DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

Facility Name:	***Union Carbide Corporation***
Facility Address:	***437 MacCorkle Avenue SW, South Charleston, West Virginia 25303***
Facility EPA ID#:	***WVD005005483***

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.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

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

Definition of "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 objective of the RCRA Corrective Action program the EI are nearterm 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 are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do 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 Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. 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)?

	Yes	No	?	Rationale/Key Contaminants
Groundwater	__X_	____	____	***27 constituents exceed screening levels; See Rationale and Reference Section below.***
Air (Indoors)[2]	__X_	____	____	***4 constituents exceed screening levels; See Rationale and Reference Section below.***
Surface Soil (e.g., <2 ft)	__X_	____	____	***6 constituents exceed screening levels; See Rationale and Reference Section below.***
Surface Water	____	_X_	____	***See Rationale and Reference Section below.***
Sediment	____	_X_	____	***See Rationale and Reference Section below.***
Subsurf. Soil (e.g., >2 ft)	__X_	____	____	***8 constituents exceed screening levels; See Rationale and Reference Section below.***
Air (outdoors)	____	_X_	____	***See Rationale and Reference Section below.***

_____ 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.

Facility Background:

The Union Carbide Corporation (UCC) South Charleston Facility, hereafter referred to as the Facility, is located in South Charleston, West Virginia, adjacent to the Kanawha River. The property encompasses approximately 200 acres, comprising two major sections, the Mainland Complex and Blaine Island. Within the Facility boundaries, several private and corporate chemical production facilities have operated. Chemical production facilities located on Blaine Island were developed after UCC's acquisition of the property in 1923. A barium reduction facility and a glass manufacturing facility occupied a portion of the Mainland Complex prior to UCC's acquisition of the property.

In the early 1900s, prior to UCC's acquisition, a chlorobenzene/dichlorobenzene production plant existed in the vicinity of the western property boundary between UCC and the adjacent FMC property near the Kanawha River. Facility operations since the 1920s have included the aforementioned barium reduction and glass manufacturing facilities and the production of various specialty chemicals, including vinyl acetates and petroleum compounds.

A summary of investigations conducted at the Facility is provided in the: RCRA Facility Investigation (RFI) Report, South Charleston Facility, South Charleston, West Virginia (CH2M HILL, November 2003); Draft Site Assessment Report, South Charleston Facility Front Entrance, South Charleston, West Virginia (CH2M HILL, January 2005); and Draft Follow-up RFI Report, South Charleston Facility, South Charleston, West Virginia (CH2M HILL, April 2005).

Three interim measures were implemented at the Facility in the late 1980s and the 1990s in response to observed releases of contaminants to the environment. These interim measures are described in the Draft Follow-Up RFI Report (CH2M HILL, April 2005).

Rationale:

Groundwater concentrations were compared to USEPA Region III Risk Based Concentrations (RBCs) (USEPA, April 2005) and Maximum Contaminant Levels (MCLs) (USEPA, 2004). The results of this comparison are shown below in Table 1. Lead concentrations in groundwater were compared to the USEPA Safe Drinking Water Act lead action level of 15 µg/L. Based on the results of the groundwater evaluation, key constituent groups for groundwater criteria exceedances are: volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs), primarily bis(2-chloroethyl)ether, bis(2-chloroisopropyl)ether, bis(2-ethylhexyl)phthalate, 2-methylnaphthalene, and naphthalene; and metals.

Table 1
Constituents of Potential Concern in Groundwater that Exceed Risk-Based Screening Levels

