



**STRUCTURAL INTEGRITY  
CRITERIA & HYDROLOGIC/  
HYDRAULIC  
CAPACITY ASSESSMENT  
MERAMEC ENERGY CENTER**

*Meramec Energy Center  
8200 Fine Road  
St. Louis, MO 63129*

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# STRUCTURAL INTEGRITY CRITERIA & HYDROLOGIC/ HYDRAULIC CAPACITY ASSESSMENT - MERAMEC ENERGY CENTER

## I. Introduction

Ameren Missouri has evaluated the Meramec Energy Center's ("Meramec") active surface impoundments in accordance with the following operating and design criteria requirements:

§257.71, Liner Design Criteria;  
§257.73(c)(1), History of Construction;  
§257.73(a)(2), Periodic Hazard Potential Classification;  
§257.73(d)(1), Periodic Structural Stability Assessment;  
§257.73(e)(1), Periodic Safety Factor Assessment;  
§257.82, Initial Hydrologic and Hydraulic Capacity Requirements; and

For this initial assessment, Ameren Missouri retained the engineering firm Reitz & Jens, Inc. to evaluate Meramec's active surface impoundments to determine whether such units conform to good engineering practices<sup>1</sup> with respect to the following criteria: liner design criteria; hazard potential classification; structural stability assessment; safety factor assessment; and initial hydrologic and hydraulic capacity requirements. Such criteria will be reassessed every five years until such time as the units are closed in accordance with regulatory requirements. Engineering calculations, diagrams modeling, and work papers supporting this assessment have been placed in the facility's operating record.

## II. Background

### A. Active Ponds

Meramec utilizes four (4) active surface impoundments for the management of process waters along with fly and bottom ash; Pond 498 (fly ash) and Ponds 492, 493 and 496 (bottom ash). Such impoundments have been identified as follows: *MCPD (498)*; and *MCPB (493)*, *MCPA (492)* and *MCPC (496)*. The facility also uses a Retention Pond to manage stormwater and discharge waters from the active ponds, but such impoundment does not collect or manage CCR and is not subject to 40 CFR §257 requirements.

Ameren Missouri redeveloped MCPD in 2002 as an above grade, lined impoundment located within the footprint of the original 1950's vintage ash ponds which had been deactivated years earlier. MCPA, MCPB and MCPC were constructed in the 1950s, are interconnected, and two of the ponds (MCPA and MCPC) are incised. The location of the Meramec Energy Center is depicted on Figure

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<sup>1</sup> Based on engineering codes, widely accepted standards, or a practice widely recommended through the industry. See 40 CFR 25.53, *Definitions*.

1, United States Geological Services (“USGS”) topographical quadrangle map. Various design and operational features of the CCR units, including water flow path, is set forth on Figure 2.

### **B. Embankment Levee**

The plant and all impoundments are contained within an approximate 6,500 foot perimeter embankment constructed in various phases beginning in the 1950s. Portions of the embankment levee have been armored with riprap installed in stages. The exterior sides of the active pond MCPB have been armored with riprap.

In 2000, Ameren Missouri constructed a rail line adjacent and parallel to the perimeter embankment. The rail loop bifurcates a portion of MCPB. The embankment and rail line are depicted on Figure 2. The height of the perimeter embankment varies, but in the vicinity of the bottom ash ponds is approximately 24.7 feet from the toe to the crest. All active impoundments are offset at least 1,400 feet from the Meramec River and further separated from the river by out-of-service impoundments. No residential homes, businesses or lifeline facilities are located down gradient of the ponds. Meramec’s nearest neighbor is the Metropolitan Sewer District wastewater treatment plant located upstream (north) of the facility.

## **III. Structural Integrity Assessment**

### **A. Liner Design Criteria – 40 CFR §257.71**

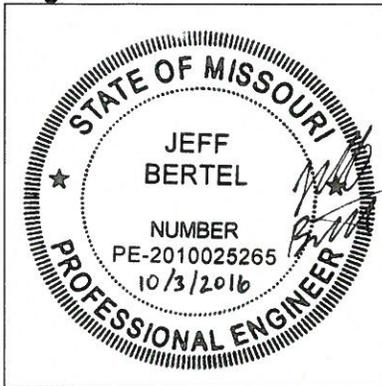
For existing CCR surface impoundments constructed with liner systems, an owner/operator of such units must determine if such liner complies with the specified design and performance standards. At Meramec, only MCPD was constructed with a liner system: 60 MIL HDPE on the slopes and 40 MIL HDPE on the bottom. The existing liner system does not satisfy the required design criteria set forth in *40 CFR 257.71* in that it does not have a 2-foot layer of compacted soil with hydraulic conductivity of no more than  $1 \times 10^{-7}$  cm/sec.

