



REPORT

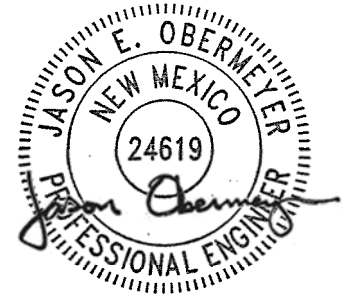
Active Coal Combustion Residuals Landfill Annual Inspection *Escalante Generating Station*

Submitted to:

Tri-State Generation and Transmission Association, Inc.
1100 West 116th Avenue Westminster, Colorado 80234

Submitted by:

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January 15, 2019

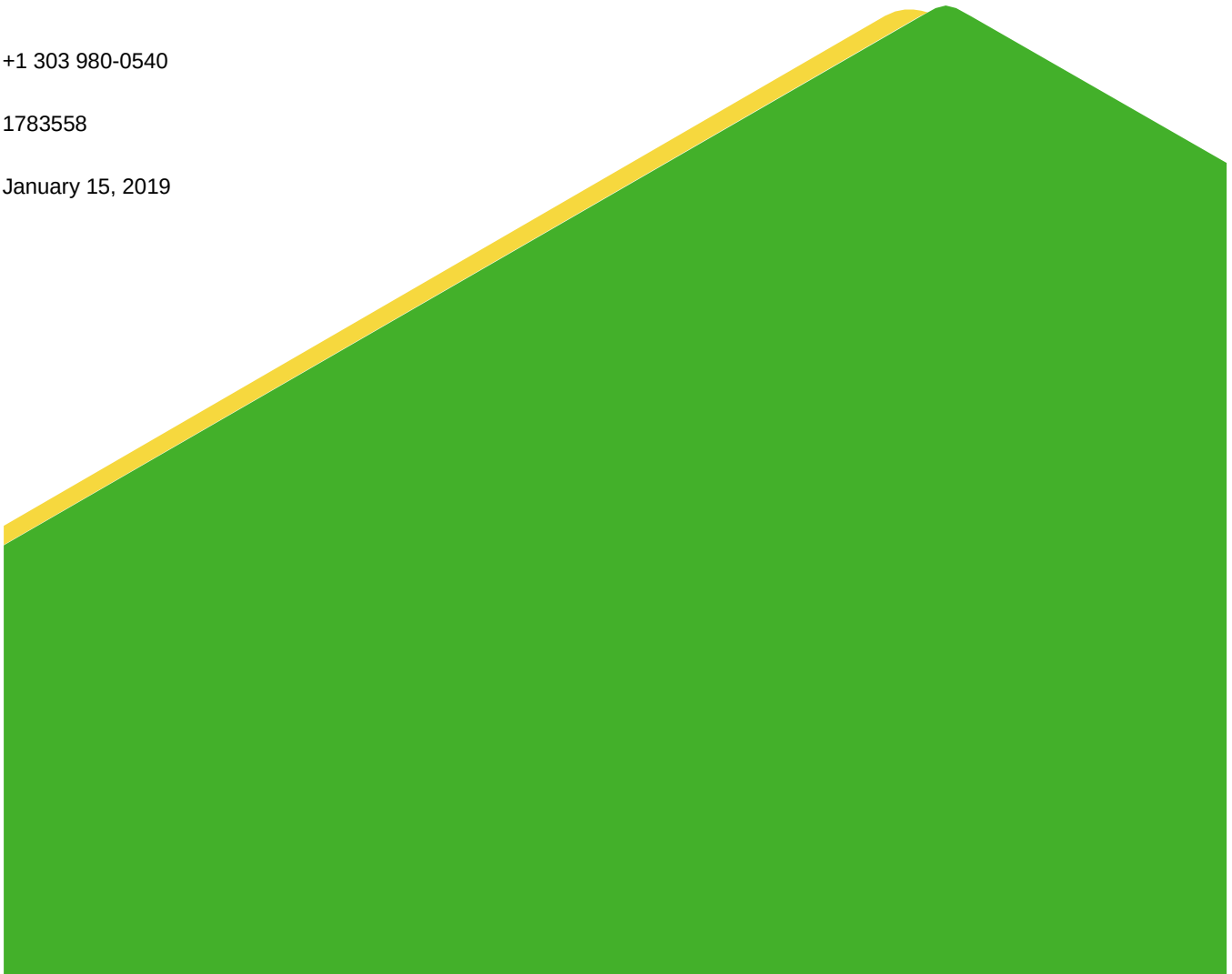


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1.0 INTRODUCTION

1.1 Background

Golder Associates Inc. (Golder) has prepared this annual inspection report for Tri-State Generation and Transmission Association, Inc. (Tri-State) to summarize our review of available information and visual observation of the active disposal facility for coal combustion residuals (CCRs) at Escalante Generating Station. The facility classifies as an existing CCR landfill under 40 CFR 257. The purpose of Golder's review of available information and visual observation was to satisfy the requirements of 40 CFR 257.84(b)(1), which prescribes periodic completion of these activities by a qualified professional engineer to verify that the design, construction, operation, and maintenance of the facility are consistent with recognized and generally accepted good engineering practice. The discussion presented in this report is limited to the active CCR disposal facility at Escalante Generating Station and does not include consideration of the inactive CCR disposal facility at the site. Golder's visual observations took place on November 14, 2018. This report is the fourth annual inspection report for the facility under 40 CFR 257.84(b)(1).

This report presents a description of the facility (Section 1), a summary of Golder's review of available information about the facility (Section 2), the findings from Golder's visual observation of the facility (Section 3), and Golder's conclusions and recommendations (Section 4).

1.2 Facility Description

Escalante Generating Station is a 270-megawatt coal-fired electric generation plant. The site is located approximately 4.2 miles northwest of Prewitt, New Mexico. Tri-State currently generates fly ash, bottom ash, and flue gas desulfurization (FGD) material at Escalante Generating Station and disposes these materials in the facility. The facility is one of several site features regulated by the New Mexico Environmental Department (NMED), Ground Water Quality Bureau, under Discharge Permit DP-206. Filling began at the facility in 2009, and CCRs have been deposited over approximately 24 acres to date. The total facility footprint is approximately 54 acres.

