ADMINISTRATIVE CENTER
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Grand River Dam Authority

April 11, 2025

Ms. Hillary Young, P.E.
Chief Engineer
Land Protection Division
Oklahoma Department of Environmental Quality (DEQ)
707 North Robinson
P.O. Box 1677
Oklahoma City, Oklahoma 73101-1677

RE: Corrective Measures Implementation Plan
Grand River Dam Authority (GRDA)
Grand River Energy Center
Solid Waste Permit No. 3549012
Chouteau, Oklahoma

Dear Ms. Young:

GRDA is pleased to present the Corrective Measures Implementation Plan (CMIP) for the Assessment of Corrective Measures Report (ACM) dated February 16, 2024. GRDA provided additional information that was requested by DEQ on July 18, 2024 and August 14, 2024. In your letter of September 5, 2024, you accepted the ACM Report, along with the supplied additional information, and requested the CMIP. The CMIP plan includes a schedule for implementing and completing the remedial activities in accordance with OAC 252:517-9-8(d).

If you have any questions, please feel free to contact me at (918) 824-7565.

Sincerely,

Michael L. Bednar

Michael L. Bednar
Manager of Environmental Compliance

Corrective Measures Implementation Plan

Grand River Dam Authority Landfill

Grand River Energy Center

Mayes County, Oklahoma

Solid Waste Permit No. 3549012

Submitted to:
Grand River Dam Authority
Mayes County, Oklahoma
April 2025

GRDA
Grand River Dam Authority

LICENSED PROFESSIONAL ENGINEER
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4/10/2025

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List of Acronyms and Abbreviations

ACM	Assessment of Corrective Measures
BMP	Best Management Practice
CAMP	Corrective Action Groundwater Monitoring Plan
CCR	Coal Combustion Residuals
CMIP	Corrective Measures Implementation Plan
CN	Curve Number
COC	Constituents of Concern
cm/s	centimeter per second
EMNA	Monitored Natural Attenuation using an Enhanced Monitoring Network
EPA	United States Environmental Protection Agency
GRDA	Grand River Dam Authority
GREC	Grand River Energy Center
MNA	Monitored Natural Attenuation
NHIW	Non-Hazardous Industrial Waste
OAC	Oklahoma Administrative Code
ODEQ	Oklahoma Department of Environmental Quality
OPDES	Oklahoma Pollutant Discharge Elimination System
PVC	Polyvinyl Chloride
Tc	Time of Concentration
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey

ENERCON

Corrective Measures Implementation Plan

Grand River Dam Authority

Grand River Energy Center (GREC)

Prepared by: Steven Krul Date 4/10/25

Preparer: Steven Krul

Preparer Title: Principal Project Manager

Reviewed by: Digitally signed by Caitlin L. Current, PG Date: 2025.04.10 '10:58:24 -04'00 Date 4/10/25

Reviewer: Caitlin L. Current, PG

Reviewer Title: Principal Hydrogeologist

Approved by: Donald R. Hixson Jr. Digitally signed by Donald R. Hixson Jr. DN: C=US, E=dhixson@enercon.com, O="ENERCON SERVICES, INC.", CN=Donald R. Hixson Jr. Date: 2025.04.10 16:16:18-04'00' Date 4/10/25

Approver Donald R. Hixson Jr., P.E., PLS

Approver Title: Manager, Civil Engineering/Environmental Services

1.0 INTRODUCTION

GRDA was created by the 15th Oklahoma Legislature in 1935 as a conservation and reclamation district for the waters of the Grand River and authorized GRDA to build dams for the purposes of hydroelectricity production and flood control. GRDA is Oklahoma's largest public power electric utility, fully funded by revenues from electric and water sales instead of taxes. GRDA is also a steward of the waters of the Grand and Illinois Rivers in Oklahoma and manages over 70,000 surface acres of premier Oklahoma lake waters, as well as miles and miles of the Scenic Illinois River. GRDA is committed to be a good steward of the natural resources under its control.

The Grand River Dam Authority (GRDA) owns and operates the Grand River Energy Center (GREC) electric generating station located approximately three (3) miles east of the City of Chouteau in Mayes County, Oklahoma. The facility operated two coal-fired boilers (Unit #1 and #2) and one combined-cycle natural gas turbine (Unit #3). Unit #1 was retired in December 2020, while Unit #2 and #3 remain in service. As previously communicated, decommissioning of Unit #2 is currently planned for 2026 and coincides with the commercial operation of a new simple cycle combustion turbine (Unit #4). However, the effects of executive orders issued by the President of the United States, including "Declaring a National Energy Emergency" and "Strengthening the Reliability and Security of The United States Electric Grid", as well as general electric reliability concerns, critical infrastructure considerations and increased customer demand require GRDA to determine whether a plant retirement will occur as planned or not.

GREC operates an Oklahoma Department of Environmental Quality (ODEQ) permitted Non-Hazardous Industrial Waste (NHIW) landfill, used for the on-site disposal of coal combustion residual (CCR) materials including fly ash, bottom ash, and spent powdered activated carbon (generated from flue gas emissions control). This landfill is situated south of the primary operational area within the GREC complex.

The original landfill permitted area consisted of approximately 116 acres, of which only 69.5 acres were available for use. GRDA submitted a Closure Plan to ODEQ for the CCR Landfill on 10/11/2016. A revised landfill permit reduced the permitted landfill area to approximately 67 acres, of which 48 acres are available for use. The vacated eastern 69 acres never received waste. A revised Closure Plan for the landfill was resubmitted on 2/12/2018. GRDA also submitted a Run-On and Run-off and Post Closure Plan to ODEQ on May 14, 2018. ODEQ approved the Run-On and Run-off and Closure and Post Closure plans on September 14, 2018

The stormwater and plant water systems at the GREC facility were designed to manage stormwater runoff generated across the site, address runoff from coal piles, and treat wastewater produced during energy generation and air quality control processes. GRDA has twelve (12) wastewater/stormwater process ponds that are permitted by ODEQ and are used to reduce suspended solids, coal fines, CCR material, and adjust pH before discharging from GREC to the Neosho River. The landfill, ponds and flow patterns are shown on **Figure 1**.

