HALEY ALDRICH

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REPORT ON

INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
AREA 1 POND
TECUMSEH ENERGY CENTER
TECUMSEH, KANSAS

By Haley & Aldrich, Inc.
Cleveland, Ohio

For Westar Energy, Inc.
Tecumseh, Kansas

File No. 41938-008
September 2016

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29 September 2016
File No. 41938-008

Westar Energy, Inc.
818 South Kansas Avenue
Topeka, Kansas 66612

Attention: Mr. Jared Morrison

Subject: Initial Periodic Structural Stability Assessment
Area 1 Pond
Westar Tecumseh Energy Center
Tecumseh, Kansas

Dear Mr. Morrison:

Enclosed please find our Initial Periodic Coal Combustion Residuals (CCR) Surface Impoundment Structural Stability Assessment Report for the Westar Energy, Inc. (Westar) Area 1 Pond located at the Tecumseh Energy Center (TEC) in Tecumseh, Kansas.

We completed our site visit and inspection on behalf of Westar on 7 October 2015 and have completed this assessment as a follow up activity. This work was performed by Haley & Aldrich, Inc. on behalf of Westar in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257 (Final CCR Rule), in particular §257.73(d).

The scope of our work consisted of the following: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Area 1 Pond and appurtenant structures; 2) perform a visual inspection of the impoundment; 3) evaluate whether the design, construction, operation, and maintenance of the surface impoundment are consistent with generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our evaluation of the impoundment, including recommendations and remedial actions.

Thank you for inviting us to complete this assessment and please feel free to contact us if you wish to discuss the contents of the report.

Sincerely yours,
HALEY & ALDRICH, INC.

Steven F. Putrich, P.E.
Project Principal

Enclosures

Executive Summary

This report summarizes the results of the Initial Periodic Structural Stability Assessment conducted by Haley & Aldrich, Inc. (Haley & Aldrich) for the Area 1 Pond CCR surface impoundment at the Tecumseh Energy Center (TEC) in Tecumseh, Kansas. This work was completed in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257 (Final CCR Rule), specifically §257.73(d).

The Area 1 Pond was constructed in 1968. In 1980, the impoundment was deepened and an internal splitter berm constructed which separates the Area 1 Pond into approximately equal size north and south ponds. Bottom ash from the power plant is sluiced to the Area 1 Pond where it directed to either the north pond or the south pond. When bottom ash has reached a pre-determined level in one of the ponds, flow is directed to the other pond and the first pond dewatered and the ash removed and sold or landfilled on-site in dry form.

The eastern portion of the Area 1 Pond is incised (i.e., cut into the existing topography with no berm). Berms exist on the north, south and west sides of the impoundment, in addition to the internal berm that separates the north and south ponds. Of the three berms, the north berm has the greatest total height of 39 ft. The total surface area of the north and south ponds is 2 acres and the storage capacity is approximately 20 acre-ft.

Impoundment Inspection Assessment and Recommendations

Based on conditions observed during our visual inspection of the impoundment, discussions with site personnel and a review of available documents, the following deficiencies were noted:

1. A low spot exists in the berm crest at the southwest corner of the south pond. At this location, the crest is also sloped toward the upstream slope, resulting in some erosion of the upstream slope caused by runoff.

2. A number of relatively small animal burrows (about 2 inches in diameter) exist on the downstream slopes of the north, west and south berms, and along the downstream edge of the north and west crests. A larger burrow hole, approximately 3 inches in diameter, exists at the downstream edge of the west berm.

3. On the west downstream slope, grass was observed at up to 18 inches in height and patches exist where the grass is dead. On the south berm downstream slope, there are a number of patches (up to 30 ft x 30 ft in size) where the grass is dead.

4. At the toe of the west berm, some rutting, erosion and tearing of the erosion control blanket exist where a tracked vehicle had traversed the area at some time in the past.

5. Some relatively minor surface erosion exists on the downstream slope at the junction between the west and south berms.

6. Localized sloughing in a 5-ft x 5-ft area of the south downstream slope caused by erosion in the bottom of the unlined drainage ditch on the north side of SE 2nd Street.

Haley & Aldrich recommends the following actions:

1. Place and compact fill as needed to raise the grade in the low spot on the crest at the southwest corner of the south pond.

2. Backfill animal burrows with a compacted sand and gravel mix.

3. Regularly manage vegetation on slopes to maintain allowable vegetative growth height.

4. Seed and re-establish vegetation in the dead patches on the south and west downstream slopes.

5. Fill ruts and erosion channels on the west and south downstream slopes.

6. Evaluate need for armoring the bottom of drainage ditch between SE 2nd Street and the south downstream toe of slope in the vicinity of the slough to prevent continued deepening of the channel and resulting sloughing of the downstream slope.

7. Regularly monitor banks of Tecumseh Creek at toe of north downstream slope for signs of instability.

8. Monitor the area of mature trees downstream of the west berm for uprooting, signs of decay, or other conditions that could potentially impact the Area 1 Pond.

Structural Stability Assessment

In accordance with 40 CFR §257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

Haley & Aldrich reviewed the information provided to us and inspected the Area 1 Pond as described above. Based on our review of the information and observations during our inspection, we have concluded the following in accordance with 40 CFR §257.73(d):

1. §257.73(d)(1)(i) – Stable Foundations and Abutments:

   Based on test borings performed by Golder Associates and information contained in their December 2009 report (Reference 1), it appears the foundation soils below the Area 1 Pond consist of stiff silty clay. Based on our review of the available information and observations during our inspection, the foundation soils were judged to provide a stable foundation for the surface impoundment.

2. §257.73(d)(1)(ii) – Adequate Slope Protection:

   The north and west downstream slopes are generally well protected against surface erosion by the heavy erosion control blankets placed during 2010 and 2012 construction activities and the

vegetation that has become established since construction. The south berm downstream slope is generally vegetated with grass but there are a number of patches where the grass has died. The Area 1 Pond downstream slopes were judged to have adequate slope protection.

On the upstream slopes, no slope protection is provided and there is little vegetation on the slopes. The upstream slopes consist of exposed bottom ash. Despite having no erosion protection, the upstream slopes appear to be stable but exhibit some surface erosion from runoff which will require ongoing maintenance. Based on observations during our inspection, the Area 1 Pond upstream slope cover appears adequate to protect against surface erosion, wave action and sudden drawdown, assuming regular maintenance of the upstream slopes is performed.

3. §257.73(d)(1)(iii) – Dikes Mechanically Compacted:

   Although records on the construction of the Area 1 Pond are not available, the test borings and laboratory testing performed by Golder Associates indicate the berms are constructed from stiff to very stiff silty clay. Based on the results of the test borings and laboratory testing, it is likely the berm fill was mechanically compacted during construction.

4. §257.73(d)(1)(iv) – Height of Vegetation:

   As discussed above, the Area 1 Pond downstream slopes are vegetated with grass although some patches exist where the grass has died. On the north downstream slope, the grass was generally well maintained and was generally around 6 inches in height at the time of our inspection. On the west and south downstream slopes, the grass was taller, up to 18 inches in height.

5. §257.73(d)(1)(v)(A) – Spillway Cover:

   The Area 1 Pond discharges through a concrete box intake structure located at the west end of the separator berm. Being a concrete structure, the structure is non-erodible and appears to be in good condition.

6. §257.73(d)(1)(v)(B) – Spillway Capacity:

   The spillway capacity for the impoundment will be modeled and calculated in accordance with §257.82 Hydrologic and Hydraulic Capacity Requirements for CCR surface impoundments. Westar will complete that capacity requirement under separate cover, consistent with the CCR Rule Preamble reference to the same.

