

Appendix E

Comparative Analysis and Scoring of Alternatives for OU2 at the Burton Island Historical Ash Disposal Area Indian River Generating Station, Dagsboro, Delaware

Criteria	S-1 No Action	S-2 Targeted Soil Cover with Land Use Controls	S-3 Full Soil Cover with Institutional Controls	S-4 Excavation and Off-Site Disposal
Overall Protection of Human Health, Welfare, and the Environment				
Minimizes human cancer risks and non-cancer hazards from exposure to soil.	<ul style="list-style-type: none"> No change in current condition. 	<ul style="list-style-type: none"> Limits potential exposure to ash material in soil thereby minimizing risks and hazards. 	<ul style="list-style-type: none"> Limits potential exposure to ash material in soil thereby minimizing risks and hazards. 	<ul style="list-style-type: none"> Minimizes potential risks and hazards from exposure to ash material in soil at the site by transferring ash material to off-site location.
Minimize migration of COCs from OU2 to other OUs or off-site.	<ul style="list-style-type: none"> No change in current condition. 	<ul style="list-style-type: none"> Minimizes potential migration of COCs by controlling exposed ash material in soil. 	<ul style="list-style-type: none"> Minimizes potential migration of COCs by controlling ash material in soil. 	<ul style="list-style-type: none"> Minimizes potential migration of COCs from OU2 by transferring ash material to off-site location.
Reduces ecological risks to lowest practicable levels.	<ul style="list-style-type: none"> No change in current condition. 	<ul style="list-style-type: none"> Limits potential exposure to ash material in soil thereby minimizing risks. 	<ul style="list-style-type: none"> Limits potential exposure to ash material in soil thereby minimizing risks. 	<ul style="list-style-type: none"> Minimizes potential risks and hazards from exposure to ash material in soil at the site by transferring ash material to off-site location.
Minimizes unnecessary injuries to natural resources resulting from remedial action.	<ul style="list-style-type: none"> No remedial action. 	<ul style="list-style-type: none"> Temporary adverse impacts in discrete areas associated with existing vegetation clearing. 	<ul style="list-style-type: none"> Significant injuries in terms of total vegetation and habitat destruction. 	<ul style="list-style-type: none"> Significant injuries in terms of total vegetation and habitat destruction.
Ensures no significant degradation of groundwater, surface water, or sediment quality beyond existing levels.	<ul style="list-style-type: none"> No anticipated change in current condition and no monitoring. 	<ul style="list-style-type: none"> No anticipated change in current groundwater condition. Controls potential source of COCs from entering surface water or sediment via overland flow. 	<ul style="list-style-type: none"> No anticipated change in current groundwater condition. Controls potential source of COCs from entering surface water or sediment via overland flow. 	<ul style="list-style-type: none"> Significantly reduces potential source of COCs thereby preventing degradation of other media.
Protectiveness Score*	1	4	3	2
*Score for Overall Protection of Human Health, Welfare, and the Environment ranges from 1 to 4 (preferred alternative) with 1 representing not protective or lowest degree of protection for both human health and the environment combined and 4 representing highest degree of protection.				

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Compliance with Applicable Laws and Regulations				
Federal, state, and local chemical-specific, action-specific, and location specific applicable laws and regulations and other guidance.	<ul style="list-style-type: none"> • Would not comply with chemical-specific requirements. • Action- and location-specific requirements not applicable. 	<ul style="list-style-type: none"> • Multiple federal, state, and local authorizations/permits can be easily obtained due to limited disturbance from remediation. 	<ul style="list-style-type: none"> • Due to significant vegetative/habitat disturbance and surficial alteration of the site through grading, multiple federal, state, and local authorizations/permits would be required. • Potential complications during wildlife protection review. 	<ul style="list-style-type: none"> • Due to significant vegetative/habitat disturbance and alteration of the site through removal, multiple federal, state, and local authorizations/permits would be required. • Wetland mitigation would be required. • Potential complications during wildlife protection review.
Compliance Score*	1	4	3	2
*Score for Compliance with Applicable Laws and Regulations ranges from 1 to 4 (preferred alternative) with 1 representing not compliant or most complex for regulatory review and approval and 4 representing least complex.				
Community Acceptance				
Public concerns about remediation.	<ul style="list-style-type: none"> • Community acceptance will be evaluated after the public comment period for the Proposed Plan. 	<ul style="list-style-type: none"> • Community acceptance will be evaluated after the public comment period for the Proposed Plan. 	<ul style="list-style-type: none"> • Community acceptance will be evaluated after the public comment period for the Proposed Plan. 	<ul style="list-style-type: none"> • Community acceptance will be evaluated after the public comment period for the Proposed Plan.
Community Score*	4	4	4	4
*Ranking score for Community Acceptance cannot be assigned until public comments are received; thus, each alternative scored the same.				

