**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:** | **Wilson Jones** |
| **Facility Address:** | **Crozet, VA** |
| **Facility EPA ID #:** | **VAD003124989** |

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?

   **X** 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).

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?

__X__ 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:**

Acme Visible Records began manufacturing records storage and retrieval equipment in 1954 in the town of Crozet, located west of Charlottesville, Virginia. Building assets were sold in 1988 and metal-handling operations ceased. The manufacture of printed folders continued until 1992 when the property was purchased by Wilson Jones Corporation. Currently no manufacturing operations exist on site. All equipment associated with former operations was demobilized and/or removed from operation.

Undocumented spills/leaks of chlorinated solvents occurred throughout the history of manufacturing operations and trichloroethene (TCE) concentrations were detected within all three site production wells in 1988 at an average concentration of 700 micrograms per liter (ug/l). Environmental site assessments were performed in 1989 and 1993 that focused efforts at the wastewater lagoon. The lagoon was closed with waste in place and groundwater remediation was initiated in 1999 using Hydrogen Release Compound (HRC) injected into groundwater downgradient of the closed lagoon. Groundwater monitoring was conducted at the closed lagoon pursuant to a post-closure permit and in support of the HRC injection until 2007. Additional groundwater investigations were performed in 2004 and 2005 to support an Environmental Indicator determination of groundwater contamination under control; however, the additional investigations revealed a greater magnitude of groundwater contamination and led to further investigation and site-wide groundwater monitoring beginning in 2007. Investigation continued through 2007 and the highest concentrations of TCE impacted groundwater were discovered beneath the factory floor. The facility conducts quarterly sampling, semiannual sampling, and annual sampling of various subsets of wells and surface water locations totaling approximately 50 sample points. Table 1 is a listing of all onsite constituents-of-concern that exceed screening levels for the EI investigations and the Phase I RFI investigation.

**Table 1:**

| Contaminants of Concern | MCL/RSL[2] (µg/L) | Maximum Detected Concentration (µg/L) | Secondary Constituents | MCL/RSL[2] (µg/L) | Maximum Detected Concentration (µg/L) |
|---|---|---|---|---|---|
| 1,1,2-trichloroethane | 5 | 14 | 1,1,1-trichloroethane | 200 | 11.7 |
| 1,1-dichloroethane | 2.4 | 100 | 1,1-dichloroethene | 7 | 7 |
| 1,2-dichloroethane | 5 | 42 | 2-butanone | 4900 | 6100 |
| Benzene | 5 | 330 | Isobutyl alcohol | 4600 | 390 |
| Cis-1,2-dichloroethene | 70 | 1300 | 3-methylphenol | 720 | 370 |
| Methylene chloride | 5 | 3100 | Methylcyclohexane | 6300 | 4.8 |
| Tetrachloroethene | 5 | 5200 | Toluene | 1000 | 64 |
| Trichloroethene | 5 | 89000 | Trans-1,2-dichloroethene | 100 | 11 |
| Vinyl chloride | 2 | 59 | Xylene | 10000 | 98 |
| Acrolein | 0.041 | 37 | Beryllium | 4 | 17 |

| Contaminants of Concern | MCL/RSL[2] (µg/L) | Maximum Detected Concentration (µg/L) | Secondary Constituents | MCL/RSL[2] (µg/L) | Maximum Detected Concentration (µg/L) |
|---|---|---|---|---|---|
| Chloroethane | 21000 | 10 | Chromium | 100 | 1100 |
| Chloroform | 80 | 43 | Iron | 11000 | 59400 |
| Methyl tert butyl ether (MTBE) | 12 | 43.9 | Lead | 15 | 220 |
| 1,4-dioxane | 0.67 | 21.4 | Manganese | 320 | 1980 |
| 2-methylnaphthalene | 27 | 540 | Nickel | 780 | 1200 |
| 4-methylphenol | 1400 | 370 | Zinc | 4700 | 1880 |
| Beta-bhc | 0.022 | 0.62 | | | |

**REFERENCES:**


- Phase I RCRA Facility Investigation Workplan – Revision 1, November 2006
- EPA Primary National Drinking Water Standards (MCL)
- EPA Region 3 RSL Table – April 2012


[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).

[2] Region III Risk-based Screening Levels (RSLs) are used when a Maximum Contaminant Levels (MCLs) are not applicable. .

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:**

The facility has implemented interim measures in the source area beneath the manufacturing floor and area around monitoring well EI-2. The interim measures consisted of a soil vapor extraction (SVE) system on contaminated soil and a groundwater recirculation system for the saturated zone to enhance in-situ microbe activity in the main source area. In addition, In-Situ Chemical Oxidation was implemented in the area around monitoring well EI-2. These interim measures were intended to stabilize and shrink the plume.

In Area of Concern (AOC) No. 6 (Metal Fabrication Area), which is located in the southwest portion of the main manufacturing building, a combination of SVE and Enhanced Bioremediation technologies were operated to reduce the chlorinated ethene impacts within the underlying vadose zone, unsaturated overburden, and fractured bedrock. SVE operations from February 2011 to March 2012 removed approximately 251 pounds of target constituents of concern (COC). Vapor and soil performance monitoring conducted following one year of operation indicated decreases in the COC concentrations across the well field when compared to the baseline concentrations.

