DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRIS Code (CA725)

Current Human Exposures Under Control

Facility Name: **Cedar Chemical Corporation**
Facility Address: **State Highway 242, West Helena, Arkansas**
Facility EPA ID #: **ARD990660649**

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 (SWMUs), regulated units (RUs), and areas of concern (AOCs)), 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.

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EIs) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved) 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 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 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).

Facility Information

The Cedar Chemical Corporation (CCC) West Helena Plant facility is located to the south of Helena and West Helena, Arkansas. The plant is located on 48 acres of the Helena-West Helena Industrial Park, approximately one and one quarter mile southwest of the intersection of U.S. Highway 49 and State Highway 242. The plant is bordered by farms, State Highway 242, the Union-Pacific Railway, and other industrial park properties. Residential areas are located within one-half mile to the southwest and northeast of the CCC site (Environmental and Safety Designs, 1996).

The CCC plant property was divided into two major areas: the manufacturing area and the wastewater treatment system area. Agricultural and organic chemicals including insecticides, herbicides, polymers, and organic intermediates were manufactured within six production units at the facility. In addition to chemical production, plant activities included product formulation and packaging. Chemical production occurred in batches and fluctuated based on the season. New products were frequently introduced into production. Production Units 1 and 4 manufactured various custom products, Production Unit 2 produced propanil, Production Unit 5 manufactured nitroparaffin derivatives, and Production Unit 6 produced dichloroaniline. Production Unit 3 manufactured herbicides (RP-10), benzene sulfonyl chloride, alkylated phenol, and methylthiopinacolone oxide (MTPO) until it was destroyed in an explosion and fire on September 26, 1989. Chemical processing at the production units included alkylation, amidation, carbamoylation, chlorination, distillation, esterification, acid and base hydrolysis, and polymerization (Environmental and Safety Designs, 1996).

CCC owned and operated the West Helena Plant facility from 1986 until 2002, when facility operations ceased due to bankruptcy. CCC submitted a revised RCRA Part A Permit on March 1, 1986. On May 30, 1986, ADPC&E conducted a compliance evaluation inspection (CEI) and observed violations (ADEQ, 1986). As a result, ADPC&E issued a Notice of Violation on December 19, 1986, indicating that CCC was disposing of hazardous waste in the biological treatment ponds and that a sump pump within the container storage area was broken at the time of the CEI. Subsequently, Consent Administrative Order (CAO) No. LIS 86-027 was issued to CCC on July 16, 1987, which essentially required CCC to stop disposing of hazardous waste to surface impoundments and investigate potential release(s) to surrounding media. Because the two storage units were RCRA closed in 1988, with no post-closure care required, the Part B application was ultimately not processed and a RCRA Permit was not issued. However, ADPC&E issued CAO No. LIS 91-118, requiring CCC to conduct a facility investigation (FI). Field activities for Phase I of the FI began on August 30, 1993. Two additional phases (Phase II and III) of the FI were conducted in 1994 and 1995, respectively. In 1996, a FI report was submitted that summarized all three phases of the FI and recommended that additional sampling be conducted as part of a corrective measures study (CMS). Subsequent to the FI, a risk assessment and a risk assessment addendum were submitted in March 2001 and January 2002, respectively.

After CCC ceased operations due to bankruptcy, the USEPA Region 6 developed a Draft Conceptual Site Model Report in 2003 then a Trip Report for Groundwater Sampling Activities in September 2005, both prepared by Booz Allen Hamilton. In the summer of 2004, ADEQ collected and analyzed groundwater samples as part of a site assessment for CCC. From the groundwater data analyzed, the U.S. Department of Health and Human Services conducted an ASTDR Health Consultation (ATSDR, 2005) and determined the site to represent an *Indeterminate Public Health Hazard*, since the concentration of 1,2-DCA in the samples collected warranted further investigation. In November 2004, a letter from the Arkansas Division of Health was issued to the property owners advising against the use of the agricultural/irrigation wells until further sampling was conducted. Additional groundwater sampling was conducted by ADEQ and USEPA Region 6 in August 2005. The U.S. Department of Health and Human Services conducted another ASTDR Health Consultation (ATSDR, 2006) as a follow-up report on the health

