**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:** | KRATON Polymers U.S. LLC |
| **Facility Address:** | 2982 Washington Blvd., Belpre, OH 45714-0235 |
| **Facility EPA ID #:** | OHD 004 343 117 |

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 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 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 | | | 1,1,1-TCA, 1,1-DCE, benzene, arsenic, ethylbenzene, styrene, and toluene exceed MCLs |
| Air (indoors)[2] | | X | | No occupied buildings overlie areas of contaminated soil or groundwater, or routine testing of VOCs are below OSHA PELs |
| Surface Soil (e.g., <2 ft) | X | | | Arsenic exceeds industrial RBSL and background |
| Surface Water | | X | | Arsenic below Ohio Water Quality Standard and NPDES permit discharge level |
| Sediment | X | | | Arsenic exceeds background |
| Subsrf. Soil (e.g., >2 ft) | X | | | Arsenic exceeds industrial RBSL and background |
| Air (outdoors) | | X | | No VOCs in surface soil above risk-based inhalation levels |

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

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

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

Rationale and Reference(s):

[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.

*References*:

- *Administrative Record for Shell Chemical Company, OHD 004 343 117, Belpre, Ohio*, including Statement of Basis dated November 5, 2001, Index to Administrative Record, and Documents Shell-001 through Shell-121.
- A series of Semiannual Groundwater Monitoring Reports for monitoring events conducted in May and December 2001, May and December 2002, and May 2003.
- *Final Decision and Response to Comments for Shell Chemical Company, Belpre, Ohio, OHD 004 343 117*, April 23, 2002.
- *Administrative Order on Consent*, EPA Docket No. RCRA-05-2003-0007, effective March 17, 2003.
- E-mail from Janice Wendel, Shell Chemical, regarding NOVA Process Building Indoor Air Quality, September 3, 2003.

*Rationale*: **Groundwater -** Groundwater beneath and downgradient of the Former North Side Burn Pit (AOC E) contains 1,1,1-trichloroethane (TCA) and 1,1-dichloroethene (DCE) above maximum contaminant levels identified as the Groundwater Performance Standards (GWPS) in the Administrative Order on Consent (Consent Order). As of May 2003, the maximum detected concentration of 1,1,1-TCA was 2.6 mg/l and 1,1-DCE was 0.063 mg/l. The respective GWPS are 0.2 and 0.007 mg/l. Groundwater at the southeast corner of the Tank Farm (AOC D) currently contains 0.0078 mg/l of benzene; the GWPS is 0.005 mg/l. Groundwater just west of the Lower Slag Ponds has historical arsenic concentrations from 0.067 to 0.18 mg/l; the GWPS is 0.010 mg/l. The NOVA portion of the facility has LNAPL present in groundwater in the interior area. Contaminant concentrations in groundwater at the NOVA portion of the facility are 28 mg/l of ethylbenzene, 51 mg/l of styrene, and 8.5 mg/l of toluene. The respective GWPS are 0.7, 0.1, and 1.0 mg/l.

**Air (indoors) -** The only area of the KRATON Polymers facility where occupied buildings are located over contaminated soil or groundwater is at the NOVA portion of the facility. Based on the presence of LNAPL on the water table in the area adjacent to the main process building, the Johnson-Ettinger model was used to initially evaluate the vapor intrusion/indoor air pathway. The model indicated that vapor intrusion could potentially occur if subsurface soil contained primary LNAPL constituents at concentrations exceeding 4.63 mg/kg of ethylbenzene, 494 mg/kg of styrene, 222 mg/kg of toluene, and 140 mg/kg xylenes. Actual subsurface soil concentrations exceed these threshold values.

However, routine industrial hygiene organic vapor testing in the NOVA process building shows indoor air concentrations of the three primary LNAPL components, ethylbenzene, styrene, and toluene, to be below OSHA PELs. In addition, total organic vapors are measured at three stations near ground level on the first floor of the process building. With the exception of an occasional equipment leak or maintenance activity, the VOC monitors read zero. An alarm is programmed to sound if detected organic vapor concentrations reach 20 ppm. OSHA PELs for the primary LNAPL components are 100 ppm for ethylbenzene, 100 ppm for styrene, and 200 ppm for toluene.