**1. Engineering Certification – Liner Design Criteria for Existing CCR Surface Impoundments**

The existing CCR surface impoundments MCPA, MCPB, MCPC and MCPD at the Meramec Energy Center were evaluated to determine if they were constructed with a liner which meets the requirements of §257.71, Liner Design Criteria for Existing CCR Surface Impoundments. The existing liner system does not have a 2-foot layer of compacted soil with hydraulic conductivity of no more than  $1 \times 10^{-7}$  cm/sec.

CCR Unit	Existing liner meets requirements of 40 CFR 257.71
MCPA, MCPB and MCPC	No
MCPD	No

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## B. Periodic Hazard Potential Classification – 40 CFR §257.73(a)(2)

Every five (5) years, an owner or operator of a coal combustion residual (“CCR”) unit must update the hazard potential of CCR units and certify the results by a qualified professional engineer. The classification categories are based upon criteria established by the Federal Emergency Management Agency (FEMA) and range as follows: *low hazard potential, significant hazard potential, and high hazard potential*. The FEMA classification system categorizes a dam based on the probability of loss of human life and the impacts on economic, environmental, and lifeline facilities should the dam fail. The specific categories are defined as follows:

- (1) *High hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation will probably cause loss of human life.*
- (2) *Significant hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.*
- (3) *Low hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner’s property.*

### 40 CFR §257.53

All of the active ponds at Meramec are classified as having a *low hazard potential* because any structural failure would not be expected to cause a loss of human life.

- **MCPD** - Failure of *MCPD* would result in a release of water and CCR into surrounding CCR units and thus be contained predominantly onsite. In the event of such a failure, loss of life or significant environmental damage would not be expected.
- **MCPA, MCPB, MCPC** are located east of *MCPD* and out-of-service *Pond 490* and north of the power plant building. For a release to occur at these units the perimeter levee would need to fail or overtop. In such a circumstance, the preferential pathway of such a release would be into the low flow tributary of the Meramec River located on the northern edge of the property. The embankment in this area has been armored with rip rap and positive drainage created. Failure of the impoundment is not expected to cause a loss of human life, and the economic, environmental and lifeline losses are expected to be low.

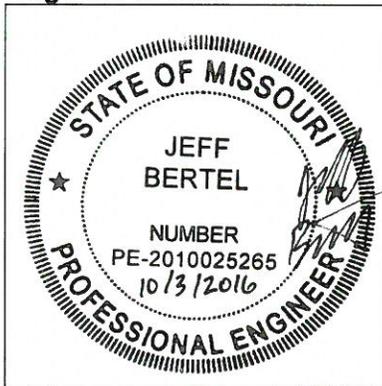
Since none of the active impoundments are classified as *high or significant potential hazards*, an emergency action plan does not need to be prepared. The hazard classification of these units must be re-evaluated every five (5) years.

**1. Engineering Certification – Periodic Hazard Potential Classification**

The 2015 Periodic Hazard Potential Classification Assessment was conducted for active CCR surface impoundments MCPA (Pond 492), MCPB (Pond 493), MCPC (Pond 496), and MCPD (Pond 498) at the Meramec Energy Center was conducted in accordance with the requirements of 40 CFR 257.73(a). These CCR surface impoundments are low hazard potential because failure of the impoundment is not expected to cause a loss of human life, and the economic, environmental and lifeline losses are expected to be low. The hazard potential classification was completed in general accordance with *Federal Guidelines for Dam Safety: Hazard Potential Classification for Dams* by the Federal Emergency Management Agency (January 2004). The engineering support for this certification has been placed in the operating record.

CCR Unit	Hazard Potential Classification
MCPD (Pond 498)	Low
MCPA (Pond 492), MCPB (Pond 493), MCPC (Pond 496)	Low

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### **C. Periodic Structure Stability Assessment – 40 CFR §257.73(d)**

The owner or operator of a CCR unit must inspect and certify that the design, construction, operation and maintenance of a CCR unit are in accordance with good engineering practices. Such engineering assessment includes the following: stable foundations and abutments; slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown; berm compaction is sufficient to withstand the range of loading conditions, including low pool of an adjacent water body or sudden drawdown; adequately vegetated slopes and surrounding areas; adequate spillway capacity, operation and maintenance; spillways constructed, operated, and maintained to adequately manage the design flow event; and structural integrity and functionality of hydraulic structures underlying the base of CCR unit or passing through the dike.

The active ponds are protected by a perimeter embankment that has been armored with rip rap. Vegetative cover and riprap exists on the interior slopes of MCPB. MCPD's downstream slopes are vegetated, and the upstream slopes are covered with a synthetic liner. MCPA and MCPC are incised. Vegetative management protocols are set forth in the Operations and Maintenance Procedures and have been implemented so as to minimize erosion while facilitating the visibility of slopes during inspections.

