

**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:** J. W. Fergusson & Sons  
**Facility Address:** 4107 Castlewood Road  
 Richmond, Virginia 23234  
**Facility EPA ID #:** EPA ID No. VAD003109360

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**

The J.W. Fergusson and Sons, Inc. facility site is a 79,000 square foot single story, concrete block building which operated a Rotogravure printing facility. The Rotogravure presses utilized significant amounts of toluene and printing inks in the printing processes. The facility sits on approximately 3.35 acres of land and the site is relatively level with elevations between 100 and 120 feet above sea level. The site is bound to the south by a Dominion Virginia Power Storage Yard, to the east by Castlewood Road with a trailer park on the other side of the public thoroughfare, the west by a rail spur and further commercial developments. To the north, the site is bound by a commercial facility named UPACO Adhesives.

J.W. Fergusson and Sons, Inc. purchased the property in 1962. Prior to this time, the property was a vacant lot that had not been used in any prior business. The printing facility was constructed in 1964. It was used for that purpose until 2006, the date of foreclosure of the business by the lending institution. The facility ceased all business activity effective September 2006. At the time of the EPA's CA site visit on April 1, 2008, J.W. Fergusson and Sons, LLC. (the former operating company), was in Chapter 7 Bankruptcy. All manufacturing equipment, process raw materials, and waste materials had been removed and transported off-site for reclamation, re-use, or disposal. In addition, all process material tanks and waste tanks had been decontaminated, removed, and transported off-site for reclamation, re-use or disposal. The facility was in the final stages of removing equipment related infrastructure, such as air pollution control duct work, etc., as part of the Chapter 7 liquidation process leaving the building virtually empty.

J.W. Fergusson and Sons, Inc. operated a container storage hazardous waste management unit (HWMU) with a storage capacity of 2,500 gallons at the facility site under Interim Status effective November 19, 1980. The Virginia Department of Health (VDH), Division of Solid and Hazardous Waste Management, issued correspondence, dated December 14, 1983, formally requesting the facility to submit a RCRA Part B Permit Application for management and storage of hazardous waste. The State received a RCRA Permit Application withdrawal request for the container (drum) storage facility on June 25, 1984, and the facility indicated it intended to operate the container storage area under 40 CFR § 262.34, Accumulation Time, as a less-than 90-day accumulation area as a generator. VDH received a Closure Plan for the container storage HWMU on July 2, 1984. The Closure Plan for the container storage HWMU was approved by the VDH on September 11, 1984. EPA received the Closure Certification according to Plan on October 12, 1984 and the closure verification was also on October 12, 1984. After "clean closure" approval of the container storage HWMU, the facility actively operated the same container storage area as a large quantity generator (LQG) under 40 CFR § 262.34, until the facility operations were terminated due to foreclosure in September 2006 (See SWMU No. 4, Hazardous Waste Container Storage Area No. 1, of CA Site Visit Report.).

The facility generated hazardous wastes from chrome plating operations and chrome stripping operations, including caustic waste from washing equipment in the printing plant, waste solvents, and still bottoms. (See CA Site Visit Report for further

details regarding hazardous wastes managed and generated.). Raw materials used at the site included acetone, toluene, methyl ethyl ketone, isopropyl acetate, hexane, alcohols, esters, and ethylene vinyl acetate. The facility maintained underground storage tanks containing raw materials used in the manufacturing process. Additionally, the facility operated a solvent recovery system which consisted of large granular activated carbon vessels and several above ground storage tanks for containing recovered solvent and waste water from the carbon stripping steam down process.

The site is zoned M-1-Light Industrial and proposed reuse of the property is industrial. The site is fenced on all sides which restricts access to the site. Potable water is provided to the facility and nearby vicinity by the City of Richmond public water supply (PWS) system.

#### **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**”<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):**

The facility maintained a number of SWMUs consisting of a drum storage area (SWMU 7), underground storage tanks containing raw materials used in the manufacturing process (SWMUs 8 and 9), and a solvent recovery system (SWMU 6). Releases and contamination from SWMUs 6 and 8 have been previously identified. Investigation of soil and groundwater and remedial activities on the Fergusson property were completed in accordance with the UST Program, the Virginia Voluntary Remediation Program (VRP), and RCRA Corrective Action Program (RCRA CA).