implications of farm workers exposed to 1,2-DCA contaminated groundwater adjacent to CCC. From this report, it was concluded that 1,2-DCA poses no apparent public health hazard to exposed individuals based on evaluation of groundwater sampling data and site-specific air dispersion modeling. The report also recommended that off-site wells AGI-1 and BHAGI-1 be returned to normal operating conditions.

References:

ADPCE, 1984. "Letter from Richard Quinn, ADPCE, to Joe Porter, Vertac Chemical Corporation, West Helena, Arkansas." Arkansas Department of Pollution Control and Ecology (ADPCE), November 16, 1984.

ADEQ, 1986. "Memorandum from Karen Deere, ADEQ Hazardous Waste Inspector, to Mike Bates, ADEQ

Enforcement Branch. Re: Vertac - West Helena, Compliance Evaluation Inspection." Arkansas Department of Environmental Quality (ADEQ), June 10, 1986.

ASTDR, 2005. "Health Consultation: Health Implications of Farm Workers Exposed to Groundwater Adjacent to Cedar Chemical Corporation." US Department of Health and Human Services, August 1, 2005.

ATSDR, 2006. "Health Consultation Follow-up Report on the Health Implications of Farm Workers Exposed to 1,2-DCA Contaminated Groundwater Adjacent to Cedar Chemical Corporation." US Department of Health and Human Services, June 16, 2006.

Booz Allen, 2003. "Draft Site Conceptual Model." Booz Allen Hamilton (Booz Allen, 2003), March 14, 2003

Booz Allen, 2005. "Trip Report for Groundwater Sampling Activities." Booz Allen Hamilton (Booz Allen, 2005), September 30, 2005.

Environmental and Safety Designs, Inc, 1996. "Facility Investigation Report." Environmental and Safety Designs, Inc., June 28, 1996.

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			**Above MCLs or tap water HHMSSLs / Metals, Pesticides, SVOCs, and VOCs**
Air (indoors)[2]		x		No impact to on-site indoor air
Surface Soil (e.g., <2 ft)	x			**Above industrial HHMSSLs / Metals, Pesticides, and VOCs**
Surface Water		x		No impact to surface water
Sediment	x			**Above industrial HHMSSLs/Metals**
Subsurf. Soil (e.g., >2 ft)	x			**Above industrial HHMSSLs/Metals, Pesticides, and VOCs**
Air (outdoors)		x		No impact to outdoor air

_____ 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.

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[1] "Contamination" and "contaminated" describe 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) suggests 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.

Rationale and Reference(s):

A total of 80 SWMUs and three AOCs were identified at the CCC facility. A detailed summary of these SMWUs and AOCs as well as site conditions can be found in the Draft Conceptual Site Model Report (Booz Allen, 2003). The majority of the SWMUs and AOCs have low release potential and require no further action. CCC conducted the FI on a "Site" basis, which incorporated multiple SWMUs and/or AOCs into a site, rather than investigating each individual SWMU or AOC. Eight sites (Site 1 through 6, Site 8, and Site 9) were included in the FI.

Thus, contaminated media in this question will also be discussed on a Site basis; with the exception of groundwater, which will be discussed in terms of on-site and off-site contamination.

Groundwater: Three water-bearing units exist in the vicinity the CCC site and include:

- A discontinuous perched zone that occurs (Site 1 and Site 2) at 10 to 20 feet below ground surface (bgs) in the upper disturbed soil or fill. The bottom of the perched zone is bounded in vertical extent by a 15- to 20-foot thick clay layer.
- A continuous confined/semi-confined alluvial aquifer that occurs (on- and off-site) from approximately 30 feet to 150 feet bgs. The upper limit of the aquifer is bound by silts and clays and the lower limit is bounded by the top of the Jackson-Claiborne Group.
- The Sparta Sand/Memphis Sand aquifer system that occurs (on and off site) at approximately 400 feet bgs. The aquifer is confined by 250 feet of low permeability materials from the Jackson-Claiborne Group (Environmental and Safety Designs, Inc, 1996).

