Report of Phase 1 Facility Assessment

Coal Combustion Product Impoundments and Disposal Facilities
Various Locations, Tennessee

Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

June 24, 2009

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June 24, 2009

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Re: Report of Phase 1 Facility Assessment
Coal Combustion Product
Impoundments and Disposal Facilities
Various Locations, Tennessee

Dear Mr. Kammeyer:

Stantec Consulting Services Inc. (Stantec) is pleased to provide this report of Phase 1 facility assessments for the Coal Combustion Product (CCP) impoundments and disposal facilities. This report summarizes our Phase 1 activities at TVA's fossil plants in Tennessee. It also includes our recommendations for Phase 2 studies, engineering designs, maintenance and other activities at TVA's CCP disposal facilities.

Stantec appreciates the opportunity to provide TVA with these engineering and dam safety services. We hope the information contained in this report assists you and the Fossil Power Group with future planning and operational decisions. Please call us if you have questions.

Sincerely,

STANTEC CONSULTING SERVICES INC.

John S. Montgomery, PE
Senior Principal

Stephen H. Bickel, PE
Senior Principal

/ddb

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Table of Contents

Section **Page No.**

1. Introduction 1
1.1. Purpose of Disposal Facility Assessments 1
1.2. TVA Fossil Plants and Facilities Assessed 1
1.3. Scope of Services and Limitations 3
1.3.1. Phase 1a Tasks 3
1.3.2. Phase 1b Tasks 4
1.3.3. Future Scope Phases 4
1.3.4. Report Organization 5

2. Phase 1 Observations and Findings 5
2.1. Document and Records Review 5
2.2. Field Observations 6
2.3. Notable Findings 7
2.3.1. Limited Record Drawings and Construction Testing/Observation Records 7
2.3.2. Construction of Stacks over Ash Ponds and the Operation of Fly Ash Dredge Cells 7
2.3.3. Tall, Unsupported Weir Structures 8
2.3.4. Conduit and Weir Abandonment Procedures 8
2.3.5. Maintenance 8
2.3.6. Limited Operation and Maintenance Manuals (OM) and Emergency Action Plans (EAP) 8
2.3.7. Limited Geotechnical Instrumentation 8

3. Phase 1 Conclusions and Recommendations 9

4. Phase 2 Scheduling 12

List of Tables

Table **Page No.**

Table 1. Summary of Fossil Plants and Facilities Assessed 2

List of Figures

Figure **Page No.**

Figure 1. TVA Fossil Plants Located in Tennessee 3

List of Appendixes

Appendix

Appendix A Tables A.1 and A.2
Appendix B Allen Fossil Plant
Appendix C Bull Run Fossil Plant
Appendix D Cumberland Fossil Plant
Appendix E Gallatin Fossil Plant
Appendix F John Sevier Fossil Plant
Appendix G Johnsonville Fossil Plant
Appendix H Kingston Fossil Plant
Appendix I Watts Bar Fossil Plant

Report of Phase 1 Facility Assessment

Coal Combustion Product Impoundments and Disposal Facilities Various Locations, Tennessee

1. Introduction

1.1. Purpose of Disposal Facility Assessments

The Tennessee Valley Authority (TVA) has requested that Stantec Consulting Services Inc. (Stantec) perform Phase 1 assessments of coal combustion product (CCP) impoundments and disposal facilities at eleven active fossil plants and at one closed fossil plant. These facilities are located in the states of Kentucky, Tennessee and Alabama.

This report presents the results of the assessments for the eight plants located in Tennessee. The purpose of this first phase is to:

- Identify conditions that may affect the stability and functionality of the facilities reviewed.
- Determine the need for short term corrective actions and further Phase 2 engineering evaluations.
- Prioritize and schedule disposal facilities for future Phase 2 engineering evaluations.

