DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRAInfo code (CA725)
Current Human Exposures Under Control

Facility Name: Schering Corporation
Facility Address: 1011 Morris Avenue, Union, New Jersey 07083
Facility EPA ID#: NJD001317601

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 EIs 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 "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no unacceptable human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all 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 objectives of the RCRA Corrective Action program, the EIs are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The "Current Human Exposures Under Control" EI is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and does not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

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

Facility Information

Schering Corporation has operated a pharmaceutical research and development facility, with limited manufacturing activities, at this location since 1938. The facility is located on a 60-acre property in a light industrial/commercial area. The facility and surrounding area are highly developed. The facility is bordered to the northwest by Conrail railroad tracks, to the southwest by Morris Avenue, to the southeast by commercial offices and private residences, and to the northeast by the Elizabeth River. Elizabeth

River Park, a county recreational area, is located on the other side of the Elizabeth River. Kean University is located southwest across Morris Avenue.

Historical facility operations have included fermentation, biological and chemical synthesis, and extraction of pharmaceutical intermediates; pilot plant process development; raw material and finished item shipping, receiving, and warehousing; product and material quality control, inspection, and analysis; and administration. Facility infrastructure has included surface impoundments, wastewater treatment operations, underground and aboveground storage tanks, loading/unloading areas, drum and container storage areas, industrial wastewater, sanitary, and storm water sewer systems, and non-contact cooling water systems. Schering currently stores wastes in two containerized hazardous waste storage sheds and a waste solvent blending tank, pursuant to a New Jersey Department of Environmental Protection (NJDEP) RCRA Permit.

In 1984, Schering conducted a hydrogeologic study that identified groundwater contamination attributable to historical facility practices. In 1985, Schering entered into an Administrative Consent Order (ACO) with NJDEP to investigate and remediate groundwater at the site. Subsequent investigations and remedial work were undertaken leading to the issuance of a New Jersey Pollutant Discharge Elimination System Discharge to Groundwater (NJPDES-DGW) permit in 1991. The 1985 ACO was terminated when the NJPDES-DGW permit was issued. Under the terms of the NJPDES-DGW permit, Schering designed and constructed an extensive Ground Water Extraction System (GWES) to control off-site migration of contaminated groundwater from the overburden aquifer. The NJPDES-DGW permit was canceled in 1994, and a second NJDEP ACO was issued. The GWES was brought on line in 1994, and remains in operation today under the terms of the 1994 ACO.

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, 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 #6 and enter IN (more information needed) status code

Summary of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs): The Schering site has been the subject of over 16 years of study and remediation under NJDEP oversight. During these studies nearly 200 soil samples have been collected and more than 120 groundwater monitoring points have been installed and monitored, both on site and off site. During the course of investigations the following nine (9) SWMUs and AOCs have been identified at the property. A facility map depicting the area of individual SWMUs and AOCs is provided in Attachment 1.

SWMU 1, Former Railroad Siding: This unit was located in the northwestern portion of the site and was an area used until the 1970s for handling bulk shipments of solids and liquids, including solvents such as methylene chloride, chloroform, acetone, butyl ether, methanol, and acids. During previous investigations, metals were detected in soil and volatile organic compounds (VOC) were detected in groundwater, both above relevant standards (Ref. 1). Soil in this area was excavated, stockpiled, and disposed during the 1994 Site Substation Upgrade Project and sampling indicated no detectable concentrations of any priority pollutants. Groundwater in this area is within the capture zone of the GWES. In addition, historical data indicates that concentrations of contaminants in groundwater have decreased significantly since the mid-1980s. A majority of this area is now covered by buildings or asphalt, with a few small gravel or grass areas remaining.

SWMU 2, Industrial Sewer Lines: This unit consists of a network of industrial sewer lines, concentrated in the northwestern portion of the property, that were in service from the 1940s through the present. These underground sewer lines are still used to transport non-hazardous wastewater from various facility production areas to the wastewater treatment system, but have not been used to transport solvent-contacted wastewater since 1992. New aboveground sewer lines were installed in 1992 to convey the industrial waste liquids to the on-site wastewater treatment plant (WWTP). No soil contamination has been detected during investigations at this unit; however, VOCs and semi-volatile organic compounds (SVOC) were detected above relevant standards in groundwater. Constituent concentrations in groundwater have shown a declining trend since the mid-1980s due to natural attenuation and the GWES operation (Ref. 5).