2.0 SITE DESCRIPTION

2.1 Background

As part of a Consent Agreement with ODEQ, signed on August 25, 2023, an Assessment of Corrective Measures (ACM) was prepared and submitted to ODEQ on February 16, 2024, addressing releases from the CCR landfill to on-site groundwater. Addendums with responses for additional information were submitted to ODEQ on July 18, 2024, and August 14, 2024. The final ACM recommendations included:

- Proposed Interim Remedy 1- Monitored Natural Attenuation (MNA) with Enhanced Monitoring
- Proposed Interim Remedy 2- Pond Closure/Sediment Cleanout of Nearby Wastewater Ponds and MNA with Enhanced Monitoring
- Proposed Final Remedy 1 - Source Reduction through Final Landfill Closure

On September 5, 2024, ODEQ accepted the ACM proposed remedies, and requested submittal of a Corrective Measures Implementation Plan (CMIP) outlining the proposed remedies including the locations of the sentinel monitor wells, pond closure / sediment cleanout plan, final closure design criteria, and a schedule for implementing and completing the remedial activities in accordance with Oklahoma Administrative Code (OAC) 252:517-9-8(d). This CMIP will address the proposed remedies as outlined above in the following sections.

2.2 Current Groundwater Monitoring Program

The site hydrogeologic setting and current site conceptual model are described in detail in the approved ACM. Groundwater monitoring for the CCR landfill has been on-going for over 30 years at the site. Required groundwater sampling events occur semi-annually, as directed by ODEQ and the United States Environmental Protection Agency (EPA). There are currently 19 landfill monitor wells. Two background monitor wells, MW93-1 and MW22-01, are located upgradient of the landfill, and the remainder of the monitor wells are located downgradient or side gradient of the landfill. **Figure 2** presents the current monitor well locations.

Groundwater is analyzed for:

- Appendix A (Constituents for Detection Monitoring): boron, calcium, chloride, fluoride, pH, sulfate, total dissolved solids (TDS), specific conductivity, total alkalinity, and sodium; and
- Appendix B (Constituents for Assessment Monitoring): antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, selenium, thallium, and radium 226 and 228 combined.

Data from groundwater sampling conducted over the past five years indicate that most analytical parameters were non-detect or below regulatory standards or concentrations observed in background wells. Lithium and molybdenum have been observed in three landfill monitor wells at concentrations that are statistically greater than background levels/groundwater protection standards. These exceedances prompted GRDA to develop a Groundwater Corrective Measures Plan.

Data review indicates that groundwater concentrations that exceed background for lithium and molybdenum have not been detected in downgradient wells and are not moving off site.

2.3 Potential Receptors

Surface water receptors include the creek to the east of the landfill, the wastewater ponds, and, ultimately, Chouteau Creek (located between 2,500 feet and 4,800 feet to the west and south of the site) and the Neosho River (located approximately 1,500 feet to the southeast at its closest point). The creek to the east of the landfill discharges to wastewater pond F09 and does not flow offsite. A search of public and private water supply wells indicated that no public or private water supply wells were identified within the 0.5-mile radius of the site. As such, the risk posed for public or private water supply wells in the vicinity of the site does not exist at this time.

3.0 IMPLEMENTATION PLAN – COMPLETED TASKS

GRDA proactively completed several tasks beginning in August 2024 to better understand stormwater and surface water conditions to facilitate the implementation of the ACM interim and final recommendations. These tasks include completion of stormwater and surface water modeling, bathymetric survey of ponds to determine sediment volumes, a review of the area for threatened and endangered species, and a wetlands delineation. A summary of completed tasks is provided below.

3.1 Supplemental Survey

A supplemental ground survey was conducted to accurately map wastewater / stormwater conveyance systems and discharge structure inverts to and from the wastewater ponds for input into the hydraulic model.

3.2 Stormwater and Surface Water Modeling

The surface and facility generated water systems at the GREC facility are designed to manage and treat stormwater runoff generated across the site, including runoff from the coal pile and wastewater produced from energy generation and air quality control processes. The facility operates under an Oklahoma Pollutant Discharge Elimination System (OPDES) Permit (OK0035149) to discharge treated stormwater and process wastewater to the Grand Neosho River. The stormwater and process wastewater are treated through a series of twelve (12) wastewater ponds shown in **Figure 1**.

A stormwater and surface water model was developed for the site in order to evaluate actions related to Interim Remedy 2 of the ACM, the impact of the proposed wastewater pond closures, Pond F04 and Pond F08 and the sediment removal from Pond F07. The model evaluated the current stormwater infrastructure subbasin drainage patterns, water control mechanisms, and storm event performance for the network of wastewater treatment ponds at the facility. Sub-basins and off-site discharges at the site's western outfall points were also evaluated.

Stormwater and surface water modeling was completed using the National Resources Conservation Service – Soil Conservation Service method as defined in Technical Release 55 (TR-55) within Autodesk Storm and Sanitary Analysis software and Hydraulic Toolbox. The TR-55 model begins with a rainfall amount uniformly applied to a watershed within a specified time distribution. Using a weighted curve number (CN) the rainfall applied to the watershed can be converted to stormwater runoff. The weighted CN is determined by taking the different types of soils, plant cover, amount of impervious area, interception, and surface storage which are sub-sections of the total area of the watershed to develop a composite value in proportion to the watershed's area. The hydraulic flow path, Time of Concentration (Tc), is determined by taking the longest travel time for a raindrop to traverse the watershed. For this analysis, the velocity method of calculating Tc was used.