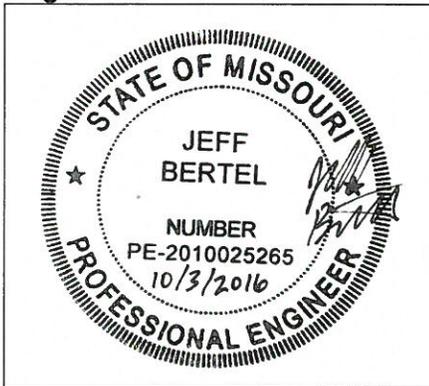
The engineering team visually inspected the interior and exterior embankment slopes of the active surface impoundments, and reviewed pertinent geotechnical data. Reitz & Jens visually inspected berm foundations for signs of instability. None were observed. In addition, hydraulic structures (i.e. spillways, overflow pipes and ditches) were inspected to confirm proper maintenance and operation. No significant deficiencies of the structures were observed. (Some of the piping was under water and not available for visible inspection.) Recommended and ongoing activities include general maintenance (i.e. seeding for vegetative cover) and monitoring (e.g. spillways, submerged piping, pond levels, wet areas near berms, and installation of staff gauge to maintain pool levels).

**1. Engineering Certification – Periodic Structural Stability Assessment**

The 2015 Initial Periodic Structural Stability Assessment was conducted for the active CCR surface impoundments MCPA (Pond 492), MCPD (Pond 493), MCPC (Pond 496), and MCPD (Pond 498) at the Meramec Energy Center. The structural stability assessment was completed in general accordance with 40 CFR Part §257.73(d)(1). Assessment of all four CCR Units found no structural stability deficiencies, no significant issues with the current operations and maintenance, and that the design and construction are adequate, however some corrective measures were recommended. The engineering support for this certification has been placed in the operating record.

Requirement	MCPA (Pond 492), MCPB (Pond 493), and MCPC (Pond 496)	MCPD (Pond 498)
Initial periodic assessment was completed in general accordance with the requirements of 40 CFR Part §257.73(d)(1)	Yes	Yes

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D. **Safety Factor Assessment – 40 CFR §257.73(e)**

All active CCR units must have calculated Factors of Safety (FOS) that meet or exceed the following designated values:

**Table 1**

<b>Loading Conditions</b>	<b>Minimum FOS</b>
Maximum Storage Pool	1.50
Maximum Surcharge Pool	1.40
Seismic	1.00
Liquefaction	1.20

Reitz & Jens performed stability analysis on the active CCR surface impoundments and calculated the following values:

**Table 2**

<b>Ponds</b>	<b>Maximum Storage Pool (FOS)</b>	<b>Maximum Surcharge Pool (FOS)</b>	<b>Seismic (FOS)</b>	<b>Liquefaction (FOS)</b>
<b>MCPD</b>	2.21	2.22	1.18	1.62
<b>MCPA</b>	1.71	1.62	1.45	1.77
<b>MCPB</b>	1.71	1.62	1.45	1.77
<b>MCPC</b>	1.71	1.62	1.45	1.77

The calculated factors of safety for the critical cross-section at each CCR unit identified above **meet or exceed** the minimum factors of safety for each loading condition required by 40 CFR §257.73(e).

**1. Engineering Certification – Safety Factor Assessment**

The 2015 Periodic Safety Factor Assessment was conducted for the active CCR surface impoundments MCPA (Pond 492), MCPB (Pond 493), MCPC (Pond 496), and MCPD (Pond 498) at the Meramec Energy Center. The Periodic Safety Factor Assessment for each active CCR Unit at the Meramec Energy Center shows that the critical cross section for these Units meet or exceed the minimum factors of safety specified in 40 CFR Part §257.73(e)(1) as summarized below. The engineering support for this certification has been placed in the operating record.

Requirement	MCPA (Pond 492), MCPB (Pond 493), and MCPC (Pond 496)	MCPD (Pond 498)
The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.	≥1.50	≥1.50
The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.	≥1.40	≥1.40
The calculated seismic factor of safety must equal or exceed 1.00.	≥1.00	≥1.00
The calculated liquefaction factor of safety must equal or exceed 1.20.	≥1.20	≥1.20

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### E. Hydrologic and Hydraulic Capacity Requirements - 40 CFR §257.82

Flood control system plans must be adequate to manage the inflow from a designated flood event. Such plans must be updated and verified every five (5) years. The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge from the design flood event.

