

June 30, 2015

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Subject: Ivy Material Utilization Center (Permit #125)
Corrective Action Plan
Response to First Technical Review

Dear Ms. Stuart,

On behalf of the Rivanna Solid Waste Authority (RSWA), Environmental Standards, Inc. is submitting one hardcopy and one electronic copy of the revised Corrective Action Plan (CAP) for the Ivy MUC, Permit #125. The revised CAP incorporates modifications based on the Virginia Department of Environmental Quality's First Technical Review, dated March 20, 2015.

The following information is provided to clarify the specific VA DEQ comments and subsequent modifications incorporated into the revised CAP. Italicized RSWA responses follow each VADEQ comment.

AQUIFER CHARACTERISTICS REVIEW:

The choice for a specific remedy to be implemented on site to address the known groundwater impacts must be screened against the following topics concerning the aquifer and its potential use as a source of drinking water.

Required Discussion	Adequate Discussion?
Aquifer characteristics of site & surrounding property [D.1.b.(6).(e)]	Yes
Background groundwater quality and aquifer yield [D.I.b.(6).(c)]	(1)
Discussion of current resource value (use) of the aquifer [D.1.b.(6).(a)]	(1)
Discussion of future resource value (use) of the aquifer [D.I.b.(6).(a)]	(1)
Current proximity and withdrawal rates of any GW users [D.I.b.(6).(b)]	(1)
Current extent of contamination [D.1.b.(1)]	(2)
Potential drainage to crops/vegetation and wildlife caused by potential exposure to landfill waste constituents in the groundwater [D.I.b.(6).(d)]	(1)
Availability (and cost) of groundwater treatment vs providing alternate water supplies [D.I.b.(6).(f/g)]	(1)

Review Comments:

- 1) Section 3.3 must include statements regarding the current groundwater use in the area and the source of water supply for the Ivy MUC. This section must also note that the adjacent residential water users obtain their water supply from wells and whether any changes to the source of drinking water are expected in the future during CAP implementation.

Response: The following language has been added to Section 3.1.2, Area Land Use:

“RSWA legally owns/controls the areas currently underlain by groundwater impacted by landfilling activities at the Ivy MUC. Groundwater sourced from a supply well on the Ivy MUC property (Figure 2) is currently used on Site for sanitary and shop maintenance purposes only. A notice alerting employees not to drink water from the tap is clearly posted at water spigots connected to the on-site well water system. An alternate drinking water supply is provided in the employee break room.

There is currently little potential for exposure of the public or environmental receptors to contaminated groundwater. Based on demographics and growth plans and patterns, no changes to the sources of drinking water on Site or adjacent to the property are expected to occur during implementation of this CAP.”

- 2) Updated groundwater contour (Figure 2) and total groundwater constituent contour maps should be provided in the CAP. The latest information provided in the 2014 CASE report may be used to fulfill this requirement. Because of the large number of monitoring points within each plume, all injection wells, monitoring wells and surface water monitoring locations should be added onto the substrate delivery systems (SDS) maps provided in Figure 7 of the CAP.

Response: A groundwater contour map is included as Figure 4 and has been updated to reflect groundwater elevation data collected during the Fall 2014 Compliance groundwater monitoring event. Figure 5 has been added to the CAP and depicts total volatile organic compound and semivolatile organic compound concentration contours. The SDS maps provided in Figure 8 have been updated to include monitoring points designed to monitor the areas influenced by each SDS.

REMEDY ABILITY TO ADDRESS RISK:

The Permittee must demonstrate that the chosen remedy is able to reduce risk exposure on site (and surrounding properties if applicable) based on the screening criteria below, criteria which do not represent a full risk assessment as defined in USEPA RCRA guidance. This exercise does not mandate conclusions based on site pilot studies or actions. It can refer to prior applications of the remedy at similar sites and published EPA site summaries or technical guidance.

Required Discussion	Adequate Discussions?
Ability to reduce risk to HH & E [D.1.a.(1).(a)]	Yes
Ability to control residual risk from post remedy implementation waste mass releases to groundwater [D.1.a.(1).(b) & (2) (c)]	Yes
Assessment of the short term risk to community, workers, or environment during the implementation of the remedy [D.1.a.(1).(d/f) & B.(5)]	(3)

Review Comments:

- 3) Section 3.4 of the CAP (p. 3-10) notes that on-site assessments were performed in 1996 and 2002 and again in 2014 for cobalt. The CAP must discuss how these prior assessments apply to current site conditions.

Response: Section 3.4 has been revised to state that potential receptors and exposure pathways identified in these assessments are consistent with current Site conditions; they are also consistent with realistic future exposure scenarios.