Chemical	Maximum Detection (µg/L)	Sample Qualifier	Location of Maximum Detection	Region III RBC - Tap Water (µg/L)	MCL (µg/L)
1,1,2-Trichloroethane	1.70E+04		Blaine Island-SCFB-A029	1.88E-01	5.00E+00
1,2-Dichloroethane	6.20E+03		Blaine Island-SCFB-C231	1.16E-01	5.00E+00
1,2-Dichloroethene (total)	5.00E+02		Mainland-SCFM-A231	5.48E+01	NA
1,2-Dichloropropane	1.32E+03		Blaine Island-SCFB-A033	1.55E-01	5.00E+00
1,4-Dioxane	4.27E+03	J	Mainland-SDFM-C212FD	6.09E+00	NA
Benzene	3.23E+04		Blaine Island-SCFB-A222	3.36E-01	5.00E+00
Chlorobenzene	7.19E+04	J	Mainland-SCFM-C212	1.06E+02	NA
Chloroform	5.25E+02		Mainland-SCFM-B528	1.55E-01	8.00E+01
Ethylbenzene	7.96E+03		Blaine Island-SCFB-B210	1.34E+03	7.00E+02
Tetrachloroethene	1.06E+03	J	Mainland-SCFM-C212	1.04E-01	5.00E+00
Toluene	3.10E+03		Blaine Island-SCFB-A034	7.47E+02	1.00E+03
Trichloroethene	2.46E+02		Mainland-SCFM-A244	2.64E-02	5.00E+00
Vinyl chloride	3.53E+03		Blaine Island-SCFB-B504	1.50E-02	2.00E+00
Xylenes, Total	3.39E+03		Blaine Island-SCFB-A034	2.13E+02	1.00E+04
1,2-Dichlorobenzene	2.67E+04		Mainland-SCFM-A240	2.68E+02	6.00E+02
1,4-Dichlorobenzene	3.94E+04		Mainland-SCFM-A240	4.73E-01	7.50E+01
2-Chlorophenol	4.78E+01	K	Mainland-SCFM-C212FD	3.04E+01	NA
2-Methylnaphthalene	3.79E+03		Blaine Island-SCFB-B513	2.43E+01	NA
Acenaphthene	5.57E+02		Blaine Island-SCFB-B513	3.65E+02	NA
Acenaphthylene	1.05E+03		Blaine Island-SCFB-B513	6.51E+00	NA
Bis (2-chloroethyl) ether	8.21E+02		Blaine Island-SCFB-A023	9.59E-03	NA
Bis (2-chloroisopropyl) ether	1.50E+03		Blaine Island-SCFB-A021	2.60E-01	NA
Bis (2-ethylhexyl) phthalate	6.72E+03	J	Mainland-SCFM-A019	4.78E+00	6.00E+00
Fluorene	3.46E+03		Blaine Island-SCFB-B513	2.43E+02	NA
Naphthalene	7.54E+03		Blaine Island-SCFB-B513	6.51E+00	NA
Phenanthrene	7.54E+03		Blaine Island-SCFB-B513	1.83E+02	NA
Arsenic	9.91E-02		Blaine Island-SCFB-B001	4.46E-02	1.00E+01

Vapor intrusion was evaluated following the USEPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) (USEPA, November 2002). The results of this comparison are shown below in Table 2. Soil gas data collected at 5 feet below ground surface were used to evaluate potential vapor intrusion into indoor air. This depth interval is reflective of current facility building construction (i.e., no basement). The soil gas data were compared with USEPA target soil gas concentrations corresponding to target indoor air concentrations for residential structures provided in the Draft Guidance (USEPA, November 2002). These screening values were used in the absence of values for industrial settings, such as that present at the Facility. Evaluation of potential risks associated with those constituents with concentrations above vapor intrusion screening values was based on industrial site conditions, not residential.

Table 2
Constituents of Potential Concern in Soil Gas that Exceed Risk-Based Screening Levels for Indoor Air

Chemical	Maximum Detection (ppbv)	Sample Qualifier	Location of Maximum Detection	Sample Depth (feet bgs)	Target Soil Gas Concentration Corresponding to Target Indoor Air Concentration (ppbv)
1,3-Butadiene	1.00E+00		Mainland-SCFM-SG17	5	3.90E-01
Carbon Tetrachloride	3.00E+00		Mainland-SCFM-SG06	5	2.60E+00
Chloroform	7.10E+01		Blaine Island-SCFB-SG04	5	2.20E+00
Vinyl Chloride	4.70E+01	J	Blaine Island-SCFB-SG01	5	1.10E+01

Surface soil and subsurface soil concentrations were compared to Industrial Soil RBCs and to the mean natural background concentrations of inorganics in West Virginia soil provided in the West Virginia Voluntary Remediation and Redevelopment Act Guidance Manual, Version 2.1 (West Virginia Department of Environmental Protection [WVDEP], 2000). Published background values were used because site-specific background values were not available. Soil lead concentrations were compared to the USEPA residential child soil screening value of 400 mg/kg, described in the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (USEPA, July 1994). The results of these comparisons for surface soil and subsurface soil are shown below in Tables 3and 4, respectively. Surface soil concentrations above the screening values are predominantly associated with polyaromatic hydrocarbons (PAHs), arsenic and lead at SWMU 1. See the Draft Follow-up RCRA Facility Investigation (RFI) Report, South Charleston Facility, South Charleston, West Virginia (CH2M HILL, April 2005) for specific soil sample locations.

