GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

Specific Site Assessment for Coal Combustion Waste Impoundments at Basin Electric Laramie River Station

Wheatland, Wyoming

Submitted to:
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
5304P
1200 Pennsylvania Avenue NW
Washington, DC 20460

Submitted by:
GEI Consultants, Inc.
4601 DTC Boulevard, Suite 900
Denver, CO 80237

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Project 092886

Gillian M. Hinchliff, P.E.
Project Engineer

Richard Westmore, P.E.
Technical Reviewer

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Acronyms and Abbreviations List

Basin Electric	Basin Electric Power Cooperative
CCW	coal combustion waste
El.	elevation
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GEI	GEI Consultants, Inc.
IDF	inflow design flood
LRS	Laramie River Station
MW	megawatts
PMF	probable maximum flood
PVC	polyvinyl chloride
PMP	probable maximum precipitation
RCP	reinforced concrete pipe
SEO	State Engineer's Office
STPE	Sewage Treatment Plant Effluent
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey

1.0 Introduction

1.1 Purpose

This report presents the results of a specific site assessment of the dam safety of coal combustion waste (CCW) impoundments at the Laramie River Station (LRS) northeast of Wheatland in Platte County, Wyoming. The LRS is owned by the Missouri Basin Power Project and operated by Basin Electric Power Cooperative (Basin Electric). The ponds are permitted with the State of Wyoming as two ponds each consisting of cells: the Bottom Ash Pond which is comprised of three cells (1, 2, and 3) and the Emergency Holding Pond which is comprised of two cells (East and West). In this report, the individual pond cells will be referred to as Bottom Ash Pond 1, Bottom Ash Pond 2, Bottom Ash Pond 3, East Emergency Holding Pond, and West Emergency Pond. The specific site assessment was performed on May 12, 2011.

The specific site assessment was performed with reference to Federal Emergency Management Agency (FEMA) guidelines for dam safety, which includes other federal agency guidelines and regulations (such as U.S. Army Corps of Engineers [USACE] and U.S. Bureau of Reclamation [USBR]) for specific issues, and includes defaults to state requirements where not specifically addressed by federal guidance or if the state requirements were more stringent.

1.2 Scope of Work

The scope of work between GEI Consultants, Inc. (GEI) and the U.S. Environmental Protection Agency (EPA) for the specific site assessment is summarized in the following tasks:

1. Acquire and review existing reports and drawings relating to the safety of the project provided by the EPA and Basin Electric.
2. Conduct detailed physical inspections of the project facilities. Document observed conditions on Field Assessment Check Lists provided by EPA for each management unit being assessed.
3. Review and evaluate stability analyses of the project’s coal combustion waste impoundment structures.
4. Review the appropriateness of the inflow design flood (IDF), and adequacy of ability to store or safely pass the inflow design flood, provision for any spillways, including considering the hazard potential in light of conditions observed during the inspections or to the downstream channel.
5. Review existing dam safety performance monitoring programs and recommend additional monitoring, if required.

6. Review existing geologic assessments for the projects.
7. Submit draft and final reports.

1.3 Background Information

The following available documents were provided to GEI for review by Basin Electric for this assessment:

1. Drawing OCY-6001, “MBPP Ash Pond”, April 1975.
2. Drilling Logs, Holes 29 to 32, by Burns & McDonnell Engineering Company, October 1975.
3. Drawing SB-1, “Subsurface Investigation, General Site Boring Locations”, Burns & McDonnell Engineering Company, January 1976.
4. Drawing Y46, “Ash Pond Grading Plan”, Burns & McDonnell Engineering Company, March 1976.
5. Drawing S49, “Ash Recycle Pumphouse Plans and Section”, Burns & McDonnell Engineering Company, October 1977.
6. Drawing Y164, “Grading Plan, Emergency Holding Pond-1”, Burns & McDonnell Engineering Company, Dec. 1977.
7. Drawing Y165, “Grading Plan, Emergency Holding Pond-2”, Burns & McDonnell Engineering Company, Dec. 1977.
8. Drawing Y172, “Emergency Holding Pond Details”, Burns & McDonnell Engineering Company, no date.
9. Drawing UP46, “Plan of Ash Recycle Pump Station”, Burns & McDonnell Engineering Company, Dec. 1977.
10. Drawing UP56, “Emergency Holding Pond Structure Details”, Burns & McDonnell Engineering Company, Dec. 1977.
11. Drawing Y640, “South Ash Pond Details”, Burns & McDonnell Engineering Company, April 1981.
12. Drawing Y641, “Grading Details”, Burns & McDonnell Engineering Company, April 1981.
13. Drawing OP-6002, “Water Quality Monitoring Program”, Basin Electric Power Cooperative.
14. Drawing YCD-2, “Site Utility Plan, Yard Composite, Drawing 2”, Burns & McDonnell Engineering Company, January 2002.

15. Letter from Basin Electric Power Cooperative containing groundwater measurements, May 2011.
16. Monitoring well data, Wells 21B, 22B, and 23B from Basin Electric Power Cooperative, May 2011.

1.4 Authorization

GEI performed the coal combustion waste impoundment assessment as a contractor to the EPA. This work was authorized by EPA under Contract No. EP09W001698, Order No. EP-B11S-00046 between EPA and GEI, dated April 26, 2011.

1.5 Project Personnel

The scope of work for this task order was completed by the following personnel from GEI:

Richard Westmore, P.E.	Technical Reviewer
Stephen G. Brown, P.E.	Senior Project Engineer
Gillian M. Hinchliff, P.E.	Project Engineer
Michael Woodward, E.I.	Staff Engineer

The Program Manager for the EPA was Stephen Hoffman.

1.6 Limitation of Liability

This report summarizes the assessment of dam safety of coal combustion waste impoundments Bottom Ash Ponds 1, 2 and 3 and East and West Emergency Holding Ponds at Laramie River Station, Wheatland, Wyoming. The purpose of each assessment is to evaluate the structural integrity of the impoundments and provide summaries and recommendations based on the available information and on engineering judgment. GEI used a professional standard of practice to review, analyze, and apply pertinent data. No warrantees, express or implied, are provided by GEI. Reuse of this report for any other purpose, in part or in whole, is at the sole risk of the user.

1.7 Project Datum

Selected design and construction drawings prepared by Burns & McDonnell in 1976, and revised in 1978, 1980 and/or 1990 were provided by Basin Electric for our reference in this assessment. A property survey of the proposed Missouri Basin Power Project Laramie River Station (the current Basin Electric LRS) was performed in 1975 by Banner Associates, Inc. Basin Electric reported that the coordinate system and datum for the plant site is based on a local projection derived from NAD27 and NGVD29.

1.8 Prior Inspections

Inspections of the CCW impoundments are made every 5 years by the Wyoming State Engineer's Office (SEO), Safety of Dams. The last inspection by the Wyoming SEO was performed June 2008.

2.0 Description of Project Facilities

2.1 General

Laramie River Station is a coal-fired power plant consisting of three units that generate about 1,710 megawatts (MW) combined. The power plant is located approximately 5 miles northeast of Wheatland town center in Platte County, Wyoming at 347 Grayrocks Road, PO Box 489, Wheatland, WY 82201-0489 (see Figure 1 on page 8 of this report). The LRS site is located at approximately 42.1089°N, 104.8877°W.

LRS is owned by Missouri Basin Power Project, which consists of six electric utilities, Basin Electric, Heartland Consumers Power District, Lincoln Electric System, Tri-State Generation and Transmission Association, Western Minnesota Municipal Power Agency and Wyoming Municipal Power Agency. LRS is operated by Basin Electric. Unit 1 went online in 1980, Unit 2 went online in 1981, and Unit 3 went online in 1982. Bottom Ash Ponds 1, 2 and 3 are located west of the plant and the East and West Emergency Holding Ponds are located north of the plant (see Figure 2 on page 9 of this report). Other impoundments include the Raw Water Storage Pond and the Coal Runoff Pond, which according to Basin Electric, do not contain CCW, either currently or in the past. The Raw Water Storage Pond and Coal Runoff Pond were not considered to be CCW impoundments and therefore were not included in this assessment. The Raw Water Storage Pond and Coal Runoff Pond are located approximately 1,500 feet northwest of the plant (see Figure 2). Bottom Ash Ponds 1, 2 and 3 store bottom ash and boiler slag, and the East and West Emergency Holding Ponds store flue gas emission control residuals and lime slurry. Some of the design records and construction drawings of the impoundments were available for review during the preparation of this report. An aerial site plan is shown in Figure 3 on page 10 of this report.

2.2 Impoundment Dams and Reservoirs

The CCW impoundments have been previously assigned a "Low" hazard potential by the Wyoming SEO. Based on the geometry of the impoundments and the facilities downstream, recommended hazard potential classifications for the impoundments have been developed in Section 4.0 of this report. The basic dimensions and geometry of the CCW impoundments are summarized in Table 2-1.

Table 2-1: Summary Information for Impoundment Dam Parameters

Parameter	Bottom Ash Ponds			Emergency Holding Ponds	
	1	2	3	East	West
Estimated Maximum Height (ft)	25	25	50[1]	20.5	20
Estimated Perimeter Length (ft)	3,280	4,650	6,880	5,600	4,555
Minimum Crest Width (ft)	15	15	15	15	15
Crest Elevation (ft)	El. 4565	El. 4565	El. 4590	El. 4540.5	El. 4540.5
Design Side Slopes Upstream (H:V)	3:1	3:1	3:1	3:1	3:1
Design Side Slopes Downstream (H:V)	3:1	3:1	3:1	2:1	2:1
Estimated Freeboard (ft) at time of site visit	2.2	4.1	2.5	4.8	4.8
Approximate Storage Capacity (ac-ft)	~300[2]	~600[2]	~1,200[2]	~440	~475
Surface Area (acres)	15.5	30.9	59.9	27.9	30.1

1. The estimated maximum height of Bottom Ash Pond 3 was measured from the crest elevation (El.) 4590 of Bottom Ash Pond 3 to the toe El. 4540 of Bottom Ash Pond 1 and 2.
2. Combined storage capacity at Bottom Ash Ponds 1, 2, and 3 is 2,111.1 ac-ft.

The five CCW impoundments were commissioned during construction of the plant in 1980. None of the ponds has been expanded since commissioning.

2.2.1 Bottom Ash Ponds 1, 2 and 3

Based on the selected design and construction plans by Burns & McDonnell from 1978, bottom Ash Ponds 1, 2 and 3 were constructed with a 30 mil polyvinyl chloride (PVC) liner to reduce seepage from the ponds. A typical cross-section from the Burns & McDonnell 1978 drawings of the interior slopes of Bottom Ash Ponds is shown in Figure 4 on page 11 of this report.

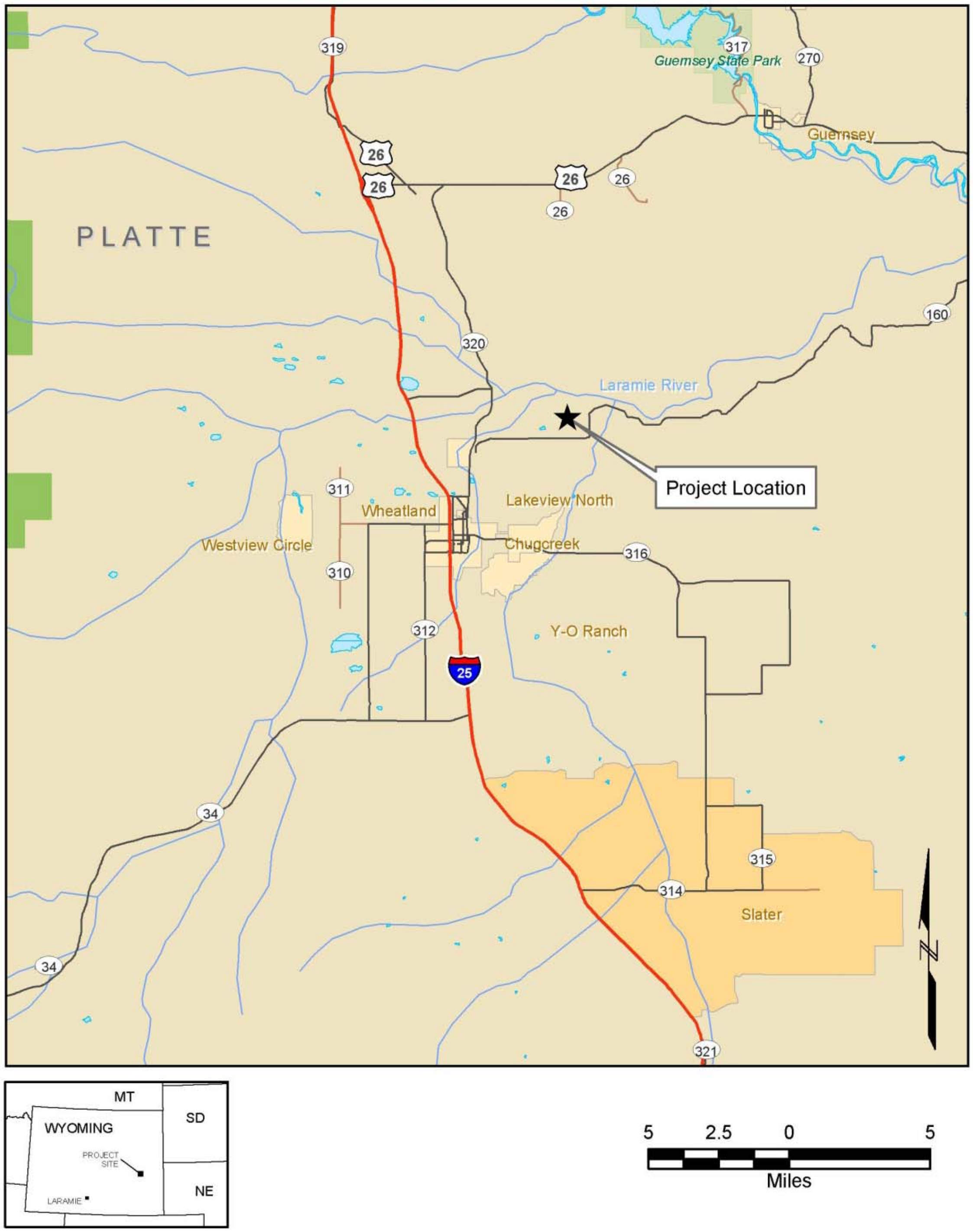
- The interior slopes of Bottom Ash Pond 1 have a PVC liner covered with 12 inches of soil, 6 inches of bentonite, 24 inches of soil over the bentonite and concrete slope protection to protect against wave and ice damage. Basin Electric reported to GEI that the concrete slope protection at Bottom Ash Pond 1was partially repaired in 2011 and the repair will be completed during the summer of 2012.

- The interior slopes of Bottom Ash Ponds 2 and 3 have 6 inches of bedding material, 12 inches of cover material and 12 inches of rip rap over the PVC liner.

Bottom Ash Ponds 1 and 2 are separated by a divider dike and have a plan area of about 46 acres combined. The maximum dike heights of Bottom Ash Ponds 1 and 2 are about 25 feet. Bottom Ash Pond 3 is located to the south of Bottom Ash Ponds 1 and 2 and the bottom of the pond is at a higher elevation than Bottom Ash Ponds 1 and 2. Bottom Ash Pond 3 has a plan area of about 60 acres, and has a maximum dike height of about 50 feet. Bottom Ash Ponds 1, 2 and 3 have a combined storage of about 2,111.1 acre-feet as reported by Basin Electric. The upstream and downstream slopes of Bottom Ash Ponds 1, 2, and 3 are 3 Horizontal to 1 Vertical (3H:1V). General views of Bottom Ash Ponds 1, 2, and 3 are presented in Photos 2-1 through 2-3 on pages 12 and 13 of this report.

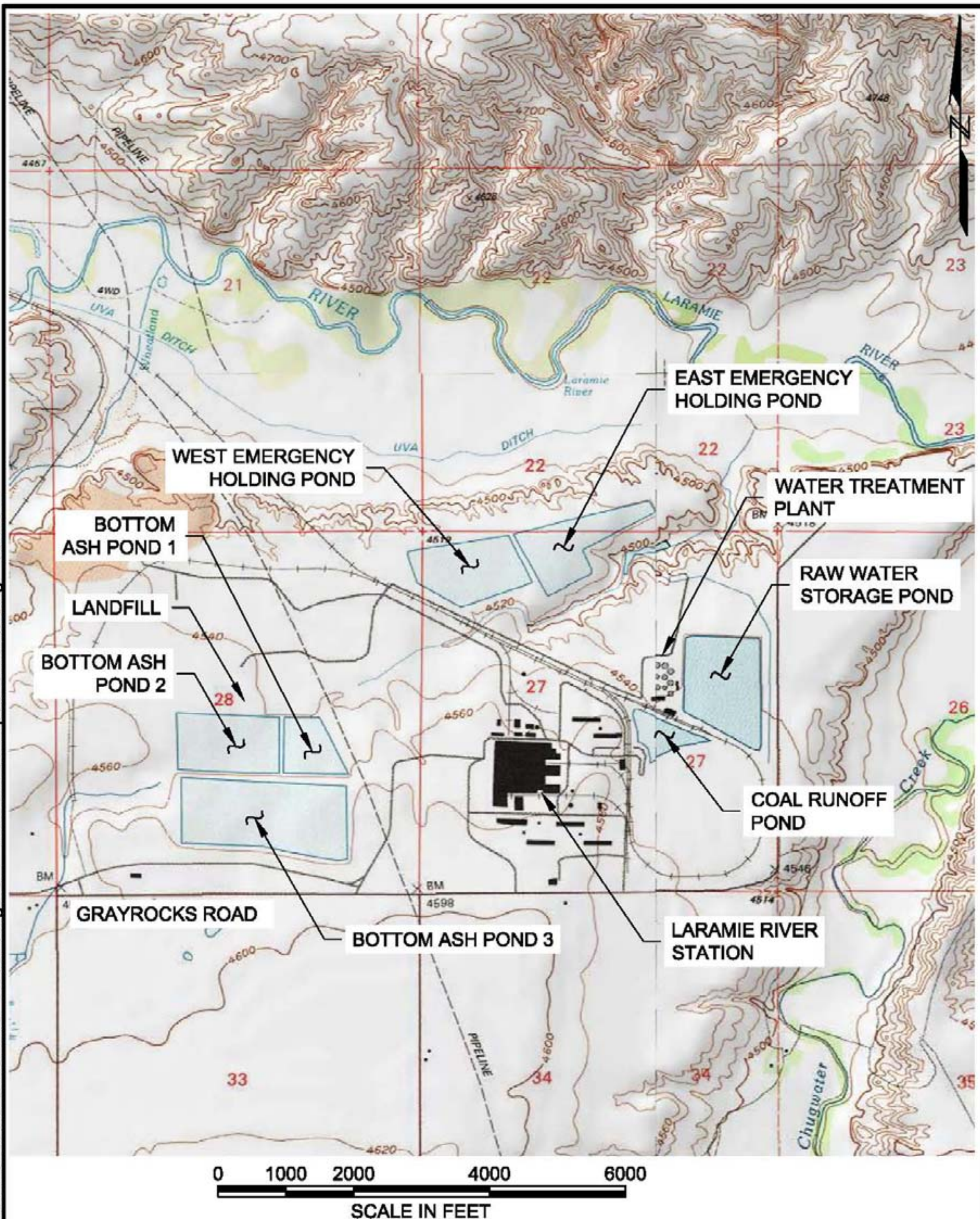
2.2.2 East and West Emergency Holding Ponds

The East and West Emergency Holding Ponds are also separated by a divider dike. The Emergency Holding Ponds combined have a plan area of about 58 acres and have a capacity of about 915 acre-feet combined. The maximum dike height is about 20.5 feet. The upstream slopes are about 3H:1V and the downstream slopes are about 2H:1V. The East and West Emergency Holding Ponds have a 30 mil Hypalon liner protected by 12 inches of gravel filter and 12 inches of rip rap. General views of the East and West Emergency Holding Ponds are presented below in Photos 2-4 and 2-5 on pages 13 and 14 of this report. A typical cross-section from the Burns & McDonnell 1978 drawings of the interior slopes of the Emergency Holding Ponds is shown in Figure 4 on page 11 of this report.



