

March 16, 2016

15-20347

Justin L. Williams  
Land Protection and Revitalization Division Director  
Virginia Department of Environmental Quality  
PO Box 1105  
629 East Main Street  
Richmond, VA 23219

**RE: RESPONSE TO DEQ TECHNICAL REVIEW COMMENTS  
DOMINION – BREMO POWER STATION SURFACE IMPOUNDMENTS SOLID WASTE  
APPLICATION (SWP 618)**

Dear Mr. Williams:

Please find herein Golder Associates Inc.'s (Golder's) responses to the technical review comments issued by the Department of Environmental Quality (DEQ) on January 22, 2016 (copy attached) relating to the Bremo Power Station's permit application for Coal Combustion Residuals (CCR) Surface Impoundment Closures. For clarity, we have repeated each DEQ comment in italics, followed by our response.

**Permit Application Fee**

1. *Based upon the modules applicable to the facility, Dominion needs to remit a permit application fee in the amount of \$5,470. This amount shall be paid by check, draft or postal money order made payable to "Treasurer of Virginia."*

Response:

The Permit Module Fee of \$5,470, made payable to "Treasurer of Virginia," has been submitted to DEQ Accounts Receivable and a copy of the check, and its transmittal letter, accompanies this submittal.

**Closure by Removal**

2. *Dominion has proposed closure by removal of the West Ash Pond and portion of the Eastern Ash Pond. The submitted closure plan includes the appropriate demonstration pursuant to 40 CFR 257 §257.100(b)(5); however, the closure by removal and closure plan must address the required standard under 9VAC20-81-370(A) in addition to the EPA rule standard.*

*Please revise the closure plan to include an appropriate protocol to take additional action to meet the requirements of 9VAC20-81-370(A). This protocol should include additional excavation beyond visible residual as well as groundwater monitoring upon removal to make the require demonstration.*



Response:

The Closure Plan has been revised to incorporate the standards from the Virginia Solid Waste Management Regulations (VSWMR) under 9VAC20-81-370.A. This discussion includes the proposed protocol for excavation beyond visible residual material, as well as demonstration groundwater monitoring. In addition, areas proposed for clean closure have been specifically identified for clarity.

**Closure Plan**

3. *Section 3.3.3 specifies a minimum transmissivity of  $5.0 \times 10^{-4}$  m<sup>2</sup>/s (permeability of 7.87 cm/s) for the 250-mil geocomposite. The specified permeability is lower than 33 cm/s used in the HELP model. Please provide a calculation to demonstrate that the specified geocomposite is adequate to prevent building up of liquid head that may cause the instability of the final cover system. The calculation should include adequate factor of safety and reduction factors.*

Response:

The calculations have been revised to demonstrate adequacy of a  $5.0 \times 10^{-4}$  m<sup>2</sup>/s transmissivity, 250-mil geocomposite. Additionally, the protective cover and vegetative support layer soil permeabilities have been modified to reflect updated borrow soils data. The borrow soils are expected to be either ML or SC soils, so default HELP model values for ML soils were conservatively selected. The revised permeabilities are listed in Table 1 of the revised calculation.

Further, as shown in the calculations, the maximum daily head on the geomembrane in the North Ash Pond is 0.185 inch, which is fully contained within the geocomposite drainage layer. The maximum daily head on the geomembrane in the East Ash Pond is 0.082 inch.

An additional calculation was performed in accordance with the methodology proposed by Richardson, Giroud, and Zhao in "Design of Lateral Drainage Systems for Landfills" (2000). This calculation demonstrates the acceptability of the proposed geocomposite drainage layer for the North and East Ash Ponds. A factor of safety of 1.5 was used, and appropriate reduction factors were taken from the referenced document. The calculation was added to the existing HELP Model calculation package in Appendix D, which has been renamed "Cap Drainage Calculations." As demonstrated by these calculations, the cap design ensures that the liquid head will not build up to unacceptable levels, and the final cover system will be stable.

4. *It is understood from the submittal that the East and North Ash Ponds do not have traditional leachate collection systems (Section 3.6 of the Closure Plan); however, there are several instances within the submittal where the term leachate is used. It is unclear from the text of the Closure Plan what is being collected (leachate or stormwater infiltration) by the toe drains along the East and North Ash Ponds and how the collected material is to be handled. Please verify and correct the following instances of the term leachate accordingly and add a discussion to Section 3.6 of the Closure Plan to address the drainage mechanism for liquid entrained within the East and North Ash Ponds (i.e. saturated ash) after closure as referenced in Section 2.3.4 of the Geotechnical Design Report found in Appendix E of the Closure Plan.*
  - *The drawings (specifically Drawing 21 and Detail 14 on Drawing 23) appear to use the term toe drain forcemain and leachate forcemain interchangeably.*
  - *Technical Specification 014516 - HDPE Pipe & Manhole Leak Test has two instances:*
    - *Section 1.03 A - "Prior to placing the leachate conveyance system into service..."*
    - *Section 3.01 A - "All new non-perforated leachate conveyance pipe..."*