1.2. TVA Fossil Plants and Facilities Assessed

TVA's Fossil Power Group currently operates seven coal-fired electric generating plants that are located in the state of Tennessee. Also located in Tennessee is TVA's only inactive, or closed, coal-fired plant; Watts Bar. The active plants contain a total of 33 separate coal-fired generation units with a combined capacity of approximately 9,600 MW. In the process of burning coal, the seven active plants produce, on an annual basis, approximately 1,375,000 tons of fly ash, 450,000 tons of bottom ash and boiler slag, and 1,100,000 tons of gypsum.

Although some of these CCP's are recycled for a variety of beneficial uses, the plants must operate various types of impoundments and disposal facilities in order to properly handle, manage, and dispose of CCP's. These facilities generally include: ash ponds, dredge cells, dry ash or gypsum stacks, and wet gypsum stacks. While the majority of the disposal facilities are actively receiving CCP's, some are closed or inactive. Table 1 includes a summary of the plants and the associated disposal facilities that were assessed in this Phase 1 study. Following Table 1, is a map that depicts the locations of TVA's coal-fired plants in Tennessee.

Table 1. Summary of Fossil Plants and Facilities Assessed

Fossil Plant	City, State	Year Construction Began	Observed Facilities
Allen (ALF)	Memphis, TN	1956	East Ash Pond and Dredge Cell East Ash Stilling Pond West Ash Pond
Bull Run (BRF)	Clinton, TN	1962	Bottom Ash Disposal Area 1 Gypsum Disposal Area 2A Fly Ash Pond/Stilling Pond Area 2 East/West Dredge Cell Dry Fly Ash Stack Dry Fly Ash Stack Sediment Pond
Cumberland (CUF)	Cumberland City, TN	1968	Gypsum Storage Area Ash Pond Dry Ash Stack
Gallatin (GAF)	Gallatin, TN	1953	Bottom Ash Pond A Fly Ash Pond E Stilling Ponds B,C and D Closed Disposal Area
John Sevier (JSF)	Rogersville, TN	1952	Dry Fly Ash Disposal Area Sediment Pond West (Former Stilling Pond) Bottom Ash Disposal Area 2 Ash Disposal Area J Sediment Pond East
Johnsonville (JOF)	New Johnsonville, TN	1949	Active Ash Disposal Areas 2 & 3 South Railroad Loop Ash Disposal Area 4 Ash Dredge Pond East of Gas Turbines Area 5 North Abandoned Ash Disposal Area 1
Kingston (KIF)	Kingston, TN	1951	Ash Pond Stilling Pond Peninsula Gypsum Pond
Watts Bar (WBF) (Closed Plant)	Spring City, TN	1940	Slag Disposal Area Ash Pond / Stilling Pond

