FIVE-YEAR REVIEW REPORT

for

RENTOKIL, INC.
SUPERFUND SITE

HENRICO COUNTY, VIRGINIA

SEPTEMBER 2003

Prepared by:
U.S. Environmental Protection Agency
Region III
Philadelphia, Pennsylvania

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Hazardous Site Cleanup Division

9/17/03
Date

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Attachments

List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
FS	Feasibility Study
mg/kg	milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OU	Operable Unit
RA	Remedial Action
RAO	Remedial Action Objectives
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
USACE	United States Army Corps of Engineers
VDEQ	Virginia Department of Environmental Quality

EXECUTIVE SUMMARY

Cleanup work at the Rentokil, Inc. Superfund Site in Henrico County, Virginia included a removal action and a remedial action. The objective of the removal action was to minimize the migration of contaminated soil from the Site to North Run Creek. This was accomplished by covering the CCA Area with a temporary plastic liner and constructing a berm and a sediment trap along the northern border of the Site prior to the point where the surface water drainage entered the creek.

The remedial action included demolition and off-site disposal of the remaining structures at the Site, excavation and on-site disposal of the contaminated sediments from Wetlands A, B, and C, removal of the former Site pond, excavation and off-site disposal of the CCA Area, construction of a slurry wall around the former process and storage areas, construction of a RCRA Subtitle C cap over the area encompassed by the slurry wall, installation of three directionally drilled wells within the containment area, and construction of three divider wall structures.

The site achieved construction completion status with the signing of the Preliminary Close Out Report on September 2, 1999. The trigger for this five-year review was the date construction of the remedy started, May 18, 1998.

The assessment of this five-year review found that the remedy was constructed in accordance with the requirements of the Record of Decision Amendment (ROD Amendment). EPA, however, is deferring its decision of whether the Site is protective of human health and the environment at this time. An additional investigation of the contamination found in the ground water in the vicinity of VPMW-2 is needed before a determination of protectiveness can be made.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name: Rentokil Inc. Superfund Site

EPA ID: VAD0710400752

Region: 3	**State:** VA	**City/County:** Richmond, Henrico County

SITE STATUS

NPL status: ✖ Final ❑ Deleted ❑ Other (specify)_____

Remediation Status (choose all that apply): Under Construction ❑ Operating ✷ Complete

Multiple OUs? ❑ YES ✷ NO	**Construction completion date: 09/2/1999**

Has site been put into reuse? ❑ YES ✖ NO

REVIEW STATUS

Lead agency: ✖ EPA ❑ State ❑ Tribe ❑ Other Federal Agency_____

Author(s) name: Andrew Palestini

Author(s) title: Remedial Project Manager	**Author(s) Affiliation: U.S. EPA - Region 3**

Review period: 12/12/2002 to 09/17/2003

Date(s) of site inspection: 04/10/2003

Type of review: ✖ Post-SARA ❑ Pre-SARA ❑ NPL-Removal only ❑ Non-NPL Remedial Action Site ❑ NPL State/Tribe-lead ❑ Regional Discretion

Review number: X 1 (first) ❑ 2 (second) ❑ 3 (third) ❑ Other(specify)_____

Triggering action:

X Actual RA Onsite Construction at Site
❑ Actual RA Start at OU# _____
❑ Construction Completion
❑ Previous Five-Year Review Report
❑ Other (specify)

Triggering action date: 05/18/1998

Due date (five years after triggering action date): 05/18/2003

Five-Year Review Summary Form, cont'd

Issues:

Containment of the contaminated ground water plume has not been confirmed (high levels of ground water contamination have been detected at monitoring well VPMW-2).

Institutional controls have not yet been implemented.

Wetland A re-vegetation has not met criteria for successful mitigation.

Recommendations and Follow-up Actions:

Additional investigations are necessary to determine whether the ground water contamination detected at monitoring well VPMW-2 is emanating from containment system.

Virginia Properties Inc. (VPI) submitted draft institutional controls to EPA. EPA needs to complete its review of the draft document and submit comments to VPI. VPI needs to make any necessary revisions (based on EPA review) and formalize the institutional controls.

VPI will continue to monitor the Wetland A re-vegetation and submit end-of-year reports to EPA and U.S. Fish &Wildlife Service until criteria are met.

Protectiveness Statement:

EPA is deferring its decision on the protectiveness of the remedial action at this time.

All threats at the site associated with ingestion or dermal contact with contaminated soil and sediments have been addressed. The ground water clean-up goals selected for the site are protective of human health and the environment. In the interim, exposure pathways that could result in unacceptable risks are being controlled and institutional controls will be implemented to prevent exposure to, or ingestion of, contaminated ground water.

Long-term Protectiveness:

Long-term protectiveness of the remedial action will be verified through the continued monitoring of the ground water plume downgradient of the slurry wall. The previous ground water modeling results should be compared with the actual ground water monitoring results to date. The model may have to be re-calibrated using the actual monitoring results.

Rentokil Inc. Superfund Site
Richmond, Virginia
Five-Year Review Report

I. Introduction

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

The Agency is preparing this five-year review pursuant to CERCLA § 121 (the Comprehensive Environmental Response, Compensation and Liability Act, as amended) and the National Contingency Plan (NCP). CERCLA § 121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at a site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section 106, the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The agency interpreted this requirement further in the National Contingency Plan (NCP); 40 C.F.R. §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The United States Environmental Protection Agency (EPA) Region 3 has conducted a five-year review of the remedial actions implemented at the Rentokil Inc. (Virginia Wood Preserving) Site in Henrico County, Virginia. This review was conducted from December 2002 through September 2003. This report documents the results of the review.

This is the first five-year review conducted at the Rentokil Inc. Site. The triggering action for this review is the initiation of the remedial action on May 18, 1998.

The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. This review covers the entire site as EPA did not divide cleanup at the site into separate operable units.

For this five-year review, the project managers from EPA and the Virginia Department of Environmental Quality (VDEQ) jointly inspected the site on April 10, 2003.

II. Site Chronology

The purpose of this section is to list all important site events and relevant dates.

Table 1: Chronology of Site Events

Event	Date
Placed on National Priorities List	March 1989
Wood treating operations ceased	January 1990
Consent Order signed to prevent sediment migration	March 9, 1992
Sediment control devices installed	April 1992
Record of Decision	June 22, 1993
Work began on RD Work Plan	November 1993
RD Work Plan approved	September 1994
Value Engineering completed	October 1995
Record of Decision Amendment	August 27, 1996
VDEQ conditionally approves divider wall concept	January 1997
Final design completed	September 1997
Construction start	May 18, 1998
Pre-final inspection	August 3, 1999
Preliminary Close Out Report	September 2, 1999

III. Background

The purpose of this section is to describe the site characteristics and to identify the threat posed to the public and the environment at the time of the initial ROD.

