



Post-Closure Plan Tecumseh Energy Center Industrial Landfill #0322

Prepared for:

Westar Energy

Tecumseh Energy Center

Tecumseh, Kansas

Prepared by:

CB&I Environmental & Infrastructure, Inc.

October 2016



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Plan Review/Amendment Log §257.102(b)(3)

Date of Review	Reviewer Name	Amendment Required (YES/NO)	Sections Amended and Reason



CCR Regulatory Requirements

USEPA CCR Criteria 40 CFR §257.104	Tecumseh Energy Center Post-Closure Plan
<p>§257.104(a)(1) stipulates:</p> <p><i>(a) Applicability. (1) Except as provided by either paragraph (a)(2) or (3) of this section, §257.104 applies to the owners or operators of CCR landfills, CCR surface impoundments, and all lateral expansions of CCR units that are subject to the closure criteria under §257.102.</i></p>	<p>Section 1.0, Page 1</p>
<p>§257.104(b)(1) stipulates:</p> <p><i>(b) Post-closure care maintenance requirements. Following closure of the CCR unit, the owner or operator must conduct post-closure care for the CCR unit, which must consist of at least the following:(1) Maintaining the integrity and effectiveness of the final cover system, including making repairs to the final cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover;</i></p>	<p>Section 7.1, Page 7</p>
<p>§257.104(b)(2) stipulates:</p> <p><i>(2) If the CCR unit is subject to the design criteria under §257.70, maintaining the integrity and effectiveness of the leachate collection and removal system and operating the leachate collection and removal system in accordance with the requirements of §257.70; and</i></p>	<p>Section 7.2, Page 7</p>



USEPA CCR Criteria 40 CFR §257.104	Tecumseh Energy Center Post-Closure Plan
<p>§257.104(b)(3) stipulates:</p> <p><i>(3) Maintaining the groundwater monitoring system and monitoring the groundwater in accordance with the requirements of §257.90 through §257.98.</i></p>	<p>Section 7.3, Page 8</p>
<p>§257.104(c)(1) stipulates:</p> <p><i>(c) Post-closure care period: (1) Except as provided by paragraph (c)(2) of this section, the owner or operator of the CCR unit must conduct post-closure care for 30 years.</i></p>	<p>Section 4.0, Page 4</p>
<p>§257.104(d)(1)(i) stipulates:</p> <p><i>(d) Written post-closure plan—(1) Content of the plan. The owner or operator of a CCR unit must prepare a written post-closure plan that includes, at a minimum, the information specified in paragraphs (d)(1)(i) through (iii) of this section. (i) A description of the monitoring and maintenance activities required in paragraph (b) of this section for the CCR unit, and the frequency at which these activities will be performed;</i></p>	<p>Section 7.0, Page 7</p>
<p>§257.104(d)(1)(ii) stipulates:</p> <p><i>(ii) The name, address, telephone number, and email address of the person or office to contact about the facility during the post-closure care period; and.</i></p>	<p>Section 10.0, Page 11</p>



USEPA CCR Criteria 40 CFR §257.104	Tecumseh Energy Center Post-Closure Plan
<p>§257.104(d)(1)(iii) stipulates:</p> <p><i>(iii) A description of the planned uses of the property during the post-closure period. Post-closure use of the property shall not disturb the integrity of the final cover, liner(s), or any other component of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements in this subpart. Any other disturbance is allowed if the owner or operator of the CCR unit demonstrates that disturbance of the final cover, liner, or other component of the containment system, including any removal of CCR, will not increase the potential threat to human health or the environment. The demonstration must be certified by a qualified professional engineer, and notification shall be provided to the State Director that the demonstration has been placed in the operating record and on the owners or operator's publicly accessible Internet site.</i></p>	<p>Section 4.0, Page 4</p>
<p>§257.104(d)(2)(i) stipulates:</p> <p><i>(2) Deadline to prepare the initial written post-closure plan: (i) Existing CCR landfills and existing CCR surface impoundments. No later than October 17, 2016, the owner or operator of the CCR unit must prepare an initial written post-closure plan consistent with the requirements specified in paragraph (d)(1) of this section.</i></p>	<p>Report submitted prior to October 17, 2016.</p>
<p>§257.104(d)(2)(ii) stipulates:</p> <p><i>(ii) The owner or operator has completed the written post-closure plan when the plan, including the certification required by paragraph (d)(4) of this section, has been placed in the facility's operating record as required by 257.105(i)(4).</i></p>	<p>Will be completed after approval</p>



USEPA CCR Criteria 40 CFR §257.104	Tecumseh Energy Center Post-Closure Plan
<p>§257.104(d)(3) stipulates:</p> <p><i>(3) Amendment of a written post-closure plan. (i) The owner or operator may amend the initial or any subsequent written post-closure plan developed pursuant to paragraph (d)(1) of this section at any time.</i></p> <p><i>(ii) The owner or operator must amend the written closure plan whenever:</i></p> <p><i>(A) There is a change in the operation of the CCR unit that would substantially affect the written post-closure plan in effect; or</i></p> <p><i>(B) After post-closure activities have commenced, unanticipated events necessitate a revision of the written post-closure plan.</i></p> <p><i>(iii) The owner or operator must amend the written post-closure plan at least 60 days prior to a planned change in the operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the need to revise an existing written post-closure plan. If a written post-closure plan is revised after post-closure activities have commenced for a CCR unit, the owner or operator must amend the written post-closure plan no later than 30 days following the triggering event.</i></p>	<p>Section 11.0, Page 12</p>
<p>§257.104(d)(4) stipulates:</p> <p><i>(4) The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the initial and any amendment of the written post-closure plan meets the requirements of this section.</i></p>	<p>Section 12.0, Page 13</p>



