

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

RDMS DocID 106730

Facility Name: Solutia Inc., Indian Orchard Plant
 Facility Address: Springfield, MA
 Facility EPA ID #: MAD001114818

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

If yes - check here and continue with #2 below.
 If no - re-evaluate existing data, or
 If data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND**Definition of Environmental Indicators (for the RCRA Corrective Action)**

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

Definition of "Migration of Contaminated Groundwater Under Control" EI

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

Relationship of EI to Final Remedies

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

Duration / Applicability of EI Determinations

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

RCRA RECORDS CENTER
 FACILITY Solutia Inc
 I.D. NO. MAD001114818
 FILE LOC. R-13
 OTHER #106730

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

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

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

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

Rationale and Reference(s):

The following VOC and inorganic constituents were detected in groundwater above applicable standards of the Massachusetts Department of Environmental Protection (MADEP) Massachusetts Contingency Plan (MCP) 310 CMR 40.1600 on the Solutia Indian Orchard Plant Property (Figure 1). The water-table surface above the till in the deltaic sand is shown on Figure 2 with elevation contours as a gray shaded area.

Compound	MADEP Reportable Concentration (RC) for GW-2	Total Number of Times Compound Sampled and Analyzed	Total Number of Times Compound Detected	Total Number of Times Concentrations Exceed RCGW-2	Detected Concentration Range (mg/L)
VOLATILE ORGANIC COMPOUNDS					
Chlorobenzene	0.5	566	194	87	0.001 to 42
Vinyl chloride	0.002	568	53	37	0.001 to 4.7
Ethylbenzene	4	570	62	11	0.001 to 26
1,2-Dichloroethane	0.02	568	26	4	0.001 to 0.12
Styrene	0.9	562	19	3	0.001 to 27
1,2-Dichloropropane	0.009	568	18	3	0.001 to 0.036
trans-1,3-Dichloropropene	0.005	568	1	1	0.001 to 0.029
Benzene	2	568	133	1	0.001 to 0.21
INORGANICS					
Cadmium	0.01	89	28	15	0.01 to 0.07
Silver	0.007	88	9	8	0.01 to 0.05
Nickel	0.08	77	29	7	0.01 to 2.8
Cyanide, Total	0.01	75	5	5	0.01 to 0.5
Lead	0.03	89	36	4	0.01 to 4.1
Mercury	0.001	88	6	2	0.001 to 0.005
Arsenic	0.4	89	39	1	0.003 to 1.2
Beryllium	0.05	77	6	1	0.01 to 0.06
Chromium	2	89	32	1	0.01 to 4.2
Vanadium	2	44	24	1	0.5 to 4.8
Zinc	0.9	76	52	1	0.01 to 15

Notes:

RCGW-2 = Reportable Concentration for non-potential or current drinking water Groundwater from Table 1 - Massachusetts Oil and Hazardous Material List of MCP 310 CMR: Department of Environmental Protection (effective 10/29/99).

“Total Number of Times Compound Sampled and Analyzed” includes all detected and undetected results.

“Total Number of Times Compound Detected” includes all results that were above the quantitation detection limit.

“Exceed RCGW-2” is a count of samples that exceeded the RCGW-2 criteria for the constituent.

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Chlorobenzene was most frequently detected in groundwater above MADEP MCP Reportable Concentrations (RCs) (MADEP, 2001) and was detected in groundwater above the MADEP MCP GW-3 standard established for groundwater discharge to surface water. No nonaqueous phase liquids (NAPL) were detected in groundwater; however NAPL was detected in one soil boring drilled within landfill SWDA No. 1, perched above the water table. There are two separate chlorobenzene plumes, one from SWDA No. 1 and the other from the former World War II Naval Research Area (WWII NRA).

In 1985, benzene and 1,2 dichloropropane were detected sporadically and temporally within the chlorobenzene plume associated with SWDA No.1, without spatial relationship. These constituents have decreased in concentration to below detection and or below RCs (BBL, 1996; BBL, 2001a).

Vinyl chloride was detected in the eastern portion of the plant and is associated with former polyvinyl chloride (PVC) manufacturing (BBL, 2000). Remediation has been conducted at this area. The constituents 1,2 dichloroethane, trans-1,3-dichloropropene, styrene, and ethylbenzene were detected in the vicinity of the former PVC manufacturing area; however, the source of the styrene and ethylbenzene is from an upgradient offsite source (BBL, 2000). Styrene and ethylbenzene remediation is ongoing upgradient to address the source.

The inorganic compounds arsenic, beryllium, cadmium, chromium, lead, mercury, nickel, vanadium, and zinc reported were detected in unfiltered groundwater above MADEP MCP GW-3 standards in MW-78S and TW-05, but when resampled using low-flow techniques again without filtering, these constituents were either not detected above method quantitation limits or were well below MCP RCs and GW-3 standards.

References:

BBL. 2001a. *Groundwater and Soil Analytical Data Compendium*, Solutia Inc., Indian Orchard Plant, Springfield, Massachusetts, prepared by BBL, February 2001.

BBL. 2000. *MCP Phase II Comprehensive Site Assessment Report for RTNs 1-10793, 1-10868, 1-10869, 1-11693, 1-11694, and 1-11901 Investigation Areas*, Volume I of II and II of II, February 2000.

BBL. 1996. *Supplemental RFI/MCP Phase II CSA Report*, Indian Orchard Plant, Springfield, MA, by BBL, April 1996.

MADEP. 2001, *The Massachusetts Contingency Plan 310 Code of Massachusetts Regulation 40.0000*, Bureau of Waste Site Clean up, June 27, 2003.

Additional references to be provided in the Addendum RFI/MCP Phase II CSA Report to be prepared in 2004.

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).

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)?

