AECOM

Periodic Structural Stability Assessment Report

Upper AQC Impoundment
La Cygne Generating Station

Evergy Metro, Inc.

October 2021

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Appendices

1. Introduction

1.1 Purpose

The purpose of this Periodic Structural Stability Assessment Report is to document whether the Upper AQC Impoundment at the Evergy Metro Inc. (Evergy) La Cygne Generating Station continues to meet the requirements of 40 CFR §257.73(d) of the Coal Combustion Residuals (CCR) Rule[1]. The Upper AQC Impoundment is an existing CCR surface impoundment as defined by 40 CFR §257.53.

1.2 Regulatory Requirements

In accordance with the CCR Rule, this assessment documents whether the design, construction, operation, and maintenance of the Upper AQC Impoundment is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the Upper AQC Impoundment has been designed, constructed, operated, and maintained in accordance with 40 CFR §257.73(d) referenced below. The periodic assessment must also identify any structural stability deficiencies associated with the Upper AQC Impoundment in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

This Periodic Structural Stability Assessment Report has been completed by October 11, 2021, five years after the Initial Structural Stability Assessment Report. Periodic structural stability assessments shall be prepared every five years. The date of completing the initial assessment is the basis for establishing the deadline to complete the first periodic assessment.

Regulatory Citation: 40 CFR §257.73(d) Periodic structural stability assessments. (1) The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:

(i) Stable foundations and abutments;

(ii) Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;

(iii) Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;

(iv) Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms of slope protection;

(v) A single spillway or a combination of spillways configured as specified in paragraph (d)(1)(v)(A) of this section. The combined capacity of all spillways must be designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in paragraph (d)(1)(v)(B) of this section.

(A) All spillways must be either:

(1) Of non-erodible construction and designed to carry sustained flows; or

(2) Earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or

(2) 1000-year flood for a significant hazard potential CCR surface impoundment; or

(3) 100-year flood for a low hazard potential CCR surface impoundment.

(vi) Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure; and

(vii) For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

(2) The periodic assessment described in paragraph (d)(1) of this section must identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

1.3 Brief Description of Impoundment

The La Cygne Generating Station is a coal-fired power plant located near La Cygne in Linn County, Kansas. The Station is located approximately 6.25 miles east of the city of La Cygne and is bordered to the west by La Cygnes Lake. The Upper AQC Impoundment is located on plant property. A site Location Map showing the area surrounding the station is in Figure 1 of Appendix A.

1.3.1 Design Operation and Construction

The original construction of the Upper AQC Impoundment was substantially completed in 1979. The Impoundment was constructed with embankments having an approximately maximum height of 50 feet and a crest elevation of 890 feet[2]. The embankments have 2.5 horizontal to 1.0 vertical side slopes. The ponding water has a surface area of approximately 17 acres at a current typical operating level of 869.5 feet and a surface area of approximately 98 acres at the zero-freeboard elevation of 889.0 feet. The unit currently has a substantial amount of material above existing water levels, and therefore a smaller water surface area, due to the closure in place process.

1.3.2 Outlet Structures

The principal spillway for the Upper AQC Impoundment is located at the south side of the impoundment and consists of a 6-foot-wide by 9-foot-long by 22-feet-high concrete riser fitted with stop logs. Stop logs are added or removed to manage operational water levels in the impoundment. The concrete riser is connected to a 30-inch corrugated metal pipe (CMP) that discharges to a concrete lined ditch that flows west and discharges into La Cygnes Lake.

The impoundment also has an auxiliary spillway. The auxiliary spillway is a 50 ft. wide riprap lined channel that extends over the crest of the embankment and along the downstream slope and discharges into a drainage swale. The design plans show that the opening for the spillway is 3 ft. lower than the top of embankment and has a 1 ft. thick, 66 ft. wide, 4 ft. deep seepage cut off wall at the inside crest. The auxiliary spillway discharges into a drainage swale that slopes downward to the west and discharges into La Cygnes Lake. The auxiliary spillway is functioning; however, to be conservative, the auxiliary spillway was not considered when analyzing the outlet from the Upper AQC Impoundment.

1.4 Assessment Approach

This periodic structural stability assessment was performed to document the design, construction, operation, and maintenance of the impoundment is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The analyses used: the Initial Structural Stability Assessment, subsurface information collected from recent and historic subsurface investigations and laboratory testing data; reviews of historical construction[2]; engineering drawings; site inspections by Evergy personnel; inspections of hydraulic structures[3], and geotechnical evaluations conducted by AECOM[4,5]. The following sections summarize the evaluations performed and the results from the analyses.

Table 1 cross references 40 CFR §257.73(d) with the assessment section.

