

2020 ECR Plan Status Update Report Quarterly Report – Update #4 October 29, 2021

Executive Summary:

General

This report covers LG&E and KU’s (“Companies”) progress on the 2020 Environmental Cost Recovery (“ECR”) Plan through the third quarter of 2021. The Companies filed applications requesting approval on March 31, 2020¹ and received approval on September 29, 2020.

The 2020 ECR Plan safety performance through the third quarter of 2021 was excellent with a year-to-date OSHA Recordable Incident Rate of 0.0 and an inception-to-date OSHA Recordable Incident Rate of 0.0, compared to the industry average of 3.2. Work to date has been engineering and site geotechnical/tie-in investigative fieldwork. No field construction work has begun on the projects.

As reported in the last quarter, the total 2020 ECR Plan filed cost of \$405.2 million (net)² as provided in Case Nos. 2020-00060 (KU) and 2020-00061 (LG&E) was reduced to \$242.8 million (net)². The total spend to date has increased from \$36.2 million (net)² last quarter to \$47.8 million (net)² through September 30, 2021.

Background

The Environmental Protection Agency’s (“EPA”) 2015 ELG Rule and amendments precipitated the need to construct ELG water treatment systems at Trimble County (“TC”), Mill Creek (“MC”), and Ghent (“GH”), as well as a Bottom Ash Transport Water (“BATW”) recirculation system at GH. The EPA’s proposed amendments to the 2015 ELG Rule were finalized in the Fall of 2020. The current ELG Rule includes daily maximum and monthly average limits for the concentration of mercury, nitrates/nitrites, selenium and arsenic allowed in Flue-Gas Desulfurization (“FGD”) wastewater effluent.

To meet the revised limits for these constituents, the Companies are required to install ELG water treatment systems to treat the effluent from the physical/chemical FGD process water treatment systems recently placed into service as described in the 2016 ECR Plan quarterly reports. Without the proposed 2020 ECR Plan projects at TC, MC, and GH stations, the Companies would not be able to continue steam generating operations at these generating stations and simultaneously comply with the ELG Rule, as enforced by Kentucky Pollutant Discharge Elimination System (“KPDES”) permits at each generating station. This would significantly impair the Companies’ ability to fulfill their mandate to provide adequate, efficient, and reasonable service to their ratepayers as these generating stations are the three largest generating

¹ Case No. 2020-00060 and Case No. 2020-00061

² Co-Owners of the Trimble County plant: Illinois Municipal Electric Agency (IMEA) and Indiana Municipal Power Agency (IMPA) are responsible for 25%. IMEA owns 12.12% and IMPA owns 12.88%. Co-owner shares are not included in the costs provided in this report.

stations within the Companies’ generating fleet. The ELG Rule requires compliance for the FGD wastewater as soon as possible on or after November 1, 2020, but no later than December 31, 2025.³

The final ELG Rule also includes up to 10 percent volumetric discharge limit (on a 30-day rolling average) for BATW, which must be complied with “as soon as possible” but in no event later than December 31, 2025. This proposed discharge limit requires KU to construct a BATW recirculation system on the existing bottom ash transport system at GH. The recirculation system will collect the transport water currently discharged from the remote bottom ash dewatering facility and reroute it through tanks and piping systems back to the four generating units for reuse. TC and MC do not require a BATW recirculation system due to their bottom ash transport systems being previously converted to a dry transport instead of a wet sluicing system like GH’s.

Schedules

FGD Process Water Treatment Facilities and Diffusers

<u>Project</u>	<u>Project #</u>	<u>Awarded Contractor</u>	<u>Status⁴</u>	<u>ECR Filing In-Service Date⁵</u>
Trimble County Effluent Limitations Guidelines Water Treatment System ⁶	KU Project 44 LG&E Project 32	OKEP	Awarded March 15, 2021	July 2023
Mill Creek Effluent Limitations Guidelines Water Treatment System ⁶	LG&E Project 31	OKEP	Awarded March 15, 2021	June 2024
Mill Creek Outfall 025 Diffuser	LG&E Project 31	Tetra Tech	Awarded May 12, 2021	November 2021
Ghent Effluent Limitations Guidelines Water Treatment System ⁶	KU Project 43	OKEP	Awarded March 15, 2021	November 2024
Ghent Bottom Ash Transport Water Recirculation System ⁷	KU Project 43	OKEP	Awarded March 15, 2021	December 2023
Ghent Outfall 001 Diffuser	KU Project 43	MAC Construction & Excavating	Awarded March 22, 2021	November 2021

³ 84 Fed. Reg. 64664.

