DRAFT REPORT

Dam Safety Assessment of CCW Impoundments

WH Zimmer Station

United States Environmental Protection Agency
Washington, DC

June 2010

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DRAFT REPORT

13498/46122

Dam Safety Assessment of CCW Impoundments

WH Zimmer Station

Prepared for:
US Environmental Protection Agency
Washington, DC

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1. INTRODUCTION

1.1 GENERAL

In response to the coal combustion waste (CCW) impoundment failure at the TVA/Kingston coal-fired electric generating station in December of 2008, the U. S. Environmental Protection Agency (US EPA) has initiated a nationwide program of structural integrity and safety assessments of coal combustion waste impoundments or "management units".

A CCW management unit is defined as a surface impoundment or similar diked or bermed management unit or management units designated as landfills that receive liquid-borne material and are used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Management units also include inactive impoundments that have not been formally closed in compliance with applicable federal or state closure/reclamation regulations.

The US EPA has authorized O'Brien & Gere to provide site specific impoundment assessments at selected facilities. This project is being conducted in accordance with the terms of BPA #EP10W000673, Order NO. EP10W001240, dated April 8, 2010.

1.2 PROJECT PURPOSE AND SCOPE

The purpose of this work is to provide Dam Safety Assessment of CCW management units at the Duke W.H. Zimmer power plant, located in Moscow, Ohio (subject facility), including the following:

- Identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures
- Note the extent of deterioration, status of maintenance, and/or need for immediate repair
- Evaluate conformity with current design and construction practices
- Determine the hazard potential classification for units not currently classified by the management unit owner or by state or federal agencies

O'Brien & Gere's scope of services for this project includes performing a site specific dam safety assessment of the CCW management units at the subject facility. Specifically, the scope includes the following tasks:

- Perform a review of pertinent records (prior inspections, engineering reports, drawings, etc.) made available at the time of the site visit to review previously documented conditions and safety issues and gain an understanding of the original design and modifications of the facility.
- Perform a site visit and visual inspection of each CCW management unit and complete the visual inspection checklist to document conditions observed.
- Perform an evaluation of the adequacy of the outlet works, structural stability, quality and adequacy of the management unit's inspection, maintenance, and operations procedures.
- Identify critical infrastructure within 5 miles downstream of management units.
- Evaluate the risks and effects of potential overtopping and evaluate effects of flood loading on the management units.
- Immediate notification of conditions requiring emergency or urgent corrective action.
- Identify environmental permits issued for the management units
- Identify leaks, spills, or releases of any kind from the management units within the last 5 years.
- Prepare a report summarizing the findings of the assessment, conclusions regarding the safety and structural integrity, recommendations for maintenance and corrective action, and other action items as appropriate.

This report addresses the above issues for the Wastewater Pond Complex at the W. H. Zimmer Station in Moscow, Ohio. The above impoundment is owned and operated by Duke Energy Ohio, Inc. (Duke Energy). In the course of this assessment, O'Brien & Gere obtained information from representatives of Duke Energy Ohio and BBC&M Engineering.

2. PROJECT/FACILITY DESCRIPTION

The W. H. Zimmer Station is located in Clermont County at 1781 US Route 52 in Moscow, Ohio. The facility operates one surface impoundment for storing CCW called the Wastewater Pond Complex. The dam safety assessment summarized in this report details the April 28, 2010 inspection of the Wastewater Pond Complex.

A site location map is provided as Figure 1.

2.1 MANAGEMENT UNIT IDENTIFICATION

The Wastewater Pond Complex is located at the north end of the site and is identified on Figure 2. The Wastewater Pond Complex carries the following identification numbers:

- Ohio Department of Natural Resource (ODNR) state dam identification number 8741-010
- National Inventory of Dams identification number OH01393

2.2 HAZARD POTENTIAL CLASSIFICATION

State of Ohio – ODNR Classification

The State of Ohio classifies dams or embankments in accordance with the statutes of the Ohio Administrative Code (OAC) and Ohio Revised Code (ORC). These codes are administrated by the ODNR Division of Soil and Water Resources Dam Safety Program.

The OAC defines a dam as:

> *"… any artificial barrier together with any appurtenant works, which either does or may impound water or other liquefied material. Upground reservoirs and lagoons are considered to be dams. A fill or structure intended solely for highway or railroad use that does not permanently impound water or other liquefied material as determined by the chief is not considered a dam." (OAC 1501:21-3-01)*

Four dam classifications are established in OAC 1501:21-13-21 and range from Class IV (lowest) to Class I (highest)and the classification for a particular dam is based on the following criteria:

- Height of embankment
- Volume of water/material impounded
- Risk to human life
- Risk to adjacent properties/structures
- Risk to nearby roads, railroads and public utilities

Until November 2009, the ODNR had classified the Wastewater Pond Complex as a Class III dam in accordance with the OAC. In November 2009 the ODNR changed the classification for the Wastewater Pond Complex from Class III to Class II for consistency with the classification of similar facilities.

US EPA - CCW Impoundment Guidelines

The definitions for the four hazard potentials (Less than Low, Low, Significant and High) to be used in this assessment are included in the EPA CCW checklist found in Appendix A. Based on the checklist definitions and as a result of this assessment, the hazard potential rating recommended for the Wastewater Pond Complex is

LOW. This rating is generally in line with ODNR's former classification of Class III versus its more recent reclassification to a Class II structure.

As described in Appendix A, the **LOW** hazard rating is justified as follows:

> *"Given the existing drainage pathways around the Wastewater Pond Complex, flow damage from a breach of the embankments would likely be directed along the owner's property with some carryover into the Ohio River. Given the relative size of the impoundments, the quantity of flue gas desulfurization (FGD) solids typically stored in the impoundment and in the absence of a detailed dam breach analysis, it is the belief of the inspection team that some FGD solids could reach the Ohio River in the event of a breach of the impoundment. However, the anticipated quantity of solids that may reach the river is expected to be minor and would likely result in limited environmental damage".*

2.3 IMPOUNDING STRUCTURE DETAILS

The following sections summarize the structural components and basic operations of the Wastewater Pond Complex. A diagram of the Wastewater Pond Complex and its relevant features is provided as Figure 3. It should be noted that the site plan shown in Figure 3 was adapted from the original design drawings and aerial photography images and may not depict all current features. Additionally, photos taken during the visual inspection are incorporated in a Photographic Log provided as Appendix B.

2.3.1 Embankment Configuration

The Wastewater Pond Complex is comprised of diked embankments on four sides. There are three main ponds within the Wastewater Pond Complex as listed below. The normal active pond elevations are also given.

- Coal Pile Runoff Pond – 508'
- Wastewater Pond – 507'
- Clear Water Pond – 503'

In general, the crest is a relatively constant elevation of 511' around a majority of the impoundment perimeter.

2.3.2 Type of Materials Impounded

Currently, the main influent into the Wastewater Pond Complex includes the following sources:

- Stormwater runoff from direct precipitation on the impoundment area
- Stormwater runoff and leachate from the off-site ash landfill
- Stormwater runoff from the coal pile area
- High Pressure Turbine Building wastewater
- Flue Gas Desulfurization (FGD) treatment wastewater

In general, the FGD wastewater is the source of significant solids which are deposited into the Wastewater Pond. Typically, the Wastewater Pond is dredged for FGD solids removal on a bi-annual basis.

2.3.3 Outlet Works

As noted above, the Wastewater Pond Complex consists of three main ponds. Each pond has an outlet to convey water to the next pond in the treatment process. A summary of the various outlet works is presented in the following table.