REMEDY TECHNICAL PERFORMANCE TOPICS:

The remedy chosen for site implementation must have been screened against the technical topics outlined below and the results must be supportive its application on site to address the known groundwater impacts.

Required Discussion	Adequate Discussions?
Has capability to achieve GPS [D.I.b.(2)]	Yes
Estimated time until GPS is achieved on site [D.I.a.(l).(e) and (2).(d)]	Yes
Ability to handle/manage waste in a manner protective of HH & E and meeting all federal/state requirements [D.I.a.(5)]	(4)
Ability to utilize future enhancements in technology [D.I.b.(4)]	Yes
Ability of containment to reduce further releases to GW [D.1.a.(2).(a)]	Yes
Extent to which active groundwater treatment technologies will be used on site [D.1.a.(2).(b)]	Yes

Review Comments:

- 4) The Corrective Action Monitoring Plan (CAMP) must describe the management of investigatively-derived waste. Section 6.5 in the Appendix C of the CAP notes that disposal of purge water from wells with no GPS exceedances will be discharged to ground surface. Consistent with the Department's policy on investigatively derived waste (IDW), "Purge water... must be disposed at a publicly owned treatment works (POTW) or other wastewater treatment system operating in accordance with its Virginia Pollutant Discharge Elimination System (VPDES) permit, provided that all other pertinent criteria are satisfied" A copy of this document (LPR-REM-01-1995) may be found on the

Virginia Town Hall website at <http://townhall.virginia.gov/L/ViewGDoc.cfm?gdid=1939>. This section of the CAP should be revised to note that purge water will be collected and disposed.

Response: The SAP submitted on July 26, 2013 did not include a Section 6.5. To comply with the above request, the following language has been added to Section 12.2, Well Evacuation: "Purge water will be collected in 5-gallon buckets and discharged to the Ivy MUC leachate collection pond. Water from that pond is periodically removed and subsequently treated at the Rivanna Water and Sewer Authority's Moore's Creek Facility."

REMEDY OPERATIONS / MAINTENANCE TOPICS:

Any remedy chosen for site implementation will have some component of Operations and Maintenance that must be screened against the technical topics outlined below.

Required Discussion	Adequate Discussion
The type/degree of any long-term O&M requirements [D.1.1.(1).(c)]	(5)
Long-term reliability of any engineering/institutional controls [D.1.a.(1).(g)/(3).(b)]	Yes

Review Comments:

- 5) Section 4.2.5 (p. 4-24) and Section 7.0 of the CAMP (Appendix B, p. 7-2) must describe the clean-out of the injection wells to ensure water is prevented from entering any surface water.

Response: The following has been added to section 7.0 of the CAMP: Development water will be collected in 5-gallon buckets or a poly-tank and discharged to the Ivy MUC leachate collection pond. Water from that pond is periodically removed and subsequently treated at the Rivanna Water and Sewer Authority's Moore's Creek Facility.

Additionally, a subsection titled "EBR Injection Well Cleaning" was added to Section 7.0 of the CAMP and includes the following language: "EBR injection wells may also require periodic maintenance to manage potential biofouling and sediment accumulation. Periodic high pressure water jetting of injection wells may be implemented to ameliorate biofouling. Replacement of individual injection points may be required if extensive biofouling that cannot be resolved through normal maintenance measures is observed. Produced waters will be collected in a poly-tank and discharged to the Ivy MUC leachate collection pond. Water from that pond is periodically removed and subsequently treated at the Rivanna Water and Sewer Authority's Moores Creek Facility."

REMEDY IMPLEMENTATION TOPICS:

Although a groundwater remedy chosen may have the theoretical technical capability to achieve remedial endpoints, the Permittee must still screen its implementation against several performance criteria that may act to potentially limit its usefulness on the site.

Required Discussion	Adequate Discussion
Demonstration any community concerns were addressed by remedy implementation [D.1.a.(6)]	(6)
Evaluation of potential difficulty in remedy construction [D.1.a.(3).(c)]	Yes
Need for other Agency permits/approvals prior to implementation [D.1.a.(3).(c)]	Yes
Necessary equipment/specialists required for are available [D.1.a.(3).(c)]	Yes
Needed treatment capacity/storage/disposal services available [D.1.a.(3).(e) & b.(3)]	Yes
Practical economic capability of owner/operator to install and complete the remedy [D.1.a.(4)/b.(7)]	Yes
The need for use of Interim Measures based on factors of F.3	Yes

Review Comments:

- 6) During the previous CAP submittal approved on October 29, 2004, the use of MNA for metals was not presented because Cobalt and Cadmium had not exceeded GPS at the site.