7. §257.73(d)(1)(vi) – Hydraulic Structures Underlying or Passing Through Embankment:

   The Area 1 Pond discharges through a concrete box intake structure located at the west end of the separator berm. The concrete box intake structure discharges to a steel outflow pipe which was lined with a plastic pipe insert in 2012. The outflow pipe is buried at relatively shallow depth below the west berm before exiting the berm and running above ground to the non-CCR Area 2 Pond. There is no evidence of seepage along the outside of the outflow pipe and the above ground portion of the pipe and its supports appear to be in good condition.

8. §257.73(d)(1)(vii) – Inundation of Downstream Slopes:

   In 2009, Golder Associates drilled three test borings in the Area 1 Pond berms and performed slope stability analyses on the configuration of the Area 1 berms at that time. Based on the results of their 2009 analysis, Golder recommended flattening the north downstream slope to 1.7H:1V. In 2010, Golder installed two piezometers in the Area 1 north berm. Using groundwater levels recorded in the two piezometers and assuming a 1.7H:1V downstream slope, Golder performed additional slope stability analyses on the north berm. Results of the analyses indicated acceptable factors of safety for the recommended 1.7H:1V slope configuration. Results of the stability analysis are discussed in Reference 2. Flattening of the north slope adjacent to the creek was performed during the 2010 construction season based on their modeling of the berm and creek.

   Westar will be performing a Safety Factor Assessment in accordance 40 CFR §257(e). Results of the Safety Factor Assessment will be provided under separate cover.

9. §257.73(d)(2) – Deficiencies and Recommendations:

   See Section 3 of this report for a discussion of deficiencies and recommendations.

PREFACE

The assessment of the general condition of the surface impoundment is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report. In reviewing this report, it should be realized that the described condition of the impoundment is based on observations of field conditions at the time of inspection, along with other data available to the inspection team. It is important to note that the condition of an impoundment depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the impoundment will continue to represent its condition at some point in the future.

CERTIFICATION

I certify that the Initial Periodic Structural Stability Assessment for Westar's Area 1 Pond at the Tecumseh Energy Center was conducted in accordance with the requirements of §257.73(d) of the USEPA's CCR Rule.

Signed: 

Consulting Engineer

Print Name: Steven F. Putrich
Kansas License No.: 24363
Title: Project Principal
Company: Haley & Aldrich, Inc.

Professional Engineer's Seal:

List of Figures

1. Introduction

1.1 GENERAL

1.1.1 Authority

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Westar Energy, Inc. (Westar, Owner) to perform the Initial Periodic Structural Stability Assessment for the Area 1 Pond CCR surface impoundment located at the Tecumseh Energy Center (TEC) in Tecumseh, Kansas. This work was completed in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257 (Final CCR Rule), specifically §257.73(d).

This report summarizes the results of our Initial Periodic Structural Stability Assessment for the Area 1 Pond impoundment, including our previous visual inspection of the impoundment. Results of our previous inspection were also included in our Initial Annual CCR Surface Impoundment PE Inspection Report dated 15 January 2016.

1.1.2 Purpose of Work

The purpose of this assessment was to document whether the design, construction, operation, and maintenance of the Area 1 Pond is consistent with recognized and generally accepted good engineering practices. The visual inspection is intended to identify signs of distress or malfunction of the surface impoundment, should they exist. This report addresses summarizes those findings and notes conditions observed that are disrupting or have the potential to disrupt the operation and safety of the surface impoundment.

The investigation is divided into four parts: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Area 1 Pond impoundment and appurtenant structures; 2) perform a visual inspection of the impoundment; 3) evaluate whether the design, construction, operation, and maintenance of the CCR surface impoundment is consistent with generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our evaluation of the retention structure, including recommendations and remedial actions.

1.1.3 Definitions

To provide the reader a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix C. Many of these terms may be included in this report. The terms are presented under common categories associated with dams and surface impoundments which include: 1) orientation; 2) dam components; 3) hazard potential classification; and 4) miscellaneous.

1.2 DESCRIPTION OF PROJECT

1.2.1 Location

The Area 1 Pond is located at Tecumseh Energy Center in Tecumseh, Kansas. TEC is located on the northern side of SE 2nd Street at North latitude 39° 3.1' and West longitude 95° 34.3', as shown on Figure 1, Project Locus. The Area 1 Pond is adjacent to the power plant and lies along the western boundary of the facility. The impoundment is accessed from the plant site along a gravel access road. Access to the plant and Area 1 Pond is restricted by full-time security and barriers/fences at the plant.

Areas to the west and south of the impoundment are generally mixed use consisting of residential, commercial and agricultural areas. The TEC power plant exists immediately to the east of the Area 1 Pond, while the area southeast of the impoundment is primarily residential.

Discharges from the facility flow into Tecumseh Creek which is located at the toe of the west downstream slope. The creek flows to the Kansas River which is located a few hundred feet north of the Area 1 Pond.

1.2.2 Owner/Operator

The Area 1 Pond is owned and maintained by Westar Energy.

	Impoundment Owner	Impoundment Caretaker
Name	Westar Energy	Westar Energy Tecumseh Energy Center
Mailing Address	818 South Kansas Avenue	5330 SE 2nd St.
Town	Topeka, Kansas 66612	Tecumseh, KS 67357
Facility Contact	Jared Morrison	Geoff Greene
Daytime Phone	(785) 575-8273	(785) 379-4320
Emergency Phone	911	911
Email Address	westarccr@westarenergy.com	westarccr@westarenergy.com

1.2.3 Purpose of the Area 1 Pond

The TEC was originally commissioned in 1925. At the time of our inspection, the plant included two steam electric generating units and one auxiliary boiler. Following our inspection, one of the steam generating units was retired from operation.

The Area 1 Pond was constructed in 1968 to create a sedimentation basin and temporary staging for bottom ash. In 1980, the pond was deepened and an internal splitter berm constructed which separates the Area 1 Pond into approximately equal size north and south ponds. Currently, Westar cycles the two ponds between actively sluicing water and bottom ash while drying out the idled pond for excavation.

1.2.4 Description of the Area 1 Pond and Appurtenances

The Area 1 Pond is located west of the TEC power plant along the western boundary of the facility as shown in Figure 2, Site Plan.

During the original construction, the east end of the Area 1 Pond was incised into the sloping topography while above-grade berms were constructed around the north, south and west sides of the pond. Currently, the berm crest is at El. 885, resulting in a total berm height of 39 ft for the north berm, 25 to 35 ft for the west berm, and 10 to 20 ft for the south berm. The embankments are constructed from on-site silty clay. The crest of the impoundment is generally 18 to 25 ft in width. The crest perimeter is approximately 1,300 ft in length.

The Area 1 Pond has a total surface area of approximately 2 acres, comprised of the north and south ponds, each of which has a surface area of approximately 1 acre.

Bottom ash from the power plant is sluiced to the Area 1 Pond where it directed to either the north pond or the south pond. When bottom ash has reached a pre-determined level in one of the ponds, flow is directed to the other pond and the first pond dewatered and the ash removed and sold or landfilled on-site in dry form.

The upstream slopes range from nearly vertical to about 1H:1V with little to no vegetation. The berm crests are gravel surfaced and hard, being capable of supporting service vehicle traffic without significant rutting.