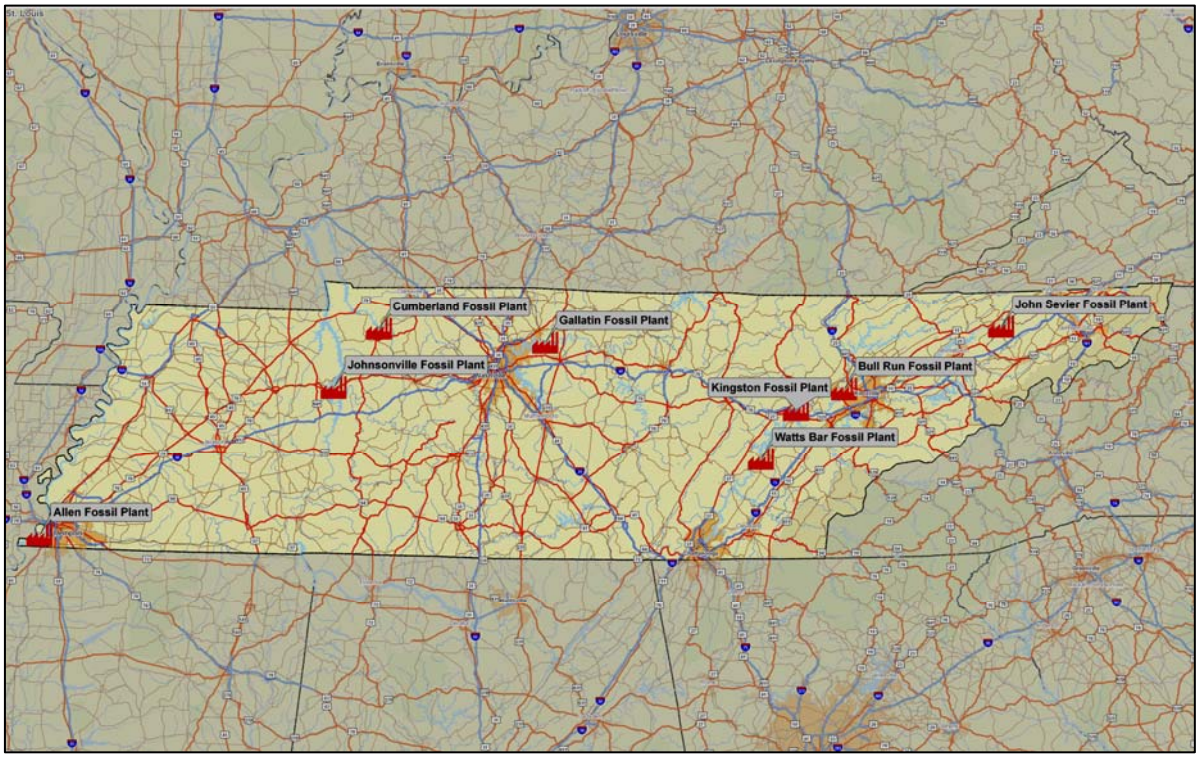

Figure 1. TVA Fossil Plants Located in Tennessee

1.3. Scope of Services and Limitations

Stantec's scope of services for the Phase 1 assessment was divided into two sub-phases; Phase 1a and Phase 1b. This report presents the results of both phases. It is important to understand that Phase 1 is judgment-based, non-invasive, and limited to features and concerns that have been observed in the field or discovered in reviews of historical documents. Phase 1 does not constitute a complete engineering evaluation of the facilities reviewed. The following paragraphs describe the specific tasks performed for each phase.

1.3.1. Phase 1a Tasks

Tasks performed for Phase 1a included:

- Review of most recent TVA Dike Stability Inspection Report for each plant.
- Visits to fossil plants by Stantec assessment teams to interview plant personnel and to perform initial walk-over of disposal facilities and ponds. Photographs and field notes were taken. The assessment teams consisted of two engineers; one of which was a licensed professional engineer (PE) with experience in dam design and dam safety.

The Phase 1a work was completed in one week and the results used to identify those facilities that potentially represented the most risk from a structural perspective. These observations were also used to provide TVA with preliminary recommendations for initiating

geotechnical explorations and short term improvements at those facilities, prior to completion of the Phase 1 scope. The information gathered during Phase 1a was presented to TVA during a meeting held in their Chattanooga office on January 20, 2009.

1.3.2. Phase 1b Tasks

Tasks performed for Phase 1b included:

- Review of documents and records provided by TVA. TVA provided Stantec with electronic copies of reports, drawings, data, memorandums, etc., pertinent to the characterization, design, construction, operation, and maintenance of its CCP disposal facilities and other ponds. Stantec engineers also visited TVA's Chattanooga office to review documents compiled by TVA and to assist TVA with prioritizing the copying/scanning process.

- Further site reconnaissance of disposal facilities and ponds by Stantec assessment teams including measurement of embankment slopes and crest widths, freeboard, extent of observed seepage, and slope instabilities. The teams again interviewed plant personnel to gain additional information, and recorded observations/measurements using a dam safety inspection checklist customized for the types of CCP management units encountered. Additional follow-up visits were also made to some plants, as conditions warranted.

- At the completion of field efforts and document review, the Stantec teams prepared facility assessment forms, assembled photographs, and prepared aerial photograph exhibits to present the results. These assessment forms also contain recommendations for Phase 2 engineering activities and for maintenance items. This information is included in the appendices of this report, with a separate appendix for each plant.