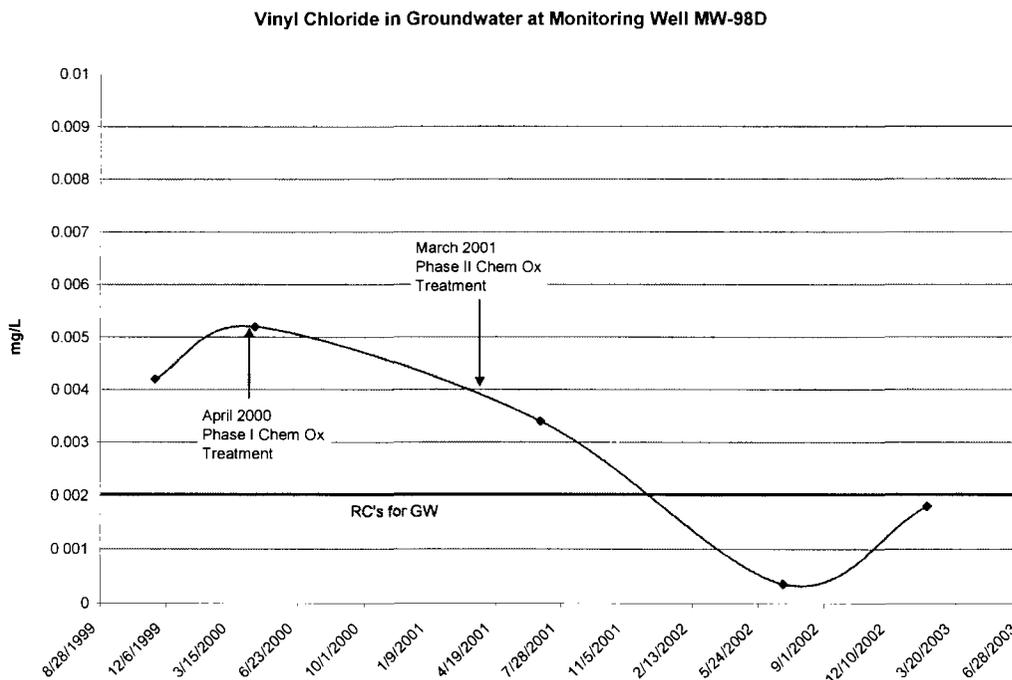
- If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the “existing area of groundwater contamination”².
- If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the “existing area of groundwater contamination”²) – skip to #8 and enter “NO” status code, after providing an explanation.
- If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

Three separate volatile organic plumes were identified on the property. One plume comprises mostly vinyl chloride (Figure 3) and the other two comprise dissolved chlorobenzene (Figure 4). The vinyl chloride extent in groundwater is stabilized and is within the property. Chlorobenzene plume extents have stabilized, although these two plumes extend to and terminate at the Chicopee River. The rationale and references for the vinyl chloride and chlorobenzene plumes extent and stabilization are discussed below.

Vinyl Chloride In Groundwater

The vinyl chloride plume extent was defined. The downgradient edge was observed to terminate approximately 600 feet from the Chicopee River (Figure 3) (BBL, 2000; BBL, 2001; BBL, 2004). Analytical data from annual groundwater monitoring for more than five years supports that the plume is not advancing (BBL, 2004). A graph of the consistently low concentrations, slightly above the method detection limit of 0.001 mg/L at the downgradient edge of the plume at MW-98S, is presented below with in-situ chemical oxidation remediation dates.



Based on a preliminary solute transport model and sampling for biodegradation by products, natural attenuation of vinyl chloride may be occurring (BBL, 2001b). Depleted dissolved oxygen, carbon dioxide, and ethane groundwater plumes are coincidental with the plume extent for vinyl chloride.

Chlorobenzene in Groundwater

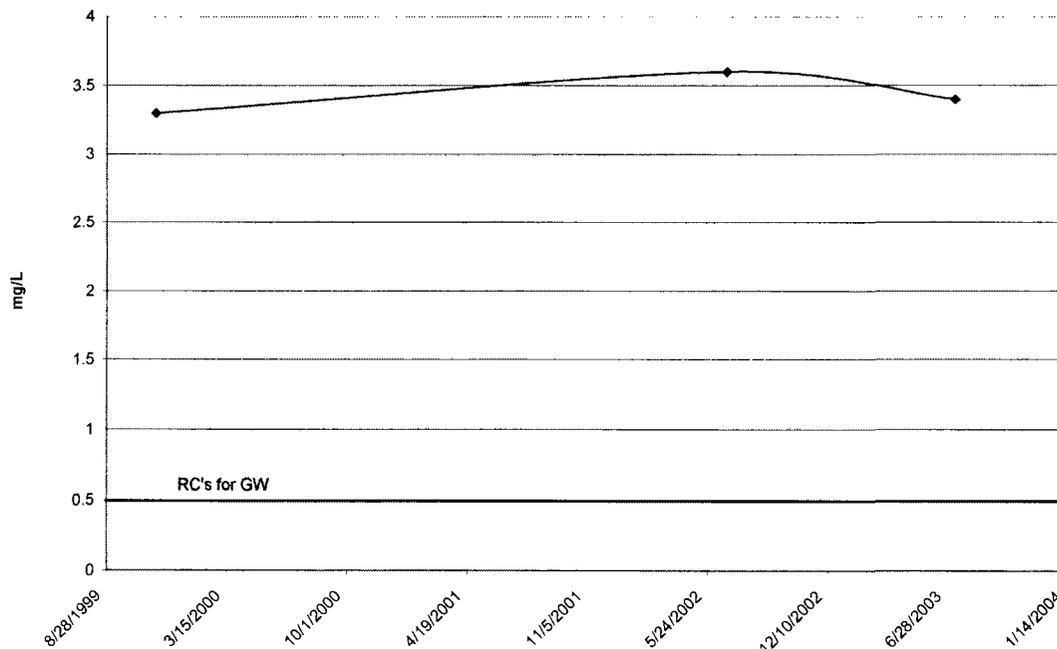
The extent of chlorobenzene was defined horizontally and laterally. The dissolved chlorobenzene extent was identified at two separate locations (Figure 4). One plume originates from SWDA No.1 and the other from former WWII NRA (BBL,1996; BBL, 2004). Both plumes are located within the site property, except along the downgradient edge at the Chicopee River. Both plumes extend to the Chicopee River, which borders the property to the north (BBL, 1996; BBL, 2004).