Stage Storage Calculations

The model was used to develop storage capacity of each stormwater pond and retention basin. The table below presents a summary of calculations for stage storage:

Pond	∑ VOLUME OF SEDIMENT (Cu. Ft)	∑ VOLUME OF WATER (Cu. Ft)
F01	NA	558,900
F02-1	161,850	696,025
F02-2	17,851	210,113
F03	121,314	116,299
F03-1	26,588	38,879
F04	329,119	1,957,217
F11	20,355	323,409
F06	397,688	3,294,652
F07	1,056,017	10,000,851
F08-1	431,908	5,404,628
F08-2	142,475	1,075,600
F09	486,470	3,958,022
F10	619,393	5,057,843
F104	23,494	301,272
F001	50,596	455,187

Peak Flow Rate Model Results

The peak flow rate and peak volume of the stormwater model results were tabulated for the 25-year and 100-year 24-hour storm events. The summary table below outlines the peak flow rate in cubic feet per second (cfs) at the outfall for each of the existing ponds during the 25-year and 100-year storm events.

Pond/Outfall	25-Year Peak Flow Rate (cfs)	100-Year Peak Flow Rate (cfs)
F01 to F01-Forebay	4	8
F01-Forebay to F03-1	4	8
F02-1 to F02-2	71	90
F02-1 to F03-1	77	100
F02-2 to F06	65	71
F03 to F04	23	23
F03-1 to F03	35	35
F04 to F06	22	24

F11 to F06	0	0
F06 to F07	65	76
F07 to F08-1	47	60
F08-1 to F08-2	57	61
F08-2 to F09	65	77
F09 to F10	134	180
F10 to F104	48	48
F10 to F001	54	54
F104 to F001	58	85
F001 to Neosho River	100	100

These modeling results will be used in the engineering design of the pond closures to determine stormwater runoff from the closed pond areas, temporary erosion and sediment control best management practices (BMPs) during pond closure activities, and post-closure permanent erosion and sediment controls. In addition, the model will assist in sizing appropriate temporary and permanent bypass conveyances for wastewater flow around the closed pond areas, as necessary. A description of the ponds proposed to be included in the CMIP are detailed below:

<u>Pond - F04</u>

The process water recovery basin F04 encompasses a storage capacity of 1,957,217 ft³ and incorporates three inlets. The first two inlets flow from Pond F03-1, comprising a thirty-six-inch (36") reinforced concrete pipe and an eight-inch (8") polyvinyl chloride (PVC) sump drain. The third inlet is identified as a four-inch (4") PVC pipe that connects from a drop inlet situated at the base of the CCR storage area to the east. This pipe is routed alongside the access road between ponds F03 and F04 which collects stormwater runoff from the access roads and closed and vegetated portions of the CCR storage area. The outlet comprises three twenty-four-inch (24") pipes with inverts approximately 19 feet above the bottom of the pond that direct flow into Pond F06. As part of the CMIP this pond will be closed, and returned to preconstruction, natural drainage conditions.

<u>Pond – F08-1</u>

Ponds F08-1 and F08–2 were constructed by the Department of Transportation as borrow sources during the upgrade of US Highway 412 to a 4-lane facility. Conveyance of stormwater and process water from the west side of the system to current day Pond F09 was through a connecting channel that flowed from Pond F07 along the general alignment of the F08 ponds and discharged from the control structure of F08-2 into F09. The introduction of the two ponds has introduced added retention time to the system whose loss will be considered in the ACM's Interim Remedy 2.

The stormwater detention Pond F08-1 has a storage capacity of 5,404,623 ft³ and includes an inlet from Pond F07 via a forty-eight-inch (48") corrugated metal pipe. There is one outlet that connects to Pond F08-2; however, the survey team was unable to identify it properly as the pipe was submerged underwater. Based on the characteristics of other ponds and the storm pipes that connect them, it is estimated that the pipe is also a forty-eight-inch (48"). This pond will be closed as part of the CMIP, and drainage returned to preconstruction, natural patterns.

Pond – F08-2

Stormwater detention Pond F08-2 has a storage capacity of 1,075,600 ft³ and includes two inlets. One inlet is derived from Pond F08-1 through what is an estimated forty-eight-inch (48") corrugated metal pipe that is submerged as mentioned previously, while the other inlet is a swale from the north that collects runoff from the eastern side of the ash storage area. This pond has one outlet: a five-foot-long rectangular weir approximately half a foot below the water surface elevation at the time of the survey and five and half feet above the bottom of the pond. After the water flows over the weir, it is directed to Pond F09 via a vegetated swale. This pond will be closed as part of the CMIP, and drainage returned to preconstruction, natural patterns.

Pond – F07

The southwest water detention Pond F07, with a storage capacity of 10,000,851 ft³, includes two inlets, namely the thirty-inch (30") corrugated plastic pipe from Pond F06 and a swale that collects water along the western side of the site. The outlet structure sits less than half a foot below the water surface elevation at the time of survey and incorporates a forty-eight-inch (48") corrugated metal pipe with invert roughly 19.5 feet above the bottom of the pond and connects to F08-1. GRDA plans for Pond-F07 to remain in service until the closure of the CCR Landfill, discussed in Section 4.4.

The majority of the overall site drainage basin flows in a southerly then easterly direction. Most of the drainage basin discharges at Outfall 001 at the southeast corner of the site. A summary of calculations for the stage storage of each stormwater pond and retention basin is presented in table below:

Pond	Bottom of Pond (ft)	Top of Pond (ft)	Max Elevation 25 Yr. (ft)	25-Year Peak Flow Rate (cfs)	Max Elevation 100 Yr. (ft)	100-Year Peak Flow Rate (cfs)
F01	606	616	615.47	160	615.66	217
F01-Forebay	607	616	610.01	4	610.38	8
F02-1	603	614	612.83	332	613.83	420
F02-2	602	610.5	608.94	71	609.38	92
F03	607	610	609.81	41	609.81	48
F03-1	605	610	610.00	172	610.00	235
F04	592	610	608.79	86	608.90	118
F06	598	609	607.77	156	607.97	207
F07	579	596	595.58	313	595.96	419
F08-1	589	598	594.78	284	595.01	370
F08-2	589	595	594.50	270	594.50	302
F09	583	595	594.29	469	594.47	508
F10	581	590	589.92	272	590.00	340
F11	602	611	607.49	14	607.70	18
F104	581	590	588.90	51	589.01	64
F001	580	589	588.66	101	588.76	120
Neosho-Outfall 001	-	-	-	100	-	100