Table 2.3 *Summary of Outlet Works at Wastewater Pond Complex*

TO	FROM	DESCRIPTION
Wastewater Pond	Coal Pile Runoff Pond	- 18" diameter steel pipe, submerged
Clear Water Pond	Wastewater Pond	- Concrete box weir - 250' long, elevation 507' - 42" x 42" cross sectional size - Open channel at discharge
Ohio River	Clear Water Pond	- Concrete box weir - 100' long, elevation 503' - 42" x 42" cross sectional size -Box weir transitions to 36" diameter pipe via a concrete drop structure - Outfall discharge flume elevation of 490' - Upon exiting flume, water cascades down rip-rap reinforced channel to Ohio River, normal pool elevation 455'

The Wastewater Pond Complex discharge to the Ohio River is permitted as Outfall 005 under OEPA Permit #1IB00011*JD (NPDES permit # OH0048836).

3. RECORDS REVIEW

A review of the available records related to design, construction, operation and inspection of the Wastewater Pond Complex was performed as part of this assessment. The documents provided by Duke Energy are listed below:

Table 3.1 *Summary of Wastewater Pond Complex Documents Reviewed*

Document	Dates	By	Description
Wastewater Pond Complex Design Drawings	1986 - 1987	American Electric Power Service Corporation	Site plan, grading plan, sections and details of the Wastewater Pond Complex
OEPA Permit to Install Application	1986	American Electric Power Service Corporation	Permit application and related design documents to construct the impoundment for wastewater treatment purposes
Final Design Report	1986	American Electric Power Service Corporation	Full design report including design calculations, sizing, geotechnical borings and soil testing
Dam Inspection Report	2008	Ohio Department of Natural Resources	State inspection report
Dam Inspection Report	2009	BBC&M Engineering	Third party consultant engineer inspection report
Weekly Plant Inspection Forms	2009	Duke Energy	Visual inspection checklists by facility personnel
Outfall 005 Readings	2009	Duke Energy	Daily recorded flow and semi-monthly sample results for TSS and TDS discharged from the impoundment
Water Flow Diagram	2009	Duke Energy	Flow chart of plant process and waste water
Response to EPA RFI	2010	Duke Energy	Utility's response to EPA questionnaire regarding CCW impoundments

3.1 ENGINEERING DOCUMENTS

Review of the design drawings revealed information on the design details of the Wastewater Pond Complex. No significant modifications have been made to the impoundment since its construction. The following is a summary of basic design information.

- The Wastewater Pond Complex was originally constructed during the late 1980's, when the W. H. Zimmer Station was converted from a planned nuclear operation to a coal fired operation

- The embankments for the Wastewater Pond Complex are founded on native soils. Additionally, the embankments were constructed from native soils excavated from the site as well as sand dredged from the Ohio River.

- The pond bottoms and embankments were constructed with a 3-foot thick clay liner with permeability <1 x 10^{-7} cm/sec. The original Final Design Report noted that the native soils are primarily clayey soils that have a naturally low permeability. The report suggests that during construction, these materials were not to be disturbed if already properly located to serve as a liner. Additionally, the report suggested that these soils could be used as the liner material and augmented as needed with imported material.

- The Wastewater Pond Complex embankments were constructed with a gravel toe drain which was added to the design at the request of ODNR in 1986.
- No indication of construction phase documentation was noted in the records reviewed.
- Geotechnical borings, soils sampling and analysis results utilized in the design of the Wastewater Pond Complex were summarized in the Final Design Report.
- Design slope stability analyses were included in the Final Design Report. A minimum factor of safety of 1.65 was reported for the most critical sections of the embankments for steady-state, normal pool loading conditions.
- Hydrologic analyses were observed in the Final Design Report. The ponds have adequate outlet capacity and embankment freeboard to address stormwater or pump malfunction (uncontrolled pumping).
- A water flow diagram for the power plant was provided, which indicates normal and maximum design flows for the various water management systems in use at the facility.
- No indication or mention of coal ash, coal slimes, or other CCW by-products within the embankments or embankment foundations was noted in our review of the engineering records listed above.
- No indication of former spills or releases of impounded materials from the Ash Pond was noted in the records reviewed.

3.1.1 Stormwater Inflows

Stormwater inflows to the Wastewater Pond Complex are minimal. The impounding structures are comprised of embankments on all four sides, which direct storm water away from the impoundment and limit runoff to precipitation that falls directly on the water surface and crest of the embankments. Stormwater runoff from the coal pile is pumped from collection points to the Coal Pile Runoff Pond portion of the Wastewater Pond Complex, but not at rates that are likely to cause overtopping.

3.1.2 Stability Analyses

Stability analyses were documented in a geotechnical design report from the original design of the impoundment. Using the Modified Bishop Method and a computer software package named STABL3, a minimum factor of safety of 1.65 was calculated for the outboard slope stability of the most critical portions of the embankments under steady state, normal pool loading conditions. According to additional correspondence on this matter, it was noted that ODNR verified this result using similar software. It does not appear that maximum pool, earthquake or rapid drawdown loading cases were analyzed.

Based on our records review, the original stability analyses have never been updated. The operating water levels, embankment dimensions and related loading conditions observed during the visual inspection are consistent with the assumed conditions of the design slope stability analysis. Indications of slope distress were not observed during our visual inspection of the Wastewater Pond Complex.

3.1.3 Modifications from Original Construction

Based on the records review and discussions with plant personnel, the Wastewater Pond Complex has not undergone any significant modifications since its original construction.

3.1.4 Instrumentation

Instrumentation is present in three locations at the Wastewater Pond Complex as follows:

- Water Level Monitoring – Coal Pile Runoff Pond
- pH/Conductivity Monitoring – Discharge from Wastewater Pond to Clear Water Pond
- Flow Monitoring – Discharge from Clear Water Pond to Ohio River

No other instrumentation is used at the Wastewater Pond Complex.

3.2 PREVIOUS INSPECTIONS

During the inspection, the Wastewater Pond Complex was reported to have the following inspection schedule:

- Facility, Visual – Weekly
- Third Party, Professional Engineer – Annual
- ODNR, Agency review – 3 to 5 years

For the most recent third party dam safety inspection, in June 2009, Duke Energy retained the services of BBC&M Engineering.. BBC&M made nine recommendations in their inspection report as summarized below:

1) Regrade wet areas along the toe
2) Clean out a drainage ditch along the eastern embankment
3) Regrade around culverts under crest roadway
4) Perform more regular mowing
5) Repair bare areas on embankments with grass
6) Monitor shoreline erosion
7) Repair rodent burrows
8) Check grading around utility poles
9) Repair potholes on crest roadway

At the time of O'Brien & Gere's inspection, Items 1, 6 and 7 were still in need of repair or had recurred since the BBC&M inspection.

For the most recent ODNR inspection, agency officials visited the site in June 2008. The only maintenance items noted for repair were minor erosion and overgrowth vegetation. At the time of O'Brien & Gere's inspection, these items were observed as completed.