SWMU 3, Four Surface Impoundments: This unit consisted of four surface impoundments, located along the northwestern boundary of the property, that were used to dispose of waste liquids from testosterone production, principally chromic and sulfuric acid wastes. The impoundments were used from the 1940s to the early 1950s, and were dredged and backfilled for construction of Building 14, in 1958. During previous investigations, metals and VOCs were detected in soil (Ref. 1), and VOCs were also detected in groundwater above relevant standards.

During the early 1990s, soil excavated for construction of Building 14 (within this unit) was stockpiled and analyzed for waste characteristics prior to disposal. No detectable concentrations of priority pollutants were found. During supplemental investigations in 1997, toluene was detected in soil above relevant standards in one sample collected at this unit (Ref. 5). Groundwater underlying this SWMU is within the capture zone of the GWES.

SWMU 4, Waste Solvent Pit: This unit consisted of an alleged disposal area for solvents, located near the northern boundary of the site and the Elizabeth River. An investigation performed by the facility, historical aerial photographs and as-built drawings from the site showed no evidence of a waste solvent pit, and interviews and on-site research have produced no corroborating evidence to support the original assertions (Ref. 3). USEPA has determined that no further action is required for this SWMU. Soil and groundwater contamination have been detected within this unit; however, this unit is within the footprint of SWMU 5. Thus, all associated remedial activities are discussed under SWMU 5.

SWMU 5, Unpaved Drum Storage Areas: This unit consists of two separate areas located in the north-central portion of the site, that were formerly used for drum, refuse, and raw material (acidic mother liquor) storage from the 1940s until the 1970s. Previous investigations have detected metals and VOCs in soil and VOCs in groundwater above relevant standards. Soils in this area were excavated, analyzed, and removed during construction of Buildings 12, 18, and 18A in the 1990s (Ref. 5). Sample results did not detect any reportable levels of priority contaminants. Additional soil sampling and analysis was conducted during 1997 and no samples detected contaminants above New Jersey non-residential direct contact screening criteria (NRDCSC) for contaminants in soil (Ref. 5). Groundwater within this SWMU has shown a general decrease in contaminant concentrations over time and is within the capture zone of the GWES.

AOC 6, Aboveground Storage Tank (AST) Farms: This unit consists of four AST farms that are located in various locations throughout the site. These tank farms contain ASTs used for storing raw materials, wastewater, and hazardous waste generated as part of site operations. Soil borings did not show the presence of contaminants above relevant standards (Ref. 2). However, during the installation of three monitoring wells (MW-6D, MW-7, MW-12) in the eastern tank farm (the tank farm on the northern corner of SWMU 5) and the tank farm in the western portion of the production area, elevated levels of VOCs, SVOCs, and metals were detected in soil. In supplemental soil investigations conducted in 1997, sample results did not reveal constituents above the NJ NRDCSC standards. Groundwater contamination has also been observed in the vicinity of the tank farms. However, it is possible that groundwater contamination is associated with other units and plumes on site. All inactive ASTs have been decommissioned, while all active ASTs are now located in secondary containment and are inspected regularly.

AOC 7, Underground Storage Tanks (UST): This AOC consisted of ten USTs, located in eight different areas on site, formerly used to store alcohol, gasoline, fuel oil, diesel fuel, and methanol. All of these tanks have been taken out of service and abandoned in place or removed in accordance with applicable regulations (Ref. 2). During UST removal or abandonment activities, no evidence of leakage or contamination was observed and no contamination was detected during soil sampling. Monitoring wells in the vicinity of several former USTs have detected contaminants such as benzene, bis(2-chloroethyl)ether, and toluene. However, because no signs of leakage were observed during tank closures, and because these contaminants are

similar to other contaminants detected on site, it is unlikely that any of these detections are related to the USTs.

AOC 8, Peninsula Area/MW-28: This area is located in the northeastern portion of the site, and consists of an area where light non-aqueous phase liquid (LNAPL) was detected (MW-28) during quarterly sampling events between 1992 and 1998 (Ref. 5). In response to the LNAPL detects, Schering has implemented product recovery actions in this portion of the site. During recent soil investigations benzene, chloroform, and methylene chloride were detected above relevant residential standards but below industrial standards (Ref. 5). Groundwater contaminants detected during recent sampling rounds consist of benzene, toluene and chlorobenzene. The number of contaminants detected in this area and their level have decreased significantly between 1990 and 1999. This AOC is immediately upgradient of the GWES, and thus, it is within the capture zone of the GWES.