- Based on the field observations and records review, Stantec assisted TVA with prioritizing the disposal facilities for Phase 2 explorations and analyses.

- Communications with TVA throughout the Phase 1 efforts included submittal of weekly status reports and attendance at bi-weekly progress meetings in Chattanooga.

1.3.3. Future Scope Phases

Future phases for continuation of facility assessments, repairs, and CCP management will include the following:

Phase 2 – As a result of Phase 1 assessments, Phase 2 engineering work scopes will be developed and executed. Phase 2 engineering evaluations will include initial recommendations/designs for temporary corrective measures, geotechnical explorations, hydraulic and hydrologic evaluations, conceptual designs for improvements, and general engineering support. Rather than delay action until the completion of Phase 1 activities, TVA proactively initiated Phase 2 work for selected structures that have been identified as having primary concerns. These include: Johnsonville Ash Disposal Areas 2 and 3 (Active Ash Disposal Area West of Harbor) - due to inadequate freeboard, observed seepage, steep slopes, and tall, unsupported weir spillways with history of sinkholes; Cumberland Dry Ash

Stack and Gypsum Disposal Area - due to these facilities being active stacks operated over an ash pond; John Sevier Ash Disposal Area and Pond 2 - due to previously reported stability issues and it being an active stack operated over an ash pond; and Bull Run - due to an active stack operated over an ash pond.

Phase 3 – Phase 3 work will include a variety of engineering tasks including planning assistance for short and long term CCP management, final design of conceptual repairs as identified in Phase 2, preparation of construction plans/specifications, cost opinions, and permitting assistance. No scopes have been developed for Phase 3 work at this time.

Phase 4 – This phase will involve assisting TVA with improving its dam safety program within the fossil power group, dam safety training for appropriate TVA CCP staff, and annual facility inspections. This work has been initiated in parallel with Phase 1.

1.3.4. Report Organization

The remainder of this report is organized as follows: Section 2 describes the observations and findings of the document review and site reconnaissance tasks; Section 3 presents the conclusions and recommendations; and Section 4 discusses Phase 2 scheduling and prioritization.

The report includes one appendix for each fossil plant located in the state of Tennessee. Each plant's appendix contains the following:

- Phase 1 CCP Disposal Facility Summary Form for each individual facility reviewed. This form contains pertinent information relative to the Phase 1 assessments, lists noted observations, and offers recommendations for both maintenance and Phase 2 evaluations.
- Photographs and photo log for each facility reviewed.
- Aerial photographs illustrating the plant and facility general layout.
- Log of reviewed TVA documents.

2. Phase 1 Observations and Findings

2.1. Document and Records Review

TVA provided Stantec with electronic copies of reports, drawings, data, and correspondence, etc.; pertinent to the history, characterization, design, construction, operation, maintenance, and closure of its CCP disposal facilities at the Tennessee fossil plants included in this work scope. Stantec engineers also visited TVA's Chattanooga office to review documents compiled by TVA and to assist them with prioritizing the copying/scanning process. Review of this information helped Stantec understand the history, construction methods, design, operation, and maintenance practices of the CCP facilities and ponds. Over 8,000 documents were provided by TVA. The following sections describe in general terms, the available information and highlight a few notable findings and trends.

With construction of TVA's fossil plants in Tennessee having begun in the 1940's, the CCP impoundments and disposal facilities have undergone a continual process of new construction, expansion, rehabilitation, repair, modification, and closure (for the older or initial disposal facilities). The TVA-provided documentation of these efforts varies in terms of quantity and detail. Original construction documents for the older facilities are sparse or often were not located during this effort. For newer facilities, the trend of documentation seemed to become more common with increasing detail.

The following list summarizes the general types of documentation provided by TVA. It is not intended to be a comprehensive list, but rather to convey the general categories of the various types of documents that TVA provided.

