DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
FINAL 09/22/05

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name:	Bayer CropScience – Institute Facility
Facility Address :	State Route 25 Institute, West Virginia
Facility EPA ID#:	WVD005005509

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

The following discussion provides a brief background and overview of information collected to date regarding known or reasonably suspected releases to groundwater media.

The Institute facility (hereafter referred to as the facility) is a chemical production complex located between the Kanawha River and State Route 25 in Institute, West Virginia (Figure 1). The facility consists of three distinct areas: the main chemical plant facility, which occupies approximately 350 acres of land; the Bayer wastewater treatment unit (WWTU), which is located to the southwest of the facility; and the Goff Mountain Landfill (GML), which is located to the north of the facility across Route 25. The WWTU and GML are separately permitted RCRA units. The main chemical plant facility currently produces and has historically produced various hydrocarbons and agricultural products.

The facility began operation in 1943 as a synthetic rubber production plant during World War II originally owned by the federal government. UCC purchased and operated the facility from 1947 to 1986. Rhone-Poulenc Ag Company (Rhone-Poulenc) purchased the facility in 1986 and then sold it to Aventis CropScience in January 2000. Bayer CropScience purchased the facility in 2002.

RCRA Corrective Action activities are currently being conducted by the Union Carbide Corporation (UCC) on behalf of Bayer in accordance with a RCRA Corrective Action permit issued on January 21, 1991. Several stages of investigation, described in the paragraph below, have been completed in accordance with the RCRA Corrective Action permit.

Facility Investigations

A Verification Investigation was performed for the 23 identified Solid Waste Management Units (SWMUs) and four Areas of Concern (AOCs) at the facility (REMCOR, July, 1992). The 23 SWMUs and 4 AOCs are shown in Figure 1. This investigation determined that the majority of the SWMUs had constituents in soil and groundwater generally below the EPA's existing/proposed action levels at that time (referred to as low priority SWMUs later in this text). There were, however, six SWMUs that were determined to need additional investigation. These SWMUs consist of the following facility areas: the methyl carbamate (MCB) and SEVIN® manufacturing units (SWMU 1, 7, 20, and 21) (hereafter referred to as the SEVIN® Unit), and the Ethylidene norbornene (ENB) manufacturing unit (SWMU 18 and 22).

Based on the results of the Verification Investigation, a Stage II RFI (UCC, July 1995) was conducted at the SEVIN® Unit (SWMU 1, 7, and 20), and the ENB Unit (SWMU 18 and 22). The Stage II RFI identified areas of elevated constituents in groundwater including chloroform, carbon tetrachloride, di- and trichlorofluoromethane, and tetrachloroethene in the ENB Unit. Elevated levels of toluene, chlorobenzene, benzene, and chloroform were present in groundwater in the SEVIN® Unit. The Stage II RFI recommended air sparging, with soil vapor extraction, and pump and treat remedial alternatives to address contaminated groundwater at the facility (the remediation based on these recommendations is discussed further in Question 3).

A Stage III RFI (UCC, February 2001) was conducted for the low priority SWMUs (e.g., all SWMUs except those associated with the SEVIN® and the ENB Units) and the 4 identified AOCs (UCC 2001). Based on this investigation and USEPA Region III comments, five SWMUs/AOCs were granted no further action and two were granted no further action status provided that certain monitoring wells were re-sampled. The Stage III RFI and USEPA Region III comments also found that twelve SWMUs/AOCs and two undesignated areas (southeastern property and the river boundary) required some form of additional work to further evaluation environmental conditions at the facility. In addition, SWMU 11 (Chemfix Area) was recommended to be addressed with evaluation of the WWTU.

A RFI Stage III Additional Investigation (Kemron, June 2003) included additional data collection at twelve SWMUs and two AOCs as well as the river boundary and southeast property boundary. The results of this investigation recommended that five SWMUs/AOCs be considered to require no further action and seven SWMUs/AOCs and the river and southeastern boundaries be investigated further (Kemron, 2003).

A Supplemental RFI included groundwater and surface water sampling in the Kanawha River (CH2M HILL, April 2005). The results from this investigation and the previous investigations were combined to evaluate risk to human and ecological receptors. The conclusions from the risk assessments were that there were no known risks to ecological receptors at the facility or in the Kanawha River and that there was a potential risk to construction workers through inhalation of volatile compounds in groundwater, however due to the depth of groundwater (approximately 16 feet) at the facility, excavation to this depth is expected to be relatively uncommon. In the Supplemental RFI, recommendations were made for additional work at the facility as part of the RCRA Corrective Action process.