- *Appendix D of the Closure Plan contains several references to leachate, when it appears those references should be to stormwater drainage due to infiltration above the geomembrane in the final cover system. See specifically:*
  - *Section 3.0 Model Inputs and Assumptions states "The geomembrane layer was modeled conservatively to generate the maximum leachate head."*
  - *The last graph of Section 4.3, titled Total Collected Drainage, shows volume of leachate over a 30 yr period. The graphed results appear to be the summation of the quantity of stormwater drainage shown for the North Ash and East Ash Ponds from the landfill cap drainage layer above the geomembrane and should not be labeled as leachate.*
  - *The table headers in the Appendix D attachments are labeled as leachate flow.*
- *The Groundwater Monitoring Plan contains two instances:*
  - *The fifth paragraph of Section 6.3 states "... purge water generated during sampling activities in the Facility's leachate collection system or by another approved means."*
  - *Appendix C, Section 6.3 states "... well development water ... subsequently transported to a POTW or the site's leachate collection system for disposal."*

Response:

References to "leachate" in the drawings, Technical Specifications, Closure Plan, and Groundwater Monitoring Plan have been revised to clarify the nature of the collected liquid. The drainage from the North and East Ash Ponds is water collected from the toe drains, which is typical embankment seepage due to the phreatic surface developed within the earthen impoundment structures.

Additional discussion explaining the functionality of the toe drains and the expected diminishing of the phreatic surface (and embankment seepage) during the post-closure period has been added to Section 3.6 of the Closure Plan.

5. *9VAC20-160.D.5.a. requires posting one sign at the entrance of the facility notifying all persons of the closing, and the prohibition against further receipt of waste materials. A sign shall be posted to identify the prohibition against further receipt of waste materials in the East and North Ash Ponds. Please include this requirement.*

Response:

The requirement to post a sign at the entrance of the facility has been added to Section 4.1 of the Closure Plan. The sign, as stated in the revised Closure Plan, will conform to the requirements of 9VAC20-81-160.D.5.a.

6. *Section 4.3 addresses closure certification of the East and North Ash Ponds; however, certification of closure by removal of the West Ash Pond and eastern portion of the East Ash Pond to be repurposed as a Stormwater Management Pond is also required in accordance with 40 CFR 257.100(c)(3).*

Response:

A paragraph discussing the requirement for certification of closure by removal has been included in Section 4.3 for the West Ash Pond and eastern portion of the East Ash Pond, and the newly added northwestern corner of the East Ash Pond, which is also proposed to be clean closed.

**Closure and Post-Closure Cost Estimates**

7. *The Closure Cost Estimates for the North and East Ash Ponds need to be revised to address the estimated quantities of soil fill needed to stabilize slopes and dikes as referenced within the text of the Closure Plan and its Attachments.*

Response:

The financial assurance worksheets have been revised to account for the costs of side slope stabilization for the East and North Ash Ponds, as well as the shared embankment between the East Ash Pond and the proposed stormwater management area. Please note that recompacted CCR will be used for the side slope stabilization material and clean earthen soil fill for the shared embankment.

8. *The Closure Cost Estimate for the West Ash Pond needs to include additional costs to cover the closure by removal demonstration.*

Response:

The financial assurance worksheet for the West Ash Pond includes the costs for closure by removal under the "Engineering and Documentation" section. As stated on the worksheet, the certification costs are included in the Construction Quality Assurance / Quality Control (QA/QC) line item. The certification costs also include the closure by removal demonstration.

9. *Section I of the Post-closure cost estimate should be adjusted accordingly for any proposed changes to the GW monitoring network.*

Response:

The post-closure cost estimates have been revised to account for groundwater sampling and analysis at a total of 16 monitoring wells.

10. *Section IV of the Post-closure cost estimate should be calculated for monthly inspections as identified on the Inspection Checklist (Appendix A of the Post-Closure Care Plan). As per the note within the Cost Estimate Worksheet, the cost should account for personnel time to complete routine inspections per Post-Closure Care Plan Inspection Frequency.*

Response:

The Post-closure Plan Financial Assurance worksheet has been revised to show 12 post-closure inspections per year and 1 dam safety inspection per year, in accordance with the Post-closure Plan Inspection Checklist. This estimate includes personnel time to complete the routine inspections.

11. *Once the cost estimates are revised accordingly, please provide a signed DEQ Form CE SWDF certifying the cost estimates provided are in accordance with 9VAC20-70. Form provided: <http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/Forms.aspx>*

Response:

The signed DEQ forms have been included in the Closure and Post-closure Plans.

