AEP Gavin Power Plant
Cheshire, Ohio
US EPA Inspection
Stingy Run Fly Ash Dam and Bottom Ash Pond Complex
Action Plan based on Final Recommendations
September 2009

Recommendation:
Response:

4.2 Maintaining Vegetation Growth

The vegetation growth was cut on the embankments immediately prior to our site visit and during our site visit. We recommend that vegetation be cut prior to each quarterly performed by AEP representatives so that adequate visual inspections can be made.

AEP fully understands that maintenance of the facilities is part of the actions required to ensure the integrity of the dam and dikes at the AEP facilities. Therefore, AEP will continue a proactive maintenance and monitoring program as established.

As part of our annual maintenance program, mowing is performed at least twice a year. Mowing will be coordinated such that the visual inspections can be performed without hindrance.

4.3 Bottom Ash Pond South Dike Upstream Slope Stabilization and Wet Area

The upstream slope of the South Dike at the Bottom Ash Pond has experienced several surficial slumps, which are likely the result of over steepening of the slope by crest road grading activities which has resulted in a widening of the crest in combination with undercutting from wave action.

CHA recommends the upstream slope be re-graded to correct the steepness and slumped areas for stabilization. This effort should be coordinated with the recommendations made in Section 4.11 to analyze the upstream slope.

AEP plans to construct a berm at the water's edge to repair the erosion due to wave action. Areas that have upstream slopes steeper than 2H:1V will be regraded from the berm level to the crest. This work will be completed no later than November 30, 2010. Disturbed areas will either be revegetated or other erosion control measures will be implemented.

4.4 Bottom Ash Pond South Dike Wet Area

At about the mid-point along the length of the south dike downstream slope, there is a wet area which appears to be perched water on surface soil layers. The area was recently re-graded to improve drainage. This area should be monitored on a continual basis. Should a change be observed in this area during an inspection, a qualified engineer should further evaluate this new condition.

AEP will continue to monitor this area as part of its Dam Inspection and Maintenance Program (DIMP). Monthly inspections of the facility are performed by Plant personnel and AEP Engineering Services conducts an annual inspection. AEP Engineering Services will evaluate any changing conditions.

4.5 Bottom Ash Pond East Dike Erosion

Areas of erosion gullies along the transition from the crest to the downstream slope were observed during our site visit. AEP should continue to monitor these areas and perform repairs, as part of ongoing maintenance of the dikes. Repairs should included stabilizing the areas with seed and mulching the areas to establish better vegetation.

AEP will continue to monitor this area as part of its Dam Inspection and Maintenance Program (DIMP). Monthly inspections of the facility are performed by Plant personnel and AEP Engineering Services conducts an annual inspection. If erosion areas are noted during the inspections, repairs will be performed and vegetated.

4.6 Bottom Ash Pond East Dike Repair of Rodent Holes

As discussed in Section 2.2.1.2 – East Dike, several large rodent holes were observed. A few of these appeared to be plugged and AEP personnel indicated that they have had to trap rodents from time to time. CHA recommends that AEP continue with efforts to plug these holes and trap rodents. In addition, noting the locations that have been plugged will provide a record which can be used to more easily identify active versus inactive rodent burrows (i.e. stable versus potentially changing conditions).

AEP will continue to monitor this area as part of its Dam Inspection and Maintenance Program (DIMP). Monthly inspections of the facility are performed by Plant personnel

and AEP Engineering Services conducts an annual inspection. If rodent holes are noted during the inspections, repairs will be performed.

4.7 Bottom Ash Pond East Dike Tree and Stump Removal

As discussed in Section 2.2.1.2 – East Dike, there are a few tree stumps along the toe of the east dike. AEP personnel did not know when these trees were cut or why the bench with the access road was apparently constructed around them. These stumps should be monitored for decay and the stumps and associated root balls removed under the direction of a professional engineer.

Several small diameter trees were observed at the water line around the pond. These trees have been allowed to grow despite routine mowing efforts. CHA recommends that these trees be cut and the root mass be left in place for trees less than 5 inches in diameter. Trees equal to or larger than 5 inches in diameter should have the root masses removed under the direction of a professional engineer.

After the US EPA inspection, the drawings were reviewed and it was determined that the access road along the east dike was constructed after the initial dike was built. Therefore, the remaining stumps are in a portion of fill that is not part of the original embankment. However, AEP will monitor the stump decay as part of the DIMP. In addition, AEP will cut the trees along the water line of the pond as recommended above. This work will be completed by November 2010.

4.8 Bottom Ash Pond North Dike Runoff from Flushing the Conveyor

Previous inspection reports indicated that there was an area at the northeast corner where runoff from flushing dust from the coal conveyor was resulting in an erosion gully on the downstream slope. A concrete pad and knee wall was placed under the coal conveyor at this location to minimize the impact of routine cleaning of the coal conveyor on the dike. There are other areas along the conveyor at which coal dust runs out of the conveyor during this process. We recommend that best management practices be utilized during flushing operations to minimize erosion of the embankment.