Physical Characteristics

The Rentokil Inc. Site (Site) is located at the intersection of Peyton Street and Ackley Avenue in Henrico County, near Richmond, Virginia (see Figure 1 - Regional Location Map). In addition to the facility, the site includes three wetland areas which received runoff from the site: the area immediately north of the site which is within the flood plain of an unnamed tributary to North Run (Wetland A); the area at the southeastern corner of the site (Wetland B); and the area immediately south of the site which is across Peyton Street (Wetland C). The unnamed tributary north of the site is referred to as North Run Creek. The land immediately surrounding the site is mostly open space/woodlands. Nearby development is comprised of light industrial, commercial, and low density residential. The site and the immediate surrounding land are presently zoned for light and general industry.

Surface water runoff from the northern portion of the site flowed towards Wetland A and into North Run Creek (See Figure 2). North Run Creek flows into Talley's Pond, then to North Run, Upham Creek, and finally into the Chickahominy River. Prior to the remedial action, surface water runoff from the southern portion of the site flowed towards Wetland B, where it was retained and discharged to Wetland C when flow was high. Because the culvert carrying surface water runoff from Wetland C was about two feet above the normal elevation of Wetland C, site-related runoff was retained within Wetland C.

Land and Resource Use

Wood treatment operations occurred at the site from 1957 until January 1990. The initial operation was performed on a five acre parcel of land. The land area for the wood treatment operations grew to ten acres over the years as the operations were expanded. The facility has been inactive since all operations were ceased in January 1990.

The current use of the land surrounding the Site is light industrial, commercial, and low density residential. EPA anticipates that this same mix of land uses will continue into the future, with the majority of the light industrial/commercial uses centered around Parham Road, located approximately 0.1 mile from the site. In establishing cleanup requirements for the site, EPA anticipated the site will remain light industrial/ commercial. The site itself is currently fenced and the contaminated soils and sediments are contained within the fenced area under an impermeable cap.

The ground water aquifer underlying the site is currently not being used as a drinking water source. The dominant ground water flow direction in the area of the Site is to the northwest, toward North Run Creek.

History of Contamination

Wood treatment operations were performed at the site with different chemicals being used over the years. These included pentachlorophenol (PCP), chromium zinc arsenate (CZA), copper chromated arsenate (CCA), fire retardant, creosote, and xylene. Throughout the operational history of the site, freshly treated wood was allowed to drip onto the soil and then stored in nearly all open areas of the site. In addition, wastes from early operations were reportedly discharged to a blowdown sump. The previous owners replaced the blowdown sump in 1963 with a concrete holding pond and constructed a covered unlined lagoon. The concrete holding pond was linked to the covered unlined lagoon by an underground drainpipe. The drainpipe was closed and apparently abandoned in place in 1974, with no details given of any testing, sampling, or the method of abandonment.

In 1976 or 1977, a batch of CCA precipitated in a process tank and was rendered unusable. This batch of approximately 1,100 to 1,400 pounds of CCA was disposed of in a pit in the northeastern quadrant of the site in what has since been referred to as the CCA Area.

Initial Response

Because of fish kills in Talley's Pond, the blowdown sump was cleared, cleaned, and replaced with the concrete holding pond in 1963, under the direction of the Virginia State Water Control Board. In 1987, the contents of the covered holding lagoon were removed and transported to off-site treatment/disposal facilities. However, no soil or water samples were collected. Because the area was not backfilled, an open excavation containing a combination of rainwater and ground water reformed.

After discontinuing treatment operations, Virginia Properties, Inc. (VPI, the successor to Rentokil) constructed a roof over the concrete holding pond and installed a polyvinyl chloride cover over the drip pad to prevent storm water from falling on the surface. In the spring of 1991, VPI arranged for the removal of all wood treatment equipment from the site. All eight aboveground storage tanks and the three treatment cylinders were dismantled and disposed of off-site. Clean compacted clay was placed over the area where the cylinders were located to prevent surface water infiltration and subsequent transport of site related constituents. A roof was also built over the former tank farm area.

Because of the high levels of inorganics detected in the surface water and sediments in North Run Creek, EPA and VPI entered into an Administrative Order By Consent for Removal Action in March 1992. The Order called for VPI to design, construct, and maintain sediment control structures to prevent additional migration of arsenic, copper, chromium, and zinc into North Run Creek. The work, consisting of covering the CCA Area with heavy plastic and constructing a berm and sediment trap, was completed in June 1992.

Basis for Taking Action

Contaminants

Hazardous substances that have been released at the Rentokil, Site include:

arsenic	benzoic acid
chromium	2,4-dimethylphenol
copper	2-methylphenol
zinc	4-methylphenol
benzene	pentachlorophenol
ethylbenzene	phenol
styrene	PAHs
toluene	dioxins
xylenes	furans

Exposures to soil and ground water are associated with significant human health risks, due to exceedance of EPA's risk management criteria for the average exposure scenario. The carcinogenic risks were highest for exposures to the perched ground water due to the high concentrations of carcinogenic polyaromatic hydrocarbons (PAHs). Non-carcinogenic hazards were also highest for exposure to the perched ground water due to the high concentrations of arsenic and one of the PAHs. Carcinogenic risks from exposure to saprolite ground water were significant due to the presence of PCP and dioxins. Non-carcinogenic risks from exposure to soil were significant due to the presence of arsenic, chromium, PCP, and one of the PAHs.

IV. Remedial Actions

The purpose of this section is to discuss initial plans, implementation history, and current status of the remedy.

Remedy Selection

The ROD for the Rentokil Inc. Site was signed on June 22, 1993. Remedial Action Objections (RAOs) were not specifically listed in the ROD. However, as can be inferred from the list of the major components of the remedy listed below, the objectives of the remedy are:

Source Control Response Objectives

- Reduce risks to human health by preventing direct contact with, and ingestion of, contaminants in the site soil, wetland sediments, and pond sediments, and by preventing potential ingestion of contaminated ground water;

- Reduce risks to the environment by preventing direct contact with, and ingestion of, contaminants in the wetland sediments; and

- Minimize the migration of contaminants from site soil and wetland sediments that could result in surface water concentrations in excess of Ambient Water Quality Criteria.

Management of Ground Water Migration Response Objectives

- Eliminate or minimize the threat posed to human health and the environment by preventing exposure to the contaminants in the ground water; and

- Restore contaminated ground water to Federal and State applicable or relevant and appropriate requirements (ARARs), including drinking water standards, and to a level that is protective of human health and the environment within a reasonable period of time.