**Closure Plan Drawings (Appendix B of the Closure Plan)**

12. *Drawing 14 - An area outside of the northwest corner of the East Ash Pond is marked as "area to be clean closed." This area was not identified in the Closure Plan. Please address this area and the plans for closure by removal within the text of the Closure Plan. Note whether the standards for closure by removal per 40 CFR 257.100(b)(5) or 40 CFR 257.102(c) apply to this area.*

Response:

Relic East Ash Pond CCR was identified in the northwest corner area of the East Ash Pond beyond the original delineated limits, and is planned to be removed in accordance with 40 CFR 257.100(b)(5). See response to comment #2. Changes have been made in the text of the Closure Plan to clarify.

13. *Drawings 15 and 16 – Please indicate the outlets of the channel underdrain pipe in the gabion downchutes as depicted in Detail 7/24.*

Response:

The outlets for the channel underdrain pipe have been identified on Drawings 14, 15, 16 and 17.

14. *Drawing 20 - Section J-J shows small eastern portion of the EAP will be closed by removal to become a stormwater pond. A new soil dike will be built at western end of the pond as a containment dike to ash. Please address any potential seepage through the dike including the possible installation of a liner.*

Response:

A geomembrane liner has been added on the interior face (East Ash Pond side) of the dike to prevent seepage through this dike. This feature is identified on Drawing 20 as well as on Drawing 16.

15. *Drawing 22 - The arrow on middle of the page states 'East Pond Liner Grade' while drawing is for North Ash Pond. Verify and correct accordingly.*

Response:

The label is correct in showing the East Pond Liner Grade. Drawing 22 is for the North and East Ash Pond toe drain collection system. The profile has been titled to reflect this.

16. *Drawing 25 - The "Approximate limits of CCR Impoundment/CCR Unit Boundary" seems to include the Stormwater Management Pond adjacent to the East Ash Pond as shown on Drawing 16. No other drawings appear to identify the CCR Unit Boundary specifically and instead identify the Proposed Anchor Trench Location, which is assumed to coincide with the CCR Unit Boundary. Please confirm and revise accordingly.*

Response:

Yes, the Proposed Anchor Trench Location coincides with the CCR Unit Boundary. Drawing 25 has been revised and labeled to show this boundary, as well as the post-closure grades for clarity.

**Construction Quality Assurance Plan & Technical Specifications (Appendix C of the Closure Plan)**

17. *Section 1.3 - Please define the role of land surveyor.*

Response:

The role of land surveyor has been defined in Section 1.3.5.

18. *Section 4.2.4 states "All protrusions extending more than one-half inch from the surface shall be removed, crushed, or pushed into the surface with a smooth-drum compactor." Pushing stones into the surface should not be allowed because the stones may come out during the geomembrane deployment.*

Response:

The reference to pushing stones into the liner subgrade has been removed.

19. *Sections 4.3.4.1 and 4.3.4.3 – Please verify the values specified in Table Minimum Polyethylene Seam Properties (per GRI GM-19) with those specified in GM-19. Note that GRI Test Method GM-19 was last revised 2/12/2015.*

Response:

The values in the tables in Sections 4.3.4.1 and 4.3.4.3 have been revised to meet the values contained in GRI GM-19 as last revised 2/12/2015.

20. *Section 4.5.4.1 starts with "EPDM trial seams..." however, the paragraph is included under the XR-5 section of the CQA Plan. It is likely this is a typo and should be XR-5 trial seams... Please confirm that trial seam procedures apply to XR-5 as well.*

Response:

Section 4.5.4.1 has been corrected to state "XR-5 trial seams..." The seam values for adhesion and bonded seam strength are correct.

21. *Technical Specification 015200 - Construction Facilities and Temporary Controls is listed in TOC, but not provided in the PDF copy of the submittal. In its place is a second copy of the Table of Contents.*

Response:

A copy of Technical Specification Section 015200 – Construction Facilities and Temporary Controls has been included.

22. *Technical Specification 310000 - Section 3.02 A states that "... however CCR-mixed soils shall not be used as final protective cover (2.04) or vegetative support layer (2.05) materials." Section 2.04 was not provided, and it appears that reference to Section 2.05 should be 2.03. Also, procedures to protect underlying geosynthetics from damage during the placement of protective cover layer should be included in this specification.*

Response:

References to protective cover and vegetative support layer materials have been revised to reference the correct paragraphs. Geosynthetics protection measures have been added to Section 3.07.

23. *Technical Specification 310519.13 - Section 2.02 B says "woven geotextile shall..." when it should say nonwoven geotextile.*

Response:

Technical Specification Section 310519.13 paragraph 2.02 B has been modified to state "non-woven geotextile."