**Surface soil -** Surface soil at the Landfarm (SWMU 91) and the Upper Slag Pond (SWMU 92) contains arsenic at maximum detected concentrations of 45 and 91 mg/kg respectively, which exceeds the industrial risk-based screening level (RBSL) for particulate ingestion of 3.82 mg/kg and the calculated facility background of 24 mg/kg.

Surface soil at the NOVA portion of the facility at MW-8N contained arsenic at 34 mg/kg which exceeds the industrial RBSL for soil ingestion of 3.82 mg/kg and the calculated facility background for arsenic of 24 mg/kg.

**Surface water -** Davis Creek receives up to 1.5 million gallons per day of water discharged from the Lower

Slag Ponds (SWMU 93) under an NPDES permit. The discharge water typically comprises 100% of the Davis Creek flow except during storm events. Discharge water is monitored weekly by collecting a 24-hour composite sample. The permitted discharge for arsenic is 0.100 mg/l on a monthly average and 0.150 mg/l for a daily maximum. Composite sample data for 2003 shows that the monthly average for arsenic ranged from 0.019 to 0.037 mg/l and the highest daily maximum was 0.042 mg/l. There were no exceedances of the NPDES permit or the Ohio Water Quality Standard of 0.150 mg/l.

**Sediment -** Sediment in Davis Creek just downstream of NPDES outfall from the slag ponds contains arsenic at a maximum detected concentration of 339 mg/kg.

**Subsurface soil -** Subsurface soil at the Landfarm (SWMU 91) contains arsenic at a maximum detected concentration of 46 mg/kg which exceeds the industrial RBSL for soil ingestion of 3.82 mg/kg and the calculated facility background for arsenic of 24 mg/kg. Subsurface soil at the NOVA portion of the facility at SB-4 contained arsenic at 26 mg/kg which exceeds the human-health industrial RBSL and facility background for arsenic.

**Air (outdoors) -** No known areas of affected surface soils with constituents exceeding air exposure criteria based on either residential or industrial criteria are present at the facility. Therefore, on-site or off-site exposure to soil vapor/particulates in ambient air is not a potentially complete exposure partway.

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 | No | No | No | No |
| Soil (surface, e.g., <2 ft) | No | No | No | No | No | No | No |
| Sediment | No | No | No | No | No | No | No |
| Soil (subsurface, e.g., >2 ft) | No | No | No | No | No | No | No |

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.

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

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

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

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

Rationale and Reference(s):

*References:*

- *Administrative Record for Shell Chemical Company, OHD 004 343 117, Belpre, Ohio,* including Statement of Basis dated November 5, 2001, Index to Administrative Record, and Documents Shell-001 through Shell-121.
- A series of Semiannual Groundwater Monitoring Reports for monitoring events conducted in May and December 2001, May and December 2002, and May 2003.
- *Final Decision and Response to Comments for Shell Chemical Company, Belpre, Ohio, OHD 004 343 117,* April 23, 2002.
- *Administrative Order on Consent,* EPA Docket No. RCRA-05-2003-0007, effective March 17, 2003.
- Letter from Jim Thrall, KRATON Polymers, regarding Maintenance of Site Access Controls, September 10, 2003.
- Letter from Jim Thrall, KRATON Polymers, regarding Access Controls at Slag/Fly Ash Management Area, September 23, 2003.

*Rationale*: **Groundwater -** The groundwater plumes identified at the KRATON Polymers facility are wholly contained within the facility property boundary. There are no on-site wells that use groundwater as a water source. Contaminated groundwater is typically 40-feet below the ground surface and would not be encountered in a subsurface excavation. In addition, the Consent Order specifically prohibits the use of groundwater at the facility for drinking, bathing, washing, or other human contact purposes or for livestock, farming or irrigation until the groundwater performance standards are achieved. The Consent Order also prohibits the installation of any new water wells for the same purposes until the groundwater performance standards are achieved.

**Surface soil -** Landfarm (SWMU 91) access is restricted by a 4-foot barbed wire fence, three 16-foot steel gates with chains and locks, and "No Trespassing" signs posted every 100 to 150-feet along the fence and on each locked gate. The fence line is inspected and maintained as necessary twice a year. Entrance to the Landfarm is limited to authorized personnel who are informed of site conditions. Excavation permitting procedures are in place to prevent workers from unknowingly digging in contaminated areas. As part of the final remedy, a three-foot protective soil cover will be placed on the landfarm to protect ecological receptors and human health. The cover is scheduled for spring 2004 and will further minimize exposure pathways.