Table 3
Constituents of Potential Concern in Surface Soil that Exceed Risk-Based Screening Levels

Chemical	Maximum Detection (mg/kg)	Sample Qualifier	Location of Maximum Detection	WVDEP Background Value (mg/kg)	Region III RBC - Industrial Soil (mg/kg)
Benzo (a) anthracene	3.77E+01		Blaine Island-SCFB-SB006	NA	3.92E+00
Benzo (a) pyrene	3.20E+01		Blaine Island-SCFB-SB006	NA	3.92E-01
Benzo (b) fluoranthene	9.23E-01		SCFW11-SO012	NA	3.92E+00
Indeno (1,2,3-c,d) pyrene	1.19E+01		Blaine Island-SCFB-SB006	NA	3.92E+00
Arsenic	3.89E+02		Blaine Island-SCFW1-SO001	8.64E+00	1.91E+00
Lead	3.05E+03		Blaine Island-SCFW1-SO001	1.65E+01	8.00E+02

Table 4
Constituents of Potential Concern in Subsurface Soil that Exceed Risk-Based Screening Levels

Chemical	Maximum Detection (mg/kg)	Sample Qualifier	Location of Maximum Detection	WVDEP Background Value (mg/kg)	Region III RBC - Industrial Soil (mg/kg)
1,1,2-Trichloroethane	9.71E+02	J	Blaine Island-SCFB-MP02	NA	5.02E+01
1,2-Dichloroethane	4.82E+02	J	Blaine Island-SCFB-MP02	NA	3.14E+01
Benzene	1.65E+03		Blaine Island-SCFB-DP075	NA	5.20E+01
Benzo (a) anthracene	2.18E+02		Blaine Island-SCFB-DP075	NA	3.92E+00
Benzo (a) pyrene	7.73E+01		Blaine Island-SCFB-MP02	NA	3.92E-01
Benzo (b) fluoranthene	1.40E+02		Blaine Island-SCFB-DP075	NA	3.92E+00
Bis (2-chloroethyl) ether	6.80E+02		Blaine Island-SCFB-MP02	NA	2.60E+00
Arsenic	1.20E+01	J	Blaine Island-SCFB-DP070	8.64E+00	1.91E+00

Surface water samples were collected from the Kanawha River in December 2004 to evaluate the potential effects of contaminated groundwater discharge to surface water. There were no constituents detected in the surface water samples collected from the Kanawha River. There were several constituents with detection limits higher than the Ambient Water Quality Criteria (USEPA, November 2002). However, those constituents with detection limits higher than the corresponding Ambient Water Quality Criteria (AWQC) were either not detected in groundwater or were detected at concentrations lower than Groundwater RBCs, with the exception of bis(2-chloroethyl)ether and bis(2-ethylhexyl)phthalate. In the absence of lower detection limits, USEPA Maximum Contaminant Levels (MCLs) for drinking water use were compared with non-detect reporting values to determine if surface water should be further evaluated. The range of non-detect values for bis(2-ethylhexyl)phthalate in surface water (5 µg/L to 5.85 µg/L) are below the MCL (6 µg/L). Because potential contact with surface water adjacent to the Facility would be limited to non-drinking water use (i.e., recreational use) and non-detect reporting values for bis(2-ethylhexyl)phthalate are below the MCL, potential risks associated with bis(2-ethylhexyl)phthalate in surface water are not likely to be significant. There is no MCL available for bis(2-chloroethyl)ether. However, the AWQC were developed for human drinking water consumption and fish exposure pathways following the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (USEPA-822-B-00-004, October 2000) and Federal Register notice (65 FR 66443, November 2000). Recreational use exposures are expected to occur considerably less frequently and with less consumption than the drinking water ingestion assumption of ingestion of two liters per day used to derive the AWQC. Additionally, there is a fish consumption advisory currently in place for the Kanawha River from the I-64 Bridge at Dunbar (approximately 1.5 miles downstream of the Facility) to its confluence with the Ohio River (approximately 40 miles downstream) as noted in West Virginia Sport Fish Consumption Advisory for 2005 (West Virginia Department of Health and Human Resources, (http://www.wvdhhr.org/fish/current.asp). This advisory has been in place since the late 1980s as a result of detection of dioxin in fish tissues. Based on the intermittent and infrequent exposure for recreational users to surface water adjacent to the Facility and the fish advisory in place for the Kanawha River, any potential risks associated with the recreational exposure scenario to surface water are likely not significant. Therefore, surface water is not further evaluated.

