

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action Environmental Indicator (EI) RCRAInfo code (CA750) Migration of Contaminated Groundwater Under Control

Facility Name: Aristech Chemical Corporation (formerly USX Corporation) Site
Facility Address: **1711 West Elizabeth Avenue, Linden, New Jersey 07036**
Facility EPA ID#: **NJD001724988**

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 EIs 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 objectives 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 “Migration of Contaminated Groundwater Under Control” EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater 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 the RCRAInfo national database ONLY as long as they remain true (i.e., RCRAInfo status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

The Aristech Chemical Corporation site (formerly United States Steel Corporation [a.k.a., USX]) in Linden, New Jersey is located on four parcels (Lots 18, 19, 20 and 21) totaling 3.25 acres adjacent to the town of Rahway. The site is bordered by industrial properties to the southwest and northeast, by Merck Pharmaceuticals and rail lines of the Penn-Central Railroad (currently owned by Amtrak) and the New

Jersey Transit Authority to the east, and by West Elizabeth Avenue to the west. The property is zoned for industrial use by the City of Linden.

The Aristech site was vacant land until 1950. From 1950 to 1980, the site was used for manufacturing polyester resins under the consecutive ownership of Marco, Celanese Corporation of America, Cornelius Wax Refining Co., W.R. Grace, USX, and eventually Aristech. In 1986, USX entered into an agreement to transfer the Linden site to Aristech. From 1990 to 1998, only two small pilot plants remained in intermittent operation to produce small batches of specialty resins and to determine how best to manufacture the product in commercial quantities. Aristech began scaling back facility operations in 1985, and pilot production was discontinued in 1998. At present, the facility is used solely for warehousing and distribution.

The site has been divided into four property parcels (Lots 18 through 21) as shown on Figure 2 from the Off-Property Remedial Investigation Report/Remedial Investigation Workplan dated November 26, 2001. In 1998, Aristech sold Lot 20 to Chemical Services Inc. Lot 21 is privately owned by Jean Ball, but a portion of this lot is still leased by Aristech. The remainder of Lot 21 is leased and operated by Industrial Machine Engineering. Aristech no longer operates facilities or leases property on Lots 18 and 19.

Polychlorinated biphenyls (PCBs) are the primary constituents of concern (COCs) for soil at the Aristech site, with impacts identified on all four parcels (Lots 18 through 21). PCB contamination is also present in off-property areas adjacent to the southeastern boundary of the site; these impacts are believed to be associated with stormwater runoff from the Aristech site. Limited hot spots of ethylbenzene, styrene, polynuclear aromatic hydrocarbons (PAHs), and total petroleum hydrocarbons (TPHCs) have also been detected in soil on Lots 20 and 21. Groundwater beneath Lots 20 and 21 has been impacted by volatile organic compounds (VOCs) above New Jersey Groundwater Quality Criteria (NJ GWQC), but the plume of contamination has not migrated beyond site boundaries. Volatile COCs for groundwater have historically included benzene, ethylbenzene, and styrene. PCBs have also been reported above standards in the vicinity of well MW-4A. Groundwater at Lots 18 and 19 has not been impacted by site-related COCs. Contamination at the Aristech site is likely related to former activity at the pilot plants, the distillate incinerator, the aboveground storage tanks, and the raw material storage area. Ethylbenzene, specifically, is considered an inherent impurity in styrene production, as well as a byproduct of the styrene decomposition process.

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 code.

Summary of Historical Operations and AECs:

Polyester resin was produced at the Aristech site by combining various raw organic chemicals (e.g., glycols, organic acids) in a closed, heated reactor and blending this material with an organic diluent (styrene) to form a viscous liquid at room temperature. Heat transfer systems were used to keep the raw chemicals heated to their molten states so they could be pumped and metered into the reaction vessels. Prior to 1972, hydraulic oil used in the two heat transfer systems contained PCBs—typically Aroclor 1242. The total quantity of PCB-containing oil (FR-1, manufactured by Monsanto) historically introduced into the systems is unknown. In 1972, Monsanto discontinued the sale of PCBs, and PCB-containing oil in the heat transfer systems was replaced with phthalate ester heat transfer fluids (Ref. 7). Elevated PCB levels in soil on a portion of Lot 20 (Area D) is believed to be associated with incidental spills from the heat transfer systems, as no other PCB uses are known to have occurred on the Aristech site. PCBs discharged on Lot 20 were then apparently tracked onto Lots 18, 19, and 21 via vehicular traffic, resulting in the observed distribution of PCBs in surface soil on all four of the parcels. This method of transport seems to be confirmed by the sporadic and spatially variable concentrations of PCBs in soil in both on- and off-property soil (Ref. 7).