We understand that in 2010, vegetation was removed from the downstream slope of the north berm and the slope was flattened from about a 1H:1V to the current 1.7H:1V per recommendations by Golder Associates (Reference 1). In addition, we understand that in 2012, heavy vegetation and stumps were removed from the west berm downstream slope. Currently, the downstream slopes of the north, west and south berms are generally vegetated with grass, however, in some areas the vegetation is dead or is absent. The north and west slopes are covered with heavy erosion control blankets which have generally been effective in preventing erosion and aiding in establishment of the grass cover.

Water and bottom ash flow from the power plant through a steel pipe which discharges into a small pool located at the northeastern corner of the Area 1 Pond. The discharged water and ash are directed by a flow divider to either the north pond, or to a channel which flows to the south pond.

Decant water from the Area 1 Pond flow to a concrete box intake structure located at the west end of the separator berm. Water levels in the ponds are controlled by a sluice gate on each side of the structure. Flow from the box structure enters a steel outflow pipe that penetrates the berm near the northwest corner of the impoundment and discharges to the non-CCR Area 2 Pond which ultimately discharges to the Tecumseh Creek. We understand the outflow pipe was lined with a pushed-in plastic pipe in 2012 (with the exception of a short section just downstream from the concrete box intake structure).

1.2.5 Operations and Maintenance

The Area 1 Pond is operated and maintained by TEC personnel. Operation of the impoundment includes regulating pond levels using the weir plates in the concrete box structure, directing the water/bottom ash flow to the north or south pond, dewatering the ponds, and removal/recovery of bottom ash from the ponds for reuse or landfilling. Maintenance of the impoundment includes regular cutting of vegetation on the downstream slopes and removal of vegetation as needed on the upstream slopes.

Recently, Westar has initiated an operating and maintenance plan in accordance with the state agency concurrence.

1.2.6 Hazard Potential Rating

Hazard Potential Classification is being completed outside the scope of this report in accordance with the applicable regulations. Results will be provided under separate cover.

1.3 PERTINENT ENGINEERING DATA

1.3.1 Drainage Area

Based on observations during our previous inspection and site visit and our review of available site plans, the Area 1 Pond receives water from the following sources: 1) discharge of water/bottom ash slurry from the TEC plant and cinder pit, 2) direct precipitation falling into the impoundment, and 3) limited runoff entering the impoundment during rain events and snow melt. There is no external inflow from upland watershed areas.

1.3.2 Reservoir

The design total capacity of the impoundment is approximately 20 acre-ft as estimated from the most recent topographic survey. As described in Figure 4, the remaining storage capacity was approximated by determining the volume of the impoundment (as of the most recent survey Western Air Maps and PEC) below El. 885, which is the elevation of the berm crest on the inspection date. Because no bathymetric data was available, the bottom of the pond was approximated to be at El. 877.

The impounded CCR volume is variable due to temporary nature of CCR storage in the Area 1 Pond and the periodic cycling between the north and south ponds.

The impoundment has a maximum berm height of 39 ft, based on the crest elevation of El. 885 and the stream bed elevation of Tecumseh Creek at approximately El. 846 at the toe of the north berm.

1.3.3 General Elevations

Relevant elevations and impoundment parameters are as follows:

A.	Top of Impoundment Berms	El. 885
B.	Normal Pool	Approx. El. 882.25
C.	Pond Level at Time of Inspection	Approx. El. 882 (south pond), north pond drained
D.	Spillway Type	Concrete Box Weir Structure
E.	Spillway Crest	El. 882.25 (low weir) to El. 882.5 (high weir)
F.	Low Point along Toe of the Berms	Approx. El. 846 (toe of north berm)

1.3.4 Design and Construction Records

The Area 1 Pond was constructed in 1968 to create a sedimentation basin and temporary staging for bottom ash. In 1980, the Area 1 Pond was deepened and an internal berm constructed to provide separate north and south ponds. It is our understanding the Area 1 Pond was an engineered structure however, Westar does not have engineering drawings or construction records of the impoundment.

1.3.5 Operating Records

Written operational records have not historically been maintained for the impoundment. Westar is currently performing required inspections in accordance with §257.83(a).

1.3.6 Previous Inspection Reports

In December 2009, Golder Associates published a report entitled, "Evaluation of Ash Pond Berm Stability" (Reference 1). The report summarized the results of a visual inspection of the berms, geotechnical test borings and laboratory testing, and slope stability analyses.

In May 2011, AMEC Earth & Environmental, Inc. published a report entitled, "Report on Dam Safety Assessment of Coal Combustion Surface Impoundments" (Reference 2). The report summarized the results of a visual inspection of the Area 1 Pond berms, and provided comments regarding hydrologic and hydraulic design criteria and slope stability analyses performed by Golder Associates.

2. Inspection

2.1 VISUAL INSPECTION

On 7 October 2015, Haley & Aldrich conducted a visual inspection of the Area 1 Pond impoundment. The inspection was performed by Mark D. Brownstein, P.E. and Andy Lucas, EIT of Haley & Aldrich. In attendance for at least a portion of the inspection were the following Westar personnel: Jared Morrison, Stone Junod, Brandon Griffin, and Kirk Wiscomb. In addition, Sam Sunderraj of Kansas Department of Health and Environment was present for the inspection.

The following paragraphs describe the conditions observed on the north, west, and south berms during the inspection. Photographs taken during the inspection are included in Appendix A. A copy of the Inspection Checklist is included Appendix B.

2.1.1 General Findings

2.1.1.1 Area 1 Pond Upstream Slopes

At the time of the inspection, the north pond had been drained and the full height of the slope was visible. The south pond was filled with water with approximately 3 ft of the slope visible above the water surface (pond level at approximately El. 882). See Photos 1 through 4.

The upstream slopes are steep, ranging from nearly vertical to about 1H:1V. No slope protection is provided and there is little to no vegetation on the slopes. Despite having no protection, the slope appeared to be reasonably stable but exhibited some erosion from runoff (Photos 8 and 9).

2.1.1.2 Area 1 Pond Crest

The berm crests are generally 18 to 25 ft in width and are gravel surfaced, providing access to service vehicles around the ponds. The surface is hard and being capable of supporting vehicle traffic without significant rutting (Photos 5 and 6).

The crest alignment appeared generally level, however, a low spot exists at the southwest corner of the south pond. At this location, the crest was also sloped toward the upstream slope, resulting in some erosion of the slope caused by runoff (Photos 7 and 8).

Several rodent burrows were observed along the downstream edge of the crest, primarily along the north berm at the fence line located on the downstream edge of the crest. The burrows were typically on the order of 2 inches in diameter. A somewhat larger burrow hole, approximately 3 inches in diameter, was observed at the downstream edge of the west berm crest (Photo 19). Two dead moles were observed on the crest of the west berm.

The crest exhibited no signs of surface cracking, significant rutting, sinkholes, or depressions other than noted above.

2.1.1.3 Area 1 Pond Downstream Slope

The north and west downstream slopes are well protected against surface erosion by the heavy erosion control blankets placed during 2010 and 2012 construction activities and the vegetation that has become established since construction (Photos 10 and 11). On the north downstream slope, a continuous cover of grass exists that was generally well maintained. On the west downstream slope, vegetation was less established resulting in some areas where the grass was dead. In addition, there were patches where the grass was up to 18 inches in height (Photo 12).

Erosion on the north and west downstream slopes was noted in a few limited areas. At the toe of the west berm, a tracked vehicle had traversed the area at some time in the past, causing some rutting of the soft ground and tearing of the erosion control blanket along the edge of the ruts (Photo 13). Runoff from the west slope has caused some erosion in the ruts within a relatively limited area. Some relatively minor surface erosion was also noted on the downstream slope at the junction between the west and south berms.