⁴ Project Engineering Department or Engineering, Procurement, and Construction (“EPC”) Contract work status.

⁵ At this time, the In-Service Dates are per the ECR filing (Straight Testimony, page 4-5).

⁶ ELG Equipment OEM: Frontier

⁷ BATW Equipment OEM: United Conveyor Corporation

Project Details

KU Project 44 and LG&E Project 32 – Trimble County (TC) Station Effluent Limitations Guidelines (ELG) Water Treatment System

The current forecasted capital cost to implement these facilities remains at \$47.2 million (net)², being split between KU and LG&E, with construction planned for completion in July 2023. This is split as KU’s 48 percent being \$22.7 million (Project 44) and LG&E’s 52 percent being \$24.5 million (Project 32) – both of these costs are net².

The ELG system will be constructed in close proximity to the recently completed process water treatment system (“PWS”). All facilities will be installed on land currently owned by KU and LG&E at the generating station. The system is being designed to handle water flow capacity up to 750 gallons per minute.



Trimble County – ELG Water Treatment Future Location – July 2021



Trimble County – ELG Water Treatment Future Location – October 2021

LG&E Project 31 – Mill Creek (MC) Station Effluent Limitations Guidelines (ELG) Water Treatment System and Diffuser

General

Project 31 is for construction of an ELG water treatment system and wastewater diffuser at the MC generating station. The current forecasted capital costs to implement these facilities remains at \$66.9 million, with construction planned for completion in November 2021 for the diffuser and June 2024 for the ELG water treatment system.

ELG

The ELG system will be constructed in close proximity to the recently completed process water treatment system. All facilities will be installed on land currently owned by LG&E at the generating station. The system is being designed to handle water flow capacity up to 600 gallons per minute.

Diffuser

The diffuser was installed in the river by Tetra Tech during the quarter. Final completion is planned for November 2021.



Mill Creek – North Diffuser – October 2021



Mill Creek – ELG Water Treatment Future Location – July 2021



Mill Creek – ELG Water Treatment Future Location – October 2021

KU Project 43 – Ghent (GH) Station Effluent Limitations Guidelines (ELG) Water Treatment System, Bottom Ash Transport Water (BATW) Recirculation System, and Diffuser

General

Project 43 is for construction of an ELG water treatment system, a BATW recirculation system, and a wastewater outfall diffuser at the GH generating station. These facilities are designed to process and lawfully discharge wastewater from GH in accordance with the EPA’s existing and proposed amendments to the ELG Rule and the existing Kentucky Pollutant Discharge Elimination System (“KPDES”) Permit for GH. The current forecasted capital costs to implement these facilities remains at \$128.7 million, with construction tentatively planned for completion in November 2021 for the diffuser, December 2023 for the BATW recirculation system, and November 2024 for the ELG water treatment system.

ELG

The ELG system will be constructed in close proximity to the recently completed process water treatment system. All facilities will be installed on land currently owned by KU at the generating station. The system is being designed to handle water flow capacity up to 1,000 gallons per minute.



Ghent – ELG Water Treatment Future Location – July 2021



Ghent – ELG Water Treatment Future Location – September 2021

Bottom Ash Transport Water (“BATW”)

The ELG Rule requires that BATW be recirculated, instead of used once, to transport bottom ash and then discharged. The BATW recirculation system at GH consists of transfer tanks, low pressure pumps, high pressure pumps, piping, foundations, controls, and related equipment. This system will collect the bottom ash sluice water, after being dewatered from the bottom ash solids in the remote bottom ash dewatering facility and pump the water to collection tanks where the water will then be pumped back to the bottom ash removal systems underneath the four generating unit boilers to be used again for sluicing bottom ash to the remote dewatering facility. The water will be recirculated as necessary, with fresh water being added to replace evaporated water. A purge system, up to 10 percent of the volumetric discharge limit (on a 30-day rolling average) for BATW per the ELG Rule, will be included to control pH and other constituent buildup in the recirculation system.

