Stantec Consulting Services Inc.
11687 Lebanon Road, Cincinnati, OH 45241

October 13, 2021
File: 175531034
Revision 0

Ohio Valley Electric Corporation
3932 U.S. Route 23
P.O. Box 468
Piketon, Ohio 45661

RE: Periodic Inflow Design Flood Control System Plan
Boiler Slag Pond
EPA Coal Combustion Residuals (CCR) Rule
Kyger Creek Station
Cheshire, Gallia County, Ohio

1.0 PURPOSE

This letter documents Stantec's certification of the inflow design flood control system plan for the Ohio Valley Electric Corporation (OVEC) Kyger Creek Station's Boiler Slag Pond. The EPA CCR Rule requires a new certification to be performed on a five-year periodic interval under 40 CFR 257.82(c)(4). The initial certification of the inflow design flood control system plan was placed in the operating record in October 2016.

2.0 INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

The initial inflow design flood control plan is attached. The 1000-year flood event was selected for the design storm based upon a hazard potential classification of "significant." The initial assessment found that the Boiler Slag Pond met the requirements of 40 CFR 257.82(a) and (b).

3.0 CURRENT INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Stantec reviewed the result of the initial inflow design plan and the changes in site conditions that have occurred in the past five years. The following operational changes and other factors were considered in this periodic assessment:

1. Stop logs have been removed in preparation of pond closure. The operational pool for the Boiler Slag Pond is El. 557.4 feet and El. 549.5 feet for the Clearwater Pond. The maximum operating pool modeled was El. 558.0 feet for the Boiler Slag Pond and El. 553.0 for the Clearwater Pond. This improves the available storage capacity of the impoundment.

2. Cross-sectional geometry of the perimeter dike system has not changed.

Re: **Periodic Inflow Design Flood Control System Plan**
Boiler Slag Pond
EPA Coal Combustion Residuals (CCR) Rule
Kyger Creek Station
Cheshire, Gallia County, Ohio

3. Annual and weekly inspections conducted since 2015 were reviewed as part of this assessment. There were no observations of deficiencies that would negatively affect the result of the inflow design assessment.

Based on our review, there are no conditions that have changed in the past five years that would have a negative effect on the inflow design assessment.

4.0 SUMMARY OF FINDINGS

Based on a review of the initial inflow design plan and the items listed in Section 3.0, the result of this periodic inflow design plan is that the Boiler Slag Pond at Kyger Creek Station meets the requirements of §257.82(a) and (b) of the EPA CCR Rule.

5.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Jacqueline S. Harmon, being a Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering,

2. that the information contained herein is accurate as of the date of my signature below, and

3. that the inflow design flood control system plan for the OVEC Kyger Creek Station's Boiler Slag Pond meets the requirements specified in 40 CFR 257.82(a), (b), and (c)(1).

SIGNATURE _____ DATE 10/13/2021

ADDRESS: Stantec Consulting Services Inc.
11687 Lebanon Road
Cincinnati, Ohio 45241

TELEPHONE: (513) 842-8200

ATTACHMENTS: Kyger Creek Station Boiler Slag Pond Initial Inflow Design Flood Control System Plan

Stantec Consulting Services Inc.
11687 Lebanon Road, Cincinnati, OH 45241

October 12, 2016
File: 175534017
Revision 0

Ohio Valley Electric Corporation
3932 U.S. Route 23
P.O. Box 468
Piketon, Ohio 45661

RE: Initial Inflow Design Flood Control System Plan
South Fly Ash Pond and Boiler Slag Pond
EPA Final CCR Rule
Kyger Creek Station
Cheshire, Gallia County, Ohio

1.0 PURPOSE

This letter documents Stantec's certification of the initial inflow design flood control system plan for the Kyger Creek Station's South Fly Ash Pond and Boiler Slag Pond. Based on this assessment, the South Fly Ash Pond and Boiler Slag Pond are in compliance with the initial inflow design flood control requirements in the EPA Final CCR Rule at 40 CFR 257.82(a)(3)(ii).

2.0 INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

As described in 40 CFR 257.82(c), documentation is required on how the inflow design flood control system has been designed and constructed to manage the design storm required by the hazard classification. The inflow design storm event was selected from §257.82(a)(3)(ii) as the 1000-year event based upon a hazard potential classification of significant. A rainfall amount for the 1000-year storm event (5.61 inches) was obtained from the "Precipitation Frequency Atlas of the United States, NOAA Atlas 14" using a precipitation event duration of 6 hours.

