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## **D. B. Wilson Station CCR Landfill**

### **Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule Run-on and Run-off Control System Plan**

**October 11, 2016**

**Prepared By:**



**Project ID: 160030**

**Big Rivers Electric Corporation  
Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule  
Run-on and Run-off Control System Plan**

**CCR Landfill Information**

Name: D.B. Wilson Station CCR Landfill  
Operator: D.B. Wilson Generating Station  
Address: 5663 State Route 85 West  
Centertown, KY 42328

**Qualified Professional Engineer**

Name: David A. Lamb  
Company: Associated Engineers, Inc.  
Kentucky P.E. Number: 17822

**Regulatory Applicability**

As part of the § 257.81 for existing CCR landfill requirements, the owner or operator of an existing or new CCR landfill must design, construct, operate, and maintain a run-on and run-off control system plan as specified below. The owner or operator of the CCR unit must prepare the initial inflow design flood control system plan no later than October 17, 2016.

The owner or operator of an existing CCR landfill must design, construct, operate, and maintain:

- (1) A run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm; and
- (2) A run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

Run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under § 257.3-3 (Part 257 - Criteria for Classification of Solid Waste Disposal Facilities and Practices Subpart A - Classification of Solid Waste Disposal Facilities and Practices Section 257.3-3 - Surface water):

Run-on and run-off control system plan:

- (1) *Content of the plan.* The owner or operator must prepare initial and periodic run-on and run-off control system plans for the CCR unit. These plans must document how the run-

on and run-off control systems have been designed and constructed to meet the applicable requirements of this section. Each plan must be supported by appropriate engineering calculations. The owner or operator has completed the initial run-on and run-off control system plan when the plan has been placed in the facility's operating record.

- (2) *Amendment of the plan.* The owner or operator may amend the written run-on and run-off control system plan at any time provided the revised plan is placed in the facility's operating record. The owner or operator must amend the written run-on and run-off control system plan whenever there is a change in conditions that would substantially affect the written plan in effect.

### **Description of Landfill**

An aerial photo of the CCR unit is provided as Attachment A and an excerpt from U.S. Geological Survey (USGS) 7.5 minute Equality topographic quadrangle map showing the location of the CCR unit is provided as Attachment B.

The CCR unit is used for the placement of coal combustion residual material; currently fly ash, bottom ash and related material. The approximate total volume of CCR contained in the unit at the time of inspection is 1.8 million cubic yards. This volume was calculated from available flight derived pre-disposal baseline topography compared to December 2015 flight derived topographic contours. The D.B. Wilson CCR landfill is raised above adjacent ground to a maximum elevation of approximately 520 feet AMSL. The original ground surface within the landfill footprint was irregular and the predominant features were the headwaters of Elk Creek and small stream valleys draining south. Other small tributaries drained west towards the Green River and north towards the Rough River.

### **Run-on and Run-off Control System Plan**

The initial run-on and run-off control system plan documents that the run-on control system will prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour/25-year storm; and that the run-off control system from the active portion of the CCR unit will collect and control at least the water volume resulting from a 24-hour/25-year storm.

#### **Run-on Control Analysis**

An evaluation of the D.B. Wilson CCR landfill configuration and topography resulted in the determination that because of the elevated position of active portions of the landfill, no significant run-on can occur and the only drainage onto active areas is storm water generated from direct precipitation; thus the CCR unit run-on system will prevent flow onto the active portion of the CCR unit during the peak discharge from the design storm event.

#### **Run-off Control Analysis**

Analysis of the D.B. Wilson CCR landfill drainage and sedimentation basin configurations and designs via SEDCAD modeling demonstrates that the design flood control system

adequately manages flow out of the CCR unit during and following the specified 24-hour/25-year storm event. SEDCAD by Civil Software Design, LLC is a widely recognized comprehensive hydrology and sedimentology package, useful for runoff and sediment control design calculations. The SEDCAD modeling results for the D.B. Wilson CCR landfill are attached to this report.