3.3 OPERATOR INTERVIEWS

Numerous plant and corporate personnel took part in the inspection proceedings. The following is a list of participants for the inspection of the Wastewater Pond Complex:

Table 3.3 *List of Participants*

Name	Affiliation	Title
Tom Patt	Duke Energy Ohio – W.H. Zimmer	Plant Environmental Coordinator
David Holsteen	Duke Energy Ohio – W.H. Zimmer	Plant Production Coordinator
Tammy Jett	Duke Energy - Corporate	Environmental Specialist III
Jim Stieritz	Duke Energy - Corporate	Principal Environmental Specialist
Adam Deller	Duke Energy – Corporate	Civil Engineer
Ron Ehlers	Duke Energy – Corporate	Senior Engineer
Jeff Tripp, PE	BBCM Engineers	Project Engineer
Scott Cormier, PE	O'Brien & Gere	Vice President
Gary Emmanuel, PE	O'Brien & Gere	Project Manager
Jason Huber, PE	O'Brien & Gere	Design Engineer

Facility personnel provided background information on the design, construction and operations of the Wastewater Pond Complex, described general plant operations and provided requested historical documentation. In addition to the facility personnel, the plant's engineering consultant was present to provide additional information from previous impoundment inspections. These personnel also accompanied O'Brien & Gere throughout the visual inspections to answer questions and to provide additional information as needed in the field.

4.VISUAL INSPECTION

The following sections summarize the inspection of the Wastewater Pond Complex, which occurred on April 28, 2010. At the time of the inspection, O'Brien & Gere completed an EPA inspection checklist for the Wastewater Pond Complex, which was submitted electronically to EPA on May 6, 2010. A copy of the completed inspection checklist is included as Appendix A.

4.1 GENERAL

The weather on the date of the inspection was clear and approximately 70 degrees. The visual inspection consisted of a thorough site walk and recording of observations along the toe, outboard slope, and crest of the embankments, and along exposed portions of the inboard slopes of the Wastewater Pond Complex. O'Brien & Gere also observed the inlet/outlet structures and current Complex operations.

Photos of relevant features and conditions observed during the inspection were taken by O'Brien & Gere and are provided in Appendix B. A site plan of the Wastewater Pond Complex is presented as Figure 3 and provides photograph locations and directions.

4.2 SUMMARY OF FINDINGS

The following observations were made during the inspection:

- The Wastewater Pond Complex was observed in normal operation at the time of the visual inspection. Water levels in each pond of the complex were at design levels and water was observed flowing freely through the complex to the NPDES discharge point.
- Ponded water was observed at the toe of the slope along the majority of the west embankment and western portion of the north embankment. The ponded water was reportedly due to recent heavy rains and poor local surface drainage and is expected to dry up in time. As a result it is not believed to be seepage from the Wastewater Pond Complex.
- Minor scarping/wave eroded areas were observed along the water's edge of the inboard slopes of the Wastewater Pond and the Clear Water Pond.
- Rodent burrows were observed at multiple locations on the inboard slope of the north embankment and at one location on the inboard slope of the west embankment of the Wastewater Pond.
- Erosion was observed across the secondary access road on the north embankment.
- A non-uniform slope was observed at the north end of the east embankment. This departure from the design slope was reported to be a result of fill placed to create an access ramp on the slope for maintenance activity related to the adjacent highway.

5. CONCLUSIONS

Based on the ratings defined in the RFP (Satisfactory, Fair, Poor and Unsatisfactory), the information reviewed and the visual inspection, the overall condition of the Wastewater Pond Complex is considered to be **SATISFACTORY**. Acceptable performance is expected under applicable loading conditions. There are some minor maintenance items that require action and/or additional monitoring, which include the following:

- Minor scarping/wave eroded areas along the water's edge of the inboard slopes of the Wastewater Pond and the Clear Water Pond
- Rodent burrows at multiple locations
- Ponded water along the outboard toe of the north and west embankments that could cause saturation and weakening of the toe in these areas.
- Erosion across the secondary access road on the north embankment
- Potential for erosion or sloughing in the non-uniform slope at the north end of the east embankment

The owner has implemented regular inspections and maintenance which enable the impoundments to be kept in good working order. Interviews with plant engineering personnel responsible for the operation of the impoundments indicate that a regular operations plan is in use at the W. H. Zimmer Station.

The plant and corporate engineering staffs maintain design documents and inspection reports in a well organized manner. The plant participates in and cooperates with regular state inspections in addition to its own weekly walkthroughs and annual third party inspections.

Based on these findings, O'Brien & Gere is of the opinion that the operation and maintenance procedures being practiced at the Wastewater Pond Complex are adequate.

6. RECOMMENDATIONS

Based on the findings of our visual inspection and review of the available records for the Wastewater Pond Complex, O'Brien & Gere recommends that additional maintenance of the embankments be performed to correct the erosion, drainage, and other miscellaneous deficiencies cited above.

6.1 URGENT ACTION ITEMS

None of the recommendations are considered to be urgent, since the issues noted above do not appear to threaten the structural integrity of the dam in the near term.

6.2 REPAIRS/LONG TERM IMPROVEMENT

The following minor repairs should be undertaken:

- Filling of noted rodent burrows and elimination/relocation of rodents

The following long term improvements should also be completed:

- Regrading to promote positive drainage of wet areas along the outboard toe of the west embankment and western portion of north embankment.

6.3 MONITORING AND FUTURE INSPECTION

The following items should be monitored more closely and in the event their condition is observed to worsen, immediate action to remedy to situation should be taken:

- Scarping/wave erosion in Wastewater and Clear Water Ponds
- Non-uniform slope at the north end of the east embankment
- Erosion on secondary access road on north embankment

O'Brien & Gere recommends that Duke Energy continue with its current schedule of weekly inspection and annual third party inspections. O'Brien & Gere also recommends that Duke Energy continue its current practice of regular mowing to manage vegetative growth on the embankment slopes to prevent the growth of woody vegetation, prevent erosion, and facilitate inspection. Consideration should be given to placing rip rap or similar measures to prevent further erosion of the inboard slopes of the embankments at the normal operating water levels.

In addition, consideration should be given to updating the original slope stability analyses to include all applicable loading conditions and to meet current dam safety standards. While the site is located in an area of relatively low seismic risk, seismic loading should be one of the loading conditions evaluated.

6.4 TIME FRAME FOR COMPLETION OF REPAIRS/IMPROVEMENTS

O'Brien & Gere recommends that the minor repairs noted in Section 6.2 above be completed by the end of calendar year 2010.

O'Brien & Gere also recommends that the long term improvements noted in Section 6.2 above be completed by the end of calendar year 2011. Should the wet areas along the toe return upon completion of regrading, further

investigation may be necessary to verify if seepage is an issue.