3.0 SUMMARY OF FINDINGS

The attached report presents the hydrology and hydraulic analysis for the South Fly Ash Pond and Boiler Slag Pond for 50 percent of the Probable Maximum Precipitation (PMP) event (9.5 inches in 6 hours). The calculations assume the outlet structure is inoperable and two drainage pumps are functioning. The resulting water surface elevations are shown in the following table. The results show that the hydrology and hydraulic analyses for the two ponds using the 50-percent PMP event meets the criteria; therefore, the design is also acceptable for the 1000-year event and the requirements set forth in 40 CFR 257.82(a).

Re: **Initial Inflow Design Flood Control System Plan**
South Fly Ash Pond and Boiler Slag Pond
EPA Final CCR Rule
Kyger Creek Station
Cheshire, Gallia County, Ohio

Station	Facility	Inflow Design Storm	Modeled Design Storm	50% PMP Water Surface Elevation (feet)	Embankment Elevation (feet)
Kyger Creek	South Fly Ash Pond	1000-year storm	50% PMP	586.0	590.0
Kyger Creek	Boiler Slag Pond	1000-year storm	50% PMP	559.3	582.0

4.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Stan A. Harris, being a Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;

2. that the information contained herein is accurate as of the date of my signature below; and

3. that, pursuant to 40 CRR 257.82(c)(5), the inflow design flood control system plan for the Kyger Creek Station's South Fly Ash Pond and Boiler Slag Pond meets the requirements specified in 40 CFR 257.82(a) and (c)(1).

SIGNATURE _____ DATE 10/12/16

ADDRESS: Stantec Consulting Services Inc.
11687 Lebanon Road
Cincinnati, Ohio 45241

TELEPHONE: (513) 842-8200

ATTACHMENTS: Kyger Creek Station Landfill Runoff Collection Pond Inflow Design Flood Control System Plan

STATE OF OHIO STAN A. HARRIS 53083 REGISTERED PROFESSIONAL ENGINEER 10/12/16

DLZ Ohio, Inc. (2015). *Professional Engineer Certification Report for: South Fly Ash Pond and Boiler Slag Pond Embankments at the Ohio Valley Electric Corporation. Kyger Creek Station.* Gallipolis, Ohio. Prepared for: American Electric Power. DLZ Job No. 1521-3007.00. December 8.

APPENDIX III

Hydrologic and Hydraulic Evaluations

Hydrologic and Hydraulic Analysis Related to Compliance Requirements
South Fly Ash Pond, Boiler Slag Pond and Clearwater Pond
Kyger Creek Power Plant, Gallia County, Ohio

General

The intent of this section is to ascertain the compliance of the South Fly Ash Pond, Boiler Slag Pond, and Clearwater Pond with the recently mandated coal combustion residuals (CCR) rules with regard to the hydrologic and hydraulic capacity requirements for surface impoundments (Ref 1). All three impoundments are up ground reservoirs which function as tailings ponds for the Ohio Valley Electric Corporation's (OVEC's) Kyger Creek Power Plant. A site map is shown in Figure 1.

The CCR rules require that the impoundments undergo periodic hazard potential classification. Currently, South Fly Ash Pond and Boiler Slag Pond (which includes Clearwater Pond) are listed under the Class II Hazard Classification for dams in the State of Ohio. This classification is somewhat different from the hazard classification listed in Section 257.73 (a) (2) of the CCR but may be construed as equivalent to a significant hazard potential CCR surface impoundment. As per Section 257.82 (a) (3) (ii) the inflow design flood for a significant hazard CCR surface impoundment is the 1,000-yr flood. However, since the primary classification is the State of Ohio Class II Hazard classification, the minimum design flood for such structures as per Ohio Administrative Code Rule 1501:21-13-02 is the 50% probable maximum flood (50% PMF). In addition, the 50% PMP depths for this location are larger than the 1000-yr rainfall depths for the same duration and thus the use of the 50% PMP for this analysis is conservative. Consequently, the inflow design flood chosen to determine the hydraulic capacity requirement is the 50% PMF.