In 1993, releases of toluene and n-propyl acetate occurred from two USTs (SWMU 8) located on the south side of the manufacturing building. The UST Program investigated the nature and extent of the releases under PC#93-1936. Soil results indicated the presence of toluene and acetone below residential RBCs for direct contact. N-propyl acetate was not detected in soil. No free product was encountered during the investigation. Groundwater results indicated a toluene concentration of 9,125 ug/l, above its MCL of 1,000 ug/l. Acetone was detected in groundwater at 23.3 ug/l, below its tap water RBC of 22,000 ug/l and n-propyl acetate was not detected in groundwater. Subsequently, the USTs were evacuated of residual fluids, closed in place by filling them with concrete, and the area overlying the USTs was surfaced with concrete.

In 2004, a limited Phase II Environmental Site Assessment (ESA) was conducted by GaiaTech. The ESA consisted of advancing seventeen soil borings site-wide, of which fourteen temporary piezometers were installed, utilizing direct push technology to sample soil and groundwater. Soil and groundwater samples were collected across the site and analyzed for VOCs, SVOCs, and eight RCRA metals. Soil results could not be screened against DAF-1 SSLs because analytical reporting limits were higher than current SSLs. Soil results indicated that VOCs and SVOCs were below residential RBCs for direct contact. Groundwater results associated with SWMU 8 (discussed above) at sample location GP-3 did not indicate the presence of toluene and acetone. Groundwater results indicated that arsenic and chromium exceeded the MCLs of 10 ug/ and 100 ug/l, respectively. Additionally, a number of VOCs in groundwater associated with the western portion of the property where the solvent recovery system (SWMU 6) is located exceeded MCLs and/or tap water RBCs including; benzene, 1,1-dichloroethylene, toluene, acetone, carbon tetrachloride, methyl ethyl ketone, and methylene chloride. Subsequently, the western portion of the property (SWMU 6, solvent recovery system) was accepted into the VRP.

The facility further investigated groundwater conditions associated with the western portion of the property from 2004 to 2007 in accordance with VRP requirements. This area of the property was impacted by release(s) from the facility’s solvent recovery system as discovered during the limited Phase II ESA. Groundwater monitoring wells were installed upgradient and downgradient of the area to characterize groundwater conditions. During this time the facility stopped manufacturing activities and the solvent recovery system, including manufacturing equipment, was removed from the property. The facility performed on-going groundwater monitoring from 2005 to 2007. Results of this monitoring indicated that in 2007 primarily benzene, arsenic, and chromium exceeded MCLs. Based on this, the facility imposed a groundwater use restriction on the entire property. Subsequently, the facility was issued a “Certificate of Satisfactory Completion” in accordance with VRP in 2007.

**References:**

EPA Region III Corrective Action Program, *Final RCRA Site Visit Report*, December 24, 2008, by U.S. Army Corps. of Engineers

*Limited Phase II Site Investigation Letter Report* - for J.W. Fergusson & Sons, Inc., dated March 8, 2004, by GaiaTech

*Site Characterization Report*, Berluk (J.W. Fergusson) Site, 4107 Castlewood Road, Richmond, VA, VRP No. 00392, dated February 27, 2007, by ENVIRON

DEQ, Voluntary Remediation Program (VRP) Administrative Record for J. W. Fergusson & Sons, 4107 Castlewood Road, Richmond, VA, VRP00392

DEQ, VRP Certificate of Satisfactory Completion of Remediation and Declaration of Restrictive Covenants for J. W. Fergusson & Sons, 4107 Castlewood Road, Richmond, VA, VRP00392, dated March 7, 2008, and Certified April 14, 2008.

EPA Risk-Based Concentration Table Screening Levels, dated May 19, 2009.

**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”<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):**

In 1993, two USTs containing toluene and n-propyl acetate (SWMU 8) were closed in place by evacuating residual fluids and filling them with concrete as a result of a release. Soil and groundwater were assessed for which the results indicated the presence of toluene and acetone. The surface at the UST locations was resurfaced with concrete. These activities indicate that the sources of contamination at these locations were removed and known contaminants left in place in soil were capped by concrete, mitigating further migration to groundwater. Subsequent groundwater sampling in this area conducted as part of the 2004 Phase II ESA (sample location GP-3) did not indicate the presence of toluene and acetone above groundwater drinking standards.