Concentrations in groundwater at the rivers edge are not increasing and are considered stabilized as shown on the graphs presented in the discussions for SWDA No.1 and WWII NRA below.

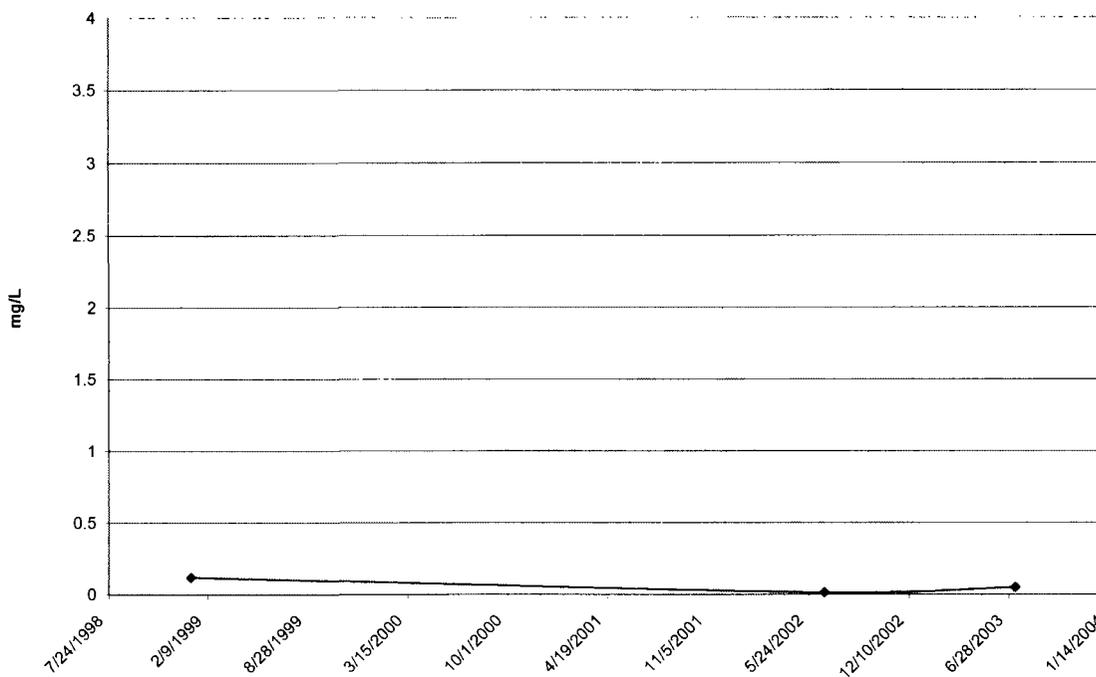
Former World War II Naval Research Area Monitoring Wells MW-105S and MW-96S at Downgradient Edge of Plume Adjacent to the Chicopee River

Based on passive vapor diffusion (PVD) sampling in September/October 2003, chlorobenzene was not detected in the pore water beneath the river prior to entry to the groundwater/surface-water/sediment interaction (hyporheic zone) adjacent to or downstream of the former WWII NRA. To check the PVD results, the chlorobenzene detected in groundwater from monitoring well MW-105S adjacent to the Chicopee River and downgradient of the WWII NRA was modeled to discharge to surface water per dilution model using the MADEP's Guide to the Regulation of Toxic Chemicals in Massachusetts Waters (MADEP, 1990). Based on a measured plume area of 1,750 square feet, a permeability of 3.8×10^{-4} feet per second, a measured hydraulic gradient of 0.045, and an effective porosity 0.03, the modeled surface-water concentration was estimated at 0.001 mg/L. This modeled concentration was 10 times below the available National Recommended Water Quality Criteria 2002 for chlorobenzene (Human Health Criteria for consumption of water and organism), at 0.013 mg/L. A graph of the concentrations at the downgradient edge of the plume from the WWII NRA adjacent to the Chicopee River at MW-105S, and from a monitoring well (MW-96S) located approximately 50 feet from MW-105S (also adjacent to the Chicopee River) is presented below.

Chlorobenzene in Groundwater at Monitoring Well MW-105S



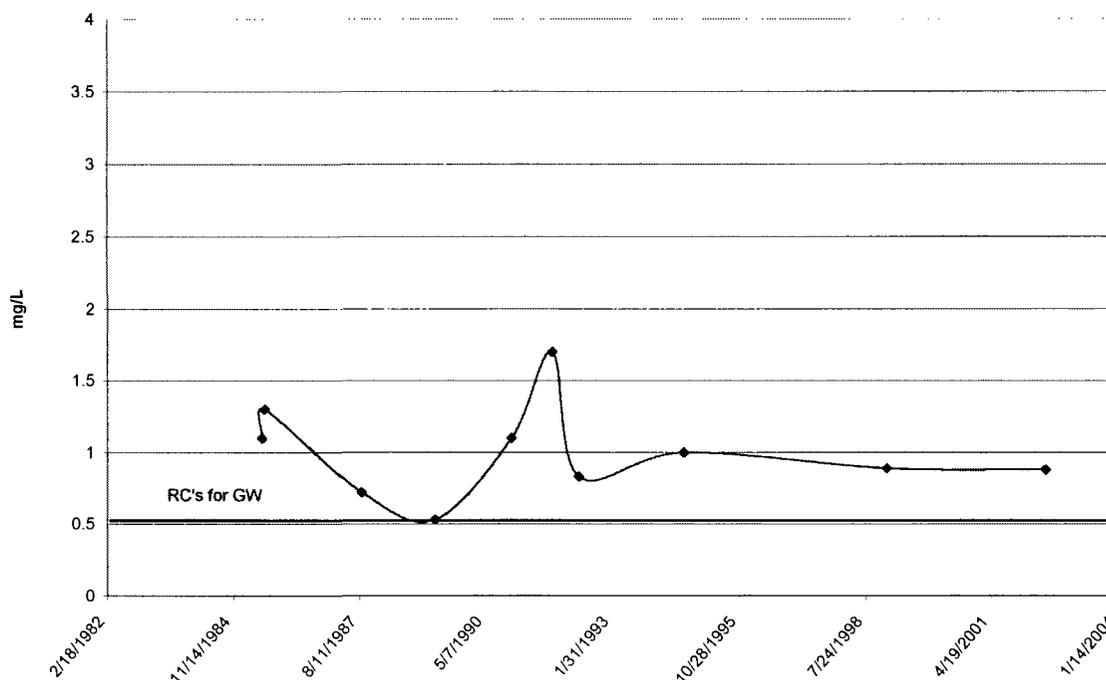
Chlorobenzene in Groundwater at Monitoring Well MW-96S