Sediment data was not collected at the Facility. VOCs and many SVOCs detected in the Facility groundwater could migrate through groundwater for discharge to the Kanawha River, but are relatively volatile, relatively soluble, and have little tendency to adsorb to sediments based on their physical and chemical properties (such as relatively high solubility and relatively low affinity for organic carbon). As part of an interim measure described in the Union Carbide South Charleston Facility Lead Corrective Action Program Interim Measures Report. South Charleston, West Virginia (Union Carbide Corporation, May, 2000), an interceptor trench was installed on the bank of the river adjacent to the former Gyro Unit in mid-1996 to intercept shallow groundwater before it discharged to the river. Oily sheens observed on the river prior to the operation of the trench have been eliminated,

and the interceptor trench is still in place. Based on the presence of the interceptor trench and low- to non-detections of constituents in surface water, sediment is not further evaluated.

Outdoor air (ambient air) concentrations in fugitive dust and volatile emissions from soil were modeled from the maximum concentrations detected in soil using methods in USEPA's Soil Screening Guidance: Technical Background Document (USEPA, May 1996). These modeled values were compared with USEPA Region III Ambient Air RBCs (USEPA, April 2005). Only the modeled ambient air concentration of the maximum chromium concentration was above the Ambient Air RBC. The Ambient Air RBC for hexavalent chromium (0.00015 micrograms per cubic meter [$\mu g/m^3$]), the more toxic form, was conservatively used as the screening value. Chromium occurs naturally in soil primarily in the trivalent and hexavalent states. The relative abundance of chromium in these different states depends upon several soil characteristics, including pH, reduction and oxidation potential, soil organic matter content, soil moisture content and iron and manganese concentrations. In general, hexavalent chromium is less stable in soil than trivalent chromium, and in most soils, chromium is found primarily in the trivalent state. The modeled chromium ambient air concentrations are much lower than the Ambient Air RBC for trivalent chromium (5,475 $\mu g/m^3$). Additionally, buildings, gravel, asphalt, and/or concrete cover more than 95 percent of the total Facility, which inhibit the release of particulates and volatiles associated with soil into the atmosphere. Therefore, outdoor air is not further evaluated.

Notes:

For specific concentrations of constituents above groundwater and soil RBCs and target soil gas concentrations, refer to the following:

Draft Site Assessment Report, South Charleston Facility Front Entrance, South Charleston, West Virginia (CH2M HILL, January 2005), Tables 6 through 8; and

Draft Follow-up RCRA Facility Investigation (RFI) Report, South Charleston Facility, South Charleston, West Virginia (CH2M HILL, April 2005), Tables 7-2 through 7-10.

References:

Union Carbide South Charleston Facility Lead Corrective Action Program Interim Measures Report. South Charleston, WV. (UCC, May 2000).

RCRA Facility Investigation Report, South Charleston Facility, South Charleston, West Virginia. Prepared for Union Carbide Corporation, A Subsidiary of The Dow Chemical Company. (CH2M HILL, November 2003).

Draft Site Assessment Report, South Charleston Facility Front Entrance, South Charleston, West Virginia Prepared for Union Carbide Corporation, A Subsidiary of The Dow Chemical Company. (CH2M HILL, January 2005).

Draft Follow-up RCRA Facility Investigation (RFI) Report, South Charleston Facility, South Charleston, West Virginia. Prepared for Union Carbide Corporation, A Subsidiary of The Dow Chemical Company. (CH2M HILL, April 2005).