3.2 Bathymetric Survey and Sediment Volumes

The bathymetric survey was performed from a manned boat, using Real Time Kinematics / Global Positioning System (for horizontal positioning), and a sonar depth finder (distance from the water surface). The sonar was tested and calibrated at each pond, accounting for the effects of murky water. Horizontal and vertical accuracies were expected to be <0.5 foot. The bathymetric survey mapped the surface topography of sediment at the pond bottom. Shot spacing did not exceed the equivalent of a 25-foot grid. The survey footprint extended to each pond's edge of water. A digital surface model was generated from the set of survey shots, and a survey elevation contour map was prepared to represent the top of the sediment. Sediment thickness measurements were taken at a spacing that did not exceed the equivalent of a 50-foot grid using a pointed survey range pole. Sediment thickness was computed by the depth difference between the range pole tip at rest on the pond bottom and the pole tip pushed through to full resistance. An interpolated sediment thickness was applied to all survey points, and a digital model was generated to represent the bottom of the sediment. A composite comparison was made between the survey surface model and the sediment bottom model to compute the total volume of sediment.

The results of the bathymetric and sediment thickness survey show the following wet sediment volumes (assuming 2.0% solids) and dewatered sediment volumes (assuming 25% solids) in ponds F04, F07, and F08. These sediment volumes will be used during the design of the pond cleanouts and closures for estimating dredging and dewatering efforts along with space and costs for dewatered sediment disposal.

Pond	Volume of Wet Sediment at 2.0% solids (cubic yards)	Volume of Dewatered Sediment at 25% solids (cubic yards)
F04	12,190	975
F07	39,112	3,129
F08	21,273	1,702

3.3 Threatened and Endangered Species Evaluation

An assessment for threatened and endangered species was completed at the site in September 2024 to identify suitable habitats for all federal and state threatened and endangered species, provide a general listed species field survey, and provide a summary report for the implementation of interim and final ACM recommendations. The evaluation included a desktop review of plant and animal species listed as federally or state-protected that are known to occur or likely to occur within the Area of Interest based upon review of published U.S. Fish and Wildlife Service, Oklahoma Department of Wildlife Conservation online databases of documented listed species occurrences and a determination of potential suitable habitats. After the desktop study, a team of ecologists/biologists conducted a survey on the Area of Interest on September 4 and 5, 2024.

Based upon a thorough desktop determination of listed animal and plant species and potential suitable habitats, and a two-day site reconnaissance completed by qualified biologists, the following conclusions were reached:

- No federally or state-listed species were observed within the Area of Interest.
- No federal or state-listed plant species were observed within the Area of Interest.
- No such plant species are known to occur in the surrounding vicinity.
- The Area of Interest is not located within any federally designated critical habitats or consultation areas.

Overall, the proposed development of the CMIP work will have no negative impacts on any federal- or state-listed species.

3.4 Wetlands Evaluation

GRDA, conducted a wetland delineation and stream characterization to identify and delineate the location of any potentially U.S. Army Corps of Engineers (USACE) regulated jurisdictional wetlands and streams present at site. The project area of Interest includes wastewater ponds F04, F07 and F08, as well as downgradient wastewater ponds, F09 and F10 and surrounding upland areas.

Before initiating field work, a review of publicly available aerial imagery, topographic maps, soil survey data, online mapped wetlands and streams, and wastewater permit information was reviewed to evaluate potential wetlands and waterbodies within the Project Area of Interest and Delineation Study Area based. Additionally, aerial imagery, created between 2016 and 2022 by National Geographic and downloaded from ArcGIS Online, and United States Geological Survey (USGS) topographical maps created in 2021 by National Geographic and I-Cubed and downloaded from ArcGIS Online, were reviewed to assess potential water resource features. Web Soil Survey data, obtained from the US Department of Agriculture was reviewed for soil unit texture, hydric rating, and location. National Wetlands Inventory mapping, obtained from the US Fish and Wildlife Service, was reviewed for the project vicinity. Data downloaded from the USGS National Hydrography Dataset was reviewed to determine the location and reported information of mapped stream flowlines within the project vicinity.

A field team completed a site assessment of the area in September 2024 to identify and delineate the location of any potentially jurisdictional wetlands and streams present within the study area. The assessment included review of streams, drainage, plant and soils conditions. The field team carefully studied the ponds and drainage areas south of the landfill.

Results concluded that one area, the pond south of Pond F08 and north of US Highway 412, originally created as a borrow source for old Highway 33, now US Highway 412, would likely be considered jurisdictional by the USACE. Additionally, one perennial stream, located south of Pond F09, has previously been considered jurisdictional by the USACE. Both areas are not in the proposed interim or final remedy area.

The final authority over any delineated feature and jurisdictional determination rests with the USACE Regulatory Program and the Fort Gibson Project, whose property some of the facility is leased. Any necessary construction/encroachment permits or rental agreements for impacts to jurisdictional features must be obtained prior to construction activities.

4.0 IMPLEMENTATION PLAN – TASKS TO BE COMPLETED

The implementation of the interim and final corrective measures includes source reduction through pond closure efforts in ponds F04 and F08 through sediment removal and restoration to natural/preconstruction conditions. Sediment will be removed from Pond F07. Monitored natural attenuation using an enhanced monitoring network (EMNA) will begin once this CMIP is approved and will continue for several years to evaluate the data set.

4.1 EMNA

Once this CMIP is approved, GRDA will submit a Corrective Action Groundwater Monitoring Plan (CAMP) that will meet the requirements of an assessment monitoring program under OAC 252:517-9-6 and will ensure the detection of landfill COCs in groundwater before flowing offsite.

