

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

Revised 9/20/02

RCRA Corrective Action
Environmental Indicator (EI) RCRA Info code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: Harcros Chemicals, Inc.
Facility Address: 5200 Speaker Road, Kansas City, KS 66106
Facility EPA ID #: KST210010062

DETERMINATION RESULT: YE

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

X If yes - check here and continue with #2 below.

 If no - re-evaluate existing data, or

 if data are not available, skip to #8 and enter "IN" (more information needed) status code.

The Harcros Chemicals, Inc. (Harcros), facility is located at 5200 Speaker Road in Kansas City, Kansas (see Figure 1), along the Kansas River. The documentation produced since an Administrative Order on Consent executed in 1983 divides the facility into four zones, based on distinctions in normal business operations and contamination types: the Mid-Area (MA), the Restricted Zone (RZ), the Area North of the Levee (NOL), and the Surface Drainages (SD) Area (see Figure 2). Except where noted, the descriptions below derive from the draft Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) (Burns and McDonnell [BMD] 1996).

The Harcros facility has been in operation since 1960. Current activities at the site include packaging acids, formulating surfactants, manufacturing animal feed supplements, and warehousing and distributing industrial chemicals and supplies. Past activities also have included formulating pesticides (including chlordane, aldrin, and dieldrin); manufacturing phenoxy herbicides (including dichlorophenoxyacetic acid [2,4-D]; 2,4,5-trichlorophenoxyacetic acid [2,4,5-T]; and Agent Orange), and performing wholesale distribution of industrial, dry cleaning, and laundry chemicals and supplies (BMD 1996).

Encompassing most central operational areas at Harcros, the MA zone is the area of several ongoing processes—including packaging solvents and surfactants, and loading and unloading raw materials and finished products. Discontinued processes in the area include pesticide formulation, which began in 1967 at the area on the western side of the Liquid Blending Complex (LBC) and continued until the late 1970s.

Including most operational areas on the western side of Harcros, the RZ is the area of several ongoing processes—including loading and unloading raw materials and finished products, storing drums of hazardous waste, and storing materials long-term in aboveground storage tanks (AST). Discontinued processes in the RZ include manufacturing phenoxy herbicides and recycling solvents. Production of phenoxy herbicides began in 1960 and continued until 1977. A building was constructed to house herbicide manufacture in 1963. The building subsequently was closed in 1983 and demolished in 2000 (URS 2000). The RZ was also the area of Agent Orange manufacture from 1967

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RCRA RECORDS

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until 1971 or 1972, when all raw materials and finished products were removed. Agent Orange is a mixture of 2,4-D; 2,4,5-T; and trace amounts of dioxins (in particular 2,3,7,8-tetrachlorodibenzo-p-dioxin).

The NOL zone consists of the unfenced area that lies south of the Kansas River and north of the levee. It is not an operational area of the facility but has been used for unregulated waste disposal and permitted National Pollutant Discharge Elimination System (NPDES) discharges from Harcros property. The facility currently discharges treated groundwater to the Kansas River under a NPDES permit (EPA 2005).

The SD zone consists of several drainageways and facilities related to the Ethyloxylation (EO) Plant. Except for the EO Plant, the SD zone is not an operational area, but it does receive runoff from both the RZ and MA zone. Soils and sediments in the SD zone contain some of the highest detections of semi-volatile organic compounds (SVOC), pesticides, and herbicides at Harcros as a result of runoff from the MA and RZ.

The following list of solid waste management units (SWMU), areas of interest (AOI), and regulated units (RU) is organized by zone.

Mid-Area

SWMU D, Acid Drainage Area (or Acid Wash-Down Area). From the mid 1960s until the mid 1980s in this area, railcars brought in and unloaded acids that were drummed for use on site. Spills or overflows were contained by, and flowed along, a collection trench lined with concrete and crushed limestone before entering a neutralization pit filled with limestone. Groundwater and soil contamination concentrations at this SWMU are low relative to the facility as a whole.