6.5 CERTIFICATION STATEMENT

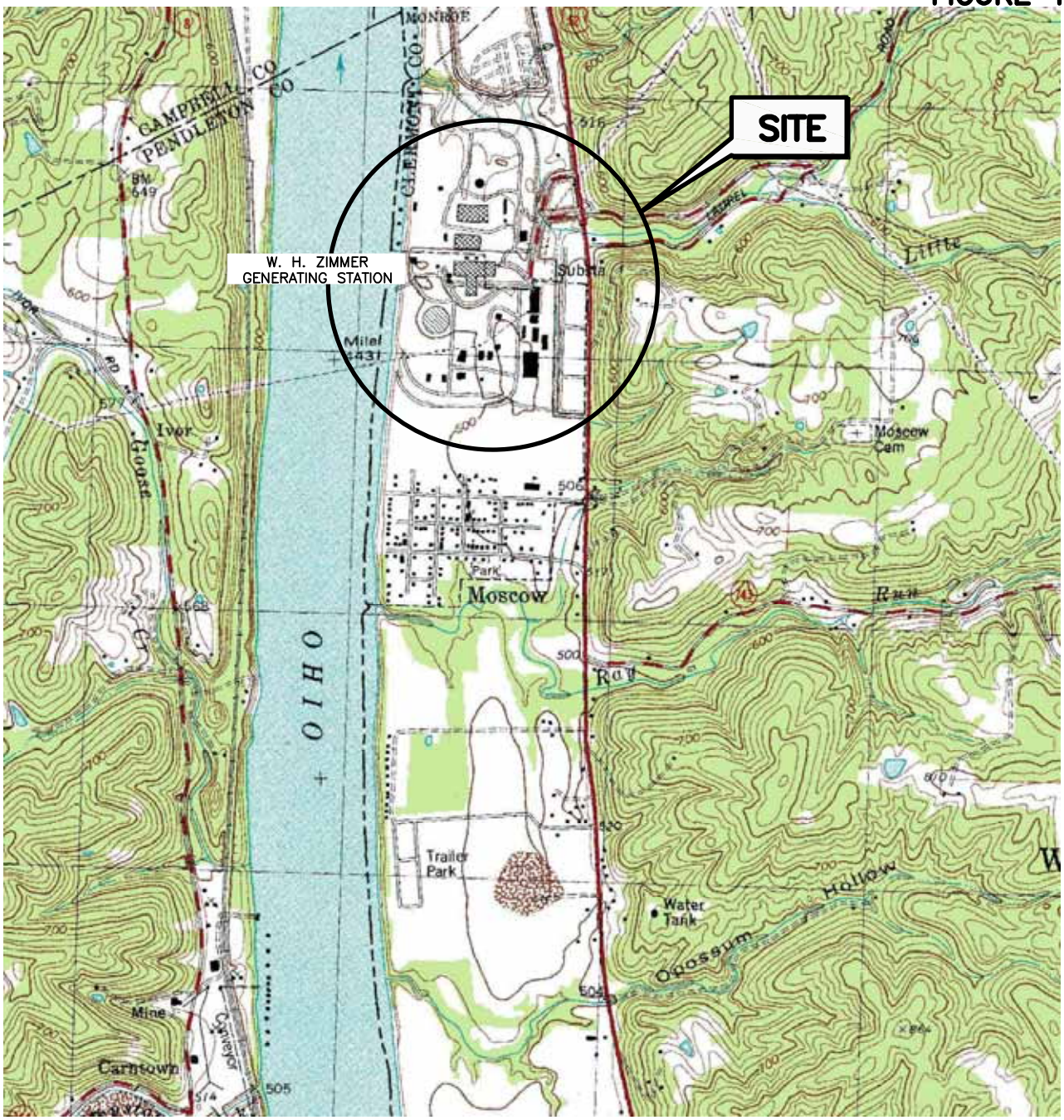
I acknowledge that the Wastewater Pond Complex management unit at the W. H. Zimmer Station referenced herein was personally inspected by me on April 28, 2010 as was found to be in the following condition:

SATISFACTORY
~~FAIR~~
~~POOR~~
~~UNSATISFACTORY~~

Signature: _____ Date: _____

Scott L. Cormier, PE
OH PE # E64400

FIGURE 1



ADAPTED FROM: MOSCOW QUADRANGLE, OHIO U.S.G.S. 7.5 MIN. QUAD 1981, REVISED 1992

QUADRANGLE LOCATION

US EPA
DAM SAFETY ASSESSMENT
OF CCW IMPOUNDMENTS

W. H. ZIMMER GENERATING STATION
MOSCOW, OHIO

SITE LOCATION MAP

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

SCALE: 1:24000

46122–MOSCOW–F01
JUNE 2010

O'BRIEN & GERE

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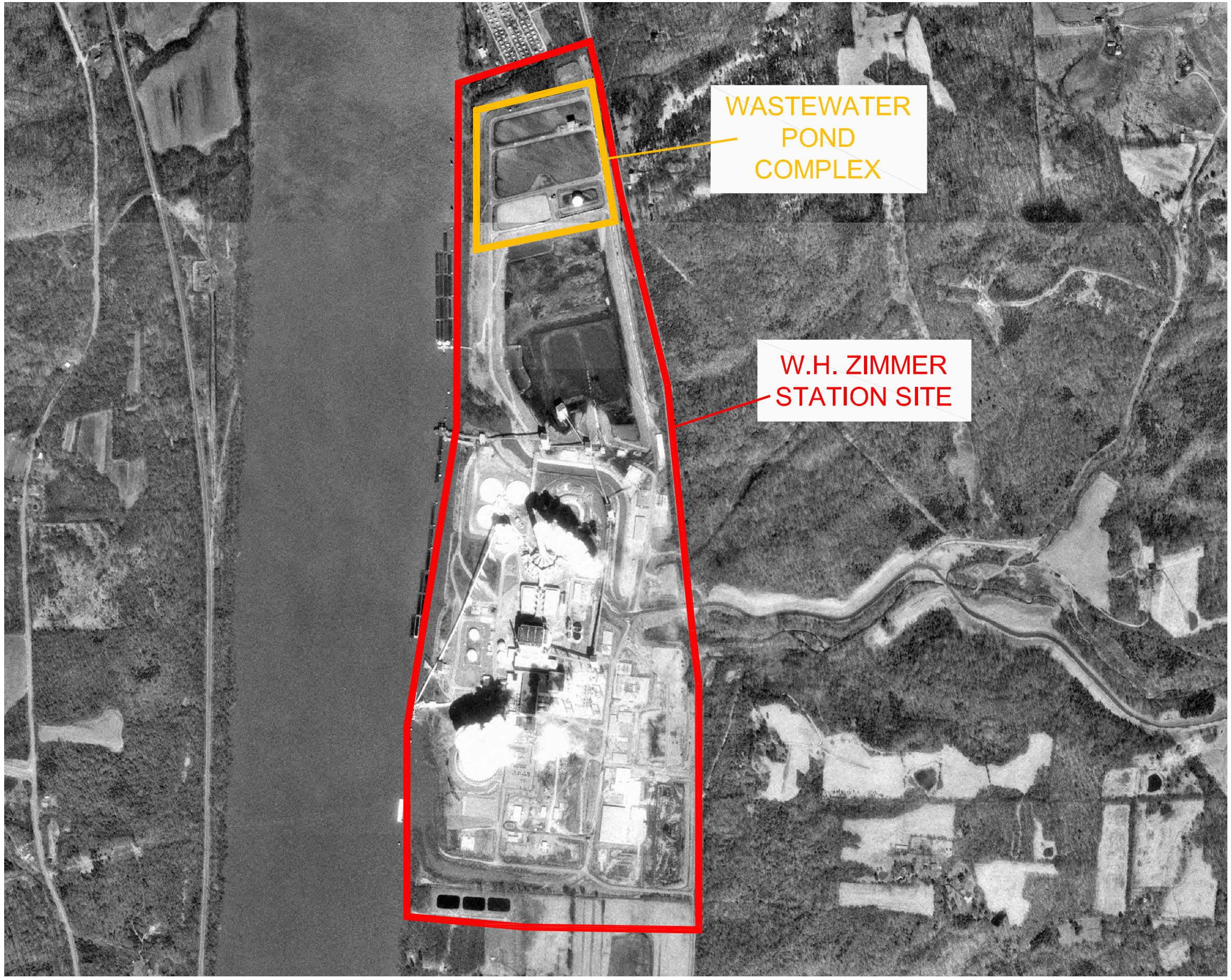

FIGURE 2

NORTH

NOTES:
1. BASE PHOTO FOR DRAWING DATED 2000. CERTAIN SITE FEATURES MAY NOT BE DEPICTED
2. BASE DRAWING OBTAINED FROM THE OHIO GEOGRAPHICALLY REFERENCED INFORMATION PROGRAM WEBSITE