AOC 9, Backfilled Area: This area is located on the eastern boundary of the site (part of AOC 6) and consists of a backfilled area along the Elizabeth River. During site expansion activities, this area was filled to level the site and provide room for the new WWTP. The soils used to fill the area were derived from on-site sources and are the subject of the AOC. Soil samples collected in this area did not detect contaminants above relevant standards. Recent groundwater samples collected in this area indicate the presence of TCE and benzene contamination. However, because no signs of soil contamination have been observed it is possible that groundwater contamination in this area is associated with other units and plumes on site (Ref. 5).

Only one unit, SWMU 4, has received a No Further Action determination from NJDEP and USEPA. With respect to the remainder of the units, soil contamination has only been recently detected in SWMU 3 above relevant industrial standards. The most recent soil investigations in all other SWMUs and AOCs have revealed no elevated contamination concentrations. It should also be noted that the majority of this site is covered by buildings or asphalt pavement. A few small grass covered areas exist. However, Schering maintains an environmental management plan on site which monitors disruption of the capping system and on-site soil. Groundwater contamination has been associated with all units. In general, groundwater at this site is not being evaluated on a unit by unit basis, but rather on a site-wide basis. Schering has installed the GWES to capture groundwater contamination that has been detected throughout the site. This GWES continues to extract contaminated groundwater at the site and its performance is monitored on a semi-annual basis.

References:

1. Remedial Investigation Report, Schering Corporation, Union, New Jersey. Prepared by Roy F. Weston, Inc. Dated June, 1986.
2. Supplemental Remedial Investigation Report on Storage Tanks as Potential Sources of Contaminants, Schering Laboratories, Union, New Jersey. Prepared by Roy F. Weston, Inc. Dated August, 1989.
3. Supplemental Waste Disposal Pit Investigation Report, Schering Laboratories, Union, New Jersey. Prepared by Roy F. Weston, Inc. Dated August, 1989.
4. Supplemental Remedial Investigation Report, Schering Corporation, Union, New Jersey. Prepared by Ebasco Environmental. Dated September, 1990.
5. Comprehensive Site Conditions Report, Schering Corporation, 1095 Morris Avenue, Union, New Jersey. Prepared by Earth Tech. Dated May 24, 2000.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective risk-based levels (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			VOCs, SVOCs, Inorganics
Air (indoors)[2]		X		
Surface Soil (e.g., <2 ft)	X			VOCs
Surface Water		X		Contamination is present, but it is not related to SWMU/AOC activities at the Schering facility.
Sediment		X		Contamination is present, but it is not related to SWMU/AOC activities at the Schering facility.
Subsurface Soil (e.g., >2 ft)	X			VOCs
Air (Outdoor)		X		

____ If no (for all media) - skip to #6, and enter YE, status code after providing or citing appropriate levels, and referencing sufficient supporting documentation demonstrating that these levels are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each contaminated medium, citing appropriate levels (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

____ If unknown (for any media) - skip to #6 and enter IN status code.

Rationale:

Groundwater

Groundwater beneath the Schering site occurs at approximately 10 feet below ground surface across most of the site. The uppermost aquifer beneath the site is located in unconsolidated glacial, fill, and alluvial deposits of the Elizabeth River (Ref. 6). Initial investigations determined that the unconsolidated

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[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 appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

aquifer is unconfined, and that groundwater in this unit flows to the north and northeast, partially discharging to the river. At a depth of approximately 20 to 35 feet, the unconsolidated aquifer is underlain by the fractured bedrock aquifer. The bedrock beneath the site is comprised of the Passaic Formation (formerly referred to as the Brunswick Formation), a shale with sandstone and siltstone interbeds. Groundwater in the upper portion of the bedrock aquifer was also found to flow to the east-northeast beneath the site, towards the river (Ref. 6).