The facility is located immediately south of the inactive CCR disposal facility at the site. Placement of CCRs commenced at the east end of the facility and is progressing westward as design grades or interim grades are reached. As the height of the fill increases, CCRs are being placed such that they abut ("piggy back") the inactive CCR disposal facility on the north end. The outer embankment slopes for the facility are designed at a slope ratio of 3 horizontal to 1 vertical.

2.0 REVIEW OF AVAILABLE INFORMATION

2.1 Information Reviewed

40 CFR 257.84(b)(1)(i) requires the annual inspection to include a review of information pertaining to the status and condition of the facility, including files that are available in the operating record. Golder has reviewed information provided by Tri-State as part of our effort to verify that the design, construction, operation, and maintenance of the facility are consistent with recognized and generally accepted good engineering practice. The information Golder has reviewed includes the following:

- Ground Water Discharge Permit Modification DP-206, which authorizes operation of the facility (New Mexico Environment Department 2015);
- Design and operational information for the facility (Metric Corporation 2006);

- The fugitive dust control plan for the facility (Golder Associates Inc. 2015);
- The run-on and run-off control system plan for the facility (Golder Associates Inc. 2016a);
- The closure plan for the facility (Golder Associates Inc. 2016b);
- The initial annual inspection report for the facility (Golder Associates Inc. 2016c);
- The second annual inspection report for the facility (Golder Associates Inc. 2017);
- The third annual inspection report for the facility (Golder Associates Inc. 2018); and
- Weekly inspection forms documenting weekly inspections conducted by qualified persons employed by Tri-State between December 21, 2017, and December 18, 2018.

The weekly inspection forms provided valuable information regarding the status and condition of the facility throughout 2018.

2.2 Changes in Facility Geometry

40 CFR 257.84(b)(2)(i) requires the annual inspection report to include a summary of changes in facility geometry since the previous annual inspection. During Golder's site observations, the geometry of the facility was found to be in general conformance with the design. Since the previous annual inspection, the CCR deposition area has moved west, adjacent to the deposition area that was being used previously. The previous deposition area has been left at interim grades as placement of CCRs proceeds westward. As such, the current CCR deposition area is topographically lower than the deposition area that was being used during the previous annual inspection. This is the only significant change in facility geometry that was noted during the site observations.