SWMU F, Sump 2. This sump is one of two that make up SWMU F (Concrete Sumps); the other sump is in the RZ. This sump receives washwater from the LBC and some stormwater runoff from the MA zone. At times in the past, it also has been the destination for laboratory wastes, including solvents, acids, bases, and cooling water from Supply Well (SW) 6. Runoff and washwater is conveyed from Sump 2 to an equalization tank that discharges to the Kansas City, Kansas, sanitary sewer system through site sewers or the NOL zone through Outfall 2. Groundwater and soil contaminant concentrations at this SWMU are low relative to the facility as a whole.

SWMU G, East Spur. This railroad spur is one of two that make up SWMU G (Tank Car Unloading Area); the other is in the RZ. In this currently inactive area, tank cars containing, for example, acids and solvents had been unloaded and then loaded with finished products, primarily pesticides. This SWMU was also the site of pesticide formulation from the late 1960s until the late 1970s. The East Spur is the location of some of the highest soil concentrations of volatile organic compounds (VOC), SVOCs, and pesticides in the MA zone (BMD 2000a)—as well as limited contamination of soil by herbicides (BMD 1998). Because of high concentrations of contaminants in soil just above the water table, this SWMU is likely one of the primary sources for VOCs, SVOCs, and pesticides in groundwater at the Harcros facility (BMD 1998).

Central Tank Dike Area. This AOI consists of ASTs and five earthen dikes put into use in about 1965. The tanks stored solvents until the early 1970s. During the 1960s, this area also was used to package solvents into drums. As of 1996, the tanks stored solvents and other raw materials for, and finished products from, the EO Plant. The EO Plant was constructed in about 1965 and served to manufacture surfactants, industrial emulsifiers, and wetting agents. Groundwater and soil contaminant concentrations at this AOI are low relative to the facility as a whole.

Liquid Blending Complex (LBC). From the late 1960s to 1996, this AOI was used for blending and drumming solvents and emulsifiers. A building was constructed on the same location for this use in the early 1970s. In the early 1960s, this area additionally included a tank that stored tetrachloroethene (PCE); the tank subsequently was moved to the northern portion of the LBC in the 1970s, and to the tank farm in the RZ (SWMU E) in the mid 1980s. Pesticides also were formulated in the general area of the LBC from 1967 to the late 1970s. This area has some of the highest concentrations of VOCs, SVOCs, and pesticides in the MA zone in shallow soil and soil just above the

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water table. Because of high concentrations of contaminants in soil just above the water table, this SWMU is likely one of the primary sources for VOCs, SVOCs, and pesticides in groundwater at the Harcros facility (BMD 1998).

Drum Storage Pad (DSP). This AOI is an uncurbed concrete pad constructed in 1970 that has been used for drum storage—primarily to store empty drums, but also possibly to store merchandise (probably primarily pesticides) for short periods of time. Runoff from the DSP drains into Surface Drainage Way (SDW) 3 and is probably the source of soil and groundwater contamination in the northern part of SDW3.

Restricted Zone

SWMU A, Pilot Plant Solvent Recycling Area. The solvent recycling plant was not associated with production activities in the RZ but lies immediately to the southwest of the RZ. From mid 1982 to mid 1983, it was the location of a pilot program to recycle and reclaim 1,1,1-trichloroethane and, to a lesser extent, PCE and methylene chloride. Any spills from this area may have discharged to site sewers. Groundwater and soil contaminant concentrations at this SWMU are low relative to the facility as a whole.

SWMU B, Area East of Dike #2. Since 1980, this paved area has been used for short-term (less than 90 days) storage of drums of hazardous waste and solid waste containing hazardous constituents. Groundwater and soil contaminant concentrations at this SWMU are low relative to the facility as a whole.