EMNA will be conducted utilizing the existing 19 landfill monitor wells with the addition of two new "sentinel" monitor wells. One new monitor well will be located south (downgradient) of current monitor wells MW23-04 and MW23-05 and the second will be located south (downgradient) of MW23-02 and MW22-06 as shown in **Figure 3.** The locations for the sentinel monitor wells were selected to monitor groundwater conditions downgradient of the landfill and in areas not likely to be disturbed by the proposed highway expansion or facility modifications. Upon approval of the CMIP, GRDA will install the sentinel monitor wells at the approved locations.

Sentinel monitor wells will be sampled quarterly for eight consecutive quarters to establish a statistical population of data. The existing landfill monitor wells will continue to be sampled on a semi-annual basis. Annual groundwater monitoring reports will include the groundwater monitoring results of landfill compliance monitor wells and sentinel monitor wells. Statistical analysis of groundwater data will be completed for the landfill monitor wells and the sentinel monitor wells once eight rounds of data collection are complete. EMNA will continue until concentrations of landfill COCs have not exceeded the groundwater protection standards for a period of three years using statistical procedures and performance standards in OAC 252:517-9-4(f) and (g).

4.2 Preparation to Implement Corrective Measures

Plans for the closure of Unit #2 are progressing; however, changes in direction for energy demands have recently been re-focused by federal order that has required GRDA to re-assess the closure timetable. The development of the revised closure timing is dependent on multiple factors including power demands for customers, installation of new power generation technologies (solar battery energy storage systems, or gas fired boilers), protection of the environment, and current and future environmental regulations. Because of this, the date of the retirement of Unit #2 will be contingent on these other factors. As such, the progression of the corrective measures will be influenced by the assessment, design and implementation of the modification of the supporting surface water management system.

GRDA has already completed several engineering studies to facilitate the interim corrective measures (discussed in Section 3), and GRDA plans on proactively completing as many actions as reasonably possible to facilitate the pond closures and sediment removal activities in coordination with the retirement of Unit #2.

Final implementation of the closure of Unit #2, will necessitate GRDA completing a detailed engineering evaluation in order to facilitate the pond closures including:

- Evaluations to determine the most efficient methodology for sediment removal
- Testing to determine optimal dewatering, handling, and transportation methods for sediments removed from the ponds
- Additional hydraulic modeling for selection of the best methods to re-route process water without impacting ponds during closure
- Additional stormwater modeling to determine flow/storage capabilities during storm events to avoid impact to facility operations, erosion or flooding
- Pre and post sediment removal sample collection and analytical testing methods and
- Evaluation of permitting considerations including those related to the Clean Water Act, Oklahoma Industrial Wastewater, and US Army Corps of Engineers

Additional data that will be collected by GRDA will include rainfall levels to evaluate seasonal stormwater flow. GRDA will install staff gauges in ponds to measure low and high-water events and track seasonal changes. Process water flow changes and stormwater runoff will be gauged and recorded to supplement the existing stormwater model. GRDA will complete observations and data point collection for at least one (1) year.

During this period of time, GRDA will also provide the required written notifications to ODEQ, as specified in 252:616-13. These include:

1. A written notice of intent that includes:
    a. the name, address and title of person(s) who will remain in charge of or otherwise have continuing management responsibility of the facility or site and who will retain an ownership interest in personal or real property affected by the permitted operation;
    b. a detailed schedule of proposed closure activities; and
    c. the forwarding addresses and names of each present owner or operator under the current permit.
2. A pre-closure sampling and analysis plan that outlines sediment and closure sampling activities and analytical testing procedures to ensure clean closure and appropriate sediment disposal methods.

These preparation activities will be completed in order to facilitate the implementation of corrective measures in a timely manner once the determination to close Unit #2 has been made.

4.3 Pond Closure/Sediment Removal Activities

Once GRDA determines the schedule for close of Unit #2, GRDA will have previously completed the bulk of the regulatory, permitting, and engineering design actions related to the pond closure and sediment removal activities, and GRDA will begin pond closure and sediment removal activities.

Sediment Removal

GRDA will remove sediment from Ponds F08 (F08-1 is the west pond and F08-2 is the east pond) F04, and F07, and close and restore ponds F08 and F04 to native conditions. Pond closures will be conducted in accordance with OAC 252:616-13. GRDA will provide engineering and safety oversight while completing Interim Remedy 2.

Based on completed engineering evaluations, the order of sediment removal/pond closure will be F08-2, followed by F08-1, F04, and, lastly, F07. Pond locations are shown on Figure 1.

Sediment removal and pond closure activities will involve bypassing storm and process water flow to isolate each pond. Stormwater will be routed around each pond prior to sediment removal or closure activities using either pumps or other engineering methods. Once a pond is isolated from stormwater/process water flow, closure/sediment removal activities will begin. All loose sediments from the base of each pond will be removed. Testing to confirm removal and confirm disposal methods will be conducted, and removed sediment will be properly disposed. Sampling and disposal methods will be included in a sampling and analysis plan in accordance with OAC 252:616-13.

A discussion of sediment removal methodologies being considered is below:

Hydraulic Dredging

Hydraulic dredging allows sediment removal without dewatering the ponds. Each pond would be isolated from flow to prevent sediment migration during the dredging process. Centrifugal pumps are used to suction up the sediments off the pond bottom, then transfer the sediments through pipelines, as a slurry, to dewatering equipment.

Dewatering equipment would be either geotubes, dewatering boxes, filter presses or other methods. Bench-scale testing will be conducted prior to closure, to determine the most effective measures for sediment removal and dewatering.

Geotubes are made from geotextile fabric which filters or retains the sediment within the tube while allowing the water to flow through the fabric; the tubes are filled under pressure which maximizes the amount of solids loaded into the tube. Once a tube is full and the sediments have dewatered, the tubes are torn open, and the sediments are mechanically loaded into dump trucks for transport and proper disposal. The tubes will be placed on plastic liners to collect and direct the water back into ponds.