AEP follows the best management practices during the flushing operations of the coal conveyor as part of its environmental program. If any new erosion areas are noted during the routine inspections, the eroded areas will be repaired and stabilized.

4.9 Stingy Run Dam Hydraulic Analysis

We recommend that in the event of a major storm event that raises the pool elevation, AEP closely monitor the behavior of the structure. First filling of a dam is a sensitive time because of changes in stress on the earthen embankment. Because the normal pool and design flood storage elevations are significantly different, it is our opinion that storm events that cause the reservoir elevation to rise should be considered as first filling events and the appropriate level of observation be taken to ensure that the dam is not exhibiting signs of internal erosion, piping and/or other concerns as a result of the surcharge pool.

As part of the DIMP, increased monitoring is required during and following major storm events. The increased monitoring includes visual inspections of the dam and appurtenances to assure the dam is not exhibiting signs of distress, internal erosion, piping and/or other concerns that could impact the integrity of the facility. The increased monitoring includes addition readings of the piezometers and weirs at the outfall and seepage locations.

4.10 Recommendations for Additional Stability Analyses – Bottom Ash Pond

Based on our review of available information for the Bottom Ash Pond we recommend that the following tasks be performed to confirm that the embankments are indeed stable under the various loading conditions outlined in Section 3.3.

- We recommend that an investigation be performed in which the properties of the alluvium silt/clay layer can be investigated in more detail in order to determine the presence and thickness of the soft layer of material indicated in the boring logs from June 2009. This scope of work should include additional laboratory testing of samples retrieved from the alluvium layer. (AEP disagrees with this recommendation, see comment 1 on Section 4.11 (page 3 of 5) received from AEP on August 18, 2009)

- We recommend that additional borings be performed to provide better areal coverage of the dikes and the potential soft alluvium layer. This layer appears, from the borings already performed, to vary in elevation and thickness. While at the elevation encountered under the south dike this layer does not create a critical surface, at a higher elevation, and potentially revised design strength, we suggest that this layer may produce a critical surface. (AEP disagrees with this recommendation, see comment 1 on Section 4.11 (page 3 of 5) received from AEP on August 18, 2009)

- CHA modeled the upstream slope using the south embankment geometry and the steady state loading condition and the soil parameter provided in the June 2009 report. The calculated factor of safety was 1.3 which is below the minimum required factor of safety (according to the USACOE). We recommend that a model be prepared for this load case using the soil parameters for the soft alluvium layer described above. AEP indicated in review comments on the Draft version of this report that their consultant has confirmed that regrading the upstream slopes to design grades will result in a factor of safety of at least 1.5 using the soil parameters summarized in Table 4.

- The rapid-draw load case was not evaluated as part of the June 2009 investigation. CHA performed a preliminary analysis of the south embankment slope which indicated that the calculated factor of safety for the rapid draw-down load condition is close to 1.0, which is the minimum required value (according to the USACOE). We recommend that a model be prepared for this load case. While a rapid drawdown is not a scenario that has a high probability of occurrence, CHA recommends understanding the condition and meeting recommended stability factors of safety for the unlikely event that water must be evacuated rapidly via methods other than the existing outlet control structures such as pumping to prevent a more catastrophic release should an emergency condition develop in the embankment. (AEP disagrees with this recommendation, see comment 5 on Section 4.11 (page 3 of 5) received from AEP on August 18, 2009)

1) *During the recent subsurface investigation and analysis, efforts were made to obtained undisturbed samples of the soft foundation materials. Acceptable samples could not be obtained; therefore, the consultant tested the disturbed samples to select strength parameters based on the Index properties. The selected strength of 30 degrees is based on the mode value based on the table presented in the report. Subsequently, the consultant also performed a back-analysis of the Section B to determine at what shear strength (of the weak alluvium) would the factor of safety*

drop below 1.5. That analysis indicates that a shear strength value below 26.5 degrees is required. Therefore, AEP believes the selected parameter is representative of the weaker foundation material. However, in the spirit of cooperation with the US EPA assessment program, AEP will perform additional field work, laboratory testing and engineering analysis as suggested in the first two bullets of the recommendation. This additional work will be completed by December 31, 2010.

2) *The above (1) plan addresses the second bullet item to determine the areal extent of the potential softer alluvium foundation materials.*
3) *AEP concurs that the inboard slopes should be reshaped to the original design configurations. The consultant has confirmed that regrading will improve the factory of safety to at least 1.5. Please see the action plan for this work as defined in reply to 4.3*
4) *Due to the fixed operations of the facility and physical design of the discharge tower, a rapid drawdown condition cannot be developed at this facility. However, as part of the work outlined herein, a rapid drawdown scenario will be developed and analyzed.*

4.11 Stingy Run Dam Recommendations for Additional Stability Analyses

Based on our review of available information for the Stingy Run Dam we recommend that the following tasks be performed to confirm that the embankments are indeed stable under the various loading conditions outlined in Section 3.3.