2.3 Ash Volume Contained in the Facility

40 CFR 257.84(b)(2)(ii) requires the annual inspection report to include an estimate of the volume of CCRs contained within the facility at the time of the inspection. Based on historical information and CCR placement data provided by Tri-State, Golder estimates that the volume of CCRs contained within the facility is 865,000 cubic yards through December 31, 2018.

2.4 Changes Affecting Stability or Operation

40 CFR 257.84(b)(2)(iv) requires the annual inspection report to include a summary of changes that may have affected the stability or operation of the facility since the previous annual inspection. Our review of the weekly inspection forms completed between December 21, 2017, and December 18, 2018, indicates that changes affecting the stability or operation of the facility have not been identified during the weekly inspections. Indications of changes that affect stability or operation of the facility were not identified during Golder's visual observations on November 14, 2018 (refer to Section 3).

3.0 VISUAL OBSERVATION

3.1 Overview

40 CFR 257.84(b)(1)(ii) requires the annual inspection to include visual observation of the facility that is intended to identify signs of distress or malfunction. 40 CFR 257.84(b)(2)(iii) requires the annual inspection report to include a description of appearances of structural weakness at the facility, in addition to existing conditions that

are disrupting or have the potential to disrupt the operation and safety of the facility. These requirements are addressed in this section.

3.2 Visual Observation Terminology

Terms used in this section are defined as follows:

Condition of Facility Component

Good:	A condition that is generally better than the minimum expected condition based on the design criteria and maintenance performed at the facility.
Fair:	A condition that is generally consistent with the minimum expected condition based on the design criteria and maintenance performed at the facility.
Poor:	A condition that is generally worse than the minimum expected condition based on the design criteria and maintenance performed at the facility.

Severity of Deficiency

Minor:	An observed deficiency where the current condition is worse than the minimum expected condition but does not currently pose a threat to structural stability.
Significant:	An observed deficiency where the current condition is worse than the minimum expected condition and could pose a threat to structural stability if it is not addressed.
Excessive:	An observed deficiency where the current condition is worse than the minimum expected condition and either hinders the ability of an inspector to evaluate the facility component or poses a threat to structural stability.

3.3 Findings

Golder conducted a visual observation of the facility on November 14, 2018. Golder observed the condition of the deposition area, embankment slopes, embankment crest, embankment toe, and storm water control features. The annual inspection form is included in Appendix A.

3.3.1 Deposition Area

The deposition area was observed to be in good condition. Signs of ground movement, such as sloughing or sliding, cracking, subsidence, or bulging, were not observed in the deposition area. Deposition of CCRs was occurring at the time of the visual observation. The deposition methodology appeared to be appropriate. Appropriate grading had been established to collect contact water within the deposition area. A berm that was several feet in height was in place around the perimeter of the deposition area to prevent migration of contact water out of the deposition area. Fugitive dust was not observed at the time of the visual observation. The typical condition of the deposition area is depicted in Photograph 1.



Photograph 1: Typical Deposition Area Condition

3.3.2 Embankment Crest

The embankment crest was observed to be in good condition. Cracking that would be indicative of ground movement was not observed along the embankment crest. Low areas that would be indicative of differential settlement were not observed along the embankment crest. The typical condition of the embankment crest is depicted in Photograph 2.



Photograph 2: Typical Embankment Crest Condition

3.3.3 Embankment Slopes

The embankment slopes were observed to be in fair condition. Signs of ground movement, such as sloughing or sliding, cracking, subsidence, or bulging, were not observed on the embankment slopes. Evidence of significant or excessive erosion or slope deterioration was not observed on the embankment slopes, although some rilling was observed on the south embankment slopes. The rilling does not pose a threat to structural stability. The most recent seeding effort appeared to have included the use of hydraulic mulch, which was observed to have created a crust at the ground surface that was helping to resist further rilling. Golder recommended that rill repair efforts be deferred until the rills become more severe (approximately 12 inches wide or 12 inches deep) or a reseeding attempt is planned, since repair efforts will disturb the crust.

Native vegetation is being established on the embankment slopes, but establishment of a mature vegetative community is challenging given the climatic conditions at the site. Unusually poor or thriving vegetative growth was not observed on the embankment slopes, but there was generally less vegetative coverage on the south embankment slope than on the east embankment slope due to the southern aspect. No trees or woody vegetation were observed on the embankment slopes. No evidence of recent animal burrowing was observed on the embankment slopes. The typical condition of the embankment slopes is depicted in Photograph 3.