- Annual inspection reports on dike stability and seepage inspection.
- Quarterly inspection reports of ash pond dikes and toe areas for seepage.
- Geotechnical reports, geologic reports, geophysical reports, geotechnical data, laboratory testing data, and stability analyses.
- Design and construction drawings.
- Design, feasibility, CCP management reports.
- Permit documents.
- Design calculations.
- Aerial photography.
- Various other correspondence and documentation (sketches, e-mails, letters, contractor work orders, meeting notes, etc.).
- Water quality testing data.

A complete list of documents provided by TVA is presented within each plant's appendix.

In addition to document review, Stantec assessment teams also conducted interviews with plant personnel during site visits and in subsequent meetings/phone discussions to gain additional historical information regarding plants and CCP disposal facilities.

2.2. Field Observations

For Phase 1 field observations, Stantec assembled six assessment teams. Teams consisted of at least two engineers; one of which was a licensed professional engineer with experience in dam design, dam safety, and geotechnical engineering. The licensed engineer assumed the role as team lead. Teams often provided field and/or office assistance to one another, depending on work loads, schedules and project needs.

As described previously, Phase 1a field observations consisted of on-site interviews with TVA plant personnel followed by initial facility walk-over's. Photographs and field notes were taken. The intent of the initial facility walk-over was specifically to look for visible or obvious

signs of distress or concerns that may require short term corrective action and to prioritize initial Phase 2 activities. Items of primary concern included: active seepage areas and their appearance and flow conditions, evidence of slope instability (cracking, sloughing, hummocky ground surface), sinkholes and depressions, insufficient freeboard, steepness and height of dike slopes, and condition/adequacy of spillways and pipes through dikes. If time permitted during initial walk-over's, items considered to be of a maintenance nature were also noted, such as erosion, sparse or lack of vegetation, trees on dike slopes, animal burrows, and standing water/poor drainage. Phase 1a field assessments were performed the week of January 12 - 16, 2009.

Return visits to the plants were made at various times during the remainder of January and through February, 2009 for Phase 1b field observations. These site visits were made after Stantec had reviewed historical documents provided by TVA, which allowed the teams to become more familiar with facility history and TVA practices prior to returning. The Phase 1b field activities consisted of further discussions with plant personnel to gain additional information relative to the history, maintenance, operations, and issues of each facility. Further site reconnaissance of disposal facilities and ponds was then conducted, which included limited measurements of embankment slopes, crest widths and freeboard; and further noted the extent of seepage, slope instability, erosion, sparse vegetation, trees, animal burrows, poor surface drainage, and other relevant features. Measurements and observations were then recorded using dam safety checklists customized for CCP impoundments and disposal facilities.

2.3. Notable Findings

Certain findings and trends were directly useful in helping Stantec to understand TVA's system-wide historical CCP disposal philosophies and practices. Some notable system-wide concerns gleaned from Stantec's historical research and document review are described below:

2.3.1. Limited Record Drawings and Construction Testing/Observation Records

Stantec found relatively few as-built construction records or construction testing records for the disposal facilities. These records are important to illustrate how facilities were actually constructed, compliance with project plans and specifications, and to show adjustments that may have been necessary to deal with changes or unexpected conditions that may differ from the original plans.

2.3.2. Construction of Stacks over Ash Ponds and the Operation of Fly Ash Dredge Cells

Hydraulically-placed fly ash in ponds and dredge cells is generally very soft in terms of consistency and loose in terms of density, porosity and void ratio. This condition can sometimes result in significant and sudden loss of shear strength within the sluiced ash at low strains due to embankment loading. TVA has several active facilities that have been constructed over ash ponds. These include the gypsum stacks at the Cumberland and Bull Run plants and dry ash stacks at Cumberland, John Sevier and Bull Run. Operating CCP disposal facilities on top of ash that has been sluiced into ponds, is a common practice in the industry. While this practice represents greater risk than constructing over natural earth materials, the risk is typically managed by ensuring appropriate geotechnical analyses have been completed to support design and operation, and that operation includes instrumentation

to monitor pore pressures, settlement and slope movement. Load rates must also be controlled to minimize the build-up of excess pore pressures.