The CCR rules also only state that the CCR unit must adequately manage the flow into and from the unit during and after the inflow design flood. No specific criterion for freeboard in the CCR unit is specifically listed. However, Ohio Administrative Code Rule 1501:21-13-07 for Class II dams that are up ground reservoirs specifically states that the minimum elevation of the embankment crest shall be 5 feet higher than the elevation of the designed maximum operating pool level. As part of this compliance certification, checks are conducted to verify that the 5 ft freeboard criterion for the top of dam as compared to the operating pool level is met. In addition, surcharge elevations associated with the inflow of the 50% PMF with maximum operating pool as the initial condition are also determined to ensure adequate storage capacity of the tailings ponds.

PMP Estimates

The rainfall depth for the 6-hr 1 sq. mile PMP for the Kyger Creek Plant as per the latest guidelines (Ref 2) developed by the Ohio Department of Natural Resources (ODNR) is 19 inches. Since the drainage areas to the ponds are relatively small and the associated time of concentrations will be much less than 6 hours, it is reasonable to use the 6-hr 1 sq. mile value for the PMP. It should be noted that the point 1000-yr 6-hr rainfall depth for the area is 5.6 inches as compared to the 0.5 PMP depth of 9.5 inches.

Topographic Data

Topographic data for all three ponds were generated using the 2007 LiDAR information for the project site that is available online from the Ohio Geographically Referenced Information Program (OGRIP) website. The drainage areas and elevation-area data for each of the ponds were developed using the above data. It should be noted that the elevations with the LiDAR data are referenced to the NAVD 88 vertical datum. Since the historical information for the ponds are based on the NGVD 29 datum, all elevations based on this data are converted to the NGVD 29 elevations by adding 0.7 ft, which is the appropriate correction factor for the project area. All elevations in this document are referenced to the NGVD 29 datum unless otherwise expressly stated.

Historic Data and Previous Studies

Historic data on the tailing ponds were primarily taken from several previous studies (Refs 3 and 4). This includes outlet structure information and normal pool elevations. Information was also obtained from communications with OVEC and American Electric Power (AEP) personnel. A site visit was also conducted on 7/22/15 to observe the various facilities on site.

South Fly Ash Pond

The drainage area for the South Fly Ash Pond is approximately 67.7 acres. The outlet structure for South Fly Ash Pond is located near the south west corner of the pond and consists of a 36-inch concrete pipe, with a 42 inch by 39 inch concrete riser pipe with the principal spillway at elevation 582 ft. As per OVEC and AEP personnel, the maximum operating pool is at elevation 585 ft.

The site visit revealed that the Kyger Creek Plant's coal yard drainage as well as storm drainage from a portion of the plant site is pumped to the pond. This information is not available from any of the previous reports. Discussions with OVEC and AEP personnel revealed that originally four Goyne pumps each rated at 5,000 GPM delivered the drainage flow to the ponds. Currently, only two are working and there are no current plans to replace the other two. For the purpose of this study, it is assumed that two pumps will be active during storm events. The combined coal yard/plant drainage area is approximately 38 acres as per OVEC and AEP personnel.

Conservatively, it is assumed that the outlet structure is blocked during the occurrence of the 0.5 PMP event, the initial pond elevation is at the maximum operating pool, and that the direct inflow to the reservoir from the 0.5 PMP rainfall and the associated pumped drainage from the coal yard/plant area are instantaneously imposed on the pond.

Assuming no losses, the direct inflow volume to the pond = 0.5*19/12*67.7 = 53.6 ac-ft. Drainage volume to the pond from the pumps will be the minimum of the pump delivery or the flow volume associated with the drainage area. Maximum pump delivery during the 6-he PMP will be the rated pump capacity multiplied by the 6-hr duration. Maximum pump volume = 5,000*2*60*6/7.48/43,560 = 11.0 ac-ft. Assuming no losses, the maximum volume from the 38 acre coal yard/plant drainage area during the 0.5 PMP = 0.5*19/12*38 = 30 ac-ft. It appears that flow from the drainage area will be limited by the

pump capacity which may not be the case in reality since there will be losses associated with the rainfall over the coal/plant yard. A runoff coefficient of approximately 0.37 will make the runoff volume almost the same as the pump capacity. Conservatively, the total volume to the pond can be estimated as 53.6+11.0 = 64.6 ac-ft.