Table 1. CCR Rule Cross Reference Table

Report Section	Title	CCR Rule Reference
2.1	Foundations and Abutments	§257.73 (d)(1)(i)
2.2	Slope Protection	§257.73 (d)(1)(ii)
2.3	Dike Compaction	§257.73 (d)(1)(iii)
2.4	Spillways	§257.73 (d)(1)(v)(A) and (B)
2.5	Stability and Structural Integrity of Hydraulic Structures	§257.73 (d)(1)(vi)
2.6	Downstream Slope Inundation/Stability	§257.73 (d)(1)(vii)
2.7	Structural Stability Deficiencies	§257.73 (d)(2)

2. Structural Stability Assessment

Regulatory Citation: 40 CFR §257.73(d)(1); Conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein.

A periodic structural stability assessment has been performed to document that the design, construction, and operation of the Upper AQC Impoundment is consistent with good engineering practices. The results of the structural stability assessment are discussed in the following sections.

2.1 Foundations and Abutments

CCR unit has been designed, constructed, operated, and maintained with stable foundations and abutments.

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by Evergy personal. Additionally, slope stability analyses[4,5] were performed by AECOM to evaluate slip surfaces passing through the foundations. The Upper AQC Impoundment is an enclosed impoundment with dikes (embankments) and does not have abutments. No changes to the foundation soils of this unit have been made over the past five years.

Based on this evaluation, stable foundations were designed and constructed at the Upper AQC Impoundment, and operational and maintenance procedures are appropriate to maintain the stable conditions. Therefore, the Upper AQC Impoundment meets the requirements presented in §257.73(d)(1)(i).

2.2 Slope Protection

CCR unit has been designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown.

The adequacy of slope protection was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by Evergy personal. The downstream slopes of the impoundment cannot be inundated by the pool of an adjacent water body; consequently, the downstream slopes are not subject to sudden drawdown[4,5].

No significant changes to the slope protection for this unit have been made over the past five years[6-11]. Based on this evaluation, adequate slope protection is present at the Upper AQC Impoundment, and operational and maintenance procedures are appropriate to protect against surface erosion and wave action. Therefore, the Upper AQC Impoundment meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction

CCR unit has been designed, constructed, operated, and maintained with dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by Evergy personal. Additionally, slope stability analyses[4,5] were performed by AECOM to evaluate slip surfaces passing through the dikes over the range of expected loading conditions as defined within the section §257.73.

No significant changes to the dike compaction, design, construction, operation, or maintenance of this unit have been made over the past five years that would detrimentally change the structural stability of this unit[6-11]. Based on this evaluation, the original design and construction of the Upper AQC

Impoundment included sufficient dike compaction. The operational and maintenance procedures at the Upper AQC Impoundment are appropriate for maintaining compaction of the dikes. Therefore, the Upper AQC Impoundment meets the requirements in §257.73(d)(1)(iii).

2.4 Spillways

CCR unit has been designed, constructed, operated, and maintained with a single spillway or a combination of spillways configured as specified in paragraph (A) and (B):

(A) all spillways must be either: (1) of non-erodible construction and designed to carry sustained flows; or (2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected;

(B) the combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:

(1) probable maximum flood (PMF) for a high hazard potential CCR surface impoundment
(2) 1000-year flood for a significant hazard potential CCR surface impoundment; or
(3) 100-year flood for a low hazard potential CCR surface impoundment

The spillways were evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by Evergy personal. Additionally, hydrologic and hydraulic analyses were completed by AECOM to evaluate the capacity of the spillways relative to inflow estimated for the 100-year flood event for the low hazard potential Upper AQC Impoundment[12]. The flow downstream, once discharged to the Lower AQC, has been redirected west to the adjacent Lake[11].

Based on this evaluation, the spillways were designed and constructed from non-erodible material and adequately manage flow during peak discharge conditions resulting from a 100-year flood event. The operational and maintenance procedures at the Upper AQC Impoundment are appropriate for maintaining the functionality of the spillways. Therefore, the Upper AQC Impoundment meets the requirements in §257.73(d)(1)(v)(A) and (B).

2.5 Stability and Structural Integrity of Hydraulic Structures

CCR unit has been designed, constructed, operated, and maintained with hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.

The structural stability and integrity of the hydraulic structures were evaluated by reviewing design drawings, operational and maintenance procedures, closed-circuit television pipe video[3], and conditions observed in the field by Evergy personal.

Based on this evaluation, the spillways were designed and constructed and are operated and maintained in a manner where they do not present significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris. Additionally, the spillways maintain structural integrity during the expected range in loading conditions. Therefore, the Upper AQC Impoundment meets the requirements in §257.73(d)(1)(vi).

