136,529	$66,136,529	$66,136,529	$66,136,529	$66,136,529
Book Depreciation rate, per year	0.000%	0.000%	2.350%	2.350%	2.350%	2.350%	2.350%	2.350%	2.350%	2.350%
Tax Depreciation rate, per year	0.000%	0.000%	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	0	0	10,779,278	11,285,969	11,709,498	12,056,310	12,331,929	12,541,878	12,690,914	12,783,793
Book Accumulated Depreciation Balance	0	0	64,759	1,618,967	3,173,176	4,727,384	6,281,592	7,835,801	9,390,009	10,944,218
Unrecovered Investment -- Book	0	31,000,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529
Book Depreciation	0	0	64,759	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208
Unrecovered Investment -- Tax total	0	31,000,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529
Bonus Tax Depreciation	0	0	26,454,611	0	0	0	0	0	0	0
MACRS Tax Depreciation	0	0	1,488,072	2,864,638	2,649,562	2,451,152	2,267,028	2,097,189	1,939,652	1,794,416
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	64,759	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208
Tax expense total	0	0	27,942,683	2,864,638	2,649,562	2,451,152	2,267,028	2,097,189	1,939,652	1,794,416
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	0	0	10,779,278	506,691	423,529	346,812	275,619	209,949	149,036	92,879
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	0	31,000,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529	66,136,529
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	(64,759)	(1,618,967)	(3,173,176)	(4,727,384)	(6,281,592)	(7,835,801)	(9,390,009)	(10,944,218)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	0	0	(10,779,278)	(11,285,969)	(11,709,498)	(12,056,310)	(12,331,929)	(12,541,878)	(12,690,914)	(12,783,793)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	0	31,000,529	55,292,492	53,231,593	51,253,855	49,352,834	47,523,007	45,758,850	44,055,606	42,408,518
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$0	$3,097,366	$5,524,457	$5,318,546	$5,120,943	$4,931,006	$4,748,182	$4,571,919	$4,401,742	$4,237,176
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	64,759	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208	1,554,208
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	0	46,501	99,108	96,776	94,445	92,114	89,782	87,451	85,120
Total OE	$0	$0	$111,259	$1,653,316	$1,650,985	$1,648,653	$1,646,322	$1,643,991	$1,641,660	$1,639,328
Total E(m) - Project	0	3,097,366	5,635,716	6,971,862	6,771,928	6,579,659	6,394,504	6,215,910	6,043,402	5,876,505

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF KENTUCKY	**)**	
UTILITIES COMPANY FOR	**)**	
CERTIFICATES OF PUBLIC	**)**	
CONVENIENCE AND NECESSITY	**)**	**CASE NO. 2016-00026**
APPROVAL OF ITS 2016 COMPLIANCE	**)**	
PLAN FOR RECOVERY BY	**)**	
ENVIRONMENTAL SURCHARGE	**)**	

DIRECT TESTIMONY OF

JOHN J. SPANOS

ON BEHALF OF

KENTUCKY UTILITIES COMPANY

Filed: January 29, 2016

TABLE OF CONTENTS

I. <u>INTRODUCTION AND PURPOSE</u>

Q. PLEASE STATE YOUR NAME AND ADDRESS.

A. My name is John J. Spanos. My business address is 207 Senate Avenue, Camp Hill, Pennsylvania.

Q. ARE YOU ASSOCIATED WITH ANY FIRM?

A. Yes. I am associated with the firm of Gannett Fleming Valuation and Rate Consultants, LLC ("Gannett Fleming").

Q. HOW LONG HAVE YOU BEEN ASSOCIATED WITH GANNETT FLEMING?

A. I have been associated with the firm since college graduation in June, 1986.

Q. WHAT IS YOUR POSITION WITH THE FIRM?

A. I am a Senior Vice President.

Q. WHAT IS YOUR EDUCATIONAL BACKGROUND?

A. I have Bachelor of Science degrees in Industrial Management and Mathematics from Carnegie-Mellon University and a Master of Business Administration from York College.

Q. PLEASE OUTLINE YOUR EXPERIENCE IN THE FIELD OF DEPRECIATION.

A. I have extensive experience in the field of depreciation, including conducting depreciation studies for many utilities throughout the United States and submitting testimony to regulatory utility commissions on the subject of utility plant depreciation. My experience is more fully detailed in my curriculum vitae, which is attached to my testimony as Exhibit JJS-1.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I sponsor the depreciation rates for ash ponds recovery for Kentucky Utilities Company ("KU"), and to demonstrate the KU has recovered only a minimal amount of terminal net salvage cost in base rates for the ask ponds.

II. DEPRECIATION RATES FOR ASH PONDS

Q. PLEASE DEFINE THE CONCEPT OF DEPRECIATION.

A. Depreciation refers to the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of utility plant in the course of service from causes which can be reasonably anticipated or contemplated, against which the Company is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand and the requirements of public authorities.

Q. DID YOU DETERMINE THE DEPRECIATION RATES FILED BY KENTUCKY UTILITIES COMPANY IN THIS PROCEEDING?

A. Yes. I determined the depreciation rates for ash pond recovery by KU with its filing in this proceeding. My analyses set forth the depreciation rates to be utilized by KU in order to recover the costs to close the ash ponds at various generating sites.

Q. CAN YOU EXPLAIN THE DEVELOPMENT OF DEPRECIATION RATES FOR THE RECOVERY OF ASH PONDS?

A. Yes. There were two specific components of the analyses. The first phase was to determine the original cost and accumulated depreciation expense as of September 30, 2015 for each ash pond site. The second phase included recovering the remaining net plant as well as the future cost of removal for each site over its remaining life.

Q. PLEASE EXPLAIN THE FIRST PHASE OF THE CALCULATION.

A. The initial step included identification within the property records of the age and surviving original cost as of September 30, 2015 of each ash pond site. Additionally, the corresponding accumulated depreciation for each asset was based on the age and approved depreciation parameters for each ash pond by location.

Q. WERE THERE ANY OTHER COSTS TO BE DETERMINED?

A. Yes. In addition to the net plant (original cost minus accumulated depreciation as of September 30, 2015), there are future removal costs for each ash pond to be determined. These costs totaled $423,231,000 for all KU sites and were established by engineering studies. Each site was assigned a specific removal cost.

Q. PLEASE EXPLAIN THE SECOND PHASE OF THE CALCULATION.

A. Once the remaining net plant and future removal costs for each ash pond site were established, then depreciation rates and expense were determined to recover the full service value of the ash ponds over the remaining life. The remaining life for each site is the time from September 30, 2015 to the probable retirement date of the related generating facility which was approved in the 2012 base rate case[1].

Q. HAVE YOU PREPARED AN EXHIBIT THAT SETS FORTH RECOVERY OF THE ASH PONDS COSTS?

A. Yes. Exhibit JJS-2 sets forth the recovery of the remaining ash pond costs over the remaining life of each site.

Q. CAN YOU USE AN EXAMPLE TO ILLUSTRATE THE DEPRECIATION RECOVERY?

[1] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates,* Case No. 2012-00221 (Dec. 2012).

A. Yes. I will use the ash ponds for Ghent Unit 4 for KU. The ash ponds for Ghent Unit 4 were placed in Account 312, in 1994 and 2004. The surviving original cost as of September 30, 2015 is $32,692,663.85 with an associated accumulated depreciation of $13,338,503. This produces a net plant $19,354,161 ($32,692,664 minus $13,338,503) as of September 30, 2015. Based on the engineering study, the costs of removal for the Ghent Unit 4 ash ponds are $217,401,690. Therefore, the full recovery of the Ghent Unit 4 ash ponds over their remaining life is $236,760,375.

The remaining life is 22.7 years which is the time between September 30, 2015 and the probable retirement date (2038) of Ghent Unit 4, based on the two vintages of the ash ponds. The weighted remaining life is 22.7 years. Therefore, the future service value of $236,760,375 should be recovered equally over 22.7 years or $10,407,050 annually.

Q. IS IT REASONABLE TO RECOVER THE ASH POND COSTS THROUGH THE REMAINING LIFE OF THE FACILITY?

A. Yes. The overall costs of the ash ponds and their closure should be recovered over the life of the associated generating facility as the ash pond life is associated with the generating facilities. This is consistent with the concept of group depreciation.