Response: A public meeting regarding the Cobalt NES/ACM occurred on November 17, 2010 and a public comment period occurred from October 27, 2010 through November 25, 2010. Although several requests were received for copies of the Draft NES/ACM document (which were distributed electronically), no specific comments were received regarding the information or strategies detailed in the document. The notes from the public meeting are included in Appendix F to the Cobalt NES/ACM.

The RSWA will maintain a public repository of Ivy MUC Corrective Action documents and related reports at their offices located at 695 Moores Creek Lane, Charlottesville, VA 22902, for public review.

Documents can be reviewed by arranging for an office visit within normal business hours. Preferred times for individuals to review documents are between the hours of 9:00 am and 4:00 pm.

REMEDY MONITORING TOPICS:

Before a remedy can be implemented, the Permittee must demonstrate the remedy can be monitored long term to quantify its ability to achieve remedial groundwater endpoints.

Required Discussion	Adequate Discussion?
Site Plan shows the locations and designations of all remediation related groundwater monitoring points	Yes

Required Discussion	Adequate Discussion?
Network has sufficient <i>compliance, performance, and sentinel wells</i> , to define the horizontal and vertical extent of the aquifer impacted above background levels	(7)
For MNA sites, network has wells located at appropriate distances along downgradient flow paths (<i>located at a distance no greater than a five year travel time distance</i>)	(7)
Sampling constituent list can demonstrate the effectiveness of the remedy [D.1.c.(3) and (4)] (<i>for sites using MNA, are the additional USEPA parameters included</i>)	(8)
Minimum sampling frequency meets 260.D.1c.(1) (<i>for sites using MNA is the frequency at least quarterly in the 1st year as suggested by USEPA</i>)	(9)

Review Comments:

- 7) The monitoring network provided in the CAP must describe performance and sentinel wells able to define a plume horizontally and vertically to background concentrations [9 VAC 20-81-260.D.1.c.(2)]. Existing wells that are not currently included within the network may be used to fulfill this requirement. The corrective action monitoring network should be revised based on discussions with the RSWA and their consultant on February 23, 2015.

Sentinel wells were not defined in the previous CAP. Sentinel wells are those which ensure there is no expansion of the plume or impact to sensitive receptors as a result of changes in plume migration post remedy implementation. These wells should intercept groundwater which shows no impact over background such that the data obtained from them can assist in delineating the full extent of the landfill-impacted groundwater. The sentinel wells defined in the CAP, meeting the definition noted above, do not need to be the same as the RSWA settlement agreement wells. Section 1.3.2 in Appendix C of the CAP should be revised to reflect sentinel wells meeting this requirement.

Response: Sections 4.3 and 11.3.2 have been added to the CAMP/SAP and detail the inclusion of a Sentinel Monitoring Network in the groundwater monitoring well network at the Ivy MUC.

- 8) Table 1 of the Groundwater Sampling and Analysis Plan, Appendix C, should be revised to clearly describe that the compliance monitoring network will be sampled annually for Table 3.1 Column B and semi-annually for Table 3.1 Column A plus Column B detects required under the assessment monitoring program [9 VAC 20-81-250.B.3.a and 250.B.3.c.(2)].

Response: Table 1 has been modified to describe that each Compliance Monitoring Network (CMN) well will be sampled for the permit-required VSWMR Table 3.1, Column B constituents annually, and that during the other semiannual event, each CMN well will be

sampled for the permit-required VSWMR Table 3.1, Column A constituents plus VSWMR Table 3.1, Column B list analytes that have had sample detections in that well within the past three years.

- 9) Substrate injections were halted in September 2013 to allow for an evaluation of the EBR remedy. The CAMP should reflect a revised semi-annual sampling frequency during this evaluation. However, the sampling frequency to be described in the CAMP should reflect a quarterly frequency after injection events, consistent with current evaluation practices.

Response: The text of section 12.3.3.a has been revised to include the following language: EBR CAMN wells will be sampled quarterly for one year and semiannually thereafter during evaluation of the EBR Remedy. If at any point additional substrate injections are deemed necessary, quarterly sampling of CAMN wells will be resumed.

SURFACE WATER ISSUES:

State Water Law prohibits unpermitted discharge to state waters. If the available information suggests the groundwater plume is, or is at risk for, discharge of landfill contaminants to state waters, the Permittee should address this environmental condition in the proposed Corrective Action plan.