The operating facility has verified that discharge from the D.B. Wilson CCR landfill is handled in accordance with the surface water requirements under § 257.3-3 (Part 257 - Criteria for Classification of Solid Waste Disposal Facilities and Practices Subpart A - Classification of Solid Waste Disposal Facilities and Practices Section 257.3-3 - Surface water).

### **Sources of Information**

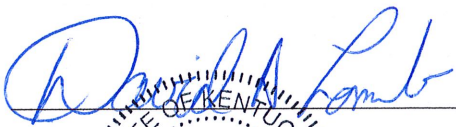
Geotechnical and other information provided by Associated Engineers, Inc.

Engineering design drawings and other information provided by Big Rivers Electric Corporation

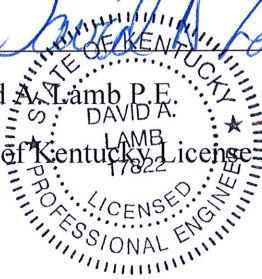
United States Geological Survey U.S. Geological Survey (USGS) 7.5 minute Equality topographic quadrangle map

**Professional Engineer Certification [Per 40 CFR § 257.81]  
D.B. Wilson CCR Landfill Run-on and Run-off Control System Plan**

I hereby certify that myself or an agent under my review has prepared this Run-on and Run-off Control System Plan (Plan), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Plan has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.81. To the best of my knowledge and belief, the information contained in this Plan is true, complete, and accurate.

  
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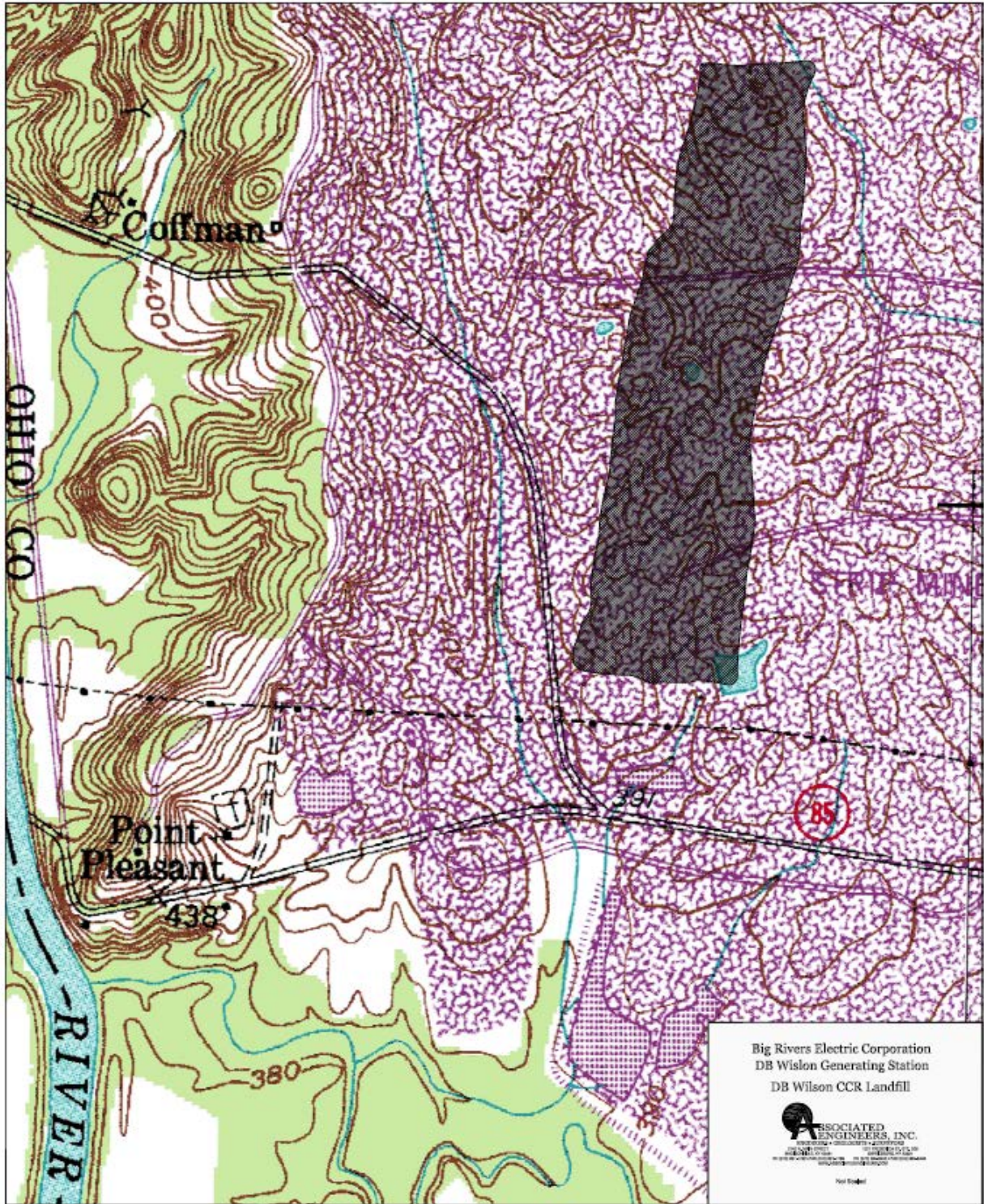
David A. Lamb P.E.  
State of Kentucky License No. 17822