Photograph 3: Typical Embankment Slope Condition

3.3.4 Embankment Toe

The embankment toe was observed to be in good condition. Signs of seepage, such as springs or boggy areas, were not observed along the embankment toe. A small area near the center of the east embankment toe was observed to have a white residue at the ground surface and some moisture in the near-surface soil. Golder recommended that Tri-State excavate a test pit at this location and observe it over the course of at least one week to verify that no signs of seepage, such as standing water in the base of the test pit or saturated soils in the test pit walls, are present. Tri-State excavated the test pit on December 17, 2018 and provided photographic documentation of the findings to Golder on December 19, 2018 and January 2, 2019. No signs of seepage were observed, and the test pit will be backfilled. The typical condition of the embankment toe is depicted in Photograph 4.



Photograph 4: Typical Embankment Toe Condition

3.3.5 Storm Water Control Features

The storm water control features at the facility were observed to be in good condition. At the time of the visual observation, the only permanent storm water control feature at the facility was a run-on control channel that is designed to convey storm water from west to east along the south end of the facility. The run-on control channel is armored with riprap. Relatively large shrubs were observed to be growing in the flow path. The shrubs do not pose a threat to structural stability, but they should be removed periodically to help maintain the channel's flow capacity. The typical condition of the run-on control channel is depicted in Photograph 5.



Photograph 5: Typical Storm Water Channel Condition

4.0 CONCLUSIONS AND RECOMMENDATIONS

Golder completed an annual inspection of the active disposal facility for CCRs at Escalante Generating Station to address the requirements of 40 CFR 257.84. Signs of distress or malfunction of the facility were not observed, and appearances of actual or potential structural weakness of the facility were not identified. Facility maintenance activities that should be carried out as the need is indicated by weekly inspections conducted in accordance with 40 CFR 257.84(a) include control of burrowing animals, repair of significant erosion damage on embankment slopes, establishment of suitable vegetation on embankment slopes, control and containment of CCR contact water, and promotion of positive storm water drainage away from the facility.

REFERENCES

Golder Associates Inc. (2015). Escalante Generating Station Coal Combustion Residuals Fugitive Dust Control Plan. Plan prepared for Tri-State Generation and Transmission Association, Inc. October.

Golder Associates Inc. (2016a). Escalante Generating Station Active Coal Combustion Residuals Landfill Run-on and Run-off Control System Plan. Plan prepared for Tri-State Generation and Transmission Association, Inc. October.

Golder Associates Inc. (2016b). Escalante Generating Station Active Ash Landfill Closure Plan. Plan prepared for Tri-State Generation and Transmission Association, Inc. October.

Golder Associates Inc. (2016c). Coal Combustion Residuals Landfill Annual Inspection Report, Escalante Generating Station. Report prepared for Tri-State Generation and Transmission Association, Inc. January 18.

Golder Associates Inc. (2017). Coal Combustion Residuals Landfill Annual Inspection Report, Escalante Generating Station. Report prepared for Tri-State Generation and Transmission Association, Inc. January 18.

Golder Associates Inc. (2018). Coal Combustion Residuals Landfill Annual Inspection Report, Escalante Generating Station. Report prepared for Tri-State Generation and Transmission Association, Inc. January 15.

Metric Corporation (2006). Scrubber Sludge/Fly Ash Landfill Expansion Plan for the Tri-State Escalante Generating Station. Plan prepared for Tri-State Generation and Transmission Association, Inc. August 14.

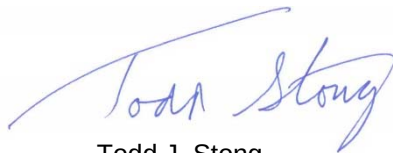
New Mexico Environment Department (2015). Discharge Permit Modification, Escalante Generating Station, DP-206. February 10.

Signature Page

Golder Associates Inc.