Required Discussion	Adequate Discussion
Does site contain any surface water bodies or does surface water form any of the Permitted facility boundaries? (If yes answer the questions below)	(6)
Is GW plume moving toward, or has it reached any surface water bodies	Yes
CAMP contains a surface water sampling program containing, at a minimum, the contaminants of concern	Yes
CAMP contains a surface water sampling program which contains, at a minimum, sampling points at the upgradient property boundary, downgradient property boundary, and plume discharge points	Yes

Review Comments:

- 10) In the Surface Water Monitoring Plan (SWMP), Appendix F, Table 1 should reflect the GPS- exceeding constituents that each sampling point will monitor. For example, alpha-BHC and beta-BHC do not exceed GPS in wells located in the northeast or west plumes, but does exceed in the east plume, so these constituents would not need to be sampled in the surface water monitoring points downgradient of the northeast or west plumes.

Response: Table 1 has been modified to detail GPS-exceeding constituents from the upgradient compliance monitoring well that each sampling point is designed to monitor. Each SWM location will also be sampled for constituents monitored at upstream SWM locations.

- 11) SWM-7 is missing from the sampling plan but shown on Figure 2. SWM-5 is not shown on Figure 2 in the SWMP, Appendix F, but is listed in the sampling program. Section 4.0 notes that it was removed from sampling program because it was consistently dry, so the SWM-5 monitoring point may be removed from the sampling plan.

Response: The sampling plan and Figure 2 have been modified to include monitoring point SWM-7 and omit monitoring SWM-5.

REMEDY EVALUATION TOPICS:

Once implemented, the Corrective Action plan must address how the effectiveness (and potential replacement) of the remedy will be evaluated over time.

Required Discussion	Adequate Discussion?
Content of periodic CASE reports [D.1.b.(8/9) and G.1]	(12)
Potential need for replacement remedy [D.1.a.(1).(h)]	(13)
Process for determining GPS cannot be practically achieved [G.2]	(14)
Timeframe for submittal of a technical impracticality report [G.3.a]	(14)
Process for implementation of Alternate Measures [G.3.b-d]	(14)
Timing of demonstration/certification of remedy completion [H.1-3]	Yes

Review Comments:

- 12) The Department has prepared Submission Instruction No. 25 for the development and submission of Corrective Action System Evaluation (CASE) reports. The content required in the CASE reports must be included in Section 6.1.

Response: Section 6.0 has been revised to include the following language:

“The scheduled evaluation of the Site remedy will be submitted in report form, titled CASE Report, on a three year basis during the execution of Site remedies. The CASE Report will address topics pertaining to the EBR remedy, [Non biological] MNA (NB MNA) remedy for cobalt and cadmium, Surface Water Monitoring Program, sentinel well monitoring, and voluntary operation of the SVE system as part of the PPIM. While the selected Site remedies are not consistent with natural biological degradation-based MNA remedies, performance evaluation topics addressed in CASE report submissions will be consistent with the performance criteria presented the VA DEQ Submission Instructions No. 25 “Groundwater MNA based Corrective Action Site Evaluation Reports at Solid Waste Landfills”. An example VA DEQ CASE report summary form, which details performance criteria that may be addressed in CASE report submissions, is included as Appendix F.”

With the halting of substrate injections in September 2013, the CASE reporting period may be adjusted to allow adequate data collection for evaluation of the EBR remedy (e.g., 3 years).

- 13) Section 6.4 must describe any alternate remedies that may be used at the site. The Department advises all parties entering corrective action to additionally discuss in the CAP, an alternate remedy to be implemented if it is shown the primary remedy (or remedies) are insufficient to achieve GPS. This may remove the need for a Major Permit modification action in the future.

Response: Section 6.4 of the CAP, Implementation of Alternate Corrective Methods, describes alternate remedial methods that may be used at the Site and references the 2002 ACM regarding evaluation of the methods:

- 14) Section 8 of the CAP must also note the procedure for determining any technical impracticality described under G.2 and G.3.

Response: Section 8.4, Technical Impracticability, has been added to the CAP and includes the following language:

“The chosen site remedies may be deemed technically impractical if data from EBR and [non biological] MNA performance monitoring demonstrate, over a sufficient length of time and using appropriate statistical procedures, that the selected remedies cannot practically achieve the groundwater protection standards.

Groundwater monitoring data collected during remedy implementation will be evaluated for the performance criteria discussed in Section 6.0. Evaluation of groundwater monitoring data will be presented in CASE Report submissions every three years. Statistical procedures for groundwater data evaluation will be consistent with the methods outlined in 9VAC20-81-250.D and are outlined in the CAMP (Appendix B).

Per 9VAC20-81-260.G.2, if it is determined that the selected remedies cannot practically achieve groundwater protection standards, the RSWA will implement other methods or techniques that could practically achieve compliance with the requirements. Within 90 days of recognizing that condition, the RSWA will respond in accordance with 9VAC20-8-260.G.3.