Date: 10/11/16



Attachment A. Aerial Photo of the D.B. Wilson CCR Landfill



Attachment B. Topographic Map showing the D.B. Wislon CCR Landfill

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**Big Rivers Electric Corporation**  
**D.B. Wilson Station**  
**Centertown, Kentucky**

***Stormwater Evaluation***

***Wilson Landfill***

***Pond 002***

***25 Year - 24 Hour Event***

***AEI Project #16-0030***

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***General Information***

***Storm Information:***

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.870 inches

***Structure Networking:***

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Pond 002

#1  
Pond

***Structure Summary:***

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	161.970	161.970	331.31	46.58
	Out			241.61	46.58

## ***Structure Detail:***

### **Structure #1 (Pond)**

*Pond 002*

Pond Inputs:

Initial Pool Elev:	405.50 ft
Initial Pool:	12.61 ac-ft

#### **Broad-crested Weir**

Weir Width (ft)	Spillway Elev (ft)
20.40	405.50

Pond Results:

Peak Elevation:	407.95 ft
Dewater Time:	0.94 days

*Dewatering time is calculated from peak stage to lowest spillway*

### **Elevation-Capacity-Discharge Table**

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
401.30	1.250	0.000	0.000	
401.31	1.264	0.013	0.000	
401.50	1.530	0.278	0.000	
401.60	1.660	0.437	0.000	
401.90	2.080	0.997	0.000	
402.00	2.230	1.212	0.000	
402.20	2.350	1.670	0.000	
402.50	2.536	2.403	0.000	
402.80	2.729	3.192	0.000	
403.10	2.929	4.041	0.000	
403.40	3.136	4.950	0.000	
403.70	3.349	5.923	0.000	
404.00	3.570	6.961	0.000	
404.30	3.647	8.043	0.000	
404.60	3.726	9.149	0.000	
404.90	3.805	10.279	0.000	
405.20	3.885	11.432	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
405.50	3.965	12.609	0.000	Spillway #1
405.80	4.046	13.811	10.347	13.75
406.00	4.100	14.626	22.265	4.85
406.10	4.129	15.037	29.268	1.00
406.40	4.215	16.289	53.768	1.25
406.70	4.302	17.566	82.784	0.55
407.00	4.390	18.870	115.692	0.35
407.30	4.479	20.200	152.080	0.25
407.60	4.569	21.557	191.645	0.20
407.90	4.660	22.942	234.143	0.20
407.95	4.675	23.178	241.613	0.10 Peak Stage
408.00	4.690	23.409	248.930	
408.20	4.888	24.367	279.393	
408.50	5.193	25.879	327.227	
408.75	5.454	27.210	368.971	
408.80	5.507	27.484	377.516	
408.99	5.710	28.549	410.585	
409.00	5.720	28.606	412.353	