Jason E. Obermeyer, PE
Associate and Senior Consultant



Todd J. Stong
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JEO/TJS/ds

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APPENDIX A

Annual Inspection Form



TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION **ESCALANTE GENERATING STATION ACTIVE CCR LANDFILL** **ANNUAL INSPECTION FORM**

Inspection Date: November 14, 2018	Inspection Time: 10:30 am to 11:45 am	Legend: Y Yes N No NI Not inspected NA Not applicable RA Requires action
Inspector(s): Jason Obermeyer, PE	Title(s): Senior Consultant	
Reviewer: Todd Stong, PE	Title: Senior Consultant	

Instructions: Complete each part of the annual inspection form. Indicate areas of concern on the plan view on page 3. Elaborate on deficiencies in Section J.

A. Previous Open Items

1. Please list open items from the previous inspection form (Section I.) and indicate whether or not the open items have been resolved: None						
a.	Y	N	NI	NA	RA	If N and/or RA, please elaborate.
b.	Y	N	NI	NA	RA	If N and/or RA, please elaborate.
c.	Y	N	NI	NA	RA	If N and/or RA, please elaborate.

B. Atmospheric Conditions

1. Briefly describe precipitation conditions (rainy, dry, snowy) or notable precipitation events over the last five days: Dry, no precipitation in the last five days
2. Briefly describe wind (calm, breezy, windy, gusty) and weather (cold, warm, cloudy, sunny) conditions during the inspection: Calm, partly cloudy, cool (~40°F)

C. Facility Access

1. Are facility access roads in good condition?	Y	N	NI	NA	RA	If N and/or RA, please elaborate.
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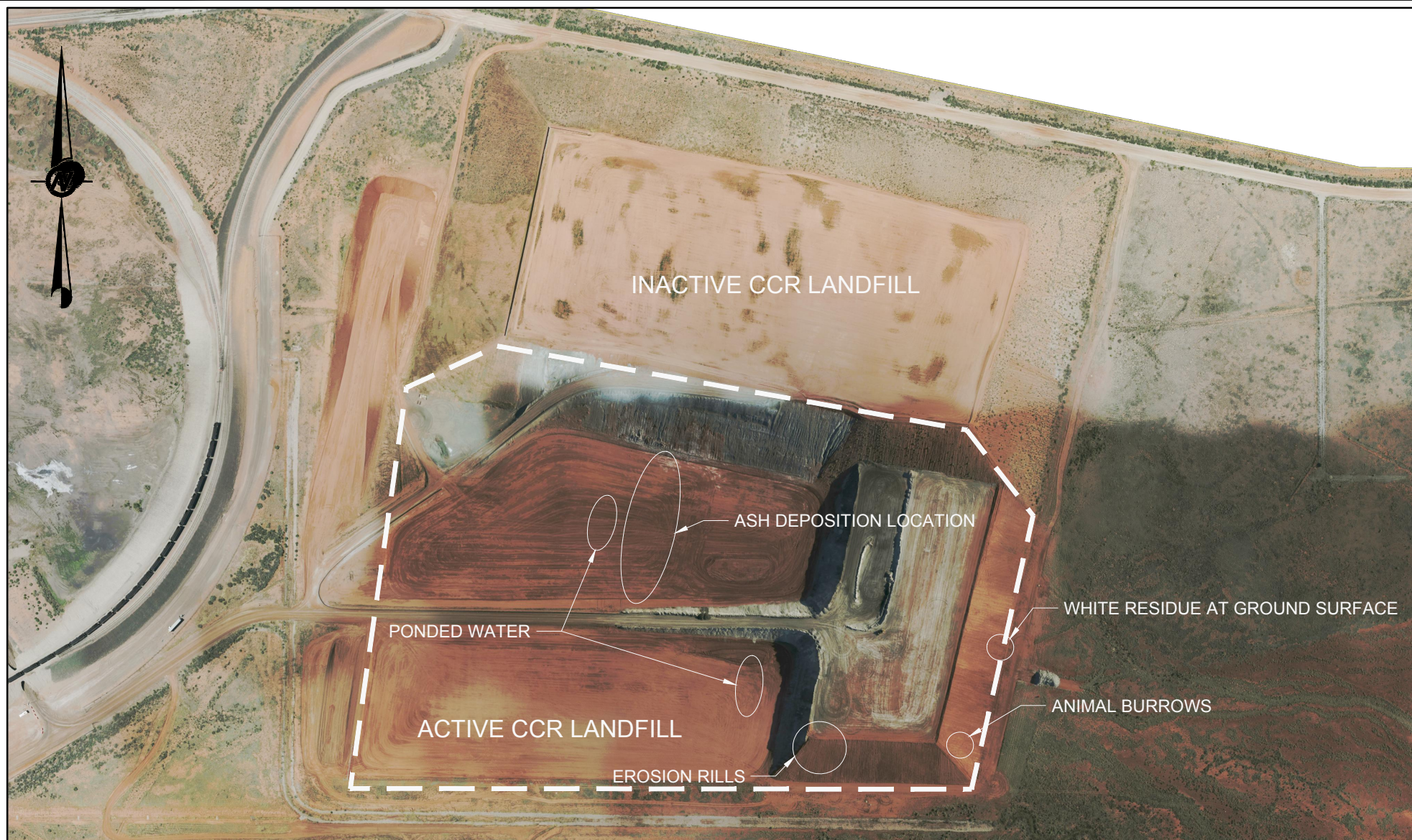
D. Fill Area