SWDA No. 1 Monitoring Well at Downgradient Edge of Plume Adjacent to the Chicopee River

Based on PVD sampling in September /October 2001, chlorobenzene was detected in the pore water beneath the river prior to entry to the groundwater/surface-water /sediment interaction (hyporheic zone) downgradient of the plume associated with SWDA No. 1, at a concentration of 0.051 mg/L. This concentration was approximately 10 times below the MADEP groundwater criteria of 0.5 mg/L for groundwater discharge to surface water. To check the PVD results, the chlorobenzene detected in groundwater from monitoring well MW-43D adjacent to the Chicopee River and downgradient of SWDA No. 1 were also modeled to discharge to surface water per dilution model using the MADEP's Guide to the Regulation of Toxic Chemicals in Massachusetts Waters (MADEP, 1990). Based on a measured plume area of 6,000 square feet adjacent to the Chicopee River, a permeability of 3.8×10^{-4} feet per second, a measured hydraulic gradient of 0.03, and a porosity of 0.3, the modeled surface-water concentration was estimated at 0.002 mg/L. This modeled concentration is nearly 10 times below the available National Recommended Water Quality Criteria 2002 for chlorobenzene (Human Health Criteria for consumption of water and organism), at 0.013 mg/L. A graph of the concentrations since 1985 at the downgradient edge of the plume from MW-43D associated with SWDA No.1 is presented below.

Chlorobenzene in Groundwater at Monitoring Well MW-43D



References:

BBL. 1996. *Supplemental RFI/MCP Phase II CSA*, Solutia Inc, Indian Orchard Plant, Springfield, Massachusetts, April 1996.

BBL. 2001b. *MCP Second Semi-Annual 2001 Release Abatement Measure Status Report for Former Gas Holder Area RTN 1-11901*, August 2001.

BBL. 2004. *First Semi Annual 2004 Phase V Inspection and Monitoring Report for Former Vinyl Chloride Gas Holder Area, RTN 1-11901*, February 2004.

MADEP. 1990. *Guide to the Regulation of Toxic Chemicals in Massachusetts Waters*, Office of Research and Standards (ORS Report 90-2).

Additional reference to be provided in the addendum to the RFI/MCP Phase II CSA to be prepared in 2004.

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.

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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):

Groundwater downgradient of SWDA No. 1 containing low concentrations of dissolved chlorobenzene and ranging from 0.051 to 0.001 mg/L discharges to the Chicopee River, based on PVD sample results (BBL, 2001c). Groundwater downgradient of the WWII NRA discharges to the Chicopee River. PVD sample results (pore water beneath the river prior to entry to the groundwater/surface-water/sediment interaction [hyporheic zone]) were below the analytical method detection limit of 0.059 mg/L (STL, 2003). Discharge could be through the till or along the top of till toward the river as the depth to glacial till confining unit is shallow (near bank elevation). However, discharges of groundwater along the bank of the river have not been observed during inspection on April 8, 2004, April 16, 2004, May 6, 2004 or May 10, 2004. Based on the subsurface geology in soils borings along the Chicopee River projected northward beneath the Chicopee River, the geologic unit underlying the Chicopee River is composed of till for most of stretch of river bordering the property, except west of TW-01. The underlying geologic unit beneath the river west of TW-01 is glacial outwash sand.

References:

BBL, 2001c. *Technical Memorandum – SWDA No. 1 Chlorobenzene Fate Study, Interim Status Update*, November 13, 2001.

STL, 2003, *Severn Trent Laboratory of Westfield Massachusetts Analytical Report Job Number 210498 prepared for Blasland, Bouck & Lee, Inc. for Solutia RTN 1-0183*, October 14, 2003.

Additional reference to be provided in the addendum to the RFI/MCP Phase II CSA to be prepared in 2004.

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5. Is the discharge of “contaminated” groundwater into surface water likely to be “insignificant” (i.e., the maximum concentration 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 concentration³ of key contaminants discharged above their groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

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

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

Rationale and Reference(s):

Also see discussion for question #3. Downgradient of SWDA No 1, chlorobenzene is detected at a maximum concentration of approximately 3 mg/L and is detected along the edge of the river at approximately 1 mg/L. Further downgradient, trace chlorobenzene was detected in two of 60 PVDs in the Chicopee River at 10 times below the MADEP MCP GW-3 standard and is considered insignificant (BBL, 2001c).

Chlorobenzene has not been detected in PVDs from the Chicopee River downgradient of WWII NRA. The upgradient maximum concentration at WWII NRA is approximately 40 mg/L.