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of 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.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

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	Trespassers	Recreation	Food[3]
Groundwater	***No***	***No***	***No***	***Yes***	***No***	***No***	***No***
Air (indoors)	***No***	***Yes***	***No***	***No***	***No***	***No***	***No***
Soil (surface, e.g., <2 ft	***No***	***Yes***	***No***	***Yes***	***No***	***No***	***No***
~~Surface Water~~							
~~Sediment~~							
Soil (subsurface e.g., >2 ft)	***No***	***No***	***No***	***Yes***	***No***	***No***	***No***
~~Air (outdoors)~~							

Instructions 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 ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ 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).

__***X***__ 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

Rationale and Reference(s):

A human health risk assessment (HHRA) was conducted for the Front Entrance Site Assessment (CH2M HILL, January 2005), Section 4, and potential risks for remaining portions of the Facility were evaluated in the HHRA conducted as part of the Draft Follow-Up RFI Report (CH2M HILL, April 2005), Section 7. The HHRA for the Front Entrance Site Assessment (CH2M HILL, January 2005) was developed in accordance with risk assessment guidance presented in the Voluntary Remediation and Redevelopment Act Guidance Manual version 2.1 (West Virginia Department of Environmental Protection, May 2000).

The HHRA conducted in support of the Draft Follow-Up RFI Report (CH2M HILL, April 2005) was developed in accordance with USEPA guidance and methodology primarily including the following:

- ***Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part A* (USEPA, December 1989);**
- ***Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule. Federal Register.* 61(85): 19432-19464. (USEPA, 1996);**
- ***Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA, December 2002);**
- ***Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (USEPA, December 2002); and**
- **Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Interim) (USEPA, July 2004).**

The conceptual model of human exposures supporting the HHRA is presented in Figure 7-1 of the Draft Follow-Up RFI Report (CH2M HILL, April 2005).The Facility has been in continuous operation for chemical production since the 1920s. The majority of the Facility is currently zoned heavy industrial with minor portions zoned as light industrial. Continuous heavy and light industrial use of the property is expected to continue into the foreseeable future. Both the Mainland Complex and Blaine Island areas of the Facility are fenced with restricted access and 24-hour guard stations preventing access from trespassers on to the property. Figure 2-2 in the Draft Follow-Up RFI Report (CH2M HILL, April 2005) depicts the approximate extent of grass-covered (green shading) and gravel-covered (blue shading) areas within the fenced portion of the Facility. The remaining (unshaded) areas are primarily building-, asphalt-, or concrete-covered.

Residential areas are located approximately 700 feet away, directly across the Kanawha River from Blaine Island. The West Virginia-American Water Company provides potable water for the cities of Charleston and South Charleston from a surface water intake on the Elk River. Recreational activities (e.g., swimming, boating, water skiing, and fishing) occur on the Kanawha River. As previously mentioned, there is a fish consumption advisory is currently in place for the Kanawha River from the I-64 Bridge at Dunbar (approximately 1.5 miles downstream of the Facility) to its confluence with the Ohio River (approximately 40 miles downstream). There are limited accessible points to the Kanawha River at the Facility for recreational users. Those areas are vegetated banks and rip rap areas on the perimeter of the Facility. However, there is a small sand bar at the downstream end of Blaine Island that could potentially be accessed from the river by boats. Due to the limited size of the sand bar, proximity to other recreational amenities, and seasonal changes, use of this area would likely be very infrequent. Recreational use is evaluated qualitatively in the HHRA presented in the Draft Follow-Up RFI Report (CH2M HILL, April 2005). Due to the limited size of the sand bar area, potential contact with environmental media by recreational users would likely be limited to surface water. Because recreational use of this area is minimal and intermittent at best, any potential risks associated with the recreational exposure scenario to surface water are likely not significant.

The Facility is anticipated to continue chemical manufacturing operations, with the exception of the Building 82/603 area. On-site indoor workers could be exposed to volatile emissions migrating from the subsurface into indoor air through building foundations. Therefore, the on-site worker indoor air inhalation pathway was evaluated in the HHRA in the Draft Follow-Up RFI Report (CH2M HILL, April 2005). Although the Facility is primarily covered with asphalt, concrete, gravel, and buildings, which restricts potential exposure to soils, the HHRA in the Draft Follow-Up RFI Report (CH2M HILL, April 2005) conservatively evaluated on-site worker potential exposure to soils through incidental ingestion, dermal contact, and inhalation to provide an upperbound estimate of potential risk.