US EPA

DAM SAFETY INSPECTION
OF CCW IMPOUNDMENTS

W.H. ZIMMER STATION
MOSCOW, OH

SITE LAYOUT MAP

1"=800' 800 0 800

FILE NO. 13498/46122-002
MAY 2010

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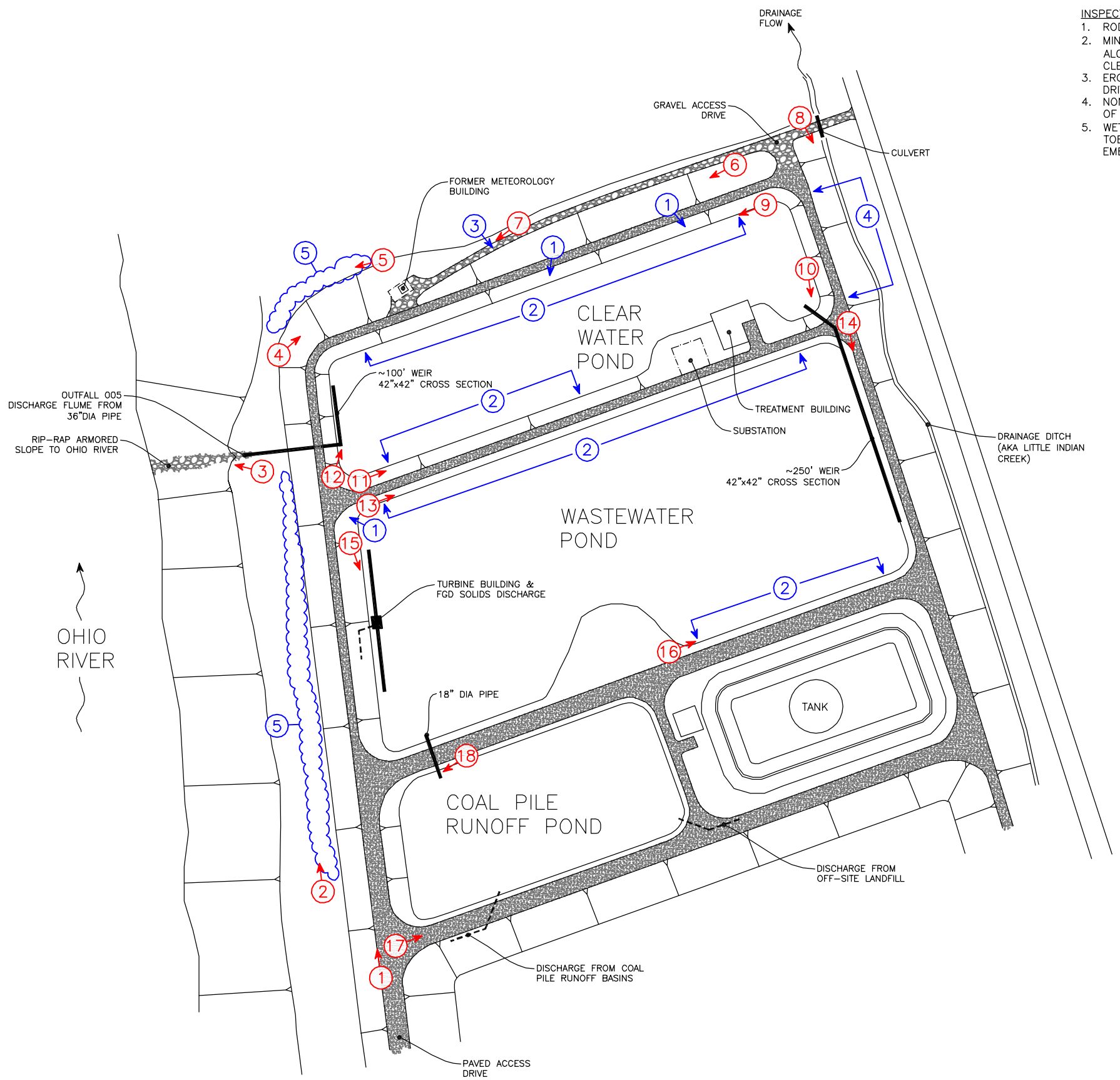
FIGURE 3



INSPECTION NOTES:

1. RODENT BURROW(S)
2. MINOR SCARPING/WAVE ERODED AREAS ALONG WATER'S EDGE OF WASTEWATER AND CLEAR WATER PONDS
3. ERODED GULLY ACROSS GRAVEL ACCESS DRIVE ON NORTH EMBANKMENT
4. NON-UNIFORM SLOPE AT NORTH PORTION OF EAST EMBANKMENT
5. WET/POORLY DRAINED AREAS OBSERVED AT TOE ALONG WEST EMBANKMENT AND NORTH EMBANKMENT

NORTH

LEGEND

APPENDIX B PHOTO REFERENCE – ARROW DEPICTS ORIENTATION OF PHOTO

VISUAL INSPECTION OBSERVATION – ARROW DENOTES LOCATION OF OBSERVATION(S) – SEE INSET NOTES

US EPA

DAM SAFETY INSPECTION OF CCW IMPOUNDMENTS

W. H. ZIMMER STATION
MOSCOW, OH

SITE PLAN

1"=200' 200 0 200

FILE NO. 13498.46122-003
MAY 2010

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5/25/10 JPH div078

APPENDIX A

Visual Inspection Checklist

Coal Combustion Dam Inspection Checklist Form
Duke Energy Ohio, Inc.

US Environmental Protection Agency

Site Name: W.H. Zimmer Station	Date: April 28, 2010
Unit Name: Wastewater Pond Complex	Operator's Name: Tom Patt - Site Env Coordinator
Unit I.D.:	Hazard Potential Classification: High Significant Low
Inspector's Name: Gary Emmanuel, PE and Scott Cormier, PE	

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Multiple		18. Sloughing or bulging on slopes?		x
2. Pool elevation (operator records)?	Multiple		19. Major erosion or slope deterioration?		x
3. Decant inlet elevation (operator records)?	503'		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	490'		Is water entering inlet, but not exiting outlet?		x
5. Lowest dam crest elevation (operator records)?	511'		Is water exiting outlet, but not entering inlet?		x
6. If instrumentation is present, are readings recorded (operator records)?	x		Is water exiting outlet flowing clear?	x	
7. Is the embankment currently under construction?		x	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?		n/a	From underdrain?		x
9. Trees growing on embankment? (If so, indicate largest diameter below)		x	At isolated points on embankment slopes?		x
10. Cracks or scarps on crest?		x	At natural hillside in the embankment area?		x
11. Is there significant settlement along the crest?		x	Over widespread areas?		x
12. Are decant trashracks clear and in place?	x		From downstream foundation area?		x
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		x	"Boils" beneath stream or ponded water?		x
14. Clogged spillways, groin or diversion ditches?		x	Around the outside of the decant pipe?		x
15. Are spillway or ditch linings deteriorated?		x	22. Surface movements in valley bottom or on hillside?		x
16. Are outlets of decant or underdrains blocked?		x	23. Water against downstream toe?	x	
17. Cracks or scarps on slopes?	x		24. Were Photos taken during the dam inspection?	x	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

See list of notes on next page for comments.