### Detailed Discharge Table

Elevation (ft)	Broad- crested Weir (cfs)	Combined Total Discharge (cfs)
401.30	0.000	0.000
401.31	0.000	0.000
401.50	0.000	0.000
401.60	0.000	0.000
401.90	0.000	0.000
402.00	0.000	0.000
402.20	0.000	0.000
402.50	0.000	0.000
402.80	0.000	0.000
403.10	0.000	0.000
403.40	0.000	0.000
403.70	0.000	0.000
404.00	0.000	0.000
404.30	0.000	0.000
404.60	0.000	0.000
404.90	0.000	0.000

Elevation (ft)	Broad- crested Weir (cfs)	Combined Total Discharge (cfs)
405.20	0.000	0.000
405.50	0.000	0.000
405.80	10.347	10.347
406.00	22.265	22.265
406.10	29.268	29.268
406.40	53.768	53.768
406.70	82.784	82.784
407.00	115.692	115.692
407.30	152.080	152.080
407.60	191.645	191.645
407.90	234.143	234.143
408.00	248.930	248.930
408.20	279.393	279.393
408.50	327.227	327.227
408.75	368.971	368.971
408.80	377.516	377.516
408.99	410.585	410.585
409.00	412.353	412.353

### ***Subwatershed Hydrology Detail:***

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	19.960	0.080	0.270	0.308	77.000	M	68.71	5.593
	2	13.640	0.078	0.832	0.270	79.000	M	48.91	4.047
	3	10.940	0.135	0.687	0.277	91.000	F	44.35	4.242
	4	27.660	0.053	0.907	0.267	79.000	M	99.17	8.207
	5	58.870	0.376	0.457	0.233	79.000	M	121.86	13.917
	6	16.130	0.096	0.000	0.000	79.000	M	57.83	4.786
	7	13.520	0.247	0.487	0.325	91.000	F	51.19	5.185
	8	1.250	0.000	0.000	0.000	99.000	F	5.62	0.599
<b>Σ</b>		<b>161.970</b>						<b>331.31</b>	<b>46.577</b>

### ***Subwatershed Time of Concentration Details:***

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	11.08	46.00	415.00	2.660	0.043
		8. Large gullies, diversions, and low flowing streams	5.81	57.00	981.00	7.230	0.037
<b>#1</b>	<b>1</b>	<b>Time of Concentration:</b>					<b>0.080</b>
#1	2	6. Grassed waterway	1.01	4.00	396.00	1.500	0.073
		7. Paved area and small upland gullies	28.19	64.00	227.00	10.680	0.005
<b>#1</b>	<b>2</b>	<b>Time of Concentration:</b>					<b>0.078</b>
#1	3	5. Nearly bare and untilled, and alluvial valley fans	4.40	22.00	500.00	2.090	0.066
		8. Large gullies, diversions, and low flowing streams	0.66	4.00	606.00	2.430	0.069
<b>#1</b>	<b>3</b>	<b>Time of Concentration:</b>					<b>0.135</b>
#1	4	3. Short grass pasture	22.22	22.00	99.00	3.770	0.007
		8. Large gullies, diversions, and low flowing streams	1.40	7.00	500.00	3.540	0.039
		7. Paved area and small upland gullies	21.46	56.00	261.00	9.320	0.007
<b>#1</b>	<b>4</b>	<b>Time of Concentration:</b>					<b>0.053</b>
#1	5	3. Short grass pasture	0.21	1.00	474.00	0.360	0.365
		7. Paved area and small upland gullies	22.52	91.00	404.00	9.550	0.011
<b>#1</b>	<b>5</b>	<b>Time of Concentration:</b>					<b>0.376</b>
#1	6	3. Short grass pasture	4.64	20.00	431.00	1.720	0.069
		8. Large gullies, diversions, and low flowing streams	2.56	12.00	469.00	4.790	0.027