Over the years, Tecumseh Creek has eroded a deep channel along the downstream toe of the north berm (Photo 27). Although the channel has steep sides in some areas, the channel banks appear to be stable due to the apparent stiffness of the soil and remaining root mass from trees previously cut immediately adjacent to the creek.

The north and west downstream slopes appeared to be stable. During the inspection, no signs of seepage, slides, sloughs or unusual movements were observed.

The south berm downstream slope is generally vegetated with grass but there were a number of patches where the grass was dead (Photos 14 and 15). The dead patches were up to approximately 30 ft x 30 ft in size. Much of the slope was covered with pieces of woody vegetation that had recently been mowed. With the exception of one area as discussed below, the slope appeared to be stable with no significant erosion or signs of slope instability. A notable exception is a slough that exists on the slope approximately 50 ft west of the chain link gate on SE 2nd Street. Runoff from SE 2nd Street flows to an unlined drainage ditch at the toe of the south berm. Flow in the ditch has deepened the channel to the point that it caused a localized slump, approximately 5 ft x 5 ft in size on the slope (Photos 16 and 17).

Small rodent burrows, generally about 2 inches in diameter, were noted on all downstream slopes but appeared to be most prevalent on the north slope, particularly at the top of the slope near the downstream edge of the crest (Photo 18). This may be due to the rodents being trapped under the heavy erosion control blanket on the slope, and exiting at the upper edge of the blanket at the top of the slope.

2.1.1.4 Area 1 Pond Intake and Outflow Structures

The Area 1 Pond discharges through a concrete box intake structure located at the west end of the separator berm (Photos 20 to 22). Decant water from the pond flows into the concrete box structure through a sluice gate installed on each side of the structure. Flow from the box structure enters a steel outflow pipe that penetrates the berm near the northwest corner of the impoundment and discharges to the Area 2 Pond (Photo 23).

The concrete box intake structure has minor, isolated, concrete chips and weathering but was otherwise in good condition. Minor, surficial rusting was observed on the exposed metal hardware which was otherwise in good condition. After exiting the Area 1 Pond berm, the outflow pipe, which was lined with a plastic pipe insert in 2012, is above ground and the pipe and supports appeared to be in stable condition.

2.1.1.5 Area 1 Pond Downstream Area

Downstream of the west berm toe of slope, mature trees exist between Tecumseh Creek and the toe of slope. Due to the heavy vegetative cover, it was not possible to observe the condition of the ground downstream of the west toe of slope.

On the south side of the impoundment, SE 2nd Street exists downstream of the toe of slope. No signs of seepage or instability were observed in this area.

Downstream of the north berm, the topography immediately begins sloping upward to the non-CCR Area 2 pond. The area appeared stable.

2.2 CARETAKER INTERVIEW

On the day of the inspection, Haley & Aldrich spoke with the Westar Energy personnel listed above regarding the operations and maintenance of the impoundment. Information provided by Westar personnel has been incorporated into this report.

2.3 OPERATION AND MAINTENANCE PROCEDURES

The Area 1 Pond is operated and maintained by TEC personnel. Operation of the impoundment includes directing flow to the north or south pond, regulating water levels in the ponds, dewatering the ponds and removing settled ash for reuse.

Maintenance of the berms includes regular cutting of vegetation on the downstream slopes and removal of vegetation as needed on the upstream slopes.

2.4 EMERGENCY ACTION PLAN

A written Emergency Action Plan (EAP) does not currently exist for Area 1 Pond; however, plant personnel are familiar with the impoundment operations and construction. An overall communications plan is in place for the power plant.

The Area 1 Pond CCR Surface Impoundment is judged to have a Significant Hazard Potential Classification in accordance with EPA's Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257. In accordance with 40 CFR Part 257.73, an Emergency Action Plan will need to be written for the impoundment.

3. Impoundment Inspection Assessment and Recommendations

3.1 ASSESSMENTS

The following deficiencies were observed at the Area 1 Pond:

1. A low spot exists in the berm crest at the southwest corner of the south pond. At this location, the crest is also sloped toward the upstream slope, resulting in some erosion of the upstream slope caused by runoff.

2. A number of relatively small animal burrows (about 2 inches in diameter) exist on the downstream slopes of the north, west and south berms, and along the downstream edge of the north and west crests. A larger burrow hole, approximately 3 inches in diameter, exists at the downstream edge of the west berm.

3. On the west downstream slope, grass was up to 18 inches in height and patches exist where the grass is dead. On the south berm downstream slope, there are a number of patches (up to 30 ft x 30 ft in size) where the grass is dead.

4. At the toe of the west berm, some rutting, erosion and tearing of the erosion control blanket exist where a tracked vehicle had traversed the area at some time in the past.

5. Some relatively minor surface erosion exists on the downstream slope at the junction between the west and south berms.

6. Localized sloughing in a 5-ft x 5-ft area of the south downstream slope caused by erosion in the bottom of the unlined drainage ditch on the north side of SE 2nd Street.

3.2 RECOMMENDATIONS

We recommend the following remedial measures be undertaken:

1. Place and compact fill as needed to raise the grade in the low spot on the crest at the southwest corner of the south pond.

2. Backfill animal burrows with a compacted sand and gravel mix.

3. Regularly maintain vegetation on slopes to allowable heights.

4. Seed and re-establish vegetation in the dead patches on the south and west downstream slopes.

5. Fill ruts and erosion channels on the west and south downstream slopes.

6. Evaluate need for armoring the bottom of drainage ditch between SE 2nd Street and the south downstream toe of slope in the vicinity of the slough to prevent continued deepening of the channel and resulting sloughing of the downstream slope.

7. Regularly monitor banks of Tecumseh Creek at toe of north downstream slope for signs of instability.

Monitor the area of mature trees downstream of the west berm for uprooting, signs of decay, or other conditions that could potentially impact the Area 1 Pond.

4. Structural Stability Assessment

In accordance with 40 CFR §257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

Haley & Aldrich reviewed the information provided to us and inspected the Area 1 Pond as described above. Based on our review of the information and observations during our inspection, we have concluded the following in accordance with 40 CFR §257.73(d):

1. §257.73(d)(1)(i) – Stable Foundations and Abutments:

   Based on test borings performed by Golder Associates and information contained in their December 2009 report (Reference 1), it appears the foundation soils below the Area 1 Pond consist of stiff silty clay. Based on our review of the available information and observations during our inspection, the foundation soils were judged to provide a stable foundation for the surface impoundment.

2. §257.73(d)(1)(ii) – Adequate Slope Protection:

   The north and west downstream slopes are generally well protected against surface erosion by the heavy erosion control blankets placed during 2010 and 2012 construction activities and the vegetation that has become established since construction. The south berm downstream slope is generally vegetated with grass but there are a number of patches where the grass has died. The Area 1 Pond downstream slopes were judged to have adequate slope protection.

   On the upstream slopes, no slope protection is provided and there is little vegetation on the slopes. The upstream slopes consist of exposed bottom ash. Despite having no erosion protection, the upstream slopes appear to be stable but exhibit some surface erosion from runoff which will require ongoing maintenance. Based on observations during our inspection, the Area 1 Pond upstream slope cover appears adequate to protect against surface erosion, wave action and sudden drawdown, assuming regular maintenance of the upstream slopes is performed.

3. §257.73(d)(1)(iii) – Dikes Mechanically Compacted:

   Although records on the construction of the Area 1 Pond are not available, the test borings and laboratory testing performed by Golder Associates indicate the berms are constructed from stiff to very stiff silty clay. Based on the results of the test borings and laboratory testing, it is likely the berm fill was mechanically compacted during construction.