USEPA CCR Criteria 40 CFR §257.104	Tecumseh Energy Center Post-Closure Plan
<p>§257.104(e) stipulates:</p> <p><i>(e) Notification of completion of post-closure care period. No later than 60 days following the completion of the post-closure care period, the owner or operator of the CCR unit must prepare a notification verifying that post-closure care has been completed. The notification must include the certification by a qualified professional engineer verifying that post-closure care has been completed in accordance with the closure plan specified in paragraph (d) of this section and the requirements of this section. The owner or operator has completed the notification when it has been placed in the facility's operating record as required by §257.105(i)(13).</i></p>	<p>Section 8.0, Page 9</p>
<p>§257.104(f) stipulates:</p> <p><i>(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in §257.105(i), the notification requirements specified in §257.106(i), and the Internet requirements specified in §257.107(i).</i></p>	<p>Section 9.0, Page 10</p>



1.0 INTRODUCTION

CB&I Environmental and Infrastructure, Inc. (CB&I) has prepared the following Post-Closure Plan (Plan) at the request of Westar Energy (Westar) for the Industrial Landfill No. 0322 (Landfill) located at the Tecumseh Energy Center (TEC) in Tecumseh, Kansas. TEC is a coal-fired power plant that has been in operation since 1925. The Landfill has been deemed to be a regulated coal combustion residue (CCR) unit by the United States Environmental Protection Agency (USEPA) through the Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (CCR Rule) 40 CFR §257 and §261.

Following the closure of the Landfill per §257.102 for closure of CCR material in place, Westar intends to conduct the post-closure care of the Landfill in line with the requirements outlined in §257.104 *Post-Closure Care Requirements*. The criteria for conducting the post-closure care of the Landfill are detailed in Section 2.0. All post-closure care processes have been established to control, minimize, and eliminate infiltration of liquids into waste and release of leachate.



2.0 POST-CLOSURE PLAN

On April 17, 2015, The United States Environmental Protection Agency (USEPA) published the CCR Rule under Subtitle D of the Resource Conservation and Recovery Act (RCRA) as 40 CFR Parts §257 and §261. The purpose of the CCR Rule is to regulate the management of CCR material in regulated units for landfill and surface impoundments. The Bottom Ash Area Landfill at TEC has been deemed to be a regulated CCR unit.

Section 257.104(d) of the CCR Rule requires owners or operators of CCR Landfills to prepare a written Plan describing the monitoring and maintenance activities, contact personnel during the post-closure care period, the planned use of the unit during post-closure care period, and the schedule for implementation of the Plan. The following citations from the CCR Rule are applicable for the Landfill as discussed in this Plan:

§257.104(d)(1) stipulates:

“The owner or operator of a CCR unit must prepare a written post-closure plan that includes, at a minimum, the information specified in paragraphs (d)(1)(i) through (iii) of this section

- (i) A description of the monitoring and maintenance activities required in paragraph (b) of this section for the CCR unit, and the frequency at which these activities will be performed;*
- (ii) The name, address, telephone number, and email address of the person or office to contact about the facility during the post-closure care period; and*
- (iii) A description of the planned uses of the property during the post-closure period. Post-closure use of the property shall not disturb the integrity of the final cover, liner(s), or any other component of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements in this subpart...”*



3.0 TEC LANDFILL OVERVIEW

3.1 Location, Topography, and Description

Bottom ash and fly ash (CCR material) are disposed of within TEC's Landfill. The closure of the Landfill will be accomplished by leaving the CCR material in place and covering the CCR material with an engineered cap.

The Landfill is located within TEC in Tecumseh, Kansas in Shawnee County. TEC is located approximately 6.5 miles east of Topeka, Kansas and approximately 2 miles north of Highway 70. The Landfill is bounded to the north by 2nd Street, the TEC facility, and an adjacent industrial property, with the Kansas River located less than one-half mile north of the Landfill. The Landfill is bounded on the east and south by agricultural land and Highway 40 is along the southern boundary, with rural residential properties located along the western portion of the Landfill boundary. The location of the Landfill is depicted in **Figure 1**.

The Landfill footprint is approximately 56 acres total, with approximately 32 acres used for CCR material disposal and management. The Landfill is being filled in three separate phases: Phase 1 (the northern phase, 7.4 acres), Phase 2 (the southern phase, 15.4 acres), and Phase 3 (the middle phase, 9.2 acres) which is located between Phases 1 and 2. Phase 1 is has a temporary clay cap with established vegetation. Phase 2 is operational and is being used for current CCR material disposal. Approximately 9.2 acres of the Phase 2 cell has a final clay cover with established vegetation which meets the CCR Rule requirements. Phase 3 was previously operational, however, has not received waste in several years.

Topography varies across the Landfill plateau in approximate elevations ranging from 927 feet mean sea level (ft. MSL) to 961 ft. MSL. Direct precipitation that falls onto active portions of the Landfill has historically been managed by a contact water basin located in Phase 3. The contact water basin is bounded by a 10-foot high perimeter berm designed to prevent the off-site discharge of contact water. As landfilling operations continue, the contact water basin will be drained and closed in compliance with 40 CFR Part §257.102. Once the final cover is complete, the Landfill will be graded to have a one percent slope on the plateau to a 3.5H:1V side slope that drains into perimeter drainage channels along the toe of the Landfill. Existing and permitted site topography is depicted in **Figure 2** and **Figure 3**, respectively.

3.2 Existing Regulatory Permits and Consents

Westar was granted an Industrial Landfill Permit (Number 0322) at TEC by the Kansas Department of Health and Environment – Bureau of Waste management (KDHE-BWM), in accordance with Kansas Statutes Annotated (KSA) 65-3407. KDHE modified the solid waste permit, per K.A.R. 28-29-6a, in response to the CCR Rule to include all on-site CCR material units as disposal areas under the existing solid waste permit for TEC. The current Industrial Landfill Permit was approved on October 15, 2015. This allows CCR material generated on-site at TEC to be properly disposed of within the Landfill Permit boundary in line with the approved final grades, which are detailed in **Figure 3**.