SWMU E, Tank Farm Area. The tank farm formerly was used for herbicide formulation and also for raw material storage, including solvents such as PCE. The farm consists of a number of ASTs and four tank dikes—three concrete and one earthen—located along the edge of the West Spur. The area around Dikes 1 and 2 was used for herbicide formulation until 1978. The Dike 3 area was used to store PCE from the mid 1980s until 1990. The area within Dike 4, the earthen dike, has contained tanks of iso-octyl alcohol or caustic soda. This area has some of the highest concentrations of VOCs, SVOCs, and herbicides in the RZ in shallow soil and soil just above the water table. Because of high concentrations of contaminants in soil just above the water table, this SWMU is likely one of the primary sources for herbicides in groundwater at the Harcros facility (BMD 1998).

SWMU F, Sump 1. This sump is one of two that make up SWMU F (Concrete Sumps); the other is in the MA zone. This sump receives stormwater runoff from the RZ, including from SWMUs E and B. Water is conveyed from Sump 1 to an equalization tank that discharges to the Kansas City, Kansas, sanitary sewer system through site sewers or the NOL zone through Outfall 1. The northern portion of the RZ near Sump 1 has some of the highest concentrations of SVOCs, herbicides, and dioxins in the RZ in shallow soil and soil just above the water table. Because of high concentrations of contaminants in soil just above the water table, this SWMU is likely one of the primary sources for herbicides in groundwater at the Harcros facility (BMD 1998).

SWMU G, West Spur. This railroad spur is one of two that make up SWMU G (Tank Car Unloading Area); the other is in the MA zone. In this currently inactive area, tank cars containing, for example, solvents and acids, were unloaded and then loaded with finished products, primarily herbicides. The southern portion of this SWMU also was used to package materials, probably herbicides. The West Spur is the location of some of the highest concentrations of VOCs in soil in the RZ.

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Area North of the Levee

SWMU H, Empty Drum Disposal. This area includes a former drum disposal area created by the Army Corps of Engineers in 1972 and an area used by Harcros to allow sulfuric acid drums to depressurize. An investigation conducted by Harcros in 1984 also revealed that the area was being used to dispose of unregulated solid waste—including empty drums, plastic liners, and household trash. All these materials, along with two or three drum volumes of discolored soil, were removed at that time. Groundwater and soil contaminant concentrations at this SWMU are low relative to the facility as a whole.

SWMU I, Ponding Area. This area includes the outfalls for noncontact cooling water from the RZ and the MA zone. Until the site was regraded in 1997 (BMD 1998), water from these outfalls ponded in the area as it infiltrated the soil. Water from the outfalls now flows toward the Kansas River, usually infiltrating or evaporating before it reaches the river. SWMU I is now also a collection point for stormwater runoff (BMD 2000a). Surface water collected after storm events contains VOCs, mostly chlorinated solvents, and limited detections of pesticides have occurred in sediments. Groundwater and soil contaminant concentrations at this SWMU are low relative to the facility as a whole.

Surface Drainages Area

SWMU C, Open Trenches and Sewers. This SWMU consists of a series of unlined open ditches and leaking sewer canals surrounding the closed Surface Impoundment (SI). These ditches and trenches transported wastewater and some runoff to the equalization tank in the northeastern part of the site. Although they currently are lined with concrete, portions of these trenches were unlined in the past. Groundwater and soil contaminant concentrations at this SWMU are low relative to the facility as a whole.

Surface Drainage Ways (SDW). SDWs were identified as AOIs in the administrative order on consent. They conduct stormwater runoff from the operational areas of the facility into site or city sewer systems. SDW 1 drains the RZ, SDW 2 receives stormwater runoff from the northeastern portion of facility, and SDW 3 drains the MA zone. Water from SDW 1 and 2 collects in the northern part of the facility. During periods of high flow, water in SDWs 1 and 2 may flow east, off of Harcros property, to a culvert through the levee (near the U.S. Postal Service facilities) and then to the Kansas River. SDW 3 flows south to ditches along Speaker Road, where it either infiltrates or runs into Kansas City, Kansas, city sewers. In addition to these three on-site SDWs, drainage ditches also run along Speaker Road. Contaminants in excess of site-specific screening levels (SSSL) have been found in these other drainageways. The area in SDW 3 next to the DSP has soil contaminated with VOCs and SVOCs in excess of SSSLs. Contamination in these areas is probably the result of runoff from operational areas, rather than releases in the SDWs.