There were no active permanent ash dredge cells observed at any of the plants. Ash dredging and temporary stockpiling is occurring within the ponds at the Johnsonville and Allen plants. However, once dewatered, the stockpiles are excavated and materials transported off-site for permanent disposal in landfills.

2.3.3. Tall, Unsupported Weir Structures

A number of the facilities have weir structures that are tall and unsupported. System-wide, weir structures are typically vertical, push-together, reinforced concrete pipe or manhole sections. This type of weir system presents a concern from the standpoint of developing leaking joints and leaning. In addition, outlet pipes from the weir structures are constructed of reinforced concrete culvert pipe. This type of pipe does not employ a restrained joint system and is also susceptible to developing leaking joints. Some past inspection reports have documented these problems.

2.3.4. Conduit and Weir Abandonment Procedures

As various disposal facilities have been raised in the past to increase CCP storage capacity, process water conduits and weirs have been abandoned in place. Apparently, the abandonment procedures have varied from site to site over the years and are not documented. Improper abandonment can lead to internal piping and loss of materials through joint separation in the conduits.

2.3.5. Maintenance

Annual dike inspection reports appear to be adequate in identifying items for maintenance, but there is a trend of not executing all of the maintenance recommendations provided in these reports. In many instances, the same maintenance recommendations were made repeatedly in the annual reports from year to year. Tree and other vegetation removal from dikes and surface drainage ditches is an example of one of the typical recurring items.

2.3.6. Limited Operation and Maintenance Manuals (OM) and Emergency Action Plans (EAP)

During the historical research/document review phase, Stantec found a general lack of Emergency Action Plans (EAP) for the disposal facilities. These items are important for the safe operation of a dam/impoundment, and for the protection of downstream communities, as well as plant personnel.

2.3.7. Limited Geotechnical Instrumentation

Dam safety management of significant impoundments should include an instrumentation program to monitor performance and condition changes during operation of the facility. In general, instrumentation may consist of piezometers to monitor pore pressures within embankments and foundations, slope inclinometers and surface monuments to monitor movement, and plates for monitoring settlement. The type of instrumentation installed will depend on the type and function of the facility and design/operation concerns. Limited

geotechnical instrumentation was observed at a majority of the facilities during Phase 1 reviews and the presence of a program to routinely obtain measurements was not witnessed.

Facility specific findings are presented in each appendix.

3. Phase 1 Conclusions and Recommendations

3.1 Due to limited record drawings and construction QA/QC documentation at any of the facilities, Stantec is unable to render opinions relative to overall structural integrity. Therefore, Stantec recommends that all significant impounding facilities be subjected to a Phase 2 engineering evaluation. For the purposes of this recommendation, the term "significant impoundment" is defined as a surface impoundment having been created by a dike or dam having a height of 25 feet or taller, or an impounding capacity of 50 acre-feet or greater. The facilities meeting these conditions are identified in Table A.1 of Appendix A. These facilities generally include all ash ponds, wet stacks, and gypsum stacks. In some instances, additional surveys will have to be performed to confirm the size of the facility relative to the criteria stated herein.

The Phase 2 evaluations should include a geotechnical exploration and hydrologic/hydraulic assessment. The geotechnical exploration scope should include field explorations, laboratory testing, and engineering analysis. Field explorations should include drilling soil borings to characterize subsurface conditions and obtain samples for laboratory testing. Both conventional and cone penetration methods may be needed depending on the data required and subsurface conditions anticipated. Field CCP and soil sampling should consist of standard penetration testing (ASTM D 1586), thin-walled Shelby tube (ASTM D 1587) sampling and grab bulk samples. Drilling should be supervised by a geotechnical engineer or geologist.

Cone penetration testing may be useful at some sites. Data collected will include tip resistance, skin resistance and pore pressure dissipation.