4.0 POST-CLOSURE OVERVIEW AND PLANNED USE (§257.104(d)(1)(iii))

This Plan applies to existing and proposed disposal units in TEC's Landfill. The total area requiring post-closure care after a specific phase is closed is the total area of the Landfill. The post-closure care of the Landfill must and will be conducted for 30 years, as required by §257.104(c)(1) and KAR 28-29-12.

The currently proposed end use of the Landfill is a natural area of passive open space that will not disturb the integrity of the final cover system. No waste will remain exposed after completion of the Landfill closure. The Landfill entrance/exit gate will be locked when it is closed. The Landfill will be closed to the public.



5.0 INSPECTION ACTIVITIES

Weekly (7-day) inspections and annual reporting are currently undertaken in accordance with §257.84(b). These activities will continue to be performed during the operational life of the Landfill. Current inspections and reporting will identify any stability, stormwater, erosion controls, or vegetation which requires attention, in addition to any operational changes.

As part of the post-closure care phase for the Landfill, it is anticipated that the current weekly (7-day) inspections will revert to quarterly inspections; annual reporting will continue for the duration of the post-closure care period. The annual report will provide any recommendations for future inspections and monitoring which will be undertaken as part of the post-closure care phase for the Landfill.

The inspection of the closed Landfill will be conducted by TEC personnel or their designee(s). The purpose of the visual inspections during the post-closure care phase will be to detect any damage, distress, or malfunctions to the Landfill final cover, cover soils, vegetation, and stormwater management systems for the Landfill. Any detection will be repaired to maintain the erosion control measures and prevent a breach of the containment structures.



6.0 GROUNDWATER AND SURFACE WATER MONITORING ACTIVITIES

Water quality monitoring will occur throughout the post-closure care period. Monitoring will include groundwater and surface water at the designated monitoring wells and sampling points for the Landfill. The groundwater monitoring system maintenance and monitoring will be in accordance with the requirements in §257.90 through §257.98, as required by §257.104(b)(3). The groundwater monitoring, sampling requirements and methodology, and reporting procedures are provided in the Sampling and Analysis Plan (SAP) for the Landfill. TEC's groundwater system will be sampled semi-annually and all groundwater wells shall be inspected at least annually to ensure any damage due to settlement or other means is repaired. No assessment monitoring is anticipated to be required.

The sampling of the surface water sedimentation basins are described in TEC's NPDES Permit No. I-KS72-BO01.



7.0 MAINTENANCE ACTIVITIES (§257.104(d)(1)(i) and §257.104(b))

Per §257.104(d)(1)(i) *Written post-closure plan* and §257.104(b) *Post-closure care maintenance requirements*: “Following the closure of the CCR unit, the owner or operator must conduct post-closure care for the CCR unit, which must consist of at least the following:

1. *Maintaining the integrity and effectiveness of the final cover system including making repairs to the final cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover*
2. *If the CCR unit is subject to the design criteria under §257.70, maintaining the integrity and effectiveness of the leachate collection and removal system and operating the leachate collection and removal system in accordance with the requirements of §257.70; and*
3. *Maintaining the groundwater monitoring system and monitoring groundwater in accordance with the requirements of §257.90 through §257.98.”*

7.1 Final Cover System Maintenance and Repair Plan (§257.104(b)(1))

The final cover system may experience minor settlement over time due to waste or foundation consolidation/settlement. Only minor settlement is anticipated due to the physical characteristics of CCR material, the CCR material is compacted during placement, and most of the settlement will have already occurred shortly after landfilling. Minor regrading and repair of the erosion control layer soil component may be required in the event that future non-uniform settlement is observed to be impacting the functional design and/or operation of the Landfill and surrounding areas. The proposed synthetic final cover components are flexible and will retain their integrity under minor differential settlement.

Maintenance of the final cover will include periodic mowing of the vegetative cover and reseeding as necessary. The grass will be maintained at such a level as to facilitate inspection. This will help to discourage the inhabitation of burrowing animals. Mowing activities will be conducted on an as-need basis. The erosion control layer on the final cover system will be inspected, filled with appropriate soil, regraded, and seeded if the erosion channels are approximately 6-inches deep.

Routine maintenance of run-on and run-off control structures include cleaning sediment from structures such as ditches, culverts, sedimentation ponds, downchute pipes, and pond outlets. Repair of these structures will typically be performed by outside contractors who will bring in heavy equipment such as backhoes, dump trucks, dozers, and scrapers. Materials such as silt fence, straw bales, and soil will be kept on-site to implement short-term repairs while waiting for permanent repairs. By maintaining the system of perimeter stormwater berms and channels, run-on/run-off will be prevented from eroding or damaging the final cover system.

7.2 Maintain Leachate Collection and Removal System (§257.104(b)(2))

Due to the Landfill being an existing and operational waste management unit prior to the commencement of the Rules, there is no leachate collection and removal system in the Landfill. Therefore, no maintenance will need to be performed.



7.3 Maintenance Groundwater Monitoring Systems (§257.104(b)(3))

Monitoring of the groundwater and routine maintenance of groundwater monitoring wells, such as replacing locks, painting, pad repairs, and regrading of soil areas around the wells, will be performed in accordance with 40 CFR §257.90 through §257.98. Any routine maintenance required by the groundwater monitoring system will be performed by TEC personnel or their designee(s). Other maintenance work such as protective casing repair, well replacement, and repair of sampling pumps will be performed by specialty contractors. The groundwater monitoring wells will be abandoned in compliance with KDHE regulations and the SAP.