Diffuser

The diffuser was installed in the river by MAC Construction during the quarter. Final completion is planned for November 2021.



Ghent Outfall 001 Diffuser – Land Overview Looking Southeast – October 2021

Quarterly Status Update:

General

The EPC contracts for TC, MC, and GH were awarded on March 15, 2021 to Old Kentucky Energy Partners (“OKEP”) which is a joint venture between Bowen Engineering (a local company) and United E&C. Work to date includes but is not limited to engineering, design, initial sitework investigations and pre-mobilization activities.

Burns & McDonnell (“B&McD”) is the ELG Owner’s Engineer and is assisting LG&E and KU with reviewing engineering, design and construction support related to submittals and fieldwork from the EPC (OKEP) and ELG technology providers (Frontier – ELG) or United Conveyor Corporation (Ghent BATW).

KU Project 44 and LG&E Project 32 – Trimble County (TC) Station Effluent Limitations Guidelines (ELG) Water Treatment System

Work completed during the third quarter of 2021 includes: participating in project technical engineering and design meetings with OKEP and the ELG Original Equipment Manufacturer (“OEM”) Frontier, 30% model review, control philosophy review meeting, submittal and review of various project documents, commercial activities, and schedule reviews. OKEP began mobilizing to the site the week of September 26, 2021.

To streamline the review process and to take advantage of multiple internal resources, the TC project team has included the Mill Creek and Ghent project teams during all major reviews. This collaborative effort has been implemented to minimize the issues associated with the TC project all while accelerating the review process on the subsequent projects.

LG&E Project 31 – Mill Creek (MC) Station Effluent Limitations Guidelines (ELG) Water Treatment System and Diffuser

Work completed during the third quarter of 2021 includes: participating in project technical engineering and design meetings with OKEP and the OEM Frontier, safety training and site visits to support the engineering, design, geotechnical and tie-in investigation of the projects, submittal and review of various project documents, commercial activities, and schedule reviews.

Diffuser – Work completed during the third quarter of 2021 includes: completing the installation of all manholes and on-land portion of piping for the new outfall, dredging and installation of carbon steel piping in the Ohio River.

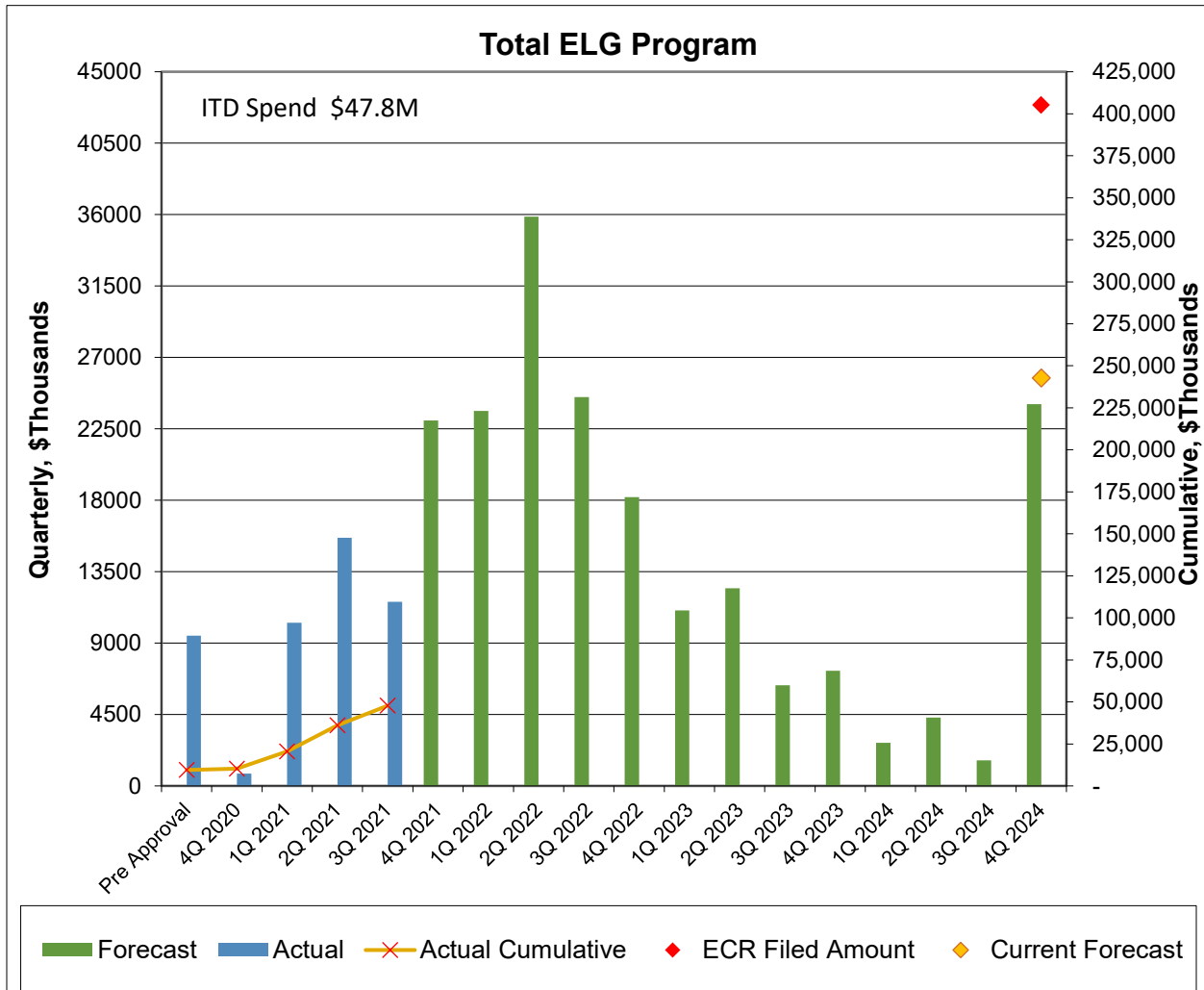
KU Project 43 – Ghent (GH) Station Effluent Limitations Guidelines (ELG) Water Treatment System, Bottom Ash Transport Water (BATW) Recirculation System, and Diffuser