Groundwater monitoring wells were installed at the CCC site during various phases of investigation. Six on-site monitoring wells (1MW-1, 1MW-2, 1MW-3, 1MW-4, 1MW-5, and 2MW-2) were installed and screened in the perched groundwater zone. Fifteen upper alluvial groundwater monitoring wells have been installed on site. These include 1MW-6, 1MW-7, 2MW-3, 2MW-4, 2MW-5, 2MW-6, 4MW-1, 4MW-3, 9MW-1, EMW-1, EMW-2, EMW-3, EMW-4, EMW-7, and EPZ-5. Two additional upper alluvial groundwater monitoring wells (OFFMW-2 and OFFMW-4) were installed off site and downgradient of the CCC site. Two lower alluvial groundwater monitoring wells (2MW-7 and 4MW-4) have been installed at the CCC site and two lower alluvial groundwater monitoring wells (OFFMW-1 and OFFMW-3) were installed downgradient of the CCC site. To date, a groundwater monitoring program has not been established. The most recent groundwater sampling event was conducted in August 2005. The groundwater data indicate that metals, pesticides, semi-volatile organic compounds (SVOCs), and volatile organic compounds (VOCs) have been detected in groundwater above either the Federal Maximum Contaminant Levels (MCLs) or the EPA Region 6 Human Health Medium Specific Screening Levels (HHMSSLs) for Tap Water. In addition, off-site agricultural wells, screened in the alluvial groundwater unit, were sampled in August 2005.

On-site Groundwater

The maximum detected concentrations in perched groundwater exceeding MCLs or HHMSSLs were as follows: 8.8 μg/l of arsenic (2MW-2) [HHMSSL = 0.045 μg/l], 100 μg/l of 1,2-dichloroethane (1MW-4) [MCL = 5 μg/l; HHMSSL = 0.12 μg/l], and 1 μg/l of 1,4-dichlorobenzene (1MW-3) [HHMSSL = 0.47 μg/l]. The maximum detected concentrations in upper alluvial groundwater exceeding the screening criteria were as follows: 118 μg/l of arsenic (2MW-4) [HHMSSL = 0.045 μg/l], 180 μg/l of bis(2-chloroethyl)ether (2MW-3) [HHMSSL = 0.0098 μg/l], 6,800 μg/l of 1,2-dichlorobenzene (4MW-1) [HHMSSL = 61 μg/l], 670 μg/l of 4-chloroaniline (4MW-1) [HHMSSL = 150 μg/l], 170 μg/l of dinoseb (EPZ-5) [MCL = 8 μg/l; HHMSSL = 37 μg/l], 24,000 μg/l of 1,2-dichloroethane (EMW-7) [MCL = 5 μg/l; HHMSSL = 0.12 μg/l], 760,000 μg/l of toluene (4MW-1) [MCL= 1,000 μg/l; HHMSSL = 720 μg/l],

2,000 μg/l of ethylbenzene (4MW-1) [MCL = 700 μg/l; HHMSSL = 1,300 μg/l], 810 μg/l of benzene (4MW-1) [MCL = 5 μg/l; HHMSSL = 0.35 μg/l], 0.5 μg/l of 1,4-dichlorobenzene (EMW-4) [HHMSSL = 0.47 μg/l], and 5 μg/l of vinyl chloride (EMW-7) [MCL = 2 μg/l; HHMSSL = 0.043 μg/l]. The maximum detected concentrations in lower alluvial groundwater exceeding screening criteria were as follows: 17.5 μg/l of arsenic (2MW-7) [HHMSSL = 0.045 μg/l] and 820 μg/l of 1,2-dichloroethane (4MW-4) [MCL = 5 μg/l; HHMSSL = 0.12 μg/l] (Ensafe, 2001b).