Completion of the EBR performance evaluation period and implementation of design modification deemed necessary during the evaluation period is anticipated to be completed by approximately June, 2023. The anticipated date of completion for both the EBR and NB MNA remedies is approximately December 2033.”

REVIEW CONCLUSIONS

The Department wishes to acknowledge the RSWA's efforts in designing a generally well-organized Corrective Action Plan proposal. While the proposed Corrective Action Plan contains a good description of the planned site actions to address the current groundwater conditions on site, several applicable topics with possible impact on the final remedies chosen

require further attention. In addition to the items noted in the above paragraphs, the following topics of concern must also be addressed:

1. A request for an Alternate Point of Compliance (APC) was included with the CAP submittal in Section 4.2.1 of the CAMP. The APC requests the use of MW-33 to replace MW-2 and MW-14 replacing MW-17R. If the facility wishes to pursue an APC for both wells, the allowance to use APC must be submitted as a variance described under 9 VAC 20-81-740, with the fee of \$390. Further, the variance must demonstrate that proposed APC wells are downgradient of the respective compliance wells to intercept the landfill-derived contaminants detected in the compliance wells. Information on the technical content required for the APC variance can be found in DEQ's submission instruction, LPR-GWSI-2011-08, which is available at the Virginia Regulatory Town Hall website at [Virginia Regulatory Town Hall View Guidance Document](#).

Response: Following discussions with the VA DEQ and a thorough evaluation of analytical data and historical groundwater elevation data, the RSWA has decided not to pursue Alternate Points of Compliance for MW-2 and MW-17R. The wells will remain in the CMN network. MW-14 will not be included in a monitoring network and MW-33 will remain in the EBR Corrective Action Monitoring Network (EBR CAMN).

2. The CAP presented a CAMP in Appendix B and Sampling and Analysis Plan (SAP) in Appendix C. The corrective action and assessment monitoring programs at the facility were described in both documents. The CAMP should reflect the corrective action monitoring network wells and the required monitoring program. Alternatively, the facility may combine both documents with clear sections between compliance and corrective action monitoring.

Response: The CAMP and SAP, submitted as separate documents in 2013, have been combined and are included as Appendix B to the CAP. Details applicable to the compliance and corrective action monitoring programs are clearly outlined in the document.

As always, should you have questions, feel free to call me at 434.293.4039.

Respectfully,



Heather Tierney
Project Geoscientist

cc: Phil McKalips, RSWA
Mark Brownlee, Ivy MUC

Revised Draft
Corrective Action Plan
Ivy Material Utilization Center
Permit No. 125

(Pending VA DEQ Review)

