DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name:	**Hand Craft Cleaners (formerly)**
Facility Address:	**11401 Midlothian Turnpike, Midlothian, Virginia**
Facility EPA ID #:	**VAD 988169819**

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?

YES If yes – check here and continue with #2 below.

_____ If no – re-evaluate existing data, or

_____ If data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

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

Definition of "Migration of Contaminated Groundwater Under Control" EI

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

Relationship of EI to Final Remedies

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

Duration / Applicability of EI Determinations

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

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

__YES__ 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:

Site Description and Activities

The Hand Craft Cleaners property is located at 11401 Midlothian Turnpike in Chesterfield, Virginia (see attached site plan). The facility was operated as a dry cleaning and healthcare business using solvent tetrachloroethene (PCE) for nearly 32 years. In 1996 the property was closed. Both soil and groundwater (GW) were contaminated by PCE and its daughter products (TCE, cis-1,2-DCE, and Vinyl Chloride). Other contaminants included 1,2-dichlorobenzene, methylene chloride, 1,1,1-trichloroethane and 1,1,2-trichloroethane.

Closure activities were initiated with DEQ. A "*Groundwater Monitoring Plan*" was prepared October 1999 and revised November 2000, February 2001, and March 2001. Groundwater samples have been collected quarterly at one background and three compliance wells since September 2001 and analyzed for the initial constituent of concern (tetrachloroethene) and its potential degradation products ("contaminants"). The resulting data are provided in the attached four (4) tables for PCE, TCE, cis-1,2-DCE, and Vinyl Chloride (VC) (unit: µg/l), respectively. PCE, TCE, cis-1,2-DCE and VC have had exceedances of their corresponding MCLs in one or more wells during the monitoring period. However, none of the contaminants currently exceed the MCLs. Methylene chloride, 1,1,1-trichloroethane and 1,1,2-trichloroethane were also monitored and had been detected in one or more wells groundwater in the past , but these constituents never exceeded their respective MCLs.

In 2002, the facility completed a RCRA Facility Assessment and excavated over 325 cubic yards of contaminated soil. On June 14, 2002, EPA issued a Facility Lead Agreement to Hand Craft for the investigation and remediation. On July 31, 2002 EPA and DEQ cosigned a "comfort letter" to Hand Craft assuring them that remediation of the soils had been completed. On January 6, 2003 clean closure for soil was approved by the Department.

Remediation of groundwater was initiated at the time of the closure activities for soil and is still ongoing at the facility. Concentrations of PCE and its daughter products in all three points of compliance wells in groundwater had exceeded their corresponding Maximum Contaminant Levels (MCLs). Other contaminants, 1,2-dichlorobenzene, methylene chloride, 1,1,1-trichloroethane and 1,1,2-trichloroethane were detected in groundwater, but never exceeded their respective MCLs.

Initial in-situ groundwater treatment was performed during closure activities at the site in 2001. As approved by DEQ, the facility injected permanganate solution into the saturated zone in order to oxidize any contaminants of concern that may reside within the saturated zone. Six injectors were constructed downgradient of the excavation trench (between the trench and three groundwater monitoring wells); three injectors were constructed immediately upgradient of the excavation trench (one outside the former building, two within the building before it was demolished.

Concentrations of constituents of concern remained below MCLs until rebound occurred in early 2003. In April 2004, a Pilot Study: GW Remediation - Proposed Work Plan was approved by the Department and sodium permanganate ($NaMnO_4$) was injected at several locations into the uppermost aquifer to oxidize PCE and its daughter products (chlorinated ethenes) to CO_2, H_2O and Cl^- (Chloride). Concentrations of PCE and its daughter products quickly decreased to below their respective MCLs. However, within two years the concentrations of the PCE and its daughter products rebounded again.

In August 2006, another injection of permanganate solution occurred at 52 locations at the facility. Contaminant concentrations have stayed below MCLs since that time.

Groundwater monitoring continues at the facility and the "*Groundwater Monitoring Plan*" is currently being updated to guide monitoring activities for the next few years.

References:

General Theory, Principle and Application of Sodium Permanganate Oxidative Reactions (EPA, DOE, ITRC and etc.)