Off-site Groundwater
The maximum detected concentrations in upper alluvial groundwater collected from the monitoring wells exceeding MCLs or HHMSSLs were as follows: 13.2 μg/l of arsenic (OFFMW-2) [HHMSSL = 0.045 μg/l] and 14,000 μg/l of 1,2-dichloroethane (OFFMW-2) [MCL = 5 μg/l; HHMSSL = 0.12 μg/l]. The maximum detected concentrations in lower alluvial groundwater collected from the monitoring wells exceeding screening criteria were as follows: 14.3 μg/l of arsenic (OFFMW-1) [HHMSSL = 0.045 μg/l], 1,400 μg/l of 1,2-dichloroethane (OFFMW-1) [MCL = 5 μg/l; HHMSSL = 0.12 μg/l] , and 14 μg/l of bis(2-chloroethyl)ether (OFFMW-3) [HHMSSL = 0.0098 μg/l] (Ensafe, 2001b). The maximum detected concentration in alluvial groundwater collected from the agricultural wells was 100 μg/l of 1,2-dichloroethane (BHAG-1).

On-site Indoor Air
The maximum detected VOC concentrations in on-site perched and upper alluvial groundwater were compared to EPA Draft Vapor Intrusion Guidance (EPA, 2002) generic screening levels (Risk = 1E-05) to determine potential contaminants of concern for indoor air. Table 1 identifies the constituents exceeding the generic screening levels.

Table 1. On-site Groundwater Exceedences of Draft Vapor Intrusion Guidance Generic Screening Levels (μg/L)

Contaminant	Generic Screening Levels (Risk = 1 x 10^{-5})	Maximum Detection
Perched Groundwater		
1,2-Dichloroethane	23	100 (1MW-4)
Upper Alluvial Groundwater		
Benzene	14	810 (4MW-1)
1,2-Dichlorobenzene	2,600	6,800 (4MW-1)
1,2-Dichloroethane	23	24,000 (EMW-7)
Ethylbenzene	700	2,000 (4MW-1)
Toluene	1,500	760,000 (4MW-1)
Vinyl Chloride	2.5	5 (EMW-7)

Because the CCC site is not operational and there are no on-site indoor workers present, indoor air is not currently a concern. The Johnson and Ettinger (J&E) Model was used to develop site-specific criteria. Model default parameters for an industrial land use scenario and site-specific input parameters were used in the model. Table 2 provides site-specific parameters and the rationale for utilizing them.

Table 2. Site-Specific Parameter for J&E Model (On-site)

Site-Specific Parameter	Parameter Value	Units	Rationale
Target risk	1E-05	unitless	This value is the median of acceptable risk range and accounts for cumulative risk.
Average groundwater temperature	18	°C	This value is extrapolated from EPA's J&E Model Guidance Document.
Depth below grade to water table - 1MW-4	393	cm	This value is the minimum allowable depth to groundwater. The sum of the depth below grade to bottom of enclosed space floor and thickness of capillary zone equals 392 cm.
Depth below grade to water table - 4MW-1	823	cm	This value is the depth to monitoring well screen.
Depth below grade to water table - EMW-7	1067	cm	This value is the depth to monitoring well screen.
Soil type above water table - 1MW-4	Silt	--	Boring log indicates soil type consists of silts.
Soil type above water table - 4MW-1 and EMW-7	Silty Clay	--	Boring log indicates soil type consists of silty clay.
Soil type in vadose zone - 1MW-4, 4MW-1 and EMW-7	Silt	--	Boring log indicates vadose zone soil type consists of silts.

Table 3 provides the site-specific screening levels developed utilizing the J&E Model.