4. §257.73(d)(1)(iv) – Height of Vegetation:

   As discussed above, the Area 1 Pond downstream slopes are vegetated with grass although some patches exist where the grass has died. On the north downstream slope, the grass was generally well maintained and was generally around 6 inches in height at the time of our inspection. On the west and south downstream slopes, the grass was taller, up to 18 inches in height.

5. §257.73(d)(1)(v)(A) – Spillway Cover:

   The Area 1 Pond discharges through a concrete box intake structure located at the west end of the separator berm. Being a concrete structure, the structure is non-erodible and appears to be in good condition.

6. §257.73(d)(1)(v)(B) – Spillway Capacity:

   The spillway capacity for the impoundment will be modeled and calculated in accordance with §257.82 Hydrologic and Hydraulic Capacity Requirements for CCR surface impoundments. Westar will complete that capacity requirement under separate cover, consistent with the CCR Rule Preamble reference to the same.

7. §257.73(d)(1)(vi) – Hydraulic Structures Underlying or Passing Through Embankment:

   The Area 1 Pond discharges through a concrete box intake structure located at the west end of the separator berm. The concrete box intake structure discharges to a steel outflow pipe which was lined with a plastic pipe insert in 2012. The outflow pipe is buried at relatively shallow depth below the west berm before exiting the berm and running above ground to the non-CCR Area 2 Pond. There is no evidence of seepage along the outside of the outflow pipe and the above ground portion of the pipe and its supports appear to be in good condition.

8. §257.73(d)(1)(vii) – Inundation of Downstream Slopes:

   In 2009, Golder Associates drilled three test borings in the Area 1 Pond berms and performed slope stability analyses on the configuration of the Area 1 berms at that time. Based on the results of their 2009 analysis, Golder recommended flattening the north downstream slope to 1.7H:1V. In 2010, Golder installed two piezometers in the Area 1 north berm. Using groundwater levels recorded in the two piezometers and assuming a 1.7H:1V downstream slope, Golder performed additional slope stability analyses on the north berm. Results of the analyses indicated acceptable factors of safety for the recommended 1.7H:1V slope configuration. Results of the stability analysis are discussed in Reference 2. Flattening of the north slope was performed during the 2010 construction season based on their modeling of the berm and creek.

   Westar will be performing a Safety Factor Assessment in accordance 40 CFR §257(e). Results of the Safety Factor Assessment will be provided under separate cover.

9. §257.73(d)(2) – Deficiencies and Recommendations:

   See Section 3 of this report for a discussion of deficiencies and recommendations.

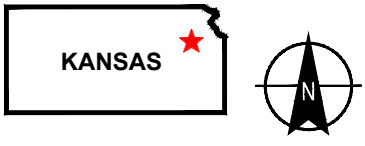
5. References

1. Golder Associates, “Evaluation of Ash Pond Berm Stability, Westar Energy, Tecumseh Energy Center,” dated December 23, 2009.

2. AMEC, “Report on Dam Safety Assessment of Coal Combustion Surface Impoundments, Westar Energy, Tecumseh Energy Center, Tecumseh, KS,” dated May 2011.

3. Burns & McDonnell Engineering Company, Inc., “Figure 2 – Site Plan, Tecumseh Energy Center, Tecumseh, Kansas,” dated 2011.

MAPSOURCE: USGS
GRANTVILLE, KANSAS
2012



HALEY ALDRICH

INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
AREA 1 POND
TECUMSEH ENERGY CENTER
TECUMSEH, KS

PROJECT LOCUS

APPROXIMATE SCALE: 1" = 5000'
SEPTEMBER 2016

FIGURE 1

BLEVINS, BRETT Printed: 9/26/2016 3:26 PM Layout: PROJECT LOCUS
\\CLE\COMMON\PROJECTS\41938 WESTAR-CCR COMPLIANCE\CAD-TEC\FIGURES\STRUCTURAL STABILITY ASSESSMENT\41938-008 FIG-1-PROJECT LOCUS.DWG

LEGEND

APPROXIMATE LIMITS OF AREA 1 POND

NOTES

1. AERIAL IMAGERY PROVIDED BY GOOGLE EARTH PRO. PHOTO TAKEN 11 MAY 2015.
2. APPROXIMATE LIMITS OF AREA 1 POND AND WATER SURFACE BOUNDARY PROVIDED BY WESTAR. DRAWING PRODUCED BY PEC TITLED "WESTAR ENERGY TECUMSEH ENERGY CENTER INDUSTRIAL LANDFILL PLAT OF SURVEY" DATED 7 OCTOBER 2015.