Groundwater contamination was initially detected at the site during the Phase II Hydrogeologic Study performed by Roy F. Weston in 1984 (Ref. 1). Groundwater contamination was detected at the primary production area of the facility, the location of the former surface impoundments, and the fill area at the WWTP. Potential sources of groundwater contamination include the industrial wastewater lines (SWMU 2), drum storage areas (SWMU 5), ASTs (AOC 7), and USTs (AOC 8). Floating product was also detected in the peninsula area (AOC 8) at MW-28.

In general, groundwater at this site is not being evaluated on a unit by unit basis, but on a site-wide basis. Despite this approach, Schering identifies that groundwater contamination at the site is related to prior spills and releases at SWMUs/AOCs. Thus, the Current Site Conditions Report (CSCR) report indicates which monitoring well locations are associated with specific SWMU/AOC areas (Ref. 6). The relationship between monitoring wells and SWMU/AOC locations is outlined in Table 1 below. The highlighted well locations represent wells in which constituents were recently detected above the higher of either the New Jersey Ground Water Quality Criteria (GWQC) or the Practical Quantitation Level (PQL) for Class II-A potable groundwater.

Table 1 - SWMU Location/Monitoring Well Relationships

SWMU/AOC	Monitoring Wells Located in the Vicinity of Unit
SWMU 1	MW-02, MW-12, **MW-15**, MW-16, P-01, P-02, BW-02
SWMU 2	MW-04R, **MW-20**, **MW-21**, **MW-22**, P-05, P-06, P-07, P-15, P-16, RW-03, RW-06, **BW-04**
SWMU 3	MW-02, **MW-03**, **MW-24**, MW-31, MW-32, MW-33
SWMU 5	**BW-04**, **BW-05**, MW-05, MW-06S, **MW-06D**, **MW-09**, **MW-20**, **MW-21**, **MW-22**, **MW-25**, MW-26, MW-27
AOC 6	MW-06S, **MW-06D**, **MW-07**, MW-12, MW-27, **MW-37**, BW-02, **BW-05**, **BW-07**, P-01, P-02, P-14
AOC 7	P-10, MW-14, TPZ-02
AOC 8	P-10, TPZ-03, **TPZ-04**, TPZ-05, **TPZ-07**, TPZ-08, **MW-28**, MW-34, **BW-06**, RW-01
AOC 9	P-13, P-14, MW-30

Groundwater was monitored on a quarterly basis until May, 1999, when NJDEP and USEPA approved Schering's request to move to a semi-annual groundwater monitoring program. Currently, groundwater contaminants above the NJ GWQC primarily consist of VOCs, SVOCs, and metals. These contaminants

are still being detected above the NJ GWQC in both on-site wells and immediate off-site well locations on the north side of the Elizabeth River. The primary constituents of concern (COCs) in groundwater are benzene, toluene, and methylene chloride. During the most recent (June, 2000) groundwater monitoring event the maximum detected concentration for these three constituents were as follows: benzene (MW-28 = 62,600 µg/l, NJ GWQC = 1.0 µg/l), toluene (MW-20D = 230,000 µg/l, NJ GWQC = 1,000 µg/l), and methylene chloride (MW-20D = 9,100 µg/l, NJ GWQC = 2.0 µg/l).

Air (Indoors)

The primary COCs that currently exist in groundwater at the site are VOCs. Recently detected concentrations of VOCs were compared to the State of Connecticut (CT) Groundwater Standards for Protection of Indoor Air under the Industrial/Commercial (I/C VC) scenario to identify constituents that may be a concern due to potential migration into indoor air. Table 2 identifies the monitoring well locations where constituent concentrations were detected above the CT I/C VC during the May 2000 semi-annual groundwater sampling event (Ref. 7).

Table 2 - Groundwater Exceedences of the Connecticut Groundwater Standards for the Protection of Indoor Air - Industrial/Commercial Scenario May 2000 (µg/L)

Constituent	CT I/C VC	MW-20	MW-21	MW-28
Benzene	530	1,680		62,600
Carbon Tetrachloride	40		120	1,770
Toluene	50,000	123,000		123,000

Due to the location of MW-28, volatilization of contaminants in this well into indoor air is not of concern. MW-28 is located along the northeastern boundary of the site and is not underneath or in the immediate vicinity of any on-site buildings. Schering has conducted numerous investigations on the contamination in MW-28, and its surrounding area, and has identified a thin layer (0.1 feet) of LNAPL (predominantly benzene and toluene) in this well (Ref. 6). The LNAPL layer is of limited areal extent and has been determined to be upgradient of, and captured by, the GWES due to the absence of LNAPL in immediate downgradient monitoring well locations. Thus, Schering has concluded that the LNAPL contamination is being captured by the GWES, and not migrating off site or under buildings.