The Upper Slag Pond (SWMU 92) is located within the 11.9-acre Boiler Slag and Fly Ash Management Area. Solids dredged from the Lower Slag Ponds (SWMU 93) are placed and dewatered in this area. After sufficient drying, the solids are hauled off-site to be recycled at coal mining areas. Access is blocked on the north by U.S. Route 50 and the facility perimeter 8-foot security fence, and to the west by Davis Creek.

Access is limited to authorized personnel who are informed of site conditions and if necessary, wear appropriate personal protective equipment. The facility uses a tiered work permitting/authorization process. The permit addendum specifies the hazards of arsenic at the slag ponds. Warning signs stating "Authorized Personnel Only - Area Contains Elevated Arsenic" and "Caution - Arsenic Concentrations in Soil and Fly Ash Mixtures Near the Slag Pond Exceed EPA Screening Levels for Soil Ingestion" are posted to identify and communicate the restricted area and potential hazards. Affected soils in the area stay moist since the area is used for dewatering of solids dredged from the Lower Slag Ponds and the solids are typically removed before complete drying.

Arsenic-contaminated surface soil at the NOVA portion of the facility is located beneath concrete pavement and not accessible without excavation. Excavation permitting procedures are in place to prevent workers from unknowingly digging in contaminated area and provide for appropriate personal protective equipment.

Land use is currently industrial but to ensure that exposure pathways remain incomplete, the Consent Order specifically prohibits residential activities for as long as soils at the facility remain contaminated above the residential performance standards for human exposure. Enforceable land use restriction agreements to create an equitable servitude have been filed with the Washington County Recorder of Deeds for the facility.

**Sediment -** Contaminated sediment in Davis Creek is continually wet and submersed beneath surface water due to the constant supply of water from the NPDES-permitted discharge at the Lower Slag Ponds (SWMU 93). There are no industrial activities or workers present in the vicinity of Davis Creek where sediments are contaminated with arsenic. Only minnows (no game fish) are present in the upper portion of the creek where contaminated sediment is present and access to this area is restricted by the facility perimeter 8-foot security fence and U.S. Route 50. As part of the final remedy, contaminated sediment in the vicinity of the Lower Slag Ponds (SWMU 93) will be dredged and hauled off-site. The dredge project is scheduled for summer 2004 and will completely eliminate any potential exposure pathways.

**Subsurface soil -** Entrance to the Landfarm is limited to authorized personnel who are informed of site conditions. Excavation permitting procedures are in place to prevent workers from unknowingly digging in contaminated areas and provide for appropriate personal equipment. As part of the final remedy, a three-foot protective soil cover will be placed on the Landfarm to protect ecological receptors and human health. The cover is scheduled for spring 2004 and will further minimize exposure pathways.

Arsenic-contaminated subsurface soil at the NOVA portion of the facility is located beneath concrete pavement. Excavation permitting procedures are in place to prevent workers from unknowingly digging in the contaminated area.

Land use is currently industrial but to ensure that exposure pathways remain incomplete, the Consent Order specifically prohibits residential activities for as long as soils at the facility remain contaminated above the residential performance standards for human exposure. Enforceable land use restriction agreements to create an equitable servitude have been filed with the Washington County Recorder of Deeds for the facility.

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."

_____ 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):

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

[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.

(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 KRATON Polymers U.S. LLC facility, EPA ID # OHD 004 343 117, located at Belpre, Ohio 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) _____ Date Sept. 26, 2003
(print) Kenneth S. Bardo
(title) Environmental Scientist

Supervisor (signature) _____ Date _____
(print) George Hamper
(title) Section Chief
(EPA Region or State) EPA Region 5

Locations where References may be found:

- *RCRA 7th Floor File room* - Administrative Record for RCRA 3008(h) Consent Order, KRATON Polymers U.S. LLC, OHD 004 343 117.
- *Washington County Public Library, 2101 Washington Blvd., Belpre, OH 45714* - Administrative Record for KRATON Polymers - Belpre Plant.

Contact telephone and e-mail numbers

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**FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.**