The major components of the remedy selected in the ROD include the following:

- Demolition, decontamination, and off-site disposal of the remaining structures.

- Excavation and on-site carbon adsorption treatment of surface water from the unlined lagoon, with discharge of treated water to North Run Creek.

- Excavation and off-site incineration treatment of approximately 70 cubic yards of K001 waste from the unlined lagoon.

- Construction of a RCRA Subtitle C cap over the area of the site where the surface soil exceeds the site-specific cleanup levels as far into the wetlands as possible.

- Construction of a slurry wall around the perimeter of the area encompassed by the cap. Installation of a dewatering system within the confines of the cap/slurry wall to produce an intragradient condition, with on-site treatment of the collected ground water and discharge to North Run Creek. The dewatering system consisted of two vertical caissons constructed to the bedrock with horizontal laterals installed on top of the hardpan and on top of the bedrock. Off-site disposal of any drums encountered in the Fill Area during the installation of the slurry wall.

- Excavation, on-site low temperature thermal desorption treatment, and on-site disposal of approximately 5,150 cubic yards of soil in the following "hot spots": CCA Disposal Area, Fill Area, and DNAPL-contaminated soils between the surface and the hardpan which occur within 25 feet of the concrete drip pad, the unlined pond, and the former blowdown sump.

- Consolidation of surface soils which lie outside the area to be capped (generally occurring in Wetland Areas A, B, and C) which exceed any site-specific cleanup level to the area of the site to be capped.

- Excavation and on-site disposal of sediments in the oxbow of North Run Creek which exceed the site-specific cleanup levels. Sampling of sediments in Talley's Pond and the sediments which were previously dredged by the owner of the pond, with excavation, treatment, and off-site disposal of any sediments which exceed the site-specific cleanup levels.

- Re-vegetation of the excavated wetland areas and mitigation of the loss of wetlands by the creation of wetlands of equal or better value.

- Implement institutional controls to prohibit residential development of the site to prevent exposure to the untreated soil at the site and to prevent residential exposure to the treated soil which meet the cleanup levels established for the future light industrial use scenario for the site. Institutional controls will also prohibit use of the ground water at the site.

- Perform long-term ground water monitoring for at least 30 years.

Following issuance of the ROD, EPA and VPI entered into a Consent Decree (CD) where VPI agreed to perform the remedial design and remedial action (RD/RA) of the remedy selected in the ROD. VPI also agreed to pay past and oversight costs in the CD. In conjunction with the preparation of the 60% design documents, VPI conducted a Value Engineering Analysis of the ROD remedy. Two major issues were addressed in the Value Engineering Analysis: (1) the technical practicability of low temperature thermal desorption treatment of the site soil with a non-combustive air pollution control system (as selected in the ROD) and (2) the value of soil treatment, given the then most current information on geological conditions and contaminant fate and transport in the ground water.

Treatability tests for the low temperature thermal desorption indicated new and more toxic constituents, primarily dioxins and benzene, could be produced during the treatment process and that these residuals could be impossible to dispose of either on or off-site due to regulatory constraints. The ground water fate and transport modeling demonstrated that the containment system selected in the ROD (construction of a cap and slurry wall and operation of a dewatering system within this containment area) would effectively prevent migration of the existing contamination under the former wood treating area and that treatment of the "hot spots" would not be warranted. EPA evaluated the ground water modeling, agreed with its conclusions, and, on August 27, 1996, issued a ROD Amendment removing the requirement for treatment of the "hot spots."

Remedy Implementation

The Remedial Design (RD), initiated in November 1993, was conducted in accordance with the ROD and the ROD Amendment. Primarily because of the delay caused by the need to issue the ROD Amendment and the lengthy review of the pre-final (95%) design, the final design was not submitted for regulatory review until September 1997.

During the pre-final design effort (November 1996 to April 1997), VPI sampled the northern portion of the site property to determine whether surface soil arsenic concentrations exceeded the site-specific cleanup levels. This was done to refine the alignment of the north slurry wall to accommodate a future rail spur to service potential development north of the site. The analytical results indicated that surface soils on the northern portion of the property had levels of arsenic below the site-specific cleanup levels. As such, EPA and VDEQ agreed to modify the alignment of the northern slurry wall.

In addition, VPI suggested several other modifications to the remedy in the pre-final design:

1. Off-site treatment and disposal of extracted ground water rather than on-site treatment and discharge.

2. Modification of the slurry wall and cap configuration to accommodate future development of the site and the adjacent property.

3. Directionally drilled laterals in lieu of caissons for ground water extraction.

4. Eliminate the removal of material from the bottom of the unlined lagoon.

EPA and VDEQ agreed to off-site handling of the ground water, modifying the alignment of the cap and slurry wall, using directionally drilled laterals, and an inspection of the lagoon after it was drained to determine whether the lagoon material is K001 waste. In addition, an agreement was reached between EPA, VDEQ, VPI, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service to mitigate the remediated wetlands at an off-site location and to place a restrictive covenant on the area known as Wetland A.

In an effort to accommodate future commercial/light industrial re-development of the site, VPI proposed to EPA and VDEQ constructing three structures they termed "divider walls." The idea was to only allow re-development of the site inside the divider wall structure. The divider walls are rectangular concrete structures constructed vertically into the cap, with the cap liner attached to both the inside and outside of the concrete walls using embedded LDPE strips in the walls. These structures allow for a total area of approximately 50,000 square feet of potential re-development. Waterstops were inserted in each concrete construction joint for future foundation construction. Utilities were also placed inside the divider wall structure to avoid disrupting the cap if development occurs. Because this deviated from the design of the typical RCRA cap and because the RCRA program is delegated to VDEQ, implementing this change required state approval of the concept. VDEQ conditionally approved the installation of divider wall structures for use in potential future re-development of the site in January 1997.

VPI awarded the construction contract to Dames & Moore, Inc, the prime contractor, on January 16, 1998. OHM Corporation was selected by Dames & Moore as the major site remediation subcontractor. NewFields, Inc. conducted quality assurance activities and was VPI's owner's agent for the construction project. Mobilization of the construction contractor began on May 18, 1998. Work at the Site was scheduled for a

winter shutdown from the end of November 1998 to the end of April 1999. However, work at the Site did not stop during the winter in order to make up for the time lost at the beginning of the RA. By continuing work during the winter, the contractor demobilized from the Site on August 10, 1999, approximately four weeks prior to the anticipated construction completion date.

EPA, VDEQ, USACE, VPI, and VPI's contractors conducted a pre-final inspection on August 3, 1999, which resulted in a list of minor construction items for correction by the contractor prior to final EPA approval.