In August 2005, sediment samples and additional surface water samples were collected from the Kanawha River to further evaluate the potential impacts to the Kanawha River from site groundwater. The results of this effort are provided in this Groundwater EI.

Definition of Environmental Indicators (for the RCRA Corrective Action)

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

Definition of "Migration of Contaminated Groundwater Under Control" EI

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

Relationship of EI to Final Remedies

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

requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

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

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

   X 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 providing or 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)

Groundwater monitoring has been conducted at the facility since the Verification Investigation began in 1991. To more directly address question 2, groundwater analytical results from the most recent groundwater sampling event conducted at the main chemical plant facility in March 2005 (as part of the Supplemental RFI) and at the Chemfix area (SWMU 11) in August 2000 (as part of the Stage III RFI) were compared to the drinking water Maximum Contaminant Level (MCL) or the Region III Risk-Based Concentration (RBC) for tap water, in the event that no MCL exists, for that constituent. Groundwater monitoring conducted during the most recent sampling event at the main chemical plant facility included sampling ten pre-existing wells and one new monitoring well[2]. Samples were analyzed for the constituents of concern, which are included in the broader analysis of Target Compound List (TCL) Volatile Organic Compounds (VOCs) (USEPA Method 8260) and TCL Semi-Volatile Organic Compounds (SVOCs) (USEPA Method 8270). Groundwater monitoring conducted at the Chemfix area (SWMU 11) during the Stage III RFI included sampling three pre-existing downgradient wells. Samples were analyzed for VOCs (USEPA Method 8260), SVOCs (USEPA Method 8270), and metals (USEPA Method 6010/3050).

Tables 1 and 2 below show the VOCs and SVOCs detected in groundwater at concentrations above MCLs or RBCs[3]. Figure 2 shows the approximate area of contaminated groundwater at the facility. Six VOCs were detected in at least 1 of the 11 groundwater samples collected at the facility above screening criteria. The detected constituents above the screening criteria are 1,2-dichloroethane, 1,4-dioxane (p-dioxane), 4-methyl-2-pentanone, acetone, and chloroform. The frequency of detection of constituents at the facility was low; only one constituent (acetone) was detected in more than one sample (detected in TW27 and VW3A). Four SVOCs were detected in at least 1 of the 11 groundwater samples collected at the facility above screening criteria. The detected constituents were bis (2-chloroethyl) ether, bis (2-ethylhexyl) phthalate, isophorone, and naphthalene. Of these SVOCs, the only constituents detected in more than one sample are bis (2-chloroethyl) ether, bis (2-ethylhexyl) phthalate, and naphthalene. Bis (2-ethylhexyl) phthalate was detected at relatively low concentrations (e.g., around an order of magnitude of screening criteria), which could be related to the high turbidity observed at the time of sampling or field/laboratory contamination.

The conclusion from this evaluation is that groundwater at the facility is contaminated with VOCs and SVOCs at concentrations that exceed applicable groundwater criteria (MCLs or RBCs). Figure 3 shows the groundwater sampling locations identified in the tables below.

[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).

[2] *The ten wells were selected since they are located in an area to evaluate groundwater conditions at the facility boundary. The additional well, was sampled to evaluate groundwater conditions downgradient of AOC 2.*

[3] *A review of analytical results and information regarding facility activities from the Stage III RFIs (UCC, February 2001; Kemron, June 2003) was included in the Supplemental RFI Workplan dated June 2005. From this review, it was determined that additional monitoring for metal constituents in groundwater would not be required at the facility because metals concentrations are not related to the facility.*

TABLE 1

VOC - Constituents of Concern
Maximum Groundwater Concentrations Compared to Screening Criteria

Volatile Organic Compounds	Maximum Concentration (ug/L)	Maximum Concentration Sample Location	Frequency of Exceedance	MCL/RBC (ug/L)	
1,2-Dichloroethane	17.7	VW15B	1 out of 11 samples	5	MCL
1,4- Dioxane (p-Dioxane)	204	MW101	1 out of 11 samples	6.1	RBC
4-Methyl-2-pentanone	25,100	TW27	1 out of 11 samples	6,300	RBC
Acetone	74,200	TW27	1 out of 11 samples	5,500	RBC
Chloroform	27.6	VW3B	1 out of 11 samples	0.15	RBC

Frequency of exceedance is the ratio of the number of detects greater than the screening criteria compared to the total number of samples.