Closed Surface Impoundment (SI). The closed SI is a RU being monitored by the Kansas Department of Health and the Environment (KDHE). It was constructed in 1965 to serve as an emergency ethylene oxide relief facility. In 1973, it was drained and lined, and most sludge was removed in 1978. From 1978 to 1988, the SI served as an equalization basin for process wastewater being discharged to Kansas City, Kansas, sewers. It was taken out of service in 1988. Based on the results of continued quarterly monitoring, it appears that the SI is not a major source of constituents in groundwater at the facility relative to other contaminated areas on site (BMD 1998).

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

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

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2. Is groundwater known or reasonably suspected to be “contaminated”¹ above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) 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 Harcros facility is located at 5200 Speaker Road, in the Kansas Avenue industrial corridor of Kansas City, Kansas. Prior to 1960, the area was used largely for farming and gravel quarrying, but subsequently it has been developed extensively for heavy industry. Adjacent properties include other chemical manufacturers and storage facilities. The site lies within 0.5 mile of the Kansas River, about 7 miles upstream of its confluence with the Missouri River.

No other permanent surface-water bodies exist on the property, but pools of standing water do develop during periods of heavy precipitation (BMD 2000a). Storm runoff from the property may infiltrate into the ground on site; discharge to site sewers and then into city sewers through equalization tanks; or run south to the drainage ditches along Speaker Road and then directly into city sewers.

Groundwater at the site typically is found 35 to 40 feet below ground surface (bgs), flowing through an unconsolidated, unconfined, alluvial aquifer. During periods when no extraction wells were operating, gradients at the site were controlled entirely by the stage of the Kansas River (U.S. Environmental Protection Agency [EPA] 2001a; Harcros 2001). During periods of high stage, groundwater flowed south. During periods of low stage, groundwater flowed north towards the river. In October 2002, the groundwater stabilization system described in the Corrective Measures Study (CMS) was completed (including extraction well EW-1), and the system began operating the same month (URS 2002f). An additional extraction well, EW-2, began operation in September 2004 (URS 2004c). Attachment 1 shows the estimated capture zones for EW-1 and EW-2. Groundwater is expected to flow toward the extraction wells in the capture zones.

The Harcros facility has been the subject of ongoing groundwater monitoring since at least 1983, when Harcros entered into an administrative order on consent with KDHE to investigate the nature and extent of herbicide and dioxin contamination in the RZ. On August 3, 1990, Harcros and EPA entered into another administrative order on consent requiring a RFI and a CMS at the site. The administrative order on consent was amended further in October 2001. Under this amendment, Harcros was required to: (1) establish the extent of groundwater contamination, (2) establish a network of sentinel wells to monitor migration of contamination above EPA’s maximum contaminant levels (MCL) into uncontaminated areas, and (3) provide hydraulic containment or stabilization of the groundwater plume (EPA 2001b).

¹“Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

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During the investigations required by the original administrative order on consent and its amendments, Harcros has collected soil, sediment, groundwater, and surface-water samples. As part of these investigations, an Interim RFI Data Report was generated in May 1993 (BMD 1993), including the results of initial field work, a pumping test of SW6, and the first two rounds of groundwater sampling. The Draft RFI Report was completed in April 1996 (BMD 1996), incorporating the data from the 1993 report, along with EPA revisions, the results of additional field work, and data from the next four groundwater sampling events. The Final RFI Report (BMD 1998) was finished in February 1998. This final report summarized the results of previous drafts, presented data from groundwater sampling Rounds 7 and 9, and initiated the process of developing screening levels and corrective action objectives (CAO). After the RFI was complete, the CAO Report was generated in February 2000 (BMD 2000a), outlining Harcros's risk assessment plans and summarizing the extent of contamination at the facility. An initial draft of the CMS was submitted in 2002 but is awaiting approval by EPA (URS 2002e). These documents form the basis of this evaluation. References to the RFI refer generically to the entire investigation, unless otherwise specified.