The site achieved construction completion status when the Preliminary Close Out Report was signed on September 2, 1999.

EPA and VDEQ have determined that all RA construction activities except for the implementation of institutional controls were performed according to specifications. It is not expected that cleanup goals for all ground water contaminants will be reached for many years. The Final Close Out Report will not be issued until all ground water levels have been met.

System Operation/Operation and Maintenance

VPI is conducting long-term monitoring and maintenance activities according to the operation and maintenance (O&M) plan that was approved by EPA in June 2001. The primary maintenance activities include the following:

- Inspect the cap monthly with regard to vegetative cover, settlement, stability, and any need for corrective action. All areas of erosion damage to the cap will be promptly re-graded (where needed), patched, and re-seeded. In addition, the cap vegetation is mowed monthly during the growing season;

- Inspect the storm water collection trenches around the perimeter of the cap for debris and sediment buildup. Inspections occur monthly or after any major storm event. Debris and sediment are removed as needed to keep the trenches clear;

- Flush out the storm water collector pipe system under the cap annually;

- Inspect the ground water pumping system monthly, including the pumps, piping, flow indicators, motors, ground water level probes, and system controls. Each of the three recovery well pumps and the french drain sump pump will be disassembled, replacing worn or non-functioning parts as needed, and reinstalled annually.

- Inspect the ground water storage tanks and the associated pumps, piping, controls, and alarms monthly.

- Perform semi-annual ground water monitoring.

- Take ground water level measurements monthly.

- Inspect and submit monitoring reports on the success of re-vegetating Wetland A for years 1, 2, 3, 5, 7, and 10 following the first growing season after planting. This monitoring period may be shortened if performance criteria are achieved for three consecutive years.

As indicated previously, 6.81 acres of off-site prior converted crop land was converted back to wetlands as mitigation for disturbing Wetlands A, B, and C. In the agreement between VPI and the owner of the crop land, the land owner is responsible to restore the property to a wetland. This means that the land owner is responsible for the initial plantings as well as inspecting, monitoring, and reporting on the progress of this work. In addition, all corrective action on the property is the responsibility of the land owner.

O&M costs include cap and drainage structure maintenance, sampling and monitoring efforts, monitoring well maintenance, and maintenance of Wetland A. O&M activities are being performed by VPI under the terms of the Consent Decree and they have not provided detailed information regarding actual expenditures for O&M.

V. Progress Since the Last Review

The purpose of this section is to discuss the progress taken on follow-up actions included in the previous five-year report.

This is the first five-year review for the site.

VI. Five-Year Review Process

The purpose of this section is to describe the activities performed during the five-year review process as well as providing a summary of findings, when appropriate.

Administrative Components

A kick-off meeting for the five-year review was held in the EPA Region 3 regional office in Philadelphia on December 12, 2002. Attending the meeting were Andy

Palestini, the EPA Remedial Project Manager and the leader of the Five-Year Review Team, Bernice Pasquini, the EPA hydrogeologist, Benjamin Cohan, the EPA assistant regional counsel, VPI, and their technical and legal representatives. The purpose of the meeting was to discuss the purpose of the five-year review, the steps necessary to complete the five-year review report, and to work out a schedule for completing the work.

Specifically, we discussed the need to schedule the semi-annual ground water monitoring such that the results would be incorporated into the five-year report. In addition, there was a lengthy discussion on how to address the institutional controls so that they conformed with the latest EPA guidance.

Community Involvement

A notice was placed in the Richmond *Times Dispatch* on April 8, 2003 to inform the public that EPA was conducting a five-year review of the site. In the newspaper ad, EPA solicited the general sentiment from the local community on how the site operations affects them and whether anyone had any comments, suggestions, or recommendations regarding the site's management or operation. The advertisement also provided point of contact information for the site.

No feedback was received from the community as a result of the advertisement.

Another notice will be placed in the same newspaper to announce that the Five-Year Review report for the Rentokil, Inc. site has been completed. Information on the results of the review and the report availability will be part of the announcement.

A public meeting was not held because of the historically low attendance at the previous meetings for the Proposed Remedial Action Plans for the ROD and the ROD Amendment as well as the meeting held to discuss the final design.

Document Review

The five-year review consisted of a review of relevant documents including the ROD and ROD Amendment, the Preliminary Closeout Report, the Operation, Maintenance, and Monitoring Summary Reports for 2001 and 2002, and the Ground Water Monitoring Reports. Applicable ground water cleanup standards, as listed in the 1993 ROD, were also reviewed.

Data Review

For this Five-Year Review, EPA reviewed the following: the monthly ground water level measurements, the analytical results of the four semi-annual ground water sampling events to date, and the analytical results of the ground water collected in the horizontal well system.

The purpose of the cap/slurry wall containment system and the horizontal wells within this boundary is to cause an inward gradient across the slurry wall so that any contamination within the containment system will not migrate beyond the slurry wall. There are seven pairs of piezometers located at the site (VPPZ-1 thru VPPZ-14) with one piezometer from each pair located within the cap/slurry wall and the other piezometer located directly opposite but outside the slurry wall (Figure 3). Ground water level measurements are taken monthly at each of the piezometers to determine whether the inward gradient exists. Results to date indicate a mostly flat to inward gradient across the site, with a few instances of a slight outward gradient at several locations.

Semi-annual ground water sampling has been conducted at the site since July 2001. The sampling is conducted at the six monitoring wells (VPMW-1 thru VPMW-6) located down gradient from the former wood treating facility (see Figure 3). All of the six monitoring wells are located outside of the slurry wall, in the saprolitic ground water aquifer.

Modeling of the existing ground water plume and possible migration scenarios over time was performed during the remedial design, as part of the Value Engineering. This model was used to position the ground water monitoring wells. VPMW-1 was situated outside but immediately adjacent to the western extent of the modeled plume to determine if the plume was migrating in this direction. VPMW-2 and VPMW-3 are situated inside the modeled plume to monitor the advection and dispersion of site contaminants over time and their migration to the north. VPMW-2 was located on the western edge of the modeled plume and VPMW-3 was located in the central portion of the modeled plume. Based on the model projected plume migration, concentrations of PCP over time in wells VPMW-2 and VPMW-3 should decrease as the plume migrates towards the north.

The remaining three monitoring wells (VPMW-4, VPMW-5, and VPMW-6) were placed along the down-gradient boundary of the modeled plume for the purpose of monitoring the potential migration of the plume. According to the model, the plume could enlarge, over time, in a northerly direction. In this event, sampling results from VPMW-4 and VPMW-5 may indicate slight increases in PCP concentrations. VPMW-6 is situated outside of the northern most extent of the modeled plume at year thirty.