TABLE 2

SVOC - Constituents of Concern
Maximum Groundwater Concentrations Compared to Screening Criteria

Semi-Volatile Organic Compounds	Maximum Concentration (ug/L)	Maximum Concentration Sample Location	Frequency of Exceedance	MCL/RBC (ug/L)	
Bis (2-chloroethyl) ether	96.9	MW103	2 out of 11 samples	0.0096	RBC
Bis (2-ethylhexyl) phthalate	63.8	TW27	5 out of 11 samples	4.8	RBC
Isophorone	751	TW27	1 out of 11 samples	70.5	RBC
Naphthalene	70.7	MW103	2 out of 11 samples	6.5	RBC

Frequency of exceedance is the ratio of the number of detects greater than the screening criteria compared to the total number of samples.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[4] 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"[4]).

   ____ 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):

Based on data obtained during the Stage III RFI, the RFI Stage III Additional Investigation, and the Supplemental RFI, the following determinations have been made regarding groundwater conditions at the facility:

- *The Kanawha River acts as a boundary to plume migration in the unconsolidated aquifer*
- *Site geologic conditions and groundwater flow patterns are characterized*
- *Interim Measures have been taken to address prominent sources of contamination*

The Kanawha River Acts As a Boundary to Plume Migration in the unconsolidated aquifer:

As shown in Figure 4, groundwater at the facility flows to the Kanawha River. As a result, the Kanawha River acts as a barrier for the migration of contamination through the groundwater. Surface water was sampled, and a groundwater-to-surface water mass loading calculation was performed, in order to assess the affects of groundwater discharge to the Kanawha River. The results of the surface water sampling and the mass loading calculation are provided in response to Question 5 below.

Site Geologic Conditions and Groundwater Flow Patterns are Characterized

The facility is underlain by fill materials of varying contents ranging from 2 feet below ground surface (bgs) to 8 ft bgs. Beneath the fill material are Kanawha River alluvial deposits extending to the top of bedrock. These alluvial deposits are generally characterized as clay, silty and sandy clay, silty sand, and sand and gravel sequences extending to the surface of bedrock at approximately 55 ft to 60 ft bgs. Bedrock beneath the facility is expected to be from the Pennsylvania age Conemaugh Group. The Conemaugh Group consists of sequences of red and gray shale, siltstone, and sandstone with thin limestone and coal interbedded (WVGES 1968).

[4] "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 samples/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 location are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

The uppermost aquifer at the facility consists of sandy alluvial materials and is largely under unconfined conditions. Average aquifer thickness is approximately 38 feet (UCC 2001). However, the alluvial aquifer may exhibit confined aquifer conditions in close proximity to the Kanawha River boundary (Kemron 2003).

Groundwater within the shallow alluvial aquifer at the facility generally flows in a southerly direction and as mentioned above, discharges to the Kanawha River. Experience at other UCC sites in the Kanawha River valley has indicated that the hydraulic conductivity of the unweathered portion of the bedrock to be very low (10^{-6} cm/s) (UCC 1989), the same is expected for the bedrock at the facility. Therefore, there is low potential for contaminant migration into bedrock at the facility.

Interim Measures Have Been Taken To Address Prominent Source of Contamination

The following interim measures have been taken to help control plume migration from two prominent sources of contamination at the facility including the ENB and SEVIN® Unit:

- ***Remediation in ENB Unit*** *– The ENB Unit was characterized by high concentrations of chlorinated hydrocarbons and fluorocarbons in groundwater. Remediation at the ENB Unit was initiated in 1996 with the installation and start-up of an air sparging and soil vapor extraction (AS/SVE) system. In 2002 and 2003, an aerobic co-metabolism process was applied. By the end of the third quarter of 2003 analytical data demonstrated significant reductions, or elimination, of target compounds (i.e. elevated concentrations reduced or eliminated to levels consistent with other SWMUs at the facility). Therefore, continued operation of the systems was terminated in late 2003. Sampling at the ENB North area several months after the remediation system was turned off showed that no rebound has occurred subsequent to turning off the system.*

- ***Remediation in SEVIN® Unit*** *– The SEVIN® Unit remediation focused on the presence of high concentration of toluene in soil and groundwater. Initial remediation at the SEVIN® Unit consisted of an AS/SVE system installed and started in 1997. For approximately the first two years after system installation only the SVE portion of the system was operated, and only at partial capacity, due to the high concentration of toluene in the extracted vapors. Sparging at the SEVIN® Unit was initiated in 2000. In December 2000, the SEVIN® Unit was expanded to cover more of the toluene impact area, as determined through two additional phases of delineation performed throughout the vicinity. During the delineation of the SEVIN® Unit, toluene concentrations were found to exist in a separate portion of the SEVIN® Unit known as the Former NCF tank area. A separate AS/SVE system was required to treat this area. This system was installed during July 2000. Remediation at the SEVIN® and NCF areas was completed in the second quarter of 2002 because analytical data demonstrated significant reductions, or elimination, of target compounds. Both systems continued to operate into the fourth quarter of 2002 and were then turned off. Sampling at the SEVIN® Unit after the remediation system was turned off showed that no rebound has occurred subsequent to turning off the system.*