24. *Technical Specification 311100 - Section 3.04 C.2. states that CCR-mixed debris consisting of wood may be burned on-site (within the bounds of the existing disposal facility) if allowed by local ordinances. Note that 9VAC20-81-140.A.4. states that open burning shall not be conducted on areas where solid waste has been disposed of or is being used for active disposal. Please strike any references to open burning within the bounds of the disposal facility.*

Response:

References to open burning have been removed from Technical Specification 311100.

**Geotechnical Design Report and Attachments (Appendix E of the Closure Plan)**

25. *Related to comment #4 above, the Geotechnical Design and Geotechnical Data Reports contain language referring to seepage from the East and North Ash Ponds. It is unclear what measures will be taken to collect seepage from these ponds after installation of the final cover system. Please clarify.*

Response:

Please see response to comment #4. Additionally, the North Ash Pond has an existing toe drain that currently drains to the Stormwater Management Pond and is ultimately released through the permitted Virginia Pollutant Discharge Elimination System (VPDES) outfall 002. The East Ash Pond will have an embankment toe drain installed along its southern embankment, and collected liquid will be pumped to discharge along with the North Ash Pond toe drain into the Stormwater Management Pond, and will ultimately be released through permitted VPDES outfall 002. Both toe drain collection systems (North Ash Pond modified and East Ash Pond proposed) are shown on the permit drawings.

26. *Section 2.2.1 of the Geotechnical Design Report states the design earthquake was taken from the 2008 USGS National Seismic Hazard Map. It should be revised using 2014 USGS map which will result in a PGA value of 0.18g to 0.20g depending on the exact location of the facility. Please update and make revisions accordingly.*

Response:

Attached please find a memorandum addendum to the Geotechnical Design Report providing additional seismic analysis relative to the updated USGS National Seismic Hazard Mapping. This addendum is included as part of the Geotechnical Design Report.

27. *Section 3.3.1.1 of the Geotechnical Design Report, second bullet, states that “Maintaining temporary stability during the re-grading activities will require lowering the water level in the ash. Water levels should be lowered to at least 15 feet below the lowest dike crest elevation and/or areas of ash re-grading.” Dewatering to 15 feet below the dike were also stated in several locations throughout the Report, but the measures to achieve this dewatering goal were not provided in Closure Plan, Drawings, or cost estimate.*

Response:

Additional discussion on the measures to achieve dewatering has been added to the Closure Plan in Section 3.2. Drawing ESC-11 of the Closure Plan drawings depicts the management of dewatering water, and a typical dewatering well detail has been added to Drawing 17. Dewatering costs have been included in the revised closure cost estimate. Dewatering water management will comply with the applicable provisions of the Station’s VPDES permit (No. VA0004081).

28. *Drawings 4B and 5B – To improve the stability of side slopes, recommendations regarding 15-foot thick subgrade of the final cover system are presented in these two drawings, but these recommendations were not carried over to the Closure Plan, Drawings, or cost estimate. Please review and revise accordingly.*

Response:

Additional discussion for the improvement of side slope subgrade stability has been added to the Closure Plan in Section 3.3.1. Drawings 14, 15, 16, and 17 of the Closure Plan drawings have been revised to show the specific side slope subgrade improvement undercut areas requiring re-compaction, and the cross-section details contained in the Geotechnical Design Report have been include on Drawing 17. Side slope stability improvement costs have been included in the revised Closure cost estimate (see response to comment #7).

29. *Attachment 6 Veneer Stability Analyses - The analyses under seismic forces should be provided.*

Response:

A seismic veneer stability demonstration has been included as part of the attached memorandum addendum to the Geotechnical Design Report.

### **Post-Closure Plan**

30. *Appendix A - Post-closure Inspection Schedule - Add inspection items for dike/dam stability as required by DCR Impounding Structure Regulations. The post-closure cost estimate should be adjusted to cover costs associated with these inspections during the post-closure care period.*

Response:

Appendix A has been revised to add inspection items for dike/dam stability as required by DCR Impounding Structure Regulations. As part of the response to comment #10, these inspection costs as well as the monthly inspection requirements have been included in the revised post-closure cost estimate.

### **Groundwater Monitoring Plan (GMP)**

31. *Please identify groundwater monitoring wells which can begin immediate monitoring under the solid waste permit. These wells should include appropriate upgradient, cross-gradient, and depending upon closure activity around the particular impoundment, downgradient wells. Locations of these wells should consider potential off-site receptors such as adjacent property and the James River.*

Response:

As presented in the attached updated Groundwater Monitoring Plan, the initial proposed monitoring network is comprised of 16 monitoring wells. Monitoring wells MW-11, MW-29, and MW-30 are proposed as facility background wells, and MW-12, MW-13, MW-19 through MW-28, and MW-31 are proposed as downgradient and side-gradient compliance wells. In addition, four observation wells are proposed: OW-25d, OW-26d, OW-27d, and OW-29s.