Draper Aden Associates. January, 2008. 11401 Midlothian Turnpike. Midlothian, Virginia. Groundwater Monitoring Program. Sampling Event 21: 12-27-07. Results of Sampling and Analysis. DAA Project No. 22153.30. EPA ID 988 169 819.

Groundwater Monitoring Plan for formerly Hand Craft Cleaners @ 11401 Midlothian Turnpike, Midlothian, Virginia

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)?

__YES__ If yes – continue after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) – skip to #8 and enter "NO" status code, after providing an explanation.

_____ If unknown – skip to #8 and enter "IN" status code.

Rationale:

The groundwater monitoring system consists of one (1) background well (PZ-101), which is not an upgradient well relative to the SWMU (trench), and three (3) downgradient wells, MW-2, MW-3 and MW-4. Historically, the concentrations of the constituents of concern (COC) in the plume area have been decreasing over time, although there have been some rebounds. At present, the COCs in groundwater in the monitoring locations have stayed below MCLs.

References:

Draper Aden Associates. January, 2008. 11401 Midlothian Turnpike. Midlothian, Virginia. Groundwater Monitoring Program. Sampling Event 21: 12-27-07. Results of Sampling and Analysis. DAA Project No. 22153.30. EPA ID 988 169 819.

Tables of Historical Concentrations for the Contaminants (PCE and its potential degradation products) of Major Concerns (Attached)

Footnotes:

[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

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

_____ If yes – continue after identifying potentially affected surface water bodies

__NO__ If no – skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies

_____ If unknown – skip to #8 and enter "IN" status code.

Rationale

As mentioned in item No.3, the COCs in the plume have been decreasing over time and are currently below the MCLs in concentration. The plume is believed to have stabilized and to be decreasing. Very importantly, there is no surface water body in the region where the facility is located. Thus, it is not expected for contaminated groundwater to discharge into any nearby surface water body.

References

Draper Aden Associates. November 1998. Site Characterization, Hand Craft Cleaners, 11401 Midlothian Turnpike. Midlothian, Virginia.

Draper Aden Associates. August 2002. RCRA Facility Assessment, Hand Craft Cleaners, 11401 Midlothian Turnpike. Midlothian, Virginia.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_____ If yes – skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no – (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

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

hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

_____ If yes – continue after either:

(1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and ecosystems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR

(2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination..

_____ If no – (the discharge of "contaminated" groundwater into surface water is potentially significant) continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate

methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

YES If yes – continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no – enter "NO" status code in #8. skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies

_____ If unknown – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The facility's "Groundwater Monitoring Plan" is being updated to reflect that the monitoring program is designed to analyze the concentrations of contaminants (PCE and its potential degradation products) and to evaluate the efficiency and effectiveness of the remedy in the uppermost aquifer underlying the facility. The monitoring and remediation activities are being performed in an effort to achieve permanent "clean closure" of groundwater for the hazardous waste management unit, to meet risk-based criteria and standards under the Facility Lead Agreement (FLA) and to ensure that the facility is left in a condition suitable for further beneficial use by others. In addition, the monitoring plan has been developed to protect the health and safety of the general public and persons involved with the monitoring operations. After this revised plan becomes effective, groundwater will be monitored on a semiannual schedule vs. the quarterly basis which has occurred since September 2001.

References:

Groundwater Monitoring Plan for formerly Hand Craft Cleaners @ 11401 Midlothian Turnpike, Midlothian, Virginia

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).

YES 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 former Hand Craft Cleaners facility, EPA ID # VAD988169819, located at 11401 Midlothian Turnpike, Midlothian, Virginia. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

____ NO – Unacceptable migration of contaminated groundwater is observed or expected.

____ IN – More information is needed to make a determination.

Completed by	(signature)	Fuxing Zhou	Date	09/05/2008
	(print)	Fuxing Zhou		
	(title)	Environmental Specialist II		