N

0 120 240

SCALE IN FEET

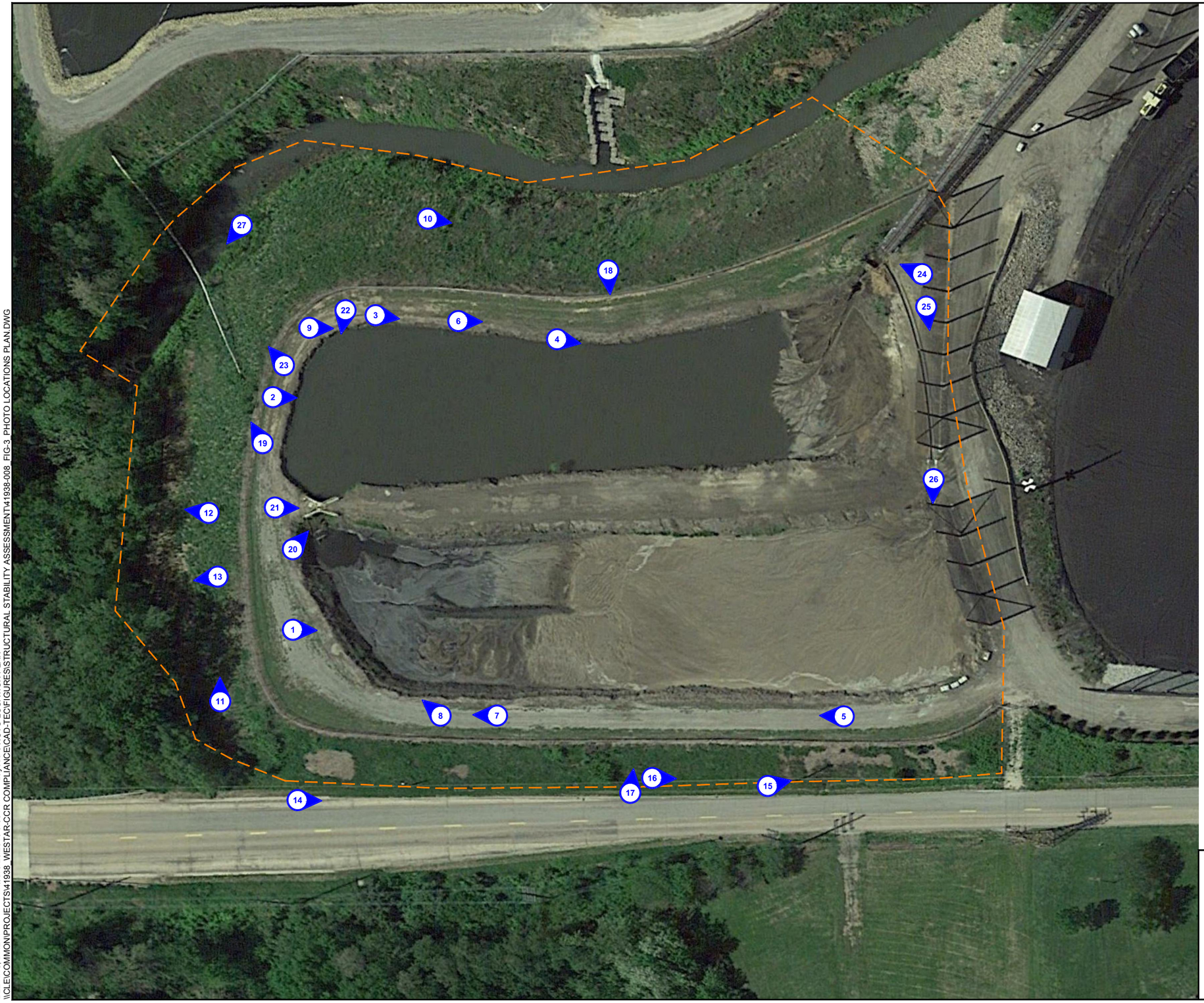
HALEY ALDRICH

INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
AREA 1 POND
TECUMSEH ENERGY CENTER
TECUMSEH, KS

SITE PLAN

SCALE: AS SHOWN
SEPTEMBER 2016

FIGURE 2



LEGEND

APPROXIMATE LIMITS OF BOTTOM AREA 1 POND

1 PHOTO LOCATION/DIRECTION

NOTES

1. AERIAL IMAGERY PROVIDED BY GOOGLE EARTH PRO. PHOTO TAKEN 11 MAY 2015.

N

0 120 240

SCALE IN FEET

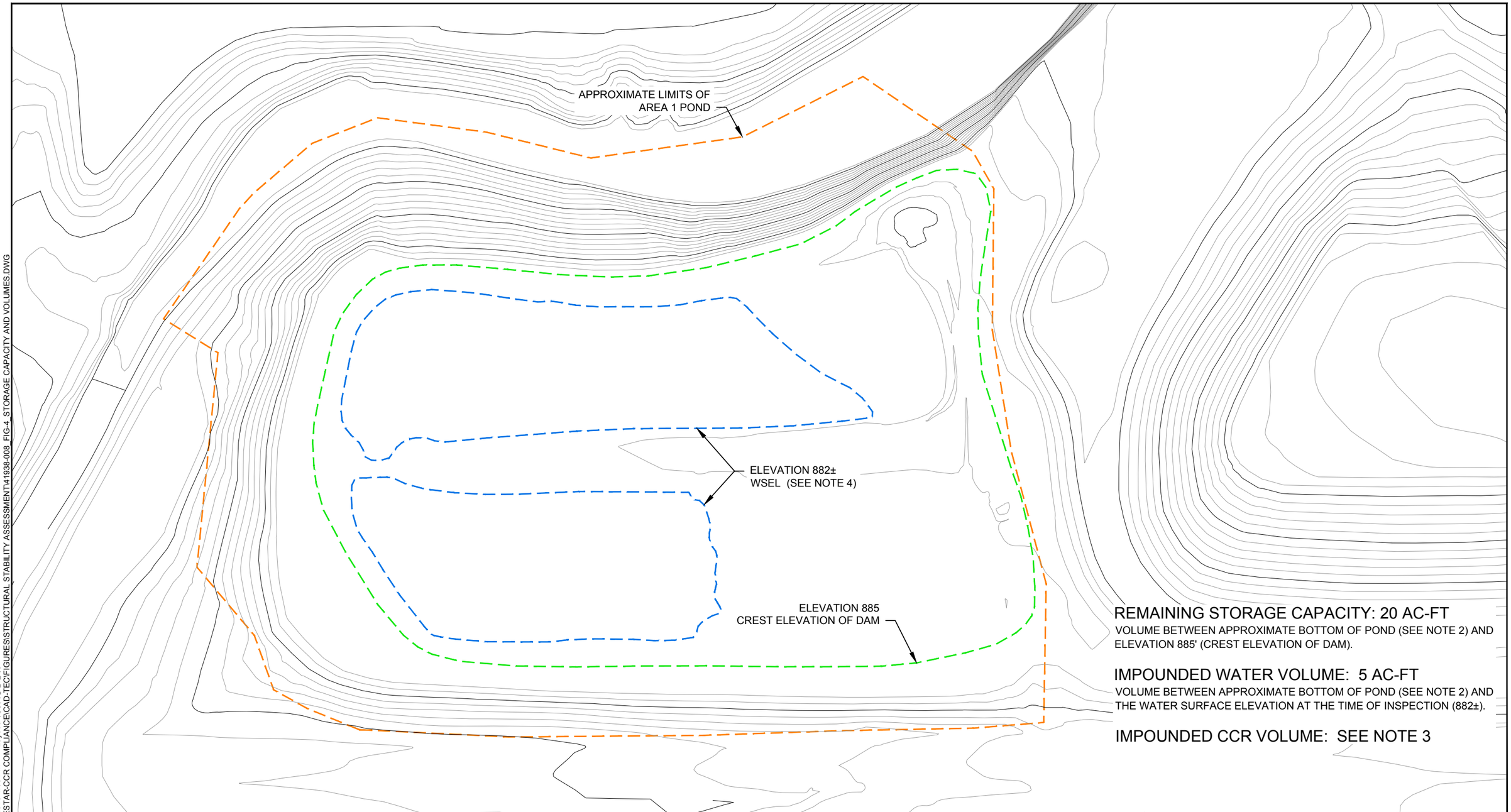
HALEY ALDRICH

INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
AREA 1 POND
TECUMSEH ENERGY CENTER
TECUMSEH, KS

PHOTO LOCATION PLAN

SCALE: AS SHOWN
SEPTEMBER 2016

FIGURE 3



REMAINING STORAGE CAPACITY: 20 AC-FT

VOLUME BETWEEN APPROXIMATE BOTTOM OF POND (SEE NOTE 2) AND ELEVATION 885' (CREST ELEVATION OF DAM).

IMPOUNDED WATER VOLUME: 5 AC-FT

VOLUME BETWEEN APPROXIMATE BOTTOM OF POND (SEE NOTE 2) AND THE WATER SURFACE ELEVATION AT THE TIME OF INSPECTION (882±).

IMPOUNDED CCR VOLUME: SEE NOTE 3

LEGEND

- ELEVATION 882± WSEL
- ELEVATION 885' CREST ELEVATION OF DAM
- APPROXIMATE LIMITS OF AREA 1 POND

NOTES

1. EXISTING TOPOGRAPHY, PROVIDED BY WESTAR, IS A COMBINATION OF CONTOURS FROM WESTERN AIR MAPS AND VARIOUS PEC TOPOGRAPHIC SURVEYS.
2. CURRENT BATHYMETRIC DATA AND APPROXIMATE TOPOGRAPHY PRIOR TO TIME OF DAM CONSTRUCTION WAS UNAVAILABLE. BOTTOM OF POND APPROXIMATED AS ELEVATION 877.
3. STORAGE IN AREA 1 POND IS TEMPORARY AND VARIES DEPENDING ON CYCLING BETWEEN PONDS AND REMOVAL OF CCR.
4. APPROXIMATE LIMITS OF AREA 1 POND AND WATER SURFACE BOUNDARY PROVIDED BY WESTAR. DRAWING PRODUCED BY PEC TITLED "WESTAR ENERGY TECUMSEH ENERGY CENTER INDUSTRIAL LANDFILL PLAT OF SURVEY" DATED 7 OCTOBER 2015.