In 2006 the facility terminated manufacturing operations and removed all manufacturing equipment from the property, including the solvent recovery system. Groundwater was monitored frequently from 2004 to 2007 as part of a limited Phase II ESA and in accordance with the VRP. Results of this monitoring indicated impact to groundwater from the solvent recovery system. However, groundwater monitoring also indicates attenuation of constituents in groundwater following the removal of the solvent recovery system. As a result of the VRP, the facility imposed a groundwater use restriction on the entire property.

In 2010 at the request of VDEQ, the facility conducted additional groundwater monitoring under RCRA Corrective Action of the existing wells previously installed under VRP. Results of this monitoring indicate that benzene, lead, and arsenic exceed drinking water standards. Benzene in groundwater was observed above MCLs at MW-5 only (21 ug/l) and lead in groundwater was observed above its MCL at MW-3 only (16.2 ug/l). Arsenic in groundwater was observed above its MCL at MW-2 (19.8 ug/l), MW-3 (50 ug/l), and MW-5 (32.5 ug/l). These groundwater monitoring results are consistent with previous results from 2007, indicating stabilization of contaminant migration in groundwater. Additionally, these results verify that source areas have been removed effectively and impacted media left in place is not contributing to groundwater contamination.

**References:**

EPA Region III Corrective Action Program, *RCRA Corrective Action Assessment Report*, October 12, 2010, by Independent Environmental Consultants, LLC

EPA Region III Corrective Action Program, *Final RCRA Site Visit Report*, December 24, 2008, by U.S. Army Corps. of Engineers

*Limited Phase II Site Investigation Letter Report* - for J.W. Fergusson & Sons, Inc., dated March 8, 2004, by GaiaTech  
*Site Characterization Report*, Berluk (J.W. Fergusson) Site, 4107 Castlewood Road, Richmond, VA, VRP No. 00392, dated February 27, 2007, by ENVIRON

DEQ, VRP Certificate of Satisfactory Completion of Remediation and Declaration of Restrictive Covenants for J. W. Fergusson & Sons, 4107 Castlewood Road, Richmond, VA, VRP00392, dated March 7, 2008, and Certified April 14, 2008.

**Footnotes:**

<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.

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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 nearest surface water body is Grindall Creek, which flows to the southeast approximately 1,000 feet south and west of the site. No springs have been identified within one mile of the property. The groundwater flow direction across the site is generally to the east and southeast. Impacted media is limited to on-site and there has been no observation or indication of migration off-site. Therefore, groundwater associated with this property does not discharge to any surface water bodies.

**References:**

EPA Region III Corrective Action Program, *RCRA Corrective Action Assessment Report*, October 12, 2010, by Independent Environmental Consultants, LLC

EPA Region III Corrective Action Program, *Final RCRA Site Visit Report*, December 24, 2008, by U.S. Army Corps. of Engineers

*Site Characterization Report*, Berluk (J.W. Fergusson) Site, 4107 Castlewood Road, Richmond, VA, VRP No. 00392, dated February 27, 2007, by ENVIRON

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5. Is the **discharge** 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.



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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 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.

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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):**

A groundwater monitoring plan will be developed and implemented at the facility to accompany the existing groundwater use restriction. The groundwater monitoring plan will include laboratory analysis of volatile organic compounds (VOCs) and target analyte list (TAL) metals, which will include arsenic and lead. Groundwater monitoring will occur once every 2 years at a minimum. Fergusson will report the results of the monitoring to the VDEQ and EPA following each monitoring event.

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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 **J. W. Fergusson & Sons** facility, EPA ID # **VAD003109360**, located at **4107 Castlewood Road Richmond, Virginia 23234**. 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 *Brett Fisher* Date 19 November 2010  
Brett Fisher, P.G.  
RCRA CA Project Manager, VDEQ ORP

Supervisor *Jutta Schneider* Date 19 November 2010  
Jutta Schneider  
RCRA CA/Groundwater Program Manager  
VDEQ CO, ORP

Locations where References may be found:

Virginia Department of Environmental Quality  
Central Office, Office of Remediation Programs  
629 East Main Street  
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