Soil at the Aristech site has also been impacted by various organic COCs, including ethylbenzene, styrene, PAHs, and TPHCs. These impacts have been linked to accidental and routine releases during processing and chemical storage at Lots 20 and 21. Although PCBs are the primary concern for soil at the site, VOC contamination is most significant in the underlying groundwater. PCB and VOC impacts in soil at Lots 18 through 21 are outlined below. An overall groundwater discussion is also provided. For a figure depicting the site layout, refer to Figure 2 of the Off-Property Remedial Investigation Report/Remedial Investigation Workplan (Ref. 7).

Lots 18 and 19

On Lot 18, 99.9 percent of the PCB mass was identified as Aroclor 1248, with insignificant quantities of Aroclors 1242, 1254 and 1260. Pre-remedial total PCB concentrations ranged from ND to 290 mg/kg in 51 samples. On Lot 19, 30.8 percent of the PCB mass was identified as Aroclor 1242, 56.3 percent as Aroclor 1248, 12.7 percent as Aroclor 1254 and 0.3 percent as Aroclor 1260. Pre-remedial total PCB concentrations ranged from ND to 191 mg/kg in 58 samples. PCB concentrations associated with these lots were highest along the southeast boundary of Lot 18. This contamination is likely attributable to occasional backflow from the ditch that runs along the southeastern property boundary that occurs during significant storm events (Ref. 7).

The off-property ditch is located primarily on the Amtrak property. It originates south of the site and generally parallels the railroad tracks, flowing southwest to northeast into a catch basin behind Lot 18. The catch basin subsequently drains into the municipal storm sewer system. The drainage ditch receives storm water runoff from the rear (southern) portion of the site as well as other industrial properties located up-flow and down-flow of the site. The ditch typically lacks standing or flowing water; however, during heavy rainfall events, storm water can exceed the capacity of the drainage ditch, and water from the ditch can flow back on to the site causing minor flooding conditions in the rear portion of the Aristech site. Thus, significant PCB impacts documented along the southeastern boundary of the site are likely due to surface runoff of PCB-impacted particulates in surface soil from the Aristech site and other adjacent properties into the off-property drainage ditch.

Remediation activities were completed on Lots 18 and 19 in 1997. Aristech excavated all PCBs in soil above the New Jersey Residential Direct Contact Soil Cleanup Criteria (NJ RDCSCC) of 0.49 mg/kg. NJDEP subsequently determined that no further investigation or remedial action (NFI/NFA) was required for Lots 18 and 19 (exclusive of off-property issues) in a letter dated October 2, 1998 (Ref. 7). Thus, Lots 18 and 19 are available for unrestricted use, but final NJDEP case closure must wait until the whole site has been remediated.

Lots 20 and 21

On Lots 20 and 21 (where the PCB heat transfer fluid was used), 99.1 percent of the PCB mass has been identified as Aroclor 1242 and 0.8 percent as Aroclor 1248. Insignificant quantities of Aroclor 1254 and 1260 were also identified. Pre-remedial total PCB concentrations ranged from ND to 5,010 mg/kg in 80 samples. Samples along the southern property boundary again showed the highest concentrations (Ref. 7). Limited hot-spots of ethylbenzene, styrene, PAHs, and TPHCs above NJ RDCSCC and New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NJ NRDCSCC) were also observed in soil on Lots 20 and 21.

On August 24, 2000, NJDEP approved a Remedial Action Work Plan (Addendum #2) to address PCB impacts on Lots 20 and 21 (Refs. 4 and 9). In November 2000, a commercially available oxygen release compound (ORC), manganese peroxide, was injected into the subsurface to stimulate biodegradation of ethylbenzene hot-spot areas. In accordance with NJDEP requirements, groundwater monitoring was completed before and after the ORC injections to document the results of the remedial strategy; these results are further discussed in the response to Question 3 below. Sampling was not conducted to assess impacts of the ORC injections on soil contamination because Aristech agreed to excavate hot spot areas of PCB and organic contamination. In February 2002, all PCB-impacted soil above the NJ NRDCSCC of 50 mg/kg was excavated from Lots 20 and 21. Co-located areas of PAH, TPHC, styrene, and ethylbenzene contamination above the NJ NRDCSCC were also excavated. A durable asphalt and concrete cover was installed over all unpaved areas where PCBs remain above the NJ RDCSCC (0.49 mg/kg) in the Summer of 2002 (Ref. 11). A Remedial Action Report documenting the PCB removal effort, capping details, and establishment of a draft deed notice is expected to be submitted to NJDEP by September 30, 2002. Based on these ongoing corrective actions, Aristech hopes to secure a NFI/NFA determination from NJDEP for Lots 20 and 21 (Ref. 10).