Q. ARE THESE ADDED COSTS CONSIDERED TERMINAL NET SALVAGE?

A. Yes.

Q. HAS KU RECOVERED SOME OF THE TERMINAL NET SALVAGE COSTS PREVIOUSLY?

A. Only a very small amount. KU had not been approved to accrue for terminal net salvage until the 2012 base rate case,[2] which those rates went into effect on January 1, 2013. The approved terminal net salvage was 2 percent. Therefore, all generating facilities and associated ash ponds have accrued for terminal net salvage for 21 months at a 2 percent level of the associated plant value. The total accrued terminal net salvage for all plants is $5,348 and the amount for Ghent Unit 4 is $1,717. Therefore, only $1,717 of the $236,760,375 for Ghent Unit 4 has been recovered as of September 30, 2015 for the ash ponds.

Q. HAVE YOU PREPARED AN EXHIBIT THAT SETS FORTH THE HISTORICAL TERMINAL NET SALVAGE RECOVERED TO DATE?

A. Yes. Exhibit JJS-3 sets forth the ash pond reserve into the two components as of September 30, 2015 and calculates the portion associated with terminal net salvage as recorded since January 1, 2013.

Q. WHY HAS KU NOT RECORDED MORE TERMINAL NET SALVAGE TO DATE?

A. The Public Service Commission of Kentucky had not approved recovery of a terminal net salvage component for any assets until the 2012 base rate case. Additionally, the level of required tasks to cap ash ponds was not specifically identified until the Coal Combustion Residual Rule ("CCR Rule") was established.

Q. WERE THERE ANY ASH PONDS RECOVERED DIFFERENTLY THAN THE METHODS DESCRIBED ABOVE?

A. Yes. There are three generating sites which have been retired during 2015. The facilities

[2] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates,* Case No. 2012-00221 (Dec. 2012).

are Green River, Tyrone and Pineville. Given these facilities have high ash pond removal which cannot be recovered by the generating station retirement, the Company is proposing to recover the ash pond costs over a four-year period of time which coincides with the needed ash pond capping project costs.

III. CONCLUSION

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

1296660

VERIFICATION

COMMONWEALTH OF PENNSYLVANIA)
) **SS:**
COUNTY OF CUMBERLAND)

The undersigned, **John J. Spanos**, being duly sworn, deposes and says that he is Senior Vice President, for Gannett Fleming Valuation and Rate Consultants, LLC, that he has personal knowledge of the matters set forth in the foregoing testimony and exhibits, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

John J. Spanos

John J. Spanos

Subscribed and sworn to before me, a Notary Public in and before said County and Commonwealth, this 26th day of JANUARY 2016.

_______________(SEAL)

Notary Public

My Commission Expires:

February 20, 2019

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Cheryl Ann Rutter, Notary Public
East Pennsboro Twp., Cumberland County
My Commission Expires Feb. 20, 2019
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

JOHN SPANOS

DEPRECIATION EXPERIENCE

Q. Please state your name.

A. My name is John J. Spanos.

Q. What is your educational background?

A. I have Bachelor of Science degrees in Industrial Management and Mathematics from Carnegie-Mellon University and a Master of Business Administration from York College.

Q. Do you belong to any professional societies?

A. Yes. I am a member and past President of the Society of Depreciation Professionals and a member of the American Gas Association/Edison Electric Institute Industry Accounting Committee.

Q. Do you hold any special certification as a depreciation expert?

A. Yes. The Society of Depreciation Professionals has established national standards for depreciation professionals. The Society administers an examination to become certified in this field. I passed the certification exam in September 1997 and was recertified in August 2003, February 2008 and January 2013.

Q. Please outline your experience in the field of depreciation.

A. In June, 1986, I was employed by Gannett Fleming Valuation and Rate Consultants, Inc. as a Depreciation Analyst. During the period from June, 1986 through December, 1995, I helped prepare numerous depreciation and original cost studies for utility companies in various industries. I helped perform depreciation studies for the following telephone companies: United Telephone of Pennsylvania, United Telephone of New Jersey, and Anchorage Telephone Utility. I helped perform depreciation studies for the following companies in the railroad industry: Union Pacific Railroad, Burlington Northern Railroad, and Wisconsin Central Transportation Corporation.

I helped perform depreciation studies for the following organizations in the electric utility industry: Chugach Electric Association, The Cincinnati Gas and Electric Company (CG&E), The Union Light, Heat and Power Company (ULH&P), Northwest Territories Power Corporation, and the City of Calgary - Electric System.

I helped perform depreciation studies for the following pipeline companies: TransCanada Pipelines Limited, Trans Mountain Pipe Line Company Ltd., Interprovincial Pipe Line Inc., Nova Gas Transmission Limited and Lakehead Pipeline Company.

I helped perform depreciation studies for the following gas utility companies: Columbia Gas of Pennsylvania, Columbia Gas of Maryland, The Peoples Natural Gas Company, T. W. Phillips Gas & Oil Company, CG&E, ULH&P, Lawrenceburg Gas Company and Penn Fuel Gas, Inc.

I helped perform depreciation studies for the following water utility companies: Indiana-American Water Company, Consumers Pennsylvania Water Company and The York Water Company; and depreciation and original cost studies for Philadelphia Suburban Water Company and Pennsylvania-American Water Company.

In each of the above studies, I assembled and analyzed historical and simulated data, performed field reviews, developed preliminary estimates of service life and net salvage, calculated annual depreciation, and prepared reports for submission to state public utility commissions or federal regulatory agencies. I performed these studies under the general direction of William M. Stout, P.E.

In January, 1996, I was assigned to the position of Supervisor of Depreciation Studies. In July, 1999, I was promoted to the position of Manager, Depreciation and Valuation Studies. In December, 2000, I was promoted to the position as Vice-President of Gannett Fleming Valuation and Rate Consultants, Inc. and in April 2012, I was promoted to my present position as Senior Vice President of the Valuation and Rate Division of Gannett Fleming Inc. (now doing business as Gannett Fleming Valuation and Rate Consultants, LLC). In my current position I am responsible for conducting all depreciation, valuation and original cost studies, including the preparation of final exhibits and responses to data requests for submission to the appropriate regulatory bodies.

Since January 1996, I have conducted depreciation studies similar to those previously listed including assignments for Pennsylvania-American Water Company; Aqua Pennsylvania; Kentucky-American Water Company; Virginia-American Water Company; Indiana-American Water Company; Hampton Water Works Company; Omaha Public Power District; Enbridge Pipe Line Company; Inc.; Columbia Gas of Virginia, Inc.; Virginia Natural Gas Company National Fuel Gas Distribution Corporation - New York and Pennsylvania Divisions; The City of Bethlehem - Bureau of Water; The City of Coatesville Authority; The City of Lancaster - Bureau of Water; Peoples Energy Corporation; The York Water Company; Public Service Company of Colorado; Enbridge Pipelines; Enbridge Gas Distribution, Inc.; Reliant Energy-HLP; Massachusetts-American Water Company; St. Louis County Water Company; Missouri-American Water Company; Chugach Electric Association; Alliant Energy; Oklahoma Gas & Electric Company; Nevada Power Company; Dominion Virginia Power; NUI-Virginia Gas Companies; Pacific Gas & Electric Company; PSI Energy; NUI - Elizabethtown Gas