Groundwater samples at the Harcros facility generally have been collected from monitoring wells screened in two depths in the aquifer (see Figure 2 for monitoring well locations). Monitoring wells are screened in a shallow zone (less than about 50 feet bgs) and a deep zone (more than about 50 feet bgs) (BMD 1996). Prior to the RFI, nine monitoring wells had been completed in the shallow part of the aquifer. During the RFI, 32 monitoring wells were installed—21 wells in the shallow aquifer zone and 11 in the deep aquifer zone. Investigators also sampled supply wells SW6 and SW5 and three monitoring wells on property to the east belonging to TH Agriculture and Nutrition (THAN), the former owners of the Harcros facility (BMD 1996, 1998). Harcros installed additional monitoring wells in 2002 in response to the amended administrative order on consent (URS 2002a, 2002b, 2002c, 2003)—four shallow and eight deep confirmation wells:

- one deep confirmation well on the southern portion of the facility
- one shallow and one deep well along Speaker Road
- one deep well in the NOL zone on the west side of facility
- one shallow well downgradient of MW-7 and two deep wells in the same area
- three deep confirmation wells adjacent to the river
- one shallow well to characterize the area west of the formulating plant
- one shallow well to characterize the area west of the warehouse.

Nine rounds of groundwater sampling were associated with the RFI. Samples for Rounds 1 and 2 were collected during January and February 1993, Rounds 3 and 4 during September and November 1994, Round 5 during May 1995, Round 6 during October 1995, Round 7 during May and July 1996, Round 8 during November 1996, and Round 9 in June 1997. Round 3 samples were collected following the summer floods of 1993 and tended to have higher concentrations of contaminants than samples collected during other rounds. A total of 330 samples was collected, with 187 samples analyzed for VOCs, 100 samples for SVOCs, 176 samples for herbicides (only 43 analyzed for atrazine), and 85 samples for pesticides. Samples also were collected during an additional sampling event in August 2001 to determine the effect of shutting down SW6, a cooling-water supply well that significantly influenced the movement of groundwater at the site (BMD 2000a, Harcros 2001). Well SW6 was shut down in September 1999 (Harcros 2001). Table 1 shows the maximum concentrations of contaminants found in groundwater during the RFI and the maximum concentrations of VOCs found in wells sampled in January 2005, the last sampling event in which all wells regularly monitored were sampled.

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TABLE 1

COMPOUNDS DETECTED IN GROUNDWATER SAMPLES COMPARED TO SCREENING LEVELS

Compound	Maximum Concentration Reported in RFI ($\mu\text{g/L}$)*	Maximum Concentration in January 2005 ($\mu\text{g/L}$)**	MCL ($\mu\text{g/L}$)
Volatile Organic Compounds			
Acetone	3,300	85 J	610 ^{††}
Benzene	120	7.2 J	5
Chlorobenzene	40	5.9 J	100
Chloroform	29	0.80 J	6.2 ^{††}
Chloromethane	21	ND	1.5 ^{††}
1,1-Dichloroethane	210	2.2	810 ^{††}
1,2-Dichloroethane	45	ND	5
1,1-Dichloroethene	38	ND	7
1,2-Dichloroethene (total)	6,400	110	100
Ethylbenzene	1,600	ND	700
Methylene chloride [†]	180	ND	4.3 ^{††}
Tetrachloroethene	300	83	5
Toluene	120	0.41 J	1,000
1,1,1-Trichloroethane	260	ND	200
Trichloroethene	260	40	5
Vinyl chloride	2,500	930	2
Xylene (total)	5,700	ND	10,000
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	42	NA	6
1,2-Dichlorobenzene	37	NA	600
2,4-Dichlorophenol	13	NA	110 ^{††}
2,4-Dimethylphenol	24	NA	730 ^{††}
2-Methylnaphthalene	27	NA	none
2-Methylphenol(o-cresol)	4	NA	1,800 ^{††}
4-Methylphenol(p-cresol)	52	NA	1,800 ^{††}
Naphthalene	16	NA	none
Phenol	48	NA	22,000 ^{††}
2,4,5-Trichlorophenol	10	NA	3,600 ^{††}
Pesticides			
Aldrin	0.038	NA	0.004 ^{††}
Chlordane (technical)	4.7	NA	2
4,4'-DDD	0.35	NA	0.28 ^{††}
Heptachlor epoxide	0.79	NA	0.2
Toxaphene	12	NA	3
Herbicides			
Atrazine	3.1	NA	3
Dichlorophenoxyacetic acid (2,4-D)	NR	NA	70
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	NR	NA	370 ^{††}
2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP) (Silvex)	88	NA	50