1. Where are ash and/or other materials currently being deposited (indicate on the plan view on page 3 or write N/A)? See page 3						
2. Do you observe signs of ground movement in the fill area?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
If Y, please circle those that apply: Slough or Slide Cracking Subsidence Bulging						
3. Do you observe ponded water in the fill area (if Y, sketch on the plan view on page 3)?	Y	N	NI	NA	RA	If RA, please elaborate.
4. Does it appear that fugitive dust (fill area and roads) is being adequately controlled?	Y	N	NI	NA	RA	If N and/or RA, please elaborate.
5. Are controls in place to keep ash contact water from migrating away from the landfill?	Y	N	NI	NA	RA	If N and/or RA, please elaborate.

E. Embankment Crest

1. Do you observe cracks along the embankment crest?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
2. Do you observe differential settlement (low areas) along the embankment crest?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
3. Are the roads around and on the facility in good condition?	Y	N	NI	NA	RA	If N and/or RA, please elaborate.

F. Exterior Slopes						
1. Briefly describe ground conditions (wet, dry, soft, firm). North: N/A East: Dry, firm South: Dry, firm West: N/A						
2. Do you observe signs of movement or instability on the exterior slopes?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
If Y, please circle those that apply: Slough or Slide Cracking Subsidence Bulging						
3. Do you observe signs of excessive erosion or slope deterioration?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
4. Do you observe unusual vegetative growth (thriving or poor growth) or woody vegetation?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
5. Do you observe animal burrows on the exterior slopes?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
G. Embankment Toe						
1. Do you observe signs of seepage (springs or boggy areas) at the embankment toe?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
2. Do you observe ash outside of the disposal footprint?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
H. Storm Water Controls						
1. Are run-on control features (ditches) in good condition?	Y	N	NI	NA	RA	If N and/or RA, please elaborate.
I. Open Items						
1. Please list unresolved items from previous annual inspections (RA in Section A.) and new items identified during the annual inspection (RA in Sections B. through H.):						
a. G.1. Excavation and observation of a test pit is recommended to assess whether preferential seepage is occurring at a location along the embankment toe (see Section J.).						
b.						
c.						
d.						
e.						
J. Elaboration						
Identify the specific item number (for instance, F.2.) and elaborate on each deficiency or issue identified during the annual inspection. Attach documentation (photographs or sketches) if practical. F.3. Minor rilling was observed, primarily on the western half of the south embankment slope (see page 3). The maximum depth of rills was 6 to 8 inches, and the maximum width of rills was approximately 6 inches. Crust from hydraulically applied mulch was observed to be holding the soil at the ground surface in place, and it is not recommended to perform rill repairs and disturb the crust at this time. The rilling is not currently of concern for stability of the embankment slope. Efforts to establish additional vegetative coverage should continue, as this would be the most effective means to limit rilling. F.5. A few burrows were observed on the east embankment slope near the southeast corner of the facility, near the embankment toe (see page 3). There was no evidence of recent activity, and the burrows are not currently of concern for stability of the embankment slope. G.1. A moist area was identified at the toe of the east embankment slope, at approximately the north-to-south midpoint (see page 3). Excavation of a test pit to a depth of four to six feet is recommended at this location, with follow-up observation over the course of at least one week to assess whether seepage may be preferentially reporting to this location.						



ANNUAL INSPECTION FORM

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION ESCALANTE GENERATING STATION ACTIVE CCR LANDFILL



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