Company; Cinergy Corporation – CG&E; Cinergy Corporation – ULH&P; Columbia Gas of Kentucky; South Carolina Electric & Gas Company; Idaho Power Company; El Paso Electric Company; Aqua North Carolina; Aqua Ohio; Aqua Texas, Inc.; Ameren Missouri; Central Hudson Gas & Electric; Centennial Pipeline Company; CenterPoint Energy-Arkansas; CenterPoint Energy – Oklahoma; CenterPoint Energy – Entex; CenterPoint Energy - Louisiana; NSTAR – Boston Edison Company; Westar Energy, Inc.; United Water Pennsylvania; PPL Electric Utilities; PPL Gas Utilities; Wisconsin Power & Light Company; TransAlaska Pipeline; Avista Corporation; Northwest Natural Gas; Allegheny Energy Supply, Inc.; Public Service Company of North Carolina; South Jersey Gas Company; Duquesne Light Company; MidAmerican Energy Company; Laclede Gas; Duke Energy Company; E.ON U.S. Services Inc.; Elkton Gas Services; Anchorage Water and Wastewater Utility; Kansas City Power and Light; Duke Energy North Carolina; Duke Energy South Carolina; Monongahela Power Company; Potomac Edison Company; Duke Energy Ohio Gas; Duke Energy Kentucky; Duke Energy Indiana; Northern Indiana Public Service Company; Tennessee-American Water Company; Columbia Gas of Maryland; Bonneville Power Administration; NSTAR Electric and Gas Company; EPCOR Distribution, Inc.; B. C. Gas Utility, Ltd; Entergy Arkansas; Entergy Texas; Entergy Mississippi; Entergy Louisiana; Entergy Gulf States Louisiana; the Borough of Hanover; Louisville Gas and Electric Company; Kentucky Utilities Company; Madison Gas and Electric; Central Maine Power; PEPCO; PacifiCorp; Minnesota Energy Resource Group; Jersey Central Power & Light Company; Cheyenne Light, Fuel and Power Company; United Water Arkansas; Central Vermont Public Service Corporation; Green Mountain Power; Portland General Electric Company; Atlantic City Electric; Nicor Gas Company; Black Hills Power; Black Hills Colorado

Gas; Black Hills Kansas Gas; Black Hills Service Company; Black Hills Utility Holdings; Public Service Company of Oklahoma; City of Dubois; Peoples Gas Light and Coke Company; North Shore Gas Company; Connecticut Light and Power; New York State Electric and Gas Corporation; Rochester Gas and Electric Corporation and Greater Missouri Operations. My additional duties include determining final life and salvage estimates, conducting field reviews, presenting recommended depreciation rates to management for its consideration and supporting such rates before regulatory bodies.

Q. Have you submitted testimony to any state utility commission on the subject of utility plant depreciation?

A. Yes. I have submitted testimony to the Pennsylvania Public Utility Commission; the Commonwealth of Kentucky Public Service Commission; the Public Utilities Commission of Ohio; the Nevada Public Utility Commission; the Public Utilities Board of New Jersey; the Missouri Public Service Commission; the Massachusetts Department of Telecommunications and Energy; the Alberta Energy & Utility Board; the Idaho Public Utility Commission; the Louisiana Public Service Commission; the State Corporation Commission of Kansas; the Oklahoma Corporate Commission; the Public Service Commission of South Carolina; Railroad Commission of Texas – Gas Services Division; the New York Public Service Commission; Illinois Commerce Commission; the Indiana Utility Regulatory Commission; the California Public Utilities Commission; the Federal Energy Regulatory Commission ("FERC"); the Arkansas Public Service Commission; the Public Utility Commission of Texas; Maryland Public Service Commission; Washington Utilities and Transportation Commission; The Tennessee Regulatory Commission; the Regulatory Commission of Alaska; Minnesota Public Utility Commission; Utah Public Service Commission; District of Columbia Public Service

Commission; the Mississippi Public Service Commission; Delaware Public Service Commission; Virginia State Corporation Commission; Colorado Public Utility Commission; Oregon Public Utility Commission; South Dakota Public Utilities Commission; Wisconsin Public Service Commission; Wyoming Public Service Commission; Maine Public Utility Commission; Iowa Utility Board; Connecticut Public Utilities Regulatory Authority; New Mexico Public Regulation Commission and the North Carolina Utilities Commission.

Q. Have you had any additional education relating to utility plant depreciation?

A. Yes. I have completed the following courses conducted by Depreciation Programs, Inc.: "Techniques of Life Analysis," "Techniques of Salvage and Depreciation Analysis," "Forecasting Life and Salvage," "Modeling and Life Analysis Using Simulation," and "Managing a Depreciation Study." I have also completed the "Introduction to Public Utility Accounting" program conducted by the American Gas Association.