Checklist Number	Description/Notes
1	Weekly inpsection performed by plant personnel. Records provided to date for 2010. Annual inspection peformed by a 3rd party PE. 2009 inspection provided, 2010 inspection scheduled for June 2010.
2	Coal Pile Runoff Pond - 508', Wastewater Pond - 507', Clear Water Pond - 503'
6	Flow from complex recorded daily, records from 2010 provided by facility personnel. pH and conductivity also reported with continuous recordings at Waste Water Pond discharge into the Clear Water Pond. Records not requested for pH and conductivity.
8	The area was reported to be cleared prior to construction of the Wastewater Pond Complex by knowledgeable site personnel. However, no historical specifications or construction reports were available to verify.
17	Various stretches along the inboard slopes of the Clear Water Pond and the Wastewater Pond were observed to have minor scarping up to 2' above the pool elevation.
18	A non uniform slope was observed at the north end of the east embankment. This non uniform slope did not appear to be due to significant sloughing or bulging of the embankment, but rather possibly a result of overfilling during original construction or another unrelated project.
21, 23	Ponded water was observed at the toe of the slope along a majority of the west and north embankments. Based on historical inspections and reports from the site walk escorts, these areas are normally dry. It is estimated that the ponded water observed during this inspection was due to heavy rains within the week prior to the site visit.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # 1IB00011*JD INSPECTOR Gary Emmanuel, PE & Scott Cormier, PE

Date April 28, 2010

Impoundment Name Wastewater Pond Complex

Impoundment Company Duke Energy Ohio, Inc.

EPA Region Region V

State Agency (Field Office) Addresss Ohio Dept. of Natural Resources - Division of Water
2045 Morse Road, Bldg B-2, Columbus, OH 43229-6693

Name of Impoundment Wastewater Pond Complex

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update X

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Settling of FGD solids and treatment of various other industrial wastewaters

Nearest Downstream Town : Name Point Pleasant

Distance from the impoundment Approx 1.3 Miles

Impoundment Location:

Longitude -84 Degrees 13 Minutes 43.788 Seconds

Latitude 38 Degrees 52 Minutes 42.258 Seconds

State Ohio County Clermont

Does a state agency regulate this impoundment? YES X NO _____

If So Which State Agency? Ohio Department of Natural Resources

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

__X__ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

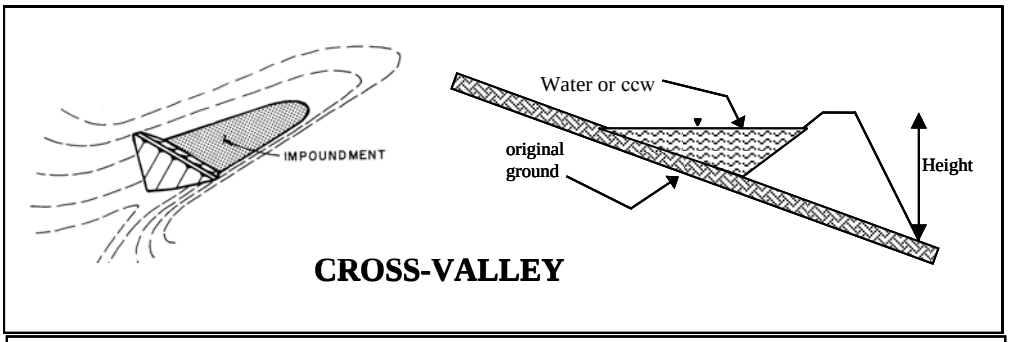
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

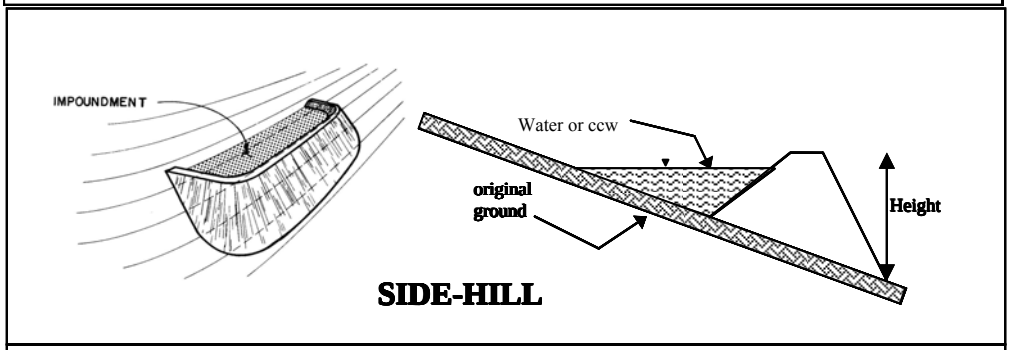
_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

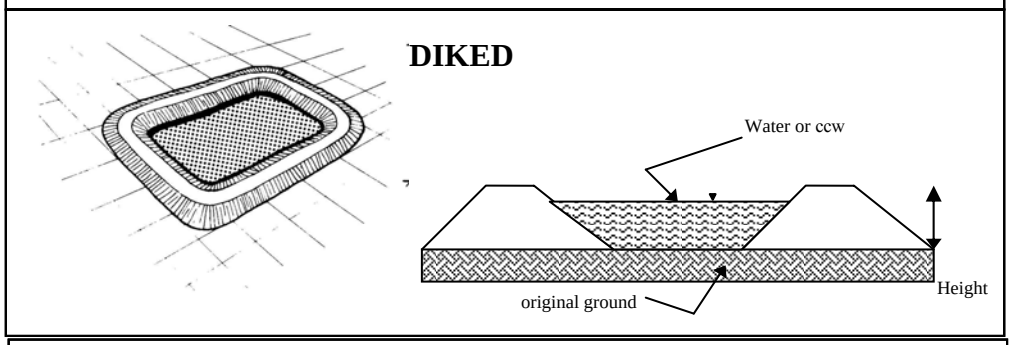
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

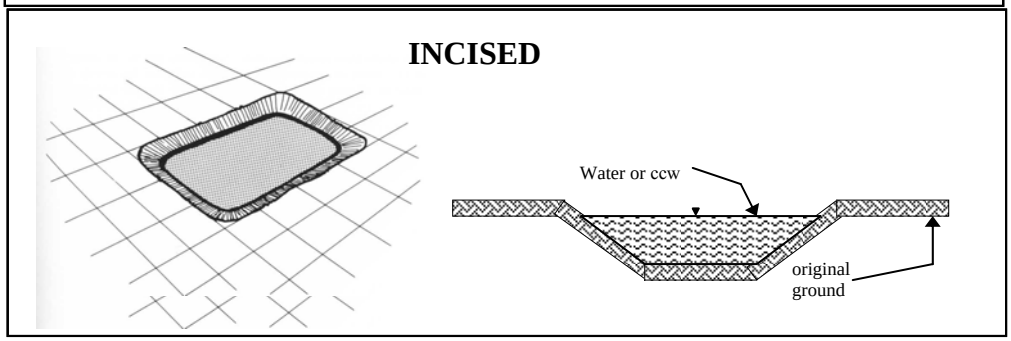
Given the existing drainage pathways around the Wastewater Pond Complex, flow damage from a breach of the embankments would likely be directed along the owner's property with some carryover into the Ohio River. Given the relative size of the impoundments, the quantity of FGD solids typically stored in the impoundments, and in the absence of a detailed dam breach analysis, it is the belief of the inspection team that some FGD solids could reach the Ohio River in the event of a breach of the impoundments. However the anticipated quantity of solids that may reach the river is expected to be minor and would likely result in limited environmental damage.