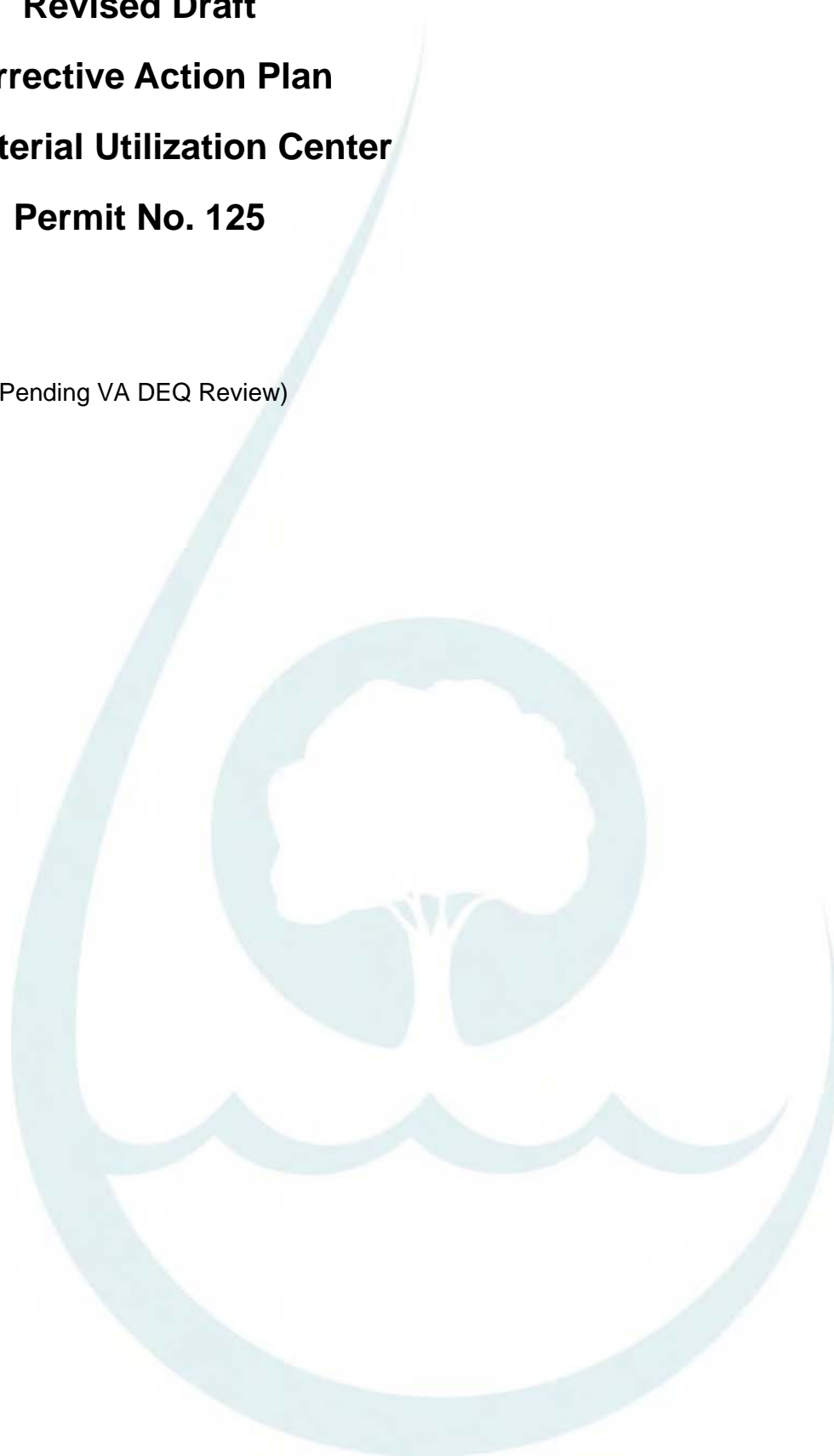


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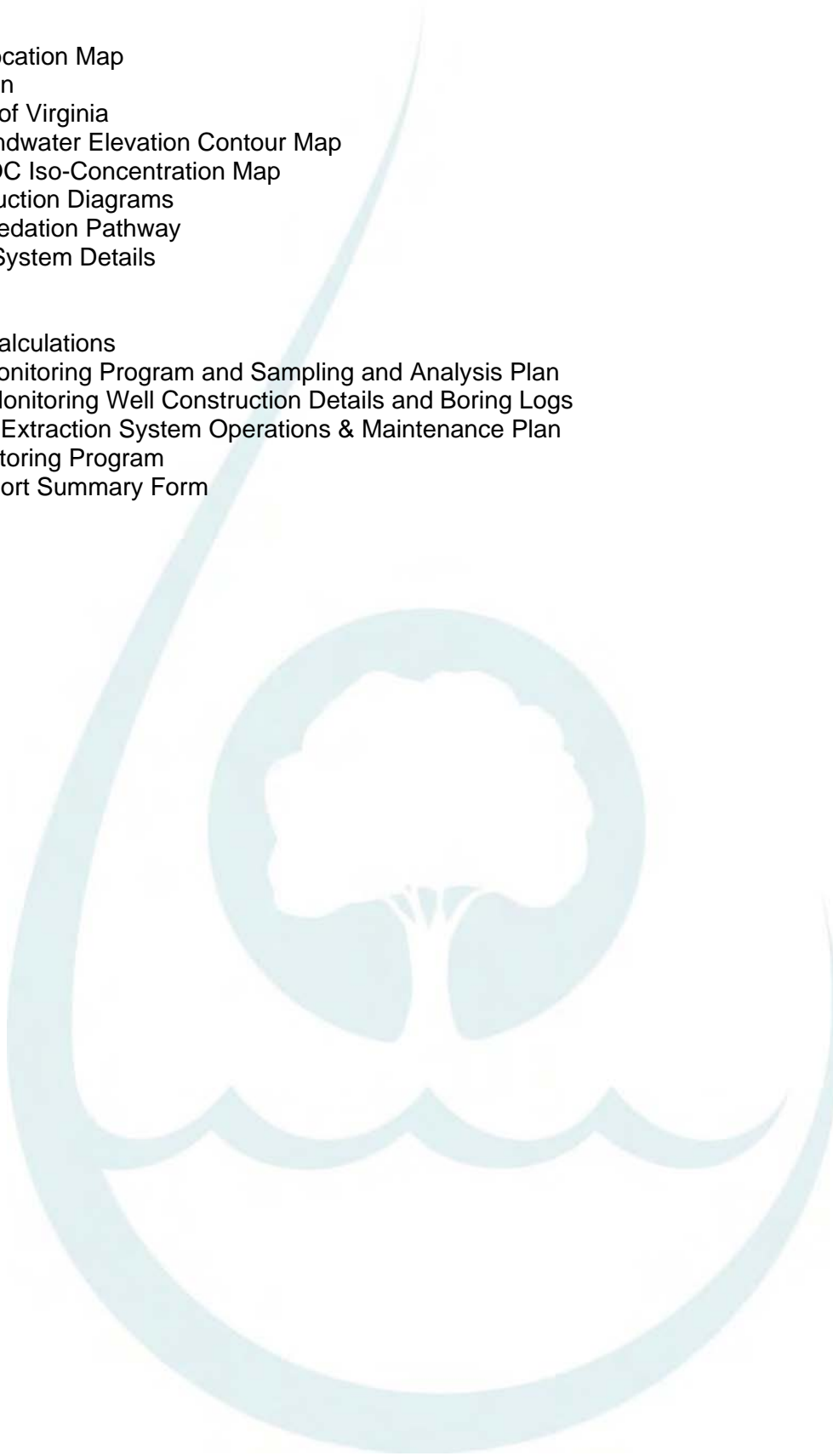
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Definitions