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Compliance Monitoring Requirements				
Requirements for compliance monitoring.	<ul style="list-style-type: none"> No monitoring conducted. 	<ul style="list-style-type: none"> Short-term monitoring of restoration. Long-term monitoring of cover integrity and performance of perimeter patrols. 	<ul style="list-style-type: none"> Short-term monitoring of restoration. Long-term monitoring of cover integrity. 	<ul style="list-style-type: none"> Short-term monitoring of restoration. No long-term monitoring required at the site as ash material would be removed.
Ability to monitor success of remediation.	<ul style="list-style-type: none"> None as no monitoring conducted. 	<ul style="list-style-type: none"> Visual observation of ground surface would be obvious and sufficient. 	<ul style="list-style-type: none"> Visual observation of ground surface would be obvious and sufficient. 	<ul style="list-style-type: none"> Visual observation of restoration would be obvious and sufficient.
Exposure pathways that cannot be monitored.	<ul style="list-style-type: none"> Not applicable as no monitoring conducted. 	<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> Not applicable.
Consequences of failed remedy.	<ul style="list-style-type: none"> Not applicable as no remedy implemented. 	<ul style="list-style-type: none"> Revisit the design of areas of repeated cover failure, if any, or trespasser access. 	<ul style="list-style-type: none"> Revisit the design of areas of repeated cover failure, if any. 	<ul style="list-style-type: none"> Revisit the design of failed areas of restoration.
Monitoring Score	1	2	3	4
<p>*Score for Compliance Monitoring Requirements ranges from 1 to 4 (preferred alternative) with 1 representing complex monitoring effort and/or no ability to monitor success/failure of remedy or detect changing conditions and 4 representing simple monitoring effort and/or ability to monitor success/failure of remedy or changing conditions.</p>				

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Technical Practicability				
Likelihood that technologies will meet performance specifications	<ul style="list-style-type: none"> Not applicable. 	<ul style="list-style-type: none"> Likely 	<ul style="list-style-type: none"> Likely 	<ul style="list-style-type: none"> Likely
Ability to construct and implement technology and reliability of technology.	<ul style="list-style-type: none"> Not applicable. 	<ul style="list-style-type: none"> Well practiced approach for discrete areas. Reliable for minimizing exposure to ash material in soil. 	<ul style="list-style-type: none"> Well practiced approach. Reliable for minimizing exposure to ash material in soil. 	<ul style="list-style-type: none"> Complex implementation due to water management during excavation. Complex implementation due to large volume of material and limited trucking access through active facility. Reliable for removing ash material from OU2.
Ease of undertaking additional remedial actions if needed.	<ul style="list-style-type: none"> No interference with additional remedial action. 	<ul style="list-style-type: none"> No interference with additional remedial action. 	<ul style="list-style-type: none"> No interference with additional remedial action. 	<ul style="list-style-type: none"> No additional remedial action anticipated.
Availability of services, equipment, specialists, and technologies.	<ul style="list-style-type: none"> Not applicable, none needed. 	<ul style="list-style-type: none"> Readily available contractors and equipment. Sufficient volume of local clean cover soil. 	<ul style="list-style-type: none"> Readily available contractors and equipment. Sufficient volume of regional clean cover soil. 	<ul style="list-style-type: none"> Readily available contractors and equipment. Potentially limited disposal options for large volume of material. Significant volume of clean fill and vegetation required for restoration.
Practicability Score*	4	3	2	1
*Score for Technical Practicability ranges from 1 to 4 (preferred alternative) with 1 representing the most difficult to implement and 4 representing the least difficult.				