Due to the location of MW-20 and MW-21, the Johnson-Ettinger (JE) Model was used to calculate the incremental risk and hazard values associated with the potential migration of volatile contaminants into indoor air. The recently detected VOC concentrations, identified in Table 2 above, were used to calculate risk and hazard estimates. The concentrations in these monitoring well locations have not been detected under buildings. However, the sample locations are in close proximity (approximately 50 feet upgradient) to on-site industrial buildings. Site-specific input parameters used in the model include: the depth below grade to bottom of enclosed space floor, depth below grade to water table, soil type, and soil/groundwater temperature. Conservative default values were used for the remaining parameters for which site-specific values were not readily available. In addition, industrial exposure assumptions (i.e., exposure duration and exposure frequency) were used in the calculations due to the current industrial nature of the property.

Table 3 - Calculated Incremental Risk Values and Hazard Quotients

Constituent	Calculated Incremental Risk Value (IRV)/Hazard Quotient (HQ)
Benzene	1.3E-06(IRV)
Carbon Tetrachloride	4.3E-07(IRV)
Toluene	6.2E-02(HQ)

The calculated IRVs and HQ for the three constituents, as seen in Table 3 above, are below or within the USEPA acceptable risk range of 1.0E-4 to 1.0E-6 and below the target HQ of 1.0. In addition, cumulative risk associated with exposure to carcinogenic compounds is within the USEPA acceptable risk range of 1.0E-4 to 1.0E-6. Based upon the current information available and considering the results of the JE Model, volatilization of groundwater contaminants into indoor air at the Schering facility does not appear to pose an unacceptable risk at this time. See Attachment 2 for JE Model results for the three carcinogenic compounds.

Surface/Subsurface Soil

Numerous soil investigations have been conducted at the Schering property. From 1984 to 1986, 38 soil borings were advanced as part of the Remedial Investigation (RI) conducted at the property. In 1991, Schering began requiring all excavated soil at the property to be stockpiled and sampled prior to transport off site (Ref. 6). After 1991, numerous on-site construction projects took place in which soil was excavated, stockpiled, and analyzed for hazardous constituents. A subsurface investigation also took place in 1997 to investigate the reduction in contaminant concentrations in soil since 1986.

Based upon soil sampling conducted in 1997, residual soil contamination has only recently been detected in SWMU 3 above NJ NRDCSC (Ref. 6).

> **SWMU 3:** During the 1986 RI, arsenic, beryllium, chromium, thallium, zinc, benzene, and methylene chloride were detected in subsurface soil. During the 1990s, construction and excavation work occurred in this area. Composite samples of excavated soil were collected and they contained no detectable concentrations of priority pollutants. In 1997, two soil borings were advanced in this SWMU. Results indicated the presence of toluene at (8,320 mg/kg) in one subsurface soil sample (sample depth not identified) above the NJ NRDCSC (1,000 mg/kg).

The CSCR also identifies a "residual [soil] contamination area" of benzene and/or toluene in soil at boring locations 1-16, 1-17, and 1-25, west of the peninsula area (Ref. 6). Benzene concentrations range from 51.1 mg/kg to 1,240 mg/kg (NJ NRDCSC = 13 mg/kg), while toluene was detected at 2,000 mg/kg (NJ NRDCSC = 1,000 mg/kg) in boring location 1-25 only. These soil samples were collected in 1985, and although they are the most recent documented soil samples in this area, they do not necessarily represent current subsurface conditions.

Surface Water/Sediment

The facility is adjacent to the Elizabeth River, which meanders in a narrow flood plain bordering the site's northeastern boundary. The river generally flows in a south to southeasterly direction and discharges into Arthur Kill.