Q. Does this conclude your qualification statement?

A. Yes.

LIST OF CASES IN WHICH JOHN J. SPANOS SUBMITTED TESTIMONY

	Year	Jurisdiction	Docket No.	Client Utility	Subject
01.	1998	PA PUC	R-00984375	City of Bethlehem – Bureau of Water	Original Cost and Depreciation
02.	1998	PA PUC	R-00984567	City of Lancaster	Original Cost and Depreciation
03.	1999	PA PUC	R-00994605	The York Water Company	Depreciation
04.	2000	D.T.&E.	DTE 00-105	Massachusetts-American Water Company	Depreciation
05.	2001	PA PUC	R-00016114	City of Lancaster	Original Cost and Depreciation
06.	2001	PA PUC	R-00017236	The York Water Company	Depreciation
07.	2001	PA PUC	R-00016339	Pennsylvania-American Water Company	Depreciation
08.	2001	OH PUC	01-1228-GA-AIR	Cinergy Corp – Cincinnati Gas & Elect Co.	Depreciation
09.	2001	KY PSC	2001-092	Cinergy Corp – Union Light, Heat & Power Co.	Depreciation
10.	2002	PA PUC	R-00016750	Philadelphia Suburban Water Company	Depreciation
11.	2002	KY PSC	2002-00145	Columbia Gas of Kentucky	Depreciation
12.	2002	NJ BPU	GF02040245	NUI Corporation/Elizabethtown Gas Co.	Depreciation
13.	2002	ID PUC	IPC-E-03-7	Idaho Power Company	Depreciation
14.	2003	PA PUC	R-0027975	The York Water Company	Depreciation
15.	2003	IN URC	R-0027975	Cinergy Corp – PSI Energy, Inc.	Depreciation
16.	2003	PA PUC	R-00038304	Pennsylvania-American Water Co.	Depreciation
17.	2003	MO PSC	WR-2003-0500	Missouri-American Water Co.	Depreciation
18.	2003	FERC	ER-03-1274-000	NSTAR-Boston Edison Company	Depreciation
19.	2003	NJ BPU	BPU 03080683	South Jersey Gas Company	Depreciation
20.	2003	NV PUC	03-10001	Nevada Power Company	Depreciation
21.	2003	LA PSC	U-27676	CenterPoint Energy – Arkla	Depreciation
22.	2003	PA PUC	R-00038805	Pennsylvania Suburban Water Company	Depreciation
23.	2004	AB En/Util Bd	1306821	EPCOR Distribution, Inc.	Depreciation
24.	2004	PA PUC	R-00038168	National Fuel Gas Distribution Corp (PA)	Depreciation
25.	2004	PA PUC	R-00049255	PPL Electric Utilities	Depreciation
26.	2004	PA PUC	R-00049165	The York Water Company	Depreciation
27.	2004	OK Corp Cm	PUC 200400187	CenterPoint Energy – Arkla	Depreciation
28.	2004	OH PUC	04-680-El-AIR	Cinergy Corp. – Cincinnati Gas and Electric Company	Depreciation
29.	2004	RR Com of TX	GUD#	CenterPoint Energy – Entex Gas Services Div.	Depreciation
30.	2004	NY PUC	04-G-1047	National Fuel Gas Distribution Gas (NY)	Depreciation
31.	2004	AR PSC	04-121-U	CenterPoint Energy – Arkla	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
32.	2005	IL CC	05-	North Shore Gas Company	Depreciation
33.	2005	IL CC	05-	Peoples Gas Light and Coke Company	Depreciation
34.	2005	KY PSC	2005-00042	Union Light Heat & Power	Depreciation
35.	2005	IL CC	05-0308	MidAmerican Energy Company	Depreciation
36.	2005	MO PSC	GF-2005	Laclede Gas Company	Depreciation
37.	2005	KS CC	05-WSEE-981-RTS	Westar Energy	Depreciation
38.	2005	RR Com of TX	GUD #	CenterPoint Energy – Entex Gas Services Div.	Depreciation
39.	2005	FERC		Cinergy Corporation	Accounting
40.	2005	OK CC	PUD 200500151	Oklahoma Gas and Electric Co.	Depreciation
41.	2005	MA Dept Tele-com & Ergy	DTE 05-85	NSTAR	Depreciation
42.	2005	NY PUC	05-E-934/05-G-0935	Central Hudson Gas & Electric Co.	Depreciation
43.	2005	AK Reg Com	U-04-102	Chugach Electric Association	Depreciation
44.	2005	CA PUC	A05-12-002	Pacific Gas & Electric	Depreciation
45.	2006	PA PUC	R-00051030	Aqua Pennsylvania, Inc.	Depreciation
46.	2006	PA PUC	R-00051178	T.W. Phillips Gas and Oil Co.	Depreciation
47.	2006	NC Util Cm.		Pub. Service Co. of North Carolina	Depreciation
48.	2006	PA PUC	R-00051167	City of Lancaster	Depreciation
49.	2006	PA PUC	R00061346	Duquesne Light Company	Depreciation
50.	2006	PA PUC	R-00061322	The York Water Company	Depreciation
51.	2006	PA PUC	R-00051298	PPL GAS Utilities	Depreciation
52.	2006	PUC of TX	32093	CenterPoint Energy – Houston Electric	Depreciation
53.	2006	KY PSC	2006-00172	Duke Energy Kentucky	Depreciation
54.	2006	SC PSC		SCANA	
55.	2006	AK Reg Com	U-06-6	Municipal Light and Power	Depreciation
56.	2006	DE PSC	06-284	Delmarva Power and Light	Depreciation
57.	2006	IN URC	IURC43081	Indiana American Water Company	Depreciation
58.	2006	AK Reg Com	U-06-134	Chugach Electric Association	Depreciation
59.	2006	MO PSC	WR-2007-0216	Missouri American Water Company	Depreciation
60.	2006	FERC	ISO82, ETC. AL	TransAlaska Pipeline	Depreciation
61.	2006	PA PUC	R-00061493	National Fuel Gas Distribution Corp. (PA)	Depreciation
62.	2007	NC Util Com.	E-7 SUB 828	Duke Energy Carolinas, LLC	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
63.	2007	OH PSC	08-709-EL-AIR	Duke Energy Ohio Gas	Depreciation
64.	2007	PA PUC	R-00072155	PPL Electric Utilities Corporation	Depreciation
65.	2007	KY PSC	2007-00143	Kentucky American Water Company	Depreciation
66.	2007	PA PUC	R-00072229	Pennsylvania American Water Company	Depreciation
67.	2007	KY PSC	2007-0008	NiSource – Columbia Gas of Kentucky	Depreciation
68.	2007	NY PSC	07-G-0141	National Fuel Gas Distribution Corp (NY)	Depreciation
69.	2008	AK PSC	U-08-004	Anchorage Water & Wastewater Utility	Depreciation
70.	2008	TN Reg Auth	08-00039	Tennessee-American Water Company	Depreciation
71.	2008	DE PSC	08-96	Artesian Water Company	Depreciation
72.	2008	PA PUC	R-2008-2023067	The York Water Company	Depreciation
73.	2008	KS CC	08-WSEE1-RTS	Westar Energy	Depreciation
74.	2008	IN URC	43526	Northern Indiana Public Service Co.	Depreciation
75.	2008	IN URC	43501	Duke Energy Indiana	Depreciation
76.	2008	MD PSC	9159	NiSource – Columbia Gas of Maryland	Depreciation
77.	2008	KY PSC	2008-000251	Kentucky Utilities	Depreciation
78.	2008	KY PSC	2008-000252	Louisville Gas & Electric	Depreciation
79.	2008	PA PUC	2008-20322689	Pennsylvania American Water Co.-Wastewater	Depreciation
80.	2008	NY PSC	08-E887/08-00888	Central Hudson	Depreciation
81.	2008	WV TC	VE-080416/VG-8080417	Avista Corporation	Depreciation
82.	2008	IL CC	ICC-09-166	Peoples Gas, Light and Coke Co.	Depreciation
83.	2009	IL CC	ICC-09-167	North Shore Gas Company	Depreciation
84.	2009	DC PSC	1076	Potomac Electric Power Company	Depreciation
85.	2009	KY PSC	2009-00141	NiSource – Columbia Gas of Kentucky	Depreciation
86.	2009	FERC	ER08-1056-002	Entergy Services	Depreciation
87.	2009	PA PUC	R-2009-2097323	Pennsylvania American Water Co.	Depreciation
88.	2009	NC Util Cm	E-7, Sub 090	Duke Energy Carolinas, LLC	Depreciation
89.	2009	KY PSC	2009-00202	Duke Energy Kentucky	Depreciation
90.	2009	VA St. CC	PUE-2009-00059	Aqua Virginia, Inc.	Depreciation
91.	2009	PA PUC	2009-2132019	Aqua Pennsylvania, Inc.	Depreciation
92.	2009	MS PSC	09-	Entergy Mississippi	Depreciation
93.	2009	AK PSC	09-08-U	Entergy Arkansas	Depreciation
94.	2009	TX PUC	37744	Entergy Texas	Depreciation
95.	2009	TX PUC	37690	El Paso Electric Company	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
96.	2009	PA PUC	R-2009-2106908	The Borough of Hanover	Depreciation
97.	2009	KS CC	10-KCPE-415-RTS	Kansas City Power & Light	Depreciation
98.	2009	PA PUC	R-2009-	United Water Pennsylvania	Depreciation
99.	2009	OH PUC		Aqua Ohio Water Company	Depreciation
100.	2009	WI PSC	3270-DU-103	Madison Gas & Electric Co.	Depreciation
101.	2009	MO PSC	WR-2010	Missouri American Water Co.	Depreciation
102.	2009	AK Reg Cm	U-09-097	Chugach Electric Association	Depreciation
103.	2010	IN URC	43969	Northern Indiana Public Service Co.	Depreciation
104.	2010	WI PSC	6690-DU-104	Wisconsin Public Service Corp.	Depreciation
105.	2010	PA PUC	R-2010-2161694	PPL Electric Utilities Corp.	Depreciation
106.	2010	KY PSC	2010-00036	Kentucky American Water Company	Depreciation
107.	2010	PA PUC	R-2009-2149262	Columbia Gas of Pennsylvania	Depreciation
108.	2010	MO PSC	GR-2010-0171	Laclede Gas Company	Depreciation