- CHA recommends that AEP confirm that the Upper Sand and Lower Sand strata do not pose a liquefaction risk at this site.
- Although previously designed for a higher operating pool, the Stingy Run Dam has not been subjected to these higher levels. Because "first filling" is a critical time for embankment dams, CHA recommends a maximum surcharge stability evaluation be performed for the current conditions. (AEP disagrees with this recommendation, see comment 2 on Section 4.12 (page 4 of 5) received from AEP on August 18, 2009)

- CHA recommends a rapid drawdown analysis be performed for the current conditions. While a rapid drawdown is not a scenario that has a high probability of occurrence, CHA recommends understanding the condition and meeting recommended stability factors of safety for the unlikely event that water must be evacuated rapidly via methods other than the existing outlet control structures such as pumping to prevent a more catastrophic release should an emergency condition develop in the embankment. (AEP disagrees with this recommendation. See comment 3 on Section 4.12 (page 4 of 5) received from AEP on August 18, 2009.)

1. *AEP will evaluate the foundation materials to determine if they are susceptible to liquefaction. This work may require additional field and laboratory support as well as engineering evaluation. AEP will complete this work by December 31, 2010.*
2. *The pool level has remained fairly constant at elevation 696 since September 1993. As part of the engineering for the 735 Dam Raising, the facility was analyzed for steady state conditions for a maximum operating pool elevation of 726. At the time of the design, the surcharge for the PMF was estimated to raise the pool elevation by 5 feet (elevation 731). Under the current operating elevation at 696, the flood surcharge from the PMF will raise the pool elevation by approximately 15 feet or elevation 711 as determined by a previous analysis. This temporary condition will not pose a greater risk to the structure than the steady state condition analyzed at the higher pool elevation of 726 for the design of the raised facility, which resulted in factor of safety greater than 1.5. However, for completeness and in the spirit of cooperation with the US EPA assessment program, AEP will perform the stability analyses. This work will be performed in conjunction with the stability analyses that will be undertaken for the bottom ash pond complex and will be completed by December 31, 2010*
3. *Rapid drawdown is defined in the USACOE EM 1110-2-1902, 31 Oct 03, as a condition when the "Embankment may become saturated by seepage during a prolonged high reservoir stage. If subsequently the reservoir pool is drawn down faster than the pore pressure can escape, excess pore pressures and reduced stability will result." AEP agrees that there is a relatively deep pool of water around the discharge tower that contains low suspended solids. However, there is no low level drain for the facility that will allow a rapid draw down of the water. To lower the pool level at this facility, stop logs must be removed from the discharge tower one at a time. AEP has performed this work at some other facilities for partial drawdown, when needed to perform repairs to the decanting structure, without upsetting environmental limits imposed by NPDES permits. The work effort takes about 4 hours to remove the initial stop log (generally a height of about 6 inches, but it could be in the range of 4 to 8 inches) and a full day to remove the second stop log, due to the flow depth over weir. Two stoplogs are the maximum number that are removed at a time because it is not possible or safe to remove any more stoplogs until the pool level recedes to the level of the stoplog. This time period is about 2 days to drop the reservoir level by about 12 to 16 inches, depending on the size of the individual stoplog. General practice considers an acceptable rate to lower a reservoir to be usually 12 inches over a 24-hour period. Due to safety and operational constrains, AEP can only drop the reservoir at a rate that is not considered a rapid drawdown condition. However, for completeness and in the spirit of cooperation with the US EPA assessment program, AEP will perform the stability analyses. This work will be performed in conjunction with the stability analyses that will be undertaken for the bottom ash pond complex and will be completed by December 31, 2010.*

4.12 Stingy Run Dam Outlet Structure Access

The access stairs and floating bridge to the Stingy Run outlet tower were barricaded in 2008 by AEP because of advanced deterioration. We recommend that the access to the tower be repaired so continued monitoring of the condition of the outlet structure can be made during the routine inspections.

AEP concurs that access to the tower needs to be repaired so continued monitoring and inspection of the outlet structure can be performed. The repairs will be completed by November 2010.

4.13 Stingy Run Dam Destroyed Instrumentation

We recommend AEP evaluate the need for and/or replace instrumentation that has been destroyed at the Stingy Run Dam. We understand that mower damage and vandals have been a problem at this site. Additional protection may be needed at the instrument locations to protect against this damage.

AEP Engineering Services will re-evaluate all of the existing instrumentation related to the Stingy Run Fly Ash Dam. That evaluation may conclude that there is a need to maintain instruments that have been damaged. If so, the particular instrument will be repaired or replaced. The evaluation may conclude that some instrumentation is no longer necessary. If so, the respective instrumentation will be properly abandoned and noted on the inspection location plan. This work will be discussed and coordinated with the Ohio Department of Natural Resources, Dam Safety Section. AEP will complete this work by December 31, 2010.