The resulting water surface elevation is calculated to be 586.0 ft (see Table 1). The top elevation of the embankment around the pond is considered to be at elevation 590 ft, though the 2007 LIDAR data indicate variations in the elevations. Therefore, the freeboard for the 0.5 PMP event (assuming the initial water level is at maximum operating pool) is of the order of 4 ft.

Also, there is a freeboard of 5 ft above the maximum operating level, which satisfies the minimum freeboard requirements of the State of Ohio for up ground reservoirs.

Boiler Slag Pond

The drainage area for the Boiler Slag Pond is approximately 30.1 acres. The outlet structure for Boiler Slag Pond is located at the southern end of the pond adjacent to the west end of the splitter dike between Boiler Slag Pond and the associated Clearwater Pond. The outlet consists of a 36-inch concrete pipe with a 42 inch by 39 inch concrete riser pipe with the principal spillway at elevation 557 ft. Water entering the outlet structure is discharged to Clearwater Pond, through a 30-inch CMP which passes through the splitter dike. There is no drainage from other sources entering Boiler Slag Pond. The maximum operating pool level is reported by OVEC and AEP personnel to be approximately 558 ft.

Conservatively, it is assumed that the outlet structure is blocked during the occurrence of the 0.5 PMP event, the initial pond elevation is at maximum operating pool, and that the inflow to the reservoir is only from the 0.5 PMP rainfall. Assuming no losses, the direct inflow volume to the pond = 0.5*19/12*30.1 = 23.8 ac-ft. The initial storage in the pond corresponding to the maximum operating pool elevation of 558.0 ft is 17.7 ac-ft, so the total storage in the pond corresponding to the 0.5 PMP is 41.5 ac-ft. The resulting water surface elevation in the pond due to the 0.5 PMP event is 559.3 ft.

The top elevation of the embankment around the pond is considered to be at elevation 582 ft, though the 2007 LIDAR data indicate variations in the elevations. Therefore, the freeboard for the 0.5 PMP event is of the order of 22.7 ft. The detailed calculations are shown in Table 2.

Clearwater Pond

The drainage area for the Clearwater Pond is 9.9 acres. The outlet structure for Clearwater Pond is located at the southeast corner of the pond and is discharged to the Ohio River through a 30-inch CMP. Details of the outlet structure do not appear to be available. The maximum operating pool level is reported by OVEC and AEP personnel to be approximately 553 ft. The only incoming flow to Clearwater Pond is from direct rainfall to the pond as well as the inflow from Boiler Slag Pond.

Clearwater Pond is not strictly a CCR unit since the purpose of Boiler Slag Pond is to store CCRs.

Assuming no losses, the combined inflow volume from the drainage areas of both Boiler Slag Pond and Clearwater Pond is = 0.5*19/12*(30.1+9.99) = 31.7 ac-ft. It is also assumed that the initial storage of 17.7 ac-ft in Boiler Slag Pond corresponding to the maximum operating pool there will drain to Clearwater Pond. In addition, since the initial elevation in Clearwater Pond is assumed to be at the maximum operating level of 553 ft, there is an initial storage in Clearwater Pond of 5.5 ac-ft. Thus the total storage volume in Clearwater Pond for these conditions assuming that the outlet is blocked is 54.9 ac-ft.

It should be noted that if the pool elevation at Clearwater Pond exceeds 557 ft (spillway elevation at Boiler Slag Pond), the storage in Boiler Slag Pond above this elevation will also be activated in addition to the storage in Clearwater Pond. The resulting water surface elevation in the pond for the 0.5 PMP event assuming that the outlet is blocked is 558.6 ft.

The top elevation of the embankment around the pond is considered to be at elevation 582 ft, though the 2007 LIDAR data indicate variations in the elevations. Therefore, the freeboard for the 0.5 PMP event is of the order of 23.4 ft. The detailed calculations are shown in Table 3.

Summary and Conclusions

A summary table of the water level conditions in the three ponds is given in Table 4. It is concluded that South Fly Ash Pond, Boiler Slag Pond and Clearwater Pond have sufficient storage capacity and freeboard to satisfy the minimum requirements of CCR rules as well as the dam safety requirements of the State of Ohio.

References

1. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule, 40 CFR Parts 257 and 261, Environmental Protection Agency, Part II, Federal Register, Vol. 80, No.74, Friday, April 17, 2015..