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):

As described above, groundwater within the alluvial aquifer at the facility generally flows in a southerly direction and discharges to the Kanawha River (UCC 2001).

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[5] 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 reasonable suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

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

   ____ If unknown – enter "IN" status code in #8.

Rationale and Reference(s):

A summary of the May 2005 and August 2005 surface water sampling conducted at the facility, and the analytical results, are provided below:

As shown in Figure 3, eight surface water samples were collected in March 2005 (SW001 – SW008BG) and three surface water samples were collected in August 2005 (SW09 – SW11) from locations along the Kanawha River. Seven of the samples were collected from locations hydraulically and topographically downgradient from the facility, spatially distributed along the river, adjacent to the facility (SW001– SW004 and SW09 – SW11). The remaining four surface water samples are representative of background conditions (SW005BG-SW008BG). The background samples were collected adjacent to the eastern boundary of the facility; even though this area is not upstream of the facility it is anticipated to be upstream of facility influences (e.g., groundwater discharge or NPDES discharges) These samples were analyzed for TCL VOCs(USEPA Method 8260) and TCL SVOCs (USEPA Method 8270).

No constituents were detected in surface water samples collected in Kanawha River in May or August of 2005. Surface water sampling was also conducted in December 2004, this data showed some detections for phenol but all were below the National Recommended Water Quality Criteria (USEPA, 2002), this information is provided in detail in the Supplemental RFI (CH2M HILL, 2005).

In addition to the surface water samples collected, a groundwater-to-surface water mass loading calculation was performed to evaluate the discharge of groundwater at the facility to the Kanawha River. All modeled results indicated that constituent concentrations in surface water would be below laboratory reporting limits. The results of the mass loading calculation are consistent with the analytical results which showed that all constituents were below detection limits.

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

A summary of the August 2005 sediment sampling conducted at the facility is provided below:

As shown in Figure 3, sediment samples were collected from nine locations along the Kanawha River. Samples were collected from seven locations spatially distributed along the river adjacent to the facility. In addition, two surface sediment samples (0 – 4 inches) were collected approximately 1/8 mile upstream of the facility to identify constituents potentially originating from upstream sources. Samples were collected and analyzed in accordance with the Supplemental RFI workplan (CH2M HILL, 2005). These samples were analyzed for TCL VOCs (USEPA Method 8260), SVOCs, and Total RCRA Metals (USEPA Method 6010). Detected constituents were considered chemicals of concern in sediment if:

- *The constituent is a chemical of concern in facility groundwater; and*
- *The constituent was present at concentration above screening criteria at a depth which provides a complete exposure pathway*

Tables 4, 5, and 6 below show the VOCs, SVOCs, and metals detected in sediment at concentrations above ecological screening criteria[6]. Two VOCs were detected in 1 of the 7 sediment samples collected at the facility above screening criteria. The detected constituents above the screening criteria are acetone and chlorobenzene. Chlorobenzene is not a chemical of concern for groundwater. Acetone and chlorobenzene were detected only in sediment at dept,h and were not present in the surface sediment samples; therefore, they do not present a pathway for ecological risk in the sediment. Four SVOCs were detected in at least 1 of the 7 sediment samples collected at the facility above screening criteria. The detected constituents are 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2-methylnaphthalene, and naphthalene. Of these SVOCs, the only constituent detected in more than one sample is naphthalene.

The majority of the detections above screening criteria were observed in the sample collected at location SD04 (2 – 3 feet below the sediment surface [bss]), the only other detection above screening criteria was naphthalene at SD02 (0 – 4 inches bss). Evaluation of the other sediment samples collected at this depth interval (0 – 4 inches bss) indicated that there were no other detections above the screening criteria. In addition, the one exceedance for naphthalene (652 ug/kg) is only slightly above the screening level and is also in line with naphthalene levels seen in Kanawha River sediments (Messinger, 2004). In conclusion, there are a few exceedances of screening criteria for sediment in the Kanawha River adjacent to the facility but they are either limited spatially, lie at depths at which there are no complete pathways to receptors, or believed to be unrelated to the facility.