The Chicopee River is classified as a Class B nonpotable cold water, for recreational purposes only. According to the Chicopee River Watershed council, the Chicopee River does not meet the Class B requirements due to excess urban runoff and storm sewer discharge during high rainfall events. Because of the urban runoff, the Chicopee River will not be reclassified as a drinking-water source (Chicopee River Watershed Council [CWC], 1996). No potentially productive aquifers were identified along the Chicopee River (MADEP, 1997). None of the Chicopee River is federally registered under the Wild and Scenic Rivers Act under 16 U.S.C 1271-1287 (U.S.C., 1968). No Areas of Critical Environmental Concern, Natural Heritage and Endangered Species, or Habitat of State-Listed Rare Wetlands Wildlife is known to occur in the vicinity of the Chicopee River and Solutia Property (MADEP, 1997).

References:

BBL. 2001c. *Technical Memorandum – SWDA No. 1 Chlorobenzene Fate Study, Interim Status Update*, November 13, 2001.

Chicopee River Watershed Council (CWC). 1996. Telephone conversation with Carl Burgman (413) 594-4468 on March 6, 1996.

MADEP. 1997. *Massachusetts Geographic Information System Executive Office of Environmental Affairs, Springfield quadrangle scale 1:25000 Theme: mcp*, November 19, 1997.

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United States of America in Congress (U.S.C.). 1968. <http://www.nps.gov/rivers/wsract.html>, *Wild and Scenic Rivers Act P.L. 90-542 and amended 16 U.S.C 1271-1287* October 2, 1968 and amendments, web site updated August 8, 2002.

Additional reference to be provided in the addendum to the RFI/MCP Phase II CSA to be prepared in 2004.

Footnotes:

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

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

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

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

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

Rationale and Reference(s): Not applicable.

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.

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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):

Continued annual groundwater monitoring will be proposed at select monitoring wells for VOCs.

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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 Solutia Inc. Indian Orchard Plant in Springfield, Massachusetts, EPA ID # MAD001114818, located at 730 Worcester Street. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

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

IN - More information is needed to make a determination.

Completed by (signature) Rapuel J. Cody Date 9-14-04
(print) RAPUEL CODY
(title) RCRA FACILITY MANAGER

Supervisor (signature) Matthew R. Hoagland Date 9/20/04
(print) Matthew R. Hoagland
(title) Section Chief
(EPA Region or State) Reg. I

Locations where References may be found:

Solutia Inc.
Indian Orchard Plant
730 Worcester Street
Springfield, Massachusetts
01151

Contact telephone and e-mail numbers

(name) Roy P. Hart
(phone #) (413) 730-2682
(e-mail) _____

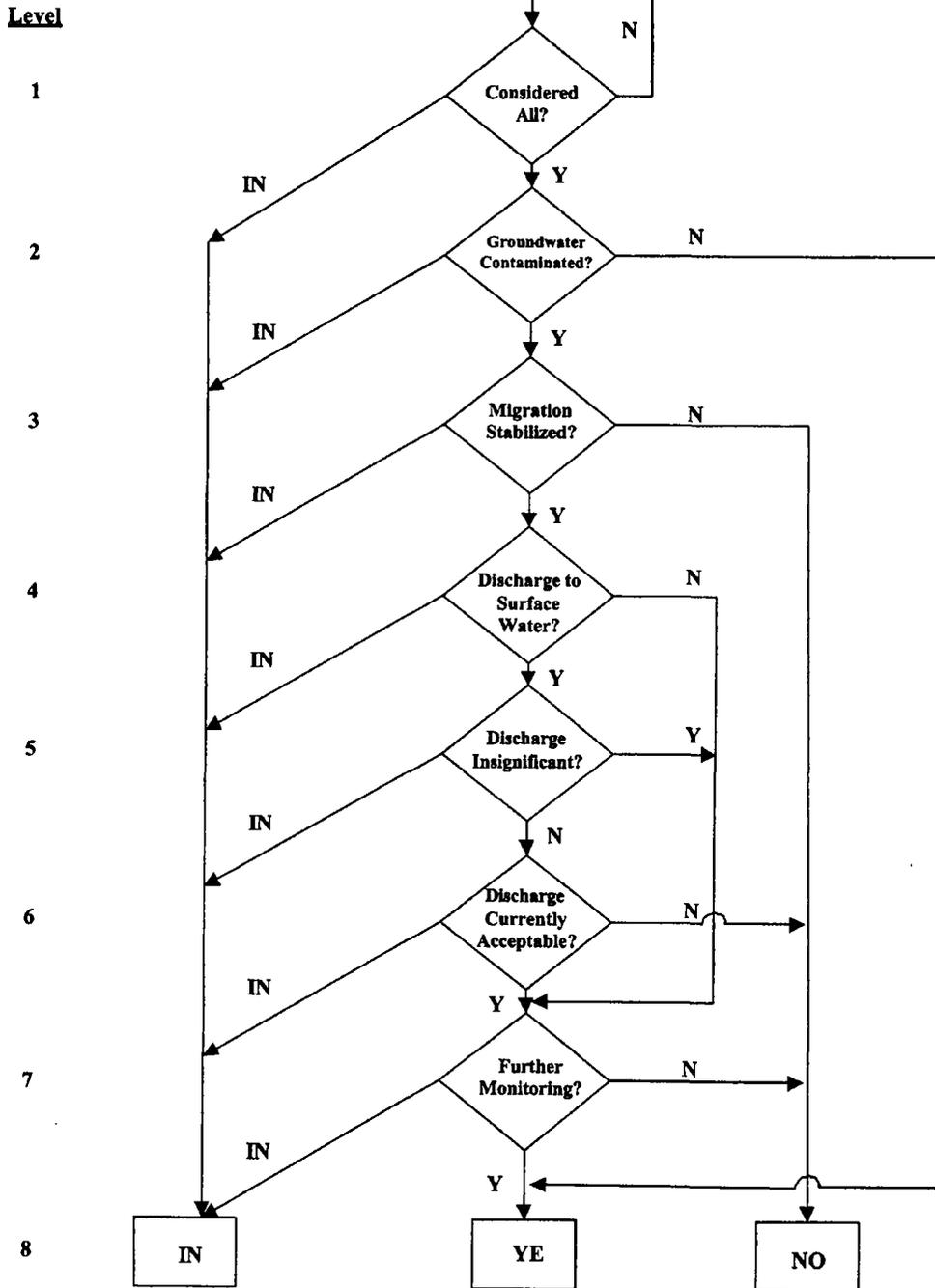
(name) Caron S. Koll, LSP
(phone #) (315) 446-2570 x148
(e-mail) _____