7.4 Maintenance of Bottom Ash Area Landfill Roads

Routine maintenance will be performed on Landfill roads if settlement, subsidence, or displacement has occurred. This may include the application of on-site materials and/or surface grading.



8.0 NOTICE OF COMPLETION OF POST-CLOSURE CARE (§257.104(e))

Westar will complete a Notice of Completion of post-closure care period within 60 (sixty) days of completion of post-closure of the Landfill. The notification will include the certification by a registered professional engineer as required by §257.104(e).



9.0 RECORDKEEPING, NOTIFICATION AND INTERNET REQUIREMENTS (§257.104(f))

Per §257.104(f), Westar will maintain an operating record which will include the required documents specified in §257.105(i), in addition to the following documents:

- Inspection records that are conducted for the disposal of materials;
- Groundwater sampling and analysis results for the Landfill, records of by-product material recycled, major operational problems, complaints or difficulties, records associated with corrective measures, and employee training records;
- A copy of the SWPPP and the SWPPP Record Forms;
- The Plan and Closure Plan, as well as closure CQA certification and post-closure inspection documentation;
- Proof of financial insurance;
- A copy of the current operating permit and any subsequent addenda; and
- Copies of the permit applications and all supporting documents.

Additionally per §257.104(f), Westar will comply with the notification requirements specified in §257.106(i). This includes submitting the following notification documents and any amendments to these documents to the state director:

- Intent to initiate post-closure care;
- Availability of annual progress reports of post-closure care implementation;
- Plan, Closure Plan, and any alternative closure requirements;
- Any required time extensions;
- Completion of post-closure care of a CCR unit; and
- Deed notation.

Internet requirements specified in §257.107(i) will be placed on owner and operators publicly accessible website, per §257.104(f). These documents include any notification on the closure or post-closure care intent or completion, annual progress reports, the written Plan, Closure Plan, and any amendments, demonstrations for time extensions, and the record of the deed.

All records that are relevant within the past five years will be maintained at TEC and/or by Westar. The records are available to KDHE representatives for review upon request.



10.0 KEY CONTACT INFORMATION (§257.104(d)(1)(ii))

Name: Jared Morrison
Director, Water and Waste Programs

Address: Westar Energy
818 South Kansas Avenue
Topeka, Kansas 66601

E-mail Address: westarccr@westarenergy.com

Phone Number: (800) 383-1183



11.0 PROCEDURES FOR PLAN ASSESSMENTS AND AMENDMENTS (§257.104(d)(3))

This Plan will continue to undergo review as the Landfill continues phased construction activities. The Plan will be amended if there is a situation stated in §257.104(d)(3)(i-iii), which includes any change in operation of the CCR unit that would affect the Plan. The Plan would also be amended 60 days prior to a planned change of the TEC facility or Landfill, or no later than 60 days after an unanticipated event that would necessitate a revision and no later than 30 days after an unanticipated event after post-closure care activities have commenced.

Any amended Plan will be reviewed and recertified by a registered professional engineer in the state of Kansas and will be placed in TEC's facility operating record as required per §257.105(i)(4). Amended Plans will supersede and replace any prior versions. Availability of an amended Plan will be noticed to the State Director per §257.106(i) and posted to the publicly accessible internet site per §257.107(i).



12.0 PROFESSIONAL ENGINEER CERTIFICATION (§257.104(d)(4))

The undersigned registered professional engineer is familiar with the requirements of §257.104 of the CCR Rule and has visited and examined TEC or has supervised examination of TEC by appropriately qualified personnel. The undersigned registered professional engineer attests that this CCR Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards and meets the requirements of §257.104, and that this Plan is adequate for TEC's facility. This certification was prepared as required by §257.104(d)(4).

Name of Professional Engineer: Richard Southorn

Company: CB&I

Signature: 

Date: 10/4/16

PE Registration State: Kansas

PE Registration Number: PE25201

Professional Engineer Seal:

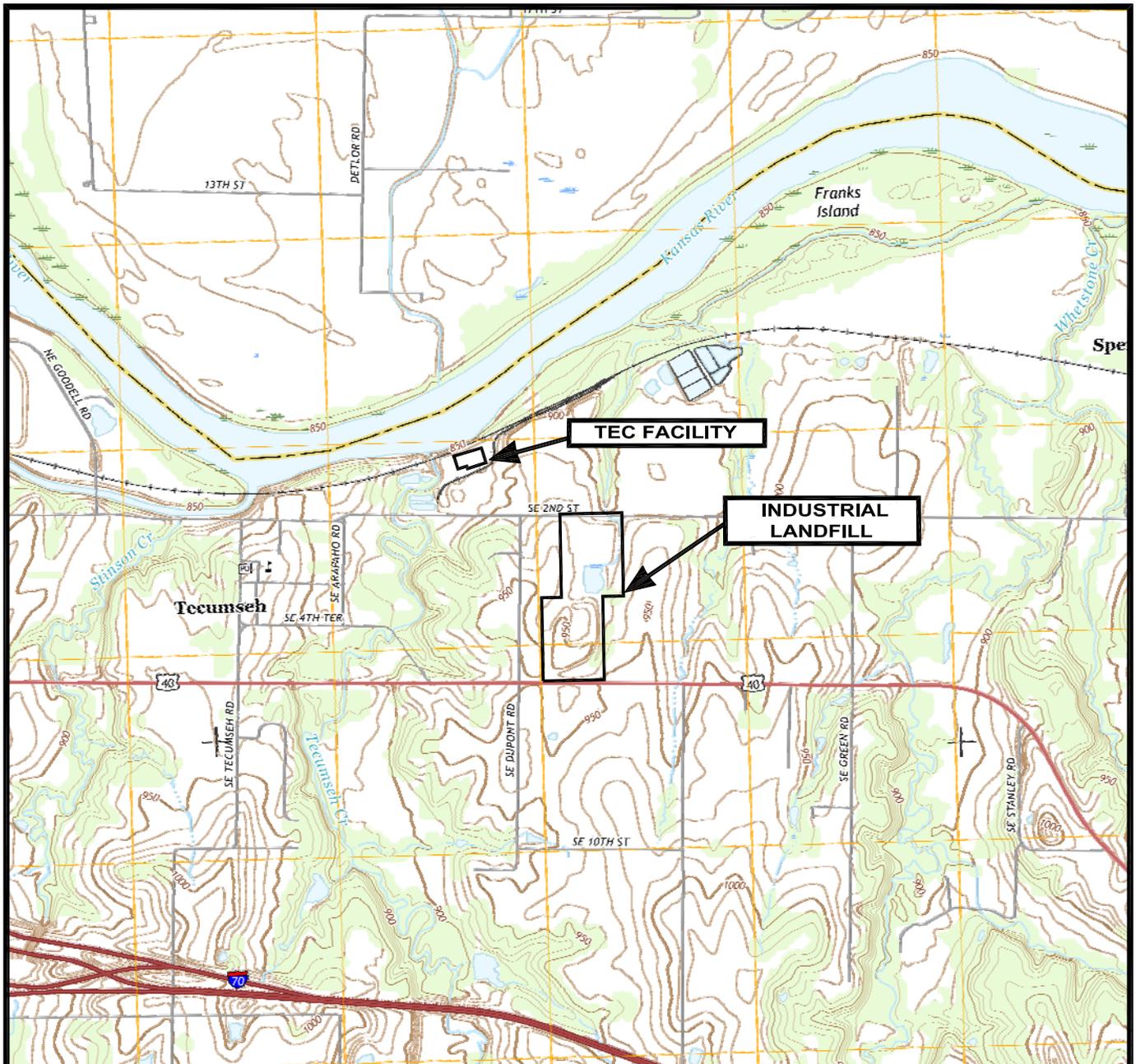


FIGURES

Figure 1 – Tecumseh Landfill, Site Location Plan

Figure 2 – Tecumseh Landfill, Existing Site Topography

Figure 3 – Tecumseh Landfill, Permitted Final Landform



LEGEND

————— APPROXIMATE CCR UNIT BOUNDARY

NOTES

1. AERIAL TOPO OBTAINED FROM USGS 7.5-MINUTE SERIES, GRANTVILLE QUADRANGLE, KANSAS, 2014.
2. ALL BOUNDARIES ARE APPROXIMATE



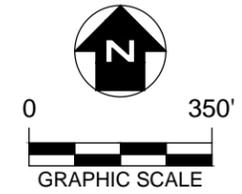
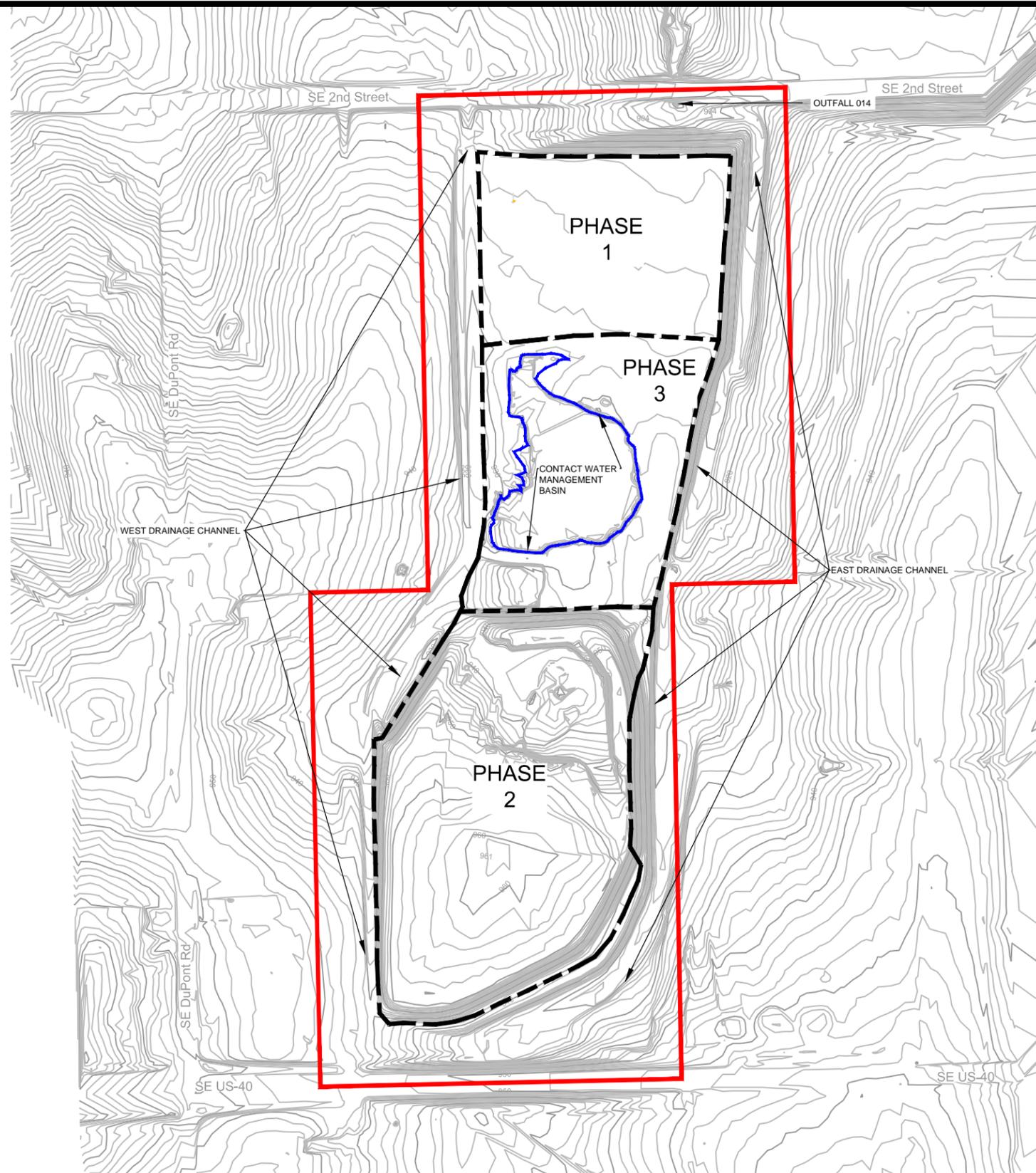
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**TECUMSEH ENERGY CENTER
5636 SE 2nd ST., TECUMSEH, KS**