Table 3. Site-Specific Screening Levels (μg/L)

Contaminant	Site-specific Screening level (Risk = 1 x 10^{-5})	Maximum Detection
Perched Groundwater		
1,2-Dichloroethane	754	100 (1MW-4)
Upper Alluvial Groundwater		
Benzene	1,750	810 (4MW-1)
1,2-Dichlorobenzene	156,000 (Solubility)	6,800 (4MW-1)
1,2-Dichloroethane	**1,530**	**24,000 (EMW-7)**
Ethylbenzene	11,700	2,000 (4MW-1)
Toluene	**181,000**	**760,000 (4MW-1)**
Vinyl Chloride	293	5 (EMW-7)

Based on the comparison of the maximum detected concentrations in groundwater to site-specific screening levels, 1,2-dichloroethane and toluene exceed the site-specific screening levels. In addition, toluene was detected above the solubility limit (526,000 μg/L) , which indicates that free product may be present in groundwater at 4MW-1. As such, if the CCC site undergoes redevelopment, further evaluation of the indoor air issue is warranted and recommended.

Off-site Indoor Air

The only VOC detected off site in upper alluvial groundwater from the August 2005 sampling event was 1,2-dichloroethane. Two off-site monitoring wells (OFFMW-2 and OFFMW-4) were screened in upper alluvial groundwater at approximately 90 to 110 feet bgs and 79 to 99 feet bgs, respectively. The EPA Draft Vapor Intrusion Guidance recommends screening groundwater data that are within 100 feet laterally and/or vertically from buildings. The aforementioned monitoring wells are located within agricultural land and are not believed to be located within 100 feet laterally from buildings. However, the extent of 1,2-dichloroethane contamination has not been defined (laterally or vertically) and location of buildings relative to the full extent of contamination is unknown; thus, it was conservatively assumed that impacted upper alluvial groundwater may potentially be within 100 feet laterally and vertically from a residential building (e.g., farm house). Thus, the maximum detected concentration of 1,2-dichloroethane detected in the off-site upper alluvial groundwater wells was compared to EPA Draft Vapor Intrusion Guidance generic screening level (Risk = 1E-05) and EPA Draft Vapor Intrusion Guidance groundwater screening levels for scenario-specific vapor attenuation factor (Risk = 1E-05; vapor attenuation factor = 1E-04) (EPA, 2002). The maximum detected 1,2-dichloroethane concentration of 14,000 μg/L (OFFMW-2) exceeded both these screening criteria (230 and 2,300 μg/L, respectively). The J&E Model and the maximum detected concentration of 1,2-dichloroethane were used to calculate the incremental risk. Model default parameters for an industrial land use scenario and site-specific input parameters were used in the model. Table 4 provides site-specific parameters and the rational for utilizing them.

Table 4. Site-Specific Parameter for J&E Model (Off-site)

Site-Specific Parameter	Parameter Value	Units	Rationale
Average groundwater temperature	18	°C	This value is extrapolated from EPA's J&E Model Guidance Document.
Depth below grade to water table	2742	cm	This value is the depth to monitoring well screen.
Soil type above water table	Clay	--	Boring log indicates soil type consists of clay.
Soil type in vadose zone	Silt	--	Boring logs indicate vadose zone soil type consists of silts.

The J&E model results indicated that the incremental risk is 5.6E-05, which is within the acceptable risk range of 1E-06 to 1E-04.

Surface/Subsurface Soil: Surface soil and/or subsurface soil samples were collected at eight sites (Site 1 through 6, Site 8, and Site 9). The available data for seven of the sites (Sites 1 through 4, Site 6, Site 8, and Site 9) were summarized in the March 2001 Risk Assessment (Ensafe, 2001a) by two soil intervals: 1) surface soil (0 - 1 feet bgs) and 2) surface/subsurface soil (all depths). Because surface soil was not collected at Site 5, only the subsurface soil interval (greater than 1 foot bgs) is summarized. For consistency, these soil intervals were used in this EI. Maximum detected concentrations in surface soil (0 - 1 feet bgs) and surface/subsurface soil (all depths) were screened against the Region 6 Human Health Medium-Specific Screening Levels (HHMSSLs) for an Industrial-Outdoor Worker.