Off-Property Areas

The property adjacent to the southeast boundary of the Aristech site has been used as a railroad corridor since the 1820s. In 1916, the area was raised above grade to facilitate more lines and faster trains. This rail line currently serves Amtrak's Northeast Corridor High Speed Rail Line for passenger travel. Several freight rail lines and spurs were also installed in this area in the 1950s and used through the 1980s. PCBs were commonly used in electric transformers and capacitors associated with electric-powered locomotives and rail lines, but PCB use was phased out in the late 1970s and early 1980s (Ref. 7). Because this area may also have been impacted by contaminated runoff from the site, Aristech is also performing soil sampling in this off-site area.

In September 2000, soil samples were collected for PCB analysis in off-site areas along the southeastern boundary of Lots 18, 19, and 20. At each sampling location, soil samples were collected near the ground surface (0-0.5 ft bgs). In some locations, where underground utilities were not believed to be present, samples were also collected at slightly greater depths (1.5 – 2.0 ft bgs). No soil samples were necessary in the area of Lot 21, given that delineation to the NJ RDCSCC (0.49 mg/kg) was previously accomplished for this area. On the Amtrak property, 99.1 percent of the PCB mass was identified as Aroclor 1248, 0.6 percent as Aroclor 1254, 0.3 percent as Aroclor 1260, and an insignificant amount as Aroclor 1242. According to the Off-Property Remedial Investigation Report/Remedial Investigation Workplan (Ref. 7), PCB concentration ranges on the Amtrak property were reported as follows:

- Adjacent to Lot 20 – ND to 40.7 mg/kg
- Adjacent to Lot 19 – 1.21 mg/kg to 234 mg/kg
- Adjacent to Lot 18 – 0.413 mg/kg to 31.6 mg/kg.

PCB concentrations in the off-property areas were highly variable, which Aristech attributes to contaminant contributions from off-site sources (e.g., other industrial properties in the area and the railroad itself) and general draining and storm water flow patterns associated with on-property areas and the off-property drainage ditch (Ref. 7).

NJDEP recently reviewed and conditionally accepted the Off-Property Remedial Investigation Report/Remedial Investigation Workplan (Ref. 10). However, NJDEP indicated that additional clarification is required regarding Aristech's contention that PCBs are not present in significant quantities at depths equal to or greater than two feet bgs. In addition, NJDEP states that the proposal to delineate and remediate PCB-impacted off-property soil to the NJ NRDCSCC of 50 ppm, and to establish institutional and/or engineering controls, cannot be approved without written concurrence from the off-site property owner (Ref. 10). Thus, additional work is pending for the off-property areas.

Groundwater

Groundwater investigation and remediation at the Aristech site has focused on Lots 20 and 21, as groundwater beneath Lots 18 and 19 does not appear to be impacted with site-related contamination (Refs. 2 and 3). A map of groundwater monitoring locations at the Aristech site is presented in Figure 1 of Reference 8. An area of VOC contamination, primarily benzene and ethylbenzene, has been observed in the area around monitoring wells MW-1A, MW-3, MW-4A, and MW-13A at the center of the site. In November 2000, Aristech implemented a remedial program involving subsurface injection of manganese peroxide near wells MW-3 and MW-13A. The purpose of the treatment program was to elevate oxygen levels in soil and groundwater to stimulate aerobic biodegradation of VOC source residuals. According to groundwater monitoring data collected both before and after the injections, benzene and ethylbenzene

concentrations have declined significantly (Ref. 8). As discussed in the response to Question 3, ethylbenzene concentrations dropped between 68 and 100 percent following the ORC injections. Benzene concentrations decreased between 38 and 48 percent (Ref. 8). Nevertheless, benzene concentrations remain slightly above NJ GWQC in monitoring well MW-1A. To address these continuing exceedances, Aristech has proposed establishing a Classification Exception Area (CEA) and Well Restriction Area (WRA) for the area immediately surrounding the well (Ref. 8). The expected duration of these restrictions is 4.4 years—the estimated length of time needed for current benzene concentrations to drop below the NJ GWQC of 1 microgram per liter ($\mu\text{g/L}$), allowing for retardation. Until this occurs, Aristech calculates that benzene contamination above the NJ GWQC will travel only 11 feet from the well (Ref. 8). This distance still places the benzene plume well within the site boundaries when concentrations drop below standards and no longer present a concern.