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Notes:

This table is derived from Burns and McDonnell (2000a) and URS (2005b). Concentrations in bold exceed the EPA MCL or Region 9 PRG.

* Only samples collected from January 1995 to June 1997 were included in these results.

** Samples collected during this event were not analyzed for semivolatile organic compounds, pesticides, or herbicides.

† Compound was often found in trip or laboratory blanks. However, the 180 µg/L result was not from a qualified sample.

†† EPA does not specify a MCL for this compound (EPA 2002a). This value is the EPA Region 9 PRG for drinking water (EPA 2002b).

DDD 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane

EPA U.S. Environmental Protection Agency

J Estimated

MCL EPA maximum contaminant level (EPA 2002a)

µg/L Micrograms per liter

NA Not analyzed

ND Not detected

NR Not reported

PRG Preliminary remediation goal

RFI Resource Conservation and Recovery Act Facility Investigations (RFI) (BMD 1993, 1996, 1998)

Groundwater at the Harcros facility is contaminated most significantly with VOCs, and the most contaminated groundwater samples are from the shallowest parts of the aquifer (BMD 1998, 2000a). However, SVOCs, pesticides, and herbicides also have been found in concentrations exceeding MCLs.

In samples collected for the RFI, VOC, SVOC, and pesticide contamination in groundwater centered around the East Spur in the MA zone. The most common VOCs detected above their MCLs were PCE (and its degradation products), acetone, ethylbenzene, toluene, and xylenes (BMD 1998). During Rounds 1 through 4, SVOCs commonly were not detected. As a result, the number of wells sampled for SVOC analysis was reduced in later rounds. SVOCs, with the exception of 1,2-dichlorobenzene, naphthalene compounds, and chlorinated phenols, commonly were not detected in groundwater at the Harcros facility. Of these, only *bis*(2-ethylhexyl)phthalate was detected in concentrations above its MCL (BMD 1998). During Rounds 1 through 4, pesticides commonly were not detected. As a result, the set of wells sampled for pesticide analysis was reduced to those in the area of the East Spur during Rounds 5, 6, and 7. The number of wells sampled for pesticide analysis was increased for Rounds 8 and 9. Aldrin, 4,4'-1,1-dichloro-2,2-*bis*(*p*-chlorophenyl)ethane (DDD), chlordane (technical), heptachlor epoxide, and toxaphene were all detected above their screening concentrations during the period from 1995 to 1997 (BMD 1998).

In samples collected for the RFI, groundwater contaminated with herbicides was found most commonly in the RZ and SDW1. Herbicides detected include 2,4-dichlorophenoxyacetic acid (2,4-D); 2,4,5-trichlorophenoxyacetic acid (2,4,5-T); 2,4,5-trichlorophenoxypropionic acid (2,4,5-TP) (silvex); and atrazine—with 2,4,5-TP the most common. In recent years, 2,4,5-TP and atrazine have been detected in concentrations above their screening levels. Samples collected during Round 3 had much higher concentrations of herbicides, with concentrations of 2,4,5-TP exceeding 3,000 micrograms per liter (µg/L) (BMD 1996). This concentration dropped off in subsequent sampling events.