P:\092886 EPA - Laramie River\Site Vicinity Map updated.mxd 08/11

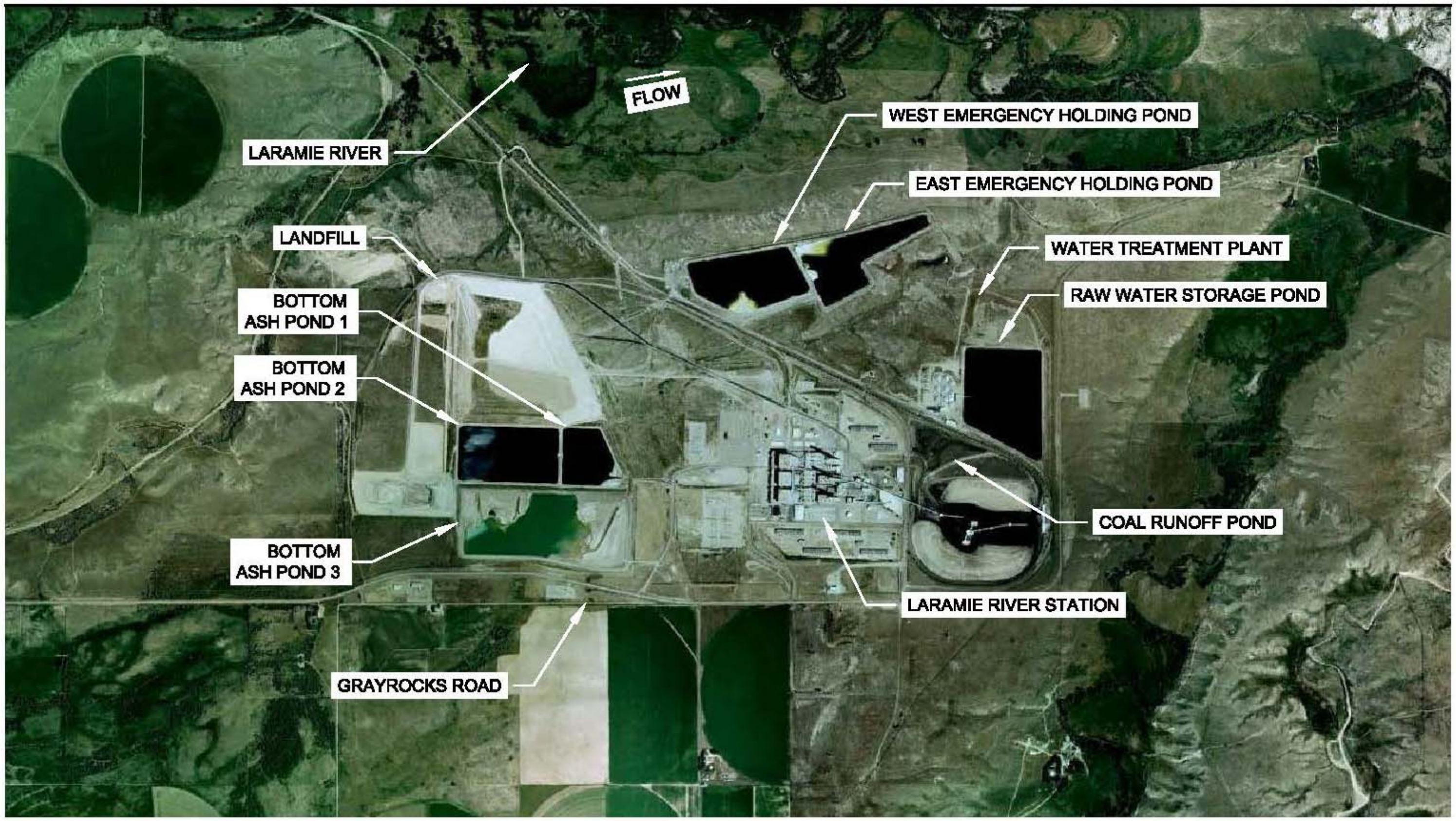
Assessment of Dam Safety of Coal Combustion Waste Impoundments at Laramie River Station	GEI Consultants	SITE VICINITY MAP
Environmental Protection Agency Washington, D.C.	Project 092886	July 2012 — Figure 1



P:\092886 EPA Ash Ponds\Laramie River Station\ Figure 2 - Plan of Ash Impoundments.dwg Jul 2012

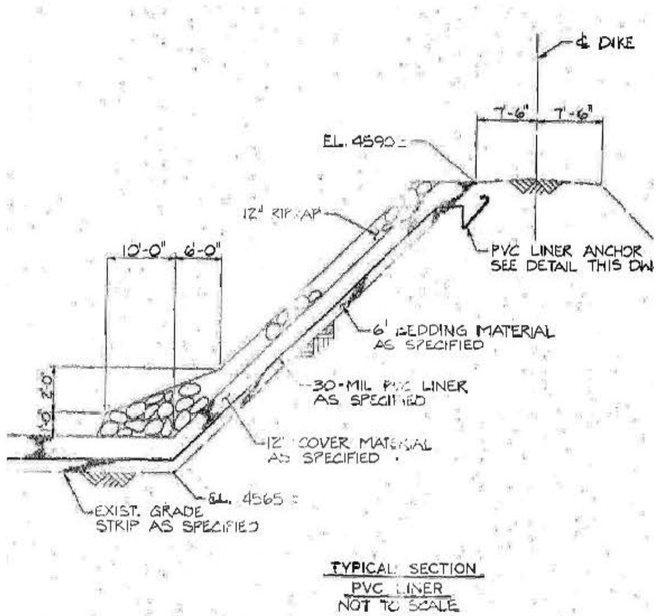
Assessment of Dam Safety of Coal Combustion Waste Impoundments at Laramie River Station	GEI Consultants	PLAN OF ASH IMPOUNDMENTS
Environmental Protection Agency Washington, D.C.	Project 092886	July 2012 Figure 2

P:\092886 EPA Ash Ponds\Laramie River Station\ Figure 3 - Aerial of Ash Impoundments.dwg Jul 2012

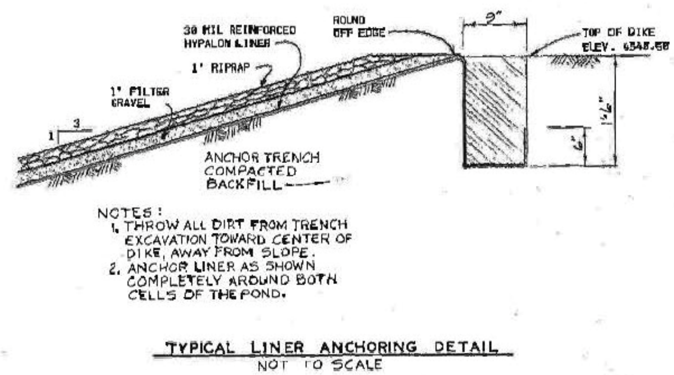


Assessment of Dam Safety of Coal Combustion Waste Impoundments at Laramie River Station	GEI Consultants	AERIAL OF ASH IMPOUNDMENTS
Environmental Protection Agency Washington, D.C.	Project 092886	July 2012 Figure 3

P:\092886 EPA Ash Ponds\Laramie River Station\ Figure 4 - Typical Section and Detail.dwg Jul 2012



BOTTOM ASH PONDS



EMERGENCY HOLDING PONDS

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Laramie River Station	GEI Consultants	**TYPICAL SECTION AND DETAIL**
Environmental Protection Agency Washington, D.C.	**Project 092886**	**July 2012 Figure 4**

Photo 2-1: Bottom Ash Pond 1 East Dike Upstream Slope, Looking South. Note damaged concrete lining, as discussed in Section 8 of report.

Photo 2-2: Bottom Ash Pond 2 North Dike Upstream Slope, Looking Northeast. Note slope of landfill that is located directly north of Bottom Ash Pond 2.

Photo 2-3: Bottom Ash Pond 3 North Dike Upstream Slope, Looking East

Photo 2-4: East/West Emergency Holding Pond Divider Dike. East Emergency Holding Pond Upstream Slope, Looking South

Photo 2-5: West Emergency Holding Pond North Dike Upstream Slope, Looking Northeast

The original design of the CCW impoundments was prepared by Burns & McDonnell of Kansas City, Missouri. Design and construction drawings of the impoundments listed in Section 1.3 were provided to us for our review. Based on boring logs provided, the on-site soils generally consist of silty fine sand and sandy fine silt with some deposits of sand with gravels and cobbles underlain by sandstone bedrock. Basin Electric indicated to GEI during the site visit that the CCW impoundment embankments were constructed of on-site, natural soils.

2.3 Spillways

None of the impoundments has a spillway.

2.4 Intakes and Outlet Works

The Bottom Ash Pond 1 intake structure consists of a square concrete drop-inlet structure approximately 48 inches wide with a stop-log weir that discharges to Bottom Ash Pond 2 through an 18-inch-diameter steel pipe, which is slip-lined inside in a 24-inch-diameter concrete pipe.

A pump house located on the Bottom Ash Pond 1/Bottom Ash Pond 2 divider dike is used to transfer water from Bottom Ash Pond 2 through either a 6-inch-diameter pipe to the Emergency Holding Ponds or through a 24-inch-diameter pipe to the plant for reuse.

The Bottom Ash Pond 3 intake structure consists of a square concrete drop-inlet structure approximately 48 inches wide with a stop-log weir that discharges through two 30-inch-diameter steel pipes. A valve is provided on each pipe. One of the pipes discharges to Bottom Ash Pond 1 and the other pipe discharges to Bottom Ash Pond 2.

The West Emergency Holding Pond outlet consists of a 24-inch-diameter Reinforced Concrete Pipe (RCP) that discharges to the East Emergency Holding Pond. The outlet pipe invert is set at El. 4535.5.

A pump house located on the East/West Emergency Holding Ponds divider dike can transfer water from the East Emergency Holding Pond to the plant for reuse. Water enters the pump house through an intake pipe from a concrete inlet structure with a grate at El. 4529. The invert elevation of the pipe is El. 4525.04. Water can also be pumped from the East Emergency Holding Pond through a 6-inch-diameter pipe to Bottom Ash Ponds 1 and 2.

2.5 Vicinity Map

LRS is located approximately 5 miles northeast of Wheatland town center, Wyoming, as shown in Figure 1. Bottom Ash Ponds 1, 2 and 3 are located west of the plant and the Emergency Holding Ponds are located north of the plant, as shown in Figure 2. Other impoundments include the Raw Water Storage Pond and the Coal Runoff Pond, which were reported to not contain CCW. Raw Water Storage Pond and the Coal Runoff Pond are located approximately 1,500 feet northwest of the plant (see Figure 2).

2.6 Plan and Sectional Drawings

Design and construction drawings prepared by Burns & McDonnell were provided for our review as listed in Section 1.3.

2.7 Standard Operational Procedures

LRS is a coal-fired power plant producing a total combined capacity of 1,710 MW. Coal is delivered by rail directly from the mine to the plant, where it is then combusted to power the steam turbines. LRS dry handles the fly ash to the onsite landfill and wet sluices the bottom ash to the impoundments. LRS is a zero discharge facility and does not discharge to the Laramie River.

Waste includes fly ash, bottom ash, boiler slag, flue gas emissions, lime slurry, and control residuals. The fly ash is dry hauled to the on-site landfills. The landfill located north of Bottom Ash Ponds 1 and 2 has been capped, and the landfill located west of Bottom Ash Ponds 2 and 3 is currently being used and has been partially reclaimed (or capped). The bottom ash and boiler slag is sluiced to Bottom Ash Pond 3. Water is decanted from Bottom Ash Pond 3 to Bottom Ash Ponds 1 and 2. Some water from Bottom Ash Pond 1 is pumped back to the plant for use as make-up water for the ash water system and for use in the scrubber system. Sprinklers are used in Bottom Ash Ponds 1, 2 and 3 to facilitate evaporation.

Flue gas emission control residuals and water treatment plant spent lime slurry are wet sluiced to the West Emergency Holding Pond. Water is decanted from the West Emergency Holding Pond to the East Emergency Holding Pond. Some water from the East Emergency Holding Pond is pumped back to the plant for re-use. Sprinklers are used in the East and West Emergency Holding Ponds to facilitate evaporation.

Plant operators perform operating inspections once per shift of the plant facilities and visually monitor water levels in the ponds.

3.0 Summary of Construction History and Operation

Unit 1 at LRS became operational in 1980, Unit 2 in 1981, and Unit 3 in 1982. The ponds were built during construction of the plant, and were commissioned in 1980. None of the ponds has been expanded since commissioning. The Bottom Ash Ponds were constructed with a 30 mil PVC liner and the Emergency Holding Ponds were constructed with a 30 mil Hypalon liner. In addition to the 30 mil PVC liner, Bottom Ash Pond 1 has a bentonite liner with concrete facing to protect the liner from wind and ice damage. All of the other ponds have rip rap protection.

Groundwater monitoring wells are located throughout the plant site. Two wells, 23B and 22B, are located on the north dike of Bottom Ash Pond 2, and one well, 21B, is located at the northeast downstream toe of Bottom Ash Pond 1. Six wells, 15B through 19B and 8BR, are located north/northwest of the Emergency Holding Ponds. The six wells located north/northwest of the Emergency Holding Ponds are approximately 500 feet away from the Emergency Holding Ponds. Groundwater elevations are periodically taken, but the wells are mostly used for environmental monitoring.

Drawings of the original design and construction of the CCW facilities were available for review. Four boring logs for borings 29 through 32 performed at the Bottom Ash Ponds prior to construction of the ponds were available for our review. The borings extended to 20 to 29 feet below the original ground surface. Soils at the Bottom Ash Ponds generally consist of medium dense fine sandy silt and silty fine sand underlain by sandstone encountered at about 16 to 26 feet below grade. Boring 29, drilled in the vicinity of Bottom Ash Pond 2, encountered dense to very dense sand with gravel and cobbles from about 3.5 feet to 16 feet underlain by sandstone. Sandstone was not encountered in Boring 30 and the boring was terminated at about 25.5 feet below grade. Bedrock was generally encountered deeper on the east side than on the west side of the ponds. It appears no borings were drilled for the Emergency Holding Ponds.

No evidence of prior releases, failures or patchwork construction was observed during the site visit or disclosed by plant personnel. In accordance with an EPA technical directive, responses to the following questions are provided below:

Bottom Ash Pond 1:
Question: *Is any part of the impoundment built over wet ash, slag, or other unsuitable materials (like TVA)?*
Answer: No. The Bottom Ash Pond 1 was constructed on undeveloped property during the initial construction of the LRS and, because of this schedule, could not have been constructed over CCW.

Bottom Ash Pond 2
Question: *Is any part of the impoundment built over wet ash, slag, or other unsuitable materials (like TVA)?*
Answer: No. The Bottom Ash Pond 2 was constructed on undeveloped property during the initial construction of the LRS and, because of this schedule, could not have been constructed over CCW.

Bottom Ash Pond 3
Question: *Is any part of the impoundment built over wet ash, slag, or other unsuitable materials (like TVA)?*
Answer: No. The Bottom Ash Pond 3 was constructed on undeveloped property during the initial construction of the LRS and, because of this schedule, could not have been constructed over CCW.

East Emergency Holding Pond
Question: *Is any part of the impoundment built over wet ash, slag, or other unsuitable materials (like TVA)?*
Answer: No. The East Emergency Holding Pond was constructed on undeveloped property during the initial construction of the LRS and, because of this schedule, could not have been constructed over CCW.

West Emergency Holding Pond
Question: *Is any part of the impoundment built over wet ash, slag, or other unsuitable materials (like TVA)?*
Answer: No. The West Emergency Holding Pond was constructed on undeveloped property during the initial construction of the LRS and, because of this schedule, could not have been constructed over CCW.

4.0 Hazard Potential Classification

4.1 Overview

Inspections of the CCW impoundments are made every 5 years by the Wyoming State Engineer's Office. The Wyoming State Engineer's Office has previously classified the CCW impoundments as Low hazard.

According to the Federal Guidelines for Dam Safety, the hazard potential classification for the CCW impoundments is based on the possible adverse incremental consequences that result from release of stored contents due to failure of the dam or misoperation of the dam or appurtenances. Impoundments are classified as Less Than Low, Low, Significant, or High hazard, depending on the potential for loss of human life and/or economic and environmental damages.

4.2 Bottom Ash Ponds 1 and 2

The Bottom Ash Ponds 1 and 2 perimeter dikes contain a surface area of about 15 and 30 acres, have a storage capacity of about 300 and 600 acre-feet and have a maximum height of about 25 feet. Dikes and ponds of these dimensions and capacities are considered "Small" sized dams in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria.