Site 1
Maximum detected concentrations in surface soil and surface/subsurface soil exceeding HHMSSLs were as follows: 44.6 mg/kg of arsenic (HHMSSL = 1.8 mg/kg), 0.593 mg/kg of dieldrin (HHMSSL = 0.12 mg/kg), and 7.5 mg/kg of 1,2-dichloroethane (HHMSSL = 0.84 mg/kg) (Ensafe, 2001a).

Site 2
No contaminants exceeded HHMSSLs in surface soil. Maximum detected concentrations in surface/subsurface soil exceeding HHMSSLs were as follows: 66.8 mg/kg of arsenic (HHMSSL = 1.8 mg/kg), 0.5 mg/kg of aldrin (HHMSSL = 0.11 mg/kg), 0.35 mg/kg of dieldrin (HHMSSL = 0.12 mg/kg), 170 mg/kg of 1,2-dichloroethane (HHMSSL = 0.84 mg/kg), 0.67 mg/kg of carbon tetrachloride (HHMSSL = 0.58 mg/kg), 13 mg/kg of chloroform (HHMSSL = 0.58 mg/kg), and 380 mg/kg of methylene chloride (HHMSSL = 22 mg/kg) (Ensafe, 2001a).

Site 3
No contaminants exceeded HHMSSLs in surface soil. The maximum detected concentration of dinoseb (13,000 mg/kg) in surface/subsurface soil exceeded the HHMSSL (680 mg/kg) (Ensafe, 2001a).

Site 4
Maximum detected concentrations in surface soil exceeding HHMSSLs were as follows: 0.445 mg/kg of dieldrin (HHMSSL = 0.12 mg/kg) and 840 mg/kg of dinoseb (HHMSSL = 670 mg/kg). Maximum detected concentrations in surface/subsurface soil exceeding HHMSSLs were as follows: 15.5 mg/kg of arsenic (HHMSSL = 1.8 mg/kg), 0.63 mg/kg of dieldrin (HHMSSL = 0.12 mg/kg), and 1,100 mg/kg of dinoseb (HHMSSL = 680 mg/kg). A HHMSSL was not available for 3,4-dichloroaniline. So, the maximum 3,4-dichloroaniline concentration of 12,000 mg/kg was screened against a surrogate HHMSSL (4-chloroaniline HHMSSL = 2,700 mg/kg); the maximum detected concentration of 3,4-dichloroaniline exceeded the surrogate HHMSSL (Ensafe, 2001a).

Site 5
The maximum detected concentration of arsenic (9.7 mg/kg) in surface/subsurface soil exceeded the HHMSSL (1.8 mg/kg) (Ensafe, 2001a).

Site 6
Maximum detected concentrations in surface soil and surface/subsurface soil exceeding HHMSSLs were as follows: 10.3 mg/kg of arsenic (HHMSSL = 1.8 mg/kg) and 0.24 mg/kg of aldrin (HHMSSL = 0.11 mg/kg) (Ensafe, 2001a).

Site 8
The maximum detected concentration of arsenic (9.7 mg/kg) in surface soil and surface/subsurface soil exceeded the HHMSSL (1.8 mg/kg) (Ensafe, 2001a).

Site 9
Maximum detected concentrations in surface soil exceeding HHMSSLs were as follows: 3.5 mg/kg of arsenic (HHMSSL = 1.8 mg/kg) and 29,000 mg/kg of dinoseb (HHMSSL = 670 mg/kg). Maximum detected concentrations in surface/subsurface soil exceeding HHMSSLs were as follows: 7.3 mg/kg of arsenic (HHMSSL = 1.8 mg/kg) and 29,000 mg/kg of dinoseb (HHMSSL = 670 mg/kg) (Ensafe, 2001a).