109.	2010	SC PSC	2009-489-E	South Carolina Electric & Gas Co.	Depreciation
110.	2010	NJ BD OF PU	ER09080664	Atlantic City Electric	Depreciation
111.	2010	VA St. CC	PUE-2010-00001	Virginia American Water Company	Depreciation
112.	2010	PA PUC	R-2010-2157140	The York Water Company	Depreciation
113.	2010	MO PSC	ER-2010-0356	Greater Missouri Operations Co.	Depreciation
114.	2010	MO PSC	ER-2010-0355	Kansas City Power and Light	Depreciation
115.	2010	PA PUC	R-2010-2167797	T.W. Phillips Gas and Oil Co.	Depreciation
116.	2010	PSC SC	2009-489-E	SCANA – Electric	Depreciation
117.	2010	PA PUC	R-2010-22010702	Peoples Natural Gas, LLC	Depreciation
118.	2010	AK PSC	10-067-U	Oklahoma Gas and Electric Co.	Depreciation
119.	2010	IN URC		Northern Indiana Public Serv. Co. - NIFL	Depreciation
120.	2010	IN URC		Northern Indiana Public Serv. Co. - Kokomo	Depreciation
121.	2010	PA PUC	R-2010-2166212	Pennsylvania American Water Co - WW	Depreciation
122.	2010	NC Util Cn.	W-218,SUB310	Aqua North Carolina, Inc.	Depreciation
123.	2011	OH PUC	11-4161-WS-AIR	Ohio American Water Company	Depreciation
124.	2011	MS PSC	EC-123-0082-00	Entergy Mississippi	Depreciation
125.	2011	CO PUC	11AL-387E	Black Hills Colorado	Depreciation
126.	2011	PA PUC	R-2010-2215623	Columbia Gas of Pennsylvania	Depreciation
127.	2011	PA PUC	R-2010-2179103	Lancaster, City of – Bureau of Water	Depreciation
128.	2011	IN URC	43114 IGCC 4S	Duke Energy Indiana	Depreciation
129.	2011	FERC	IS11-146-000	Enbridge Pipelines (Southern Lights)	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
130.	2011	Il CC	11-0217	MidAmerican Energy Corporation	Depreciation
131.	2011	OK CC	201100087	Oklahoma Gas & Electric Co.	Depreciation
132.	2011	PA PUC	2011-2232243	Pennsylvania American Water Company	Depreciation
133.	2011	FERC	2011-2232243	Carolina Gas Transmission	Depreciation
134.	2012	WA UTC	UE-120436/UG-120437	Avista Corporation	Depreciation
135.	2012	AK Reg Cm	U-12-009	Chugach Electric Association	Depreciation
136.	2012	MA PUC	DPU 12-25	Columbia Gas of Massachusetts	Depreciation
137.	2012	TX PUC	40094	El Paso Electric Company	Depreciation
138.	2012	ID PUC	IPC-E-12	Idaho Power Company	Depreciation
139.	2012	PA PUC	R-2012-2290597	PPL Electric Utilities	Depreciation
140.	2012	PA PUC	R-2012-2311725	Hanover, Borough of – Bureau of Water	Depreciation
141.	2012	KY PSC	2012-00222	Louisville Gas and Electric Company	Depreciation
142.	2012	KY PSC	2012-00221	Kentucky Utilities Company	Depreciation
143.	2012	PA PUC	R-2012-2285985	Peoples Natural Gas Company	Depreciation
144.	2012	DC PSC	Case 1087	Potomac Electric Power Company	Depreciation
145.	2012	OH PSC	12-1682-EL-AIR	Duke Energy Ohio (Electric)	Depreciation
146.	2012	OH PSC	12-1685-GA-AIR	Duke Energy Ohio (Gas)	Depreciation
147.	2012	PA PUC	R-2012-2310366	Lancaster, City of – Sewer Fund	Depreciation
148.	2012	PA PUC	R-2012-2321748	Columbia Gas of Pennsylvania	Depreciation
149.	2012	FERC	ER-12-2681-000	ITC Holdings	Depreciation
150.	2012	MO PSC	ER-2012-0174	Kansas City Power and Light	Depreciation
151.	2012	MO PSC	ER-2012-0175	KCPL Greater Missouri Operations Co.	Depreciation
152.	2012	MO PSC	GO-2012-0363	Laclede Gas Company	Depreciation
153.	2012	MN PUC	G007,001/D-12-533	Integrys – MN Energy Resource Group	Depreciation
153.	2012	TX PUC		Aqua Texas	Depreciation
155.	2012	PA PUC	2012-2336379	York Water Company	Depreciation
156.	2013	NJ BPU	ER12121071	PHI Service Co.– Atlantic City Electric	Depreciation
157.	2013	KY PSC	2013-00167	Columbia Gas of Kentucky	Depreciation
158.	2013	VA St CC	2013-00020	Virginia Electric and Power Co.	Depreciation
159.	2013	IA Util Bd	2013-0004	MidAmerican Energy Corporation	Depreciation
160.	2013	PA PUC	2013-2355276	Pennsylvania American Water Co.	Depreciation
161.	2013	NY PSC	13-E-0030, 13-G-0031, 13-S-0032	Consolidated Edison of New York	Depreciation
162.	2013	PA PUC	2013-2355886	Peoples TWP LLC	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
163.	2013	TN Reg Auth	12-0504	Tennessee American Water	Depreciation
164.	2013	ME PUC	2013-168	Central Maine Power Company	Depreciation
165.	2013	DC PSC	Case 1103	PHI Service Co. – PEPCO	Depreciation
166.	2013	WY PSC	2003-ER-13	Cheyenne Light, Fuel and Power Co.	Depreciation
167.	2013	FERC	ER13- -0000	Kentucky Utilities	Depreciation
168.	2013	FERC	ER13- -0000	MidAmerican Energy Company	Depreciation
169.	2013	FERC	ER13- -0000	PPL Utilities	Depreciation
170.	2013	PA PUC	R-2013-2372129	Duquesne Light Company	Depreciation
171.	2013	NJ BPU	ER12111052	Jersey Central Power and Light Co.	Depreciation
172.	2013	PA PUC	R-2013-2390244	Bethlehem, City of – Bureau of Water	Depreciation
173.	2013	OK CC	UM 1679	Oklahoma, Public Service Company of	Depreciation
174.	2013	IL CC	13-0500	Nicor Gas Company	Depreciation
175.	2013	WY PSC	20000-427-EA-13	PacifiCorp	Depreciation
176.	2013	UT PSC	13-035-02	PacifiCorp	Depreciation
177.	2013	OR PUC	UM 1647	PacifiCorp	Depreciation
178.	2013	PA PUC	2013-2350509	Dubois, City of	Depreciation
179.	2014	IL CC	14-0224	North Shore Gas Company	Depreciation
180.	2014	FERC	ER14-	Duquesne Light Company	Depreciation
181.	2014	SD PUC	EL14-026	Black Hills Power Company	Depreciation
182.	2014	WY PSC	20002-91-ER-14	Black Hills Power Company	Depreciation
183.	2014	PA PUC	2014-2428304	Hanover, Borough of – Municipal Water Works	Depreciation
184.	2014	PA PUC	2014-2406274	Columbia Gas of Pennsylvania	Depreciation
185.	2014	IL CC	14-0225	Peoples Gas Light and Coke Company	Depreciation
186.	2014	MO PSC	ER-2014-0258	Ameren Missouri	Depreciation
187.	2014	KS CC	14-BHCG-502-RTS	Black Hills Service Company	Depreciation
188.	2014	KS CC	14-BHCG-502-RTS	Black Hills Utility Holdings	Depreciation
189.	2014	KS CC	14-BHCG-502-RTS	Black Hills Kansas Gas	Depreciation
190.	2014	PA PUC	2014-2418872	Lancaster, City of – Bureau of Water	Depreciation
191.	2014	WV PSC	14-0701-E-D	First Energy – MonPower/PotomacEdison	Depreciation
192	2014	VA St CC	PUC-2014-00045	Aqua Virginia	Depreciation
193.	2014	VA St CC	PUE-2013	Virginia American	Depreciation
194.	2014	OK CC	PUD201400229	Oklahoma Gas and Electric	Depreciation
195.	2014	OR PUC	UM1679	Portland General Electric	Depreciation
196.	2014	IN URC	Cause No. 44576	Indianapolis Power & Light	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
197.	2014	MA DPU	DPU. 14-150	NSTAR Gas	Depreciation
198.	2014	CT PURA	14-05-06	Connecticut Light and Power	Depreciation
199.	2014	MO PSC	ER-2014-0370	Kansas City Power & Light	Depreciation
200.	2014	KY PSC	2014-00371	Kentucky Utilities Company	Depreciation
201.	2014	KY PSC	2014-00372	Louisville Gas and Electric Company	Depreciation
202.	2015	PA PUC	R-2015-2462723	United Water Pennsylvania Inc.	Depreciation
203.	2015	PA PUC	R-2015-2468056	Columbia Gas of Pennsylvania	Depreciation
204.	2015	NY PSC	15-E-0283/15-G-0284	New York State Electric and Gas Corporation	Depreciation
205.	2015	NY PSC	15-E-0285/15-G-0286	Rochester Gas and Electric Corporation	Depreciation
206.	2015	MO PSC	WR-2015-0301/SR-2015-0302	Missouri American Water Company	Depreciation
207.	2015	OK CC	PUD 201500208	Oklahoma, Public Service Company of	Depreciation
208.	2015	WV PSC	15-0676-W-42T	West Virginia American Water Company	Depreciation
209.	2015	PA PUC	2015-2469275	PPL Electric Utilities	Depreciation
210.	2015	IN URC	Cause No. 44688	Northern Indiana Public Service Company	Depreciation
211.	2015	OH PSC	14-1929-EL-RDR	First Energy-Ohio Edison/Cleveland Electric/ Toledo Edison	Depreciation
212.	2015	NM PRC	15-00127-UT	El Paso Electric	Depreciation
213.	2015	TX PUC	PUC-44941; SOAH 473-15-5257	El Paso Electric	Depreciation
214.	2015	WI PSC	3370-DU-104	Madison Gas and Electric Company	Depreciation
215.	2015	OK CC	PUD 201500273	Oklahoma Gas and Electric	Depreciation