Dewatering boxes are modified roll-off containers lined with perforated metal screens on the sides and bottom which filters the sediment and allows the water to flow out through drain ports in the container; hoses are connected to the drain ports and transfer the water back into ponds. Once the roll-off container is full, the sediment is allowed to dewater to the desired percent solids required for disposal. If disposal is onsite the container can be loaded onto a tractor trailer and taken to the landfill where the container is tilted, and the back end of the container is opened, and the dewatered sediment is dumped. If the sediment is being disposed of offsite, the sediment will be mechanically loaded on to dump trucks for transport and proper disposal.

A filter press uses pressure filtration, wherein the pumped slurry from the dredge is routed to a mobile plate and frame press and dewatered under pressure. Filter presses can use a pre-coat material to aid sediment removal. The dewatered liquid would be pumped to a pond and the solids accumulated in the press plates. Periodically, the press is stopped and opened allowing accumulated sediments to drop into a truck for transport and proper disposal.

Dredging would continue at each pond until hard bottom was encountered.

Mechanical Excavation

Mechanical excavation methods would involve using track-hoes, long reach track-hoes or rubber tire backhoes to remove sediments from the ponds. Each pond would be isolated from stormwater and process water flow and dewatered using gravity flow and pumping. As part of the drying process, dewatering trenches may be installed in the bottom of the ponds to collect water and route the water to a sump where the water will be removed using submersible dewatering pumps. Excavators would place timber mats to allow equipment access. Sediments would be stacked in piles to dewater.

Combination

The combination method would use dredging to remove sediments while water was still in the ponds. Once the dredging operations are complete, ponds would be drained and allowed to dry. Mechanical excavation would be used to remove any sediments that were not captured during dredging operations.

Disposal

The dewatered sediments, after final processing, will be transported to the CCR Landfill and disposed. If the sediment is being disposed of onsite, it may include intermediate drying with processing to and through the coal pile for consumption in the boiler. If the sediment is being disposed of offsite, the sediment would be mechanically loaded on to trucks for transport and proper disposal in a permitted facility.

Pond Closure for F04 and F08

Once all loose sediments are removed from the base of Pond F04 and F08, testing will be conducted to ensure clean closure of each of the ponds. Testing will be conducted in accordance with 252:616-13. Pond closure activities will also be conducted in accordance with other regulatory considerations including those associated with the US Army Corps of Engineers. The closure of ponds F04 and F08 will reduce the amount of water in contact with CCR material in the landfill and reduce seepage to the water table and along the southern toe of the landfill. Minimal ground disturbance will be conducted around the areas around F04 and F08 in order to return the area to natural drainage patterns.

Proposed future use alternatives for the closed pond areas would dictate the final grades and methodologies to which the ponds are reclaimed. Future use, where practical, may include installation of solar panels which would not require a completely flat surface. Stormwater drainage conveyance features would be designed to collect and direct clean stormwater offsite while minimizing the potential for erosion. Compaction requirements for the placement of borrow material would be included in the closure design for the ponds in accordance with OAC 252:616-13.

4.4 Source Reduction Through Final Landfill Closure

After the retirement of Unit #2, GRDA plans on progressing to the final closure of the CCR landfill. The current implementation plan includes maintaining a working cell in the landfill that would remain operational until the retirement of Unit #2. In the event the CCR landfill is closed prior to the cessation of operation of Unit #2, all generated CCR waste would be managed offsite in compliance with all applicable laws and regulations.

The landfill closure scope would incorporate all requirements specified in the revised permit dated 2/22/2018 and under OAC 252:517-15 including mechanisms to:

- Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;
- Preclude the probability of future impoundment of water, sediment, or slurry;
- Include measures that provide for major slope stability to prevent movement of the final cover system during the closure and post-closure care period;
- Minimize the need for further maintenance of the CCR unit; and
- Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices/controls.

The closure of the GRDA Landfill would be implemented in accordance with the following general steps:

1. The top of the CCR waste material would be graded and compacted to establish a stable subgrade for the construction of the final cover system. Subgrade elevations would not exceed the maximum allowable top of waste elevations as determined by the approved closure grading plan.
2. A twenty-four (24) inch thick compacted barrier layer consisting of clay soil would be placed over the prepared subgrade.
3. A minimum of twelve (12) inches of soil capable of sustaining native plant growth would be placed over the compacted barrier layer.
4. Native plant cover would be installed through seeding, sprigging, or sodding of the site.
5. Soil and vegetative cover of the southern and western exterior slopes that was installed earlier would be inspected and restored, if necessary.

The following sections further describe the applicable closure requirements and procedures.

Final Cover System

The purpose of the final cover system is to control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste thereby minimizing the release of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere.

Based on the existing DEQ approved landfill Closure Plan, the permitted landfill would require final closure. If closure is required prior to the utilization of the entire permitted area, this plan would be revised, and a revised closure design would be developed. Prior to the closure of the GRDA Landfill, updated engineered construction drawings and specifications would be prepared for closure construction and submitted to ODEQ for approval prior to commencing closure activities.

The final cover system, as described above, consists of a clay barrier layer, an erosion layer and vegetative cover. Prior to final cover system construction, the top of the CCR waste material is graded and compacted to establish a firm subgrade for final cover construction.

Barrier Layer

The clay barrier layer consists of at least twenty-four (24) inches of earthen material constructed in six (6) inch compacted lifts over the prepared subgrade. The clay barrier layer is to have a hydraulic conductivity no greater than 1 x 10-5 cm/sec.

The barrier layer soils meet the following standards:

- Plasticity Index (ASTM D4318): Plasticity index would be greater than or equal to 10%.
- Liquid Limit (ASTM D4318): Liquid Limit would be greater than or equal to 24%.
- Percent Fines (ASTM D422): Percent fines passing the #200 mesh sieve would be greater than or equal to 30%.
- Gravel Amount (ASTM D422): The amount of gravel (dry-weight percentage retained on the No. 4 sieve) would be less than or equal to 20%.
- Particle Size: Particle size would be less than one inch in diameter.
- Water Content: After the soil is compacted, the water content of the soil would be equal to or greater than optimum moisture.
- Soil Density: After the soil is compacted, the minimum density of the soil would be greater than or equal to:
- 95% of the standard proctor density (ASTM D698); or
- 90 % of the modified proctor density (ASTM D1557).