Work completed during the third quarter of 2021 includes: participating in project technical engineering and design meetings with OKEP and the OEMs Frontier and United Conveyor Corporation, safety training and site visits to support the engineering, design geotechnical and tie-in investigation of the projects, submittal and review of various project documents, commercial activities, and schedule reviews.

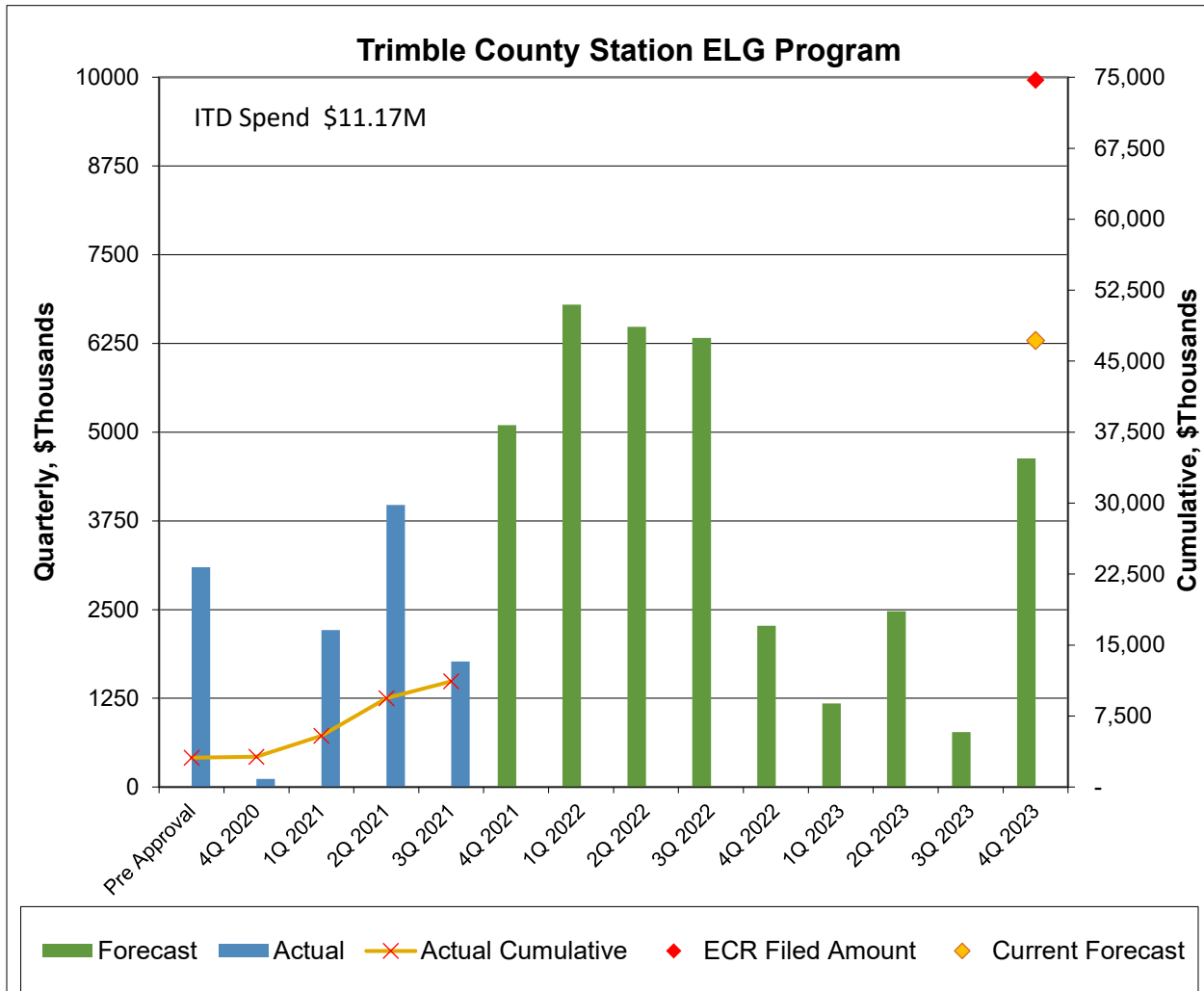
Diffuser – Work completed during the third quarter of 2021 includes: completing the installation of all manholes