

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: NOVA Chemical / Lyondell Chemical Beaver Valley Plant
(formerly ARCO Chemical)
Facility Address: 400 Frankfort Road, Monaca, PA 15067
Facility EPA ID #: PAD 068 730 225

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 Controls" 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).

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)
Page 2

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)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale/Key Contaminants</u>
Groundwater	<u>X</u>	<u> </u>	<u> </u>	<u>Various VOCs and SVOCs</u>
Air (indoors) ²	<u>X</u>	<u> </u>	<u> </u>	<u>Various VOCs</u>
Surface Soil (e.g., <2 ft)	<u>X</u>	<u> </u>	<u> </u>	<u>Various VOCs and SVOCs</u>
Surface Water	<u>X</u>	<u> </u>	<u> </u>	<u>Benzene, bis (2-ethylhexyl)phthalate, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, chromium, lead, selenium and zinc</u>
Sediment	<u>X</u>	<u> </u>	<u> </u>	<u>Benzene, SVOCs, and metals</u>
Subsurface Soil (e.g., >2 ft)	<u>X</u>	<u> </u>	<u> </u>	<u>Various VOCs and SVOCs</u>
Air (outdoors)	<u> </u>	<u>X</u>	<u> </u>	<u> </u>

_____ If no (for all media) – skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient support 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. (In order to present a more accurate representation of the site, the reviewer has chosen not to skip to #6.)

Rationale and Reference(s):

See following pages for response to Question #2 (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.

QUESTION #2 - HUMAN HEALTH - RATIONALE AND REFERENCE(S)

RESPONSE

Six Areas of historic contamination were identified at the site. These areas are the Central Plant / Styrene II Area, the Over-the-Hill (OTH) Tank Farm Area, Raccoon Creek Area, West Landfill / Dravo Quarry Area, East Landfill Area, and Phthalic Anhydride Area.

Groundwater

Groundwater throughout the facility is contaminated with various VOCs and SVOCs. Remedial investigations conducted in the late 1980s and early 1990s determined that the primary contaminants included benzene, toluene, ethyl benzene, xylenes, and styrene (BTEXS). An approximately 25-acre Non-Aqueous Phase Liquid (NAPL) plume was identified approximately 72 feet beneath the Central Plant / Styrene II Area. Similar plumes of smaller size (less than 5 acres) were identified in the OTH Tank Farm Area, Raccoon Creek Area, and West Landfill / Dravo Quarry Area. Maximum contaminant concentrations detected in each of these areas during the remedial investigations or subsequent sampling events are listed in the table below.

Constituent	Central Plant Area	Over the Hill Area	Raccoon Creek Area	West Landfill Area	East Landfill Area	Phthalic Anhydride Area	EPA MCL
Benzene	410	345	410	240	11	0.006	0.005
Toluene	3.4	8.4	31	130	3.5	ND	1
Ethyl Benzene	280	94.5	0.89	14	0.65	ND	0.7
Xylenes	44	0.85	2.6	20	0.47	ND	10
Styrene	0.68	0.038	1.2	6.3	0.93	ND	0.1

All results in mg/L.

ND – not detected

Bold – exceedance of EPA Maximum Contaminant Level

Air (indoors)

It is likely that, given the widespread contamination of soil and groundwater at the facility, there is some amount of vapor intrusion of volatile contaminants into the indoor air of facility buildings; however, no indoor air quality studies have been performed at the facility.

Surface and Subsurface Soil

As soils were treated as one media in Risk Assessments at the facility, they will be discussed together in these EI forms. Maximum contaminant concentrations detected during the remedial investigations or subsequent sampling events are listed in the table below.

Constituent	Central Plant Area	Over the Hill Area	Raccoon Creek Area	West Landfill Area	East Landfill Area	Phthalic Anhydride Area	EPA Industrial RSL
Benzene	3100	29	1900	120	19	0.076	5.4
Toluene	9600	100	1500	61	8100	2.8	45,000

Constituent	Central Plant Area	Over the Hill Area	Raccoon Creek Area	West Landfill Area	East Landfill Area	Phthalic Anhydride Area	EPA Industrial RSL
Ethyl Benzene	3200	1900	790	1800	1400	8.3	27
Xylenes	3000	0.57	640	73	6.6	0.023	2700
Styrene	5400	0.056	1200	650	5200	0.015	36,000

All results in mg/kg.

Bold – exceedance of EPA Industrial Regional Screening Level

Estimated Subsurface VOC Inventories were prepared in February 1996 for four of the six areas, as summarized in the following table. BTEX and styrene comprised the vast majority of VOCs in the estimated subsurface inventories, with ethyl benzene and benzene noted as the primary contaminants.