Soil having characteristics within the above limits are workable, good for erosion control and suitable for attaining proper grading. This soil would help minimize liquid infiltration and leachate generation. The soil characteristics for the clay cover soils would be tested at a minimum rate of one sample per 10,000 cubic yards for conformance.

Erosion Layer

The erosion layer is being installed above the barrier layer and consists of at least twelve (12) inches of soil capable of sustaining native plant growth.

Vegetation Cover

A permanent vegetative cover is being established with plant species that are of equal or superior utility to native vegetation during each season of the year. Permanent vegetation already in place has been shown to be effective, long-lasting and capable of self-regeneration and plant succession. Deep-rooted plants, trees, or other similar vegetation should not be allowed to thrive on the final cover.

Final Cover Gradient

The final cover gradient on top of the fill, as measured from the center of the fill area to the break in slope between the top and sides of the fill, is constructed to not exceed four (4) percent (25:1) to prevent the erosion of cover. Final side slopes of the fill are established to not exceed twenty-five (25) percent grade (4:1). Surface contours, including the final grading of completed disposal areas, have been constructed to prevent ponding of water and erosion of fill areas.

Final Certification

Upon completion of the final closure, a certification of final closure as specified in [OAC 252:517-15-7(f)(3)] would be prepared by a qualified professional engineer verifying that the closure has been completed in accordance with the Closure Plan, engineering design and applicable regulations. The certification of final closure would include as-built drawings for the final cover system with elevations and thickness of each layer as verified by a professional land surveyor during construction.

Post Closure Monitoring

As specified in the Closure Plan, the CAMP associated with EMNA will continue until concentrations of landfill COCs have not exceeded the groundwater protection standards for a period of three years using statistical procedures and performance standards in OAC 252:517-9-4(f) and (g).

5.0 CORRECTIVE MEASURES IMPLEMENTATION SCHEDULE

OAC 252:517-9-8(d) requires that GRDA specify as part of the selected remedy a schedule(s) for implementing and completing remedial activities. The schedules presented below documents milestones and durations for the completion of interim and final remedial activities within a reasonable period of time taking into consideration the factors set forth in paragraphs OAC 252:517-9-8 (d) (1) through (6).

The schedule is predicated on key milestones which include plan approvals by ODEQ and decisions by GRDA for the schedule to retire Unit #2 based on Presidential Executive Orders, electric grid reliability, and other critical infrastructure considerations, timeline for new power generation equipment and technologies (solar, Battery Energy Storage Systems, or gas fired boilers), protection of the environment along with current and future environmental regulations.

5.1 Schedule for Interim Remedy 1 EMNA

The schedule for EMNA assumes Day Zero (0) will begin with the approval of this CMIP.

Schedule to Implement Interim Remedy 1 - Monitored Natural Attenuation with Enhanced Monitoring	
Task Description	**Schedule Duration/Milestone**
Submit Corrective Measures Implementation Plan	**11-Apr-25**
ODEQ Review and Approves Plan	**Day 0**
Begin Enhanced Monitored Natural Attenuation Upon Approval of CMIP	Day 0 + 1
Submit Corrective Action Groundwater Monitoring Plan (CAMP)	Day 0 + 90
ODEQ Review and Approve CAMP	
Install Sentinel Monitor Wells	0 to 15 days after CAMP approval
GRDA to submit Monitor Well Installation Report	30 - 45 days after CAMP approval
Quarterly Monitoring of Sentinel Monitor Wells	2 Years (8 quarters)
Landfill Groundwater Monitoring	Semi-Annually
Enhanced Monitored Natural Attenuation	At least 3 years *

*MNA with EMN will continue until concentrations of landfill COCs have not exceeded the groundwater protection standards for a period of three years using statistical procedures and performance standards in OAC 252:517-9-4(f) and (g).

5.2 Schedule for Preparation to Complete Final Remedy 1

The schedule outlines tasks necessary for planning and preparation to complete Final Remedy 1. It assumes Day 0 will begin with the approval of this CMIP.

Schedule for Preparation to Complete Final Remedy 1 Source Reduction through Final Landfill Closure	
Task Description	**Schedule Duration/Milestone**
Submit Corrective Measures Implementation Plan	**11-Apr-25**
ODEQ Review and Approves Plan	**Day 0**
Supplemental Site Survey	Complete
Bathymetric Study of Wastewater Ponds	Complete
Stormwater and Surface Modeling of Current Conditions	Complete
Pre-Execution Engineering Study and Data Collection	Day 0 + 356 days
Submit Notice of Intent to Close Ponds	Milestone
(90 days before closing operation of treatment unit)	Day 0 + 390
Submit Closure Plan	Milestone
(90 days before closure activities commence)	Day 0 + 390 days
Submit Pre-closure sampling and analysis plan	Milestone
(30 days before pre-closure sampling activities)	Day 0 + 450 days

5.3 Schedule for Interim Remedy 2

Schedule assumes Day 0 will begin when GRDA completes engineering study, data collection and notifications.

