

**DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION**

**RCRA Corrective Action  
Environmental Indicator (EI) RCRIS code (CA750)  
Migration of Contaminated Groundwater Under Control**

**Facility Name:** Atlantic Bulk Carrier Corporation  
**Facility Address:** 1901 Roxbury Road, Roxbury, Virginia  
**Facility EPA ID #:** VAD000799379

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 #8 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).

**Migration of Contaminated Groundwater Under Control  
Environmental Indicator (EI) RCRIS code (CA750)**

2. Is **groundwater** known or reasonably suspected to be “contaminated”<sup>1</sup> 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):**

A 2011 “*Follow-up Site Characterization Report*” identified eight constituents of concern that exceeded applicable standards in groundwater beneath the site. Two follow-up site investigations conducted later in 2011 augmented the data collected in the follow-up study. The detected constituents appear related to industrial solvents evidently spilled or released on site in the distant past. These chemicals include:

- 1,1-dichloroethane
- Cis-1,2-dichloroethene
- Chloroform
- Ethylbenzene
- Tetrachloroethylene
- Trans-1,2-dichloroethylene
- Trichloroethylene, and
- Vinyl Chloride.

These constituents occur in groundwater beneath two areas of ABC’s maintenance and storage yard located east of Roxbury Road and south of the adjacent CSX Railroad tracks. The impacted water table aquifer beneath the site extends from depths of approximately four to 15 feet below grade and is underlain by a clay confining unit. There is no indication the above constituents have moved off site or into deeper aquifers including that from which ABC withdraws water for non-potable purposes. No off-site groundwater supplies are threatened.

**Table 1** below summarizes the constituents, frequency of occurrence, maximum detected concentration and comparison to regulatory and health based screening levels. The data compile the results of three sampling events undertaken between April and December 2011.

**Table 1  
Summary of Volatile Organic Compounds Detected in Water Table Aquifer Beneath ABC Site – April – December 2011**

Constituent	Number Stations Detected	Maximum Concentration	US EPA Region III RSL Tap Water (µg/L)	US EPA MCL (µg/L)	Exceeds One or Both Limits?
Acetone	2	26.3	22,000	NES	No
1,1-Dichloroethane	8	32.6	2.4	NES	Yes
1,1-Dichloroethylene	5	4.6	340	7	No
1,4-Dichlorobenzene	1	0.2	0.43	75	No
Benzene	1	0.2	0.41	5	No
2-Butanone (MEK)	1	80.5	7,100	NES	No
Chlorobenzene	2	0.1	91	100	No
Chloroethane (Ethyl Chloride)	5	6.8	21,000	NES	No
Chloroform	2	0.2	0.19	80	Yes
Chloromethane	5	0.5	190	NES	No
cis-1,2-Dichloroethylene	15	841	73	70	Yes
Ethylbenzene	3	2.6	1.5	700	Yes
m,p-Xylenes	3	4.1	1,200	NES	No
Methyl-tert-butyl ether (MTBE)	7	2.2	12	NES	No
o-Xylene	6	2.5	1,200	NES	No
Tetrachloroethylene (PCE)	10	167	0.11	5	Yes
Toluene	4	0.8	2,300	1,000	No
trans-1-2-Dichloroethylene	10	112	110	100	Yes
Trichloroethylene (TCE)	12	231	2	5	Yes
Vinyl Chloride	11	90.9	0.016	2	Yes
Xylenes, Totals	7	11.1	200	10,000	No

*Note: NES = No established regulatory limit; MCL=Maximum Contaminant Limit; RSL=Regional Screening Level*

**References:**

*Follow-up Site Characterization Report, RCRA Facility Lead Program, Atlantic Bulk Carrier Corporation, April 26, 2011*  
*Interim Report, RCRA Facility Lead Program, Atlantic Bulk Carrier Corporation, October 27, 2011*  
*Follow-up Site Characterization Report, RCRA Facility Lead Program, Atlantic Bulk Carrier Corporation, Jan 10, 2012*

**Footnotes:**

<sup>1</sup>“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).

**Migration of Contaminated Groundwater Under Control  
Environmental Indicator (EI) RCRIS code (CA750)**

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

- 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”<sup>2</sup>.
- If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the “existing area of groundwater contamination”<sup>2</sup>) – 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):**

Based on observations over a one year period, groundwater gradients in the water table aquifer are very gentle and shift seasonally depending of the level of recharge supplied by the bordering swamp. Transient recharge events induce temporarily steeper gradients from the south while periods of hydraulic stability reduce subsurface flow. Assuming the detected impact(s) originate from spills that are decades old, the current distribution of constituents of concern in the water table aquifer suggests little ongoing migration or plume expansion has occurred. This is likely due to the relatively low hydraulic conductivities of the impacted materials coupled with low and variable hydraulic gradients that have not pushed constituents steadily in any given direction. Moreover, it is likely the fine-grained characteristics of the aquifer material, further retards the migration of these constituents relative to groundwater. The occurrence of degradation daughter products including cis-1,2-dichlorethene and vinyl chloride among others is also indicative of the natural biodegradation of the solvents over time. It is expected that this natural degradation will lead to improving groundwater conditions over time.

**References:**

*Annual Report for RCRA Facility Lead Program - Atlantic Bulk Carrier Corporation (Former Chemical Carrier Corp. of Virginia) January 2012*

<sup>2</sup> “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.