Location	Central Plant Area	Over the Hill Area	Raccoon Creek Area	West Landfill Area
Unsaturated zone	767,000	55,000	102,000	294,800
Smear zone	705,000	252,700	128,800	13,800
NAPL zone	210,000	28,800	--	--
Saturated zone	80,000	11,500	24,300	12,800
Total	1,762,000	348,000	255,100	321,400

All results in lbs. NAPL zone estimates not provided for the Raccoon Creek Area and West Landfill Area.

In September 1997 an estimate of the combined mass of BTEX and styrene in subsurface soils at the East Landfill Area was conducted. The total estimate of BTEX and styrene mass was 752,000 pounds; however, this estimate was limited to the former disposal areas.

Soils at the Phthalic Anhydride Area were contaminated with mercury at both the surface and subsurface intervals. Surface soil concentrations were as high as 45,600 mg/kg. Subsurface concentrations were as high as 81.3 mg/kg. The facility excavated areas of high mercury contamination. Confirmatory sampling results were less than 225 mg/kg.

Surface Water

According to the Risk Assessment and Cleanup Plan for the OTH Tank Farm Area, the facility's consultant calculated the benzene mass loading to Raccoon Creek to be less than 0.001 lb./day. This estimate resulted in an undetectable surface water concentration in Raccoon Creek. In 1995 PADEP's consultant calculated the benzene mass loading to be between 1.6 and 2.3 lb./day. This estimate resulted in 9.69 µg/L of benzene in Raccoon Creek. The facility indicated that 47% of the 93 surface water samples collected from Raccoon Creek, between July 1997 and the time of the report, had no detectable concentrations of benzene. The remaining samples had benzene concentrations ranging between 0.13 and 1.6 µg/L with an average concentration of 0.42 µg/L. It was noted that many of these samples were split with PADEP and no significant differences had been noted.

In the Risk Assessment and Cleanup Plan for the Raccoon Creek Area surface water samples were screened against the Pennsylvania Ambient Water Quality Criteria (AWQC) for Human Health, which the facility considered protective of both human and aquatic receptors. It should be noted that the human health criteria are not the most stringent value, especially when considering inorganic standards. Maximum concentrations of chromium, lead, selenium, and zinc exceeded maximum and/or continuous aquatic life criteria.

Surface water sampling for BTEX and styrene was performed quarterly from 1997 to 2000 at a downstream transect of Raccoon Creek. Sample results were below human health AWQC except for two slight exceedances of benzene.

Sediment

It was noted in 1990 RI/FS Reports that the OTH Tank Farm Area and the Raccoon Creek Area may be contributing to sediment contamination along the banks of Raccoon Creek based on sediment sampling results. Results from a supplemental field investigation performed along the Raccoon Creek during April and May 1996 also suggest that sediment has become contaminated by the migration of contaminated groundwater primarily from the Raccoon Creek Area.

In the Risk Assessments for the OTH Tank Farm Area and the Raccoon Creek Area, the screening process for sediment samples was similar to the soil screening process. Pennsylvania's Act 2 Program established no specific sediment standards; therefore, the facility chose to screen sediment results against applicable standards for surface soils. This was considered to be conservative as the exposure to sediments is less frequent and for a shorter duration than for surface soils. Based on this screening method, no compounds were carried through to the quantitative portion of the Risk Assessments as no surface soil standards were exceeded in sediments.

PADEP questioned this screening of sediments, as soil standards are not applicable to sediments. It is unclear if sediments at the site are contaminated above appropriate standards. However, based on previously identified groundwater migration to surface water bodies and historic sampling, sediment contamination is likely.

Air (outdoors)

Air releases from the facility are regulated under a Clean Air Act Title V major permit. It is not expected that minor emissions from process deviations or other releases to outdoor air from RCRA units would constitute contamination above appropriately protective risk-based levels and would not represent a significant exposure risk to potential receptors.

Reference: Environmental Indicator Inspection Report for NOVA Chemical, prepared by Foster Wheeler Environmental Corporation, June 2003

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)
Page 3

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"	<u>Residents</u>	<u>Workers</u>	<u>Day-Care</u>	<u>Construction</u>	<u>Trespassers</u>	<u>Recreation</u>	<u>Food</u> ¹
Groundwater	<u>NO</u>	<u>YES</u>	<u>NO</u>	<u>YES</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>
Air (indoors)	<u>NO</u>	<u>YES</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>
Soil (surface, e.g., <2 ft)	<u>NO</u>	<u>YES</u>	<u>NO</u>	<u>YES</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>
Surface Water	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>YES</u>	<u>YES</u>	<u>YES</u>	<u>YES</u>
Sediment	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>YES</u>	<u>YES</u>	<u>YES</u>	<u>YES</u>
Soil (subsurface e.g., >2 ft)	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>YES</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>
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):

See following page for response to Question #3 (Rationale and Reference(s)).