2. Probable Maximum Precipitation Study for the State of Ohio, Ohio Department of Natural Resources, February 2013.

3. Assessment of Dam Safety of Coal Combustion Surface Impoundments (Task 3) Final Report, Ohio Valley Electric Corporation, Kyger Creek Power Station, Gallipolis, Ohio, February 24, 2010.

4. Report on Dam Safety Inspection, Kyger Creek Fly Ash and Bottom Ash Ponds, Kyger Creek Generation Plant, Addison, Ohio, February 1985.

Figure 1 Areal View of Project Site

Table 1: Detailed Calculations for South Fly Ash Pond

South Fly Ash Pond

Drainage Area 67.7 acres

Feature	Elevation (ft)	Surface Area (ac)	Incr Storage (ac-ft)
Principal Spillway	582.0	64.3	0.0
	582.7	64.6	45.1
	583.7	64.9	109.8
	584.7	65.2	174.9
	585.0	65.3	194.4
	585.7	65.5	240.2
	586.7	65.9	305.9
	587.7	66.3	371.9
	588.7	66.8	438.5
	589.7	68.1	505.9
Top of Dam	590.0	68.7	526.4

Inflow Volumes

(Calculations assume that outlet structure is inoperable)

50% 6hr-1sq mile PMP volume to South Fly Ash Pond	53.6	ac-ft
Coal yard drainage max pump vol for 6 hrs	11.0	ac-ft
Drainage volume from 38 acre coal yard for 50% 6-hr PMP	30.1	ac-ft
Combined flow volume from 50% 6-hr PMP to South Fly Ash Pond	64.6	ac-ft
Storage in South Fly Ash Pond due to 50% 6-hr PMP	64.6	ac-ft
Assumed initial level (maximum operating pool)	585.0	ft
Initial storage	194.4	ac-ft
Total storage in South Fly Ash Pond	259.0	ac-ft
Max South Fly Ash Pond elevation	586.0	ft
Freeboard	4.0	ft

Table 2: Detailed Calculations for Boiler Slag Pond

Boiler Slag Pond

Drainage Area 30.1 acres

Feature	Elevation (ft)	Surface Area (ac)	Incr Storage (ac-ft)
Principal Spillway	557.0	16.7	0.0
	560.7	19.5	67.0
	570.7	26.3	296.0
	579.7	29.0	544.5
Top of Dam	582.0	29.2	611.4

Inflow Volumes

(Calculations assume that outlet structure is inoperable)

50% 6hr-1sq mile PMP volume	23.8	ac-ft
Storage in Boiler Slag Pond due to 50% 6-hr PMP	23.8	ac-ft
Assumed initial level (maximum operating pool)	558.0	ft
Initial storage (curve fit)	17.7	ac-ft
Total storage in Boiler Slag Pond	41.5	ac-ft
Max Boiler Slag Pond elevation (curve fit)	559.3	ft
Freeboard	22.7	ft

Table 3: Detailed Calculations for Clearwater Pond

Clearwater Pond

Drainage Area 9.99 acres

Feature	Elevation (ft)	Surface Area (ac)	Incremental Storage (ac-ft)	Add Storage Boiler Slag Pond (ac-ft)	Total Storage (ac-ft)
Principal Spillway	552.0	5.7	0.0		0.0
	552.7	5.8	4.0		4.0
	556.7	6.4	28.4		28.4
	557.0	6.4	30.4	0.0	30.4
	560.7	6.9	54.9	67.0	122.0
	570.7	8.2	130.5	296.0	426.5
	579.7	9.6	210.7	544.5	755.2
Top of Dam	582.0	10.3	233.6	611.4	845.0

Inflow Volumes

(Calculations assume that outlet structure is inoperable)