In accordance with the ROD, the ground water samples are analyzed for the site-related contaminants listed below:

- Polynuclear Aromatic Hydrocarbons (PAHs) using EPA Method 8270
- Arsenic (Dissolved) using EPA Method 6010
- Copper using EPA Method 6010
- Chromium using EPA Method 6010
- Zinc using EPA Method 6010
- Pentachlorophenol using EPA Method 8270

In addition, although not required by the ROD, VPI has agreed with EPA's request to analyze for benzene since this contaminant was detected in the ground water prior to being transported off-site for treatment and disposal.

The PCP clean-up level for the site has been set as 1 ug/L, which is the Maximum Contaminant Level (MCL). Because EPA Method 8270 has a detection limit of 10 ug/L, samples with non-detect or J-flagged concentrations of PCP were also analyzed using the Single (Selected) Ion Method (SIM) with a detection limit of 1 ug/L.

Of the above list, PCP is the one contaminant which has exceeded the clean-up level every sampling event to date. The table below shows the analytical results of the four sampling events to date.

Table 2 - Monitoring Well Results for PCP

PCP				
	July 2001	January 2002	July 2002	January 2003
VPMW-1	11 ug/L	9.4 ug/L	19 ug/L	11 ug/L
VPMW-2	4,200 ug/L	6,500 ug/L	5,900 ug/L	10,000 ug/L
VPMW-2 duplicate	4,400 ug/L	5,500 ug/L	5,900 ug/L	5,800 ug/L
VPMW-3	--	26 ug/L	25 ug/L	4 ug/L
VPMW-4	--	72 ug/L	0.79 ug/L	--
VPMW-5	--	0.46 ug/L	--	--
VPMW-6	--	65 ug/L	not sampled	--
-- below detection limit				

As can be seen above, PCP was detected at VPMW-4 and VPMW-6 at levels exceeding the MCL only during the January 2002 sampling event. It is thought these analytical results are the result of the sampling crew not properly following the Sampling and Analysis Plan. Apparently, the person taking the samples collected the samples at these monitoring wells after taking the sample at VPMW-2, which is the most contaminated monitoring well. During the next two sampling events, VPMW-2 was sampled last and the analytical results show that PCP was not detected at these monitoring wells above the detection limit.

The following discussion lists the contaminants detected in each of the monitoring wells at the site which exceed MCL's.

At VPMW-1, the analytical data of the four sampling events to date show the PCP results exceeded the MCL on every occasion and the Bis(2-ethylhexl)phthalate (BEHP) results exceeded the MCL of 6 ug/L during the July 2001 and January 2002 sampling events. No other sampling results exceeded the respective MCLs.

At VPMW-2, the analytical data to date show the PCP results exceeded the MCL on all four of the sampling events. In addition, the BEHP results exceeded the MCL during the January 2002 and July 2002 sampling events. No other sampling results exceeded the respective MCLs.

At VPMW-3, the analytical data to date show the PCP results exceeded the MCL during the January 2002, July 2002, and January 2003 sampling events. In addition, the BEHP results exceeded the MCL during the January 2002 sampling event. No other sampling results exceeded the respective MCLs.

At VPMW-4, the analytical data to date show the PCP results exceeded the MCL during the January 2002 sampling event and the BEHP results exceeded the MCL during the July 2001, January 2002, and July 2002 sampling events. In addition, the thallium results exceeded the MCL during the July 2001 sampling event. This lone detection of thallium in the entire monitoring well network may have been the result of using the Inductively Coupled Plasma (ICP) analytical method. On January 31, 2001, EPA issued an alert which indicated that the ICP analytical method could result in false positive detection of arsenic, lead, and/or thallium above their respective MCLs. The PRP stopped using the ICP analytical after EPA notified them of this possibility. Thallium has not been detected since. No other sampling results exceeded the respective MCLs.

At VPMW-5, analytical results to date show the PCP results did not exceed the MCL at any of the sampling events to date. BEHP exceeded the MCL during the January 2002 and July 2002 sampling events. No other sampling results exceeded the respective MCLs.

At VPMW-6, analytical results to date show the PCP results exceeded the MCL during the January 2002 sampling event and the BEHP results exceeded the MCL during the July 2001 sampling event. No other sampling results exceeded the respective MCLs.

With only four sampling events to date, it is difficult to discuss trends in the analytical results. However, the high levels of PCP detected at VPMW-2 in every sampling event indicates further investigation in the area of this monitoring well is necessary. Since the PCP concentrations detected at VPMW-2 are at percent level of its solubility in water (which could be indicative of the presence of DNAPL), future sampling events should include testing for DNAPL. In addition, because there is communication between the saprolite aquifer and the bedrock aquifer, the bedrock should be investigated to determine whether the bedrock aquifer is being impacted by site contamination or could be in the long term. Finally, the ground water modeling results should be compared with the actual results to date. The model may have to be re-calibrated using the monitoring results above. It should be noted that there isn't a pair of piezometers in the vicinity of VPMW-2.

The ROD required institutional controls be implemented to prohibit residential development and use of ground water at the site. The PRP's have drafted the legal documents and submitted them to EPA for review and approval. However, EPA has yet to complete our review of these documents.

Site Inspection

A Site inspection was conducted on April 10, 2003 by the RPM and Thomas Modena, the VDEQ Project Manager. Also attending the site inspection was VPI's representative, Randy Grachek from NewFields.

During the site inspection, we walked the entire area of the cap and wetland area and inspected the water building and loading dock. The cap appears to be well maintained, with no areas of erosion of the cap soil cover observed. The vegetation on the cap was well maintained. Although somewhat sparce in several areas, the vegetation was in better condition since the last site inspection. This is probably due to the end of the drought in the area. The fence enclosing the capped area is also in good condition.

The vegetation in the wetland area also appears to be in better condition since the drought ended and additional plantings were made. Also, the soil dams placed at the request of the U.S. Fish & Wildlife Service are successfully slowing down the flow of surface water in this area. The dams are preventing further erosion in this area as well as keeping the area wetter than previously.

The water building is well maintained, except for the leak in the roofing material. The PRP has tried several times to fix the roof and it did not appear to be leaking at the time of the inspection. Time will tell if this last fix is successful. The loading dock is well maintained.

Interviews

No specific interviews were conducted as part of the five-year review process. As indicated previously, a notice was placed in the Richmond *Times Dispatch* on April 8, 2003 to inform the public that EPA was conducting a five-year review of the site but no feedback was received from the community.

VII. Technical Assessment

The purpose of this section of the five-year review is to answer the following three questions:

- Is the remedy functioning as intended by the decision documents?
- Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

- Has any other information come to light that could call into question the protectiveness of the remedy?