An area of PCB-impacted groundwater was also observed in the vicinity of monitoring well MW-4A, but removal of source soil around the well in 1995 resulted in decreases in PCB concentrations to and below applicable groundwater standards (Ref. 4). As a result, NJDEP has allowed Aristech to discontinue analyzing groundwater samples for PCB contamination (Ref. 5).

References:

1. Remedial Action Report for Lots 18 and 19 of the USX Corporation Facility. Prepared by Environmental Liability Management (ELM), Inc. Dated June 25, 1997.
2. Memorandum from David Haymes, NJDEP, to Joe Goliszewski, NJDEP, re: Review of Remedial Action Report and Request for No Further Action for Lots 18 and 19. Dated July 29, 1997.
3. Letter from Ann Wolf, NJDEP, to Colleen Donovan, Pitney Hardin Kipp & Szuch, re: Remedial Action Report for Lots 18 and 19. Dated March 13, 1998.
4. Remedial Action Workplan Addendum #2 for Lots 20 and 21. Prepared by ELM, Inc. Dated January 13, 2000.
5. Memorandum from David Haymes, NJDEP, to Joe Goliszewski, NJDEP, re: Review of Remedial Action Workplan Addendum #2 for Lots 20 and 21. Dated August 17, 2000.
6. Email Correspondence between Agi Nadai, USEPA to Joseph Goliszewski, NJDEP, re: Aristech Fact Sheet. Dated August 30, 2000.
7. Off-Property Remedial Investigation Report/Remedial Investigation Workplan for the Former USX Corporation Site. Prepared by ELM, Inc. Dated November 26, 2001.
8. Letter from Mark Whitaker, ELM, to Joseph Goliszewski, NJDEP, re: Results of Groundwater Remediation/Monitoring Program and Request for No Further Action for Groundwater with Establishment of a CEA. Dated April 10, 2002.
9. Letter from Mark Fisher, ELM, to Karen Lesto, NJDEP, re: Revised Schedule of Implementation and Project Status Update. Dated April 23, 2002.
10. Letter from John Graham, NJDEP, to Colleen Donovan, Pitney Hardin Kipp & Szuch, re: Review of Remedial Investigation Report/Remedial Investigation Workplan dated November 26, 2001. Dated June 6, 2002.
11. Email from Karen Lesto, NJDEP, to Kristin McKenney, Booz Allen Hamilton, re: Aristech Chemical Corporation Additional Information Needs Request Relative to the Groundwater EI (CA750). Dated September 16, 2002.

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 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:

Groundwater in the vicinity of the Aristech site is encountered at approximately five feet below ground surface (bgs) in unconsolidated Wisconsin Glaciation sediments. (A layer of fill material is situated above the Glaciation sediments across most of the site from the ground surface to a depth of four feet, but groundwater has not been encountered within this layer.) The unconsolidated sediments consist of stratified and unstratified clays, silts, sands, gravels, and boulders. Whereas the stratified deposits commonly form viable water-producing aquifers in this area, local unstratified drift or till deposits are relatively impermeable and serve as poor aquifers. Groundwater also occurs in joints and fractures of the underlying Brunswick Formation bedrock, consisting of thinly bedded shale, mudstone, and sandstone. Depth to bedrock in this region generally ranges from 20 to 40 feet bgs (Ref. 1). A weathered bedrock zone was also observed immediately above bedrock in off-site wells in the vicinity of the Aristech site (Ref. 3).