The following terms and abbreviations are used in this report:

ACL – Alternate Concentration Limit.

ACM – Assessment of Corrective Measures.

AWQC – Ambient Water Quality Criteria.

bgs – Below Ground Surface.

CAMN – Corrective Action Monitoring Network.

CAMP – Corrective Action Monitoring Program.

CAP – Corrective Action Plan.

CASE – Corrective Action Site Evaluation.

CDD – Construction and Demolition Debris.

cm/sec – Centimeters per Second.

CMN – Compliance Monitoring Network.

Cobalt NES/ACM - Cobalt Nature and Extent Study and Assessment of Corrective Measures Report.

COC – Constituent of Concern.

CTI – Combined Technologies, Inc.

°F – Fahrenheit.

DO – Dissolved Oxygen.

Downgradient – Site location where the groundwater elevation is lower than a specific point of reference.

DTW – Depth-to-Water.

EBR – *In-situ* Engineered, Enhanced Bioremediation.

Environmental Standards - Environmental Standards, Inc.

EPA – Environmental Protection Agency.

et. seq – Et sequens – “and the following pages.”

ft/ft – Feet per foot.

GPS – Groundwater Protection Standards; Site-specific groundwater quality standards incorporated into the facility operating permit.

HDPE – High Density Polyethylene.

ICs – Institutional controls.

IDW – Investigation--Derived Wastes

In-Situ – In place, left in the ground, not having been moved.

Inc. – Incorporated.

Ivy MUC – Ivy Material Utilization Center.

JEI – Joyce Engineering, Inc.

LCRS – Leachate Collection and Removal System.

LFG – Landfill Gas.

LFGCCS – Landfill Gas Collection and Control System.

Malcolm Pirnie – Malcolm Pirnie, Inc.

NB MNA – Non-Biological Monitored Natural Attenuation.

No. – Number.

MSL – Mean Sea Level.

MSW – Municipal Solid Waste.

NES – Nature and Extent Study.

O&M – Operation and Maintenance.

ORP – Oxidation/Reduction Potential.

Paint Pit – The former paint pit area.

Phase I EBR – Initial phase of *In-situ* Engineered, Enhanced Bioremediation implementation.

PID – Photoionization detector.

Potentiometric – A measure of the total head of groundwater (*i.e.*, groundwater elevation).

PPIM – Paint Pit Interim Corrective Measures.

PTS – Pump and Treat System.

PVC – Polyvinyl Chloride.

RCRA – Resource Conservation and Recovery Act.

RSWA – Rivanna Solid Waste Authority.

SAP – Sampling and Analysis Plan

SC – Specific Conductance.

SCFM – Standard Cubic Feet per Minute.

Site – Term used in reference to the Ivy Material Utilization Center.

SNM – Sentinel Monitoring Network.

Submission Instructions – Submission Instructions No. 17, Design of a Correction Action Plan (CAP) Concerning Groundwater Contamination at Regulated Sanitary, CDD, and Industrial Landfills.

SVE – Soil Vapor Extraction.

SVE O&M Plan – Ivy Material Utilization Center Paint Pit Soil Vapor Extraction System Operations & Maintenance Plan.

SVOCs – Semivolatile Organic Compounds.

SWM – Surface Water Monitoring Program.