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARs, and the results of the site inspection indicates that EPA cannot at this time determine whether the entire remedy is functioning as intended by the ROD and ROD Amendment.

Capping of the site has achieved the remedial objectives to control contaminant migration off-site by containment of contaminated soil and waste material, prevent dermal contact and incidental ingestion, and to prevent continued leaching of precipitation through the contaminated soil. Although the institutional controls to prohibit residential development and use of the ground water at the site have not yet been implemented, this is not an issue yet as no development has taken place in this area. Virginia Properties (VPI, the PRP) has submitted a draft of the institutional controls to EPA for review.

O&M of the cap, drainage system, and replacement wetlands have been effective. The site inspection did not identify any issues which would compromise the integrity of the landfill cap or the protectiveness of the cap.

Without additional investigations, it is impossible to determine whether the contamination detected at monitoring well VPMW-2 is emanating from the interior of the containment system or is part of the contamination that was always outside the slurry wall.

A portion of the site known as Wetland A was disturbed during the remedial action. This area was re-vegetated with U.S. Fish & Wildlife Service (USF&WS) approved wetland plant species in 2000. In 2001, the USF&WS determined that additional plantings were necessary to comply with the requirements of the approved O&M Plan. The area was replanted with replacement vegetation for the 2000 plantings that did not survive the initial year. In accordance with the O&M Plan, this area will be monitored for years 1, 2, 3, 5, 7, and 10, beginning the first full growing season after the site has been planted to assure that the criteria stated in the O&M Plan are met. The first monitoring event was conducted in October 2002. Even though the area experienced official drought conditions during the 2002 growing season, hydrophytic vegetation was exhibited throughout the Wetland A area.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy still valid?

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

Changes in Standards and To Be Considereds

As the remedial work has been completed, most ARARs for soil contamination cited in the ROD and the ROD Amendment have been met. ARARs that still must be met at this time and that have been evaluated include: the Safe Drinking Water Act (SDWA) from which many of the ground water clean-up levels were derived and ARARs related to generators and transporters of hazardous wastes. A list of these ARARs is included in Attachment 2. Of these clean-up levels, the only one which has changed since the time of the ROD is the MCL for arsenic, which has been revised by EPA from 50 ug/L to 10 ug/L.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

There have been no changes which would affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call the protectiveness of the remedy into question.

Technical Assessment Summary

According to the data reviewed and the site inspection, EPA cannot, at this time, make a determination on whether the remedy as a whole is functioning as intended by the ROD and the ROD Amendment. Additional investigations are necessary to determine whether the contamination at VPMW-2 is leaking through the containment system or whether this is the contamination that was present before the remedy was constructed. Although the lack of institutional controls is not currently impacting protectiveness of the remedy, they must be implemented before development pressures become an issue. Continued monitoring of the Wetland A area is necessary to determine whether the criteria for successful mitigation have been met. Otherwise, there have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. The ARARs for soil contamination cited in the ROD have been met. There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

VIII. ISSUES

The purpose of this section is to detail any issues related to the current site operations, conditions, or activities which would prevent the remedy from being protective.

Table 3 - Issues

Issue	Currently Affects Protectiveness	Affects Future Protectiveness
Plume containment has not been confirmed (levels of ground water contamination detected at monitoring well VPMW-2)	No	Unknown at this time
Institutional controls not implemented	No	Yes
Wetland A re-vegetation has not met criteria for successful mitigation	No	No

IX. Recommendations and Follow-up Actions

The purpose of this section is to specify the required and suggested improvements to current site operations, activities, remedy, or conditions.

Table 4 - Recommendations and Follow-Up Actions

Issue	Recommendation/ Follow-up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Levels of ground water contamination detected at monitoring well VPMW-2	Additional investigations are necessary to determine whether contamination is emanating from containment system	VPI	EPA/ VDEQ	11/1/2004	No	Not known
Draft Institutional controls not reviewed by EPA	EPA needs to complete the review of the draft institutional controls	EPA	N/A	12/1/2003	No	Yes
Institutional Controls not implemented	VPI to make any necessary revisions (based on EPA review) and formalize the institutional controls	VPI	EPA	6/1/2004	No	Yes
Continue monitoring Wetland A re-vegetation until criteria for successful mitigation is met	VPI to continue monitoring Wetland A re-vegetation and submitting end-of-year reports to EPA and USF&WS until criteria are met	VPI	EPA/ USF&WS	May 2004	No	No

X. Protectiveness Statement

A protectiveness determination of the remedy at the Rentokil, Inc. Site cannot be made at this time until further information is obtained. Further information will be obtained by determining whether the contaminant levels at VPMW-2 are due to leakage from the containment system (cap and slurry wall).