N

0 60 120

SCALE IN FEET

HALEY ALDRICH

INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
AREA 1 POND
TECUMSEH ENERGY CENTER
TECUMSEH, KS

STORAGE CAPACITY AND IMPOUNDED CCR AND WATER VOLUMES

SCALE: AS SHOWN
SEPTEMBER 2016

FIGURE 4

APPENDIX A

Photographs

Photo No. 1
South Pond

Photo No. 2
North Pond

Photo No. 3
North Pond - Drained

Photo No. 4
North Pond – Area of Ash Removal

Photo No. 5
South Berm Crest

Photo No. 6
North Berm Crest

Photo No. 7
Low Area on South Crest

Photo No. 8
Erosion on South Berm Upstream Slope

Photo No. 9
North Berm Upstream Slope

Photograph No. 10
North Berm Downstream Slope

Photo No. 11
West Berm Downstream Slope

Photo No. 12
Tall Grass and Dead Vegetation on West Downstream Slope

Photo No. 13
Rutted/Eroded Area on West Downstream Slope

Photo No. 14
South Downstream Slope

Photo No. 15
Dead Spots on South Downstream Slope

Photo No. 16
Slough and Eroded Drainage Ditch on South Downstream Slope

Photo No. 17
Slough on South Downstream Slope

Photo No. 18
Burrows at Top of North Downstream Slope

Photo No. 19
Burrow at Downstream Edge of West Crest

Photo No. 20
Intake Structure

Photo No. 21
Intake Structure

Photo No. 22
Intake Structure

Photo No. 23
Outflow Pipe

Photo No. 24
Inlet Pipe

Photo No. 25
Inlet Channel to South Pond

Photo No. 26
Discharge from Inlet Channel into South Pond

Photo No. 27
Tecumseh Creek at Downstream Toe of Slope - Northwest Corner of Area 1 Pond

\\cle\common\Projects\41938_Westar-CCR Compliance\008-TEC Stability Assessments\Dam Assessment\20151007\2015-1206-Appendix A-Photos-TEC-d1.docx

APPENDIX B

Inspection Checklist

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: Area 1 Pond

STATE ID #: N/A

REGISTERED: (YES/NO) No

NID ID #: N/A

STATE SIZE CLASSIFICATION: Small

STATE HAZARD CLASSIFICATION: TBD

CHANGE IN HAZARD CLASSIFICATION REQUESTED?: (YES/NO)

DAM LOCATION INFORMATION

CITY/TOWN: Tecumseh

COUNTY/STATE: Shawnee/Kansas

DAM LOCATION: 5330 SE 2nd St. Tecumseh, Kansas
(street address if known)

ALTERNATE DAM NAME: N/A

USGS QUAD.: Grantville, Kansas

LAT.: 39˚3.1' N

LONG.: 95˚34.3' W

DRAINAGE BASIN: N/A

RIVER: Kansas River

IMPOUNDMENT NAME(S): Area 1 Pond

GENERAL DAM INFORMATION

TYPE OF DAM: Earthen Incised and Bermed

OVERALL LENGTH (FT): 1300

PURPOSE OF DAM: Sedimentation and Storage Basin

NORMAL POOL STORAGE (ACRE-FT): 20

YEAR BUILT: 1968

MAXIMUM POOL STORAGE (ACRE-FT): 20

STRUCTURAL HEIGHT (FT) 39

EL. NORMAL POOL (FT): 882±

HYDRAULIC HEIGHT (FT): 2.75

EL. MAXIMUM POOL (FT): 885.0

RESERVOIR SURFACE AREA (ACRES): 2

WINTER DRAWDOWN (FT BELOW NORMAL POOL) 0.0

PUBLIC ROAD ON CREST: No

DRAWDOWN VOL. (AC-FT) 0.0

PUBLIC BRIDGE OVER SPILLWAY: No

NAME OF DAM: Area 1 Pond Dam | STATE ID #: N/A

INSPECTION DATE: October 7, 2015 | NID ID #: N/A

INSPECTION SUMMARY

DATE OF INSPECTION: October 7, 2015 | DATE OF PREVIOUS INSPECTION: October 26, 2010

TEMPERATURE/WEATHER: Sunny, 74 | ARMY CORPS PHASE I: No (YES/NO) | If YES, date

CONSULTANT: Haley & Aldrich, Inc. | PREVIOUS ALT. PHASE I: No (YES/NO) | If YES, date

BENCHMARK/DATUM: NGVD29

OVERALL PHYSICAL CONDITION OF DAM: | DATE OF LAST REHABILITATION: N/A

SPILLWAY CAPACITY:

EL. POOL DURING INSP.: 882.25 | EL. TAILWATER DURING INSP.:

PERSONS PRESENT AT INSPECTION

NAME	TITLE/POSITION	REPRESENTING
Mark Brownstein	Senior Engineer	Haley & Aldrich, Inc
Andy Lucas	Staff Engineer	Haley & Aldrich, Inc
Brandon Griffin		Westar Energy
Jared Morrison (part-time)		Westar Energy
Kelley Kelsey (part-time)		Westar Energy
Sam Sunderraj (part-time)		KDHE

NAME OF DAM:	Area 1 Pond Dam		STATE ID #:	N/A	
INSPECTION DATE:	October 7, 2015		NID ID #:	N/A	

OWNER:	ORGANIZATION	Westar Energy - Jeffrey Energy C	CARETAKER:	ORGANIZATION	Westar Energy - Jeffrey Energy Center
	NAME/TITLE	Mr. Jared Morrison		NAME/TITLE	Mr. Jared Morrison
	STREET	5330 SE 2nd St.		STREET	5330 SE 2nd St.
	TOWN, STATE, ZIP	Tecumseh, Kansas 67357		TOWN, STATE, ZIP	Tecumseh, Kansas 67357
	PHONE	785-575-8273		PHONE	785-575-8273
	EMERGENCY PH. #	785-231-9577		EMERGENCY PH. #	785-231-9577
	FAX			FAX	
	EMAIL	Jared.Morrison@westarenergy		EMAIL	Jared.Morrison@westarenergy.com
	OWNER TYPE	Private			

PRIMARY SPILLWAY TYPE	Decant structure		
SPILLWAY LENGTH (FT)	N/A	SPILLWAY CAPACITY (CFS)	N/A
AUXILIARY SPILLWAY TYPE	N/A	AUX. SPILLWAY CAPACITY (CFS)	N/A
NUMBER OF OUTLETS	One	OUTLET(S) CAPACITY (CFS)	Unknown
TYPE OF OUTLETS	24" dia. Steel pipe	TOTAL DISCHARGE CAPACITY (CFS)	Unknown
DRAINAGE AREA (SQ MI)		SPILLWAY DESIGN FLOOD (PERIOD/CFS)	Unkown
HAS DAM BEEN BREACHED OR OVERTOPPED? (YES/NO):	No	IF YES, PROVIDE DATE(S)	
FISH LADDER (LIST TYPE IF PRESENT)	Unkown		
DOES CREST SUPPORT PUBLIC ROAD? (YES/NO)	No	IF YES, ROAD NAME:	
PUBLIC BRIDGE WITHIN 50' OF DAM? (YES/NO):	No	IF YES, ROAD/BRIDGE NAME:	
		MHD BRIDGE NO. (IF APPLICABLE)	

NAME OF DAM: Area 1 Pond STATE ID #: N/A

INSPECTION DATE: October 7, 2015 NID ID #: N/A

EMBANKMENT (U/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	None	X		
	2. SLOPE PROTECTION TYPE AND COND.	No slope protection	X		
	3. SINKHOLE/ANIMAL BURROWS	None	X		
	4. EMB.-ABUTMENT CONTACT	N/A	X		
	5. EROSION	Some minor erosion on upstream slope		X	
	6. UNUSUAL MOVEMENT	None	X		
	7. VEGETATION (PRESENCE/CONDITION)	Generally unvegetated. Some limited areas where vegetation is taller than 6 in.			X