and on-land portion of piping for the new outfall, dredging and installation of carbon steel piping in the Ohio River, and installation of the emergency bypass pipe and fabric form concrete spillway.

Financials:

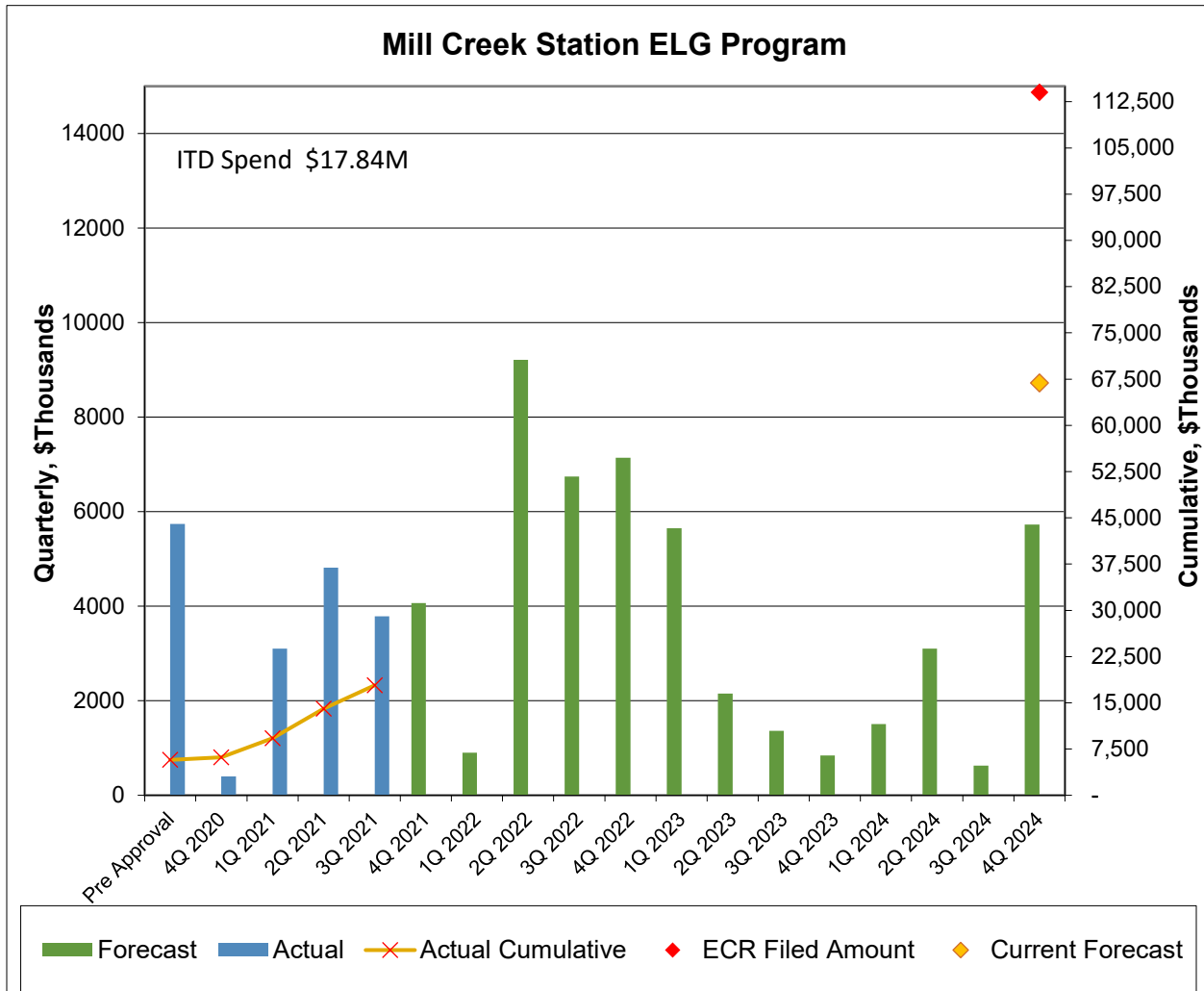
The total 2020 ELG Program forecasted cost has been reduced from \$405.2 million, as filed, to \$242.8 million. Total spend has increased from \$36.2 million (net)² to \$47.8 million (net)² through September 30, 2021. The graph below includes 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