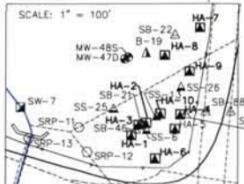
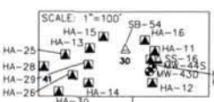
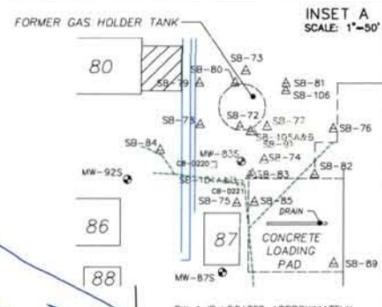
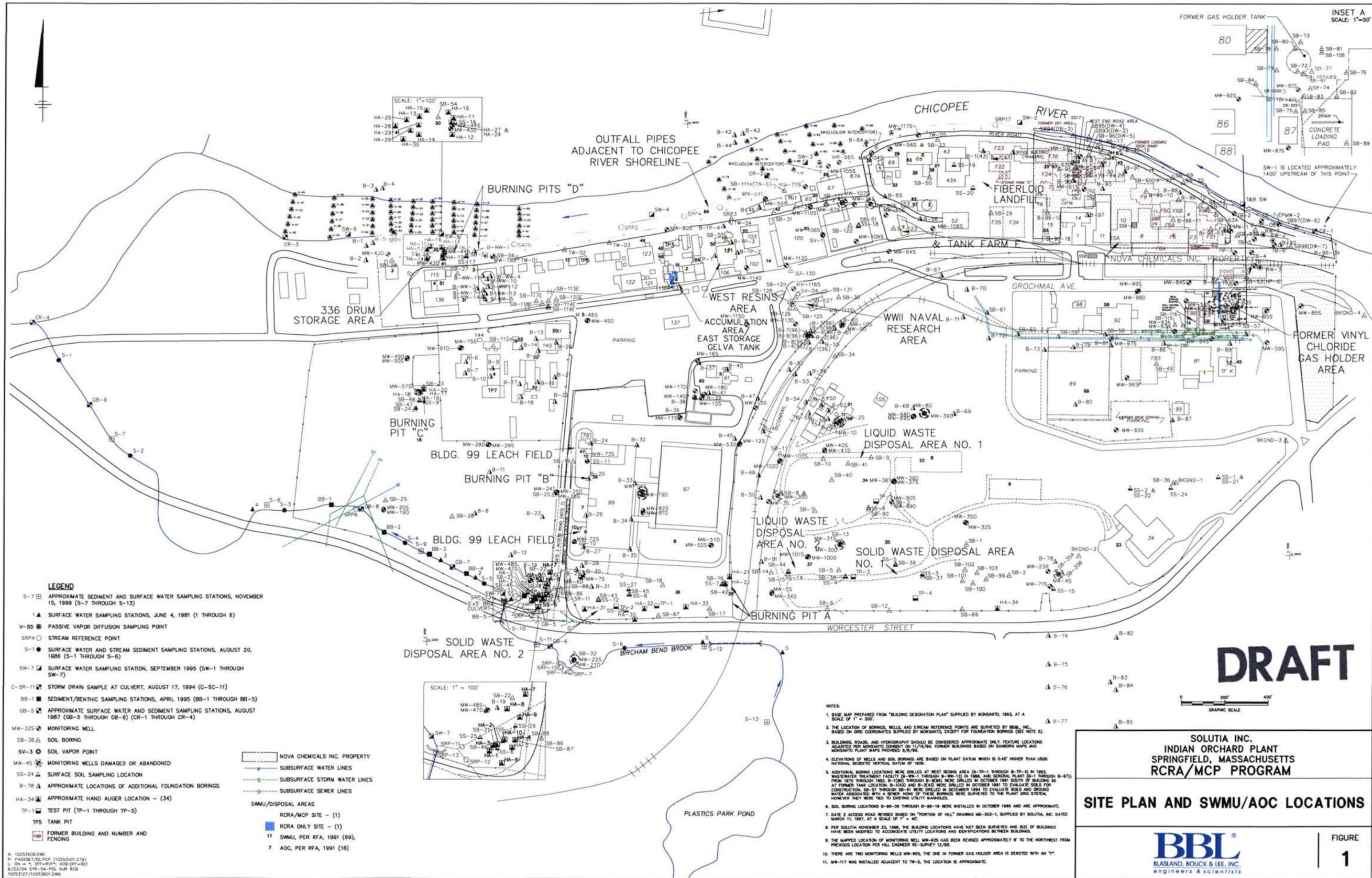
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Facility Name: _____
 EPA ID#: _____
 City/State: _____

**MIGRATION OF CONTAMINATED GROUNDWATER
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SOLUTIA INC.
INDIAN ORCHARD PLANT
SPRINGFIELD, MASSACHUSETTS
RCRA/MCP PROGRAM