A landfill is located to the north of Bottom Ash Ponds 1 and 2, and a landfill is located to the west of Bottom Ash Pond 2. These large landfills provide buttress support to the adjacent pond dikes. Therefore, failures of the north and west pond dikes are considered unlikely, and would result in a very limited release of pond contents if a failure did occur. A failure to the south is not possible because Bottom Ash Pond 3 is located directly south of Bottom Ash Ponds 1 and 2 and at a higher elevation. A failure of the Bottom Ash Pond 1 northeast or east dike would result in a CCW release across plant property and potentially across private agricultural land to the Laramie River about one mile away. A release from the pond may be intercepted by the stormwater detention basin before reaching the Laramie River; however, the stormwater detention basin could be overwhelmed, and the CCW flow could be passed by the stormwater basin spillway, or possibly overtop the stormwater drainage basin dam, and potentially reach the Laramie River. Railroad tracks located northeast of the plant could be affected by the release flood, but inundation of the tracks is not expected. Loss of life is not anticipated and, because Bottom Ash Ponds 1 and 2 contain secondary decanted water, environmental and economic damage is expected to be low.

Based on the low potential environmental impacts to the plant site, agricultural land, and Laramie River and consistent with the Federal Guidelines for Dam Safety, we recommend the Bottom Ash Ponds 1 and 2 dikes be classified as "Low" hazard structures.

4.3 Bottom Ash Pond 3

The Bottom Ash Pond 3 perimeter dikes contain a surface area of about 60 acres, have a storage capacity of 1,200 acre-feet and have a maximum height of about 50 feet. Dikes and ponds of these dimensions and capacities are considered “Intermediate” sized dams in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria.

The west side of Bottom Ash Pond 3 is bounded by an adjacent existing landfill and the southwest corner dike is only about 2 to 3 feet high. As a result, releases to the west and southwest are not expected, and would be very minor if a release did occur. An unexpected release of the south dike could overtop the adjacent county road, Grayrocks Road, by several feet and present a hazard to motorists. Overtopping of Grayrocks Road would close and potentially severely damage the plant access road. Private property located to the south could also be flooded. A failure of the east or north dike would allow CCW to flow over plant and private agricultural property a distance of about one mile northeast to potentially reach the Laramie River. A release of CCW and pond water may be intercepted by the stormwater detention basin located to the south of the Emergency Holding ponds; however, the stormwater detention basin could be overwhelmed, and the CCW flow could be passed by the stormwater basin spillway, or possibly overtop the stormwater drainage basin dam, and potentially reach the Laramie River. Bottom Ash Pond 3 contains the majority of bottom ash, which could be released in the event of failure. Loss of life is not anticipated and environmental damage is expected to be moderate.

Based on the potential environmental impacts to the plant site, private property, Laramie River, and potential flooding and damage to the country road, and consistent with the Federal Guidelines for Dam Safety, we recommend the Bottom Ash Pond 3 dikes be classified as “Significant” hazard structures.

4.4 East and West Emergency Holding Ponds

The East and West Emergency Holding Pond perimeter dikes contain a surface area of about 28 and 30 acres, have a storage capacity of about 440 and 475 acre-feet and have a maximum height of about 20 to 20.5 feet. Dikes and ponds of these dimensions and capacities are considered “Small” sized dams in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria.

A failure of the south dikes of the East and West Emergency Holding Ponds would release CCW into the stormwater drainage and detention basin located to the south of the ponds. If the stormwater detention basin was overwhelmed, the CCW flow would be passed by the stormwater basin spillway, or possibly overtop the stormwater drainage basin dam, and flow about 0.5 miles over private agricultural land to the Laramie River. A release of the east, north or west dikes would release CCW to flow about 0.3 miles over private agricultural property to potentially reach the Laramie River. The West Emergency Holding Pond contains flue gas emission control residuals and water treatment plant spent lime slurry. The East Emergency Holding Pond contains decant water from the West Emergency Holding Pond. Loss of life is not anticipated, and environmental and economic damage is expected to be low to moderate.

Based on the potential environmental impacts to the plant site, agricultural land, and Laramie River and consistent with the Federal Guidelines for Dam Safety, we recommend the East and West Emergency Holding Pond dikes be classified as "Significant" hazard structures.

5.0 Hydrology and Hydraulics

5.1 Floods of Record

Floods of record have not been evaluated and documented for the CCW impoundments at LRS. However, all five impoundments are diked facilities and are located off-channel, therefore stream inflow floods are not a concern.

5.2 Inflow Design Floods

The Wyoming State Engineer's Office has previously designated all of the CCW impoundments as "Low" hazard facilities. Based on our site visit and the data available for our review, we recommend that Bottom Ash Ponds 1 and 2 be rated "Low" hazard, and Bottom Ash Pond 3 and East and West Emergency Holding Ponds be rated as "Significant" hazard.

Based on the recommended "Low" hazard classification for Bottom Ash Ponds 1 and 2, the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 recommends a small "Low" hazard dam be capable of passing the 50- to 100-year storm event without overtopping the dam. Considering the relatively low economic and environmental damages that could potentially occur upon failure, and the recommended range of inflow design storms, it is reasonable to select the 50-year storm event as the inflow design storm for Bottom Ash Ponds 1 and 2. Accordingly, the 50-year storm 24-hour precipitation at LRS is about 3.2 inches based on NOAA Atlas 2, Precipitation-Frequency Atlas of the Western United States, Volume II – Wyoming, dated 1973.

Based on the recommended "Significant" hazard classification for Bottom Ash Pond 3 and the East and West Emergency Holding Ponds, the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 recommends an intermediate "Significant" hazard dam be capable of passing 50 to 100 percent of the probable maximum flood (PMF) without overtopping the dam. Considering the "Significant" hazard rating, the scale of the economic and environmental damages that could potentially occur upon failure, and the recommended range of inflow design storms, it is reasonable to select 50 percent of the probable maximum precipitation (PMP) as the inflow design storm for Bottom Ash Pond 3 and the East and West Emergency Holding Ponds. The 24-hour, 50 percent PMP precipitation at LRS is about 15.0 inches based on Hydrometeorological Report Number 55a 24-hour PMP data.

Formal analyses of the impoundment sites flood hydrology were not provided by Basin Electric. Based on the normal water surface of each impoundment, the estimated precipitation events according to the NOAA documents referenced above, and the impoundments being fully diked, GEI calculated the inflow design flood resulting freeboard for each impoundment in the following sections 5.2.1, 5.2.2, and 5.2.3. A summary of GEI's freeboard calculations is shown in Table 5-1. Calculations are provided in Appendix D.

5.2.1 Bottom Ash Ponds 1 and 2

Bottom Ash Ponds 1 and 2 both have perimeter dikes that limit the contributing drainage area to the pond surface area. Therefore, the inflow design flood is limited to the precipitation within the impoundment dikes. The current operating water level is approximately El. 4562.8 for Bottom Ash Pond 1 and El. 4560.9 for Bottom Ash Pond 2, which provides about 2.2 and 4.1 feet of freeboard, respectively. Normal operations include controlling water levels in the ponds by use of stop logs in the outlet works facility for Bottom Ash Pond 1 and by pumping at the pump house for Bottom Ash Pond 2. Precipitation for the 50-year storm event is approximately 3.2 inches at the site according to NOAA Atlas 2, Precipitation-Frequency Atlas of the Western United States, Volume II – Wyoming dated 1973. The contributing drainage area is limited to the pond surface area because the perimeter dikes prevent surface water run-off from entering the impoundment. Consequently, the water level in Bottom Ash Ponds 1 and 2 would be raised 3.2 inches during the 50-year storm event. Bottom Ash Pond 1 would have a resulting water surface elevation of about El. 4563.1, which provides 1.9 feet of freeboard. Bottom Ash Pond 2 would have a resulting water surface elevation of about El. 4561.2, which provides 3.8 feet of freeboard. Based on these results, Bottom Ash Ponds 1 and 2 meet the regulatory requirements for storage of the 50-year inflow design flood without overtopping the dam.

5.2.2 Bottom Ash Pond 3

Bottom Ash Pond 3 has perimeter dikes that limit the contributing drainage area to the pond surface area. Therefore, the inflow design flood is limited to the precipitation within the impoundment dikes. The current operating water level is approximately El. 4587.5, which provides about 2.5 feet of freeboard. Normal operations include controlling water levels in the ponds by use of stop logs in the outlet works facility, which controls the flow exiting the pond. Precipitation for 50 percent of the 24-hour PMP is approximately 15 inches at the site according to NOAA Hydrometeorological Report 55A dated June 1988. The contributing drainage area is limited to the pond surface area because the perimeter dikes prevent surface water run-off from entering the impoundment. Consequently, the water level in Bottom Ash Pond 3 would be raised 15 inches during the event. Bottom Ash Pond 3 would have a resulting water surface elevation of about El. 4588.75, which provides 1.25 feet of freeboard. Based on these results, Bottom Ash Pond 3 meets the regulatory requirements for storage of 50 percent of the PMP inflow design flood without overtopping the dam.

5.2.3 East and West Emergency Holding Ponds

The East and West Emergency Holding Ponds both have perimeter dikes that limit the contributing drainage area to the pond surface area. Therefore, the inflow design flood is limited to the precipitation within the impoundment dikes. The current operating water level is approximately El. 4535.7 for the East Emergency Holding Pond and El. 4535.6 for the West Emergency Holding Pond, which provides about 4.8 and 4.9 feet of freeboard, respectively. Precipitation for 50 percent of the 24-hour PMP is approximately 15 inches at the site according to NOAA Hydrometeorological Report 55A dated June 1988. The contributing drainage area is limited to the pond surface area because the perimeter dikes prevent surface water run-off from entering the impoundment. Consequently, the water level in the East and West Emergency Holding Ponds would be raised 15 inches during the event. East Emergency Holding Pond would have a resulting water surface elevation of about El. 4537.0, providing 3.5 feet of freeboard. The West Emergency Holding Pond would have a resulting water surface elevation of about El. 4536.9, providing 3.6 feet of freeboard. Based on these results, the East and West Emergency Holding Ponds meet the regulatory requirements for storage of the 50 percent of the PMP inflow design flood without overtopping the dam.

Table 5-1: Summary of GEI's Inflow Design Flood Freeboard Calculations

	Bottom Ash Pond 1	Bottom Ash Pond 2	Bottom Ash Pond 3	East Emergency Holding Pond	West Emergency Holding Pond
Normal Water Level (El.) (A)	4562.8	4560.9	4587.5	4535.7	4535.6
Crest (El.) (B)	4565	4565	4590	4540.5	4540.5
Freeboard (ft) (C = B - A)	2.2	4.1	2.5	4.8	4.9
Storm Event (in/ft) (D)	3.2 / 0.3	3.2 / 0.3	15 / 1.25	15 / 1.25	15 / 1.25
IDF Freeboard (E = C - D)	1.9	3.8	1.25	3.5	3.6

5.3 Determination of the Probable Maximum Flood (PMF)

Not applicable.

5.3.1 Freeboard Adequacy

Based on GEI's analysis of the required inflow design flood, the freeboard appears to be adequate at the LRS CCW impoundments.

5.3.2 Dam Break Analysis

Dam break analyses have not been performed for the CCW impoundments at LRS. The potentially affected off-site properties downstream of the impoundments lack population and structures that would be impacted by a failure of an impoundment. Consequently, dam break analyses are not needed for the CCW impoundments.

5.4 Spillway Rating Curves

Not applicable.

5.5 Evaluation

Based on the current facility operations and inflow design floods documents, the CCW impoundments have adequate capacity to store and pass the regulatory design floods without overtopping the dams based on the recommended hazard classification for the dams. Since water flows from Bottom Ash Pond 3 to Bottom Ash Ponds 1 and 2, operating procedures for these ponds should ensure that adequate freeboard for the inflow design floods is available at all times. Similarly, the East and West Emergency Holding Ponds are connected, and operating procedures should ensure that the ponds have adequate freeboard for the inflow design floods at all times.

6.0 Geologic and Seismic Considerations

Boring logs provided by Basin Electric indicate that the predominant overburden soil consists of medium dense fine sandy silt and silty fine sand. The borings extend to a maximum depth of about 20 to 29 feet below the ground surface, and bedrock was encountered in three of the four borings at depths ranging from 16 to 26 feet below the ground surface. Bedrock consisted of weakly- to well-cemented sandstone. Groundwater was not encountered in the borings.

We are not aware of seismic analyses that have been performed on the CCW impoundment dams or containment dikes at LRS. According to the 2008 U.S. Geological Society (USGS) Seismic Hazard Map of Wyoming, the site has a regional probabilistic peak ground acceleration of approximately 0.12g with a 2 percent Probability of Exceedance within 50 years (recurrence interval of approximately 2,500 years), which is considered applicable to Significant hazard rating structures such as Bottom Ash Pond 3 and the Emergency Holding Ponds.

7.0 Instrumentation

7.1 Location and Type

Staff gauges are located at the stoplog weir outlet works in Bottom Ash Ponds 1, 2 and 3. Survey elevations are taken approximately once every one to two months at each of the five CCW impoundments.

There are two monitoring wells on the north dike of Bottom Ash Pond 2, Wells 23B and 22B, and one monitoring well, Well 21B at the northeast corner downstream toe of Bottom Ash Pond 1. There are six monitoring wells, Wells 15B through 19B and Well 8BR located north of the Emergency Holding Ponds; however, the wells are located more than 500 feet away and would not provide useful data for evaluation of the Emergency Holding Pond dikes. Water level elevation readings are taken at the monitoring wells periodically; however, the wells are primarily used for environmental monitoring.

7.2 Readings

7.2.1 Flow Rates

Inflow and outflow rates are not recorded at any of the CCW impoundments, however, these flow rates are controlled and limited by the facility pump systems.

7.2.2 Staff Gauges

There are staff gauges at the overflow weir outlets in Bottom Ash Ponds 1, 2 and 3. There are no staff gauges at the Emergency Holding Ponds.

7.2.3 Monitoring Wells

Monitoring wells are located on-site; however, the locations and depths of the monitoring wells were selected based on environmental monitoring requirements, which is their intended purpose, rather than geotechnical monitoring of the phreatic surface for use in seepage and stability assessments.

Records of water level elevation readings in the monitoring wells 21B, 22B, and 23B indicate that water level readings over the past year have been in a close range. Water levels range from about El. 4482 to 4484 in monitoring wells 22B and 23B located on the Bottom Ash Pond 2 north dike, and from about El. 4480 to 4481 in monitoring well 21B located at Bottom Ash Pond 1 northeast dike downstream toe. Reservoir water surface elevations in the Bottom Ash Ponds 1 and 2 during the same period of time had a somewhat larger range from about El. 4558 to 4563.4.

Historically, water level elevations in monitoring wells 21B, 22B and 23B have generally ranged from about El. 4480 to 4500, and the water levels have a generally downward trend from year 1982 to 2011, indicating a general downward trend in groundwater levels during that period.

7.3 Evaluation

Instrumentation at the CCW impoundments is limited to staff gauges at Bottom Ash Ponds 1, 2 and 3 and a limited number of monitoring wells. Monitoring wells located north of the Emergency Holding Ponds are located too far away to be potentially useful for dam safety monitoring.

8.0 Field Assessment

8.1 General

A site visit to assess the condition of the CCW impoundments at the LRS was performed on May 12, 2011, by Stephen G. Brown, P.E., and Gillian M. Hinchliff, P.E. of GEI. John Ciz, David Cummings, David Herriott, Brian Larson, Arnold Minear, David Erickson and Maria Barnhardt, P.E. of Basin Electric assisted in the assessment.

The weather during the site visit (May 12, 2011) was rainy, with temperatures around 45 degrees Fahrenheit. Approximately 1.2 inches of cumulative rain fell prior to the site assessment.

At the time of assessment, GEI completed EPA Coal Combustion Dam Inspection Checklist Forms, which are provided in Appendix A, and photographs, which are provided in Appendix B. Field assessment of the five CCW impoundments included a site walk to observe the condition of the dam crests, upstream slopes, downstream slopes, and intake structures.

8.2 Embankment Dam

8.2.1 Dam Crests

The dam crests of the five CCW impoundments appeared to be in good condition. No signs of cracking, settlement, movement, erosion or deterioration were observed during the assessment. The dam crest surface is generally composed of gravel road base material or native grassy vegetation.

8.2.2 Upstream Slopes

Bottom Ash Ponds 1, 2 and 3 were constructed with a 30 mil PVC liner. The interior slopes of Bottom Ash Pond 1 have a PVC liner covered with 12 inches of soil, 6 inches of bentonite, 24 inches of soil over the bentonite and concrete slope protection. The interior slopes of Bottom Ash Ponds 2 and 3 have 6 inches of bedding material, 12 inches of cover material and 12 inches of rip rap over the PVC liner. Damage to the concrete slope protection on Bottom Ash Pond 1 was observed in the northeast corner (see Photos 8-1 and 8-2). The damage is most likely due to wind and ice action, and voids were observed beneath the concrete slope protection. The concrete is cracked and displaced which enables wave action to erode the underlying embankment. Basin Electric has indicated that the concrete slope protection at Bottom Ash Pond 1 has been partially repaired and is to be completed by summer of 2012. The upstream slopes of Bottom Ash Ponds 2 and 3 appeared to be in satisfactory condition. No scarps, sloughs, depressions or other indications of slope instability were observed during the inspection of the Bottom Ash Ponds.

Photo 8-1: Bottom Ash Pond 1 Upstream Slope Northeast Corner. Note cracked and displaced concrete slope protection and erosion of underlying embankment.

Photo 8-2: Bottom Ash Pond 1 Upstream Slope Northeast Corner. Note cracked and displaced concrete slope protection and erosion of underlying embankment.

The East and West Emergency Holding Pond upstream slopes are protected by a 30 mil Hypalon liner covered with 12 inches of gravel and 12 inches of rip rap. The upstream slopes of these two CCW impoundments appeared to be in satisfactory condition. No scarps, sloughs, depressions or other indications of slope instability were observed during the inspection of the East and West Emergency Holding Ponds.

8.2.3 Downstream Slopes

The downstream slopes of the five CCW impoundments showed no signs of scarps, sloughs, depressions or other indications of slope instability during the inspection. The downstream slopes of the five CCW impoundments are covered with native grassy vegetation, and there were no signs of erosion.

8.3 Seepage and Stability

No evidence of ongoing seepage or potential seepage was observed at any of the five CCW impoundments.