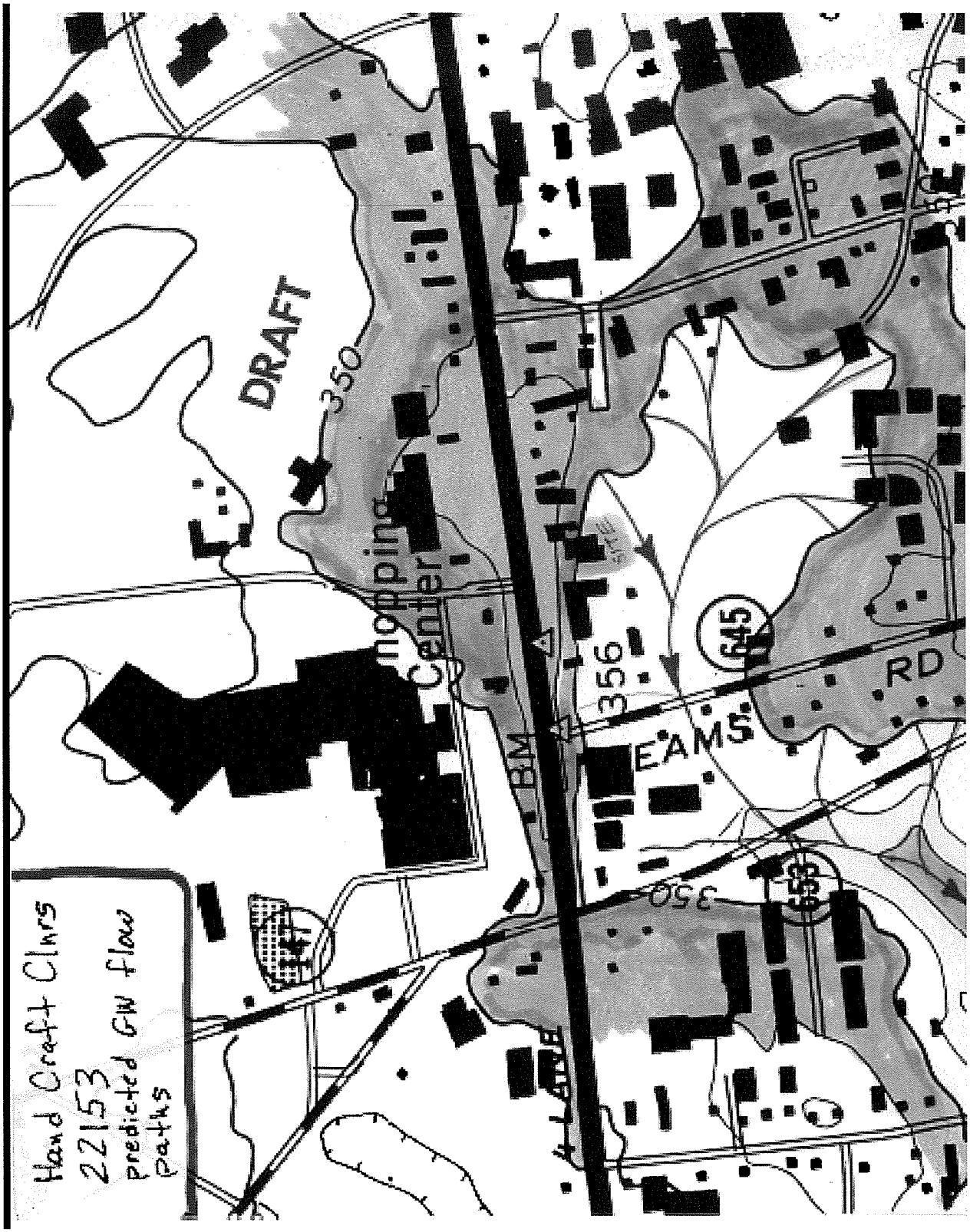
Supervisor	(signature)	Leslie A Romanchik	Date	9/8/08
	(print)	Leslie A. Romanchik		
	(title)	Director, Office of Hazardous Waste		
	(EPA Region or State)			

Locations where References may be found:
Department of Environmental Quality Division of Hazardous Waste Permitting, Groundwater 629 East Main Street Richmond, VA 23219

Contact telephone and e-mail numbers:

(name)	Fuxing Zhou
(phone #)	(804) 698-4126
(e-mail)	fzhou@deq.virginia.gov

Attachment 1: Site Map
Attachment 2: Data (Concentrations, Unit: µg/l) Tables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Hand Craft Clnrs
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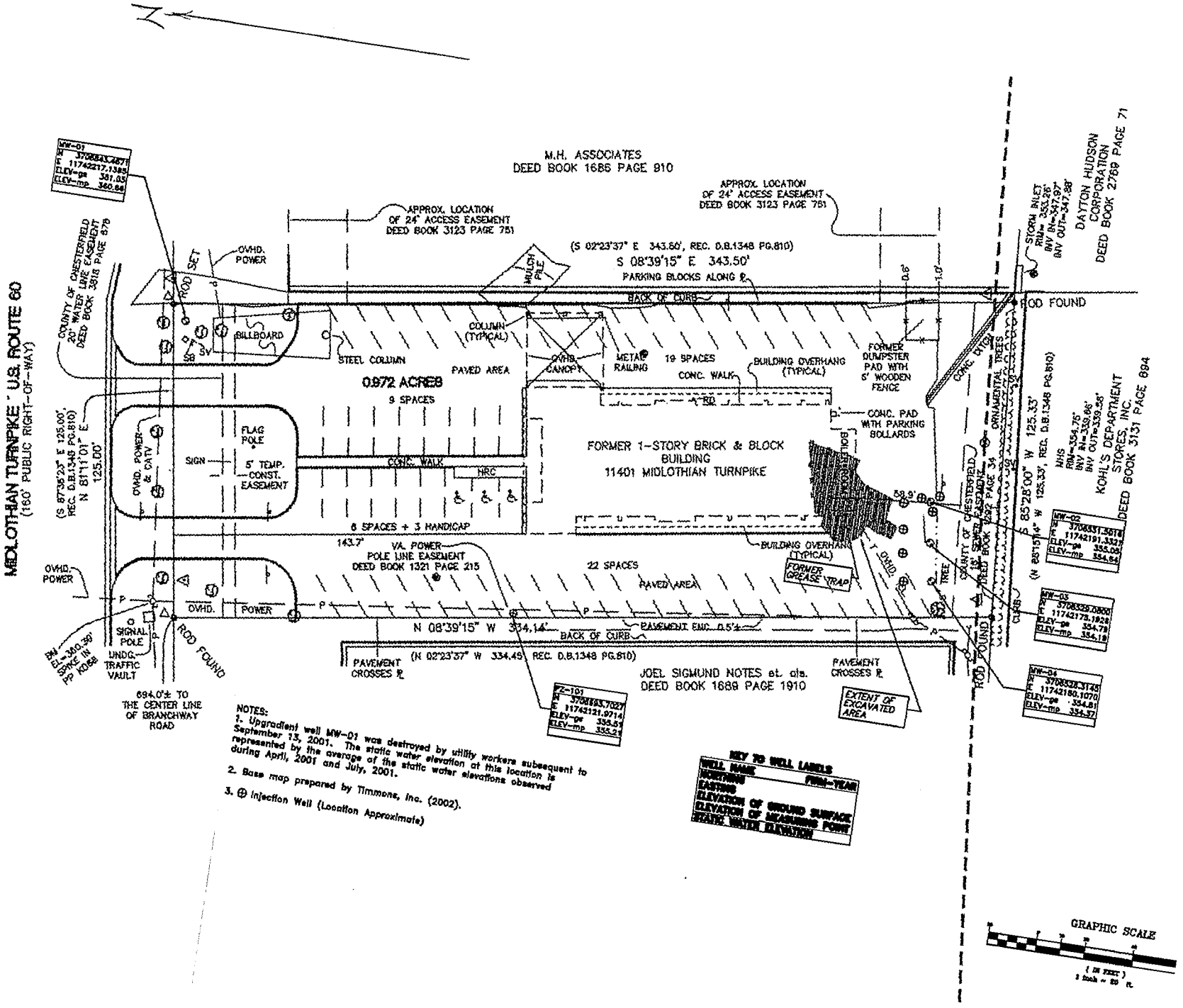
predicted GW flow
paths



NOTES:
1. Upgradient well MW-01 was destroyed by utility workers subsequent to September 13, 2001. The static water elevation at this location is represented by the average of the static water elevations observed during April, 2001 and July, 2001.
2. Base map prepared by Timmons, Inc. (2002).
3. ⊕ Injection Well (Location Approximate)