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Restoration Time Frame				
Time to implement remedy.	<ul style="list-style-type: none"> Not applicable. 	<ul style="list-style-type: none"> Less than one year. 	<ul style="list-style-type: none"> Three years. 	<ul style="list-style-type: none"> 23 years.
Time until remedial action objectives are met.	<ul style="list-style-type: none"> Infinite, RAOs would not be met. 	<ul style="list-style-type: none"> Upon completion of cover placement. 	<ul style="list-style-type: none"> Upon completion of cover placement. 	<ul style="list-style-type: none"> Upon completion of ash material transport off-site and restoration construction.
Restoration Score*	1	4	3	2
*Score for Restoration Time Frame ranges from 1 to 4 (preferred alternative) with 1 representing longest time frame and 4 representing shortest time frame.				
Reduction of Toxicity, Mobility, and Volume of Contamination				
Mitigation of risks at site	<ul style="list-style-type: none"> No change in current condition. 	<ul style="list-style-type: none"> Potential exposure routes limited by application of cover and performance of perimeter patrols. 	<ul style="list-style-type: none"> Potential exposure routes limited by application of cover over entire OU2. 	<ul style="list-style-type: none"> Permanent reduction in toxicity, mobility, and volume of COCs at site by transferring ash material off-site.
Special requirements for treatment process.	<ul style="list-style-type: none"> Not applicable. 	<ul style="list-style-type: none"> Limited process residuals including decontamination fluids and PPE require management and disposal. 	<ul style="list-style-type: none"> Process residuals including decontamination fluids and PPE require management and disposal. 	<ul style="list-style-type: none"> Significant quantities of process residuals including decontamination fluids, dewatering fluids, and PPE require management and disposal.
Extent toxicity, mobility, and volume reduced.	<ul style="list-style-type: none"> No reduction in toxicity, mobility, or volume of COCs. 	<ul style="list-style-type: none"> No reduction in toxicity or volume of COCs. Minimizes potential migration of COCs with ash material in soil through run-off and dust (i.e., reduces mobility of COCs). 	<ul style="list-style-type: none"> No reduction in toxicity or volume of COCs. Minimizes potential migration of COCs with ash material in soil through run-off and dust (i.e., reduces mobility of COCs). 	<ul style="list-style-type: none"> Permanent reduction in toxicity, mobility, and volume of COCs at site by transferring ash material off-site. No reduction in toxicity or volume of COCs at disposal facility; reduction in mobility of COCs through long-term containment.
Reduction Score*	1	2	3	4
*Score for Reduction of Toxicity, Mobility, and Volume of Contamination ranges from 1 to 4 (preferred alternative) with 1 representing lowest reduction in toxicity, mobility, and/or volume of COCs and at OU2 with greatest resulting risk and 4 representing the greatest reduction with lowest risk.				

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Long-term Effectiveness				
Contamination remaining on-site and associated risk.	<ul style="list-style-type: none"> No change in current condition. 	<ul style="list-style-type: none"> Ash material in soil remains on site; however, potential risk mitigated through soil cover and perimeter patrols. 	<ul style="list-style-type: none"> Ash material in soil remains on site; however, potential risk mitigated through soil cover on entire OU2. 	<ul style="list-style-type: none"> Ash material entirely removed from OU2 thereby eliminating potential risk from exposure.
Treatment residuals and associated risk.	<ul style="list-style-type: none"> No change in current condition. 	<ul style="list-style-type: none"> No treatment; Process residuals managed in short-term. 	<ul style="list-style-type: none"> No treatment; Process residuals managed in short-term. 	<ul style="list-style-type: none"> No treatment; Process residuals managed in short-term.
Type and degree of long-term management.	<ul style="list-style-type: none"> Not applicable, no management. 	<ul style="list-style-type: none"> Long-term management of discrete areas of soil cover and performance of perimeter patrols. 	<ul style="list-style-type: none"> Long-term management of soil cover. 	<ul style="list-style-type: none"> Management of ash material would be the responsibility of the receiving disposal facility.
Difficulties associated with long-term management.	<ul style="list-style-type: none"> Not applicable, no management. 	<ul style="list-style-type: none"> Limited vegetation management required to perform inspections and maintenance. 	<ul style="list-style-type: none"> Vegetation management required to perform inspections and maintenance. 	<ul style="list-style-type: none"> Not applicable for the site.
Potential for alternative failure and associated risk.	<ul style="list-style-type: none"> Not applicable. 	<ul style="list-style-type: none"> The potential adverse effects of a gradual 1.5 meter sea level rise would be identified during long-term monitoring and addressed as necessary. 	<ul style="list-style-type: none"> The potential adverse effects of a gradual 1.5 meter sea level rise would be identified during long-term monitoring and addressed as necessary. 	<ul style="list-style-type: none"> A potential gradual 1.5 meter sea level rise may adversely affect the restoration area. Potential failure of the restoration may result in sedimentation (from clean imported fill) of surface waters.
Long-term Score*	1	3	2	4
*Score for Long-term Effectiveness ranges from 1 to 4 (preferred alternative) with 1 representing highest potential risks after the remedy has been implemented and 4 representing lowest.				