ADDITIONAL COMMENTS:

NAME OF DAM: Area 1 Pond STATE ID #: N/A

INSPECTION DATE: October 7, 2015 NID ID #: N/A

EMBANKMENT (CREST)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Gravel/Sand	X		
	2. SURFACE CRACKING	None	X		
	3. SINKHOLES, ANIMAL BURROWS	Multiple 2-in. dia. burrows and one 3-in. borrow on D/S edge of N and W crests			X
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	Low spot at SW corner of south pond			X
	5. HORIZONTAL ALIGNMENT	OK	X		
	6. RUTS AND/OR PUDDLES	Very minor	X		
	7. VEGETATION (PRESENCE/CONDITION)	Nothing of note (generally less than 6 inches in height)	X		
	8. ABUTMENT CONTACT	N/A			

ADDITIONAL COMMENTS: Two dead moles on crest

NAME OF DAM: Area 1 Pond STATE ID #: N/A

INSPECTION DATE: October 7, 2015 NID ID #: N/A

EMBANKMENT (D/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None	X		
	2. SEEPAGE	None	X		
	3. SLIDE, SLOUGH, SCARP	5' x 5' slough on S D/S slope caused erosion in bottom of unlined drainage ditch			X
	4. EMB.-ABUTMENT CONTACT	N/A	X		
	5. SINKHOLE/ANIMAL BURROWS	Multiple small (2-in. dia.) burrows on north, west and south downstream slopes.			X
	6. EROSION	Rutting on SE corner & along creek. Erosion in tracks at bottom of W embankment		X	
	7. UNUSUAL MOVEMENT	None	X		
	8. VEGETATION (PRESENCE/CONDITION)	Dead patches on S and W D/S slopes. Some patches of grass up to 18 inches high.			X
					X

ADDITIONAL COMMENTS: Black wire exposed at ground surface adjacent to drainage ditch at slough on south downstream slope

NAME OF DAM: Area 1 Pond STATE ID #: N/A

INSPECTION DATE: October 7, 2015 NID ID #: N/A

PRIMARY SPILLWAY

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Decant structure	X		
	WEIR TYPE	Concrete stoplogs	X		
	SPILLWAY CONDITION	Fair	X		
	TRAINING WALLS	None present	X		
	SPILLWAY CONTROLS AND CONDITION	None present	X		
	UNUSUAL MOVEMENT	None present	X		
	APPROACH AREA	Fair	X		
	DISCHARGE AREA	Fair	X		
	DEBRIS	None present	X		
	WATER LEVEL AT TIME OF INSPECTION	882.25	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Area 1 Pond STATE ID #: N/A

INSPECTION DATE: October 7, 2015 NID ID #: N/A

OUTLET WORKS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE	Concrete Box Intake Structure with Steel Outflow Pipe			
	INTAKE STRUCTURE	Concrete Box Intake Structure	X		
	TRASHRACK	None	X		
	PRIMARY CLOSURE	Gate	X		
	SECONDARY CLOSURE	None	X		
	CONDUIT	Steel pipe lined with pushed-in plastic pipe liner	X		
	OUTLET STRUCTURE/HEADWALL	Discharges directly into Area 2 Pond	X		
	EROSION ALONG TOE OF DAM	None	X		
	SEEPAGE/LEAKAGE	None	X		
	DEBRIS/BLOCKAGE	None	X		
	UNUSUAL MOVEMENT	None	X		
	DOWNSTREAM AREA	Discharges directly into Area 2 Pond	X		
	MISCELLANEOUS				

ADDITIONAL COMMENTS:

NAME OF DAM: Area 1 Pond STATE ID #: N/A

INSPECTION DATE: October 7, 2015 NID ID #: N/A

DOWNSTREAM AREA

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	1. ABUTMENT LEAKAGE	N/A	X		
	2. FOUNDATION SEEPAGE	None observed. See comments below.		X	
	3. SLIDE, SLOUGH, SCARP	None observed. See comments below.		X	
	4. WEIRS	N/A	X		
	5. DRAINAGE SYSTEM	N/A	X		
	6. INSTRUMENTATION	N/A	X		
	7. VEGETATION	See comments below.		X	
	8. ACCESSIBILITY	See comments below.	X		
	9. DOWNSTREAM HAZARD DESCRIPTION	Downstream hazard is low. No occupied structures, only Bottom Ash Pond and Lake.			
	10. DATE OF LAST EAP UPDATE				

ADDITIONAL COMMENTS: Downstream area - North berm - Area immediately transitions to slope up to Area 2 Pond

Downstream area - West berm - Area heavily vegetated with trees between toe of slope and Tecumseh Creek. Ground surface not visible.

Downstream area - South berm - Area consists of SE 2nd Street

NAME OF DAM: Area 1 Pond STATE ID #: N/A

INSPECTION DATE: October 7, 2015 NID ID #: N/A

INSTRUMENTATION

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	Piezometers observed along dam crest and downstream	X		
	2. OBSERVATION WELLS	None present	X		
	3. STAFF GAGE AND RECORDER	None present	X		
	4. WEIRS	None present	X		
	5. INCLINOMETERS	None present	X		
	6. SURVEY MONUMENTS	None present	X		
	7. DRAINS	None present	X		
	8. FREQUENCY OF READINGS	No measurements are taken	X		
	9. LOCATION OF READINGS	N/A	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Area 1 Pond STATE ID #: N/A

INSPECTION DATE: October 7, 2015 NID ID #: N/A

UNDERLYING HYDRAULIC STRUCTURES/PIPES

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
UNDERLYING HYDRAULIC STRUCTURES /PIPES	TYPE	24" dia. Steel pipe	X		
	INLET				
	CONDUIT				
	OUTLET STRUCTURE/HEADWALL	Fair	X		
	EROSION ALONG STRUCTURE	None present	X		
	SEEPAGE/LEAKAGE	None present	X		
	DEBRIS/BLOCKAGE	None present	X		
	UNUSUAL MOVEMENT				
	DOWNSTREAM AREA				
	MISCELLANEOUS				

ADDITIONAL COMMENTS:

Note: Use additional sheets for additional outlets.

APPENDIX C

Definitions

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to Kansas State Rule 10 CSR 22 Dam and Reservoir Safety or other reference published by the Department of Natural Resources, the U.S. Army Corps of Engineers, the Federal Energy Regulatory Commission, the Department of the Interior Bureau of Reclamation, or the Federal Emergency Management Agency.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate there from including but not be limited to spillways; reservoirs and their rims; low level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

Size Classification

Large – structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate – structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small – structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional – structure less than 6 feet in height and having a storage capacity of less than 15 acre-feet.

Hazard Classification
(In the event the impoundment should fail, the following would occur):

Less Than Low Hazard Potential - Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

Low Hazard Potential - Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

Significant Hazard Potential - Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

High Hazard Potential - Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

General

EAP – Emergency Action Plan - Shall mean a predetermined plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam break.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. On million U.S. gallons = 3.068 acre feet

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Condition Rating

Unsafe - Major structural, operational, and maintenance deficiencies exist under normal operating conditions.

Poor - Significant structural, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

Fair - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

Good - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.

HALEY ALDRICH

www.haleyaldrich.com

REPORT ON

INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
AREA 1 POND
TECUMSEH ENERGY CENTER
TECUMSEH, KANSAS

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Westar Energy, Inc.
Tecumseh, Kansas

File No. 41938-008
September 2016