Of these wells, MW-11, MW-12, and MW-13 are existing monitoring wells, which Dominion proposes to begin monitoring within approximately 90 days of final permit issuance. The remaining wells are proposed monitoring wells, and, along with the four proposed observation wells, will be drilled and constructed within approximately 90 days of receiving DEQ approval for the monitoring well locations (*i.e.*, issuance of the draft permit), with the exception of monitoring wells MW-20, MW-21, and MW-22, which are located on the southern slope of the East Ash Pond and will be installed and sampled within 90 days of completing the closure activities in this area. The monitoring well locations were selected based on available information regarding the hydrogeologic conditions at the site, impoundment locations, facility property lines, off-site receptors, and DEQ guidance.

32. *Please identify a schedule for all proposed monitoring wells of when each well shall be establish, if a new well, and when monitoring will begin of each well.*

Response:

A schedule for drilling and constructing the proposed monitoring wells and observation wells is included the revised Groundwater Monitoring Plan.

33. *Please note that the facility should begin collecting background for the proposed groundwater monitoring constituents no later than 90 days after a final permit decision.*

Response:

Dominion acknowledges this statement. The attached updated Groundwater Monitoring Plan reflects commencing sampling of background wells MW-11, MW-29, and MW-30 no later than 90 days after a final permit decision.

34. *Please note that the facility should identify appropriate perimeter wells that can begin to be monitored no later than 90 days after a final permit decision.*

Response:

As discussed in the responses to Comments No. 31 and No. 32, Dominion is prepared to drill, log, construct, develop, and slug-test the proposed monitoring wells (13 new wells) and four observation wells within 90 days of DEQ's draft permit issuance, with the exception of monitoring wells MW-20, MW-21, and MW-22, which are located on the southern slope of the East Ash Pond and will be installed and sampled within 90 days of completing the closure activities in this area. Dominion is prepared to initiate monitoring of existing proposed background monitoring well MW-11 and existing downgradient monitoring wells MW-12 and MW-13 within 90 days of final permit issuance, and will also make a good faith attempt (weather and pond closure construction permitting) to complete the initial sampling round for the remaining 13 monitoring wells proposed for the monitoring network within 90 days of final permit issuance.

35. *Please include appropriate monitoring well to address Comment #2 above to make the required closure by removal demonstration under 9VAC20-81-370(A). These wells should be scheduled to be installed and monitored within 90 days after completion of excavation.*

Response:

As presented in the updated Groundwater Monitoring Plan and discussed in the response to comment No. 31, Dominion is proposing three downgradient monitoring wells to monitor the groundwater beneath the West Ash Pond, which is scheduled for closure by CCR removal. Details for the monitoring program are presented in the attached updated Groundwater Monitoring Plan. Two of the wells, MW-12 and MW-13, are existing wells, and the third downgradient monitoring well, MW-31, is proposed. Dominion believes that the proposed monitoring wells and their locations satisfy the monitoring requirements under 9VAC20-81-370 of the VSWMR.

36. *Because a railroad right-of-way is located on-site, the GMP should contain detailed maps showing the surveyed location of the right-of-way with respect to the extent of final waste unit closure cover and the adjacent limits of any receptor.*

Response:

Updated mapping showing the surveyed location of the railroad right-of-way (northern limits as reflected by the southern limits of Dominion's property line) with respect to the waste management unit boundary for the final cover limits on the East Ash Pond is presented in the attached Closure Plan Drawings and in Drawings 2 and 2B in the attached updated Groundwater Monitoring Plan. The nearest known off-site receptor is the James River, the location of which is indicated on the drawings.

GMP Section 1.0 Introduction

37. *Text should note that monitoring of groundwater will commence under the solid waste permit in the Phase 2 program, modified as needed to incorporate aspects of the EPA CCR rule.*

Response:

The updated Groundwater Monitoring Plan has been revised to reflect this requirement.

GMP Section 3.1 Regional and Site Geology

38. *Geologic description cited sources from 1969 which are outdated. The site is underlain by rocks associated with the Chopawamsic terrane including Ordovician to earliest Silurian volcanic arc rock and Ordovician granite unconformably overlain by post-orogenic clastic rocks of Devonian age (see Bailey and Owens, 2012; GSA Field Guide 29 – p.327-344 and references therein).*

Response:

The Groundwater Monitoring Plan has been updated to include relevant descriptions of the regional geology from Baily and Owens, 2012.