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
<b>#1</b>	<b>6</b>	<b>Time of Concentration:</b>					<b>0.096</b>
#1	7	5. Nearly bare and untilled, and alluvial valley fans	14.00	14.00	100.00	3.740	0.007
		5. Nearly bare and untilled, and alluvial valley fans	0.50	2.00	400.00	0.700	0.158
		8. Large gullies, diversions, and low flowing streams	5.71	10.00	175.00	7.170	0.006
		8. Large gullies, diversions, and low flowing streams	1.42	14.00	984.04	3.570	0.076
<b>#1</b>	<b>7</b>	<b>Time of Concentration:</b>					<b>0.247</b>

### ***Subwatershed Muskingum Routing Details:***

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
<b>#1</b>	<b>1</b>	<b>Muskingum K:</b>					<b>0.270</b>
#1	2	8. Large gullies, diversions, and low flowing streams	0.06	1.00	1,540.00	0.760	0.562
		7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
<b>#1</b>	<b>2</b>	<b>Muskingum K:</b>					<b>0.832</b>
#1	3	8. Large gullies, diversions, and low flowing streams	0.08	1.00	1,264.00	0.840	0.417
		7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
<b>#1</b>	<b>3</b>	<b>Muskingum K:</b>					<b>0.687</b>
#1	4	8. Large gullies, diversions, and low flowing streams	0.06	1.00	1,675.00	0.730	0.637
		7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
<b>#1</b>	<b>4</b>	<b>Muskingum K:</b>					<b>0.907</b>
#1	5	8. Large gullies, diversions, and low flowing streams	0.25	6.00	2,437.00	1.480	0.457
<b>#1</b>	<b>5</b>	<b>Muskingum K:</b>					<b>0.457</b>
#1	7	7. Paved area and small upland gullies	22.03	26.00	118.00	9.440	0.003
		8. Large gullies, diversions, and low flowing streams	5.35	20.00	374.00	6.930	0.014



Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	0.75	14.00	1,867.00	2.590	0.200
		7. Paved area and small upland gullies	1.00	4.00	400.00	2.010	0.055
		8. Large gullies, diversions, and low flowing streams	0.90	20.00	2,213.00	2.850	0.215
<b>#1</b>	<b>7</b>	<b>Muskingum K:</b>					<b>0.487</b>

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**Big Rivers Electric Corporation**  
**D.B. Wilson Station**  
**Centertown, Kentucky**

***Stormwater Evaluation***

***Wilson Landfill***

***Ponds 009, 014, & 015***

***25 Year - 24 Hour Event***

***AEI Project #16-0030***

Matthew T. Lile

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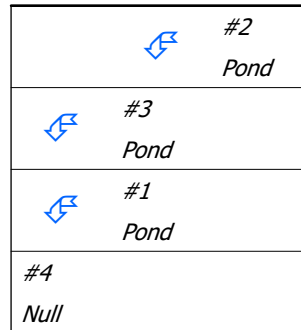
## ***General Information***

### ***Storm Information:***

Storm Type:	NRCS Type II
Design Storm:	25 yr - 24 hr
Rainfall Depth:	5.870 inches

***Structure Networking:***

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	#4	0.000	0.000	Pond 015
Pond	#2	==>	#3	0.000	0.000	Pond 009
Pond	#3	==>	#4	0.000	0.000	Pond 014
Null	#4	==>	End	0.000	0.000	Combined Discharge



***Structure Summary:***

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#2	In	11.450	11.450	42.06	3.57
	Out			41.55	3.57
#3	In	52.440	63.890	260.07	23.94
	Out			13.84	9.50
#1	In	247.380	247.380	633.06	66.65
	Out			24.72	29.79
#4		0.000	311.270	36.63	39.29

## ***Structure Detail:***

### *Structure #2 (Pond)*

*Pond 009*

Pond Inputs:

Initial Pool Elev:	402.00 ft
Initial Pool:	4.71 ac-ft

### Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
402.00	14.00	4.60:1	11.80:1	160.00

Pond Results:

Peak Elevation:	402.10 ft
Dewater Time:	0.50 days

*Dewatering time is calculated from peak stage to lowest spillway*

### Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
396.00	0.500	0.000	0.000	
397.00	0.605	0.552	0.000	
398.00	0.720	1.213	0.000	
399.00	0.798	1.972	0.000	
400.00	0.880	2.811	0.000	
401.00	0.949	3.725	0.000	
402.00	1.020	4.709	0.000	Spillway #1
402.10	1.050	4.820	41.551	12.10 Peak Stage
403.00	1.132	5.785	402.900	
404.00	1.250	6.975	1,334.105	

### Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
396.00	0.000	0.000
397.00	0.000	0.000
398.00	0.000	0.000
399.00	0.000	0.000
400.00	0.000	0.000
401.00	0.000	0.000
402.00	0.000	0.000
403.00	402.900	402.900
404.00	1,334.105	1,334.105

Structure #3 (Pond)

*Pond 014*

Pond Inputs:

Initial Pool Elev:	388.30 ft
Initial Pool:	20.79 ac-ft

Broad-crested Weir

Weir Width (ft)	Spillway Elev (ft)
10.00	391.00

Pond Results:

Peak Elevation:	391.45 ft
Dewater Time:	1.04 days

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
384.00	4.620	0.000	0.000	
385.00	4.730	4.675	0.000	
386.00	4.820	9.450	0.000	
387.00	4.880	14.300	0.000	
388.00	5.057	19.268	0.000	
388.30	5.111	20.793	0.000	
389.00	5.237	24.415	0.000	
390.00	5.420	29.743	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
391.00	5.544	35.225	0.000		Spillway #1
391.45	5.601	37.738	13.835	24.95	Peak Stage
392.00	5.670	40.832	30.870		

Detailed Discharge Table

Elevation (ft)	Broad-crested Weir (cfs)	Combined Total Discharge (cfs)
384.00	0.000	0.000
385.00	0.000	0.000
386.00	0.000	0.000
387.00	0.000	0.000
388.00	0.000	0.000
388.30	0.000	0.000
389.00	0.000	0.000
390.00	0.000	0.000
391.00	0.000	0.000
392.00	30.870	30.870

Structure #1 (Pond)

Pond 015

Pond Inputs:

Initial Pool Elev:	414.30 ft
Initial Pool:	4.27 ac-ft

Broad-crested Weir

Weir Width (ft)	Spillway Elev (ft)
10.00	417.00

Pond Results:

Peak Elevation:	417.86 ft
Dewater Time:	2.16 days

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table



Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
413.90	10.500	0.000	0.000	
414.00	10.600	1.055	0.000	
414.10	10.677	2.119	0.000	
414.20	10.754	3.191	0.000	
414.30	10.831	4.270	0.000	
414.40	10.908	5.357	0.000	
414.50	10.986	6.451	0.000	
414.60	11.063	7.554	0.000	
414.70	11.141	8.664	0.000	
414.80	11.220	9.782	0.000	
414.90	11.298	10.908	0.000	
415.00	11.377	12.042	0.000	
415.10	11.624	13.192	0.000	
415.20	11.873	14.367	0.000	
415.30	12.125	15.566	0.000	
415.40	12.380	16.792	0.000	
415.50	12.637	18.043	0.000	
415.60	12.898	19.319	0.000	
415.70	13.160	20.622	0.000	
415.80	13.425	21.951	0.000	
415.90	13.693	23.307	0.000	
416.00	13.964	24.690	0.000	
416.10	14.150	26.096	0.000	
416.20	14.338	27.520	0.000	
416.30	14.527	28.963	0.000	
416.40	14.717	30.426	0.000	
416.50	14.908	31.907	0.000	
416.60	15.099	33.407	0.000	
416.70	15.291	34.927	0.000	
416.80	15.483	36.465	0.000	
416.90	15.678	38.023	0.000	
417.00	15.873	39.601	0.000	Spillway #1
417.10	16.068	41.198	0.976	19.80*
417.20	16.265	42.815	2.761	11.35
417.30	16.463	44.451	5.072	5.25
417.40	16.662	46.107	7.809	3.15
417.50	16.862	47.784	10.914	2.20
417.60	17.061	49.480	14.347	1.60
417.70	17.260	51.196	18.080	2.15
417.80	17.461	52.932	22.088	3.35
417.86	17.587	54.016	24.724	2.95 Peak Stage