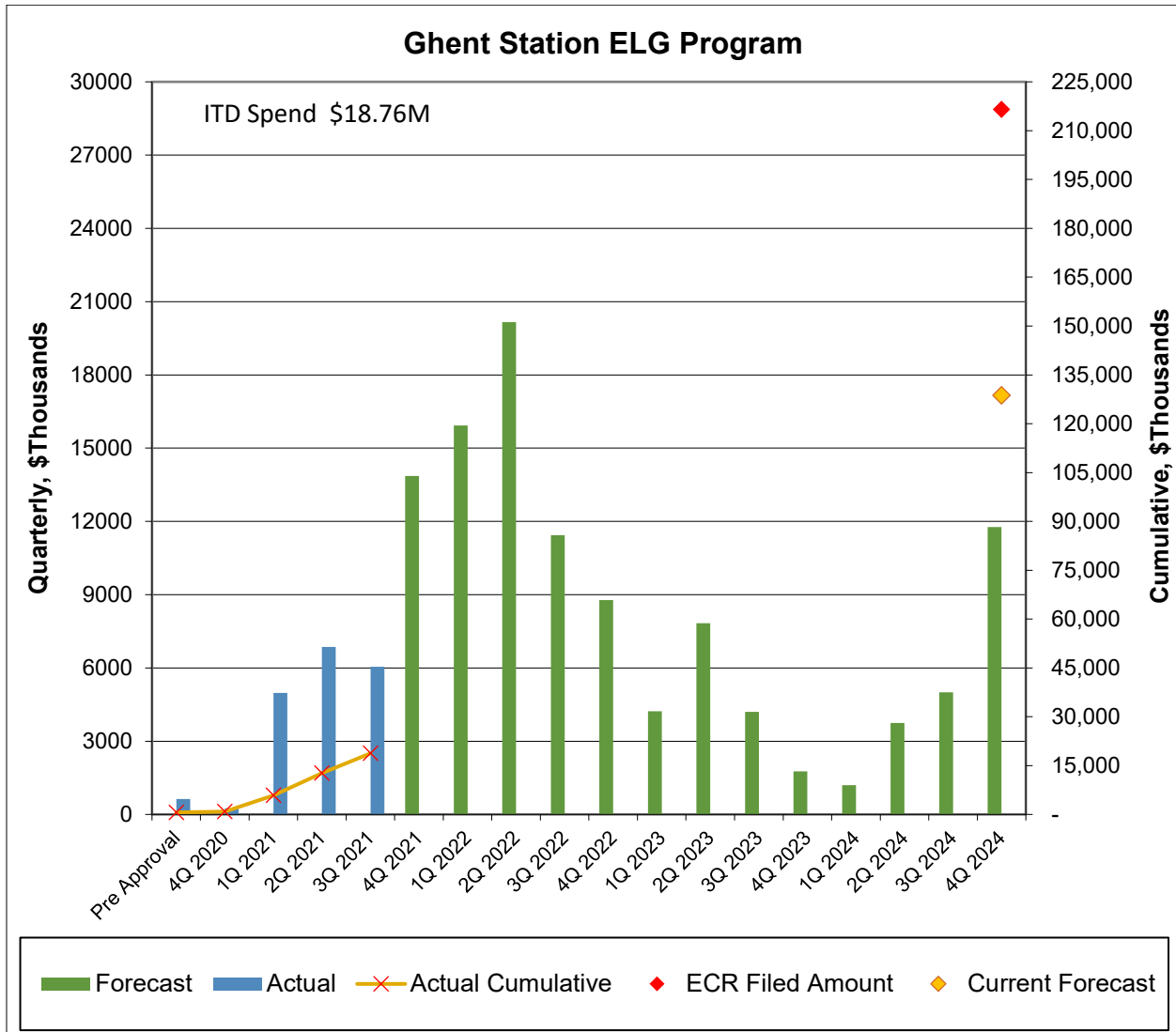
The total Trimble County Station ELG Program forecasted cost has been reduced from \$74.7 million (net)², as filed, to \$47.2 million (net)². Total spend has increased from \$9.40 million (net)² to \$11.17 million (net)² through September 30, 2021. The graph below includes 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