GMP Section 3.2 Site Soil Units

39. *Throughout this discussion, and on the included boring logs, there appears to be confusion over the interpretation of the subsurface deposits. Nearly all of the sandy, silty, or lean or plastic clays encountered in the subsurface represent saprolite (in situ, chemically weathered bedrock). This material is not Cenozoic colluvium or alluvium deposited upon the intact bedrock. Thin zones of "quartz gravel or sand" encountered within the thicker clay rich sections represents metamorphic vein quartz (which is chemically inert and therefore cannot weather into a saprolite). Please clarify.*

Response:

The interpretations presented in the Groundwater Monitoring Plan are based on field observations as documented by site personnel during the drilling and logging of the soil borings for the existing wells. Golder has relied upon this information and our knowledge of site conditions and the local geology for the Site Conceptual Model that is presented in the Groundwater Monitoring Plan. With the exception of the descriptions in the log for monitoring well MW-11, Golder believes that the materials described as being alluvium are in fact alluvium associated with the James River (*i.e.*, point bar gravel deposits and fine-grained overbank deposits).

Logs for boreholes that encountered slate or competent bedrock appear to clearly indicate those observations. Similarly, logs for boreholes that encountered saprolite, as identified based on relic rock fabric and mineral content, appear to clearly indicate this observation. The exception is the MW-11 log, which used the textural classification of "gravel" to describe a layer encountered at approximately 21 feet below grade. Based on the descriptions of the materials on either side of this gravel layer, the gravel layer may in fact be fractured rock such as a quartz vein with a gravel gradation. Alternatively, MW-11 could be drilled through a mix of colluvium based on its location on the terrace above the floodplain. Hypothetically, this colluvium could consist of matrix-supported weathered (saprolite-like) boulder-size material infilled with alluvial sediments.

At this time, the Site Conceptual Model in the Groundwater Monitoring Plan has not been revised other than to update descriptions of the locally mapped geological formations as discussed in the response to No. 38. As noted earlier, Dominion will be undertaking a drilling program following issuance of the draft permit for this facility associated with the installation of 13 additional monitoring wells and four nested observation wells. Dominion anticipates the collection of extensive geological and hydrogeological information during this program, and will use that information to supplement and update the Site Conceptual Model as needed. The data collected during the drilling program, including geophysical logs, video logs, soil boring logs, geotechnical data, and well construction logs, along with site mapping of exposed bedrock outcrops, will be presented to the DEQ with the well construction report. If it is determined that significant revisions to the Site Conceptual Model are required, Dominion will provide an updated Groundwater Monitoring Plan reflecting the revisions at that time.

GMP Section 3.3.1 Uppermost Aquifer

40. *Section should discuss the uses and locations of any potable or non-potable supply wells onsite as well as depths and construction details of such wells.*

Response:

Available information regarding the uses and locations of on-site potable and non-potable supply wells is summarized in the updated Groundwater Monitoring Plan.

41. *The effective porosity value chosen for the slug test results may not be applicable to saprolite aquifers. Please evaluate.*

Response:

The 20% effective porosity value was selected based on descriptions provided in the soil boring logs and published literature. Depending on the parent rock for the saprolite, the effective porosity could be lower or higher. It is expected that field capacity data will be collected for representative samples during the drilling program. These results will then be used to confirm/update the estimated effective porosity values for the different water-bearing materials comprising the uppermost aquifer at the facility as needed. If it is determined that significant revisions to the Site Conceptual Model are required based on these findings, Dominion will provide an updated Groundwater Monitoring Plan reflecting the revisions at that time.

42. *It appears that groundwater flow on site may exist in the three main hydrologic 'horizons'. Flow within the saprolite will be locally enhanced along relict quartz veins which will have random orientations in the subsurface. Groundwater flow will be accelerated along the diffuse, shallowly dipping, contact between saprolite and intact bedrock. Once in the bedrock, groundwater flow will be structurally controlled by metamorphic foliation and post tectonic fractures and jointing. Please evaluate the monitoring well network considering this information.*

Response:

The Site Conceptual Model in the updated Groundwater Monitoring Plan reflects the expected hydrogeological conditions at the facility based on known information and Golder's experience in similar geologic terrain. The monitoring wells that are proposed, as discussed in the response to Comment No. 32, were located based on the current understanding. As discussed previously, following DEQ's issuance of a draft permit, Dominion will commence with a drilling program designed to collect additional geological and hydrogeological information on the materials comprising the uppermost aquifer beneath the facility (both laterally and vertically). If it is determined that the approved well locations and/or selected screened intervals are insufficient to monitor the uppermost aquifer beneath the facility for impacts from the former impoundments, then Dominion will, at that time (upon completion of the drilling program), present a permit amendment to the DEQ for the modification of the facility's monitoring network.