Pertinent data regarding the active surface impoundments is set forth below:

**Table 3**

CCR Unit	Maximum Surface Area (acres)	Levee Crest Elevation (feet)	Crest Length (feet)	Normal Pool Elevation (feet)	Maximum Surcharge Pool (feet)	Upstream Slope Steepness (H:V)	Downstream Slope Steepness (H:V)
<b>MCPD</b>	13.5	423.0	3,320	418.0	420.0	3H:1V & 4H:1V	3H:1V
<b>MCPB</b>	6.9	413.2	1,200	409.5	411.3	Unknown	2:1
<b>MCPA</b>	6.1	Incised	NA	410.3	412.7	NA	NA
<b>MCPC</b>	5.9	Incised	NA	410.3	412.7	NA	NA

Reitz & Jens performed a modeling analysis using the 100-year flood event for low hazard potential surface impoundments as the design flood as required by 40 CFR §257.82(a)(3)(iii). The hydrologic and hydraulic modeling analysis assumed rainfall of 7.21<sup>2</sup> inches as an estimated 24-year, 100-year precipitation event. As depicted on Figure 2, water flows from the incised ponds (MCPC and MCPA) to MCPB before passing through primary and secondary spillway pipes to the Retention Pond. Reitz & Jens modeling analysis assumed only the secondary spillway was functional. From MCPD, the water flows to a retention pond prior to discharging in a permitted outfall.

For the bottom ash system (*MCPA, MCPB and MCPC*), peak pool (maximum surcharge) levels within the ponds are estimated to occur in 24.5 hours after the start of the storm event. Peak water levels during a 100-year flood event are projected to rise to elevation 411.3 feet, 1.9 feet below the crest of MCPB. The pool level should return to within 0.2 feet of the normal pool elevation within about 120 hours. For the fly ash pond (*MCPD*), peak pool level occurs in 16.2 hours. Maximum flow through the MCPD outlet works at peak pool is approximately 10.63 cfs. Based on the model, the peak water level during a 100-year flood event would rise to elevation 418.4 feet, 4.6 feet below the crest of MCPD; therefore, MCPD has adequate storage to contain such an event provided that the outlet works remain functional. Normal pool levels resumed approximately 24 hours after a 100-year flood event. Accordingly, the facility's inflow design control system adequately manages flow through the CCR units during and following a 100-year flood event as required by 40 CFR §257.82. Outlet works and spillways should be maintained in proper condition to ensure normal pool elevation and to lower pool levels if necessary. The CCR in the ponds will be managed so that the available storage is at least as great as that assumed in the hydrologic and hydraulic models.

<sup>2</sup> Huff, F.A. and J.R. Angel. (1992). "Rainfall Frequency Atlas of the Midwest." Bulletin 71, Midwestern Climate Center and Illinois State Water Survey.

## F. **Inflow Design Flood Control System Capacity Plan**

The initial inflow design flood control system has been evaluated for both the fly ash (MCPD) and bottom ash system (MCPA, MCPB, and MCPC) at the Meramec Energy Center. Based on the hydrologic and hydraulic capacity calculations, the inflow control system for these ponds can adequately handle and discharge the 100-Year design flood event. Specifically, 1.9 feet of freeboard exists in MCPB and 4.6 feet in MCPD. So as to properly maintain such inflow storage capacity, the following measures of the *Inflow Design Flood Control System Plan* have been incorporated into the Operations and Maintenance Manual and should be observed:

- **MCPD** - normal pool elevation should be maintained no higher than elevation 418 feet to maintain a maximum surcharge pool at elevation 420 feet.
- **MCPB** - normal pool elevation should be maintained no higher than elevation 409.5 feet to maintain a maximum surcharge pool at elevation 411.3 feet.
- **MCPA and MCPC** - normal pool elevation should be maintained no higher than elevation 410.3 feet to maintain a maximum surcharge pool at elevation 412.7 feet.
- If the water levels exceed the maximum surcharge pool elevations, special inspections by the Dam Safety Group of the primary spillways should be completed, and temporary measures implemented to prevent the water from overtopping the Pond embankments until the primary spillways are functioning as designed. Such measures could include cessation of generation, the addition of fill, sandbags, pumps, siphons, etc.
- Prior to the next scheduled evaluation of the Periodic Inflow Design Flood Control System Plan, topographic surveys should be completed on the interior of all active ponds to confirm the necessary water storage is available.
- Staff gage readings should be recorded during weekly inspections to confirm the assumed normal pool elevations.

**1. Engineer's Certification – Hydrologic and Hydraulic Capacity**

The initial inflow design flood control system plan was completed for the active CCR surface impoundments MCPA (Pond 492), MCPB (Pond 493), MCPC (Pond 496), and MCPD (Pond 498) at the Meramec Energy Center. The initial inflow design flood control system plan was completed in general accordance with 40 CFR Part §257(e)(1) using the 100-year design flood for low hazard potential CCR surface impoundments.