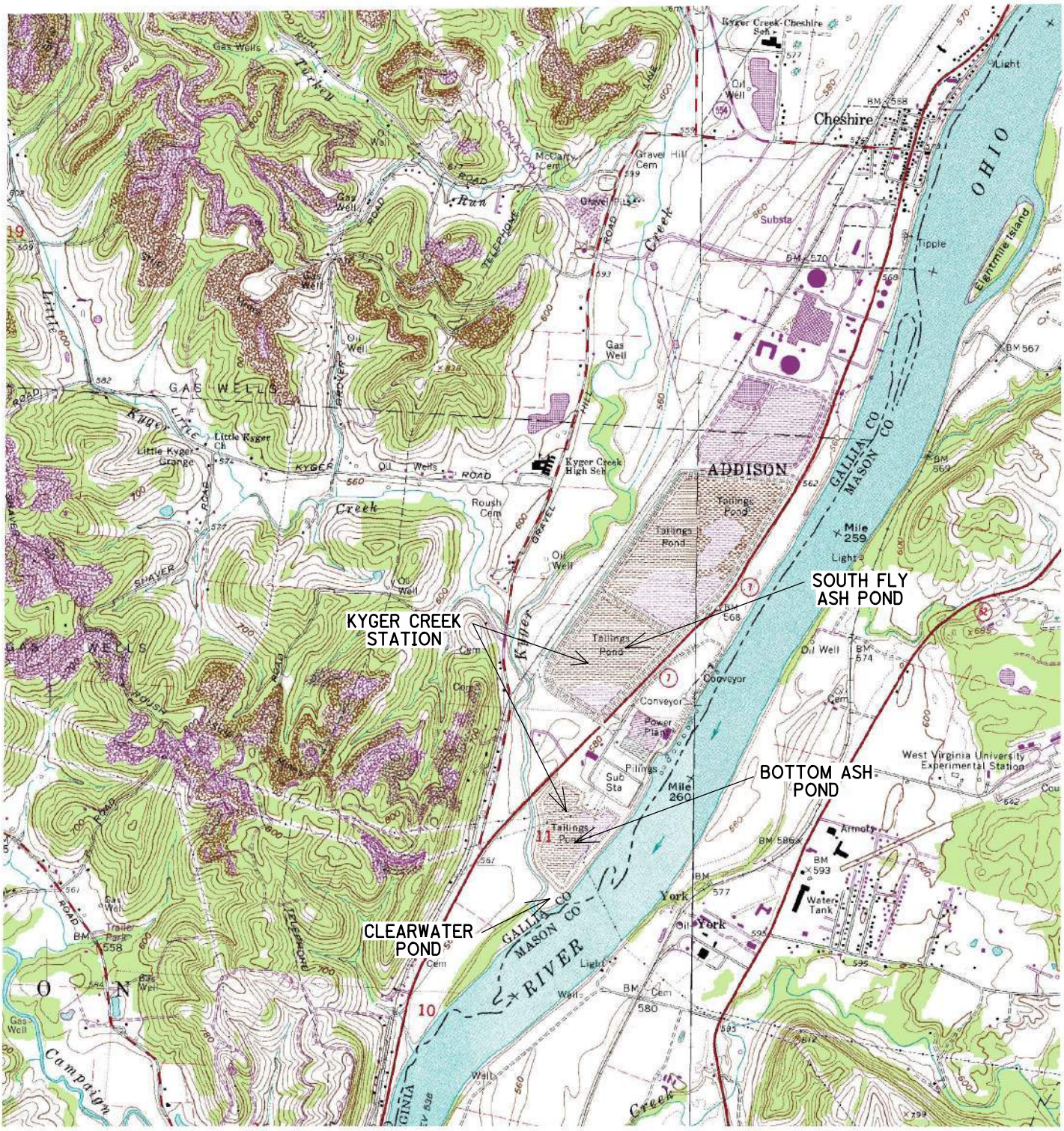
50% 6hr-1sq mile PMP volume from Clearwater Pond	7.9	ac-ft
50% 6hr-1sq mile PMP volume from Boiler Slag Pond	23.8	ac-ft
Initial flow volume in Boiler Slag Pond	17.7	ac-ft
Combined Flow Volume to Clearwater Pond	49.4	ac-ft
Assumed initial level (maximum operating pool)	553.0	ft
Initial storage (curve fit)	5.5	ac-ft
Total storage in Clearwater Pond	54.9	ac-ft
Max Clearwater Pond elevation (curve fit)	558.6	ft
Freeboard	23.4	ft

Table 4: Summary Table of Elevations

Summary Table

Feature	Elevation (ft) – NGVD 29			Freeboard (ft)		Top of Embankment Elevation(ft) – NGVD 29
	Normal Pool	Max Operating Pool	50% PMP Elevation	50% PMP Event	Max Operating Pool	
South Fly Ash Pond	582.0	585.0	586.0	4.0	5.0	590.0
Boiler Slag Pond	557.0	558.0	559.3	22.7	24.0	582.0
Clearwater Pond	552.0	553.0	558.6	23.4	29.0	582.0