Surface Water: Surface water samples were collected from stormwater and wastewater areas in 2003 and 2006. On-site surface water bodies include drainage ditches (Site 3), inactive wastewater treatment ponds (Site 1), and adjacent constructed wetlands (AOC 2). Methylene chloride samples exceeded the Region 6 HHMSSL tap water value in the stormwater retention area, the wastewater aeration pond, and the wastewater polish pond from samples taken June 25, 2003. However, when calculating potential risk for a residential child receptor, all values were found to be within an acceptable cancer (10E-05) and non-cancer (HQ = 1) risk range.

Sediment: Sediment was sampled during the FI at Site 1 and Site 3 (Environmental and Safety, Inc, 1996). Maximum detected concentrations in sediment and the screening criteria used are discussed by Site below.

Site 1
Maximum detected concentrations in sediment from the wastewater treatment ponds were screened against the Region 6 HHMSSLs for an Industrial-Outdoor Worker. The maximum detected concentration of arsenic (123 mg/kg) in sediment was the only contaminant that exceeded the HHMSSL (1.8 mg/kg) (Ensafe, 2001a).

Site 3
Maximum detected concentrations in sediment from the storm water ditches were screened against the Region 6 Human Health Medium-Specific Screening Levels (HHMSSLs) for an Industrial-Outdoor Worker. Maximum detected concentrations in sediment exceeding HHMSSLs were as follows: 222 mg/kg of arsenic (HHMSSL = 1.8 mg/kg), 0.354 mg/kg of aldrin (HHMSSL = 0.11 mg/kg), and 3.4 mg/kg of dieldrin (HHMSSL = 0.12 mg/kg) (Ensafe, 2001a).

Outdoor Air: No assessment of the impacts to outdoor air have been conducted at the CCC site. Migration of VOCs in groundwater into outdoor air is not expected to be of concern due to natural dispersion of contaminants once they reach the surface. In addition, the majority of the site is covered with either pavement, gravel, or a vegetative cover, which significantly reduces the potential for contaminated particulates to migrate into outdoor air. Thus, the migration of contaminated particulates or volatile emissions are not expected to be significant exposure pathways at the CCC site.

References:

Booz Allen, 2003. "Draft Site Conceptual Model." Booz Allen Hamilton, March14, 2003.

Environmental and Safety Designs, Inc, 1996. "Facility Investigation Report." Environmental and Safety Designs, Inc., June 28, 1996.

Ensafe, 2001a. "Risk Assessment." EnSafe, Inc. (Ensafe), March 21, 2001.

Ensafe, 2001b. "Groundwater Monitoring Report." EnSafe, Inc. (Ensafe), September 21, 2001.

Ensafe, 2002. "Risk Assessment Addendum." EnSafe, Inc. (Ensafe), January 22, 2002.

EPA, 2002. "Draft Guidance for Evaluating The Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils (Subsurface Vapor Intrusion Guidance)." Environmental Protection Agency Office of Solid Waste and Emergency Response, September 12, 2002.

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
Groundwater	no	no	no	yes	no	no	no
~~Air (indoors)~~							
Soil (surface, e.g., <2 ft)	no	yes	no	no	no	no	no
~~Surface Water~~							
Sediment	no	no	no	no	no	no	no
Soil (Subsurface, e.g., >2 ft)	no	no	no	no	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):

Because the CCC site is not operational, there are only limited on-site receptors (e.g., worker or construction workers) of concern. A security guard is present 24-hours a day at the CCC property line to restrict access and keep trespassers away from the site. The security guard does not work within the contaminated areas of the site to perform any job duties. Also, a mower is under contract during the summer season to mow the grass on the CCC property. The mower is on site approximately six times per year, and has been advised (as stated in the contract) to take precautionary measures, such as wearing a face mask and articles of clothing that cover the body, when on site. There is also a contract worker on-site in charge of operating the wastewater treatment unit. This worker has is extremely knowledgeable of the site having been a full-time employee of CCC and has also been advised of the current site conditions and does not enter areas of the site where a possible and potential exposure would be feasible. Access to the majority of the CCC site is restricted by fencing, with the exception of the southern boundary which does not include adjacent constructed wetlands (AOC 2). Thus, there is currently no potential for on-site receptors to become exposed to contaminated soil or sediment at the CCC site. However, if this property is redeveloped in the future, these on-site exposure pathways will need to be re-evaluated.