[6] *Note: There were detections also noted in the background samples but at concentrations below the ecological screening criteria, so the ecological screening criteria were used to evaluate the sediment data.*

TABLE 4
VOC - Constituents of Concern
Maximum Sediment Concentrations Compared to Screening Criteria

Volatile Organic Compounds	Maximum Concentration (ug/kg)	Maximum Concentration Sample Location	Sample Depth	Frequency of Exceedance	Ecological Screening Criteria (ug/kg)	Reference
Acetone	75.9	SD04	2 to 3	1 out of 7 samples	8.7	Jones et al, 1997
Chlorobenzene	6980	SD04	2 to 3	1 out of 7 samples	820	USEPA, 1996

Sample Depth is from top of sediment surface

Frequency of exceedance is the ratio of the number of detects greater than the screening criteria compared to the total number of samples.

Jones, D. S., G. W. Suter II, and R. N. Hull. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-associated Biota: 1997 Revision. Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-95/R4.

USEPA. 1996. Ecotox thresholds. Eco Update, Volume 3, Number 2. EPA/540/F-95/038. 12 pp.

TABLE 5
SVOC - Constituents of Concern
Maximum Sediment Concentrations Compared to Screening Criteria

Semi-Volatile Organic Compounds	Maximum Concentration (ug/kg)	Maximum Concentration Sample Location	Sample Depth	Frequency of Exceedance	Ecological Screening Criteria (ug/kg)	Reference
1,2-Dichlorobenzene	730	SD04	2 to 3	1 out of 7 samples	340	USEPA, 1996
1,4-Dichlorobenzene	2190	SD04	2 to 3	1 out of 7 samples	350	USEPA, 1996
2-Methylnaphthalene	355	SD04	2 to 3	1 out of 7 samples	70	USEPA, 1995
Naphthalene	2240	SD04	2 to 3	2 out of 7 samples	480	USEPA, 1996

Sample Depth is from top of sediment surface

Frequency of exceedance is the ratio of the number of detects greater than the screening criteria compared to the total number of samples.

USEPA. 1995. Revised Region 3 Biological Technical Assistance Group Screening Levels. Memorandum from R.S. Davis to Users. 9 August.

USEPA. 1996. Ecotox thresholds. Eco Update, Volume 3, Number 2. EPA/540/F-95/038. 12 pp.

TABLE 6
Metals - Constituents of Concern
Maximum Sediment Concentrations Compared to Screening Criteria

Metals	Maximum Concentration (ug/kg)	Maximum Concentration Sample Location	Sample Depth	Frequency of Exceedance	Ecological Screening Criteria (ug/kg)	Reference
Arsenic	8.42	SD04	2 to 3	1 out of 7 samples	8.2	USEPA, 1995
Lead	48.1	SD04	2 to 3	1 out of 7 samples	46.7	USEPA, 1995
Silver	5.47	SD04	2 to 3	1 out of 7 samples	1	USEPA, 1995

Sample Depth is from top of sediment surface

Frequency of exceedance is the ratio of the number of detects greater than the screening criteria compared to the total number of samples.

USEPA. 1995. Revised Region 3 Biological Technical Assistance Group Screening Levels. Memorandum from R.S. Davis to Users. 9 August.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[7])?

   X If yes – continue after either:1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR
   2) providing or referencing an interim-assessment[8], 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, us/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.

[7] 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.

[8] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

Rationale and Reference(s):

As shown in Question 5 above, discharge of contamination from groundwater at the facility into the Kanawha River was non-detect in May and August 2005 and below NRWQC in December 2004.

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):

The Supplemental RFI (CH2M HILL, 2005) recommended that a corrective measures study be performed to evaluate potential remedial alternatives for the high concentrations of acetone and 4-methyl-2-pentanone at sample location TW27 (SWMU 15). In addition, groundwater will continue to be monitored at the facility and Interim/Stabilization Measure (ISMs) will be implemented as appropriate.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

   X 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 Union Carbide Corporation Institute Facility, EPA ID # WVD005005509 located at State Route 25 Institute, West Virginia. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater". This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

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

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

Completed by (signature) /s/ Date 10/3/05

(print) Bill Wentworth

(title) Remedial Project Manager

Supervisor (signature) /s/ Date 10/3/05

(print) Bob Greaves

(title) Chief, General Operations Branch

(EPA Region or State) EPA Region III

Location where References may be found:

Contact telephone and e-mail numbers

(name)

(phone #)

(e-mail)