8.4 Appurtenant Structures

8.4.1 Outlet Structures

The portion of the outlet structures at the five CCW impoundments that is visible above the water line appeared to be in good condition. The pumphouse intake pipes at the Emergency Holding Ponds and Bottom Ash Pond 2 are normally submerged and were not observed during the field assessment. No evidence of erosion was observed at the outlet structure of Bottom Ash Pond 3.

8.4.2 Pump Structures

The inside of the pumphouses were not inspected during the site assessment. Intakes were submerged and not observed. Water from Bottom Ash Pond 2 and the East Emergency Holding Ponds is pumped back to the plant for reuse, and we expect that a breakdown in the system would be noticed quickly by plant operators because the power plant is operated as a closed-loop, zero discharge facility.

8.4.3 Emergency Spillways

There are no emergency spillways present at the five CCW impoundments.

8.4.4 Water Surface Elevations and Reservoir Discharge

The water level in Bottom Ash Pond 1 was about El. 4562.8, providing about 2.2 feet of freeboard. The water level in Bottom Ash Pond 2 was about El. 4560.9, providing about 4.1 feet of freeboard. The water level in Bottom Ash Pond 3 was about El. 4587.5, providing about 2.5 feet of freeboard. The water level in the East Emergency Holding Pond was about El. 4535.7, providing about 4.8 feet of freeboard. The water level in the West Emergency Holding Pond was about El. 4535.6, providing about 4.9 feet of freeboard.

9.0 Structural Stability

9.1 Visual Observations

The assessment team saw no visible signs of instability associated with the dikes of the five impoundments during the May 12, 2011 site assessment.

9.2 Field Investigations

Four boring logs prepared by Burns and McDonnell dated November 15 and 17, 1975 were available for our review. The four borings appear to have been performed within the limits of the Bottom Ash Ponds and were part of the facility design investigations. It appears no borings were performed for the East and West Emergency Holding Ponds.

Based on the available borings, subsurface soils within the Bottom Ash Ponds generally consisted of medium dense silty fine sand and fine sandy silt. Bedrock consisting of weakly to well cemented sandstone was encountered at about 16 to 17 feet below existing grade in the western borings, Borings 29 and 31, and at 26 feet below grade in the southeast boring, Boring 32. Bedrock was not encountered in the northeastern boring, Boring 30. Groundwater was not encountered during the investigation.

No structural stability field investigations have been performed on the impoundment perimeter dikes for Bottom Ash Pond 1, Bottom Ash Pond 2, Bottom Ash Pond 3, East Emergency Holding Pond, and West Emergency holding Pond.

9.3 Methods of Analysis

Based on discussions with Basin Electric managers, GEI is not aware of any slope stability analyses that have been performed for the five CCW impoundments.

The liquefaction potential at the CCW impoundments has not been previously evaluated based on review of the available documents. Conditions necessary for liquefaction include saturated, loose, granular soils and an earthquake of sufficient magnitude and duration to cause significant strength loss in the soil. Based on the 1975 boring logs prepared by Burns & McDonnell, it is not likely that the site soils would be susceptible to liquefaction because groundwater was not encountered in the subsurface soils and the soils were medium dense.

10.0 Maintenance and Methods of Operation

10.1 Procedures

Basin Electric has not formally developed an operations and maintenance manual for the CCW impoundments. Formal dam safety inspections of the five CCW impoundments are conducted every 5 years by the Wyoming State Engineer's Office.

10.2 Maintenance of Impoundments

Maintenance of the five CCW impoundments is performed by LRS staff under the guidance of LRS managers and engineers.

10.3 Surveillance

The ash ponds are patrolled once per shift by LRS operations personnel. Plant personnel are available at the power plant 24 hours a day, 365 days a year, and on 24-hour call for emergencies that may arise.

11.0 Conclusions

11.1 Assessment of Dams

11.1.1 Field Assessment

The field assessment consisted of visual observations of the CCW impoundments at LRS. No visual signs of instability, movement or seepage were observed at any of the CCW impoundments. The upstream concrete slope protection of Bottom Ash Pond 1 in the northeast corner has been cracked and displaced due to ice action, which enables wave action to erode the underlying embankment. Basin Electric has indicated the concrete slope protection has been partially repaired in 2011 and is to be completed in 2012.

11.1.2 Adequacy of Structural Stability

There are no records of structural stability evaluations of the CCW impoundments. No geotechnical information is available for the embankments and limited information is available for the foundation for potential application to a stability analysis of the dikes.

11.1.3 Adequacy of Hydrologic/Hydraulic Safety

The ponds have adequate capacity to store and pass the regulatory design floods without overtopping the dam based on the recommended hazard classification for the dam.

11.1.4 Adequacy of Instrumentation and Monitoring of Instrumentation

Bottom Ash Ponds 1, 2 and 3 have staff gauges, but the Emergency Holding Ponds do not have any instrumentation. Monitoring wells are located on-site; however, the location and depths of the monitoring wells were selected based on environmental monitoring requirements, which is their intended purpose, rather than geotechnical monitoring of the phreatic surface for use in seepage and stability assessments.

11.1.5 Adequacy of Maintenance and Surveillance

The CCW impoundments are generally adequately maintained and routine surveillance is performed by LRS staff. Basin Electric has indicated Scott Woolsey, P.E. has been trained in dam safety inspections.

11.1.6 Adequacy of Project Operations

Operating personnel are knowledgeable and are well trained in the operation of the project. The current operations of the facilities are satisfactory.

12.0 Recommendations

12.1 Corrective Measures and Analyses for the Structures

1. The concrete slope protection on the upstream slopes of Bottom Ash Pond 1 should be repaired wherever erosion has occurred, specifically in the northeast corner around the Sewage Treatment Plant Effluent (STPE) conduit that discharges into Bottom Ash Pond 1. Basin Electric reports that the concrete slope protection at Bottom Ash Pond 1 was partially repaired in 2011 and will be completed by summer of 2012.

2. A geotechnical exploration program should be performed to classify the embankment soils and the foundation soils. A geotechnical soils testing program should accompany the drilling program and should include index property tests along with strength tests. These test results would provide the necessary information to perform slope stability analyses on the CCW impoundments as described below.

3. Static and seismic slope stability analyses for the five CCW impoundments should be performed on the maximum section of each CCW impoundment with a phreatic surface representative of steady seepage at normal water surface conditions. Critical slopes should be identified and evaluated. Additional loading due to ash being piled up a few feet higher than the dike crest, such as in the northeast corner of Bottom Ash Pond 3, should be included in the stability analyses. The slope stability analysis should be presented relative to the appropriate dam safety guidelines such as the Army Corps of Engineers, Bureau of Reclamation or the Federal Energy Regulatory Commission (FERC).

12.2 Corrective Measures Required for Instrumentation and Monitoring Procedures

Staff gauges should be installed in the East and West Emergency Holding Ponds and flow rates into and out of all of the ponds should be measured. Staff gauges should be set to the vertical datum used. Static water levels, prior to pumping or sampling, should be recorded for the environmental monitoring wells located near Bottom Ash Ponds 1 and 2. If data from monitoring well 21B located at the northeast corner downstream toe of Bottom Ash Pond 1 is determined to be not helpful to dam safety monitoring, consideration should be given to installing a separate observation well in the northeast corner for dam safety monitoring because this location is near the maximum embankment section of Bottom Ash Pond 1. Observation wells should be considered for Bottom Ash Pond 3 along the south dike, and in particular, at the northeast corner as this is the highest and most critical dike location.

12.3 Corrective Measures Required for Maintenance and Surveillance Procedures

Currently, the CCW impoundments are inspected every 5 years by the Wyoming State Engineer's Office. We recommend Basin Electric develop and document informal annual inspections of the ash ponds by Basin Electric staff trained in dam safety evaluations.

12.4 Corrective Measures Required for the Methods of Operation of the Project Works

None.

12.5 Summary

12.5.1 Bottom Ash Pond 1

The following factors were the main consideration in determining the final rating of Bottom Ash Pond 1.

- The dikes at Bottom Ash Pond 1 are low-hazard structures based on federal and state classifications.

- The dikes were generally observed to be in good condition in the field assessment, except for some erosion of the upstream concrete slope protection, particularly in the northeast corner of the pond.

- GEI's hydrologic analysis indicates Bottom Ash Pond 1 will be able to store the required inflow design flood without overtopping the dam.

- There are no structural stability analyses on record for the impoundment. Structural stability analyses are recommended for identifying potential dam safety deficiencies.

- Instrumentation consists of a staff gauge, stoplog weir and environmental monitoring wells. Environmental monitoring wells located near the pond do not provide relevant information for use in dam safety seepage and stability evaluations and for monitoring of seepage conditions.

- Maintenance, surveillance and operational procedures are considered acceptable.

12.5.2 Bottom Ash Pond 2

The following factors were the main consideration in determining the final rating of Bottom Ash Pond 2.

- The dikes at Bottom Ash Pond 2 are low-hazard structures based on federal and state classifications.
- The dikes were generally observed to be in good condition in the field assessment.
- GEI's hydrologic analysis indicates Bottom Ash Pond 2 will be able to store the required inflow design flood without overtopping the dam.
- There are no structural stability analyses on record for the impoundment. Structural stability analyses are recommended for identifying potential dam safety deficiencies.
- Instrumentation consists of a staff gauge at the stoplog weir and two monitoring wells located along the north dike. Environmental monitoring wells located near the pond do not provide relevant information for use in dam safety seepage and stability evaluations and for monitoring of seepage conditions.
- Maintenance, surveillance and operational procedures are considered acceptable.

12.5.3 Bottom Ash Pond 3

The following factors were the main consideration in determining the final rating of Bottom Ash Pond 3.

- The dikes at Bottom Ash Pond 3 are significant-hazard structures based on federal and state classifications.
- The dikes were generally observed to be in good condition in the field assessment.
- GEI's hydrologic analysis indicates Bottom Ash Pond 3 will be able to store the required inflow design flood without overtopping the dam.
- There are no structural stability analyses on record for the impoundment. Structural stability analyses are recommended for identifying potential dam safety deficiencies.
- Instrumentation consists of a staff gauge at the stoplog weir. The highest and most critical embankment section with respect to stability is the northeast corner and we recommend observation wells be added at this location to monitor embankment and foundation water levels. Observation wells should also be installed along the south dike because failure of this dike has potential for releasing CCW to adjacent private property.
- Maintenance, surveillance and operational procedures are considered acceptable.

12.5.4 East Emergency Holding Pond

The following factors were the main consideration in determining the final rating of the East Emergency Holding Pond.

- The dikes at the East Emergency Holding Pond are significant-hazard structures based on federal and state classifications.
- The dikes were generally observed to be in good condition in the field assessment.
- GEI's hydrologic analysis indicates the East Emergency Holding Pond will be able to store the required inflow design flood without overtopping the dam.
- There are no structural stability analyses on record for the impoundment. Structural stability analyses are recommended for identifying potential dam safety deficiencies.
- Instrumentation consists of environmental monitoring wells located approximately 500 feet away to the north, do not provide relevant information for use in dam safety seepage and stability evaluations and for monitoring of seepage conditions. There is no staff gauge at the East Emergency Holding Pond.
- Maintenance, surveillance and operational procedures are considered acceptable.

12.5.5 West Emergency Holding Pond

The following factors were the main consideration in determining the final rating of the West Emergency Holding Pond.

- The dikes at the West Emergency Holding Pond are significant-hazard structures based on federal and state classifications.
- The dikes were generally observed to be in good condition in the field assessment.
- GEI's hydrologic analysis indicates the West Emergency Holding Pond will be able to store the required inflow design flood without overtopping the dam.
- There are no structural stability analyses on record for the impoundment. Structural stability analyses are recommended for identifying potential dam safety deficiencies.
- Instrumentation consists of environmental monitoring wells located approximately 500 feet away to the north, do not provide relevant information for use in dam safety seepage and stability evaluations and for monitoring of seepage conditions. There is no staff gauge at the West Emergency Holding Pond.
- Maintenance, surveillance and operational procedures are considered acceptable.

12.6 Acknowledgement of Assessment

I acknowledge that the management units referenced herein were found to be in the following condition:

Management Unit	Rating
Bottom Ash Pond 1	Poor
Bottom Ash Pond 2	Poor
Bottom Ash Pond 3	Poor
East Emergency Holding Pond	Poor
West Emergency Holding Pond	Poor

DEFINITIONS – Definitions are as specified in the EPA Request for Proposal for the Assessment of Dam Safety of Coal Combustion Surface project, which are modified from the New Jersey Department of Environmental Protection Dam Safety Guidelines for the Inspection of Existing Dams, January 2008**:**

SATISFACTORY: No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

FAIR: Acceptable performance is expected under all required loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

POOR: A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

UNSATISFACTORY: Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

I acknowledge that the management unit referenced herein:

Has been assessed on May 12, 2011 (date)

Signature: ______________________

Professional Engineer (Civil)
RICHARD A. WESTMORE
10547
Date
WYOMING

List of Field Inspection Participants:

Stephen G. Brown, P.E.	Senior Project Engineer/Task Leader, GEI Consultants, Inc.
Gillian M. Hinchliff, P.E.	Project Engineer, GEI Consultants, Inc.
Maria Barnhardt, P.E.	Civil Engineer, Basin Electric
David Cummings	Environmental Coordinator, Basin Electric
John Ciz	Plant Engineer, Basin Electric
Brian Larson	Plant Manager, Basin Electric
David Herriott	Operations Superintendent, Basin Electric
Arnold Minear	Basin Electric
David Erickson	Basin Electric

13.0 References

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Burns & McDonnell. "Subsurface Investigation General Site Boring Locations". Laramie River Station Units 1 & 2 Drawing Package No. SB1 – Revision 3, Revised January 29, 1976.Burns & McDonnell. Drilling Logs for Borings 29, 30, 31 and 32. November 15-17, 1975.

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Appendix A

Inspection Checklists

May 12, 2011

Site Name: **Laramie River Station, Wheatland, WY** Date: **May 12, 2011**

Unit Name: **Bottom Ash Ponds 1 & 2 (BAP1 & BAP2)** Operator's Name: **Basin Electric PC**

Unit ID: ______ Hazard Potential Classification: High Significant **Low**

Inspector's Name: **Steve Brown/Gillian Hinchliff**

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?	Every 5 years		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)? Pond 1/Pond 2	El. 4562.8/El. 4560.9		19. Major erosion or slope deterioration?	X	
3. Decant inlet elevation (operator records)? Pump Station	TBD		20. Decant Pipes (submerged, not visible)		
4. Open channel spillway elevation (operator records)?	No Spillway		Is water entering inlet, but not exiting outlet?	NA	
5. Lowest dam crest elevation (operator records)?	El. 4565		Is water exiting outlet, but not entering inlet?	NA	
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?	NA	
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)?	X		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?	NA		From downstream foundation area?		X
13. Depressions or sink holes 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?	NA		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.

Comments	Comments
1. Wyoming State Engineer inspections occur once every 5 years. Plant operators perform daily checks 2 times/day.	**2. Elevations for BAP1/BAP2. Pool elevations were surveyed on May 3, 2011. Elevations appeared to be approximately the same at the time of the inspection.**
3. Flow from the plant has been diverted (semi-permanently) to BAP3. Water from BAP1/BAP2 can only be removed by pumping to the plant from the pump house.	**6. There is a staff gauge for each pond. Survey elevations of the water level are also taken every 1 to 2 months. Groundwater monitoring wells readings are taken for environmental monitoring.**
12. No trashracks were observed. Pond outflow is controlled by a pump station with submerged intake.	**19. Concrete slope protection at northeast corner of BAP1 has been broken by ice/wave action and erosion of embankment has occurred beneath the concrete.**

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # NA (zero discharge facility) INSPECTOR Steve Brown/ Gillian Hinchliff
Wyoming PDES Permit # WY0024074

Date May 12, 2011

Impoundment Name Bottom Ash Ponds 1 & 2 (BAP1 & BAP2)

Impoundment Company Basin Electric Power Cooperative

EPA Region 8

State Agency (Field Office) Address EPA Regional Office, 1595 Wynkoop St
Denver, CO 80202

Name of Impoundment Bottom Ash Ponds 1 & 2 (BAP1 & BAP2)

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

New X Update ______

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

IMPOUNDMENT FUNCTION: Bottom ash, boiler slag, decant water from Bottom Ash Pond 3

Nearest Downstream Town: Name Fort Laramie
Distance from the impoundment 21 Miles
Impoundment
Location: Longitude 104 Degrees 53 Minutes 40.5 Seconds
Latitude 42 Degrees 06 Minutes 35.7 Seconds
State WY County Platte

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

If So Which State Agency? Wyoming State Engineer's Office, Safety of Dams

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.