Schedule for Interim Remedy 2 Pond Closure/Sediment Cleanout of Nearby Wastewater Ponds	
Task Description	**Schedule Duration/Milestone**
Completion of the engineering study, data collection and notification*	**Day 0**
Interim Remedy 2- Pond Closure/Sediment Cleanout of nearby wastewater ponds and MNA with Enhanced Monitoring	Day 0 + 45
Begin sediment removal and closure of Pond F08-2	Day 0 + 55 days
Complete sediment removal and closure of Pond F08-2	Day 0 + 100 days
Begin sediment removal and closure of Pond F08-1	Day 0 + 100 days
Complete sediment removal and closure of Pond F08-1	Day 0 + 155 days
Begin sediment removal and closure of Pond F04	Day 0 + 155 days
Complete sediment removal and closure of Pond F04	Day 0 + 210 days
Begin sediment removal at Pond F07	Day 0 + 210 days
Complete sediment removal at Pond F07	Day 0 + 300 days

*GRDA will implement Interim Remedy 2 after completion of the engineering study, data collection and notifications shown in Section 5.2

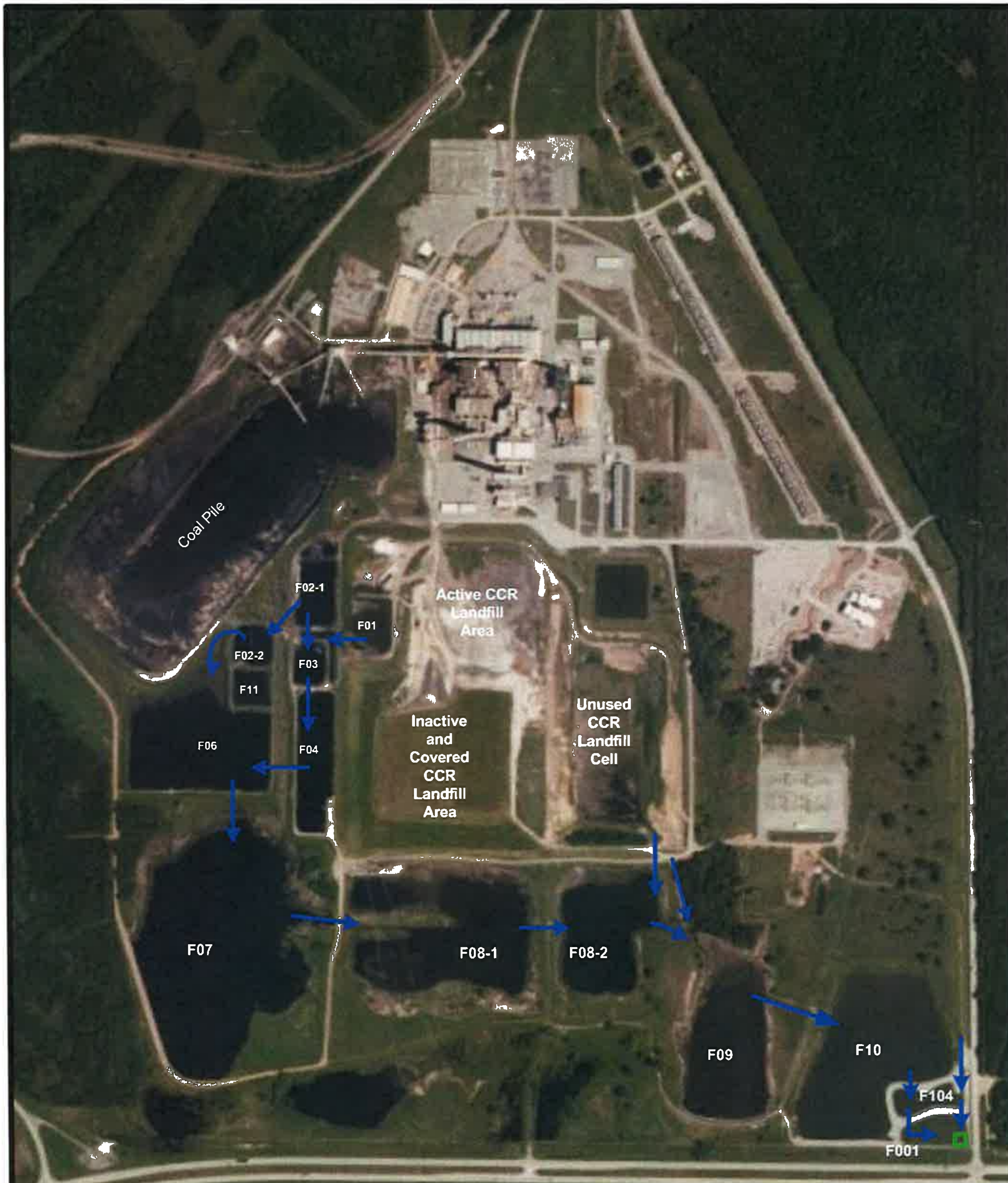
5.4 Schedule for Final Remedy 1

Schedule assumes Day 0 will begin when GRDA makes the determination to close the CCR landfill.

Schedule for Final Remedy 1 – Source Reduction through Final Landfill Closure	
Task Description	**Schedule Duration/Milestone**
GRDA makes the determination to close the CCR landfill and notifies ODEQ	**Day 0**
Source Reduction through Landfill Closure	Day 0
Grading and Installation of Final Cover	Day 0 + 35
Install Barrier Layer	Day 0 + 75
Install Erosion Layer	Day 0 + 100
Install Vegetation Cover	Day 0 + 115
Confirm Final Grade	Day 0 + 140
Final Certification	Day 0 + 185

GRDA currently plans to keep the landfill open until pond closure is complete for disposal of sediments from the ponds

FIGURES



Grand River Dam Authority
Surface Water Model
Chouteau, Oklahoma

Impoundment Water Flow Direction

Monitored Outfall Location to Grand Neosho River

N

Not to Scale

ENERCON

Figure 1
Impoundment Water Flow Pattern

Project No: GRDA-00036

Grand River Dam Authority
Grand River Energy Center
Mayes County, Oklahoma

Legend:
Monitor Well

ENERCON

Figure 2
Site Location Map and Monitor Well Locations

Project No: GRDA-00036

Grand River Dam Authority
Grand River Energy Center
Mayes County, Oklahoma

Legend:

- Monitor Well
- Proposed New Groundwater Monitoring Wells

N

ENERCON

Figure 3
Monitor Well Locations and Proposed New Groundwater Monitoring Wells

Project No: GRDA-00036