The total Mill Creek Station ELG Program forecasted cost has been reduced from \$114.0 million, as filed, to \$66.9 million. Total spend has increased from \$14.10 million to \$17.84 million through September 30, 2021. The graph below includes 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



The total Ghent Station ELG Program forecasted cost has been reduced from \$216.5 million, as filed, to \$128.7 million. Total spend has increased from \$12.71 million to \$18.76 million through September 30, 2021. The graph below includes 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



Planned Activities for Next Quarter:

KU Project 44 and LG&E Project 32 – Trimble County (TC) Station Effluent Limitations Guidelines (ELG) Water Treatment System

LG&E and KU will continue to have meetings with OKEP to review the engineering and design of the project; review project submittals and design documents; mobilization will be ongoing; and initial onsite construction activities will commence.

LG&E Project 31 – Mill Creek (MC) Station Effluent Limitations Guidelines (ELG) Water Treatment System and Diffuser

ELG: See TC above. Diffuser – The diffuser will be placed into service, as well as site restoration will continue.

B&McD continues to provide support with the engineering, design and document submittal reviews and site activities during the pre-construction phase of the projects.

KU Project 43 – Ghent (GH) Station Effluent Limitations Guidelines (ELG) Water Treatment System, Bottom Ash Transport Water (BATW) Recirculation System, and Diffuser

ELG: See TC above.

BATW – The Companies continue with various safety reviews, commercial activities, and schedule reviews.