CONFIGURATION:









_____ Cross-Valley
_____ Side-Hill
__x__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height ~15 to 20 feet
Pool Area ~15 acres
Current Freeboard _____ feet

Embankment Material Earth taken from site and dredged from Ohio River, historic plans also indicate a gravel toe drain in some areas
Liner Clay, (~3' thick beneath each unit)
Liner Permeability less than 1 x 10^{-7}

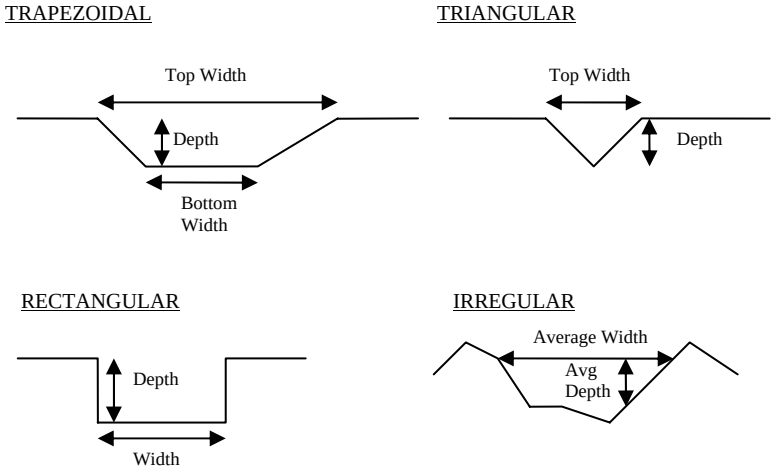
7' Clear Water Pond
4' Wastewater Pond
3' Coal Pile Runoff Pond

NOTE: Various structures are used to transfer water between the 3 ponds of the Wastewater Pond Complex. The main outlet, from the Clear Water Pond to the Ohio River, (described below) consists of a 100' long concrete box weir which transfers water to a 36" diameter steel pipe via a concrete drop chamber.

TYPE OF OUTLET (Mark all that apply)

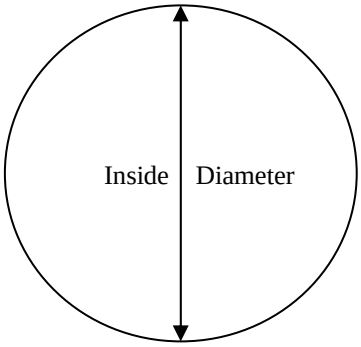
__X__ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
__X__ Rectangular
_____ Irregular

__42"__ depth
_____ bottom (or average) width
__42"__ top width



__Main__ **Outlet** (From Clear Water Pond to Ohio River)

__36"__ inside diameter



Material
_____ corrugated metal
__X__ welded steel
__X__ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) _____

Is water flowing through the outlet? YES __X__ NO _____

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) _____

The Impoundment was Designed By __American Electric Power Service Corp._____

Has there ever been a failure at this site? YES _____ NO ____X_____

If So When? _____

If So Please Describe : _____

Has there ever been significant seepages at this site? YES _____ NO __X___

If So When? _____

IF So Please Describe: _____

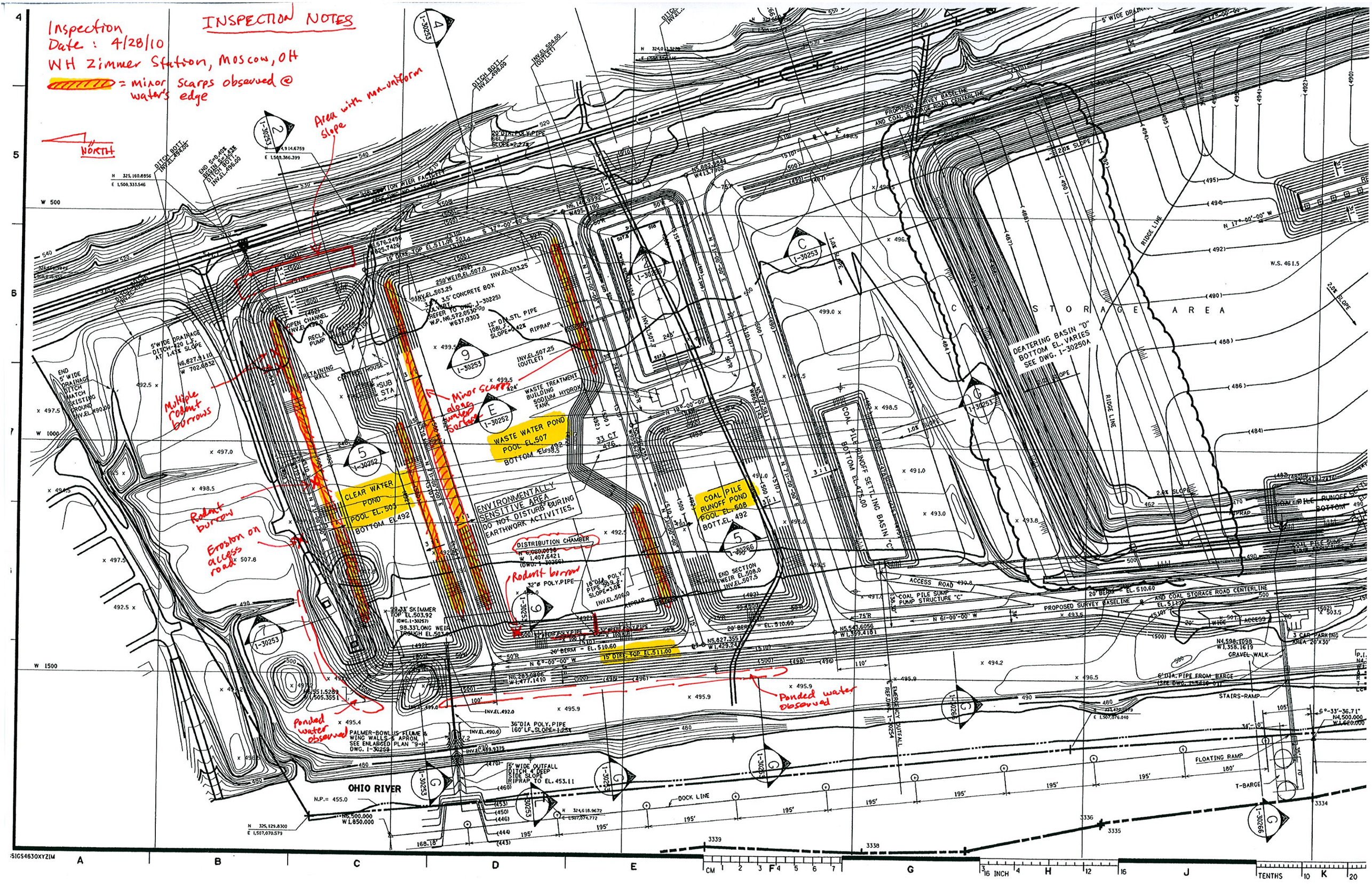
Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____NO ___X____

If so, which method (e.g., piezometers, gw pumping,...)? _____

If so Please Describe : _____

Inspection
Date : 4/28/10
WH Zimmer Station, Moscow, OH
= minor scarps observed @ water's edge