TO 14A – US EPA analytical method used in analysis of VOC concentration in airbag samples.

µg/L – Micrograms per Liter.

US – United States.

US FWS – United States Fish and Wildlife Service.

USGS – United States Geological Survey.

VAC – Virginia Administrative Code.

VA DEQ – Virginia Department of Environmental Quality.

VOCs – Volatile Organic Compounds.

VSWMR – Virginia Solid Waste Management Regulations.

Upgradient – Site location where the groundwater elevation is higher than a specific point of reference.

1.0 Executive Summary

Under contract to the Rivanna Solid Waste Authority (RSWA), Environmental Standards, Inc. (Environmental Standards) has prepared this Corrective Action Plan (CAP), which presents the current understanding of groundwater conditions and impacts at the Ivy Material Utilization Center, Solid Waste Permit Number (No.) 125 (Ivy MUC, or Site) and the corrective measures to be implemented to address groundwater impacts. The CAP was prepared to comply with requirements set forth in the Virginia Solid Waste Management Regulations (VSWMR) stipulated in 9VAC20-81-260, *et. seq.*, as administered by the Virginia Department of Environmental Quality (VA DEQ).

The Ivy MUC consists of a 300-acre property, located west of the City of Charlottesville in Ivy, Albemarle County, Virginia, of which approximately one-third was used for permitted landfilling operations. Groundwater at the Site is found in each of three somewhat interconnected hydrogeologic units: the overburden, saprolite, and fresh bedrock (consisting of horizontal schist and gneiss layers). Groundwater impacts at the Site, in excess of current Site groundwater protection standards (GPS), are presumed attributable to six waste management cells and a seventh disposal area referred to as "the former Paint Pit area" (Paint Pit). Each cell has been formally closed in accordance with the VSWMR and the Solid Waste Facility Permit No. 125.

Groundwater analytical results have demonstrated that constituents of concern are present at concentrations exceeding Site GPS in groundwater downgradient of Ivy MUC waste disposal cells. To address GPS exceedances in specific areas of the Ivy MUC, a combination of several corrective actions were selected for the Site remedy, which was developed based on the Assessment of Corrective Measures (ACM) process and further Site study.

A number of in-place controls and remedial technologies have been employed at the Ivy MUC as part of the Solid Waste Facility Permit requirements and RSWA's proactive response to remediating groundwater affected by waste disposal activities. Along with the groundwater remedial technologies, these controls are considered critical components of the Site remedy and are included as part of the CAP. The corrective action components comprising the Site remedy are cited below:

- *In-situ* Engineered, Enhanced Bioremediation (EBR).
- Non-Biological Monitored Natural Attenuation (NB MNA) for two inorganic constituents (cobalt and cadmium).
- Paint Pit Interim Measure.
- Existing in-place controls (landfill gas collection and control system, leachate collection and removal system, and waste cell final closure systems).
- Surface Water Monitoring Program.
- Engineering and Institutional controls (fencing, eventual deed restrictions).
- Presumptive remedies (storm water management, closed cell cap maintenance).

EBR is a proven technology that is judged capable of reducing contaminant concentrations in impacted groundwater. To address GPS exceedances in impacted groundwater at the Site, Full-Scale EBR was deployed as a remedial measure in 2007. Analytical results for groundwater collected during Site performance monitoring have indicated that biodegradation of constituents of concern (COCs) and reduction of COC concentrations has occurred at the Site since the EBR remedial measure has been employed. The design implementation of the EBR remedy involves injection of organic substrates into Site groundwater to augment and enhance

naturally occurring processes to degrade COCs. To better assess the long-term effect of the remedy on Site groundwater conditions, it is proposed that regular substrate injections be suspended, which will, along with regular performance monitoring of groundwater, allow for evaluation of the potential for rebound effects from current conditions, the long term efficiency of the remedy, and further design modifications to refine remedy performance.

NB MNA is a proven technology that was, during an ACM selection process, judged to be capable of bringing concentrations of the constituents cobalt and cadmium below Site GPS through already occurring natural processes. In NB MNA, natural processes, such as advection, dispersion, dilution, sorption, and retardation are relied upon to reduce constituent concentrations in groundwater. NB MNA is not an active remediation technology, but involves the careful monitoring of natural processes in the subsurface.

The Paint Pit Interim Measure (PPIM) involves voluntary operation of a soil-vapor extraction (SVE) system, which was installed to reduce the mass of potential source material in the vadose zone of the Paint Pit.

Additionally, a Surface Water Monitoring Program (SWMP) has been developed to monitor longer-term potential impacts to the Site surface water systems during implementation of the CAP.