Requirement	MCPA (Pond 492), MCPB (Pond 493), and MCPC (Pond 496)	MCPD (Pond 498)
The initial inflow design flood control system plan meet the requirements of 40 CFR Part §257.82	Yes	Yes

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**IV. Construction Summary – 40 CFR 257.73(c)**

The Meramec Energy Center is located in St Louis County at the confluence of the Mississippi and Meramec Rivers. At their confluence, the Mississippi River and Meramec Rivers have watershed areas of approximately 448,000,000 and 1,375,360 acres, respectively. River levels typically vary between el. 369 feet and el. 406.5 feet.

## A. **Owner and Operator**

The CCR Units at the Meramec Energy Center are owned and operated by Ameren Missouri. MEC plant personnel have the primary responsibility of CCR unit operation. The Meramec Energy Center is located at 8200 Fine Road in St. Louis, Missouri 63129. The Ameren Missouri Dam Safety Group performs CCR unit inspections, and reviews all updates to the Operations and Maintenance Manual.

## B. **Bottom Ash System (MCPA, MCPB, MCPC) (1950s)**

In the 1950's, Ameren Missouri constructed pond system MCPA, MCPB and MCPC to manage bottom ash from the plant's boilers and waste water from the facility's combined drain sumps (CDS). Construction and engineering drawings from that period are not available. Sluice waters are conveyed through the ponds via interior ditches that run in a south to north direction. Flow passes through the interconnected ponds from MCPC, to MCPA, and then to MCPB. Water levels in MCPA is controlled by two culverts through interior berms and fitted with knife gates. Water levels in MCPB are controlled by an 18" carbon steel primary discharge pipe. MCPB also has a secondary spillway in the form of a 24" corrugated metal pipe that discharges into a 6-foot wide bottom with 2H:1V sides that ultimately discharges into the Retention Pond. The assumed maximum depth of CCR in the bottom ash system is approximately 14-16 feet. From the Retention Pond, flows are then discharged via Outfall #3 into a tributary located on the north edge of the property. The outfall is located approximately 0.25 miles upstream of the Meramec River.

### 1. *Foundation and Abutment Geology (MCPB)(1950s)*

Boring logs in the vicinity of bottom ash pond show the uppermost stratum is generally lean clay with a thickness of 25 to 45 feet. The exception is at the south end of MCPC where a thin layer of sand was observed above the lean clay. Plant borings show the lean clay is generally firm to stiff. The lean clay is underlain by 6 to 35 feet of high plastic clay, which has a soft to stiff consistency. Beneath the high plastic clay, loose to dense sand and gravel was observed to the top of limestone bedrock which is encountered at elevations ranging from 306 to 310 feet.

### 2. *Embankment Material (MCPB)(1950s)*

There are no construction documents or records, or borings through the MCPB exterior embankment. Borings through adjacent pond embankments of the same time period show the fill material generally consists of brown and gray clays and silts of alluvial origin, which were presumably excavated from the incised portions of the ash ponds. Generally the consistency of the fine-grain fill is firm to stiff.

### 3. *Spillway and Embankment Levee Modification (MCPB) (1970s)*

In the late 1970's, Ameren Missouri raised the northern portion of MCPB's levee embankment approximately 0.5 to 2.5 feet and added fill to flatten the downstream slope to a gradient of 2H:1V. Compaction specifications required fill material to be placed in 6-inch layers and compacted to 95% Modified Proctor Density. In addition, the then-existing spillway (located in MCPB) was abandoned and replaced with a 764 feet long carbon steel spillway pipe which routes discharge waters to a Retention Pond also constructed in the 1970s.

#### *4. Railroad Embankment (MCPA, MCPB, MCPC) (2000)*

In 2000, Ameren Missouri completed construction of a railroad loop along the perimeter of the property and enlarged and flattened the downstream slope of MCPB. The rail loop bifurcates sections MCPB and MCPC, physically segregated those sections from the primary units. The railroad embankment was constructed using shot rock fill where it crosses the ponds. Where the alignment was common with the perimeter embankment, soil fill was used and sloped 2H:1V (upstream) and 3H:1V (downstream). The cutoff portions of MCPB and MCPC are filled with CCR. MCPC is currently used as a gravel covered parking lot. While physically segregated, the cutoff section of MCPB remains hydraulically connected to the pond.

#### *5. Erosion Control (MCPB) and CDS Re-route (MCPC) (2012)*

In 2012, Ameren Missouri armored the downstream slope of MCPB with riprap to improve stability and provide erosion protection for tributary floods. The slope gradient of this riprap area is 2H:1V. In addition, limestone rock fill was placed on top of the embankment for use as an access road adjacent to the rail line. The combined drain sump was rerouted from a now out-of-service pond via 20-inch HDPE pipe into MCPC.