¹ Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

QUESTION #3 - HUMAN HEALTH - RATIONALE AND REFERENCE(S)

RESPONSE

Groundwater

Although information regarding municipal and residential wells indicates that approximately 28.4% of the residents in the area obtain water from drilled wells or other private sources, and a review of water well records from the Bureau of Topographic and Geologic Surveys indicates that there are 5 private domestic wells within a one mile radius of the site and 28 wells within a two mile radius of the site, it is unlikely that residents are exposed to contaminated groundwater since none of these residences are located along the southern bank of the Ohio River in the vicinity of the facility where contaminated groundwater could be intercepted.

Workers at a neighboring site could potentially be exposed to contaminated groundwater. In the Risk Assessment for the East Landfill Area it was noted that groundwater flows towards the Zinc Corporation of America property where groundwater wells exist for the purposes of supplying manufacturing and potable water.

There are no known day care facilities in the area.

Construction workers could be exposed to contaminated groundwater during construction activities, but would likely be wearing appropriate protective equipment.

Trespassers, recreational participants, and food are not expected to be impacted by contaminated groundwater. However, contaminated groundwater could migrate to surface water bodies and create an exposure pathway.

Air (indoors)

It is expected that only workers could be exposed to potentially contaminated indoor air.

Soil (surface)

Only workers and construction workers are expected to be exposed to contaminated surface soils, but it is expected that they would be wearing appropriate protective equipment. The facility is gated and access controlled so trespassers are not anticipated.

Surface Water and Sediment

Exposures to contaminated surface water and sediment along Raccoon Creek and the Ohio River are possible for construction workers, trespassers, recreational participants, and food supplies (fish).

Soil (subsurface)

Only construction workers are expected to be exposed to contaminated subsurface soils based on the depth at which they are found. However, it is expected that appropriate protective equipment would be worn during any construction activity involving deep excavations.

Reference: Environmental Indicator Inspection Report for NOVA Chemical, prepared by Foster Wheeler Environmental Corporation, June 2003

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

Page 4

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"** (i.e., potentially² "unacceptable" levels) 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):

See following page for response to Question #3 (Rationale and Reference(s)).

² 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.

QUESTION #4 – HUMAN HEALTH – RATIONALE AND REFERENCE(S)

Groundwater

Contaminant fate and transport modeling and sampling results included in the 1998 risk assessment for the East Landfill area suggest that contamination from the facility would not migrate off-site at levels that would pose an unacceptable risk to workers drinking groundwater from potable wells at the Zinc Corporation property. Construction worker exposures are not expected to be significant due to the assumption that protective equipment would be used to eliminate or minimize exposure.

Air (indoors)

Vapor intrusion of volatile contaminants into the indoor air of facility buildings is expected to be an insignificant exposure due to the depth of both groundwater and the bulk of soil contamination beneath active areas of the facility (usually greater than 20 feet below ground surface), the natural degradability of the primary petrochemical contaminants, and the applicability of OSHA worker protection programs and Permissible Exposure Limits as a result of the use of petrochemical feedstocks in facility operations.

Soil

Workers primarily perform their work indoors or in paved areas and are not expected to be exposed to surface soils at durations or frequencies that would constitute significant levels. It is expected that construction workers would wear appropriate protective equipment during any intrusive operations that would expose them to contaminated surface or subsurface soil.

Surface Water and Sediment

Based on past data, the levels of contamination in surface water and sediment are not expected to present a significant exposure to construction workers, trespassers, recreational participants, or food supplies (fish); however, some impact to potential aquatic receptors cannot be ruled out due primarily to exceedances of ambient water quality criteria for several inorganic contaminants as noted above.

Reference: Environmental Indicator Inspection Report for NOVA Chemical, prepared by Foster Wheeler Environmental Corporation, June 2003

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)
Page 5

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 a "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 a "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): _____

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

Page 6

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

X YE – Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the NOVA Chemical (aka NOVA Chemical Cattwo, Beaver Valley Plant, formerly ARCO Chemical) facility, EPA ID PAD 068 730 225, located at 400 Frankfort Road, Monaca, PA 15067 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) /Griff E. Miller/ Date 2/11/14
 (print) Griff Miller
 (title) Remedial Project Manager

Supervisor: (signature) /Paul Gotthold/ Date 2/14/14
 (print) Paul Gotthold
 (title) Associate Director
 (EPA Region or State) EPA Region 3

Locations where References may be found:

 All reference documents are appended to the EI Report, which can be found at the USEPA
 Region III Office in Philadelphia and the PADEP Southwest Regional Office in
 Pittsburgh.

Contact telephone and e-mail numbers:

 (name) Griff Miller
 (phone #) 215-814-3407
 (e-mail) miller.griff@epa.gov

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