Between September 1994 and May 1995, groundwater also was collected during direct-push soil sampling in the RZ. Groundwater samples were collected at a depth interval of about 40 to 45 feet bgs. The maximum detections of total VOCs was 10,377 µg/L, with acetone and xylenes detected most often. Highest total SVOC concentrations were 30,440 µg/L, almost entirely chlorophenol compounds related to degradation of herbicides. Herbicides also were detected, with total herbicide concentrations as high as 361,000 µg/L. In all cases, contemporaneous groundwater samples from surrounding monitoring wells had much lower concentrations of these contaminants (BMD 1998). Direct-push investigations of groundwater in the NOL zone in late 1999 revealed no concentrations of VOCs in excess of screening levels (BMD 2000b).

Groundwater samples also were collected using direct-push methods in November 2001 (URS 2002e). This additional investigation was designed to establish the extent of groundwater contamination, guide the placement of additional monitoring wells, reveal the effects of the shutdown of SW6, and characterize previously uninvestigated areas (URS 2002e). As well as confirming the presence and extent of the contamination plumes originating from the

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MA and RZ, the direct-push investigation found two additional VOC plumes—one originating from the area of the Formulating Plant Complex and the other from the area of the Warehouse (URS 2002e). These plumes apparently formed after SW6 was shut down.

The most recent facility-wide groundwater sampling, conducted in January 2005, shows that concentrations of contaminants have declined but still exceed MCLs. Results of the most recent sampling show that, at a minimum, groundwater at the facility is still contaminated with VOCs.

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3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within “existing area of contaminated groundwater”² as defined by the monitoring locations designated at the time of this determination)?

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

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

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

Rationale and Reference(s):

The most recent amended administrative order on consent, executed in 2001, established guidelines to determine if migration of contaminated groundwater has stabilized. The order called for a ring of sentinel wells that would bound the area of groundwater contamination. The order specified that if contaminant concentrations would exceed MCLs in two consecutive sampling events in any sentinel well, SW6 must be restarted (EPA 2001b). The sentinel well system (also called the “groundwater stabilization system”) was defined in October 2002 and includes the wells shown in Table 2 (see Figures 2 and 3) (URS 2002d). In 2004, when detections of concentrations above MCL in well MW-43D began, Harcros installed extraction well EW-2 rather than restart SW6.

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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TABLE 2

GROUNDWATER STABILIZATION MONITORING NETWORK

Shallow Wells	Deep Wells
MW-1S	MW-2D
MW-17SA	MW-10
MW-31S	MW-17D
BMW-2S (on 5101 Speaker Rd. property)	MW-43D
BMW-3S (on 5101 Speaker Rd. property)	MW-44D
MW-36S	BMW-3D (on 5101 Speaker Rd. property)
MW-46S	MW-36D
	MW-46D

Notes:

Table generated from the revised plan for the groundwater monitoring system (URS 2002d).

In one sentinel well (MW-43D), contaminant concentrations have exceeded the MCL for trichloroethene (TCE) in nine of the last 12 sampling events (EPA 2004a, 2004b; URS 2004a, 2004b, 2004c, 2005a, 2005b, 2005c, 2005g). For the most recent sampling event, July 2005, the concentration of TCE in MW-43D was 3.1 µg/L, which is below the MCL.

Six groundwater samples have been collected from MW-43D, since Extraction Well EW-2 was installed in September 2004. All of the TCE detections are low levels and have varied from slightly above to slightly below the MCL of 5.0 µg/L. The laboratory's requirement for analytical precision in aqueous media was referenced to assess the comparability of these data points. As cited in the Laboratory Quality Manual, precision is an estimate of the agreement among individual measurements of the same properties under similar conditions. The laboratory calculates precision control limits based on the analysis of laboratory control samples. Analytical precision is expressed as relative percent difference (RPD) for duplicate measurements. The RPD established for analysis of TCE in aqueous matrices by Method 8260B is 23 percent. The laboratory control limit represents acceptable precision for TCE as derived from multiple analyses of a laboratory fortified clean matrix without interference from constituents present in environmental samples. Therefore, the 23 percent is a conservative precision target for actual groundwater samples.