#### *6. Pond Overflow (MCPB) (2013)*

In 2013, Ameren Missouri constructed a secondary spillway overflow pipe and overflow ditch from MCPB to the Retention Pond. The construction included 24-inch CMP pipe that discharges into an overflow ditch (2H:1V side slopes) lined with rip-rap. Water in the overflow ditch is collected in a 24-inch steel casing pipe and discharged into the retention pond.

#### *7. Staff Gage and Erosion Control (MCPB) (2015)*

In 2015, Ameren Missouri installed a staff gage near the principal spillway to monitor pond water level and additional rip-rap was placed on the downstream slope of MCPB. The area downstream of the exterior slope was graded to create positive drainage away from the embankment. The entire downstream slope of the embankment is now armored with rip-rap.

### **C. Fly Ash System (MCPD) (2002)**

Dry fly ash is deposited within the MCPD and conditioned with process water piped from the energy center. MCPD was redeveloped in 2002 and located within the footprint of ponds constructed in the 1950s but have been filled and out-of-service. The pond is lined with 40 MIL HDPE on the bottom and 60 MIL HDPE on the interior slopes. Fly ash is deposited via an inlet pipe and flexible hosing which is periodically moved to designated cells areas within MCPD. The average and maximum depth of CCR in the fly ash system is approximately 19 and 38 feet, respectively.

### *1. Foundation and Abutment Geology (2002)*

The foundation for the MCPD perimeter berms consists of fly ash underlain by lean silty clay and high plastic clay. The bottom of the pond was built on top of natural clays at elevation 395 to 398 feet. The clay extends to approximate elevations 315 to 325 feet. The clay is underlain by sand and gravel to an elevation of approximately 310 feet, where limestone is encountered.

### *2. Embankment Material (2002)*

The perimeter berm is constructed of compacted fly ash above the ground surface, which was generally at about elevation 417 feet. Fly ash placed within the berm was moisture conditioned and compacted to a minimum of 95% of maximum density as determined by laboratory compaction tests. Additional fly ash fill was placed downstream of the perimeter berm. Downstream slopes of the embankment are 3:1; upstream slopes are 4:1 and 3:1 (west berm).

### *3. Spillway Modification (2011)*

Excess process water accumulates at an outlet works and timber stop log structure that discharges via 24-inch HDPE and carbon steel pipe into the Retention Pond. (The last 25 feet of piping consist of carbon steel). The stop log structure was added to the outlet works in 2011 to increase water levels and allow for management of the levels in 6-inch increments. A precast concrete manhole contains butterfly valves on the outlet pipe approximately 25 feet upstream from the point of discharge.

### *4. Staff Gage (2015)*

In 2015 a staff gage was installed. No other instrumentation has been installed and there are no historical records regarding pool levels. The staff gage is used to measure and record pool levels during weekly inspections. The outlet works include a timber stop log structure and drop inlet with a 24-inch HDPE pipe that discharges into the Retention Pond.