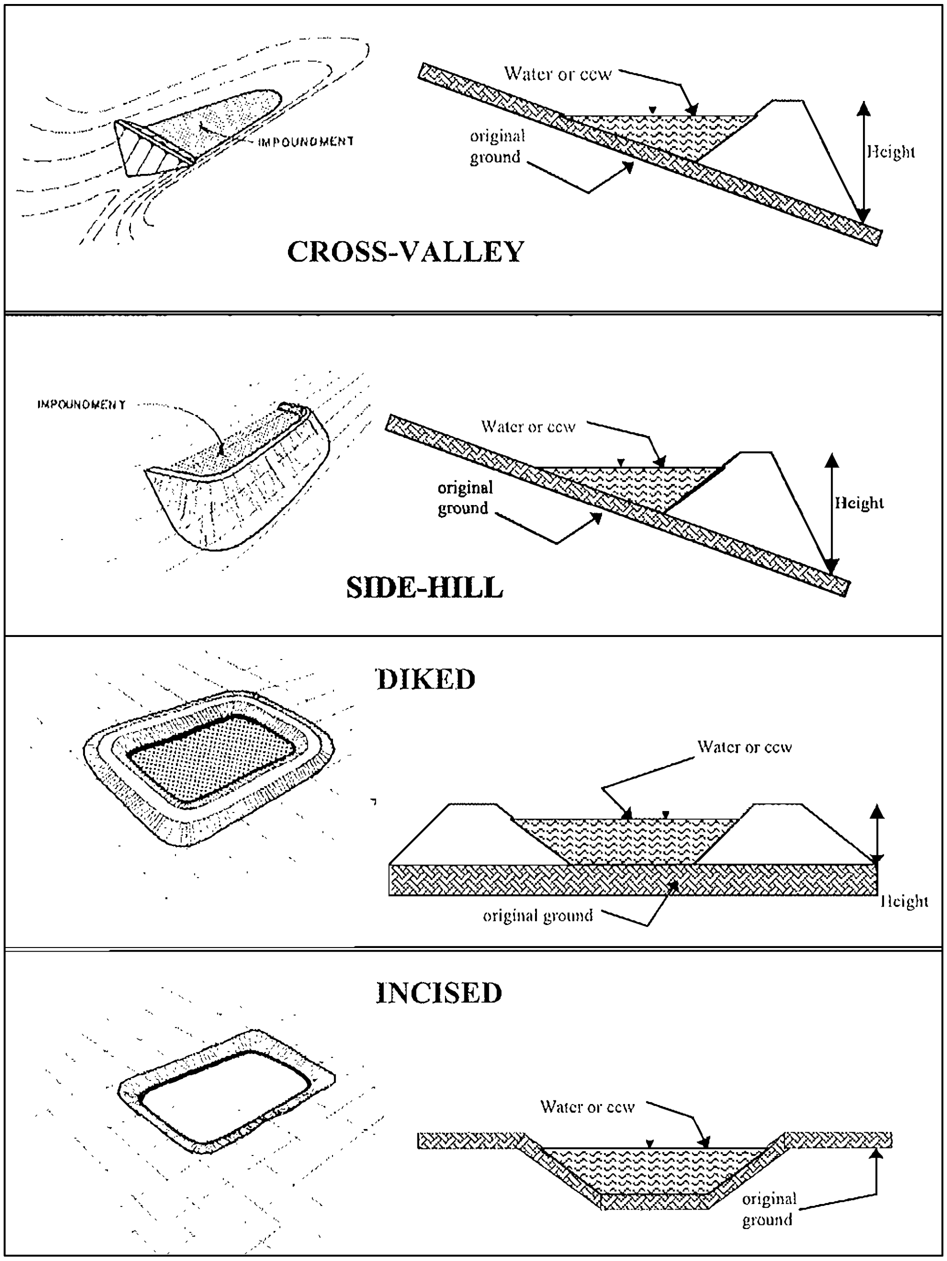
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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:

A release of Bottom Ash Ponds 1 & 2 would flow northeast about 1 mile to the Laramie River across property owned by Basin Electric and agricultural land. Landfills located to the north and west and Bottom Ash Pond 3 located to the south make a spill unlikely in those directions. No loss of life is anticipated and due to Bottom Ash Ponds 1 & 2 being mostly secondary decanted water, environmental damage is expected to be low. Plant railroad tracks could affected, but it is not expected that the tracks would be flooded.

CONFIGURATION:



______ Cross-Valley
______ Side-Hill
__X__ Diked
______ Incised (form completion optional)
______ Combination Incised/Diked

Embankment Height __25__ feet Embankment Material ____Earth____

Pool Area ____~47__ acres Liner__30 mil PVC____

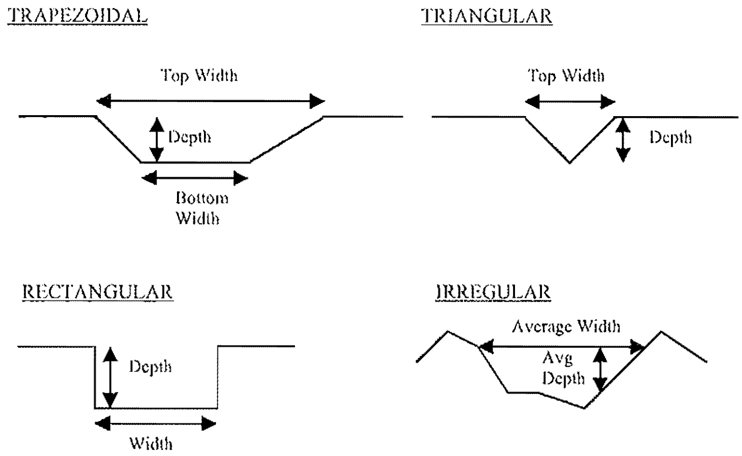
Current Freeboard __2.2/4.1*__feet Liner Permeability___1e-8 cm/sec____

***Bottom Ash Pond 1 freeboard = 2.2 ft. Bottom Ash Pond 2 freeboard =4.1 ft.**

TYPE OF OUTLET (Mark all that apply)

__NA__ **Open Channel Spillway**
______ Trapezoidal
______ Triangular
______ Triangular

______ Depth
______ Bottom (or average) width
______ Top width

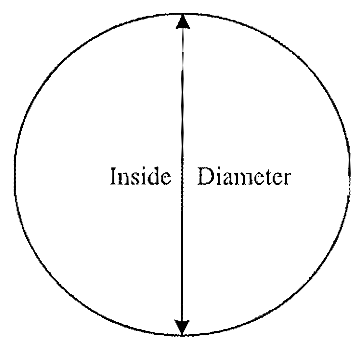


__X__ **Outlet***

__~~TBD~~__ inside diameter

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

***Water is pumped from BAP1/BAP2 through the outlet pipe to the plant for reuse.**



Is water flowing through the outlet? YES __X__ NO______

______ **No Outlet**

______ **Other Type of Outlet (Specify)** ______________________________

The Impoundment was Designed By __Burns & McDonnell__

____

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:

A system of observation wells are located around the ponds and are routinely monitored/sampled for environmental management reporting.

Site Name: **Laramie River Station, Wheatland, WY** Date: **May 12, 2011**

Unit Name: **Bottom Ash Pond 3 (BAP3)** Operator's Name: **Basin Electric PC**

Unit ID: Hazard Potential Classification: High **Significant** Low

Inspector's Name: **Steve Brown/Gillian Hinchliff**

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?	Every 5 years		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	El. 4587.5		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	~El. 4587.5		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	No Spillway		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	El. 4590		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)?	X		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?	NA		From downstream foundation area?		X
13. Depressions or sink holes 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?	NA		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.

Comments	Comments
1. Wyoming State Engineer inspections occur once every 5 years. Plant operators perform checks twice per day.	**2. Pool elevations were surveyed on May 3, 2011. Elevations appeared to be approximately the same at the time of the inspection.**
3. Outlet is an overflow weir with stop logs. Two 30" diameter steel pipes connect the overflow weir to BAP1 and BAP2. Flow from BAP3 to BAP1 was occurring at the time of the inspection.	**6. There is a staff gauge. Survey elevations of the water level are also taken every 1 to 2 months. Groundwater monitoring wells readings are taken for environmental monitoring.**
12. No trashracks were observed. Pond outflow is controlled by a weir.	**23. BAP1 and BAP2 are located at the BAP3 north dike downstream toe.**

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # **NA (zero discharge facility)** INSPECTOR **Steve Brown/ Gillian Hinchliff**

Wyoming PDES Permit # WY0024074

Date **May 12, 2011**

Impoundment Name **Bottom Ash Pond 3 (BAP3)**

Impoundment Company **Basin Electric Power Cooperative**

EPA Region **8**

State Agency (Field Office) Address **EPA Regional Office, 1595 Wynkoop St**

Denver, CO 80202

Name of Impoundment **Bottom Ash Pond 3 (BAP3)**

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

New **X** Update ______

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

IMPOUNDMENT FUNCTION: Bottom ash, boiler slag

Nearest Downstream Town: Name **Fort Laramie**

Distance from the impoundment **21 Miles**

Impoundment Location:

Longitude	**104**	Degrees	**52**	Minutes	**57.7**	Seconds
Latitude	**42**	Degrees	**07**	Minutes	**2.9**	Seconds
State	**WY**	County	**Platte**			

Does a state agency regulate this impoundment? YES **X** NO ______

If So Which State Agency? **Wyoming State Engineer's Office, Safety of Dams**

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.

______ **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.

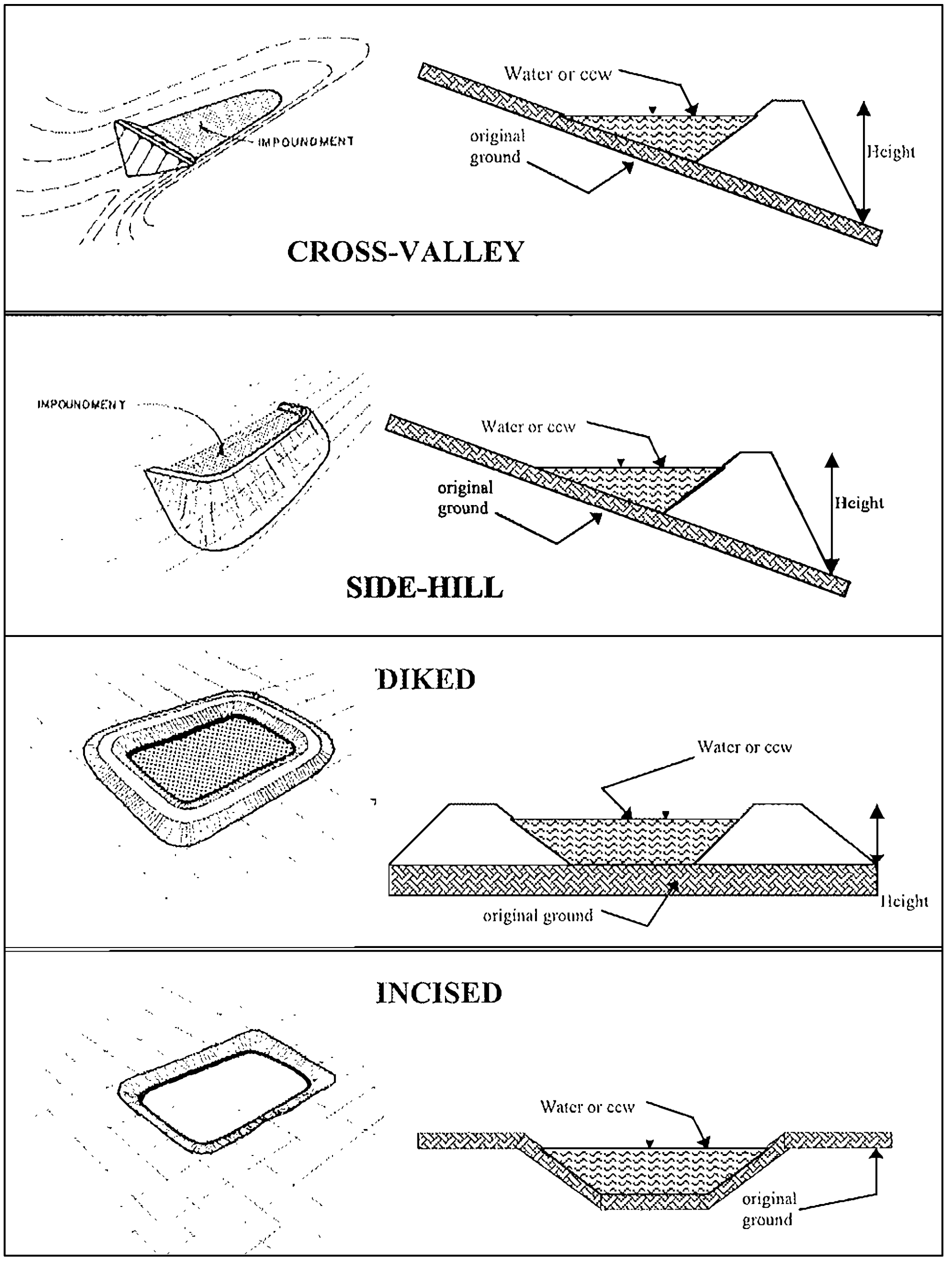
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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:

The western side of Bottom Ash Pond 3 is bounded by an existing landfill, and the height of the Bottom Ash Pond 3 dike in the southwest corner is about 2 to 3 feet above existing ground. Releases to the west and southwest are not expected to occur and would be very minor if a release did occur. An unexpected release of the south dike could overtop Grayrocks Road and flood private property located to the south. A release of the east or north dike would flow about 1 mile to the northeast to Laramie River. A full breach of BAP3 to the south would overtop Grayrocks Road by several feet and would present a hazard to motorists and would close and potentially severely damage a key plant access road. BAP3 contains the majority of the bottom ash, which would be released in the event of a pond failure. Loss of life is not anticipated and environmental damage is expected to be moderate.

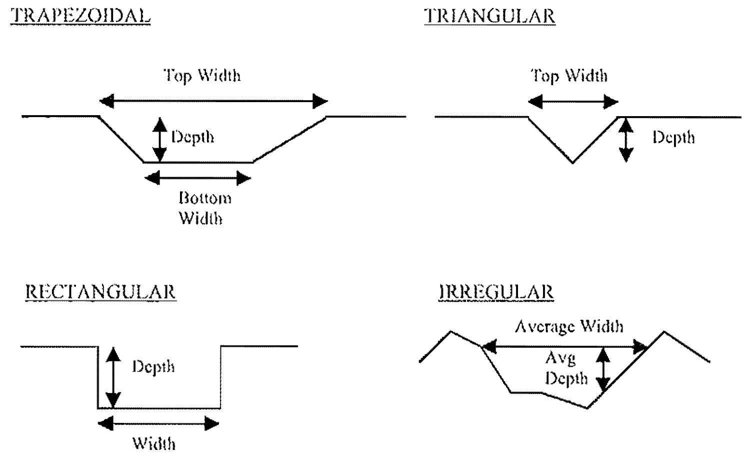
CONFIGURATION:



______ Cross-Valley
______ Side-Hill
__X__ Diked
______ Incised (form completion optional)
______ Combination Incised/Diked

Embankment Height __50__ feet Embankment Material __Earth__
Pool Area __~57.6__ acres Liner __30 mil PVC__
Current Freeboard __2.5__ feet Liner Permeability __1e-8 cm/sec__

TYPE OF OUTLET (Mark all that apply)

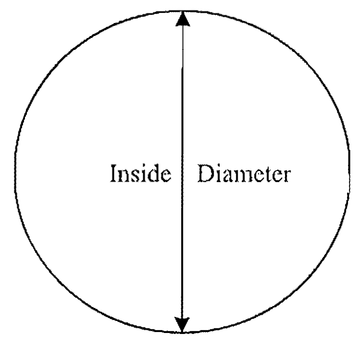


NA___ **Open Channel Spillway**
______ Trapezoidal
______ Triangular
______ Triangular

______ Depth
______ Bottom (or average) width
______ Top width

__X__ **Outlet**

__30"__ inside diameter



Material
______ corrugated metal
__X__ welded steel
______ 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 Burns & McDonnell

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:

A system of observation wells are located around the ponds and are routinely monitored/sampled for environmental management reporting.

Site Name: **Laramie River Station, Wheatland, WY** Date: **May 12, 2011**

Unit Name: **West/East Emergency Holding Ponds** Operator's Name: **Basin Electric PC**

Unit ID: ______ Hazard Potential Classification: High **Significant** Low

Inspector's Name: **Steve Brown/Gillian Hinchliff**

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?	Every 5 years		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)? West Pond/East Pond	El. 4535.6/El. 4535.7		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)? Pump Station	TBD		20. Decant Pipes (submerged, not visible)		
4. Open channel spillway elevation (operator records)?	No Spillway		Is water entering inlet, but not exiting outlet?	NA	
5. Lowest dam crest elevation (operator records)?	El. 4540.5		Is water exiting outlet, but not entering inlet?	NA	
6. If instrumentation is present, are readings recorded (operator records)?	NA		Is water exiting outlet flowing clear?	NA	
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)?	X		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?	NA		From downstream foundation area?		X
13. Depressions or sink holes 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?	NA		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.

Comments	Comments
1. Wyoming State Engineer inspections occur once every 5 years. Plant operators perform checks 2 times/day.	**2. Pool elevations were surveyed on May 3, 2011. Elevations appeared to be approximately the same at the time of the inspection.**
3. Inlet pipes from plant were submerged in WEHP. A 24" diameter RCP connects WEHP and EEHP at about El. 4535.5. Water can be pumped from EEHP to Bottom Ash Pond 1 and back to the plant from the pump house.	**6. No Instrumentation on the dikes. Groundwater monitoring wells are located north of the ponds and readings are taken for environmental purposes.**
8. Consistent with foundation notes for other plant facilities, and given that WEHP/EEHP were constructed at the same time as the plant, it is reasonable that similar foundation preparation was performed at WEHP/EEHP.	**12. No trashracks were observed. Pond overflow is controlled by a pump station with submerged intake.**

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # NA (zero discharge facility)
Wyoming PDES Permit # WY0024074

INSPECTOR **Steve Brown/ Gillian Hinchliff**

Date **May 12, 2011**

Impoundment Name **West and East Emergency Holding Ponds (WEHP and EEHP)**

Impoundment Company **Basin Electric Power Cooperative**

EPA Region **8**

State Agency (Field Office) Address **EPA Regional Office, 1595 Wynkoop St Denver, CO 80202**

Name of Impoundment **West and East Emergency Holding Ponds (WEHP and EEHP)**

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

New **X** Update ______

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

IMPOUNDMENT FUNCTION: **Flue gas emission control residuals, lime slurry**

Nearest Downstream Town: Name **Fort Laramie**
Distance from the impoundment **21 Miles**
Impoundment
Location:

Longitude	104	Degrees	52	Minutes	57.7	Seconds
Latitude	42	Degrees	07	Minutes	2.9	Seconds
State	WY	County	Platte			

Does a state agency regulate this impoundment? YES **X** NO ______

If So Which State Agency? **Wyoming State Engineer's Office, Safety of Dams**

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.