#### GMP Section 4.2 Monitoring Well Network

43. *Monitoring wells to be used for groundwater compliance purposes should be installed and screened in a natural geologic formation not artificial fill or other anthropomorphic deposits. Please ensure all proposed compliance monitoring wells met these criteria.*

Response:

Based on the available information, Golder believes that the existing wells that are proposed as part of the monitoring network are screened in natural formations. A statement regarding the need to screen wells within natural formations has been added to the updated Groundwater Monitoring Plan.

44. *If any existing wells will remain at the site in order to collect groundwater elevations, those wells should be listed in the Plan and include considerations from these comments.*

Response:

Table 1 in the updated Groundwater Monitoring Plan lists all of the existing site wells and notes the status of the monitoring wells.

45. *To ensure a proper characterization both laterally and vertically, at least some of the point of compliance wells shall be installed as nested well pairs (i.e., screened interval within saprolite, and screened interval within competent bedrock). The identifiers “s” and “d” shall be used to differentiate the nested well pairs from monitoring wells installed as single screened intervals.*

Response:

As discussed previously, following DEQ’s issuance of a draft permit, Dominion will commence with a drilling program designed to collect additional geological and hydrogeological information on the materials comprising the uppermost aquifer beneath the facility (both laterally and vertically). This program will include the installation of four nested well pairs designed to provide for the collection of vertical gradient data, which will be used to evaluate the vertical flow of groundwater in the uppermost aquifer. The nested well pairs are designated “s” and “d” (shallow and deep) to differentiate them from single wells.

46. *The downgradient monitoring wells should be installed to a depth below the original base grade of any valley subsequently filled with CCR, while the ‘cross gradient’ wells may be installed shallower (if groundwater is intercepted) to assess lateral dispersion.*

Response:

The proposed designs for the downgradient monitoring wells as discussed in the response to Comment No. 32 reflect this approach based on the current Site Conceptual Model understanding.

47. *Please document the reason, e.g. located in an area to be included in final closure cover, for any monitoring well which is slated for decommissioning.*

Response:

Existing wells MW-6, MW-7, MW-8, MW-10, MW-16, MW-17, and MW-18 are scheduled for decommissioning as part of the closure activities for the East Ash Pond. Decommissioning of these wells is required due to their location within the final closure cover work area. This information has been included in the revised Groundwater Monitoring Plan.

#### GMP Section 4.3 Monitoring Well Construction

48. *Because the groundwater constituents of concern are metals, all monitoring wells to be used as upgradient or downgradient components of the VSWMR compliance network must contain a screened interval that lies below the top of the groundwater table such that at no time during the year, is the screened interval located within or above the capillary fringe zone.*

Response:

The conceptual design for the proposed monitoring wells as discussed in response to Comment No. 32 reflects this consideration. The existing wells that are proposed for inclusion in the monitoring network are also appropriately constructed.

49. *The Plan should note the type of sampling device, e.g. bladder pumps or bailers, to be installed and whether the device will be dedicated to each well.*

Response:

The Groundwater Monitoring Plan has been updated to clearly indicate that the monitoring wells will be equipped with dedicated bladder pumps for micropurge sampling.

50. *Compliance wells located near roadways should be protected from impact by four concrete bollards installed outside of the concrete apron.*

Response:

At the time of monitoring well installation, Dominion will evaluate the need for protective bollards based on the location of each well relative to roadways. This evaluation is now discussed in the revised Groundwater Monitoring Plan.

GMP Section 5.1.2 Background Sampling

51. *Because all the compliance wells are to be installed downgradient from existing surface impoundments, there will be no need to collect "interwell" background data from downgradient compliance wells. Statistical comparisons will be completed by comparing up versus down "intra-well" data only.*

Response:

Dominion intends to complete downgradient to upgradient statistical analyses (interwell statistical analyses) for the compliance monitoring wells consistent with EPA and DEQ guidance. The Groundwater Monitoring Plan clearly reflects this protocol.

52. *Please provide the boring log for MW-24.*

Response:

Monitoring well MW-24, now proposed as monitoring well MW-29, is a proposed well that has not been installed.

53. *Background data must be collected from screened intervals intercepting the same compliance point in the downgradient wells (i.e., same geologic unit). Because saprolite is chemically weathered bedrock, it will not contain the same mineralogical (chemical) composition as competent bedrock. This is important to avoid false exceedances in collected groundwater data.*

Response:

The proposed monitoring network includes three upgradient wells that were selected based on the existing geological data regarding spatial variability of the uppermost aquifer matrix. It is anticipated that proposed monitoring well MW-30 will be screened in alluvium, MW-11 is believed to be screened in saprolite (to be confirmed during the drilling program), and MW-29 is proposed for screening in the fractured bedrock. Golder believes that these three background wells will provide sufficient data to document the spatial variability of geochemical conditions that may be present at the facility in the uppermost aquifer.