## **D. Surveillance, Maintenance and Repair of the CCR Units**

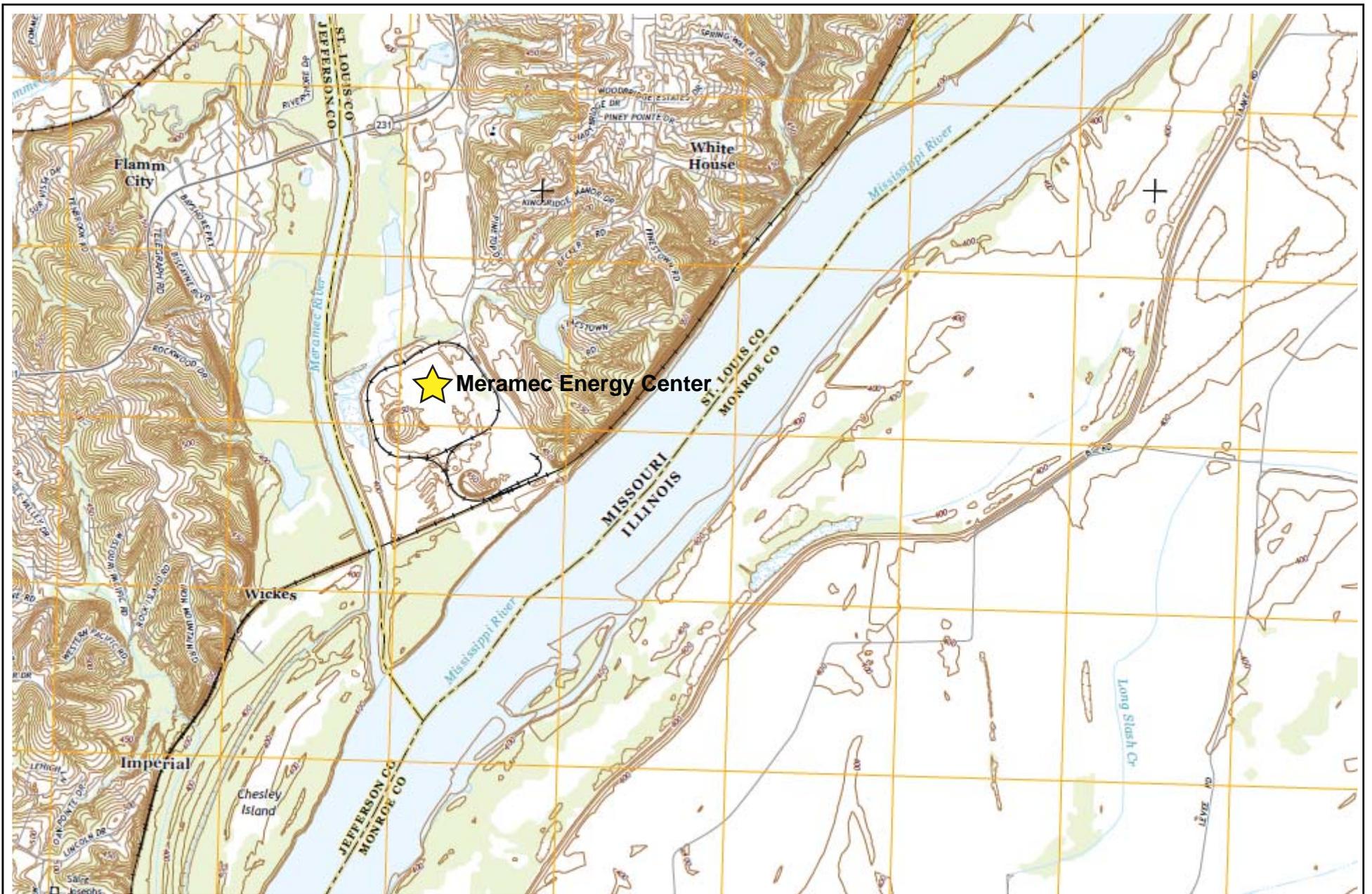
The Meramec Ash Pond Embankment Operations and Maintenance Manual outlines objectives, responsibilities, and procedures for Ameren personnel who are responsible for the management of the Meramec CCR units. The embankments of the CCR units are visually inspected weekly by Ameren plant operations staff. Ameren Missouri Dam Safety Group personnel perform annual inspections and periodic inspections or assessments with plant operations staff. In addition, the Ameren Missouri Dam Safety Group may conduct unannounced safety inspections.

The Operations and Maintenance Manual requires that timely repairs must be made after problem areas are identified. The plant engineer is to specify the work to be completed using Ameren's Work Control Process and provide direction to correct items noted in the operation and maintenance, and engineering inspections. The work request by the plant engineer will be reviewed with the Dam Safety Group to ensure proper emphasis has been placed on the request. The Operations and Maintenance Manual specifies the minimum maintenance activities and requires that maintenance activities be documented. The Operations and Maintenance Manual further specifies that no