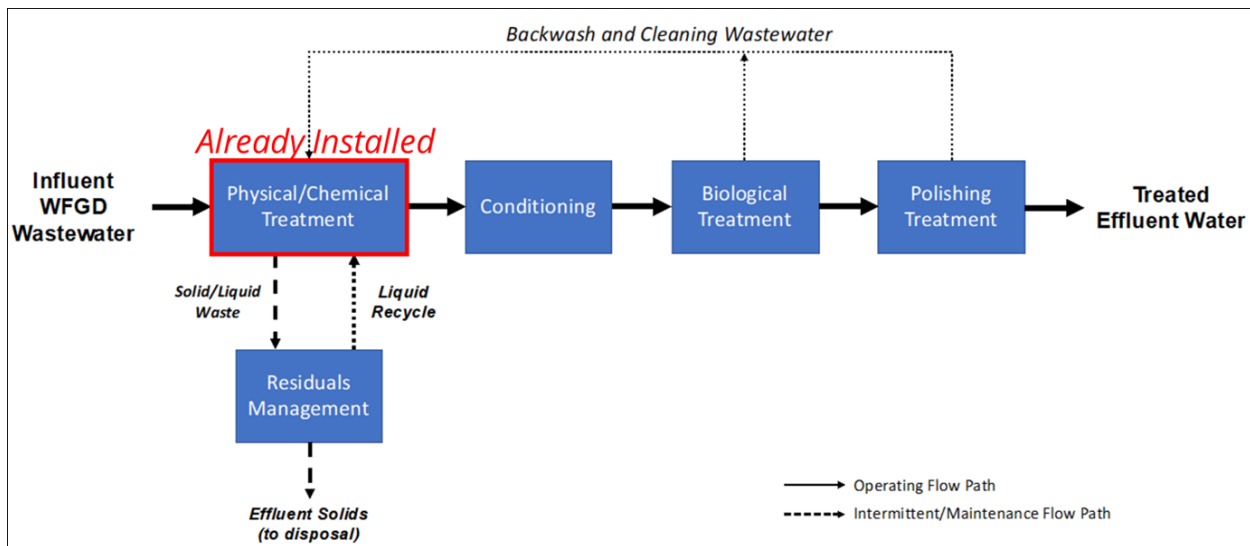
Diffuser – The diffuser will be placed into service, as well as site restoration will continue.

APPENDIX

ELG Water Treatment System Description – TC, MC, and GH

The ELG Rule requires the Companies to use the Best Available Technology Economically Achievable (“BAT”)⁸ to control particulate, metals, arsenic, mercury, selenium, and nitrates/nitrites. Current BAT technology is physical/chemical treatment plus biological treatment. The process water systems are physical/chemical systems designed to capture particulate and most metals; however, they are not designed to capture nitrates/nitrites and selenium. The levels of nitrate/nitrite and selenium capture required by the ELG Rule requires biological treatment of the process water treatment system’s effluent.

The first step in the biological treatment process is denitrification, which is the reduction in concentration of nitrates/nitrites through a biological process utilizing denitrification equipment. Effluent from the denitrification equipment is discharged to the first stage reactor, which is comprised of fiberglass vessels and internal reactor surfaces. The reactor contains living microorganisms, which are fed nutrients and convert the nitrates/nitrites and selenium molecules in an aerobic atmosphere, to an elemental form. Effluent from the first stage reactor flows into a second stage reactor, where additional biological processes reduce remaining selenium. The elemental form of selenium is transferred, via a backwash phase of the process, to the equalization tanks at the beginning of the process water treatment system for particulate removal. The second stage reactor feeds to an ultrafiltration (“UF”) system where remaining particulate metals are filtered out. The UF tank is then discharged to a series of clean water tanks, which can be used to backwash the biological and UF systems or be discharged. A “typical” flow diagram is shown below.



The majority of the mechanical and electrical systems will be constructed in a building for weather protection, whereas most of the biological process tanks will be located outside. The building houses the denitrification equipment, UF systems, effluent tanks, various pumps and support subsystems. The system

⁸ 84 Fed. Reg. 64624.

also requires cleaning and chemical feed equipment, pumps, piping, valves, and electrical equipment. Separate rooms must be constructed inside the treatment building to house battery systems and electrical equipment. A control room is also required, along with restrooms. The reactor area, including the vessels housing the microorganisms, will be constructed outside the building under a weather canopy. All of the tanks and reactors in the system must be large enough to handle the immense volume of water flowing through the effluent treatment process. In other words, the system must be sized commensurate with the process water treatment systems recently commissioned to enable treatment of the effluent of flow from the process water treatment systems.

Diffusers Description – GH and MC

The diffusers planned to be installed at GH and MC are large multi-port pipes that connect to the stations’ wastewater outfall pipe and are placed into the bottom of the Ohio River with the discharge ports above the riverbed and facing downstream. The pictures shown below provide a general concept of the GH diffuser, which will be similar to the proposed MC diffuser. As this graphic representatively shows, the diffuser is a single large discharge pipe that is installed in the riverbed. The diffuser ports face downstream to disperse the water out of multiple discharge ports instead of a single, larger point of discharge.

Ghent Outfall 001 Diffuser Concept