Instrumentation should be installed as needed to characterize subsurface conditions and measure performance. Piezometers should be installed to record phreatic conditions and pore pressure conditions. Piezometers should generally be installed using conventional drilling methods and will consist of slotted PVC screens and tubing, 1-inch diameter or greater. Zones selected for monitoring should be based on field conditions encountered. Slope inclinometer casing should be installed using conventional drilling methods where current ground movement is suspected, loading is increasing over hydraulically placed fly ash, or where it is desirable to monitor conditions in the future.

Laboratory testing should be performed in accordance with ASTM standards. Testing should include engineering classification (ASTM D 422, D 4318 and D 854), natural moisture content (ASTM D 2216), triaxial compression (ASTM D 2850 and D 4767), permeability (ASTM D 5084), unit weight determination, moisture/density relationship (ASTM D 698), and unconfined compression (ASTM D 2166) tests.

Geotechnical engineering analysis should include slope stability and seepage calculations. The calculations should be performed using recognized industry methods and software packages such as Geo-Slope, Slope-W and Seep W. For facilities that will be raised in the future, the engineering analysis should include a time rate of construction and pore pressure dissipation analysis.

Hydraulic and hydrologic analysis should include characterization of process flow rates, hydrographic surveys and storm routings to evaluate freeboard. Criteria used to evaluate freeboard should generally follow federal dam safety guidelines as appropriate.

3.2 During Phase 2, it is recommended that TVA review and update the dam safety hazard classification of each impoundment. Hazard classifications should be assigned in accordance with appropriate state and federal dam safety guidelines and should consider the size, design characteristics and consequences of failure. Further, based upon updated hazard classification, appropriate design criteria for proposed modifications and improvements should be determined.

3.3 Hydraulically placed fly ash represents significantly increased operational hazards due to the erodibility and liquefaction potential of saturated ash. In general, fly ash would be characterized as a low-strength, erodible silt and easily susceptible to piping, erosion, and liquefaction. Therefore, Stantec recommends that all dry and wet stacks operating on top of ash ponds be subjected to Phase 2 geotechnical explorations as described in Paragraph 3.1. Facilities meeting this are identified in Table A.1 of Appendix A.

3.4 In general, the outlet weir structures serving CCP impoundments are constructed of stacked concrete manhole or pipe sections. These tall, unsupported weir structures represent a risk from the standpoint of unplanned joint separation, resulting in uncontrolled releases and potential loss of pool. During routine management of the pond, such as making pool adjustments or ash dredging, it is possible to inadvertently dislodge the weir structure below the pool level. Therefore, Stantec recommends that these weir structures and outlet pipes be retrofitted or prioritized, inspected, and replaced as necessary, with a more reliable structure for pool level regulation.

3.5 Stantec recommends that TVA assemble the “best available” record drawings for each facility. This may require field surveys to confirm location, size and orientation of structures, and ancillary features. In addition, it is recommended that TVA implement a program to ensure record drawings are maintained for each facility. Modifications, expansions and improvements should be properly noted and identified with dates. Record drawings should reflect field conformance surveys of all constructed items including excavations, embankments and structures.

Further, TVA should require and retain construction quality assurance/quality control (QA/QC) plans, specifications, and documentation for all significant improvement or modification projects. QA/QC plans should address material specifications, construction execution, and QA/QC documentation.

3.6 As various disposal facilities have been raised or operated in the past, process water conduits and weirs have been abandoned in place. Based on Stantec’s

observations and review, abandonment procedures have varied over the years and also from site to site. Stantec understands that at times, these procedures have been inadequate and have led to uncontrolled releases. Therefore, Stantec recommends that Phase 2 explorations include an inventory of existing and abandoned conduits, and assessments of the abandonment procedures employed. This review should result in action plans to properly remediate these features. In general, abandoned conduits should be grouted full or removed.

