

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action

Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Atlantic Research Corporation
Facility Address: 5945 Wellington Road
Gainesville, Virginia 20155-1699
Facility EPA ID #: VAD 02 374 1705

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

If yes - check here and continue with #2 below.

If no - re-evaluate existing data, or

If data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

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2. Is **groundwater** known or reasonably suspected to be “**contaminated**”¹ above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

If yes - continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.

If no - skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing supporting documentation to demonstrate that groundwater is not “contaminated.”

If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

Based on the monitoring results documented in the **Shallow Groundwater and Stream 2001 Evaluation Report (June 2, 2002)** the Maximum Contaminant Levels (MCLs) for tetrachloroethene (PCE) [5 parts per billion (ppb)], 1,1,1-trichloroethane (1,1,1-TCA) [200 ppb], 1,1-dichloroethene (1,1-DCE) [7 ppb], trichloroethene (TCE) [5 ppb], 1,2-dichloroethene [total] (1,2-DCE) [5 ppb], cis-1,2-dichloroethene (cis-1,2-DCE) [70 ppb], and vinyl chloride (VC) [2 ppb] have been exceeded in shallow wells on the facility property. Based on the monitoring results documented in the **Supplemental RCRA Facility Investigation and Interim Measures work Plan (February 25, 2002, Revised August 29, 2002)** and from the May 2002 monitoring analytical results, the Drinking Water Equivalent Level (DWEL) of 1 micrograms/liter (ug/l) for perchlorate was exceeded in deep wells on the facility property. (Note: The Final Administrative Order on Consent Docket No. RCRA-III-056-CA for Corrective Measures Implementation Order (CMI Order) remediation levels were not established for the shallow groundwater or the point of compliance for the shallow groundwater (associated stream locations [STR-02, STR-04, and STR-06]). The shallow groundwater monitoring program was instituted to monitor the effectiveness of the soil remediation program and subsequent natural attenuation/intrinsic remediation processes in reducing volatile organic compound (VOC) concentrations in the shallow groundwater (Perchlorate is a recently discovered contaminant in September 1999).

Based on the monitoring results documented in the **Deep Groundwater 2001 Evaluation Report (May 20, 2002)** the MCLs (PCE, TCE, and VC) and the CMI Order remediation levels for contaminants of concern (PCE [5 ppb], 1,1,1-TCA [200 ppb], and 1,1-DCE [7 ppb]) were exceeded. Based on the monitoring results documented in the **Supplemental RCRA Facility Investigation and Interim Measures Work Plan (February 25, 2002, Revised August 29, 2002)** and the DWEL for perchlorate anion were exceeded.

Footnotes:

¹“Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

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3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within “existing area of contaminated groundwater”² as defined by the monitoring locations designated at the time of this determination)?

X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the “existing area of groundwater contamination”².

If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the “existing area of groundwater contamination”²) - skip to #8 and enter “NO” status code, after providing an explanation.

If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

The shallow groundwater aquifer is a perched groundwater zones atop the impermeable diabase bedrock, impeding vertical migration to the deep aquifer and discharges to small streams on-site. The stream locations are used as points of compliance for the shallow groundwater (STR-02, STR-04 and STR-06.) Over approximately the eight year history of monitoring at this facility, the data shows a significant reduction in the concentration of VOC contamination in the shallow groundwater. The shallow groundwater contamination is concentrated in the vicinity of SW 40-07, SW 40-01A and SW 40-50 in the central portion of the site. These wells are located in the central portion of the facility property on the northern side of building 40. [Reference Appendix I of the Shallow Groundwater And Stream 2001 Evaluation Report (June 4, 2002 and June 3, 2002 Bimonthly Progress Report, April and May 2002, under CMI consent Order for ARC Gainesville, VA)]. The VOC concentrations in the streams (POC locations for the shallow groundwater), have always been, and remain, well below the site specific risk-based levels established for the surface water for this facility, and continue to decrease. (Reference Table 2-1, Shallow Groundwater and Stream 2001 Evaluation Report (June 4, 2002).