Numerous wells have been installed to monitor the water table aquifer at the Aristech site. Shallow wells are generally screened from 4 to 15 feet bgs, to evaluate water quality in the upper portion of the water table aquifer. In addition, two deep wells were screened from approximately 20 to 30 feet bgs to evaluate water quality in lower portions of the water table aquifer (Ref. 2). Groundwater flow within the sediment deposits (both shallow and deep) is to the north/northwest, with an average horizontal hydraulic gradient of 0.0009 feet per foot and horizontal velocity of 27.6 feet per year (Refs. 2, 3 and 9). A slight upward vertical flow gradient has also been observed between shallow and deep wells within the water table aquifer (Ref. 2).

Although groundwater does not discharge near the Aristech site, some groundwater to surface water discharge is believed to occur at Morses Creek, approximately 4,000 feet downgradient of the site. Groundwater beneath the site is currently classified as Class II-A (potential potable water supply). Nevertheless, local water authorities (the Elizabethtown and Rahway Water Companies) indicate that

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).

groundwater in the Aristech area is not and will not be used as a public water supply in the foreseeable future (i.e., 50 years) (Ref. 4).

Groundwater monitoring began at the Aristech site in 1990. A total of 15 groundwater monitoring wells (13 shallow and 2 deep) have been installed into the water table aquifer between the surficial fill layer and underlying bedrock at the site (as shown on Figure 1 from Ref. 11), although several have since been abandoned and/or replaced due to lack of contamination or structural damage. Deep water table groundwater samples from wells DMW-11 and DMW-12 (also referenced as wells MW-11 and MW-12) were found to be in compliance with NJ GWQC for Class II-A groundwater in 1992 (Ref. 4). The lack of contamination in lower portions of the water table aquifer is supported by the measured upward vertical gradient (Refs. 3 and 4). Monitoring of the deeper water table groundwater (from approximately 25 to 35 feet bgs) has since been discontinued with NJDEP approval (Ref. 6). In addition to various groundwater investigation efforts over the years, a quarterly shallow groundwater monitoring program was implemented at the Aristech site in October 1998 (Ref. 8). The most recent quarterly monitoring round for which data are available was conducted in January 2002 (Ref. 11).

Routine monitoring has indicated the presence of several VOCs in groundwater, originating near wells MW-1, MW-3, MW-4A, and MW-13A. Benzene, styrene, and ethylbenzene have been historically reported above NJ GWQC in these source area wells, and in downgradient wells MW-1A, MW-7, and MW-8. These contaminants are believed to be the result of historic releases of styrene, which was used as a raw material for former resin production processes. Styrene has not been observed above its NJ GWQC of 100 µg/L since February 1990, when it was reported in well MW-4 at a concentration of 8,800 µg/L (Ref. 5). Because this COC was reported in site soil above New Jersey Impact to Groundwater Soil Cleanup Criteria (NJ IGWSCC), Aristech continued monitoring for styrene in the groundwater. Due to the continuing lack of groundwater impacts above NJ GWQC, styrene was eliminated from the suite of monitoring parameters in January 2001 (Ref. 11). Ethylbenzene has not been observed above its NJ GWQC of 700 µg/L since July 2000, when it was reported in well MW-13A at a concentration of 1,390 µg/L (Ref. 11).

The only contaminant observed above NJ GWQC during the last five quarterly groundwater sampling rounds is benzene. The table below presents the past year's worth of results for this groundwater COC. Although above the applicable NJ GWQC in several instances, these concentrations are lower than the maximum concentrations of benzene ever reported in wells MW-1A and MW-8 – 7.6 and 4 µg/L, respectively (Ref. 11). As shown in Table 1, the only NJ GWQC exceedances reported within the last year occur at the center of the site. Furthermore, during that last two sampling rounds, benzene exceedances have been limited to well MW-1A; concentrations in well MW-8 (located downgradient of well MW-1A) have dropped below the NJ GWQC. Geoprobe grab groundwater samples collected downgradient of MW-7 and MW-8 in 1999 also indicated no detectable VOC contamination (Ref. 10). Although routine sampling was discontinued in October 1996 (with NJDEP approval), benzene and related contamination has never been reported at detectable levels in well MW-9, located even further downgradient of the current impact area and along the northern Aristech site boundary.

Table 1. Quarterly Groundwater Monitoring Results for Benzene
(NJ GWQC = 1 µg/L)

Well	Date	Reported Concentration (µg/L)
MW-1A	4/20/01	3.8
	7/27/01	4.7
	10/5/01	4.1
	1/11/02	4.2
MW-8	4/20/01	2.1
	7/27/01	2
	10/5/01	BS
	1/11/02	ND

BS – Below NJ GWQC Standard; ND – Not Detected

Source: Reference 11, Table 2.