CLIENT: HAND CRAFT CLEANERS AND LAUNDERERS, INC

FACILITY: 11401 MIDLOTHIAN TURNPIKE

PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY

ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOD	LOQ	comment
date of well construction =			3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01			
tetrachloroethene	13-Sep-01	Analytics	<0.31	<0.31	<0.31	<0.31		0.31	1	
MCL = 5 ppb	28-Feb-02	Analytics		<0.31	<0.31	<0.31	<0.31	0.31	50	
	14-Apr-02	Analytics		<0.31	<0.31	<0.31	<0.31	0.31	50	
	18-Jul-02	Analytics		<0.31	<0.31	<0.31	<0.31	0.31	10	
	26-Mar-03	Air, Water, Soil		38	550	70	<0.2	0.2	1.0	
	25-Jun-03	Air, Water, Soil		57	660	36	<0.2	0.2	1.0	
	11-Oct-03	Air, Water, Soil		33	140	200	<0.2	0.2	1.0	
injection event	18-Jan-04	Air, Water, Soil		110	3500	330	<0.2	0.2	1.0	
March, 2004	25-Apr-04	Air, Water, Soil		85	<0.2	<0.2	<0.2	0.2	1.0	
	25-May-04	Air, Water, Soil		<0.2				0.2	1.0	verification
	30-Jul-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	31-Oct-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-Jan-05	Air, Water, Soil		1.6	<0.2	<0.2	<0.2	0.2	1.0	
	21-May-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	7-Aug-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	3-Dec-05	Air, Water, Soil		<0.2	<0.2	<0.2	< 1.0	0.2	1.0	
	19-Jan-06	Air, Water, Soil					<0.2	0.2	1.0	verification
	31-Mar-06	Air, Water, Soil					<0.2	0.2	1.0	
injection event	31-Mar-06	Air, Water, Soil		5.1	0.5	25	<0.2	0.2	1.0	
August, 2006	4-Sep-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	27-Jan-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-May-07	Air, Water, Soil		<1.0	<0.2	<0.2	<0.2	0.2	1.0	
	20-Sep-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	27-Dec-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
average =				47.1	970.1	132.2				
standard deviation =				37.0	1288.6	116.9				
coefficient of determination =				0.8	1.3	0.9				

CLIENT: HAND CRAFT CLEANERS AND LAUNDERERS, INC

FACILITY: 11401 MIDLOTHIAN TURNPIKE

PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY

ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101			comment
date of well construction =			3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01	LOD	LOQ	
trichloroethene	13-Sep-01	Analytics	<0.29	<0.29	<0.29	<0.29		0.29	1	
MCL = 5 ppb	28-Feb-02	Analytics		<0.29	<0.29	<0.29	<0.29	0.29	50	
	14-Apr-02	Analytics		<0.29	<0.29	<0.29	<0.29	0.29	50	
	18-Jul-02	Analytics		<0.29	<0.29	<0.29	<0.29	0.29	10	
	26-Mar-03	Air, Water, Soil		56	140	21	<0.2	0.2	1.0	
	25-Jun-03	Air, Water, Soil		58	110	8	<0.2	0.2	1.0	
	11-Oct-03	Air, Water, Soil		27	130	44	<0.2	0.2	1.0	
Injection event	18-Jan-04	Air, Water, Soil		70	660	150	<0.2	0.2	1.0	
March, 2004	25-Apr-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	25-May-04	Air, Water, Soil						0.2	1.0	PCE only
	30-Jul-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	31-Oct-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-Jan-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	21-May-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	7-Aug-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	3-Dec-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	19-Jan-06	Air, Water, Soil						0.2	1.0	PCE only
	31-Mar-06	Air, Water, Soil					<0.2	0.2	1.0	
Injection event	31-Mar-06	Air, Water, Soil		<0.2	<0.2	30	<0.2	0.2	1.0	
August, 2006	4-Sep-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	27-Jan-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-May-07	Air, Water, Soil		<1.0	<0.2	<0.2	<0.2	0.2	1.0	
	20-Sep-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	27-Dec-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
average =				52.8	260.0	50.5				
standard deviation =				15.8	231.2	51.1				
coefficient of determination =				0.3	0.9	1.0				