KENTUCKY UTILITIES
ASH POND RECOVERY

SUMMARY OF FUTURE RECOVERY PARAMETERS CALCULATED
AS OF SEPTEMBER 30, 2015

	ACCOUNT	SURVIVOR CURVE		NET SALVAGE PERCENT	ORIGINAL COST	BOOK DEPRECIATION RESERVE	FUTURE ACCRUALS	CALCULATED ANNUAL ACCRUAL AMOUNT	CALCULATED ANNUAL ACCRUAL RATE	COMPOSITE REMAINING LIFE
	(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)=(7)/(4)	(9)=(6)/(7)
	DEPRECIABLE PLANT									
	STEAM PRODUCTION PLANT									
311.00	STRUCTURES AND IMPROVEMENTS									
	TRIMBLE COUNTY UNIT 2	100-S4	*	**	4,562,600.30	2,148,119	33,759,545	673,709	14.77	50.1
	GHENT UNIT 1 SCRUBBER	100-S4	*	**	39,480.55	34,420	2,503,785	133,535	338.23	18.8
	GHENT UNIT 1	100-S4	*	**	322,828.55	304,586	5,015,629	267,500	82.86	18.8
	TOTAL ACCOUNT 311 - STRUCTURES AND IMPROVEMENTS				4,924,909.40	2,487,125	41,278,959	1,074,744	21.82	38.4
312.00	BOILER PLANT EQUIPMENT									
	TRIMBLE COUNTY UNIT 2	100-S4	*	**	4,610,665.23	676,102	35,287,087	695,449	15.08	50.7
	BROWN UNIT 1	100-S4	*	**	13,208,176.67	10,854,880	15,429,392	1,990,889	15.07	7.8
	BROWN UNIT 3	100-S4	*	**	19,802,080.26	6,026,115	33,380,025	1,690,128	8.54	19.7
	GHENT UNIT 1	100-S4	*	**	1,777,792.39	1,464,285	12,811,388	684,735	38.52	18.7
	GHENT UNIT 4	100-S4	*	**	32,692,663.85	13,338,503	236,760,375	10,407,050	31.83	22.7
	GHENT UNIT 2 SCRUBBER	100-S4	*	**	1,901,133.18	1,908,524	12,483,054	665,763	35.02	18.7
	TOTAL ACCOUNT 312 - BOILER PLANT EQUIPMENT				73,992,511.58	34,268,409	346,151,321	16,134,014	21.80	21.5
	TOTAL DEPRECIABLE PLANT				**78,917,420.98**	**36,755,534**	**387,430,280**	**17,208,758**	**22.85**	**21.8**
	RETIRED PLANT									
	STEAM PRODUCTION PLANT									
312.00	BOILER PLANT EQUIPMENT									
	TYRONE 3			**	575,455.75	575,456	13,103,000	3,275,750	***	4.0
	GREEN RIVER 3			**	1,831,840.98	1,831,841	56,829,000	14,207,250	***	4.0
	PINEVILLE 3			**	91,265.89	91,266	8,009,000	2,002,250	***	4.0
	TOTAL ACCOUNT 312 - BOILER PLANT EQUIPMENT				2,498,562.62	2,498,563	77,941,000	19,485,250		4.0
	TOTAL RETIRED PLANT				**2,498,562.62**	**2,498,563**	**77,941,000**	**19,485,250**		
	TOTAL COSTS TO BE RECOVERED				**81,415,983.60**	**39,254,097**	**465,371,280**	**36,694,008**		

* LIFE SPAN PROCEDURE IS USED. CURVE SHOWN IS INTERIM SURVIVOR CURVE
** TERMINAL NET SALVAGE FACTOR WHICH IS BASED ON VINTAGE AND FUTURE COSTS
*** ACCRUAL CALCULATED USING 4 YEAR AMORTIZATION

Kentucky Utilities

Ash Pond Recovery for ECR Filing

Account	Location	As of September 30, 2015 Ash Pond Original Cost	Reserve For Ash Pond	Life Reserve	Cost of Removal Reserve	COR Accruals Since Last Case was Approved	Terminal Net Salvage Since 1/1/2013
(1)	(2)	(3)	(4)	(5)	(6)	(7)*	(8)
311	Trimble County 2	4,562,600.30	2,148,119	1,897,004	251,115	14,372	287
311	Ghent 1 FGD	39,480.55	34,420	31,952	2,468	35	1
311	Ghent 1	322,828.55	304,586	285,854	18,732	56	1
312	Trimble County 2	4,610,665.23	676,102	582,935	93,167	20,172	403
312	Brown 1	9,299,115.00	7,068,828	6,241,775	827,053	26,038	521
312	Brown 1	3,909,061.67	3,786,052	3,343,084	442,968	10,945	219
312	Brown 3	19,802,080.26	6,026,115	5,697,089	329,026	48,515	970
312	Ghent 1	1,777,792.39	1,464,285	1,292,671	171,614	5,289	106
312	Ghent 4	16,544,368.66	8,003,055	7,199,548	803,507	43,429	869
312	Ghent 4	16,148,295.19	5,335,448	4,799,769	535,679	42,389	848
312	Ghent 2 FGD	1,901,133.18	1,908,524	1,708,511	200,013	4,658	93
312	Tyrone 3	575,455.72	575,456	517,910	57,546	2,920	58
312	Green River 3	1,831,840.98	1,831,841	1,025,125	806,716	7,053	141
312	Pineville 3	50,117.00	50,117	47,516	2,601	0	0
312	Pineville 3	41,148.89	41,149	39,013	2,136	0	0

* In the Matter of; Application of Kentucky Utilities Company for an Adjustment of its Electric Rates, Case No. 2012-00221 (Dec. 2012).

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF KENTUCKY UTILITIES	**)**	
COMPANY FOR CERTIFICATES OF PUBLIC	**)**	
CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00026**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
CHRISTOPHER M. GARRETT
DIRECTOR, ACCOUNTING AND REGULATORY REPORTING
KENTUCKY UTILITIES COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is Christopher M. Garrett. I am the Director of Accounting and Regulatory Reporting for LG&E and KU Services Company, which provides services to Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E") (collectively, "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes. I have submitted testimony to the Kentucky Public Service Commission ("KPSC") in KU's environmental surcharge mechanism review Case No. 2015-00020, answered requests for information on regulatory accounting issues in multiple and various proceedings before the KPSC, presented on regulatory accounting topics and informal conferences at the KPSC and otherwise have extensive work experience with regulatory accounting issues.

Q. Will you soon assume a new position with the Companies?

A. Yes. On February 1, 2016, I will assume the position of Director of Rates for the Companies. I will continue to be an employee of LG&E and KU Services Company in my new role. Also, I will continue to testify and participate in this proceeding, and do not anticipate having another witness adopt my testimony.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring one exhibit, identified as Exhibit CMG-1, CCR Closure Costs Journal Entries.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain the proposed regulatory accounting treatment for coal combustion residuals ("CCR") storage closure activities required as a result of the Coal Combustion Residual Rule ("CCR Rule") and state regulations applicable to KU's power plants and the disposal of CCR, to review KU's reporting and accounting for the operation and maintenance expenses associated with the pollution control projects in their 2016 Environmental Compliance Plan ("2016 Plan"), to demonstrate that the environmental compliance costs KU proposes to recover through its surcharge are not already included in existing base rates, and to discuss the deferred and property tax treatment included in the filing.

Regulatory Accounting Treatment – CCR Rule and Related State Regulations

Q. Briefly describe the proposed regulatory accounting treatment regarding CCR Rule and related state regulations closure costs.

A. KU adopted Statement of Financial Accounting Standard ("SFAS") No. 143, *Accounting for Asset Retirement Obligations as of January 1, 2003*.[1] Consistent with this accounting directive, KU has recognized asset retirement obligations of $357 million as of September 30, 2015.[2] Of this amount, $334 million is associated with CCR closure activities included in the 2016 Plan. These amounts will be updated as necessary on a quarterly basis in KU's Form 10-Qs or 10Ks.

[1] The guidance in SFAS No. 143 is now contained in Financial Accounting Standards Board Accounting Standards Codification Topic 410, Asset Retirement and Environmental Obligations, effective September 15, 2009.

[2] PPL Corp., Quarterly Report (Form 10-Q) (Oct. 30, 2015) at 71 (available at http://www.sec.gov/Archives/edgar/data/55387/000092222415000089/form10q.htm).