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
417.90	17.664	54.688	26.357	
418.00	17.867	56.465	30.870	

*\*Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

## Detailed Discharge Table

Elevation (ft)	Broad- crested Weir (cfs)	Combined Total Discharge (cfs)
413.90	0.000	0.000
414.00	0.000	0.000
414.10	0.000	0.000
414.20	0.000	0.000
414.30	0.000	0.000
414.40	0.000	0.000
414.50	0.000	0.000
414.60	0.000	0.000
414.70	0.000	0.000
414.80	0.000	0.000
414.90	0.000	0.000
415.00	0.000	0.000
415.10	0.000	0.000
415.20	0.000	0.000
415.30	0.000	0.000
415.40	0.000	0.000
415.50	0.000	0.000
415.60	0.000	0.000
415.70	0.000	0.000
415.80	0.000	0.000
415.90	0.000	0.000
416.00	0.000	0.000
416.10	0.000	0.000
416.20	0.000	0.000
416.30	0.000	0.000
416.40	0.000	0.000
416.50	0.000	0.000
416.60	0.000	0.000
416.70	0.000	0.000
416.80	0.000	0.000
416.90	0.000	0.000

Elevation (ft)	Broad-crested Weir (cfs)	Combined Total Discharge (cfs)
417.00	0.000	0.000
417.10	0.976	0.976
417.20	2.761	2.761
417.30	5.072	5.072
417.40	7.809	7.809
417.50	10.914	10.914
417.60	14.347	14.347
417.70	18.080	18.080
417.80	22.088	22.088
417.90	26.357	26.357
418.00	30.870	30.870

Structure #4 (Null)

*Combined Discharge*

### ***Subwatershed Hydrology Detail:***

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	3.050	0.090	0.022	0.323	79.000	M	10.94	0.905
	2	0.910	0.022	0.006	0.408	89.000	F	3.82	0.349
	3	6.990	0.028	0.000	0.000	79.000	M	25.06	2.074
	4	0.500	0.000	0.000	0.000	99.000	F	2.25	0.239
	<b>Σ</b>	<b>11.450</b>						<b>42.06</b>	<b>3.567</b>
#3	1	37.220	0.105	0.000	0.000	91.000	F	159.52	14.970
	2	10.340	0.101	0.007	0.422	79.000	M	37.07	3.068
	3	4.880	0.000	0.000	0.000	99.000	F	21.94	2.337
	<b>Σ</b>	<b>63.890</b>						<b>260.07</b>	<b>23.943</b>
#1	1	162.710	0.248	0.000	0.000	77.000	M	357.47	36.672
	2	22.580	0.105	0.013	0.402	91.000	F	96.77	9.082
	3	26.160	0.181	0.000	0.000	77.000	M	61.73	5.935
	4	11.770	0.000	0.000	0.000	99.000	F	52.91	5.637
	5	24.160	0.182	0.010	0.314	91.000	F	96.84	9.323
	<b>Σ</b>	<b>247.380</b>						<b>633.06</b>	<b>66.648</b>
<b>#4</b>	<b>Σ</b>	<b>311.270</b>						<b>36.63</b>	<b>39.288</b>

### ***Subwatershed Time of Concentration Details:***

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	3. Short grass pasture	10.00	30.00	300.00	2.520	0.033
		8. Large gullies, diversions, and low flowing streams	9.11	69.00	757.00	9.050	0.023
		8. Large gullies, diversions, and low flowing streams	1.82	51.00	2,805.12	4.040	0.192
<b>#1</b>	<b>1</b>	<b>Time of Concentration:</b>					<b>0.248</b>
#1	2	5. Nearly bare and untilled, and alluvial valley fans	9.52	26.00	273.00	3.080	0.024
		8. Large gullies, diversions, and low flowing streams	3.52	58.00	1,647.02	5.620	0.081
<b>#1</b>	<b>2</b>	<b>Time of Concentration:</b>					<b>0.105</b>
#1	3	1. Forest with heavy ground litter	5.00	15.00	300.00	0.560	0.148
		8. Large gullies, diversions, and low flowing streams	4.16	31.00	746.03	6.110	0.033
<b>#1</b>	<b>3</b>	<b>Time of Concentration:</b>					<b>0.181</b>
#1	5	5. Nearly bare and untilled, and alluvial valley fans	6.80	28.00	412.00	2.600	0.044