Enhanced Bioremediation activities at AOC No. 6 commenced in May 2011, and included quick release electron donor injection into the saturated overburden, via dedicated injection wells, and into the underlying fractured bedrock via a groundwater recirculation system. In the fractured rock, reducing conditions were established within the recirculation zone, chlorinated ethene reductive dechlorination was observed, and reductive dechlorination potential extended from the treatment zone to the downgradient monitoring wells in fractured rock.

In the area surrounding environmental indicator well EI-2 (i.e., EI-2 Area), chemical oxidation was conducted from May to June 2011 to reduce concentrations of petroleum constituents and chlorinated ethenes in the saturated overburden, reduce associated mass flux, and promote decreasing trends of site COC concentrations in downgradient monitoring wells. In the petroleum impacted shallow, saturated overburden, reductions of target COCs were observed to decrease 54%-75% by six months following oxidation by ozone and hydrogen peroxide. Decreases in chlorinated ethenes were also detected in the deep saturated overburden following the permanganate treatment.

Following the implementation of interim measures, decreasing trends (via Mann Kendall and/or linear regression analyses) have been observed in some of wells in the EI-2 Area and in the fractured bedrock underlying AOC No.6. The facility has recently proposed in the *4th Quarterly/1st Annual Interim Measures Progress Report* to continue to focus remedial efforts at AOC No. 6 and the EI-2 area to further reduce the source area impacts, and as a result, downgradient impacts.

**REFERENCES:**


- Interim Measures Work Plan – August 2010
- 2012 Environmental Indicator (EI) Update – August 29, 2012
- Interim Measures Implementation Annual and Fourth Quarterly Progress Report – July 2012


Footnotes:

[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.

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

__X__ 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:**

As described within Section 10.2 and Figure 45 of the Phase I RCRA Facility Investigation Work Plan – Revision 1.0, the following three contamination migration pathways have been indentified at the site:

- Pathway 1, which extends from AOC No. 6 and the EI-2 Area (located on the northern portion of the site) to the eastern unnamed stream, running off-site and along the southeastern boundary;
- Pathway 2, which extends from AOC No. 6 to the on-site headwaters of Powell's Branch Creek (located on the southwestern property boundary);
- Pathway 3, which extends along the length of Powell's Branch Creek to off site.

Groundwater onsite flows to the southwest through southeast, towards Powell's Branch Creek. Groundwater from the site is likely the source of Powell's Branch creek as the headwaters are located on the adjacent property to the east. Historically, TCE, at concentrations greater than 1,000 µg/l, was detected in the upper reaches of Powell's Branch creek along the southwest portion of the site. However, current monitoring results reflect maximum concentrations of PCE at 12 µg/L and TCE at 1.0µg/l in surface water. Concentrations of COCs diminish to below the applicable surface water standards prior to exiting the site. No volatile organic constituents were detected in the unnamed stream located southeast of the facility.

**REFERENCES:**

Same as above

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] 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 concentration[3] 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[3] 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[3] 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 – skip to #8 and enter "IN" status code.

**RATIONALE:**

On-site, the portion of Powell's Branch Creek which is characterized by detections of target COCs is fenced to restrict access. While Powell's Branch Creek flows off the property, the absence of Volatile Organic Compounds (VOCs) above applicable Risk Based Screening Levels (RBSL's) at surface water station SW-3, the most downgradient location on the southwest portion of the site prior to discharging off site, indicated that impacted groundwater and surface water are not reaching off-site surface water bodies at concentrations above relevant RBSLs. Similarly, the absence of VOCs in surface water station SW-East-2 above RBSLs within the unnamed creek suggests that impacted groundwater is not reaching the retention pond (and any surface water body downgradient) at concentrations above relevant RBSLs. A review of the data presented in the 2012 Environmental Indicator (EI) Update, dated August 29, 2012, indicated that the discharge of contaminated groundwater into surface water is likely to be and remain insignificant based on the interim measures that were implemented and proposed future remedial efforts.

**REFERENCES:**

Same as above

Footnotes:

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

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[4])?

_____ 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 ecosystems), 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 into surface water is potentially significant) continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of <u>each</u> 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[3] 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 – skip to #8 and enter "IN" status code.

**RATIONALE AND REFERENCES:**

Footnotes:

[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.

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. 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:**

While Interim Measures have been implemented at the site, RCRA Corrective Action is ongoing. The facility will continue to conduct performance and receptor monitoring at multiple locations moving forward and to provide periodic reports on progress. Groundwater monitoring is currently performed in accordance with the Interim Measures Work Plan. A site-wide monitoring plan will be developed in the near-future to ensure long-term assessment of groundwater and surface water. In addition, the conclusion of the RCRA Facility Investigation and the development of a Corrective Measures Study to identify the final remedy are expected to occur in 2013.

**REFERENCES:**

Same as above

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).

**X** 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 Wilson Jones facility, EPA ID # VAD003124989, located in Crozet, 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 Vincent Maiden Date 11/6/2012

(Print) Vincent Maiden

(Title) Environmental Specialist II

Supervisor Jutta Schneider Date 11/6/2012

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**FINAL NOTE: THE MIGRATION OF CONTAMINATED GROUNDWATER UNDER CONTROL EI IS A QUALITATIVE SCREENING OF CURRENT GROUNDWATER CONDITIONS AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF GROUNDWATER QUALITY.**