Consistent with the ratemaking treatment in every KU base rate case since 2003,[3] the impact of the accounting for asset retirement obligations under SFAS No. 143 is being eliminated for ratemaking purposes in this case.[4]

Therefore, KU is proposing in this case that for ratemaking purposes the CCR storage closure costs are accounted for as cost of removal and charged to the accumulated provision for depreciation reserve. An example of the journal entries to be recorded for the proposed cost of removal ratemaking treatment along with the associated asset retirement obligation journal entries is shown in Exhibit CMG-1.

The costs associated with constructing the new process water systems (e.g. tanks and basins) will be capitalized to Federal Energy Regulatory Commission's ("FERC") Account No. 107, Construction work in progress as they will continue to serve on-going operations.

Q. Why is this accounting treatment for closure costs appropriate?

A. The assets being retired as a result of the issuance of the CCR Rule and related state regulations were utilized for the production of energy from coal at various electric generating plant sites. Accordingly, these closure costs should be considered costs of removal and accounted for in the manner prescribed by FERC's Electric Plant Instruction 10 of the Code of Federal Regulations 18 CFR.

[3] *In the Matter of: An Adjustment of the Electric Rates, Terms, and Conditions of Kentucky Utilities Company,* Case No. 2003-00434, Order (June 30, 2004); *In the Matter of: Kentucky Utilities Company for an Adjustment of Base Rates,* Case No. 2008-00251, Order (Feb. 5, 2009); *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates*, Case No. 2009-00548 (July 30, 2010); *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates,* Case No. 2012-00221 (Dec. 20, 2012); *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates,* Case No. 2014-00371 (June 30, 2015).

[4] *In the Matter of: Application of Kentucky Utilities Company for an Order Approving an Accounting Adjustment to be Included in Earning Sharing Mechanism Calculations for 2003,* Case No. 2003-00427, Order (Dec. 23, 2003).

As such, the accounting treatment for the retirement of these assets should be handled in the same manner as all other generating assets.

Q. Will any changes to the monthly ECR Forms filed with the Commission be necessary to reflect the inclusion of removal costs?

A Yes. An additional column is proposed to be added to Environmental Surcharge Monthly Report, ES Form 2.10, "CCR Rule Compliance Construction Costs" to reflect the increase in rate base associated with the CCR storage facility closure expenditures. The ECR Forms are discussed in greater detail in the testimony of Derek A. Rahn.

<u>Costs Not Already Included in Existing Base Rates</u>

Q. Should KU be allowed to earn a return on closure costs charged to accumulated depreciation (cost of removal) in this proceeding?

A. Yes. Per KRS 278.183, KU is entitled to earn a return on the closure costs charged to accumulated depreciation. Recovery of the reasonable rate of return on compliance-related capital expenditures is clearly permissible through the ECR mechanism. In addition, under the FERC Uniform System of Accounts, costs incurred as a result of asset retirement obligations sustained during construction are recognized as a component of construction costs.[5] Robert M. Conroy's testimony discusses the reasonable rate of return for this ECR Plan. The costs to close the CCR storage facilities under the new CCR Rule and related state regulations will require both investment in and the associated carrying charge with the closures of these facilities.

[5] The FERC Uniform System of Accounts, Electric Plant Instructions, <u>*Asset retirement costs*</u>, states: "The costs recognized as a result of asset retirement obligations incurred during the construction and testing of utility plant shall constitute a component of construction costs."

It is KU's position that the costs of complying with the new CCR Rule and state regulations applicable to KU's power plants and the disposal of CCR were never considered in the development of KU's depreciation rates; and therefore, the vast majority of the closure costs are not already included in existing depreciation rates and thus existing base rates. The costs of complying with the new CCR Rule and related state regulations thus have not been recovered from customers.

Q. What is the accumulated cost of removal reserve for KU associated with the CCR storage facilities?

A. As shown in Exhibit JJS-3 of John J. Spanos' testimony, approximately $4.5 million for KU is associated with the retirement of these CCR storage facilities as of September 30, 2015. These amounts represent a reduction in utility capitalization and thus base rates.

Q. Why is the accumulated cost of removal reserve for these facilities so small given the expected magnitude of the closure costs as a result of the new CCR Rule and related state regulations?

A. As discussed in the testimony of Mr. Spanos, a terminal net salvage rate was not recognized in the depreciation rates for KU until the 2012 base rate case.[6] The 2012 base rate case established through an approved settlement agreement a 2% terminal salvage rate, but this rate is not remotely adequate to address the costs associated with the retirement of the CCR storage facilities as supported by the amounts provided in Mr. Spanos' testimony.

[6] In the Matter of; *Application of Kentucky Utilities Company for an Adjustment of Its Electric Rates*, Case No. 2012-00221 (Dec. 2012).

Furthermore, because there was no legal requirement to close the facilities under the new CCR Rule, the previous depreciation rates did not factor in a closure or terminal net salvage component. Therefore, KU is proposing to implement new depreciation rates to address the current accumulated depreciation reserve shortfall in this case.

Q. To the extent that removal costs have been recovered from customers through existing base rates, have customers received a corresponding benefit?

A. Yes, customers have received a benefit from the collection of the net salvage (cost of removal) component of accumulated depreciation. The recovery of retirement costs through the cost of removal component of book depreciation discussed above has resulted in a lower utility capitalization which has resulted in lower base rates.

Q. Is KU proposing new depreciation rates for the closure of the CCR storage facilities under the CCR Rule and related state regulations?

A. Yes. The testimony of Mr. Spanos presents his analysis and recommendations for specific depreciation rates associated with each of the ECR projects involving the CCR storage facilities. The existing depreciation rates approved in the 2012 base rate cases were not developed to address the costs associated with the closure of CCR storage facilities under the new CCR Rule and related state regulations and are not adequate for the recovery of this cost.

Q. Do you agree with Mr. Spanos' recommended depreciation rates?

A. Yes. KU has reviewed Mr. Spanos' recommended depreciation rates and has accepted them for purposes of this application.

In developing the revenue requirements for the 2016 Plan, KU has reduced the depreciation expense to be recovered from customers by the amounts included in base rates to avoid any form of double recovery.

Q. How will KU address an accumulated depreciation reserve imbalance should actual closure costs be higher or lower than expected, or a change in the closure timing occur?

A. KU proposes to address future accumulated depreciation reserve imbalances through either a base rate case or depreciation rate filing or a combination of both.

Q. Are any of the capital expenditures for the surface-impoundment-related construction projects, excluding the new process water systems, in the 2016 Plan already included in existing base rates?

A. The total capital expenditures for these projects included in the 2016 Plan filing have been reduced for the amounts included in the most recent base rate case. The calculation is shown on the following page:

KU ECR Projects[7]		Number of Projects	Total Estimated Capital	Spend in Base Rates	Estimated ECR Spend
39	*Retired Plant Impoundment Closure*	*5*	*$77.9 M*	*$0.4 M*	*$77.5 M*
40	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Ghent*	*5*	*$249.9 M*	*$24.3 M*	*$225.6 M*
41	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Trimble County (Net, 48%)*	*2*	*$62.7 M*	*$3.4 M*	*$59.3 M*
42	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Brown*	*1*	*$32.7 M*	*$3.0 M*	*$29.7 M*

Q. Is KU proposing to recover the costs associated with the 30-year monitoring program of these projects discussed in Gary H. Revlett's testimony?

A. Yes. This cost will be charged to the accumulated depreciation reserve similarly to other closure costs discussed above.

<u>Other ECR Projects Including New Process Water Systems</u>

Q. Is KU seeking recovery of operation and maintenance expenses associated with some of the projects included in its proposed 2016 Plan?