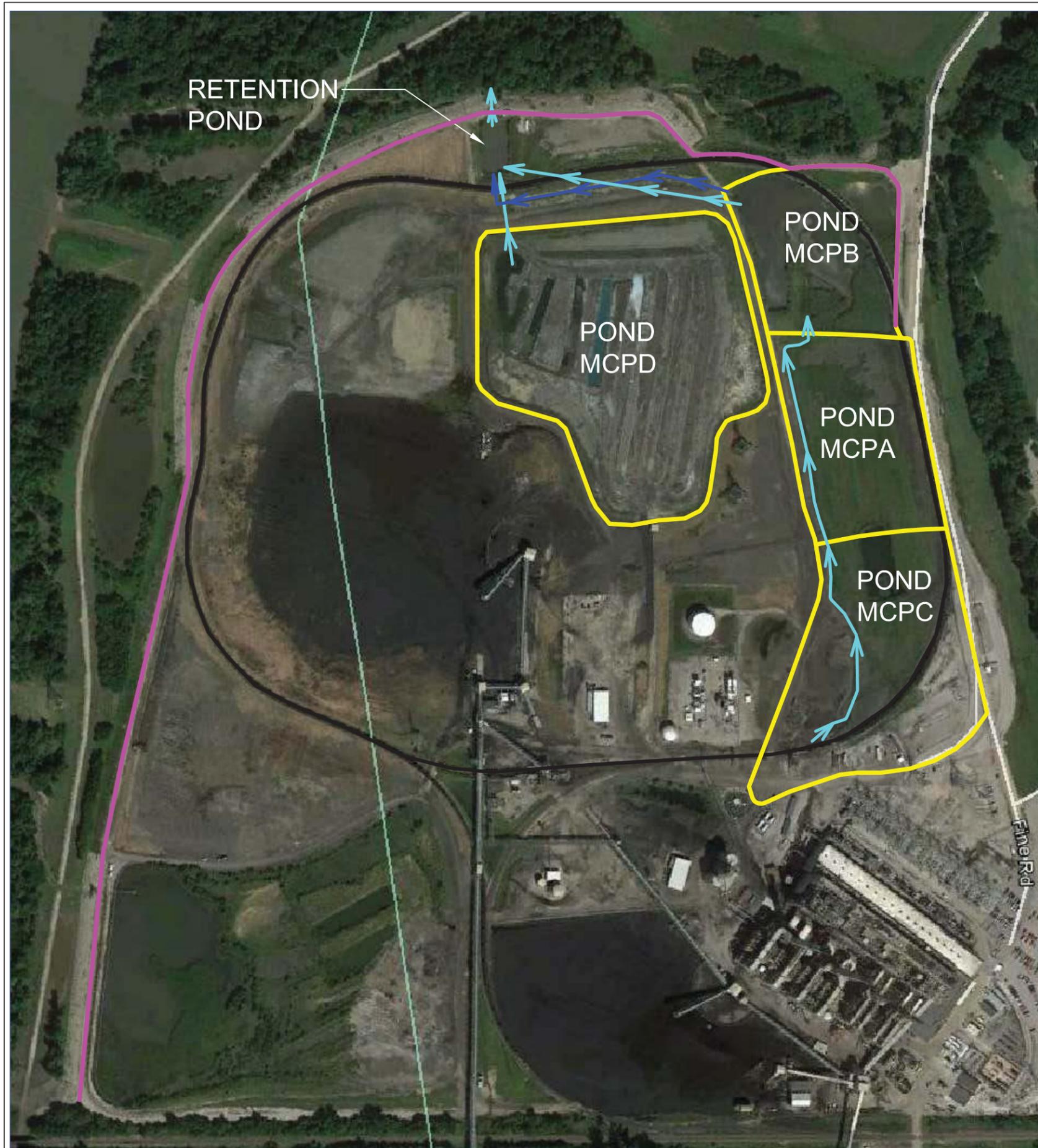
alterations or repairs to structural elements should be made without the approval of the Chief Dam Safety Engineer.

**E. Instrumentation**

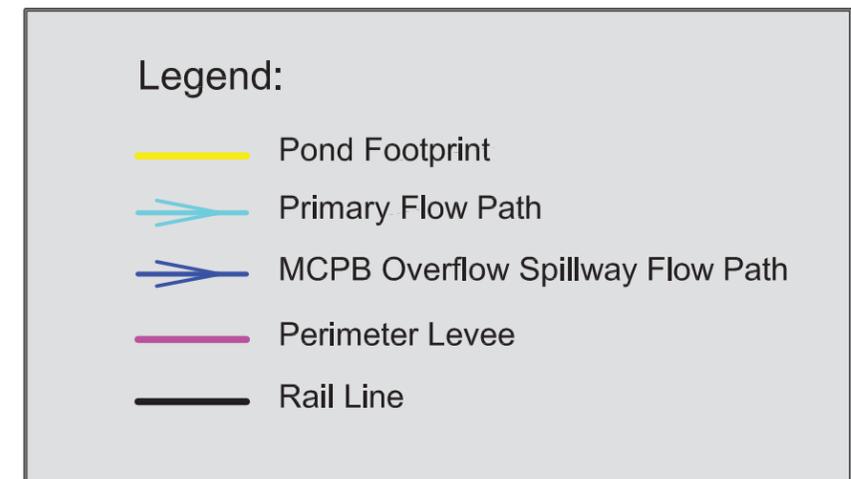
Staff gages were installed in the CCR units in late 2015. Pool level readings are documented in weekly inspection reports.



Ameren Missouri  
Meramec Energy Center  
CCR Unit Evaluation  
USGS 7.5 minute quadrangle map



CCR UNIT	MAXIMUM SURFACE ELEVATION (ACRES)	DAM CREST ELEVATION (FEET)	CREST LENGTH (FEET)	NORMAL POOL ELEVATION (FEET)	MAXIMUM SURCHARGE POOL (FEET)	UPSTREAM SLOPE STEEPNESS (H:V)	DOWNSTREAM SLOPE STEEPNESS (H:V)
MCPD	13.5	423.0	3320	418.0	420.0	3H:1V & 4H:1V	3H:1V
MCPB	6.9	413.2	1200	409.5	411.3	UNKNOWN	2H:1V
MCPA	6.1	INCISED	NA	410.3	412.7	NA	NA
MCPC	5.9	INCISED	NA	410.3	412.7	NA	NA



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 CCR Unit Evaluation  
 Figure 2 - Operational Data