2.6 Downstream Slope Inundation/Stability

CCR unit designed, constructed, operated and maintained with, for CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

The downstream slopes of the Upper AQC Impoundment are not susceptible to inundation by the pool of an adjacent water body. Therefore, the requirements listed in §257.73(d)(1)(vii) are not applicable to the Upper AQC Impoundment.

2.7 Structural Stability Deficiencies

Identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

No structural stability deficiencies were identified. Consequently, the Upper AQC Impoundment meets the requirements of §257.73(d)(2), so no corrective actions are required.

3. Limitations

Background information, design basis, and other data have been furnished to AECOM by Evergy, which AECOM has used in preparing this report. AECOM has relied on this information as furnished and is not responsible for the accuracy of this information. Our recommendations are based on available information from previous and current investigations. These recommendations may be updated as future investigations are performed.

The conclusions presented in this report are intended only for the purpose, site location, and project indicated. The recommendations presented in this report should not be used for other projects or purposes. Conclusions or recommendations made from these data by others are their responsibility. The conclusions and recommendations are based on AECOM's understanding of current plant operations, maintenance, stormwater handling, and ash handling procedures at the station, as observed by AECOM or provided by Evergy. Changes in any of these operations or procedures may invalidate the findings in this report until AECOM has had the opportunity to review the findings and revise the report if necessary.

This development of the Periodic Structural Stability Assessment Report was performed in accordance with the standard of care commonly used as state-of-practice in our profession. Specifically, our services have been performed in accordance with accepted principles and practices of the engineering profession. The conclusions presented in this report are professional opinions based on the indicated project criteria and data available at the time this report was prepared. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

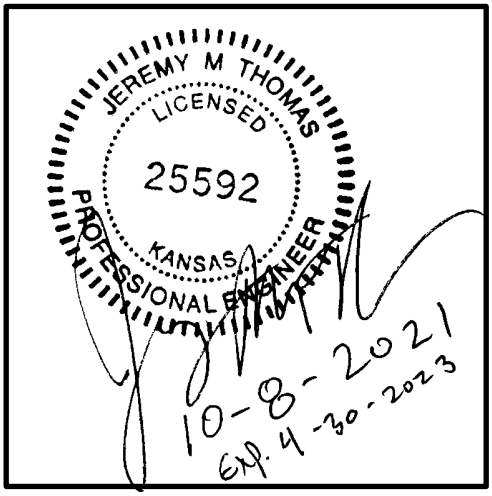
4. Certification Statement

CCR Unit: Evergy La Cygne Generating Station, Upper AQC Impoundment

I, Jeremy Thomas, being a Registered Professional Engineer in good standing in the State of Kansas, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the Periodic Structural Stability Assessment Report dated October 8, 2021, which includes all pages in Sections 1 and 2, was conducted in accordance with the requirements of 40 CFR § 257.73(d).

Jeremy Thomas
Printed Name

October 8, 2021
Date



AECOM
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1-816-561-4443

5. References

1. U.S. Environmental Protection Agency, Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, 40 CFR §257. Federal Register 80, Subpart D, April 17, 2015.

2. AECOM, History of Construction Report, Upper AQC Impoundment, La Cygne Generating Station, Kansas City Power & Light Company, dated October 2016.

3. Ace Pipe Cleaning, Video Inspection of 30" CMP performed September 9, 2021, Report "Main Inspections Pipe Run with Images", dated September 10, 2021.

4. AECOM, Geotechnical Report, Upper AQC Impoundment, La Cygne Generating Station, Kansas City Power & Light Company, dated October 2016.

5. AECOM, Geotechnical Report Addendum, Upper AQC Impoundment, La Cygne Generating Station, Evergy Metro, Inc., dated October 2021.

6. AECOM, Alternative Cover Design Test Site – Upper AQC Impoundment, La Cygne Generating Station, Kansas City Power & Light Company, dated September 2019.

7. AECOM, Upper AQC Impoundment Draining Improvements Phase 3A-1, La Cygne Generating Station, Evergy Metro, Inc., dated January 2021.

8. AECOM, Upper AQC Impoundment Closure Phase 3A-2 and 3B, La Cygne Generating Station, Evergy Metro, Inc., dated May 2021.