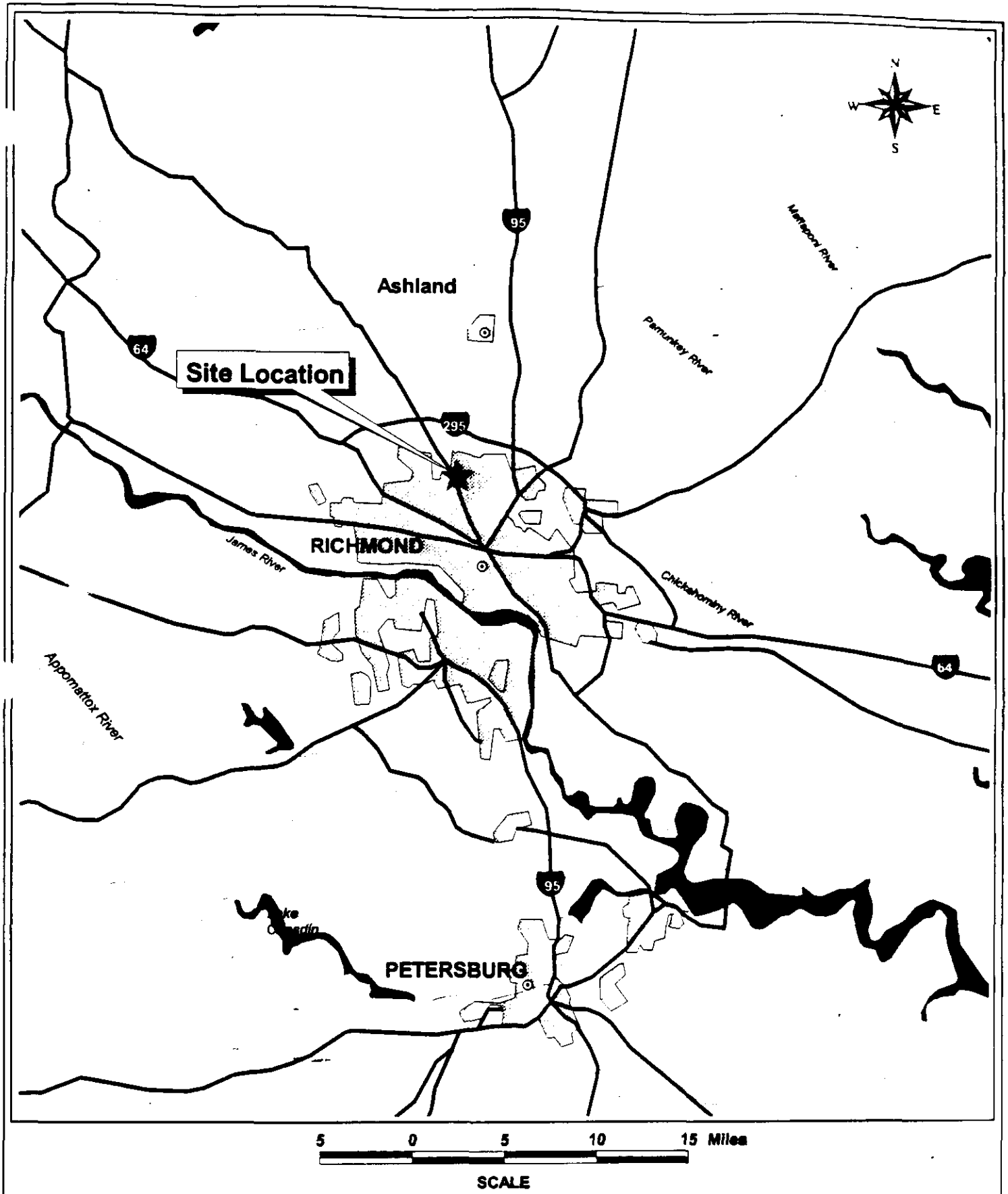
All threats at the site associated with ingestion or dermal contact with contaminated soil and sediments have been addressed through capping of the site and excavation and consolidation of those areas of contaminated soil and sediments previously located beyond the extent of the cap. The capped area is presently fenced to protect the integrity of the cap.

The ground water clean-up goals selected for the site are protective of human health and the environment. In the interim, exposure pathways that could result in unacceptable risks are being controlled. Even though no one currently uses the contaminated ground water, institutional controls will be implemented to prevent exposure to, or ingestion of, contaminated ground water.

Long-term protectiveness of the remedial action will be verified through the continued monitoring of the ground water plume downgradient of the slurry wall. The previous ground water modeling results should be compared with the actual ground water monitoring results to date and the model re-calibrated, if necessary, using the actual monitoring results.

XI. Next Five-Year Review

Since Site conditions do not allow for unlimited use and unrestricted exposure, EPA will need to conduct another five-year review of the Rentokil, Inc. Site by September 2008, five years from the date of this review.



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Virginia Properties, Inc., a Rentokil Initial company
Richmond Virginia Site
Operation, Maintenance, and Monitoring Summary Report for 2001

Figure 1
Vicinity Map

AR304158

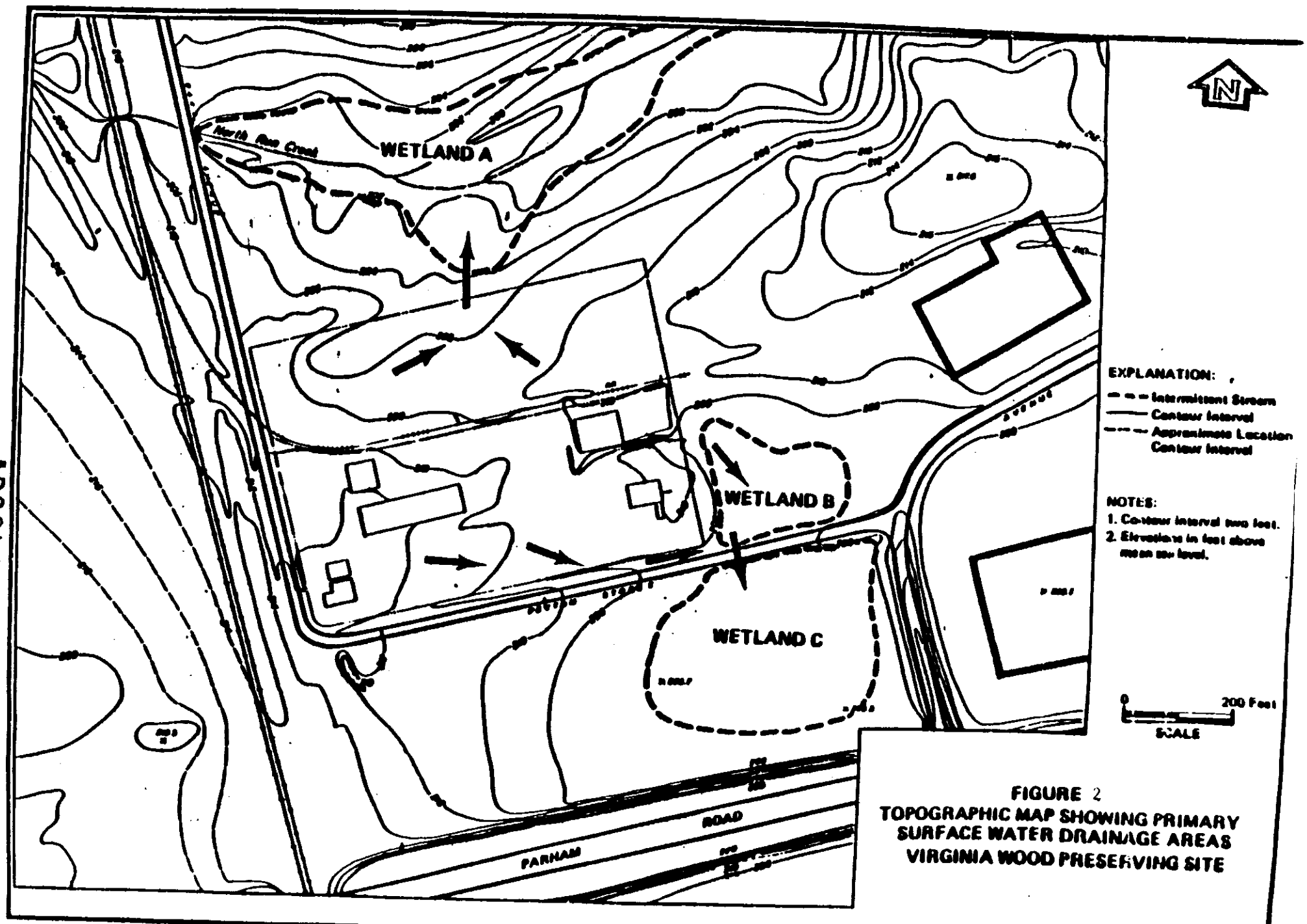

FIGURE 2
TOPOGRAPHIC MAP SHOWING PRIMARY SURFACE WATER DRAINAGE AREAS
VIRGINIA WOOD PRESERVING SITE

LEGEND

- Monitoring Well
- Piezometer
- Slurry Wall

100 0 100 Feet

SCALE

* USGS Aerial Photograph flown 3/12/94

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Richmond Virginia Site
Rentokil Initial Environmental Services