Depicted in the attached chart (Appendix B) is the reported TCE values for the first 5 sampling events, starting with September 2004, but excluding the July 2005 sampling event since the results was below MCL. The chart also depicts the range of concentrations that represent a 23 percent RPD for each of the five sampling events. Four out of the five samples share a common range of 6.15 µg/l to 7.81 µg/l. This indicates that the data points may be interpreted as analytically comparable within the target precision goal. The single outlier is slightly below the common range and is below the MCL (URS 2005f). Also, the most recent sampling event (July 2005) resulted in the TCE level below the MCL in MW-43D. Therefore, it appears that the concentrations of TCE in MW-43D have remand relatively stable, and even below the MCL at times, since the activation of extraction well EW-2.

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In two sentinel wells (MW-43D and MW-44D) contaminant concentrations have exceeded the MCL for vinyl chloride (VC). However, since January 2005, the concentrations again have remained relatively stable in MW-43D and declined in MW-44D (Appendix A).

Contaminated groundwater is not migrating into uncontaminated areas north of the Kansas River or east, south, or west of the facility. During periods of low stage, the Kansas River is expected to be a flow barrier as groundwater flows toward the river. During periods of high stage, the two extraction wells are expected to intercept contaminated groundwater as it flows away from the river. Attachment 1 (URS 2002e) provides potentiometric surface maps generated by the facility during the period before extraction wells EW-1 and EW-2 were installed.

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

 X If yes - continue after identifying potentially affected surface water bodies.

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

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

Rationale and Reference(s):

Contaminated groundwater likely is discharging to the Kansas River. As shown in the potentiometric surface maps provided in Attachment 11, groundwater discharges to the Kansas River under natural conditions (without the extraction wells influence) and during most river stages. Even with the operation of the extraction wells, monitoring wells MW-43D and MW-44D lie outside the expected capture zones for both wells (Attachment 2, URS 2005d, 2005e). Both MW-43D and MW-44D have concentrations of contaminants that exceeded MCLs during the April 2005 and July 2005 sampling events (VC in wells MW-43D and MW-44D, and TCE in well MW-43D only in April 2005). Both MW-43D and MW-44D are within 300 feet of the southern bank of the Kansas River, and concentrations in these wells are considered representative of concentrations in groundwater as it discharges to the river.

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5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater “level,” and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

 X If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected 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 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 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):

Concentrations of contaminants in groundwater as it discharges to the Kansas River likely are insignificant. In April 2005, Vinyl chloride was found at concentrations of 2.3 µg/L and 11.0 µg/L in wells MW-43D and MW-44D, respectively, and TCE was found at a concentration of 8.3 µg/L in well MW-43D. In July 2005, Vinyl chloride was found at concentrations of 2.8 µg/L and 9.4 µg/L in wells MW-43D and MW-44-D, respectively, and TCE was found at a concentration of 3.2 µg/L. However, the MCLs for VC and TCE are 2.0 µg/L and 5.0 µg/L, respectively. The concentrations of VC and TCE are less than 10 times the MCLs for these compounds. Moreover, both VC and TCE are VOCs. As such, they are not expected to persist in surface water or sediment.

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-assessment⁵, 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):

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.

⁵The 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?"

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

 If no - enter "NO" status code in #8.

 If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

Harcros does have an ongoing groundwater monitoring program. Under the current groundwater monitoring system, Harcros collects samples quarterly from sentinel wells for VOC analysis. Quarterly sampling will continue until the final remedy is implemented (EPA 2002c). Another set of designated facility-wide monitoring wells will be sampled for VOCs annually until the final remedy is implemented (EPA 2002c). Other sampling for SVOCs, pesticides, and herbicides has been discontinued (URS 2002d).

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8. Check the appropriate RCRA Info 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 Harcros Chemicals, Inc., facility, EPA ID # KST210010062, located at 5200 Speaker Road, Kansas City, Kansas. 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 Patricia Murrow Date 9/29/05
(signature)

Patricia Murrow
Project Manager, RCRA Corrective Action & Permits Branch
EPA Region 7

Supervisor Don Toensing Date 9-29-05
(signature)

Don Toensing
Branch Chief, RCRA Corrective Action & Permits Branch
EPA Region 7

Locations where References may be found:

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