CLIENT: HAND CRAFT CLEANERS AND LAUNDERERS, INC

FACILITY: 11401 MIDLOTHIAN TURNPIKE

PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY

ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOD	LOQ	comment
date of well construction =			3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01			
cis-1,2-dichloroethene	13-Sep-01	Analytics	<1	<1	<1	<1			1	
MCL = 70 ppb	28-Feb-02	Analytics		<0.26	<0.26	<0.26	<0.26	0.26	50	
	14-Apr-02	Analytics		<0.26	<0.26	<0.26	<0.26	0.26	50	
	18-Jul-02	Analytics		<0.26	<0.26	<0.26	<0.26	0.26	10	
	26-Mar-03	Air, Water, Soil		230	150	20	<0.2	0.2	0.5	
	25-Jun-03	Air, Water, Soil		300	160	62	<0.2	0.2	0.5	
	11-Oct-03	Air, Water, Soil		230	340	75	<0.2	0.2	0.5	
injection event	18-Jan-04	Air, Water, Soil		510	680	1100	<0.2	0.2	0.5	
March, 2004	25-Apr-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	25-May-04	Air, Water, Soil						0.2	1.0	PCE only
	30-Jul-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	31-Oct-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	28-Jan-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	21-May-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	7-Aug-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	3-Dec-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	19-Jan-06	Air, Water, Soil						0.2	1.0	PCE only
	31-Mar-06	Air, Water, Soil					<0.2	0.2	0.5	
injection event	31-Mar-06	Air, Water, Soil		<0.2	<0.2	11	<0.2	0.2	0.5	
August, 2006	4-Sep-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	27-Jan-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	28-May-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	20-Sep-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
	27-Dec-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	0.5	
average =				317.5	332.5	253.6				
standard deviation =				114.8	214.4	423.9				
coefficient of determination =				0.4	0.6	1.7				

CLIENT: HAND CRAFT CLEANERS AND LAUNDERERS, INC

FACILITY: 11401 MIDLOTHIAN TURNPIKE

PROJECT: GROUNDWATER MONITORING PROGRAM

HISTORY OF GROUNDWATER CHEMISTRY

ORGANIC CONSTITUENTS

CONSTITUENT	DATE	LABORATORY	MW-01	MW-02	MW-03	MW-04	PZ-101	LOD	LOQ	comment
date of well construction =			3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01	3-Apr-01			
vinyl chloride	13-Sep-01	Analytics	<0.51	<0.51	<0.51	<0.51		0.51	1	
MCL = 2 ppb	28-Feb-02	Analytics		<0.51	<0.51	<0.51	<0.51	0.51	50	
	14-Apr-02	Analytics		<0.51	<0.51	<0.51	<0.51	0.51	50	
	18-Jul-02	Analytics		<0.51	<0.51	<0.51	<0.51	0.51	10	
	26-Mar-03	Air, Water, Soil		16	7.0	3.6	<0.2	0.2	1.0	
	25-Jun-03	Air, Water, Soil		24	6.1	10	<0.2	0.2	1.0	
	11-Oct-03	Air, Water, Soil		4.3	16	1.6	<0.2	0.2	1.0	
Injection event	18-Jan-04	Air, Water, Soil		5.3	36	69	<1	0.2	1.0	
March, 2004	25-Apr-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	25-May-04	Air, Water, Soil						0.2	1.0	PCE only
	30-Jul-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	31-Oct-04	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-Jan-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	21-May-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	7-Aug-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	3-Dec-05	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	19-Jan-06	Air, Water, Soil						0.2	1.0	PCE only
	31-Mar-06	Air, Water, Soil					<0.2	0.2	1.0	
Injection event	31-Mar-06	Air, Water, Soil		<0.2	<0.2	0.7	<0.2	0.2	1.0	
August, 2006	4-Sep-06	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	27-Jan-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	28-May-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	20-Sep-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
	27-Dec-07	Air, Water, Soil		<0.2	<0.2	<0.2	<0.2	0.2	1.0	
average =				12.4	16.3	17.0				
standard deviation =				8.1	12.0	26.2				
coefficient of determination =				0.65	0.74	1.54				