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Short-term Effectiveness				
Protection of community during implementation.	<ul style="list-style-type: none"> Not applicable. 	<ul style="list-style-type: none"> Potential risks from trucking cover soil reduced by compliance with trucking safety protocols. Minimal risk due to relatively small number of trips for trucks carrying clean fill. 	<ul style="list-style-type: none"> Potential risks from trucking cover soil reduced by compliance with trucking safety protocols. Higher risk due to large number of trips for trucks carrying clean fill. 	<ul style="list-style-type: none"> Potential risks from exposure to excavated ash material and fill during material transport reduced by compliance with trucking safety protocols. Highest risk due to significantly large number of trips for trucks carrying either ash material or clean fill.
Protection of workers during implementation.	<ul style="list-style-type: none"> Not applicable. 	<ul style="list-style-type: none"> Potential risks from exposure to ash material in soil and the physical hazards of construction reduced through training, proper PPE, and compliance with health and safety plans. 	<ul style="list-style-type: none"> Potential risks from exposure to ash material in soil and the physical hazards of construction reduced through training, proper PPE, and compliance with health and safety plans. 	<ul style="list-style-type: none"> Potential risks from exposure to excavated ash material and the physical hazards of construction reduced through training, proper PPE, and compliance with health and safety plans.
Environmental impacts expected during implementation and available mitigation measures.	<ul style="list-style-type: none"> No carbon footprint or energy expended for implementation. No adverse environmental impacts from implementation. 	<ul style="list-style-type: none"> Smallest carbon footprint and least energy intensive remedy. Limited vegetation and habitat disturbance. 	<ul style="list-style-type: none"> Moderate carbon footprint and moderate energy use. Significant injuries in terms of total vegetation and habitat destruction and wildlife disruption. Larger terrestrial wildlife may successfully flee. 	<ul style="list-style-type: none"> Largest carbon footprint and most energy intensive remedy. Significant injuries in terms of total vegetation and habitat destruction and wildlife disruption. Larger terrestrial wildlife may successfully flee. Potential for sedimentation mitigated through use of BMPs.
Short-term Score*	4	3	2	1
*Score for Short-term Effectiveness ranges from 1 to 4 (preferred alternative) with 1 representing highest potential risks associated with implementation of the remedy and 4 representing lowest.				

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Cost				
Capital cost (present value)	\$0	\$1.1 million	\$13.1 million	\$287.8 million
Annualized O&M cost (present value)	\$0	\$0.9 million	\$3.3 million	\$1.7 million (5 years only)
Present value total cost (30 years at 7%)	\$0	\$2.1 million	\$16.4 million	\$289.6 million
Cost Score*	4	3	2	1

*Score for Cost ranges from 1 to 4 (preferred alternative) with 1 representing highest estimated cost and 4 representing lowest.

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Summary of Scoring and Overall Rank

Criteria	S-1 No Action	S-2 Targeted Soil Cover with Land Use Controls	S-3 Full Soil Cover with Institutional Controls	S-4 Excavation and Off-Site Disposal
<i>Threshold Criteria</i>				
Overall Protection of Human Health, Welfare, and the Environment	1	4	3	2
Compliance with Applicable Laws and Regulations	1	4	3	2
<i>Balancing Criteria</i>				
Community Acceptance	4	4	4	4
Compliance Monitoring Requirements	1	2	3	4
Technical Practicability	4	3	2	1
Restoration Time Frame	1	4	3	2
Reduction of Toxicity, Mobility, and Volume of Contamination	1	2	3	4
Long-term Effectiveness	1	3	2	4
Short-term Effectiveness	4	3	2	1
Cost	4	3	2	1
<i>Total Score</i>	22	30	27	25

Overall Rank based on Total Score, listed in decreasing order from the Preferred Alternative:

- S-2: Targeted Soil Cover with Land Use Controls. (Preferred Alternative)
- S-3: Full Soil Cover with Institutional Controls.
- S-4: Excavation and Off-Site Disposal.
- S-1: No Action.