SITE PLAN AND SWMU/AOC LOCATIONS

BBL
 BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
1

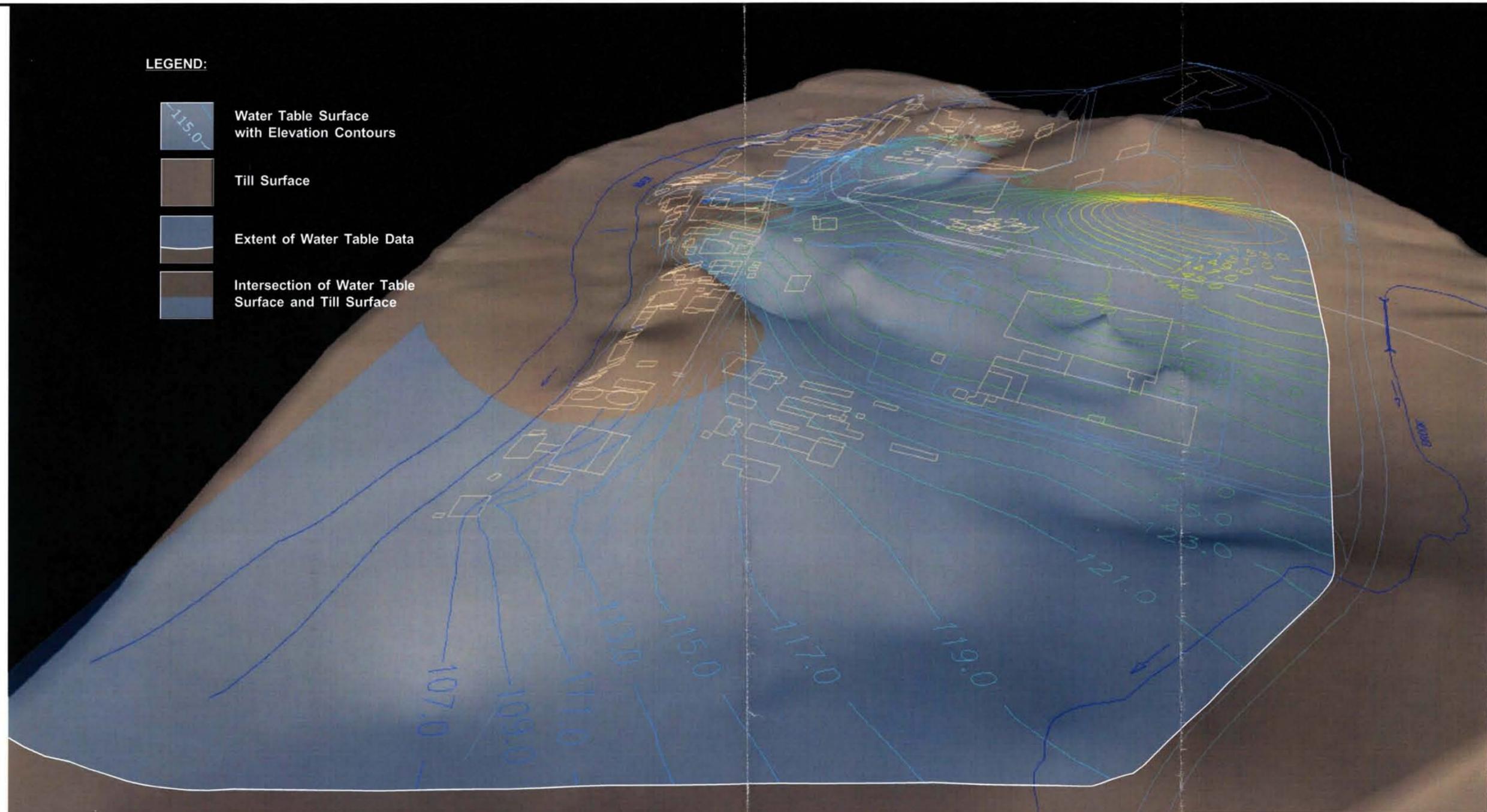
- LEGEND**
- S-7 [Symbol] APPROXIMATE SEDIMENT AND SURFACE WATER SAMPLING STATIONS, NOVEMBER 15, 1999 (S-7 THROUGH S-13)
 - 1 [Symbol] SURFACE WATER SAMPLING STATIONS, JUNE 4, 1981 (1 THROUGH 6)
 - V-55 [Symbol] PASSIVE VAPOR DIFFUSION SAMPLING POINT
 - SRP4 [Symbol] STREAM REFERENCE POINT
 - S-1 [Symbol] SURFACE WATER AND STREAM SEDIMENT SAMPLING STATIONS, AUGUST 20, 1986 (S-1 THROUGH S-6)
 - SW-7 [Symbol] SURFACE WATER SAMPLING STATION, SEPTEMBER 1995 (SW-1 THROUGH SW-7)
 - C-SR-11 [Symbol] STORM DRAIN SAMPLE AT CULVERT, AUGUST 17, 1994 (C-SC-11)
 - BB-1 [Symbol] SEDIMENT/BENTHIC SAMPLING STATIONS, APRIL 1995 (BB-1 THROUGH BB-5)
 - GB-5 [Symbol] APPROXIMATE SURFACE WATER AND SEDIMENT SAMPLING STATIONS, AUGUST 1987 (GB-5 THROUGH GB-9) (CR-1 THROUGH CR-4)
 - MW-325 [Symbol] MONITORING WELL
 - SB-36 [Symbol] SOIL BORING
 - SV-3 [Symbol] SOIL VAPOR POINT
 - MW-45 [Symbol] MONITORING WELLS DAMAGED OR ABANDONED
 - SS-24 [Symbol] SURFACE SOIL SAMPLING LOCATION
 - B-78 [Symbol] APPROXIMATE LOCATIONS OF ADDITIONAL FOUNDATION BORINGS
 - HA-34 [Symbol] APPROXIMATE HAND AUGER LOCATION - (34)
 - TP-1 [Symbol] TEST PIT (TP-1 THROUGH TP-5)
 - TP5 [Symbol] TANK PIT
 - [Symbol] FORMER BUILDING AND NUMBER AND FENCING
 - [Symbol] NOVA CHEMICALS INC. PROPERTY
 - [Symbol] SUBSURFACE WATER LINES
 - [Symbol] SUBSURFACE STORM WATER LINES
 - [Symbol] SUBSURFACE SEWER LINES
 - [Symbol] SWMU/DISPOSAL AREAS
 - [Symbol] RCRA/MCP SITE - (1)
 - [Symbol] RCRA ONLY SITE - (1)
 - 17 [Symbol] SWMU, PER RFA, 1991 (69)
 - 7 [Symbol] AOC, PER RFA, 1991 (16)