GMP Section 5.1.5 Evaluation and Response

54. *To ensure an even reporting schedule, the Department will require that the semi-annual and annual groundwater monitoring reports be submitted on a defined schedule of no later than June 30th and December 31st, respectively, each calendar year.*

Response:

The Groundwater Monitoring Plan has been updated to reflect this reporting schedule.

GMP Section 6.9.2 Laboratory Analysis

55. *For groundwater constituents listed on Table 3.1 and those metals found on EPA Appendix IV of the CCR rule, SW-846 methods (as amended) shall be used. Methods used for the groundwater quality parameters that appear on the EPA appendix shall be VELAP accredited and shall be able to provide an accurate representation of groundwater quality.*

Response:

The Groundwater Monitoring Plan reflects the use of SW-846 (as updated) methods and other EPA-approved standard methods for analysis of the monitoring constituents. The Groundwater Monitoring Plan also reflects the requirement that the analyses be performed by laboratories that hold the appropriate Virginia Environmental Laboratory Accreditation Program (VELAP) method accreditation.

56. *Please note that samples shall not be field filtered.*

Response:

The Groundwater Monitoring Plan states that compliance samples will not be field filtered.

57. *All laboratory results for metals must be analyzed for and reported in total metals.*

Response:

The Groundwater Monitoring Plan states that compliance samples being analyzed for metals will have the results reported for total metals.

GMP Section 6.9.3 Limits of Quantitation

58. *Laboratory LOQ's must be equivalent to, or lower than, the groundwater protection standard for that constituent.*

Response:

Appropriate laboratory methods and method-specific VELAP-accredited laboratories will be used for the required monitoring constituents. Accordingly, the Method Detection Limits (MDL) will be derived in accordance with VELAP requirements (*i.e.*, statistically derived based on the standard deviation of seven aliquot samples collected and analyzed from a sample of known concentration equivalent to 2.5 to 5 times the signal-to-noise ratio of the instrument being used for the analyses). Similarly, it is expected that the laboratory Limit of Quantitation (LOQ) will be selected in accordance with VELAP guidance, which references the National Environmental Laboratory Accreditation Conference (NELAC) guidelines and SW-846, which, depending on the method [*e.g.*, Gas Chromatograph (GC) Inductively Couple Plasma (ICP) versus GC-Mass Spectrometer (MS)], typically reflect a LOQ derived from 10 times the signal-to-noise ratio for the instrument. Therefore, while the goal is to use analytical methods that have LOQs that are less than applicable Groundwater Protection Standards (GPS), this may not be feasible in every case as instrumentation is updated, MDL studies become dated and are redone, etc.

GMP Section 7.3 Verification Procedure

59. *Timeframes for completion of any verification sampling must be performed within the VSWMR required timeframe.*

Response:

The Groundwater Monitoring Plan contains appropriate language regarding verification resampling in accordance with required timeframes in the VSWMR.

GMP Appendix C Well Construction Specifications Section 2.2

60. *The proposed five-foot interval for logging should be examined to ensure it can evaluate the subsurface and characterize the geologic horizons. The interval should be guided by site conditions.*

Response:

For the initial drilling program that will be implemented following DEQ's issuance of a draft permit, a full vertical sampling program will be completed at each drilling location to generate sufficient information to fine-tune the Site Conceptual Model as needed. The procedures in Appendix C of the Groundwater Monitoring Plan are provided as guidance for the installation of replacement wells or new wells as required once the site has been fully characterized.

Surface Water Monitoring

61. *Please note that the facility will be required to conduct surface water monitoring. The Department will be providing additional requirements regarding this monitoring.*

Response:

A surface water monitoring plan will be prepared and implemented after DEQ requirements are received. We trust the above responses adequately address the received comments. Should you need additional information, please let us know.

Sincerely,

**GOLDER ASSOCIATES INC.**



Ron DiFrancesco, P.E  
Principal and Senior Consultant

Cc: Dennis Slade – Dominion  
Mike Glagola – Dominion

Attachments:

1. January 22, 2016, DEQ Technical Review Letter
2. Copy of DEQ Permit Application Fee and Transmittal Letter
3. Revised Attachment IV - Closure Plan Text
  - a. Revised Appendix B - Closure Plan Drawings
  - b. Revised Appendix C - Construction Quality Assurance Plan
  - c. Revised Appendix C - Technical Specifications
  - d. Revised Appendix D - Bremo Ash Pond Final Cover Hydraulic Model Performance
  - e. Amended Appendix E - Geotechnical Design Report Addendum
  - f. Revised Appendix G – Closure Cost Estimate
4. Revised Attachment V - Post-Closure Plan Text
  - a. Revised Appendix B – Post-Closure Estimate
5. Revised Attachment X - Groundwater Monitoring Plan