______ **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.

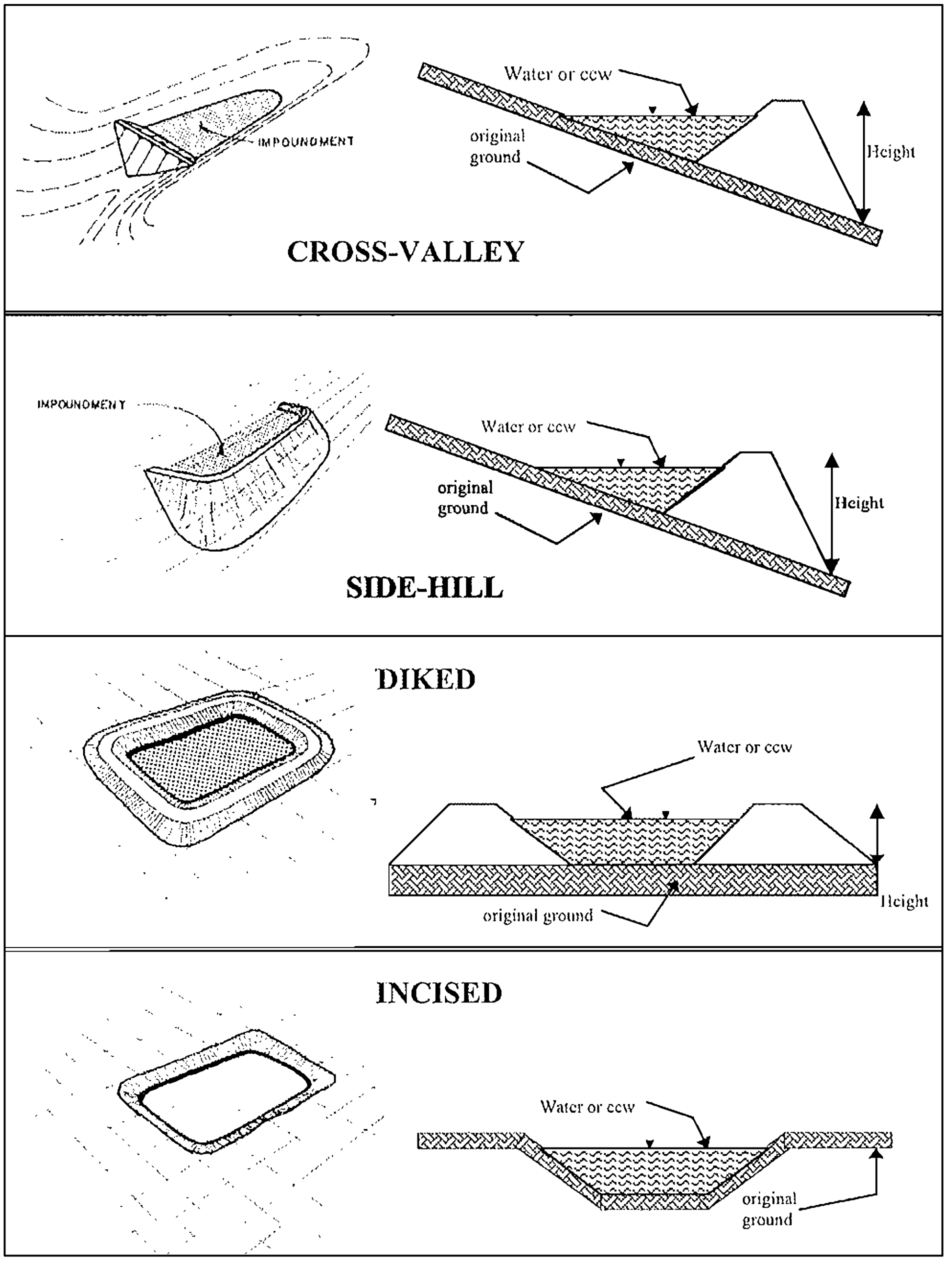
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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:

A failure of the south dikes of the Emergency Holding Ponds would release CCW into the stormwater drainage basin located south of the ponds. If the stormwater drainage basin is overwhelmed, CCW would be passed by the stormwater basin spillway, or potentially overflow the stormwater basin dam, and flow about 0.5 miles across agricultural land to the Laramie River. A release of the east, north or west dikes would release CCW to flow 0.3 miles across agricultural land to the Laramie River. Loss of life is not anticipated, however the hazard potential for environmental and economic damage due to a CCW release would be "significant".

CONFIGURATION:



______ Cross-Valley

______ Side-Hill

__X__ Diked

______ Incised (form completion optional)

______ Combination Incised/Diked

Embankment Height __20.5__ feet   Embankment Material ____Earth____

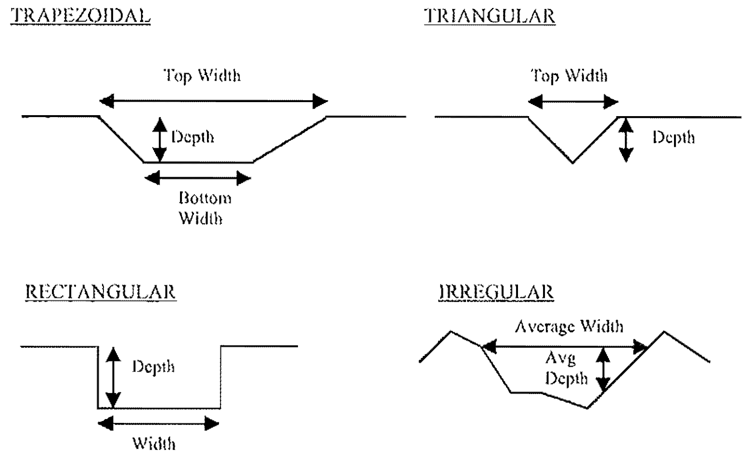
Pool Area ___54.1___ acres   Liner __30 mil Hypalon___

Current Freeboard __4.8__ feet   Liner Permeability __1e-8 cm/sec___

TYPE OF OUTLET (Mark all that apply)

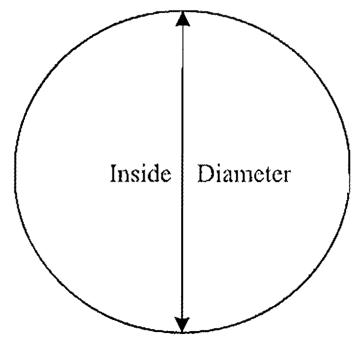
NA___ **Open Channel Spillway**
______ Trapezoidal
______ Triangular
______ Triangular

______ Depth
______ Bottom (or average) width
______ Top width



_X___ **Outlet***

TBD__ inside diameter



Material
______ corrugated metal
______ welded steel
______ concrete
______ plastic (hdpe, pvc, etc.)
______ other (specify_______________

***Water can be pumped from EEHP to the plant and Bottom Ash Pond 1 from the pump house.**

Is water flowing through the outlet? YES__X*__ NO______

***Water is pumped back to the plant for reuse.**

______**No Outlet**

______**Other Type of Outlet (Specify)** ________________________________

The Impoundment was Designed By **Burns & McDonnell**

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:

A system of observation wells are located around the ponds and are routinely monitored/sampled for environmental management reporting.

Appendix B

Inspection Photographs

May 12, 2011

Photo 1: Bottom Ash Pond 1 East Dike Upstream Slope, Looking South.

Photo 2: Bottom Ash Pond 1 East Dike Downstream Slope, Looking South.

Photo 3: Bottom Ash Pond 1 Upstream Slope Northeast Corner Erosion.

Photo 4: Bottom Ash Pond 1 Upstream Slope Northeast Corner Erosion.

Photo 5: Bottom Ash Pond 1 North Dike Upstream Slope, Looking West.

Photo 6: Bottom Ash Pond 1 North Dike Downstream Slope, Looking West.

Photo 7: Bottom Ash Pond 1 Southeast Corner Inlet Pipes. Pipes have been semi-permanently disconnected.

Photo 8: Inlet Pipes from Plant, Looking East from Bottom Ash Pond 1 Southeast Corner. Pipes have been semi-permanently routed to Bottom Ash Pond 3.

Photo 9: Looking Southeast from Bottom Ash Pond 1 Southeast Corner at Bottom Ash Pond 3 Northeast Corner Downstream Slope.

Photo 10: Bottom Ash Pond 1 South Dike/Bottom Ash Pond 3 North Dike Downstream Slope, Looking West.

Photo 11: Bottom Ash Pond 1 South Dike Crest/Bottom Ash Pond 3 North Dike Downstream Toe, Looking West.

Photo 12: Bottom Ash Pond 1/Bottom Ash Pond 2 Divider Dike, Looking South at Bottom Ash Pond 3 North Dike Downstream Slope.

Photo 13: Bottom Ash Pond 2 Pumphouse located on Bottom Ash Pond 1/Bottom Ash Pond 2 Divider Dike.

Photo 14: Bottom Ash Pond 1/Bottom Ash Pond 2 Divider Dike. Bottom Ash Pond 2 Upstream Slope. Photo looking north.

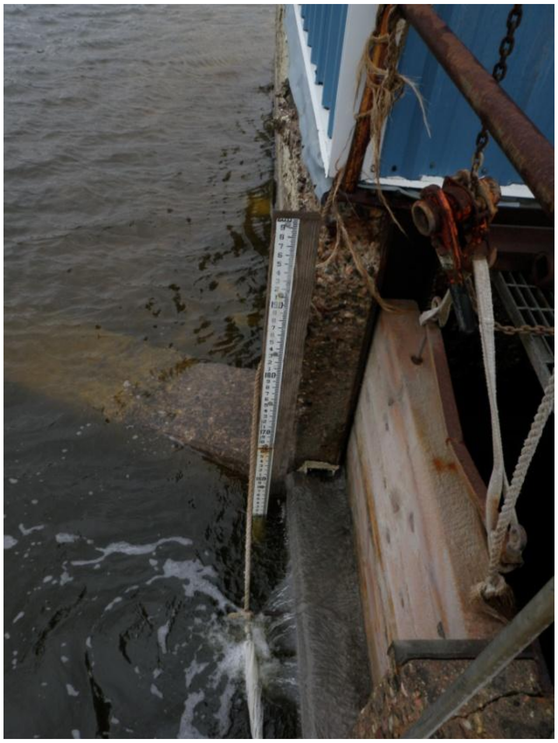


Photo 15: Bottom Ash Pond 2 Overflow Weir Staff Gauge.

Photo 16: Bottom Ash Pond 1/Bottom Ash Pond 2. Bottom Ash Pond 1 Upstream Slope, Looking North.

Photo 17: Bottom Ash Pond 1/Bottom Ash Pond 2. Bottom Ash Pond 2 Upstream Slope, Looking North.

Photo 18: Bottom Ash Pond 2 North Dike Upstream Slope, Looking West.

Photo 19: Bottom Ash Pond 2 North Dike Downstream Slope/Landfill. The landfill is the higher ground located at right of photo.

Photo 20: Bottom Ash Pond 2 North Dike Upstream Slope, Looking Northeast.

Photo 21: Bottom Ash Pond 2 West Dike Upstream Slope, Looking South.

Photo 22: Bottom Ash Pond 2 West Dike Downstream Slope/Landfill, Looking South.

Photo 23: Bottom Ash Pond 2 South Dike Upstream Slope, Looking East.

Photo 24: Bottom Ash Pond 3 West Dike Downstream Slope, Looking South.

Photo 25: Bottom Ash Pond 3 Overflow Weir with Staff Gauge.

Photo 26: Bottom Ash Pond 3 North Dike Upstream Slope, Looking East.

Photo 27: Bottom Ash Pond 3 North Dike Upstream Slope, Looking West.

Photo 28: Bottom Ash Pond 3 North Dike Crest, Looking West.

Photo 29: Bottom Ash Pond 3 West Dike Upstream Slope, Looking North.

Photo 30: Bottom Ash Pond 3 Southwest Corner Downstream Slope, Looking West.

Photo 31: Bottom Ash Pond 3 South Dike Upstream Slope, Looking East.

Photo 32: Bottom Ash Pond 3 South Dike Downstream Slope, Looking East.

Photo 33: Bottom Ash Pond 3 South Dike Culvert and Grayrocks Road, Looking South.

Photo 34: Bottom Ash Pond 3 South Dike Downstream Slope, Looking East.

Photo 35: Bottom Ash Pond 3 South Dike Upstream Slope, Looking East.

Photo 36: Bottom Ash Pond 3 East Dike Downstream Slope, Looking North

Photo 37: Bottom Ash Pond 3 Southeast Corner Downstream Slope, Looking Southeast.

Photo 38: Bottom Ash Pond 2 30-inch-diameter Steel Inlet Pipe from Bottom Ash Pond 3.

Photo 39: Bottom Ash Pond 1 30-inch-diameter Steel Inlet Pipe from Bottom Ash Pond 3.

Photo 40: East Emergency Holding Pond South Dike Upstream Slope, Looking East.

Photo 41: East Emergency Holding Pond Southwest Corner Upstream Slope, Looking North at Divider Dike and Pump House.

Photo 42: East Emergency Holding Pond South Dike Downstream Slope, Looking East.

Photo 43: East Emergency Holding Pond South Dike Upstream Slope, Looking East.

Photo 44: East Emergency Holding Pond Southeast Corner Downstream Slope, Looking South at Stormwater Detention Basin Dam.

Photo 45: East Emergency Holding Pond East Dike Downstream Slope, Looking North.

Photo 46: East Emergency Holding Pond East Dike Upstream Slope, Looking North.

Photo 47: East Emergency Holding Pond North Dike Downstream Slope, Looking West.

Photo 48: East Emergency Holding Pond North Dike Upstream Slope, Looking West.

Photo 49: East/West Emergency Holding Pond Divider Dike. East Emergency Holding Pond Upstream Slope, Looking South.

Photo 50: East/West Emergency Holding Pond Divider Dike. West Emergency Holding Pond Upstream Slope, Looking South.

Photo 51: West Emergency Holding Pond North Dike Upstream Slope, Looking Northeast.

Photo 52: West Emergency Holding Pond North Dike Downstream Slope, Looking East.

Photo 53: West Emergency Holding Pond West Dike Upstream Slope, Looking South.

Photo 54: West Emergency Holding Pond Southwest Dike Downstream Slope, Looking Southeast.

Photo 55: West Emergency Holding Pond Inlet Pipes on South Dike, Looking North.

Photo 56: West Emergency Holding Pond South Dike Downstream Slope, Looking East.

Photo 57: 24-inch-diameter RCP Overflow Pipe from West Emergency Holding Pond to East Emergency Holding Pond.

Appendix C

Reply to Request for Information Under Section 104(e)

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE: 701-223-0441
FAX: 701-557-5336

March 25, 2009

OVERNIGHT MAIL

Mr. Richard Kinch
U.S. Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Dr.
5th Floor; N-5783
Arlington, VA 22202-2733

Re: Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9604(e)

Dear Mr. Kinch:

This letter is in response to the letter dated March 9, 2009 from Barry N. Breen, Acting Assistant Administrator of the U.S. Environmental Protection Agency (EPA) to the Plant Manager of the Laramie River Station (LRS), Wheatland, Wyoming. The March 9, 2009 EPA letter was received by LRS on March 13, 2009.

The LRS located in Wheatland, WY, is owned by the Missouri Basin Power Project (MBPP) and operated by Basin Electric Power Cooperative (Basin Electric). LRS consists of three coal-based electrical generation units, which began commercial operation in the early 1980s.

LRS uses sub-bituminous coal from the Powder River Basin to fuel its three generation units. Coal combustion produces three types of byproducts; bottom ash, fly ash and FGD product. FGD refers to flue gas desulfurization, which is the result of the scrubber operation using lime or limestone to remove sulfur-dioxide emissions.

The LRS management units consist of a bottom ash pond with three cells and an emergency holding pond of two cells.

The Plant Manager of the LRS is Mr. Mike Fluharty who reports to me as the Vice President of Operations for Basin Electric. Enclosed are the specific responses to the Enclosure of the March 9, 2009 EPA letter to the LRS Plant Manager. If you have any further questions, please advise.

Sincerely,

Robert W. Holzwarth
V.P. Plant Operations

/gmj
Enclosures
cc: John Corra (w/enc.)
Ron Harper (w/enc.)

CERTIFICATION

By

Authorized Representative

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate and complete. As to the identified portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Robert W. Holzwarth

Name: ROBERT W. HOLZWARTH

Title: V.P. PLANT OPERATIONS

Laramie River Station (LRS) responses to the Enclosure of the March 9, 2009 EPA letter.

Question 1 **Relative to the National Inventory of Dams criteria for High, Significant, Low or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit does not have a rating, please note that fact.**

Response 1 The bottom ash pond and the emergency holding pond both have a rating of Low relative to the National Inventory of Dams criteria. The rating for both ponds was established by the Wyoming State Engineer's Office. Both ponds are regulated by the Wyoming State Engineer's Office.

Question 2 **What year was each management unit commissioned and expanded?**

Response 2 Both the bottom ash pond and the emergency holding pond were commissioned in 1980. Neither pond has been expanded.

Question 3 **What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash; (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).**

Response 3 The bottom ash pond contains bottom ash and boiler slag. The emergency holding pond contains flue gas emission control residuals as well as other materials. The other materials consist of water treatment plant spent lime slurry.

Question 4 **Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management unit(s) under the supervision of a Professional Engineer?**

Response 4 Both management units were designed by a Professional Engineer. Both management units were also constructed under the supervision of a Professional Engineer. Inspections that are done by the Wyoming State Engineer's Office are done under the supervision of a Professional Engineer. Please see "Response 4 Attachment 1".

Question 5 **When did the company last assess or evaluate the safety (i.e., structural integrity) of the management unit(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?**

Response 5 In June of 2008 an inspection was performed by the LRS Engineering Department in conjunction with the Wyoming State Engineer's Office, Dam Safety Inspector. These inspections take place every five years. This inspection is to determine deficiencies and assess structural integrity of the units. Representing LRS on inspections is the LRS Plant Engineer, Mr. John Ciz. Mr. Ciz has 20+ years experience as Plant Engineer which has included supervision of Engineers (Civil and Mechanical). Experience includes all aspects of LRS Engineering in all areas of the plant. A registered P.E. (Civil) is part of Mr. Ciz's professional staff who accompanies inspections and consults on questions that may arise. Assessments are planned to continue on a minimum five year cycle. Non-formal assessments are conducted on an ongoing basis by LRS Operations personnel during the course of normal duties.

Question 6 When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

Response 6 In June of 2008 an inspection was performed by the LRS Engineering Department in conjunction with the Wyoming State Engineer's Office Dam Safety Inspector. These inspections take place every five years. Please see "Response 6 Attachment 1" and "Response 6 Attachment 2".

Question 7 Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issues(s) with the management unit(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

Response 7 No safety issues have been identified with either of the management units at LRS.

Question 8 What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of materials currently stored in each of the management unit(s)? Please provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

Response 8 The combined total surface area of all three cells in the bottom ash pond is 104.6 acres and the total storage capacity is 2111.1 acre-feet. The combined total surface area of the emergency holding pond is 54.1 acres and the total storage capacity is 915.7 acre-feet. The current volume of materials in both ponds is unknown. The maximum height of the ash disposal pond is 25 feet. The maximum height of the emergency holding pond is 20 feet.