Note: Initial pond elevation for 50% PMP event assumed to be the maximum operating pool



SCALE: 1"=½MILE

DLZ

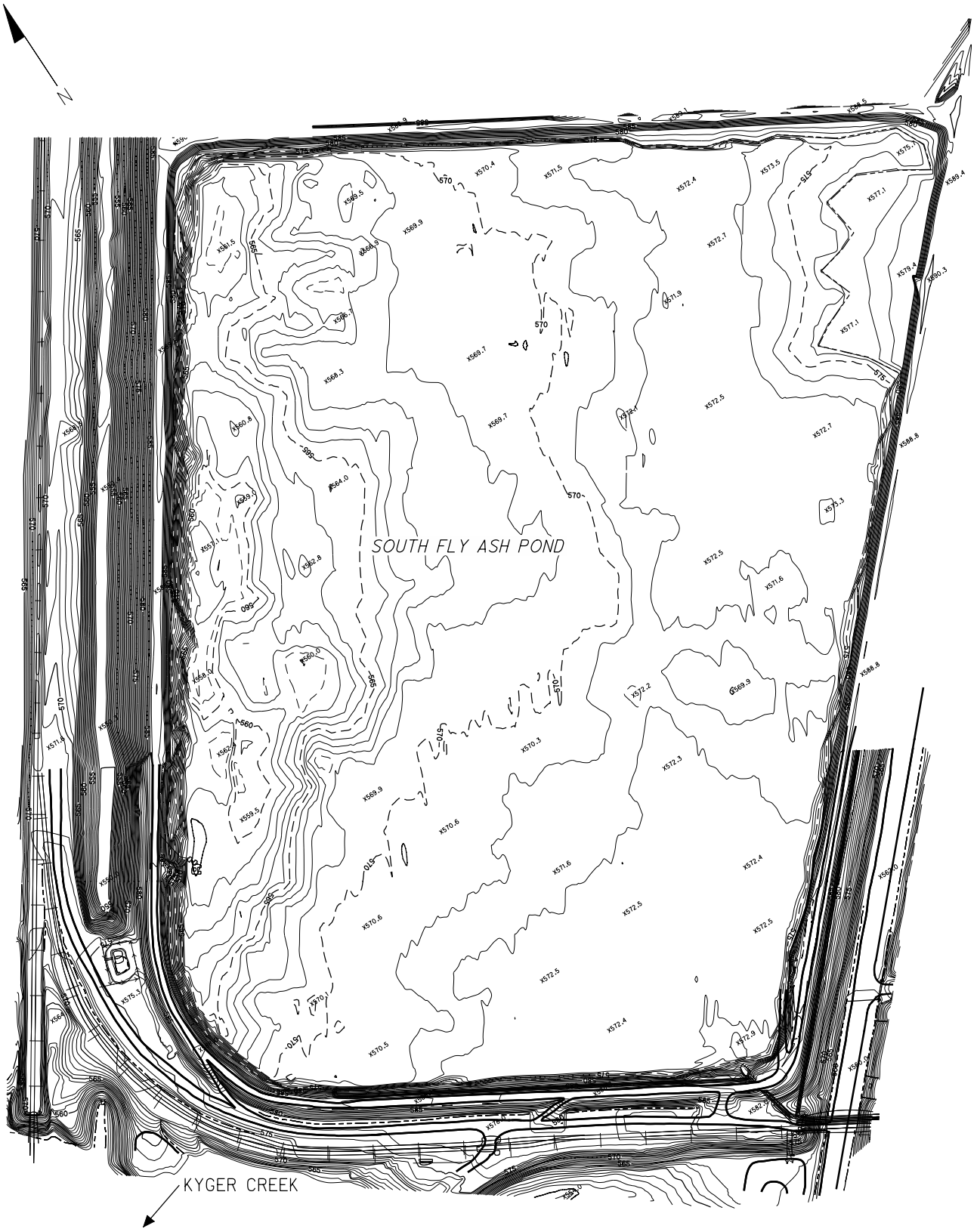
SITE LOCATION MAP

KYGER CREEK PLANT
OHIO VALLEY ELECTRIC CORP.
GALLIPOLIS, OHIO

PROJECT NO. 1021-3003.00

DATE: 11/12/2010

EXHIBIT 1



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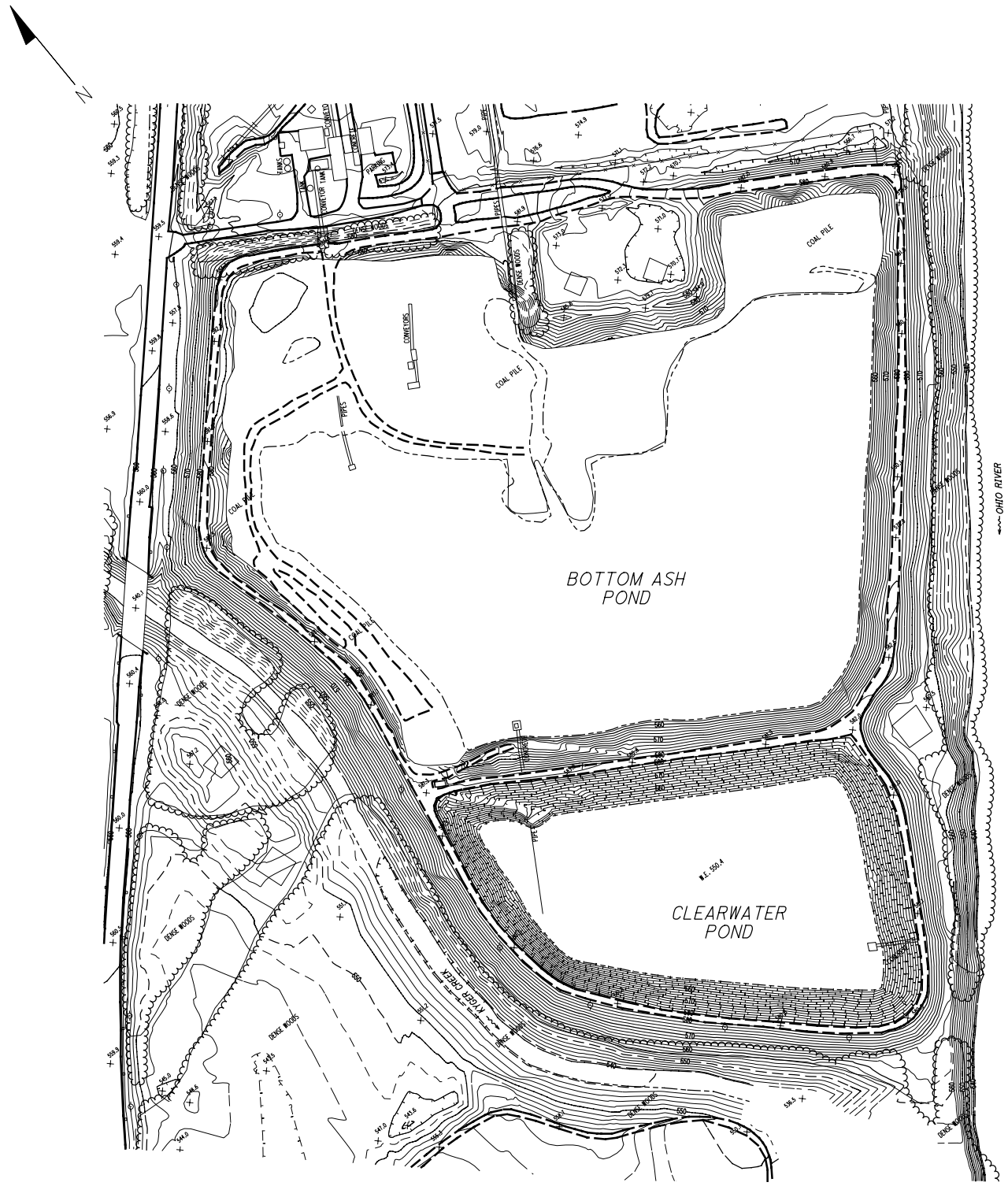
SOUTH FLY ASH POND

KYGER CREEK PLANT
OHIO VALLEY ELECTRIC CORP.
GALLIPOLIS, OHIO

PROJECT NO.
1021-3003.00

DATE: 11/12/2010

EXHIBIT 2



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DLZ

BOTTOM ASH POND

KYGER CREEK PLANT
OHIO VALLEY ELECTRIC CORP.
GALLIPOLIS, OHIO

PROJECT NO. 1021-3003.00

DATE: 11/12/2010

EXHIBIT 3