Surface water and sediment sampling was conducted as part of a Surface Water and Sediment Sampling and Analysis Report, submitted to NJDEP on May 1, 2000 (Ref. 5), and approved on January 11, 2000 (Ref. 11). Surface water and sediment samples were collected quarterly between May 21, 1999, and February 7, 2000, at six (6) paired locations along the Elizabeth River (See Attachment 1). The samples were analyzed for VOCs, base neutral acids (BNA), and metals. The tables below identify constituents detected above the NJDEP Surface Water Protection Criteria (SWPC) for FW2-NT classified rivers, and constituents detected above the NJDEP Sediment Screening Guidelines (SSG) for Freshwater Sediment. Manganese was also detected in each well above the NJDEP SWPC, but has not been included in Table 4. Manganese is not on the Priority Pollutant List and is naturally occurring. Thus, it is not of primary concern.

Table 4 - Maximum Contaminant Concentration Detected above NJDEP SWPC between May 1999 to February 2000 (µg/L)

Constituent	NJDEP SWPC	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6
VOCs							
Trichloroethene	1.09	3.3	3.2	2.9	3.3	3.1	3.3
Tetrachloroethene	0.388	0.9J	0.9J	1.0J	1.0J	1.0	1.0J
SVOCs							
bis (2-Ethylhexyl)phthalate	1.76	4.5	–	–	–	–	9.5
Metals							
Lead	5	–	–	12.1	6.2	–	6.8

J - The compound was detected at an estimated quantity less than the detection limit.

As depicted by Table 4, surface water samples revealed a limited number of contaminants consistently above the NJDEP SWPC. The contaminants identified in the river are not contaminants of concern in shallow groundwater at the Schering property. In addition, the contaminants were detected in all sample locations (i.e., upstream [SW-6], adjacent to the site [SW-2 though SW-5], and downstream [SW-1]). Thus, Schering has concluded that contamination is most likely related to regional and/or upstream contaminant sources and not to past hazardous material practices at SWMUs/AOCs at the Schering facility. NJDEP and USEPA have concurred with Schering's conclusion.

Table 5 - Maximum Contaminant Concentration Detected above NJDEP SSG for Freshwater Sediment between May 1999 to February 2000 (µg/kg)

Constituent	NJDEP SSG	SD-1	SD-2	SD-3	SD-4	SD-5	SD-6
VOCs							
Toluene	2,500	–	–	–	–	–	18,000
SVOCs							
Phenanthrene	560	3,600	2,600	12,000	4,500	2,200	13,000
Anthracene	220	670J	490J	2,800	1,000	420J	2,700J
Flouranthene	750	6,500	4,300	12,000	7,600	4,000	21,000
Pyrene	490	5,600	3,700	11,000	6,500	3,900	18,000
Benzo(a)anthracene	320	2,800	1,900	4,900	2,900	1,800	7,700
Chrysene	340	3,000	2,000	5,000	3,500	2,200	11,000
Benzo(k)flouranthene	240	1,600	1,300	2,500	1,800	1,200	4,800
Benzo(a)pyrene	370	2,600	1,800	3,900	3,100	1,800	7,600
Indeno(1,2,3-cd)pyrene	200	980	850	1,700	950	660	3,800
Dibenzo(a,h)anthracene	60	290	220	–	250	180	1,000
Benzo(g,h,i)perylene	170	780J	660J	1,300	780	510J	3,400J
Metals							
Cadmium	0.6	1.3	2.0	1.2B	3.8	3.9	2.8
Chromium	26	35.3	32.6	32.9	76.2	43.4	60.3
Copper	16	71.1	55.4	83.7	234	302	214
Lead	31	176	150	231	231	258	329
Mercury	0.2	1.4	–	–	0.48	–	0.28
Nickel	16	43.8	40.3	46.4	50.8	47.3	47.0
Silver	1	–	–	–	1.7	27.1	--
Zinc	120	291	239	174	407	330	437

J - The compound was detected at an estimated quantity less than the detection limit.
B - The compound was also detected in a laboratory sample.

As depicted in Table 5 above, sediment samples revealed several contaminants above the NJDEP SSG for Freshwater Sediment in all sample locations. Results actually show that sediment contamination concentrations are consistently higher in upstream samples (SD-6). In addition, the contaminants identified in the river sediment are not contaminants of concern in shallow groundwater at the Schering

property. Thus, Schering has concluded that contamination is most likely related to regional and/or upstream contaminant sources and not to past hazardous material practices at SWMUs/AOCs at the Schering facility. NJDEP and USEPA have concurred with Schering's conclusion.

Based upon current information, it appears that surface water and sediment in the Elizabeth River is contaminated above relevant standards; however, this contamination is not associated with releases from SWMUs/AOCs at the Schering property.