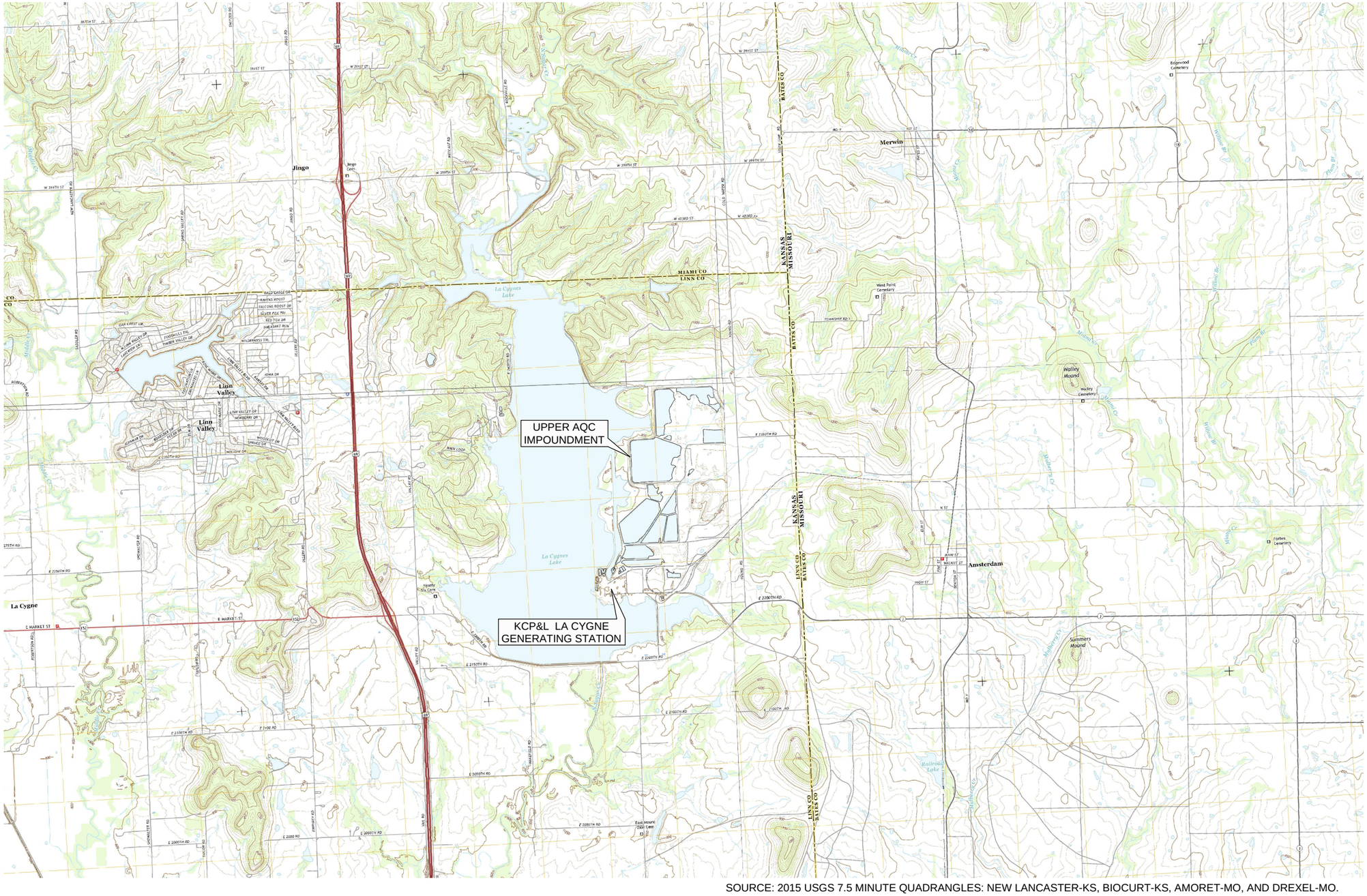
9. BHC RHODES, Topographic Survey Plans for the La Cygne Generating Station, dated 2020.

10. BHC RHODES, Topographic Survey Plans for the La Cygne Generating Station, dated 2021.

11. Burns & McDonnell, CCR Ditch Reroute Issued for Construction Drawings, La Cygne Generating Station, Evergy, dated June 2020.

12. AECOM, Periodic Inflow Design Flood Control System Plan, Upper AQC Impoundment, La Cygne Generating Station, Evergy Metro, Inc., dated October 2021.

Appendix A Figures



SOURCE: 2015 USGS 7.5 MINUTE QUADRANGLES: NEW LANCASTER-KS, BIOCURT-KS, AMORET-MO, AND DREXEL-MO.

AECOM 2380 McGee Street, Suite 200 Kansas City, Missouri 64108	KANSAS CITY POWER & LIGHT COMPANY RE-CERTIFICATION REPORT - UPPER AQC IMPOUNDMENT	Project Number 60660588	Date AUG.2021
	LOCATION AND SITE VICINITY MAP	Checked by JMT	Figure No. 1