**FIGURE 1
TECUMSEH LANDFILL
SITE LOCATION PLAN**

APPROVED BY: MMS PROJ. NO.: 631214397 DATE: OCTOBER 2016



LEGEND

- CCR UNIT BOUNDARY
- - - LANDFILL CELL BOUNDARY
- BERM STRUCTURE

NOTES

1. EXISTING CONTOURS DEVELOPED BY PROFESSIONAL ENGINEERING CONSULTANTS IN JUNE 2016.
2. FOR CLARITY, NOT ALL SITE FEATURES MAY BE SHOWN.
3. CCR UNIT BOUNDARY IS APPROX. 57.3 ACRES.
4. ALL BOUNDARIES ARE APPROXIMATE.

REV. NO.	DATE	DESCRIPTION



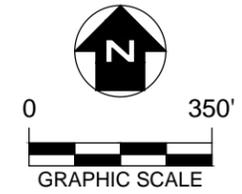
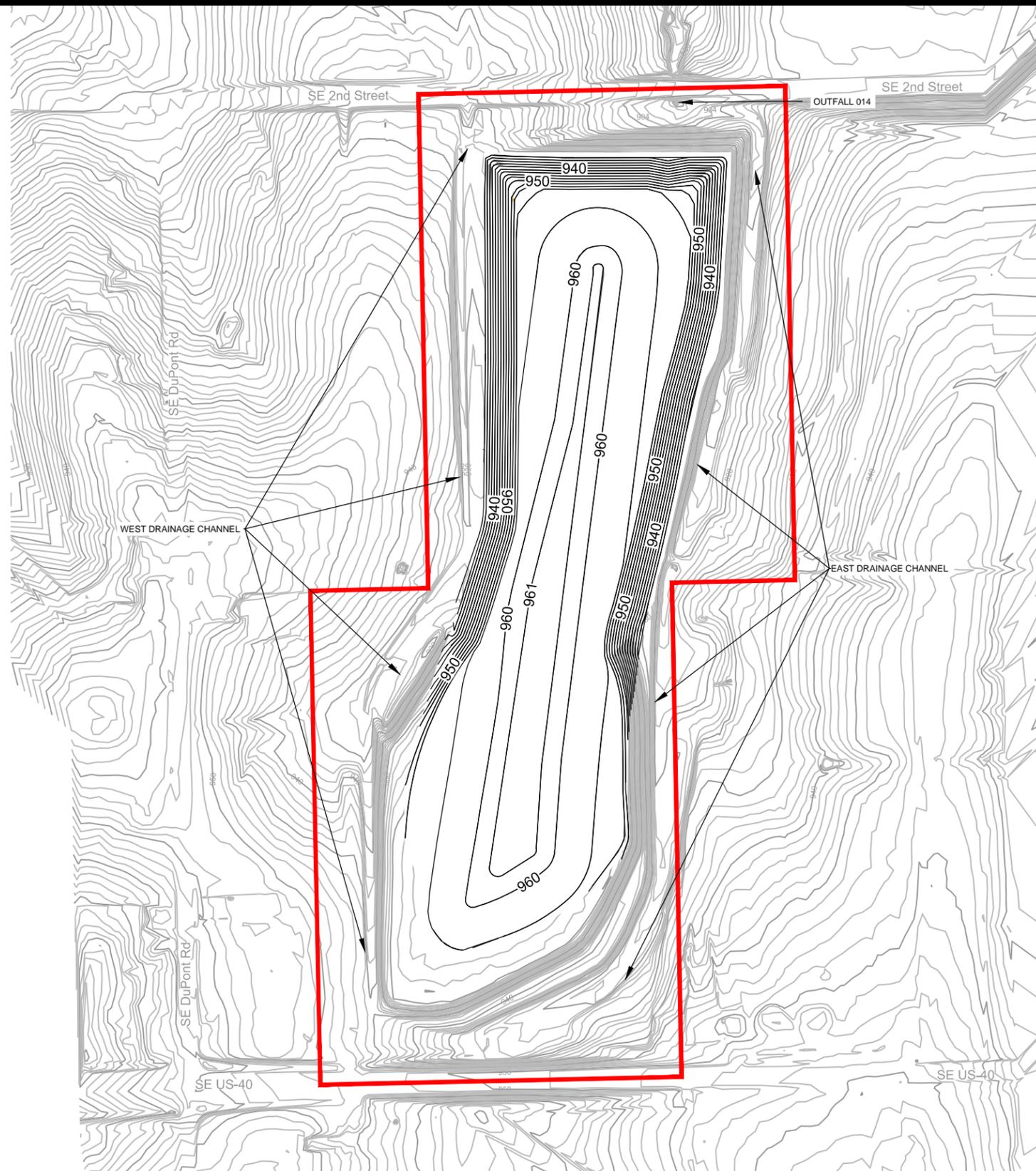
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**TECUMSEH ENERGY CENTER
5636 SE 2nd ST., TECUMSEH, KANSAS**