INSPECTION NOTES



WH Zimmer Inspection 4/28/10

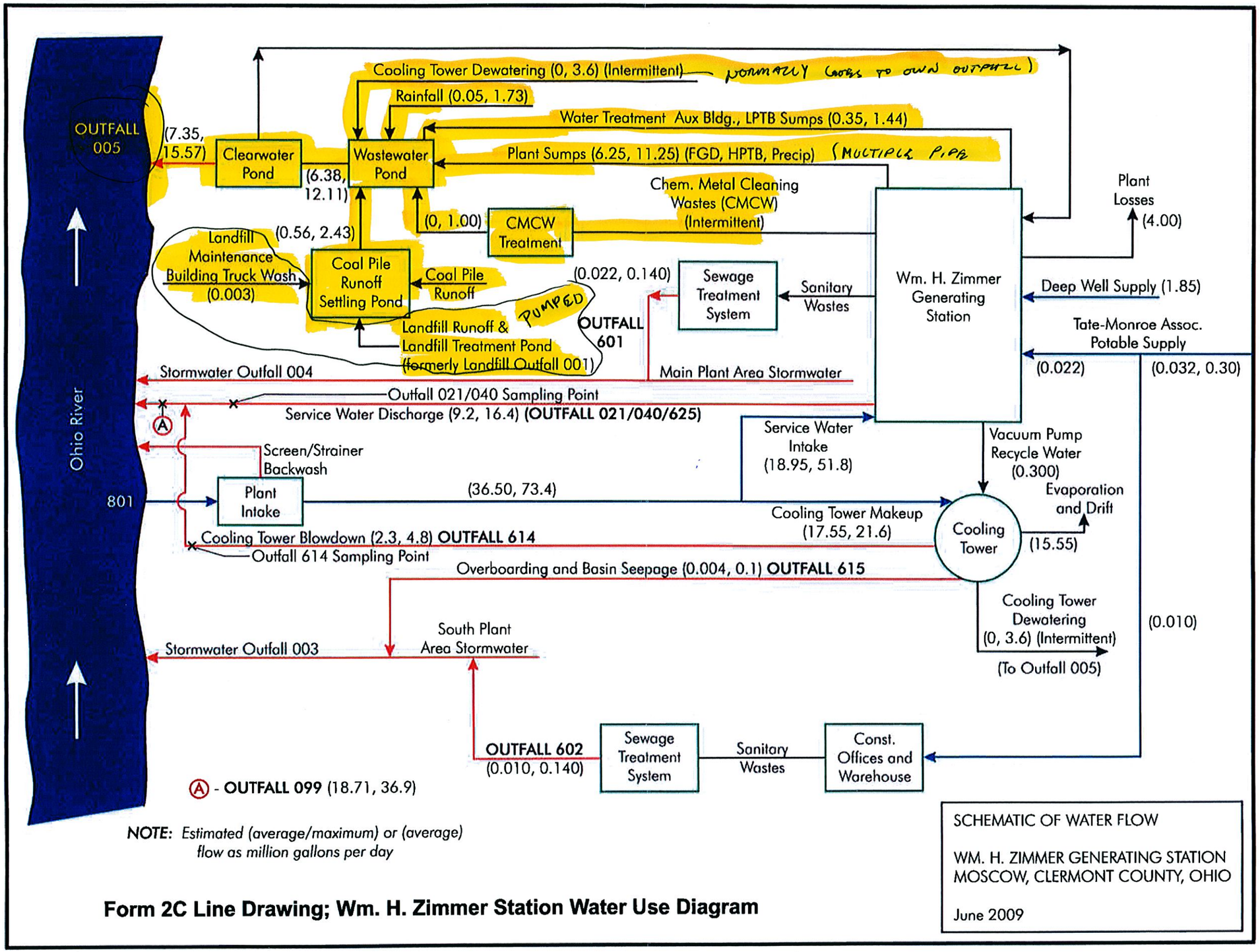
NORTH

AERIAL PHOTO WITH FLOW NOTES

WH Zimmer Station
4/28/10

PROCESS FLOW SCHEMATIC FOR FACILITY WATER

Highlighted items pertain to Waste Water Complex Inspection



Form 2C Line Drawing; Wm. H. Zimmer Station Water Use Diagram

APPENDIX B

Photographs-WH Zimmer Wastewater Pond Complex

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: WH Zimmer Station – Wastewater Pond Complex	Location: Moscow, OH

Orientation: North

Description: View along west embankment

Date: 4/28/2010

Photo Number: 1

Photographer: JPH

Orientation: North

Description: View along west embankment

Note ponded water at toe, suspected to be poor surface drainage from recent heavy rain, not seepage

Date: 4/28/10

Photo Number: 2

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: WH Zimmer Station – Wastewater Pond Complex	Location: Moscow, OH

Orientation: West

Description: View of outlet structure from Wastewater Pond Complex

Water cascades approximately 40' down rip-rap reinforced slope to Ohio River (not depicted)

Date: 4/28/2010

Photo Number: 3

Photographer: JPH

Orientation: Northeast

Description: View of embankment around northwest corner of impoundment

Date: 4/28/10

Photo Number: 4

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: WH Zimmer Station – Wastewater Pond Complex	Location: Moscow, OH

Orientation: Southwest

Description: View of embankment around northwest corner of impoundment

Note ponded water in foreground. Historically, area has been wet, however, water believed to result from poor surface drainage.

Date: 4/28/2010

Photo Number: 5

Photographer: JPH

Orientation: West

Description: View along north embankment

Date: 4/28/10

Photo Number: 6

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: WH Zimmer Station – Wastewater Pond Complex	Location: Moscow, OH

Orientation: West

Description: Erosion on access road to former meterological station on North embankment

Date: 4/28/10

Photo Number: 7

Photographer: JPH

Orientation: South

Description: View along east embankment

Note section of embankment with non-uniform slope

Date: 4/28/10

Photo Number: 8

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: WH Zimmer Station – Wastewater Pond Complex	Location: Moscow, OH

Orientation: West

Description: Inboard slope of north embankment along Clear Water Pond

Note minor scarping along length of water's edge

Date: 4/28/10

Photo Number: 9

Photographer: JPH

Orientation: South

Description: View of discharge from Wastewater Pond into Clear Water Pond

Date: 4/28/10

Photo Number: 10

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: WH Zimmer Station – Wastewater Pond Complex	Location: Moscow, OH

Orientation: East

Description: View of south inboard slope of Clear Water Pond

Note minor scarping along length of water's edge

Date: 4/28/10

Photo Number: 11

Photographer: JPH

Orientation: North

Description: View of outlet weir structure in Clear Water Pond

Date: 4/28/10

Photo Number: 12

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: WH Zimmer Station – Wastewater Pond Complex	Location: Moscow, OH

Orientation: East

Description: View of north inboard slope of Wastewater Pond

Note minor scarping along length of water's edge

Date: 4/28/10

Photo Number: 13

Photographer: JPH

Orientation: South

Description: View of outlet weir structure in Wastewater Pond

Date: 4/28/10

Photo Number: 14

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: WH Zimmer Station – Wastewater Pond Complex	Location: Moscow, OH

Orientation: South

Description: View of inlet discharge chamber in Wastewater Pond

Date: 4/28/10

Photo Number: 15

Photographer: JPH

Orientation: East

Description: View of south inboard slope of Wastewater Pond

Note minor scarping along length of water's edge

Date: 4/28/10

Photo Number: 16

Photographer: JPH

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA	Project Number: 13498/46122
Site Name: WH Zimmer Station – Wastewater Pond Complex	Location: Moscow, OH

Orientation: East

Description: View along access road on south embankment

Coal Pile Runoff Pond at left

Date: 4/28/10

Photo Number: 17

Photographer: JPH

Orientation: West

Description: View of outlet pipe from Coal Pile Runoff Pond to Wastewater Pond

Date: 4/28/10

Photo Number: 18

Photographer: JPH