**Migration of Contaminated Groundwater Under Control  
Environmental Indicator (EI) RCRIS code (CA750)**

4. Does “contaminated” groundwater **discharge** into **surface water** bodies?
- If yes - continue after identifying potentially affected surface water bodies.
- X 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 distribution of groundwater impacts as based on the three prior sampling events indicates the plume boundaries are mostly or completely defined by the existing monitoring well network. Although there is some uncertainty regarding the western extent of the plume, the concentration gradients indicated on site suggests constituent levels decline below applicable surface water standards before reaching the drainage ditch along the western shoulder of Roxbury Road. Elsewhere the plume limits do not indicate surface water discharge.

**Table 2** below summarizes concentrations of constituents of concern detected at the western plume boundary and compares them to Virginia Surface Water Quality Criteria for Human Health, both for public water supplies and for all other surface waters (9VAC25-260-140). Three of the detected constituents, including tetrachloroethylene, trichloroethylene and vinyl chloride exceed the limits for surface waters for public water supplies but not for all other surface waters. However, these concentrations, which are close to the lower of the two limits, would be expected to fall within compliance before reaching the nearest discharge point. There are no public water intakes in the vicinity of the site.

**Table 2  
Comparison of Volatile Organic Compounds Detected in Water Table With  
Virginia Surface Water Criteria – 9 VAC 25-260-140**

Constituent	Concentration at Western Plume Edge (MW-8) (µg/L)	Surface Water - Human Health		Exceeds One or Both Limits?
		Public Water Supplies (µg/L)	All Other Surface Waters (µg/L)	
Acetone	<0.2	NES	NES	No
1,1-Dichloroethane	1.8	NES	NES	No
1,1-Dichloroethylene	1.0	1.2	370	No
1,4-Dichlorobenzene	0.2	63	190	No
Benzene	<0.2	22	510	No
2-Butanone (MEK)	<0.2	NES	NES	No
Chlorobenzene	<0.2	NES	NES	No
Chloroethane (Ethyl Chloride)	<0.2	NES	NES	No
Chloroform	<0.2	340	11000	No
Chloromethane	<0.2	NES	NES	No
cis-1,2-Dichloroethylene	63.2	140	10000	No
Ethylbenzene	<0.2	530	2100	No
m,p-Xylenes	<0.2	NES	NES	No
Methyl-tert-butyl ether (MTBE)	0.2	NES	NES	No
o-Xylene	<0.2	NES	NES	No
Tetrachloroethylene (PCE)	8.2	6.9	33	Yes
Toluene	<0.2	510	6000	No
trans-1-2-Dichloroethylene	7.3	140	10000	No
Trichloroethylene (TCE)	33	25	300	Yes
Vinyl Chloride	1.8	0.25	24	Yes
Xylenes, Totals	<0.2	NES	NES	No

*Note: NES = No established regulatory limit*

**References:**

*Annual Report for RCRA Facility Lead Program - Atlantic Bulk Carrier Corporation (Former Chemical Carrier Corp. of Virginia) January 201;*  
*9VAC25-260-140. Criteria for Surface Water:*<http://lis.virginia.gov/cgi-bin/legp604.exe?000+reg+9VAC25-260-140>

**Migration of Contaminated Groundwater Under Control  
Environmental Indicator (EI) RCRIS code (CA750)**

5. Is the **discharge**<sup>3</sup> of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration<sup>3</sup> 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)?
- If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> 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 concentration<sup>3</sup> 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 concentrations<sup>3</sup> 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):

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

**Migration of Contaminated Groundwater Under Control  
Environmental Indicator (EI) RCRIS code (CA750)**

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 implemented<sup>4</sup>)?
- 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<sup>5</sup>, 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):

<sup>4</sup>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.

<sup>5</sup>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.



**Migration of Contaminated Groundwater Under Control  
Environmental Indicator (EI) RCRIS code (CA750)**

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?”
- X      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):

The facility is prepared to implement a final remedy consisting of ongoing groundwater monitoring of the existing well network for site related constituents including tetrachloroethylene, trichloroethylene and related constituents exceeding MCLs. The proposed monitoring program would include annual monitoring of wells MW-8, MW-13, MW-15, MW-17 and MW-19. The facility would also continue annual monitoring of the on-site non-potable water supply well.

**Migration of Contaminated Groundwater Under Control  
Environmental Indicator (EI) RCRIS code (CA750)**

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 Bulk Carrier Corporation facility, EPA ID # VAD000799379, located at 1901 Roxbury Road, Roxbury, Virginia. 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) \_\_\_\_\_ -s- \_\_\_\_\_ Date 09/11/12  
Erich Weisbart, P.G.  
Land and Chemicals Division  
US EPA Region III  
1650 Arch Street  
Philadelphia, PA 19103

Supervisor (signature) \_\_\_\_\_ -s- \_\_\_\_\_ Date 09/11/12  
Luis Pizarro  
Associate Director  
Land and Chemicals Division  
US EPA Region III  
1650 Arch Street  
Philadelphia, PA 19103

Locations where References may be found:

US EPA Region III  
Waste & Chemicals Management Division  
1650 Arch Street  
Philadelphia, PA 19103

Contact telephone and e-mail numbers:

(name) Erich Weissbart  
(phone #) (215) 814-3284  
(email) weissbart.erich@epa.gov