Air (Outdoors)

The Schering facility is almost entirely capped by on-site buildings or asphalt pavement. A few small areas exist on site with grass cover. Schering has management plans in place to ensure that the caps are maintained in an appropriate manner. Thus, it is unlikely that any contaminants in soil or groundwater will impact outdoor air at a level of concern for on-site receptors.

References:

1. Remedial Investigation Report, Schering Corporation, Union, New Jersey. Prepared by Roy F. Weston, Inc. Dated June, 1986.
2. Letter from Schering to NJDEP re: Submittal of Semi-Annual Groundwater Monitoring Report for May 1999. Dated July 29, 1999.
3. Supplemental Sampling Report, Schering Corporation, Union, New Jersey. Prepared by IT Corporation. Dated January, 2000.
4. Letter from Schering to NJDEP re: Submittal of Semi-Annual Groundwater Monitoring Report for November 1999. Dated January 27, 2000.
5. Surface Water and Sediment Sampling and Analysis Report, Schering Corporation, 1095 Morris Avenue, Union, New Jersey. Prepared by Earth Tech. Dated April 25, 2000.
6. Comprehensive Site Conditions Report, Schering Corporation, 1095 Morris Avenue, Union, New Jersey. Prepared by Earth Tech. Dated May 24, 2000.
7. Letter from Schering Corporation to NJDEP re: Submittal of Semi-Annual Groundwater Monitoring Report for May 2000. Dated July 31, 2000.
8. Letter from NJDEP to Schering re: Response to Comments No 1 & 2 of the October 21, 1999 Letter concerning the February 1999 Groundwater Extraction System Performance Report and the May 1999 Quarterly Groundwater Monitoring Report. Dated December 29, 2000.
9. Letter from NJDEP to Schering re: Semi-Annual Groundwater Monitoring Report for November 1999 and May 2000, Ground Water Extraction Hydraulic System Performance Report for November 1999, and the Groundwater Extraction Hydraulic Monitoring Report for May 2000. Dated January 2, 2001.
10. Letter from NJDEP to Schering re: Supplemental Sampling Report. Dated January 11, 2001.
11. Letter from NJDEP to Schering re: Surface Water and Sediment Sampling and Analysis Report. Dated January 11, 2001.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table
*Potential **Human Receptors** (Under Current Conditions)*

"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespasser	Recreation	Food[3]
Groundwater	No	No	No	No	–	–	No
Air (indoor)							
Surface Soil (e.g. < 2 ft)	No	No	No	No	No	No	No
Surface Water							
Sediment							
Subsurface Soil (e.g., > 2	–	–	–	No	–	–	No
Air (outdoors)							

Instruction for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated" as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated"Media — Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces. These spaces instead have dashes ("--"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_X_ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

____ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Rationale:

Groundwater

Groundwater contamination associated with the Schering facility primarily remains within site boundaries. Schering installed and has been using the on-site GWES since 1994 as a mechanism to provide hydraulic control of contaminated groundwater that would otherwise continue to discharge to the Elizabeth River. The GWES consists of 41 groundwater extraction wells with pairs of piezometers co-located with each extraction well (Ref. 3). Groundwater removed by the extraction wells is pumped to the WWTP. Schering conducts semi-annual monitoring of groundwater at on-site and off-site locations to determine whether concentrations are decreasing and whether or not the GWES is successfully functioning as required by the ACO. In general, groundwater monitoring conducted at the site has shown decreasing contaminant concentrations and decreasing lateral extent for most of the contaminants of concern at the site, especially in the northern production area. Thus, the GWES is successfully capturing a majority of the on-site contamination. As mentioned previously, there are several areas for which further investigation is necessary. These areas include: off-site locations immediately across the Elizabeth River, the southeastern portion of the facility along the Elizabeth River (MW-07 area), and the western portion of the facility (MW-15 area). NJDEP and USEPA have directed Schering to further investigate the contamination in these areas (Ref. 1).