Additionally, construction workers could be exposed to soil and groundwater during excavation or other intrusive activities. Potential exposure to the soil via incidental ingestion, dermal contact and inhalation and exposure to groundwater via dermal contact and inhalation were evaluated in the HHRA in the Draft Follow-Up RFI Report (CH2M HILL, April 2005).

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

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 can not 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."

__***X***__ 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 and Reference(s):

The risk assessment for the Front Entrance Site Assessment Report (CH2M HILL, January 2005) did not identify any unacceptable risks to current or anticipated future human receptors from residual constituent concentrations at the Front Entrance for soil, groundwater or indoor air. The HHRA for the remaining areas of the Facility (the Mainland Complex and Blaine Island) in the Draft Follow-Up RFI Report (CH2M HILL, April 2005) indicates there are potentially unacceptable risks associated with on-site worker and construction worker scenarios, as described herein. A summary of the risk results is presented in Table 7-26 in the Draft Follow-Up RFI Report (CH2M HILL, April 2005).

On-Site Worker Scenario: Constituents were detected in soil at concentrations greater than the USEPA Region III Industrial RBCs, as presented in Question 2. The HHRA indicates there are potentially unacceptable risks associated with on-site worker contact with soil predominantly associated with PAHs, arsenic, and lead in surface soil (0 to 0.5 foot below ground surface depth interval) at SWMU 1 located in the western portion of Blaine Island. The SWMU 1 area is fenced and no routine work activities are performed there. Although numerically, the potential risks for on-site workers direct contact with soil are above the risk thresholds, existing soil cover (buildings, pavement, gravel, and concrete) and normal worker routine (i.e., no routinely occupied areas within SWMU 1) suggest on-site facility workers do not routinely come into contact with SWMU 1 soil. Additionally, an interim measure to cover/remove the waste that is visible at the ground surface of SWMU 1 has been completed that will minimize or eliminate the potential for direct contact with waste or contaminated soil in that area.

The Johnson and Ettinger model described in USEPA's User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings (USEPA, June 2003) for soil gas was used to estimate indoor air concentrations from potential volatilization of VOCs in the subsurface. Site-specific assumptions used in the Johnson and Ettinger model for each constituent are presented in Appendix F, Tables F-1 through F-20 in the Draft Follow-Up RFI Report (CH2M HILL, April 2005).

Risk assessment results for the Facility indicate potential risks associated with indoor air for both the Mainland Complex and Blaine Island are within USEPA's risk reduction goal range of 1 x 10^{-4} to 1 x 10^{-6} described in USEPA's Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions (USEPA, April 1991) and Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule (USEPA, 1996).

Construction Worker Scenario: The HHRA for the remaining areas of the Facility (the Mainland Complex and Blaine Island) presented in the Draft Follow-Up RFI Report (CH2M HILL, April 2005) indicates there are potentially unacceptable risks associated with construction worker contact with dermal contact with groundwater and inhalation of VOC emissions from groundwater. However, it should be noted that workers would follow proper health and safety precautions to limit exposure to the groundwater through dermal contact and inhalation of VOC emissions during intrusive activities. Therefore, contact with soil and groundwater are not considered significant exposure routes for the construction worker scenario.

[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?

__*X*__ 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 and Reference(s):

Construction Worker Scenario: Adherence to safe work practices established in site-specific health and safety plans and implementation of administrative controls (e.g., personal protective equipment) ensures that potential exposures are within acceptable limits.

On-Site Worker Scenario: Based on current conditions, inhalation of volatile organics from the subsurface into indoor air in buildings is the most reasonable exposure pathway for on-site workers. The risk assessment results indicate the current indoor air exposure scenario is within acceptable limits.

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 ***Union Carbide Corporation*** facility, EPA ID ***WVD005005483***, located at ***437 MacCorkle Avenue SW, South Charleston, West Virginia 25303*** 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: (signature): _____/s/_____ (date): 8/25/05

(print):_____

(title):_____

Supervisor (signature): _____ /s/ _____ (date): 8/25/05

(print):_____

(title):_____

(EPA Region or State):_____

Locations where References may be found:
USEPA
1650 Arch Street
Philadelphia, PA 19103

Contact telephone and e-mail numbers
(name) Denis Zielinski
(phone #) 215-814-3431
(e-mail) zielinski.denis@epa.gov

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.