Perchlorate is an additional contaminate recently discovered at the facility in September of 1999. Current monitoring indicates that concentrations of perchlorate in the shallow groundwater above the DWEL established for groundwater (1 ppb) and in the stream POCs (STR-04 and STR -06 locations) above the DWEL established for surface water (60 ppb). Atlantic Research Corporation is implementing a pilot test as an interim remedial measure and anticipate being able to continue to reduce and stabilize both the VOC and perchlorate contamination in the shallow aquifer within the facility boundaries.

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The recent data from the deep groundwater monitoring (May 2002) indicates that the VOC and perchlorate contamination is being contained within the property boundary of the facility. In May 2002 the deep wells closest to the down-gradient facility boundary (DW-2, DW-12 and DW-14) were sampled for VOC and perchlorate. Concentrations of these contaminants were not detected in these wells during this monitoring event. (Reference June 3, 2002 Bimonthly Progress Report, April and May 2002, under CMI Consent Order for ARC Gainesville, VA.) Atlantic Research Corporation is proposing to implement a pilot test as an interim remedial measure and anticipate being able to continue to reduce and stabilize both the VOC and perchlorate contamination in the deep aquifer.

² “existing area of contaminated groundwater” is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of “contamination” that can and will be sampled/tested in the future to physically verify that all “contaminated” groundwater remains within this area, and that the further migration of “contaminated” groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

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4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

If yes - continue after identifying potentially affected surface water bodies.

If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The shallow groundwater discharges to the local streams. The stream located east of Buildings 28, 40, and 46 (in the central portion of the facility) flows in a southern direction. The stream located east of Building 200 and west of Building 201(in the southeast portion of the facility) flows in a southern direction. Pond 2 is located intersects the northern portion of the stream located east of Builds 28, 40 and 46 and is just south of Building 73 in the north central portion of the facility.

The Perchlorate sampling results taken from the Supplemental RCRA Facility Investigation and Interim Measures Work Plan (February 25, 2002, Revised August 29, 2002) and the volatile organic compound (VOC) sampling results taken from the Shallow Groundwater and Stream 2001 Evaluation Report (June 4, 2002) are shown below in paragraph 5.

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5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater “level,” and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

X If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater “levels,” the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter “IN” status code in #8.

Rationale and Reference(s):

The stream monitoring results have not revealed any contaminant concentration exceeding POC stream risk levels (Reference Table 2-1 of the Shallow Groundwater and Stream, June 4, 2002). The concentration of the contaminants detected are not 10 times greater than the deep groundwater Risk Levels (Table 3-1 of the Deep Groundwater 2001 Evaluation Reports, May 20, 2000 and the June 3, 2002 Bimonthly Progress Report, April/May 2002, under CMI Consent Order for ARC Gainesville, VA. Sufficient data is not available to show increasing trends for perchlorate. Only one increase in the PCE contaminant concentration at the stream POC for shallow groundwater, STR-06 over a years period of time.

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

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6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site’s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR
2) providing or referencing an interim-assessment,⁵ appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of “contaminated” groundwater can not be shown to be “**currently acceptable**”) - skip to #8 and enter “NO” status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter “IN” status code.

Rationale and Reference(s): _____

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

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7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the “existing area of contaminated groundwater?”

If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.”

If no - enter “NO” status code in #8.

If unknown - enter “IN” status code in #8.

Rationale and Reference(s):

Corrective Measures Implementation Final Administrative Order on Consent (U. S. EPA Docket No. RCRA-III-056-CA)

Supplemental RCRA Facility Investigation and Interim Measures Work Plan (February 25, 2002, Revised August 25, 2002, Revised August 29, 2002)

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8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the **Atlantic Research Corporation** facility, EPA ID # **VAD 02 374 1705**, located at **5945 Wellington Road Gainesville, Virginia 20155**. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

NO - Unacceptable migration of contaminated groundwater is observed or expected.

IN - More information is needed to make a determination.

Completed by (signature) _____ Date 08-23-02
(print) Linda Holden
(title) Remedial Project Manager

Supervisor (signature) _____ Date 09-30-02
(print) Robert E. Greaves
(title) Chief, General Operations Branch

(EPA Region or State) EPA, Region 3

Locations where References may be found:

RCRA Corrective Action File Room
U. S. Environmental Protection Agency (Region III)
1650 Arch Street
Philadelphia, PA 19103 **AND**

Prince William County Library
Information Repository
8601 Mathis Avenue
Manassas, VA 22111
(703) 361-8211

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