**FIGURE 2
TECUMSEH LANDFILL
EXISTING SITE TOPOGRAPHY**

DRAWN BY: SJL APPROVED BY: MMS PROJ. NO.: 631214397 DATE: OCTOBER 2016



LEGEND

- CCR UNIT BOUNDARY
- - - EXISTING SITE CONTOUR
- PROPOSED SITE CONTOUR

NOTES

1. EXISTING CONTOURS DEVELOPED BY PROFESSIONAL ENGINEERING CONSULTANTS IN JUNE 2016.
2. FOR CLARITY, NOT ALL SITE FEATURES MAY BE SHOWN.
3. FINAL GRADES WERE TAKEN FROM KDHE-BWM INDUSTRIAL LANDFILL PERMIT NO. 0322.
4. ALL BOUNDARIES ARE APPROXIMATE.

REV. NO.	DATE	DESCRIPTION



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**FIGURE 3
TECUMSEH LANDFILL
PERMITTED FINAL LANDFORM**

DRAWN BY: SJL APPROVED BY: MMS PROJ. NO.: 631214397 DATE: OCTOBER 2016

APPENDICES

APPENDIX A

Post-Closure Cost Estimate

Landfill Post-Closure Care - 2016 Annual Cost Estimate Worksheet - Kansas Department of Health & Environment

OWNER: <u>Westar Energy Inc.</u>	PERMIT No.: <u>322</u>		
OPERATOR: <u>Westar Energy Inc.</u>	ESTIMATOR: <u>CB&I Infrastructure and Environment on behalf of Westar Energy</u>	DATE: <u>October 2016</u>	
TOTAL PERMITTED WASTE DISPOSAL: <u>32</u> ACRES	Post-Closure Plan Title: <u>TEC Closure/Post Closure Plan</u>	Last Revision Date: _____	
TOTAL PERMITTED AREA CERTIFIED CLOSED: <u>9.6</u> ACRES			
TOTAL PERMITTED VOLUME: _____ CU. YD.	PERMITTED VOLUME FILLED: _____ CU. YD.	PERMITTED VOLUME AVAILABLE: _____ CU. YD.	
LANDFILL TYPE: _____ SUBTITLE D MUNICIPAL SOLID WASTE _____ SMALL ARID MUNICIPAL SOLID WASTE <input checked="" type="checkbox"/> INDUSTRIAL WASTE _____ CONSTRUCTION & DEMOLITION WASTE _____ WASTE TIRE MONOFILL			

LANDFILL POST-CLOSURE CARE - ANNUAL COST ESTIMATE WORKSHEET Permit No.: 322

ITEM No.	ITEM	QUANTITY	UNITS	UNIT COST	COST	SUBTOTALS	SOURCE OF UNIT COST INFO or NA
1.0.0	FINAL COVER ROUTINE MAINTENANCE						
1.0.1	Inspect soil cover, vents, flares, drainage letdowns and outfalls, etc...	2	Event	\$640.00	\$1,280.00		16 man hours per year at \$80 per hour
1.0.2	Mowing/Trimming total acres twice per year	32	ACRE	\$132.00	\$4,224.00		Mowing/ trimming done once annually
1.0.3	Clean Drain/Vent Openings		Event		\$0.00		
1.0.4	Final Cover Routine Maintenance Annual Subtotal					\$5,504.00	
2.0.0	FINAL COVER REPAIRS						
2.0.1	Remove/incorporate unacceptable materials (e.g., dead vegetation, solid waste)		Lump Sum		\$0.00		
2.0.2	Scarify and prepare surface	1.6	ACRE	\$1,297.00	\$2,075.20		Cost includes material removal and site prep for 5% of total closure area
2.0.3	Soil, On-Site (excavate, transport, place, compact)		CU. YD.		\$0.00		
2.0.4	Soil, Off-site (purchase, transport, place, compact)	2581	CU. YD.	\$8.25	\$21,293.25		1' of material for 5% of acreage to be repaired
2.0.5	Seeding and mulching	1.6	ACRE	\$1,200.00	\$1,920.00		Assume seed and mulch for 5% of area annually
2.0.6	Fertilizer	1.6	ACRE	\$272.00	\$435.20		Fertilize reseeded area
2.0.7	Final Cover Repairs Annual Subtotal					\$25,723.65	
3.0.0	ACCESS ROAD REPAIRS						
3.0.1	Reshape/regrade subgrade		Lump Sum		\$0.00		
3.0.2	Gravel (purchase, transport, place)	10	TON	\$34.14	\$341.40		Assuming 300 tons of rock to be used for road repair during 30 year post-closure plan
3.0.3	Drainage Structures (e.g., culverts)		Lin. FT.		\$0.00		
3.0.4	Riprap ditching/channels		Lin. FT.		\$0.00		
3.0.5	Access Roads Repair Annual Subtotal					\$341.40	
4.0.0	SURFACE WATER MANAGEMENT OPERATION AND MAINTENANCE (O&M)						
4.0.1	Collection system operation and maintenance (ditches, piping conveyances, outfalls, sampling points repair/replace)	6282	Lump Sum	\$0.19	\$1,193.58		2016 RS Means clearing and cleaning drainage channels (\$0.19/ L.F.)
4.0.2	Stormwater storage (sediment pond) operation/repairs	1	Lump Sum		\$0.00		NA
4.0.3	Sample collection (52 events per year)	52	Event	\$160.00	\$8,320.00		2 man hours per event at \$80/hr, monitoring vary depending on parameter monitored
4.0.4	Sample analysis and reporting (12 events per year)	12	Event	\$393.92	\$4,727.04		Based on 2016 Westar costs
4.0.5	Surface Water Management O&M Annual Subtotal					\$14,240.62	NA
5.0.0	LEACHATE COLLECTION SYSTEM O&M						
5.0.1	Generation Rate = _____ gal./ac./yr.						
5.0.2	Clean Leachate Line	1	Annual		\$0.00		
5.0.3	Collection operation/maintenance (pump, piping, storage...operation/repair/replace)	12	Months		\$0.00		NA
5.0.4	Leachate loading, off-loading and off-site transportation		Event		\$0.00		NA
5.0.5	Leachate Treatment/Disposal		Gal.		\$0.00		NA
5.0.6	Additional/upgrades for piping, pumps and storage		Lump Sum		\$0.00		NA
5.0.7	Leachate sample collection		EACH		\$0.00		NA
5.0.8	Leachate sample analysis and reporting		EACH		\$0.00		NA
5.0.9	Leachate Collection System O&M Annual Subtotal					\$0.00	