3.7 Based on observations during the Phase 1 reconnaissance, Stantec developed recommendations for short term improvements at various facilities. These improvements include installing seepage collection systems; regrading slopes; abandoning conduits/spillways; installing stability buttresses and berms; and lowering pool elevations. At the time of this report, TVA is aggressively addressing these recommendations and many of the proposed improvements are complete. Table A.2 of Appendix A summarizes these recommendations and current status/schedule for implementation. By implementing these recommendations, TVA has improved the integrity of its facilities.

3.8 TVA performs annual inspections of its CCP impoundments and disposal facilities. However, based on Stantec observations, there does not appear to be a system in place that tracks recommendations and ensures issues are addressed in a timely manner. In addition, there are inconsistency in inspections and reporting depending on staff assigned and level of understanding of dam safety operations.

Therefore, Stantec recommends TVA review its current dam safety program and include the appropriate elements within its CCP facility management program. The program should address all organizational elements responsible for planning, design, construction, operation, maintenance and regulation of facility impoundments. The program should address on-going training of staff in appropriate dam safety inspection and management procedures.

3.9 Currently, TVA maintains operations manuals for CCP's at each of its plants. In general, these plans address: key dates, CCP handling contracts, construction planning, design drawings, permit requirements, survey data, management procedures, emergency contacts lists, work packages, capital projects and marketing. At the conclusion of future phases of work, as appropriate, it is recommended that these operation manuals be reviewed and updated to address dam safety and maintenance aspects. Additional topics or sections to be added may include dam safety inspection requirements, instrumentation monitoring, management of QA/QC documentation and record drawings, routine maintenance activities, TVA staff responsibilities, and reporting.

3.10 It is recommended that TVA develop Emergency Action Plans for all impoundments determined to be "High Hazard from a dam safety perspective." Emergency Action Plans should consider the following elements: Notification Flowchart; Responsibilities; Preparedness; and where applicable, Inundation Maps. Emergency Action Plans should be patterned after the "Federal Guidelines for Dam Safety," as appropriate.

3.11 Stantec observed woody vegetation and trees growing on embankment slopes at many of TVA's CCP impoundments. Tree roots can penetrate embankments,

creating preferential flow paths. Excessive vegetation can prevent visual observation and review of dike surfaces and provide cover and habitat for burrowing animals. In some cases, vegetation inhibited review of field conditions during Phase 1. It is recommended that all trees and excessive vegetation be removed from embankments slopes and crests. Roots larger than 2-inches in diameter should be removed and the resulting rootwad cavity be backfilled with cohesive soil and compacted. Depending on the size of tree removed, benching may be needed to achieve proper backfill and compaction. It is further recommended that removal of rootwads and subsequent treatment be performed under the direction of a geotechnical engineer. Debris should be removed and disposed of away from dam embankments.

Areas previously inaccessible due to vegetation cover should be reviewed following tree and brush removal and the Phase 1 recommendations modified as appropriate.

Further, it is recommended that TVA increase the frequency of mowing and other vegetation removal activities at the CCP facilities so that dikes, slopes, ponds, shorelines, and drainage channels are kept clear of vegetation and trees. This will improve the ability of plant personnel and others to visually assess the conditions of disposal and impounding facilities.

3.12 Stantec observed conditions requiring further maintenance. These observations generally consisted of surface erosion, animal burrows, and absence of wave wash revetment. Specific instances are identified in the appendices as appropriate for each facility reviewed. Stantec recommends that TVA implement a maintenance program to address and improve these conditions. Maintenance activities that involve excavations with embankments should be performed under the direction of a geotechnical engineer.

4. Phase 2 Scheduling

Phase 2 engineering evaluations have been underway since February 2009. The goal is to complete these evaluations for the active CCP disposal impoundments and active CCP by mid-2010. The schedule for these activities is reflected in Table A.1 of Appendix A. The order in which the evaluations are being performed reflect Stantec's opinion of relative risk based on its observations of active seepage/slope stability concerns determined during Phase 1 and by issues reported to Stantec by TVA. However, depending on future findings or observations, adjustments to the order and schedules may be made.