Question 9 **Please provide a brief history of known spills or unpermitted releases from the unit within the last 10 years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).**

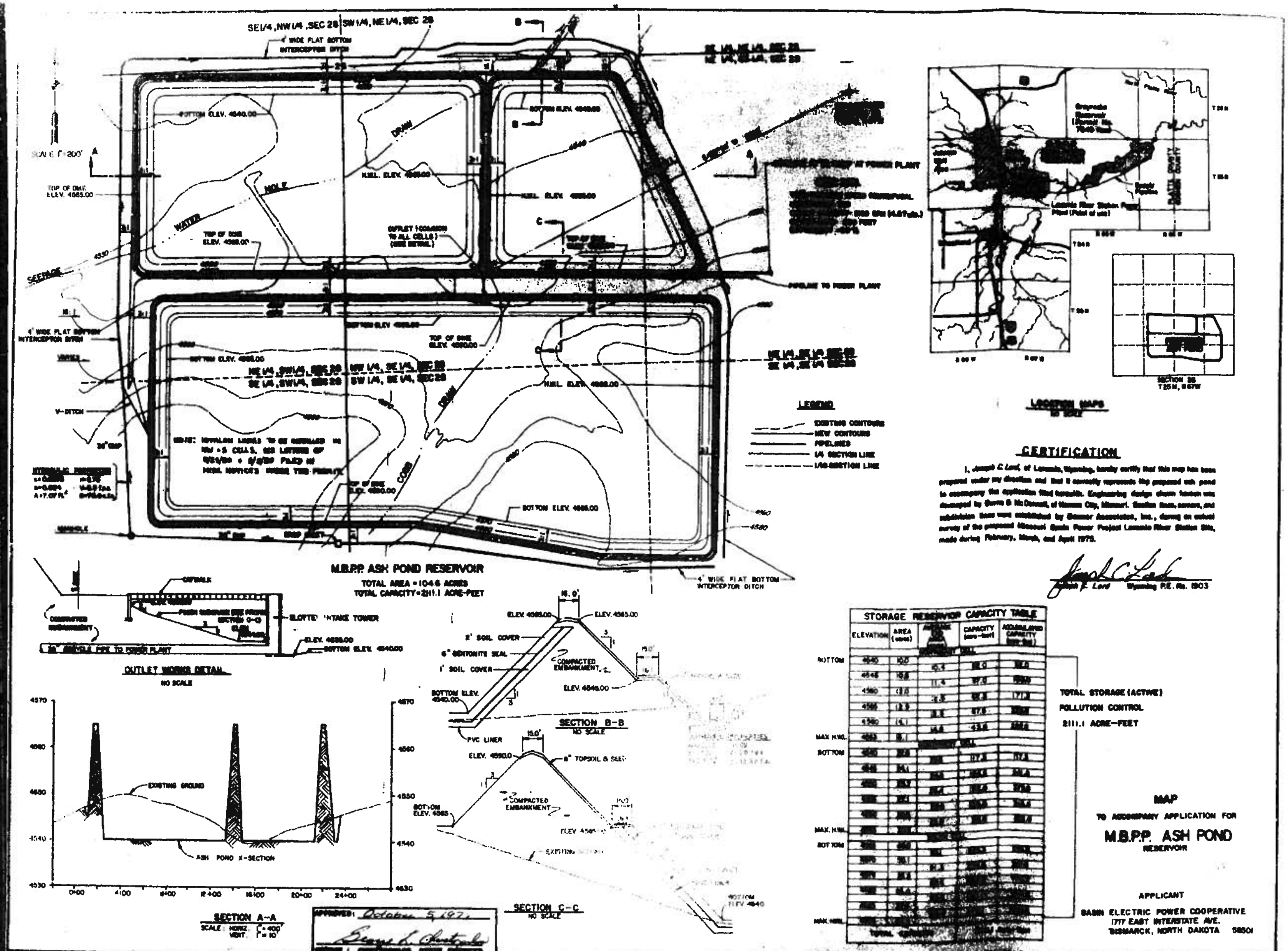
Response 9 There have been no known spills or unpermitted releases from either of the management units within the last 10 years.

Question 10 **Please identify all current legal owner(s) and operator(s) of the facility.**

Response 10 LRS is owned by the Missouri Basin Power Project (MBPP). The MBPP consists of Basin Electric Power Cooperative, Heartland Consumers Power District, Lincoln Electric System, Tri-State Generation and Transmission Association, Western Minnesota Municipal Power Agency and Wyoming Municipal Power Agency.

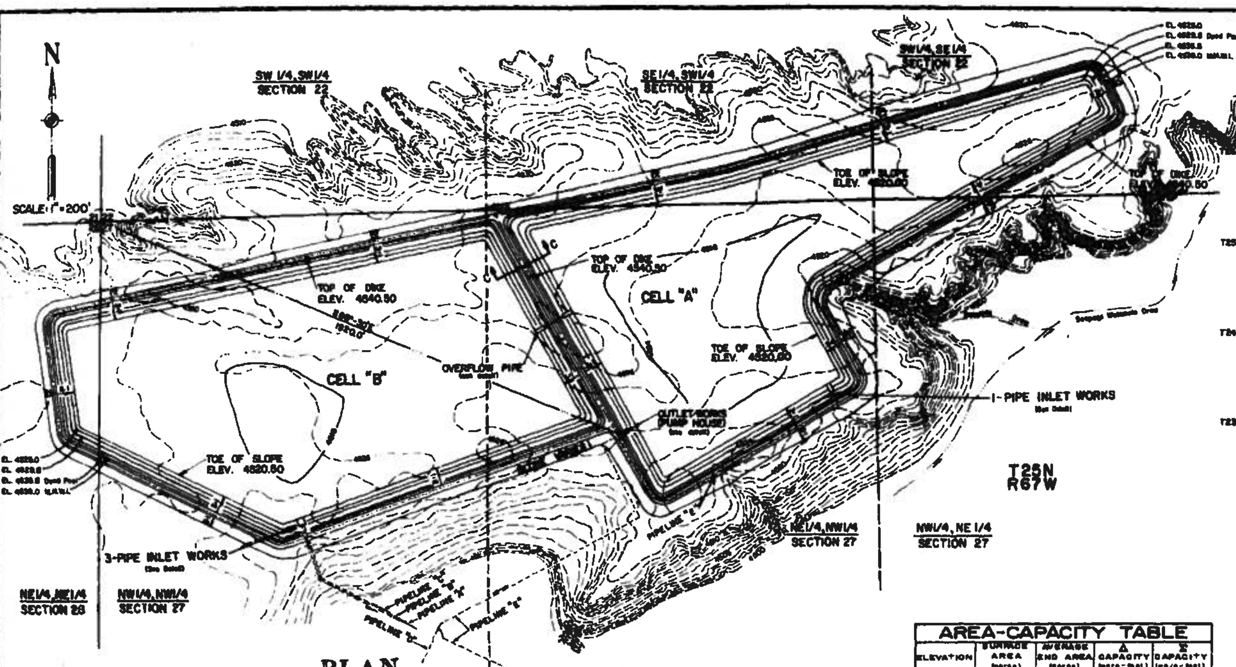
LRS is operated by Basin Electric Power Cooperative.

Response 4
Attachment 1



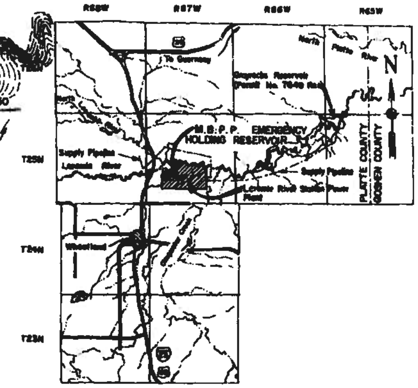
0 1 2 3 4 5 6
THIS MAP MAY NOT BE TO SCALE

7810 RES 22 1978



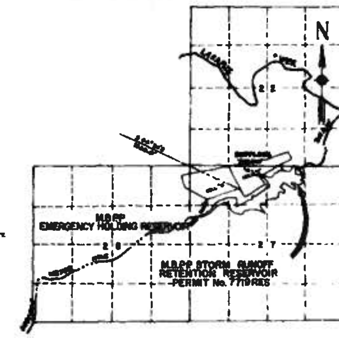
PLAN
MBPP EMERGENCY HOLDING RESERVOIR

TOTAL AREA = 54.10 ACRES
TOTAL CAPACITY = 915.70 ACRE-FEET



VICINITY MAP

SCALE: MILES



LOCATION MAP

SCALE: 1" = 2000'

AREA-CAPACITY TABLE

POLLUTION CONTROL INDUSTRIAL USE

Cell	ELEVATION	SURFACE AREA (acres)	AVERAGE END AREA (acres)	Δ CAPACITY (acre-feet)	Σ CAPACITY (acre-feet)
CELL "A"	4612.5	0			0
			4.4	6.6	
	4615.0	7.3			6.6
			15.2	56.4	
	4620.0	19.1			62.4
			20.0	100.0	
	4625.0	20.9			134.4
			21.6	98.1	
	4629.5	22.6			[illegible]
			23.6	141.6	
	4635.5	24.7			372.[illegible]
			25.2	63.0	
M.H.W.L.	4638.0	25.7			435.1
CELL "B"	4616.0	0			0
			0.9	1.0	
	4618.0	1.4			1.0
			12.3	30.7	
	4620.5	23.1			31.7
			23.7	106.7	
	4625.0	24.4			138.4
			25.1	112.9	
	4629.5	25.8			251.3
			26.6	[illegible]	
	[illegible]	27.5			[illegible]
			27.9	[illegible]	
M.H.W.L.	4638.0	28.4			460.6
TOTAL CAPACITY			915.70 Acre-Feet		

PIPELINE (INLET) DATA

PIPE	DIAMETER (in)	MATERIAL	Q (g.p.m.)	SOURCE
A	6	PVC	500	UNIT I DEMINERALIZER
B	6	FRP	800	DEMINERALIZER BUILDING (SCRUBBER SLUICE)
C	6	PVC	400	WATER TREATMENT PLANT (ACID WASTE)
D	6	FRP	465	ASH POND (BLOW DOWN)
E	8	FRP	987	CIRCULATING WATER SYSTEM (COOLING TOWERS)

LEGEND

- EXISTING CONTOURS
- NEW CONTOURS
- PIPELINE
- SECTION LINE
- 1/4 SECTION LINE
- 1/16 SECTION LINE

* After submitting the original filing for the M.B.P.P. Emergency Holding Reservoir, T.F. No 23 2/149, a change in design increased the capacity by 7.3 acre-feet. A new application was filed and this original map was revised. Therefore, this map will serve both the rejected filing and the new filing. See letter dated May 21, 1979, filed with Rejected Application, T.F. No. 23 2/149

CERTIFICATION

I, *Joseph C. Lord*, of Laramie, Wyoming, hereby certify that this map has been prepared under my direction and that it correctly represents the proposed emergency holding reservoir to accompany the application filed herewith. Engineering design shown hereon was developed by Burns & McDonnell, of Kansas City, Missouri. Section lines, corners, and subdivision lines were established by Banner Associates, Inc., during an actual survey of the proposed Missouri Basin Power Project Laramie River Station Site, made during February, March, and April 1975.

Joseph C. Lord
Joseph C. Lord Wyoming P.E. No 1903

Temp. File No. 23 2/149	Temp. File No. 23 2/181
* REJECTED: April 21, 1981	APPROVED: April 21, 1981
George L. Christopulos	George L. Christopulos
GEORGE L. CHRISTOPULOS, STATE ENGINEER	GEORGE L. CHRISTOPULOS, STATE ENGINEER

MAP
TO
ACCOMPANY APPLICATION
FOR
M.B.P.P. EMERGENCY HOLDING RESERVOIR

APPLICANT
BASIN ELECTRIC POWER COOPERATIVE
1717 E. INTERSTATE AVE.
BISMARCK, NORTH DAKOTA 58501

MAR., 1979

SHT. 1 OF 2

0 1 2 3 4 5 6
THIS MAP MAY NOT BE TO SCALE

23 2/149 23 2/181 File: E-18 Rejected; 8120 Res.

✓

Wyoming Dam Inspection Report

Date 6/13/08

Name of Dam MBPP Emergency Holding Pond Water Division # 1 District # 4C

Permit No(s). 9120R County Platte

Owner Name Basin Electric

Address P.O. Box 1348 Wheatland, Wy 82201

Location (¼ ¼, lot or tract) NE NW Section 27 Twnsp 25N Range 67W

GPS - Latitude (DMS) 42°-06'-59" Longitude (DMS) 104°-52'-49"

Type of Dam : EARTHFILL ✓ ROCKFILL ___ CONCRETE ___ OTHER ___

Hazard Rating : High (1) ___ Significant(2) ___ Low (3) ✓ Non Hazard(4) ___

Dam Height (From Plans) 20' Dam Length (From Plans) 10,500' +/- Capacity (From Plans) 915.7 AF

(Actual) ✓ (Actual) ✓ (Estimated) ✓

Freeboard (Spillway to Crest) 2.5 Crest Width 15' Emergency Spillway Width None

Outlet Pipe (Size and Type - CMP, STEEL, IRON, CONCRETE, PLASTIC) —

Present Water Level (feet below (CREST) PRINCIPAL or EMERGENCY SPILLWAY) 3'

Stream Name (Source of supply) Sleepless Draw

Use (circle) IRRIGATION, MUNICIPAL, STOCK, (OTHER) Pollution Control

For each item below place an "X" in the yes or no column and circle the word or phrase which applies. Use the back of the form to completely describe or explain the conditions that warrant the response below. Fill in all blanks, if unknown enter "UNKN"; if not applicable - enter "N/A"; if none - enter "NONE".

	EVALUATION CRITERIA	YES	NO
1)	Are the roads to the dam adequate to allow YEAR ROUND ACCESS and TRAVEL ACROSS the dam by equipment for maintenance and/or repair?	✓	
2)	Is there BRUSH , DEBRIS or OTHER on the upstream slope that inhibits visual inspection of the entire surface?		✓
3)	Is there BRUSH , DEBRIS or OTHER on the CREST or DOWNSTREAM SLOPE that inhibits visual inspection of the entire surface?		✓
4)	Are there trees growing on the CREST, UPSTREAM or DOWNSTREAM SLOPE of the embankment?		✓
5)	Are there CRACKS, SLIDES, SLUMPS, SETTLEMENT or OTHER on the CREST, UPSTREAM SLOPE, or DOWNSTREAM SLOPE?		✓
6)	Are there RODENT HOLES or ERODED GULLIES on the UPSTREAM or DOWNSTREAM SLOPE?		✓
7)	Is the upstream slope eroded from wave action?		✓
8)	Is the rip rap DISPLACED, BROKEN DOWN or MISSING?		✓
9)	Are there FLOWS of WATER or WET AREAS above the toe of the dam?		✓
10)	Is there FLOWING WATER, SAND BOILS or BOGGY AREAS at or below the toe of the dam?		✓
11)	Are there toe drains?		✓
12)	Is the water from any LEAKS, TOE DRAINS or in any BOGGY / WET AREAS found to be MUDDY, SANDY or CARRYING any material?		✓
13)	Is the outlet control easy to get to?		N/A
14)	Is the OUTLET CONTROL or GATE found to be STUCK, BROKEN or EXCESSIVELY CORRODED?		N/A
15)	Is the outlet pipe OBSTRUCTED, EXCESSIVELY CORRODED or in OTHERWISE POOR CONDITION?		N/A
16)	Is the released water UNDERCUTTING the OUTLET or ERODING the EMBANKMENT?		N/A
17)	Does the spillway channel show significant EROSION, BACKCUTTING or DETERIORATION?		N/A
18)	Is the spillway obstructed with FLASH BOARDS, TREES, DEBRIS, BRUSH or OTHER material?		NA
19)	Are spillway WALLS, FLOOR, CONTROL SECTION or ENERGY DISSIPATER in poor condition?		NA
20)	Are any concrete portions excessively CRACKED, SPALLED or DISPLACED?		✓
21)	Is there evidence that the dam has been overtopped?		✓
22)	Is the reservoir usually full year round?	✓	
23)	Do conditions warrant an inspection of this dam by an engineer?		✓
24)	Were photographs taken and forwarded to the Cheyenne office? 2006	✓	

Continued on reverse side of sheet

Additional comments and detailed narrative description of problem areas and follow-up action:

- Dam appears to be satisfactory

- Accompanied by John Cox

Sketch (use to show problem areas with the dam or related facilities)

per plans

Inspected by: L. Stockdale - SEO Eng.

Title: D. Oliver - A/E

Return to:
State Engineer's Office
Safety of Dams
Herschler Bldg. 4th Floor East
Cheyenne, WY 82002

Wyoming Dam Inspection Report

Date 6/13/08

Name of Dam MBPP Ash Pond Water Division # 1 District # 4C

Permit No(s). 7810 R County Platte

Owner Name Basin Electric

Address P.O. Box 1346 Wheatland, Wy. 82201

Location (¼ ¼, lot or tract) NW SE Section 28 Twnsp 25N Range 67W

GPS - Latitude (DMS) 42°-06'-30" Longitude (DMS) 104°-53'-43"

Type of Dam : EARTHFILL ✓ ROCKFILL ____ CONCRETE ____ OTHER ____

Hazard Rating : High (1) ____ Significant(2) ____ Low (3) ✓ Non Hazard(4) ____

Dam Height (From Plans) 25' Dam Length (From Plans) 10,000 +/- Capacity (From Plans) 2111 AF

(Actual) ✓ (Actual) ✓ (Estimated) ✓

Freeboard (Spillway to Crest) N/A Crest Width 15-20' Emergency Spillway Width N/A

Outlet Pipe (Size and Type - CMP, STEEL, IRON, CONCRETE, PLASTIC) 36" Return to plant

Present Water Level (feet below (CREST) PRINCIPAL or EMERGENCY SPILLWAY) 3'

Stream Name (Source of supply) Laramie River offstream

Use (circle) IRRIGATION, MUNICIPAL, STOCK, (OTHER) Pollution Control

For each item below place an "X" in the yes or no column and circle the word or phrase which applies. Use the back of the form to completely describe or explain the conditions that warrant the response below. Fill in all blanks, if unknown enter "UNKN"; if not applicable - enter "N/A"; if none - enter "NONE".