- NOTES:**
1. BASE MAP PREPARED FROM "BUILDING DESECTION PLAN" SUPPLIED BY MONSANTO, 1993, AT A SCALE OF 1" = 200'.
 2. THE LOCATION OF BORINGS, WELLS, AND STREAM REFERENCE POINTS ARE SURVEYED BY BBL, INC. BASED ON GRID COORDINATES SUPPLIED BY MONSANTO, EXCEPT FOR FOUNDATION BORINGS (SEE NOTE 3).
 3. BUILDINGS, ROADS, AND HYDROGRAPHY SHOULD BE CONSIDERED APPROXIMATE ONLY. FEATURE LOCATIONS ADJUSTED PER MONSANTO COMMENT ON 11/18/94. FORMER BUILDINGS BASED ON SANBORN MAPS AND MONSANTO PLANT MAPS PROVIDED 8/9/96.
 4. ELEVATIONS OF WELLS AND SOIL BORINGS ARE BASED ON PLANT DATUM WHICH IS 0.45' HIGHER THAN USGS NATIONAL GEODETIC VERTICAL DATUM OF 1928.
 5. ADDITIONAL BORING LOCATIONS WERE DRILLED AT WEST RESINS AREA (B-TP-1 THROUGH B-TP-4) IN 1992. WEST WATER TREATMENT FACILITY (B-W-1 THROUGH B-W-13) IN 1986, AND GENERAL PLANT (B-1 THROUGH B-47) FROM 1970 THROUGH 1982. B-190 THROUGH B-243 WERE DRILLED IN OCTOBER 1991 SOUTH OF BUILDING 88 AT FORMER TANK LOCATION. B-143 AND B-243 WERE DRILLED IN OCTOBER 1991 TO EVALUATE SOILS FOR CONSTRUCTION. SB-57 THROUGH SB-61 WERE DRILLED IN DECEMBER 1994 TO EVALUATE SOILS AND GROUND WATER ASSOCIATED WITH A BUNKER. NONE OF THESE BORINGS WERE SURVEYED TO THE PLANT GRID SYSTEM, HOWEVER THEY WERE TIED TO EXISTING UTILITY MANHOLES.
 6. SOIL BORING LOCATIONS B-95-06 THROUGH B-95-19 WERE INSTALLED IN OCTOBER 1986 AND ARE APPROXIMATE.
 7. GATE 2 ACCESS ROAD REVISION BASED ON "PORTION OF HILL" DRAWING MS-303-1, SUPPLIED BY SOLUTIA, INC. DATED MARCH 11, 1997, AT A SCALE OF 1" = 40'.
 8. PER SOLUTIA NOVEMBER 23, 1986, THE BUILDING LOCATIONS HAVE NOT BEEN SURVEYED AND SIZE OF BUILDINGS HAVE BEEN MODIFIED TO ACCOMMODATE UTILITY LOCATIONS AND IDENTIFICATIONS BETWEEN BUILDINGS.
 9. THE MAPPED LOCATION OF MONITORING WELL MW-825 HAS BEEN REVISIONED APPROXIMATELY 6' TO THE NORTHWEST FROM PREVIOUS LOCATION PER HILL ENGINEER RE-SURVEY 12/88.
 10. THERE ARE TWO MONITORING WELLS MW-995, THE ONE IN FORMER GAS HOLDER AREA IS DENOTED WITH AN "X".
 11. MW-117 WAS INSTALLED ADJACENT TO TP-5, THE LOCATION IS APPROXIMATE.

X: 10253K09.DWG
 P: PAGESER.TXD.PDF (10253K09.CTG)
 L: DN = A, OFF=REF, KOD OFF=REF
 8/23/04 SW-54.PLO, NUP REB
 10253127.10253001.DWG

LEGEND:

-  Water Table Surface with Elevation Contours
-  Till Surface
-  Extent of Water Table Data
-  Intersection of Water Table Surface and Till Surface



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SPRINGFIELD, MASSACHUSETTS

WATER TABLE ELEVATION SURFACE IN
3-D DATA VISUALIZATION MODEL

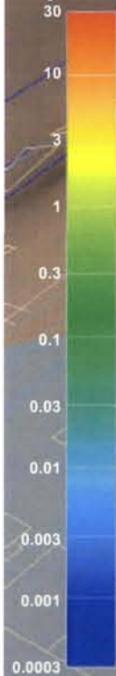


FIGURE
2

LEGEND:

-  Select Monitoring Wells and Ground Water Sample Locations
-  Water Table Surface
-  Till Surface

Vinyl Chloride (ppm)



08/19/04 SYR-J085-DJH
10253132/10253901 CDR

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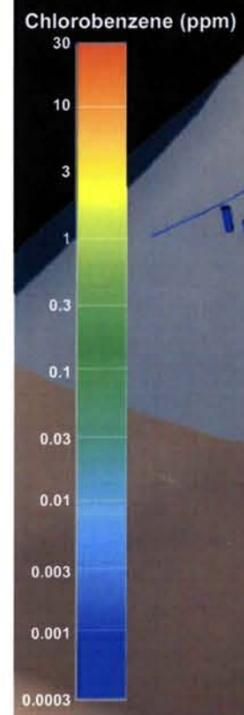
**DISSOLVED VINYL CHLORIDE
CONCENTRATIONS IN GROUNDWATER
3-D DATA VISUALIZATION MODEL**



FIGURE
3

LEGEND:

-  Select Monitoring Wells and Ground Water Sample Locations
-  Passive Vapor Diffusion Sample Locations
-  Water Table Surface
-  Till Surface



08/19/04 SYR-D85-DJH
10253132/10253g02.CDR

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INDIAN ORCHARD PLANT
SPRINGFIELD, MASSACHUSETTS

**DISSOLVED CHLOROBENZENE
CONCENTRATIONS IN GROUNDWATER
3-D DATA VISUALIZATION MODEL**



FIGURE
4