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	1.09	17.00	1,559.06	3.130	0.138
<b>#1</b>	<b>5</b>	<b>Time of Concentration:</b>					<b>0.182</b>
#2	1	3. Short grass pasture	27.22	43.00	158.00	4.170	0.010
		8. Large gullies, diversions, and low flowing streams	0.69	5.00	724.00	2.490	0.080
<b>#2</b>	<b>1</b>	<b>Time of Concentration:</b>					<b>0.090</b>
#2	2	5. Nearly bare and untilled, and alluvial valley fans	17.92	19.00	106.00	4.230	0.006
		8. Large gullies, diversions, and low flowing streams	11.65	70.00	601.00	10.230	0.016
<b>#2</b>	<b>2</b>	<b>Time of Concentration:</b>					<b>0.022</b>
#2	3	3. Short grass pasture	25.26	74.00	293.00	4.020	0.020
		8. Large gullies, diversions, and low flowing streams	5.13	4.00	78.00	6.790	0.003
		8. Large gullies, diversions, and low flowing streams	6.29	10.00	159.00	7.520	0.005
<b>#2</b>	<b>3</b>	<b>Time of Concentration:</b>					<b>0.028</b>
#3	1	5. Nearly bare and untilled, and alluvial valley fans	6.78	16.00	236.00	2.600	0.025
		8. Large gullies, diversions, and low flowing streams	4.01	70.00	1,747.00	6.000	0.080
<b>#3</b>	<b>1</b>	<b>Time of Concentration:</b>					<b>0.105</b>
#3	2	3. Short grass pasture	29.63	24.00	81.00	4.350	0.005
		8. Large gullies, diversions, and low flowing streams	1.00	6.00	600.00	3.000	0.055
		7. Paved area and small upland gullies	27.52	30.00	109.00	10.560	0.002
		8. Large gullies, diversions, and low flowing streams	4.57	42.00	919.00	6.410	0.039
<b>#3</b>	<b>2</b>	<b>Time of Concentration:</b>					<b>0.101</b>

## ***Subwatershed Muskingum Routing Details:***

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	6. Grassed waterway	3.82	13.00	340.00	2.930	0.032
<b>#1</b>	<b>1</b>	<b>Muskingum K:</b>					<b>0.000</b>
#1	2	8. Large gullies, diversions, and low flowing streams	5.34	18.00	337.00	6.930	0.013
<b>#1</b>	<b>2</b>	<b>Muskingum K:</b>					<b>0.013</b>
#1	4	6. Grassed waterway	4.12	63.00	1,530.00	3.040	0.139
<b>#1</b>	<b>4</b>	<b>Muskingum K:</b>					<b>0.000</b>
#1	5	8. Large gullies, diversions, and low flowing streams	0.91	1.00	110.00	2.860	0.010
<b>#1</b>	<b>5</b>	<b>Muskingum K:</b>					<b>0.010</b>

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	1	7. Paved area and small upland gullies	2.25	4.00	178.00	3.010	0.016
		8. Large gullies, diversions, and low flowing streams	1.23	1.00	81.00	3.330	0.006
<b>#2</b>	<b>1</b>	<b>Muskingum K:</b>					<b>0.022</b>
#2	2	8. Large gullies, diversions, and low flowing streams	6.32	11.00	174.00	7.540	0.006
<b>#2</b>	<b>2</b>	<b>Muskingum K:</b>					<b>0.006</b>
#3	2	8. Large gullies, diversions, and low flowing streams	9.28	22.00	237.00	9.140	0.007
<b>#3</b>	<b>2</b>	<b>Muskingum K:</b>					<b>0.007</b>