	EVALUATION CRITERIA	YES	NO
1)	Are the roads to the dam adequate to allow YEAR ROUND ACCESS and TRAVEL ACROSS the dam by equipment for maintenance and/or repair?	✓	
2)	Is there BRUSH , DEBRIS or OTHER on the upstream slope that inhibits visual inspection of the entire surface?		✓
3)	Is there BRUSH , DEBRIS or OTHER on the CREST or DOWNSTREAM SLOPE that inhibits visual inspection of the entire surface?		✓
4)	Are there trees growing on the CREST, UPSTREAM or DOWNSTREAM SLOPE of the embankment?		✓
5)	Are there CRACKS, SLIDES, SLUMPS, SETTLEMENT or OTHER on the CREST, UPSTREAM SLOPE, or DOWNSTREAM SLOPE?		✓
6)	Are there RODENT HOLES or ERODED GULLIES on the UPSTREAM or DOWNSTREAM SLOPE?		✓
7)	Is the upstream slope eroded from wave action?		✓
8)	Is the rip rap DISPLACED, BROKEN DOWN or MISSING?		✓
9)	Are there FLOWS of WATER or WET AREAS above the toe of the dam?		✓
10)	Is there FLOWING WATER, SAND BOILS or BOGGY AREAS at or below the toe of the dam?		✓
11)	Are there toe drains?		✓
12)	Is the water from any LEAKS, TOE DRAINS or in any BOGGY / WET AREAS found to be MUDDY, SANDY or CARRYING any material?		✓
13)	Is the outlet control easy to get to?	✓	
14)	*Is the OUTLET CONTROL or GATE found to be STUCK, BROKEN or EXCESSIVELY CORRODED?*		✓
15)	Is the outlet pipe OBSTRUCTED, EXCESSIVELY CORRODED or in OTHERWISE POOR CONDITION?		✓
16)	Is the released water UNDERCUTTING the OUTLET or ERODING the EMBANKMENT?		N/A
17)	Does the spillway channel show significant EROSION, BACKCUTTING or DETERIORATION?		N/A
18)	Is the spillway obstructed with FLASH BOARDS, TREES, DEBRIS, BRUSH or OTHER material?		N/A
19)	Are spillway WALLS, FLOOR, CONTROL SECTION or ENERGY DISSIPATER in poor condition?		N/A
20)	Are any concrete portions excessively CRACKED, SPALLED or DISPLACED?		✓
21)	Is there evidence that the dam has been overtopped?		✓
22)	Is the reservoir usually full year round?	✓	
23)	Do conditions warrant an inspection of this dam by an engineer?		✓
24)	Were photographs taken and forwarded to the Cheyenne office? 2006	✓	

Continued on reverse side of sheet

Additional comments and detailed narrative description of problem areas and follow-up action:

- Dam appears to be satisfactory

- Accompanied by John Cie

Sketch (use to show problem areas with the dam or related facilities)

per plans

Inspected by: L. Stockdale - SOO Eng.

Title: D. Oliver - H/C

Return to:
State Engineer's Office
Safety of Dams
Herschler Bldg. 4th Floor East
Cheyenne, WY 82002

Appendix D

Hydrologic Analysis of Freeboard for Required Inflow Design Flood

GEI Consultants

Client: EPA	Project: 0928860		Page: 1
Subject: Laramie River Station	By: G. Hinchliff		Date: 8/15/2012
	Checked: M. Woodward		Date: 8/24/2012
	Approved: KAW		Date: 8/24/2012

Objective: Determine freeboard at LRS CCW impoundments during required IDF.

References: NOAA Atlas 2, Precipitation-Frequency Atlas of the Western US, Vol 2-WY, 1973
NOAA Hydrometeorological Report Number 55-A 24-hour PMP data.

Bottom Ash Pond 1 - IDF is the 50-yr storm event

Precipitation = 32 tenths of an inch = 3.2 inches

Dam Crest El = 4565
NWS El = 4562.8
Freeboard = 4565 - 4562.8 = 2.2 ft

IDF = 3.2 inches = 0.27 ft ≈ 0.3 ft

IDF Freeboard = 2.2 ft - 0.3 ft = 1.9 ft

Bottom Ash Pond 2 - IDF is the 50-yr storm event

Precip = 3.2 inches = 0.3 ft

Dam Crest El = 4565
NWS El = 4560.9
Freeboard = 4565 - 4560.9 = 4.1 ft

IDF Freeboard = 4.1 ft - 0.3 ft = 3.8 ft

Bottom Ash Pond 3 - IDF is 50% 24-hr PMP

24-hr PMP = 30 inches

50% PMP = 0.5 (30") = 15 inches = 1.25 ft

Dam Crest El = 4590
NWS El = 4587.5
Freeboard = 4590 - 4587.5 = 2.5 ft

IDF Freeboard = 2.5 - 1.25 = 1.25 ft

GEI Consultants

Client	EPA	Project	092886
		Page	2
		By	G. Hinchliff
		Date	8/15/2012
Subject	Laramie River Station	Checked	M. Woodward
		Date	8/24/2012
		Approved	RAW
		Date	8/24/12

East Emergency Holding Pond - IDF is 50% 24-hr PMP

50% PMP = 15 inches = 1.25 ft

Dam Crest El = 4540.5
NWS El = 4535.7
Freeboard = 4540.5 - 4535.7 = 4.8 ft

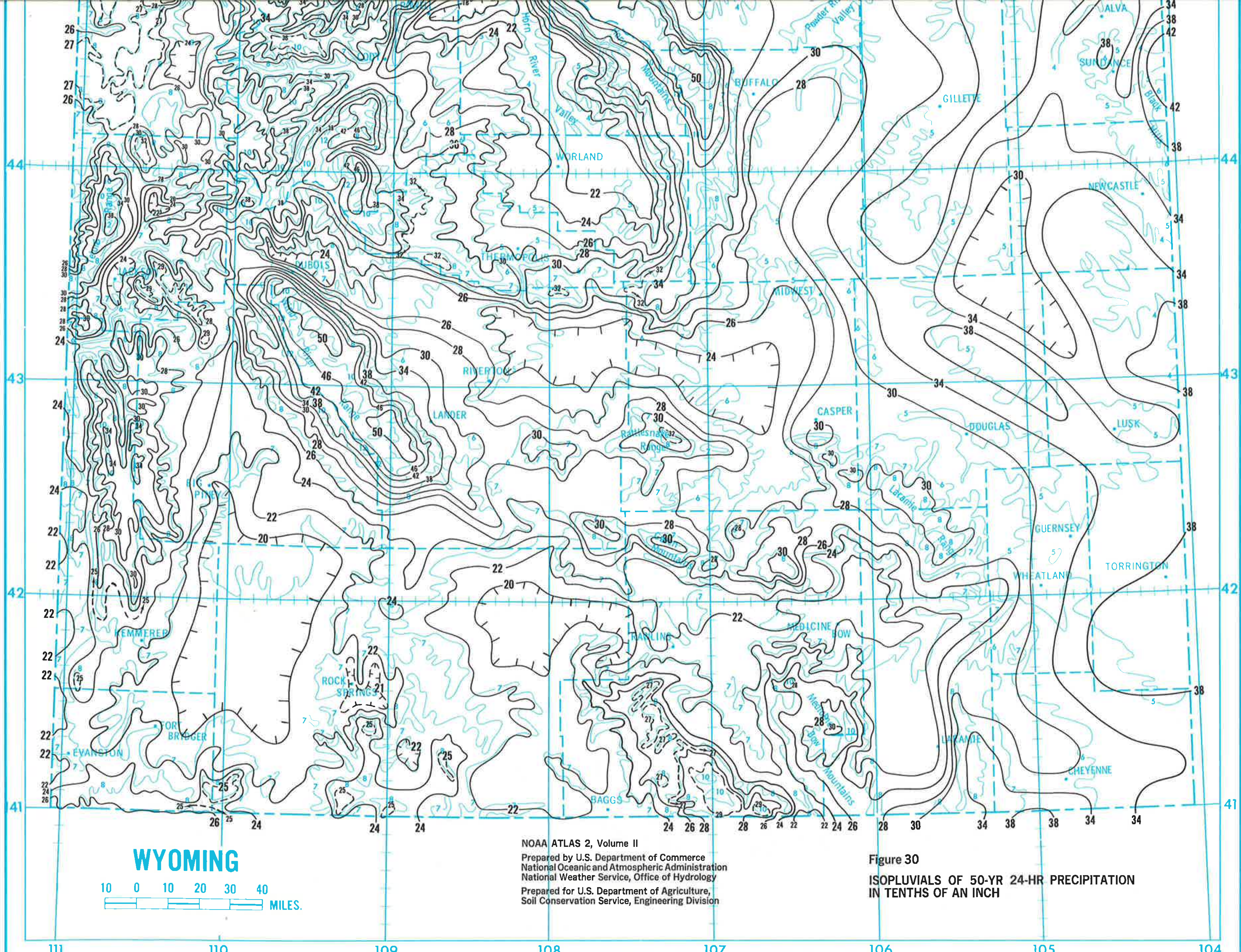
IDF Freeboard = 4.8 ft - 1.25 ft = 3.55 ft

West Emergency Holding Pond - IDF is 50% 24-hr PMP

50% PMP = 15 inches = 1.25 ft

Dam Crest El = 4540.5
NWS El = 4535.6
Freeboard = 4540.5 - 4535.6 = 4.9 ft

IDF Freeboard = 4.9 - 1.25 ft = 3.65 ft



NOAA ATLAS 2, Volume II

Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology

Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

Figure 30

ISOPLUVIALS OF 50-YR 24-HR PRECIPITATION IN TENTHS OF AN INCH

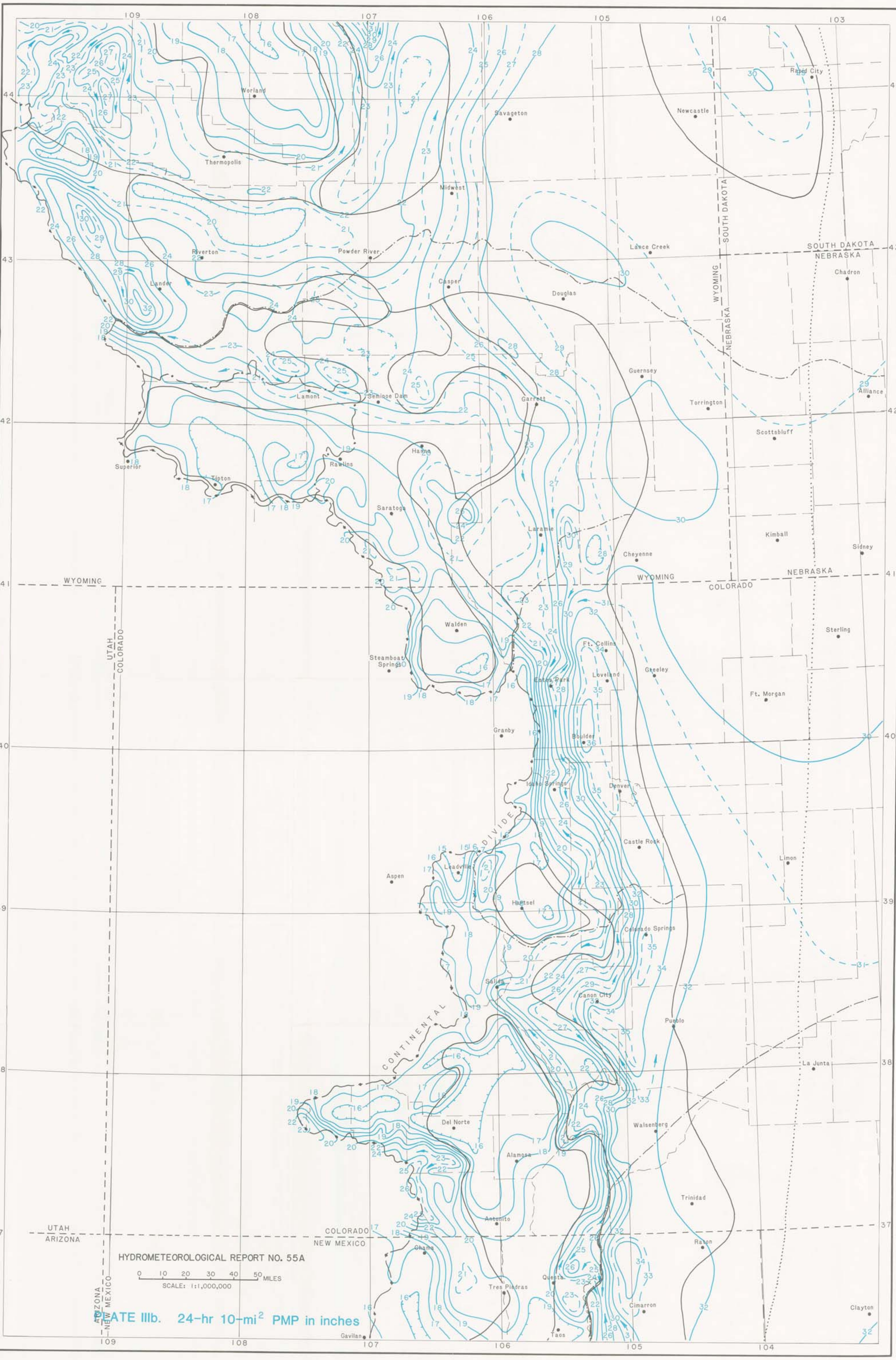


PLATE IIIb. 24-hr 10-mi^2 PMP in inches

Appendix E

GEI Response to Basin Electric Comments

GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

August 24, 2012
GEI Project 092886

Stephen Hoffman
Office of Resource Conservation and Recovery
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW (5304P)
Washington, D.C. 20460

Re: Response to Comments for Specific Site Assessment for Coal Combustion Waste Impoundments at Basin Electric Laramie River Station

Dear Mr. Hoffman:

This letter provides GEI Consultants, Inc., response to review comments provided by Basin Electric Power Cooperative (letter dated June 21, 2012) and the Environmental Protection Agency (EPA) ("Note" dated March 20, 2012) for the Specific Site Assessment for Coal Combustion Waste Impoundments at Basin Electric Laramie River Station, located in Wheatland, Wyoming. This letter provides response to review comments that were not addressed as part of the final report. The comments are repeated below followed by the response.

Responses to Technical Review Comments

Environmental Protection Agency Comments – All comments were addressed in the final report.

Basin Electric Power Cooperative Comments:

- Section 1.4 – Stephen G. Brown, P.E. is not a registered Professional Engineer in the State of Wyoming.

  Response: Wyoming P.E. registration is not required by the EPA for the CCW impoundment assessment project. We have added Richard Westmore as a Technical Reviewer for this project, and Mr. Westmore is a registered P.E. in the State of Wyoming.

- Section 2.2 – Table 2-1 and Paragraph 2: "...the maximum dike height of Bottom Ash Pond 3 is also 25 feet. According to Drawing 0CY-6004, Bottom Ash Ponds1, 2, and 3 have a combined storage of 2,111.1 acre-feet."

  Response: The Bottom Ash Pond 3 north dike is connected to Bottom Ash Ponds 1 and 2 south dike, therefore, the maximum height of Bottom Ash Pond 3 north dike can be measured from Bottom Ash Pond 3 crest El. 4590 to Bottom Ash Pond 1 and 2 toe El. 4540, resulting in an estimated maximum height of 50 ft. We estimated storage capacities for each of the pond cells. We added the combined storage capacity of Bottom Ash Ponds 1, 2, and 3 as 2,111.1 acre-feet as a note to Table 2-1.

www.geiconsultants.com

GEI Consultants, Inc.
4601 DTC Boulevard, Suite 900, Denver, CO 80237
303.662.0100 fax: 303.662.8757

- Section 4.1 – 2nd paragraph, last sentence; "Impoundments are classified as Less Than Low, Low, Significant, or High Hazard…" There is no hazard classification in either the FEMA guidelines or the USACE guideline that defines a "Less Than Low".

  Response: As indicated in EPA comments to GEI dated February 3, 2012, "Less than Low" is a hazard classification used by the EPA for the CCW impoundment assessment project.

- Section 4.2 – 2nd paragraph, third to last sentence: a CCW release would not flow across private agricultural land.

  Response: No formal hydrology analysis or model that evaluates dam breach or flood routing has been provided by Basin Electric. Based on GEI's observations at the site visit, CCW could flow across private agricultural land located between the LRS and Laramie River in the event of a breach.

- Section 4.3 – First paragraph: the maximum dike height on Bottom Ash Pond 3 is 25 ft.

  Response: See response to Section 2.2, Table 2-1 above.

- Section 4.3 – 2nd paragraph: CCW would not be released to adjacent private property due to the county road. If a failure were to occur, the CCW would be contained by the county road and only pond water would be able to potentially reach private property approximately ¼ mile south.

  Response: No formal hydrology analysis or model that evaluates dam breach or flood routing has been provided by Basin Electric. Based on GEI's observations at the site visit, the elevation of Grayrocks Road appeared to be lower than the crest of the Bottom Ash Pond 3 south dike. In the case of a breach of the south dike, CCW may potentially impact private property to the south.

- Section 6.0 – According to Figure 1 in USACE's 1979 Recommended Guidelines for Safety Inspection of Dams (ER 110-2-106), LRS is located in Seismic Zone 1. According to the above referenced document, "projects located in Seismic Zones 0, 1, and 2 may be assumed to present no hazard from earthquake provided static stability conditions are satisfactory and conventional safety margins exist." It is unclear why seismic stability analyses are recommended for all five impoundments in Section 12.1 of the Draft Site Assessment.

  Response: As provided in EPA comments to GEI dated February 3, 2012, GEI understands that EPA policy recommends static and seismic stability analyses be performed on all ponds falling within the scope of the CCW impoundment assessment.

- Section 12.5.1 – 4th bullet: Basin Electric believes that a structural stability analysis is only required for Bottom Ash Pond1 on the east and northeast dikes.

  Response: As provided in EPA comments to GEI dated February 3, 2012, EPA policy recommends static and seismic stability analyses be performed for all ponds falling within the scope of the CCW impoundment assessment. GEI recommends that the critical section or *sections be analyzed for static and seismic stability for each pond. Critical section(s) are generally determined by height, loading, and/or worst soil profile among other factors.*

- Section 12.5.3 – 5th bullet, last sentence: CCW would not be released to adjacent private property due to the county road. If a failure were to occur, the CCW waste would be contained by the county road and only pond water would be able to potentially reach the private property approximately ¼ mile south.

  Response: Same response as Section 4.3, 2nd paragraph comment above.

- Section 12.5.3 – 6th bullet: "Acceptable: would be a more appropriate rating for the maintenance, surveillance, and operational procedures due to the same procedures being used on this pond as on Bottom Ash Pond 1.

  Response: We have changed the maintenance, surveillance and operational procedures to acceptable.

We appreciate the opportunity to provide this information. If you have any questions or need additional information, please contact me.

Sincerely,

GEI CONSULTANTS, INC.

Gillian M. Hinchliff, P.E.
Project Engineer

Richard Westmore, P.E.
Technical Reviewer

GMH/DL;mw