The arsenic, bis(2-chloroethyl)ether, and 1,2-dichloroethane contamination in upper and lower alluvial groundwater has migrated downgradient (south and southeast) of the CCC site. The land downgradient of the CCC site is used for agriculture and groundwater used for irrigation is pumped from the alluvial groundwater unit. Agricultural workers may be exposed to contaminated groundwater during irrigation activities. However, the ATSDR Health Consultation (2006) ruled out any health hazards associated with the groundwater. Furthermore, the report eliminated the food consumption pathway due to the limited proximity to any residential area.

Available information indicates that shallow groundwater downgradient of the CCC site is not currently impacted by arsenic, bis(2-chloroethyl)ether, and/or 1,2-dichloroethane. Thus, construction workers are not currently expected to come in direct contact with contaminated groundwater off site. Also, available information indicates that arsenic, bis(2-chloroethyl)ether, and/or 1,2-dichloroethane has not impacted local drinking water supplies (i.e., domestic or public supply wells).

4. Can the exposures from any of the complete pathways identified in #3 be reasonably expected to be "significant"[3] (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)?

   X 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."

   _____ 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):

On-Site Surface Soils: Because the CCC site is not operational, there are only limited on-site receptors (e.g., worker or construction workers) of concern. A security guard is present 24-hours a day at the CCC property line to restrict access and keep trespassers away from the site. The security guard does not work within the contaminated areas of the site to perform any job duties. Also, a mower is under contract during the summer season to mow the grass on the CCC property. The mower is on site approximately six times per year, and has been advised (as stated in the contract) to take precautionary measures, such as wearing a face mask and articles of clothing that cover the body, when on site. There is also a contract worker on-site in charge of operating the wastewater treatment unit. This worker has is extremely knowledgeable of the site having been a full-time employee of CCC and has also been advised of the current site conditions and does not enter areas of the site where a possible and potential exposure would be feasible. Access to the majority of the CCC site is restricted by fencing, with the exception of the southern boundary which does not include adjacent constructed wetlands (AOC 2). Thus, there is currently no potential for on-site receptors to become exposed to contaminated soil or sediment at the CCC site. However, if this property is redeveloped in the future, these on-site exposure pathways will need to be re-evaluated.
Off-site Groundwater: Off-site agricultural worker exposure to contaminated groundwater is not considered a completed exposure pathway. Currently, the exposure is not significant due to the ASTDR Health Consultation (ATSDR, 2006) concluding that 1,2-DCA poses no apparent public health hazard to exposed individuals and recommended that off-site wells AGI-1 and BHAGI-1 be returned to normal operating conditions. Groundwater exposure to a construction worker is considered to be a complete pathway; however, no current conditions expose construction workers to this site since it is presently not in operation or under construction.

[3] 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 and Reference(s):

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):

YE 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 **Cedar Chemical Corporation** facility, EPA ID # **ARD990660649**, located at **West Helena, Arkansas** 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 Ashley Whitlow, ADEQ

Signature for Ashley Whitlow

Title Sr. Epidemiologist

Date 5/1/07

Supervisor Tammie J. Hynum

Signature

Title Technical Assistance Manager

Date 5/1/07

References may be found at the Arkansas Department of Environmental Quality - Hazardous Waste Division & Records Mgmt. Section.

Contact telephone and e-mail information:

Jim Rigg, Geology Supervisor
Hazardous Waste Division ,ADEQ
(501) 682-0832
rigg@adeq.state.ar.us

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.