A. Yes. As discussed in the testimony of R. Scott Straight, KU is seeking the authority to recover operating and maintenance ("O&M") expenses for Project 38, which involves the installation of low-cost and economical supplemental control technologies to reduce mercury re-emissions that will keep the Ghent units in compliance, and provide operational flexibility in maintaining compliance, with

[7] Excludes new construction for process water systems. See the table at page 11 for those costs.

the Mercury and Air Toxics Standards ("MATS Rule") for mercury. As discussed in the testimony of Mr. Conroy, the projected annual O&M cost of these facilities presented on the second page of Exhibit JNV-1 is shown as zero for all years. That is not because the systems installed through Project 38 will have no O&M cost, particularly with respect to the cost of the additives to be injected and applied; rather, the cost of such additives will correspondingly offset Powdered Activated Carbon ("PAC") costs currently being recovered through the O&M expense shown in KU's monthly ECR reports for Project 35 (approved as part of KU's 2011 Plan). Therefore, the zero-O&M costs shown in Exhibit JNV-1 represent the expectation that the O&M costs of Project 38 will be less than or equal to corresponding O&M costs currently being reported for Project 35.

Q. How will KU identify the O&M expenses associated with these projects in its 2016 Plan?

A. KU's accounting system permits the tracking of costs in accordance with FERC's's Uniform System of Accounts. KU intends to use FERC Account No. 506, Miscellaneous steam power expenses, to identify and track the O&M expenses associated with these projects. KU will use subaccounts to track specific expenses (e.g. organo-sulfide and halogenated liquid chemicals vs. PAC) and location codes to track expenses by unit.

Q. Has similar accounting proven to be successful in previous ECR cases?

A. Yes, tracking the costs using this accounting methodology has proven to be successful in the past. The costs in these accounts will be clearly detailed in the

Environmental Surcharge Monthly Report, ES Form 2.50. The ECR Forms are discussed in greater detail in the testimony of Mr. Rahn.

Q. What book depreciation rates will be used in the calculation of the depreciation expense for the new capital projects, including new process water systems?

A. The book depreciation rates to be used for the new capital projects at all existing units will be the existing depreciation rates for that group of assets. The Commission approved these rates in the 2012 base rate cases.

Q. Are any of the capital expenditures for the other ECR Projects including new process water systems in the 2016 Plan already included in existing base rates?

A. Base rates only reflect part of the cost of one of the six remaining ECR projects. The total capital expenditure for Project 36 has been reduced for the amounts included in the most recent base rate case. The calculation is shown on the following page:

KU ECR Projects[8]		Number of Projects	Total Estimated Capital	Spend in Base Rates	Estimated ECR Spend
36	*Brown Landfill (Phase II)*	*1*	*$11.9 M*	*$6.6 M*	*$5.3 M*
37	*Ghent 2 WFGD Improvements*	*1*	*$7.0 M*	*$0*	*$7.0 M*
38	*Supplemental Mercury Related Control Systems*	*4*	*$10.1 M*	*$0*	*$10.1 M*
40	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Ghent*	*1*	*$114.3 M*	*$0*	*$114.3 M*
41	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Trimble County (Net, 48%)*	*1*	*$42.6 M*	*$0*	*$42.6 M*
42	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Brown*	*1*	*$68.6 M*	*$0*	*$68.6 M*

This chart also shows that the costs for KU's ECR Projects 37, 38, 40, 41 and 42 are not already included in existing base rates.

Q. Are any of the O&M expenses associated with Project No. 38 in the 2016 Plan already included in existing base rates?

A. No, the O&M expenses associated with the use of organo-sulfide and halogenated liquid chemicals are not included in base rates.

Q. Will the installation of the new pollution control facilities in KU's 2016 Plan replace or cause existing facilities to be removed from service?

A. Yes. The additions of Project Nos. 40, 41 and 42 to the Ghent, Trimble County and Brown generation stations will result in the removal from service of some existing facilities associated with the piping for the water treatment facilities. The

[8] Includes new construction for process water systems.

exact amount cannot be readily identified with reasonable accuracy until construction is complete.

The process for accounting for and removal of such costs from the environmental surcharge, previously approved by the Commission in prior proceedings, will continue to be used by KU with the approval of the 2016 Plan.

Deferred and Property Tax Considerations

Q. What deferred income taxes are associated with these pollution control facilities?

A. Deferred income taxes are recorded for all book-versus-tax temporary timing differences. The new capital projects are eligible for accelerated tax depreciation and amortization. These assets will be eligible for bonus tax depreciation[9] and will also generally fall into a 20-year Modified Accelerated Cost Recovery System life. Some of these assets may also be considered pollution control equipment eligible for 5 year or 7 year rapid amortization treatment under section 169 of the Internal Revenue Code.

CCR closure costs charged to the accumulated depreciation reserve are deductible in the year incurred. This tax treatment results in the recording of a deferred tax liability which serves as a reduction to rate base. This deferred tax liability will reverse through book depreciation once the closure costs are included in the new depreciation rates.

[9] In December 2015, the "Protecting Americans from Tax Hikes Act of 2015" was passed into law. The new law extends the 50% bonus rate to the years 2015-17 and then phases the bonus rate down to 40% for 2018 and 30% for 2019.

Q. Please explain how property taxes associated with the new facilities are calculated?

A. Pollution control facilities in Kentucky are generally categorized as manufacturing machinery. This class of property is exempt from local property tax and is taxed at the state property tax rate of $0.15 per $100 of assessed value.

Q. Will you please provide a summary of the conclusions in your testimony?

A. Yes. The conclusions to be drawn from my testimony are:

1. KU should be allowed for ratemaking purposes to account for the CCR closure costs as cost of removal and charged to the accumulated provision for depreciation.

2. KU should be allowed to earn a recovery of and a return on the CCR closure costs and other capital projects included in the 2016 Plan.

3. The depreciation rates for the CCR closure costs provided by Mr. Spanos should be approved for purposes of calculating the ECR beginning with the expense month of July, 2016.

4. KU should be allowed to recover through the ECR surcharge the operating costs associated with the use of organo-sulfide and halogenated liquid chemicals.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) **SS:**
COUNTY OF JEFFERSON)

The undersigned, **Christopher M. Garrett**, being duly sworn, deposes and says that he is Director – Accounting and Regulatory Reporting for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Christopher M. Garrett

Christopher M. Garrett

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

Christopher M. Garrett
Director, Accounting and Regulatory Reporting
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-3328

Previous Positions:

Director, Financial Planning & Controlling	Feb 2010 – Nov 2012
Manager, Financial Planning	Nov 2007 – Feb 2010
Manager, Corporate Accounting	Jan 2006 – Oct 2007
Manager, Utility Tax	May 2002 – Jan 2006
Tax Analyst, various positions	Aug 1995 – May 2002

Education:

Eastern Kentucky University, Bachelor of Business Administration - Accounting, 1995 Graduated Magna Cum Laude
Certified Public Accountant, Kentucky, 1999

Professional Memberships:

American Institute of Certified Public Accountants (AICPA)
Kentucky Society of Certified Public Accountants (KSCPA)

Civic Activities:

St. Joseph School Board Member

CCR Closure Costs Journal Entries

Proposed Regulatory Accounting Treatment for Ratemaking (e.g. Cost of Removal Accounting)

	Account No.	Description	DR	CR
A	108	Accumulated provision for depreciation of electric utility plant	XXX	
	131	Cash		XXX
		Record capital expenditures for closure activities		
B	403	Depreciation expense	XXX	
	108	Accumulated provision for depreciation of electric utility plant		XXX
		Record depreciation expense associated with CCR closure activities		

ARO Accounting - Eliminated for Ratemaking

	Account No.	Description	DR	CR
A	101	Electric Plant in Service	XXX	
	230	Asset retirement obligations		XXX
		To record the asset retirement obligation for the CCR closure activities		
B	403.1	Depreciation expense for asset retirement costs	XXX	
	108	Accumulated provision for depreciation of electric utility plant		XXX
		To record depreciation expense for the ARO asset through expected settlement date		
C	411.10	Accretion expense	XXX	
	230	Asset retirement obligations		XXX
		To record accretion expense for the asset retirement obligation through expected settlement date		
D	182.3	Other regulatory assets	XXX	
	403.1	Depreciation expense for asset retirement costs		XXX
	411.10	Accretion expense		XXX
		To offset depreciation expense and accretion expense recorded in B and C above so that ARO accounting is income neutral		
E	230	Asset retirement obligations	XXX	
	108	Accumulated provision for depreciation of electric utility plant	XXX	
	101	Electric Plant in Service		XXX
	182.3	Other regulatory assets		XXX
		To settle the ARO obligation for CCR closure expenditures		