NJDEP, USEPA, and Schering continue to investigate contamination that has been detected in groundwater samples collected on the opposite side of the Elizabeth River. Despite this uncertainty, exposure to contaminated groundwater associated with Schering activities is not of concern. According to the CSCR, on-site and local groundwater is not utilized for potable supply. The City of Union obtains its municipal water supply from the Elizabethtown Water Company. The CSCR indicates that water supply needs for surrounding communities are being met, and will continue to be met, through the use of resources unaffected by site contamination. Thus, there is no potential for on- or off-site receptors to be exposed to contaminated groundwater emanating from the Schering facility.

A well survey was also conducted in 1986, and was documented in the CSCR (Ref. 2). Fifty-two domestic, production, and or observation wells were identified in a two-mile radius of the site. Only nine of the production wells were in the downgradient direction of the property. Based upon an evaluation of their location in relation to the facility, they are not at risk from contamination at the Schering facility. Only ten domestic wells were found within a two mile radius of the site; however, none of these wells were within one mile of the site or were located in the downgradient direction. It should be noted that many of these wells are potentially no longer in service due to the date on the well survey and the transition of many urban areas, including Union, to public water supply. Thus, based upon this information, there are currently no complete exposure pathways to contaminated groundwater associated with the Schering facility.

Surface/Subsurface Soil

According to the CSCR, over 50,000 tons of contaminated soil have been removed from the site. These efforts have resulted in removing material that could have potentially leached contaminants to the underlying groundwater and that could have posed significant risk to on-site construction workers. Some small areas of contaminated soil remain in SWMU 3 and in the area west of the peninsula (borings 1-16,

1-17, and 1-25). However, a majority of this site is covered by buildings or asphalt pavement, including these two areas, and only a few small grass covered areas exist. Additionally, the soil contamination in SWMU 3 is in the subsurface. In order to eliminate potential exposure and disruption to contaminated soil areas, Schering maintains an environmental management plan which monitors the disruption of the capping system and any work associated with on-site soil. As a result, the CSCR documents that soil does not pose a risk in terms of direct contact, volatilization of contaminants, or airborne transport of contaminated particulates. Thus, based upon the current information, there are no complete exposure pathways to on-site residual soil contamination at the Schering facility.

References:

1. Letter from NJDEP to Schering re: Surface Water and Sediment Sampling and Analysis Report. Dated January 11, 2000.
2. Comprehensive Site Conditions Report, Schering Corporation, 1095 Morris Avenue, Union, New Jersey. Prepared by Earth Tech. Dated May 24, 2000.
3. Letter from Schering Corporation to NJDEP re: Submittal of Semi-Annual Groundwater Monitoring Report for May 2000. Dated July 31, 2000.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **significant**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks?

   ____ If no (exposures cannot be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

   ____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

   ____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale:

This question is not applicable. See response to question #3.

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5. Can the "significant" **exposures** (identified in #4) be shown to be within acceptable limits?

____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale:

This question is not applicable. See response to question #3.

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_X_ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Schering Corporation Facility, EPA ID# NJD001317601, located at 1011 Morris Avenue, in Union, New Jersey, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

___ NO - "Current Human Exposures" are NOT "Under Control."

___ IN - More information is needed to make a determination.

Completed by: __original signed by_____ Date:__03/14/01_____

Kristin McKenney
Risk Assessor
Booz Allen & Hamilton

Reviewed by: __original signed by_____ Date:__03/15/01_____

Kathy Rogovin
Senior Risk Assessor
Booz Allen & Hamilton

Also Reviewed by: __original signed by_____ Date:__03/08/01_____

Elizabeth Butler, RPM
RCRA Programs Branch
USEPA Region 2

__original signed by_____ Date:__03/08/01_____

Barry Tornick, Section Chief
RCRA Programs Branch
USEPA Region 2

Approved by: __original signed by_____ Date:__03/12/01_____

Raymond Basso, Chief
RCRA Programs Branch
USEPA Region 2

Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at the USEPA Region 2, RCRA Records Center, located at 290 Broadway, 15th Floor, New York, New York, and the New Jersey Department of Environmental Protection Office located at 401 East State Street, Records Center, 6th Floor, Trenton, New Jersey.

Contact telephone and e-mail numbers: Elizabeth Butler, USEPA RPM
(212) 637-4163
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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

Attachments

The following attachments have been provided to support this EI determination.

Attachment 1 - SWMU and AOC Map

Attachment 2 - Johnson-Ettinger Model Results

Attachment 3 - Summary of Media Impacts Table

Attachments truncated, see facility file (MSS, 06/13/02)