Figure 3
Site Map

ATTACHMENT 2 -FIVE-YEAR REVIEW
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
AND TO BE CONSIDERED MATERIAL (TBCs) FOR THE
RENTOKIL, INC., SUPERFUND SITE

ARAR or TBC		Legal Citation	Classification	Summary of Requirement	Actions to be taken to attain ARAR
I. CHEMICAL SPECIFIC					
A. Water					
1.	Safe Drinking Water Act	42 U.S.C.§§300f et seq.			
a.	Maximum Contaminant Levels (MCLs)	40 C.F.R. §§141.11-16 and 141.61-62	Applicable or Relevant and Appropriate	MCLs are enforceable standards for public drinking water supply systems which have at least 15 service connections or are used by at least 25 persons.	The groundwater is being treated to ensure that these requirements are being met.
b.	Maximum Contaminant Level Goals (MCLGs)	40 C.F.R. §141.50-.51 25 PA Code Chapters 109.202 - 203	Applicable or Relevant and Appropriate	MCLGs are non-enforceable health goals for public water supplies which have at least 15 service connections or are used by 25 persons.	MCLGs are relevant and appropriate requirements which were considered in establishing ground water cleanup levels.
c.	National Primary Drinking Water Regulations	40 C.F.R. §§142	Applicable or Relevant and Appropriate	This part sets forth, pursuant to sections 1413 through 1416, 1445, and 1450 of the Public Health Service Act, as amended by the Safe Drinking Water Act, Public Law 93-523, regulations for the implementation and enforcement of the national primary drinking water regulations contained in part 141 of this chapter.	The groundwater is being treated to ensure that these requirements are being met.
d.	National Secondary Drinking Water Regulations	40 C.F.R. §§143	Applicable or Relevant and Appropriate	These regulations control contaminants in drinking water that primarily affect the aesthetic qualities relating to the public acceptance of drinking water. At considerably higher concentrations of these contaminants, health implications may also exist as well as aesthetic degradation. The regulations are not Federally enforceable but are intended as guidelines for the States.	The groundwater is being treated to ensure that these requirements are being met.

ATTACHMENT 2 -FIVE-YEAR REVIEW
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
AND TO BE CONSIDERED MATERIAL (TBCs) FOR THE
RENTOKIL, INC., SUPERFUND SITE

	ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Actions to be taken to attain ARAR
2.	Water Pollution Prevention and Control (Clean Water Act)	33 U.S.C.A.§§ 1251	Applicable or Relevant and Appropriate	The objective of this regulation is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.	These non-enforceable toxicity values have been considered while developing site-specific cleanup standards for each remedial alternative. The process of risk assessment *and development of cleanup standards was* documented in the 1993 ROD.
II. ACTION SPECIFIC					
A. Hazardous Waste					
1.	Standards Applicable to Generators of Hazardous *Waste*	Virginia Hazardous Waste Management Regulations Parts 3 and *10*	Applicable or Relevant and *Appropriate*	Establishes requirements for a generator who treats, stores or disposes of hazardous waste, *including packaging, labeling, manifesting, and* record keeping requirements.	Any treatment, storage or disposal of soils or treatment residuals that are a hazardous waste *shall comply with the substantive provisions* of these regulations.
2.	Standards Applicable to Transporters of Hazardous Waste	Virginia Hazardous Waste Management Regulations Part 3	Applicable or Relevant and Appropriate	This regulation requires the cleanup of spills so that they no longer present a hazard to the health and safety of the public or the environment.	These standards shall apply to any hazardous waste on-site.
3.	Standards Applicable to Transporters of Hazardous Waste	Virginia Hazardous Waste Management Regulations Part 7	Applicable or Relevant and Appropriate	Establishes standards for persons transporting hazardous waste off-site, including manifesting, record keeping and spill-notifications requirements.	These standards shall apply to any hazardous wastes transported off-site.
4.	RCRA - Samples	40 C.F.R. Part 261.4(d)	Applicable or Relevant and Appropriate	Exclusions on samples from being defined as hazardous waste.	Any treatment, storage or disposal of soils or treatment residuals that are a hazardous waste shall comply with the substantive provisions of these regulations.
5.	RCRA Standards applicable to generators of hazardous waste	RCRA Subtitle C 3001-3019 40 CFR 262	Applicable or Relevant and Appropriate	Establishes standards for generators of hazardous wastes. This section requires that generators comply with the requirements for identification, accumulation, recordkeeping, and reporting.	Any treatment, storage or disposal of soils or treatment residuals that are a hazardous waste shall comply with the substantive provisions of these regulations.
6.	RCRA Standards applicable to transporters of hazardous waste	40 C.F.R. Part 263 and 49 CFR 171 through 179	Applicable or Relevant and Appropriate	Establish the responsibilities of generators and transporters of hazardous waste in the handling, transporting, and management of such wastes. These regulations concern manifesting, labeling, using proper containers, recordkeeping, and reporting discharges.	These standards shall apply to any hazardous wastes transported off-site.

ATTACHMENT 2 -FIVE-YEAR REVIEW
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
AND TO BE CONSIDERED MATERIAL (TBCs) FOR THE
RENTOKIL, INC., SUPERFUND SITE

	ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Actions to be taken to attain ARAR
7.	RCRA Treatment, Storage, or Disposal of Hazardous Waste in Miscellaneous Units	40 C.F.R. Part 264 Subpart X	Applicable or Relevant and Appropriate	Hazardous Waste Units must meet certain standards that will ensure protection of human health and the environment.	In the event that a Hazardous Waste Unit is utilized, it shall be meet these standards.
B. Miscellaneous					
1.	Occupational Safety and Health Act (OSHA)	25 CFR 1910	Applicable or Relevant and Appropriate	Establishes proper training and personal protection requirements for workers who have reasonable potential to be exposed to hazardous substances while performing job functions.	The Health and Safety Plan for this Site was developed to provide safe work practices and procedures for employees and to ensure that OSHA standards could be implemented with a site-specific response plan to ensure that these standards are met.