6.0.0	GROUNDWATER MONITORING SYSTEM O&M					
6.0.1	Number of Wells in Approved System = <u>4</u>					
6.0.2	Well maintenance (e.g., protective casing (lock & hinges) repair/replacement, well pad repair/replace, etc...)	4	EACH	\$503.00	\$2,012.00	Pro-rated maintenance cost for maintenance on 4 wells every ten years.
6.0.3	Abandon & plug existing wells	0.2	EACH	\$1,328.00	\$265.60	Pro-rated cost to abandon and plug 6 wells over 30 years. Four wells currently existing plus two replacement wells as required by KDHE for replacement of 50% of groundwater wells.
6.0.4	Rehabilitate/redevelop existing wells	0.4	EACH	\$452.00	\$180.80	Pro-rated maintenance cost to rehabilitate 4 wells every ten years.
6.0.5	Well Replacement	0.07	EACH	\$6,500.00	\$455.00	Pro-rated cost for 2 new wells over 30 year post-closure period.
6.0.6	Sample collection (2 events per year)	2	Event	\$1,250.00	\$2,500.00	Sampling cost from Blackstone Environmental invoicing
6.0.7	Sample analysis and reporting (2 events per year)	2	Event	\$3,400.00	\$6,800.00	Analysis and report cost from Blackstone Environmental invoicing
6.0.8	Groundwater Monitoring System O&M Annual Subtotal					\$12,213.40

Landfill Post-Closure Care - 2016 Annual Cost Estimate Worksheet							Permit No.:		
ITEM No.	ITEM	QUANTITY	UNITS	UNIT COST	COST	SUBTOTALS	SOURCE OF UNIT COST INFO or NA		
7.0.0	GAS MONITORING SYSTEM O&M								
7.0.1	Number of Gas Monitoring Probes/Wells = _____								
7.0.2	Methane monitoring of probes/wells (4 per year)	0	Event		\$0.00			NA	
7.0.3	Methane monitoring at site boundary and structures (4 per year)	0	Event		\$0.00			NA	
7.0.4	Sample analysis and reporting	0	Event		\$0.00			NA	
7.0.5	Gas Monitoring System O&M Annual Subtotal					\$0.00			
8.0.0	GAS EXTRACTION SYSTEM O&M								
8.0.1	Gas vents, _____ # of vents, _____ average depth								
8.0.2	Passive System								
8.0.3	Passive well head turbine maintenance		EACH		\$0.00			NA	
8.0.4	Active System								
8.0.5	Flare, _____ BTU/hour		EACH		\$0.00			NA	
8.0.6	Additional Well Installation/Upgrades		EACH		\$0.00			NA	
8.0.7	Ancillary gas equipment repair/replacement (piping, blowers, condensate collection)	1	Lump Sum		\$0.00			NA	
8.0.8	Gas Extraction System O&M Annual Subtotal					\$0.00			
9.0.0	CORRECTIVE ACTION EVALUATION AND IMPLEMENTATION								
9.0.1	Resurvey monitoring well reference points and site benchmarks (prorate for annual expenses)		EACH		\$0.00			NA	
9.0.2	Remove sediments from stormwater basin(s) (prorate for annual expenses)		EACH		\$0.00			NA	
9.0.3	Groundwater exceedances statistical evaluation (EACH		\$0.00			NA	
9.0.4	Groundwater alternate source determination) (prorate for annual expenses)		EACH		\$0.00			NA	
9.0.5	Other: _____	1	Lump Sum		\$0.00			NA	
9.0.6	Corrective Action Evaluation and Implementation Annual Subtotal					\$0.00			
10.0.0	POST-CLOSURE CARE ANNUAL COST SUBTOTAL						\$58,023.07		
11.0.0	Administrative Services (Post-Closure Cost Subtotal [10.0.0] x 6%)				\$3,481.38				
12.0.0	Contingency (Post-Closure Cost Subtotal [10.0.0] x 10%)				\$5,802.31				
13.0.0	PROFESSIONAL SERVICES (Post-Closure Cost Subtotal [10.0.0] x 7%) OR Enter costs provided by third party with sources listed in line items below				\$4,061.61				
13.0.1	Engineering (annual inspection and reporting, corrective action design and bid, contract management)	1	Lump Sum	\$640.00	\$640.00				
13.0.2	Topographic and Boundary Survey	1	Lump Sum		\$0.00				
13.0.3	Corrective Action Engineering Services (construction oversight, testing, reporting, certification)	1	Lump Sum		\$0.00				
14.0.0	Subtotal of Line Items 11.0.0 through 13.3.0					\$13,985.31			
	TOTAL ESTIMATED ANNUAL POST-CLOSURE CARE COST						\$72,008.38		