In addition to the VOC contamination in groundwater, an area of PCB contamination was also detected in groundwater at Aristech monitoring well MW-4A, but this contamination has dropped consistently below the NJ GWQC of 0.5 µg/L and is no longer a concern for the Aristech site (Refs. 9 and 10).

Consequently, former PCB contamination in groundwater will not be addressed further in this EI Determination.

References:

1. Revised ECRA-2 Sampling Plan for the USX Corporation Polyester Resin Plant. Unknown Author. Dated March 1987.
2. Report of Findings for the Phase II ECRA Investigation at USX Corporation. Prepared by Keystone Environmental Resources, Inc. Dated February 1992.
3. Revised Cleanup Plan for USX Corporation Site. Prepared by ELM. Dated May 27, 1992.
4. Remedial Investigation Report, Remedial Action Selection Report & Remedial Action Workplan Report for the USX Corporation Site. Prepared by ELM. Dated August 1, 1996.
5. Remedial Investigation Report and Remedial Action Workplan Addendum for Lots 20 and 21 of the USX Corporation Site. Prepared by ELM. Dated February 11, 1998.
6. Memorandum from David Haymes, NJDEP, to Joe Goliszewski, NJDEP, re: Review of Remedial Investigation Report and Remedial Action Workplan. Dated April 30, 1998.
7. Letter from Thomas Sherman, NJDEP, to Bruce Reed, ELM, re: Request for Final Closure Approval for Aristech Chemical Corporation. Dated October 30, 1998.
8. Letter from Mark Fisher, ELM, to Joseph Goliszewski, NJDEP, re: Revised Remedial Action Schedule of Implementation. Dated April 28, 1999.
9. Remedial Action Workplan Addendum #2 for Lots 20 and 21. Prepared by ELM, Inc. Dated January 13, 2000.

10. Memorandum from David Haymes, NJDEP, to Joe Goliszewski, NJDEP, re: Review of Remedial Action Workplan Addendum #2 for Lots 20 and 21. Dated August 17, 2000.
11. Letter from Mark Whitaker, ELM, to Joseph Goliszewski, NJDEP, re: Results of Groundwater Remediation/Monitoring Program and Request for No Further Action for Groundwater with Establishment of a CEA. Dated April 10, 2002.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within “existing area of contaminated groundwater”² 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”².

_____ 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:

Groundwater contamination at the Aristech site appears to have stabilized, both in terms of overall contaminant concentrations and areal extent of groundwater impacts. Such stabilization is believed to be associated with natural attenuation processes in the subsurface, as well as with source removal and treatment programs previously implemented at the facility. To ensure that contamination remains under control in groundwater at the Aristech site, the facility has proposed implementation of a groundwater CEA and WRA over the impacted area, and NJDEP will likely require continued routine groundwater monitoring. Additional detail on contaminant stabilization in Aristech groundwater is provided in the paragraphs below.

Contaminant Concentration Trends

Concentrations of all historic groundwater COCs at the Aristech site have declined or stabilized. As stated in the response to Question 2, PCB concentrations in groundwater have dropped and remain consistently below the NJ GWQC of 0.5 µg/L. Styrene and ethylbenzene concentrations in groundwater have also decreased below applicable standards—neither detected in any of the Aristech monitoring wells during the past year of quarterly sampling (Ref. 8). Benzene is the sole remaining COC for groundwater at the Aristech site. Concentrations of this contaminant have been fairly stable (varying less than 1 µg/L) over the past year in well MW-1A. In addition, recent benzene concentrations remain consistently lower than the historic maximum detection of 7.6 µg/L and only slightly above the NJ GWQC of 1 µg/L (Ref. 8).

Reduced Areal Extent of Groundwater Contamination

² “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 sampled/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 locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

In addition to declining COC concentrations, the areal extent of contamination in groundwater at the Aristech site appears to be shrinking. Many wells across Lots 20 and 21 have historically reported groundwater impacts above applicable NJ GWQC for numerous contaminants. Over the past year of quarterly monitoring however, NJ GWQC exceedances were reported for only one COC in only two wells (benzene in wells MW-1A and MW-8). Furthermore, during the two most recent quarterly monitoring rounds, only benzene in MW-1A exceeded NJ GWQC. Thus, the areal extent of groundwater contamination now appears limited to the area surrounding well MW-1A and immediate downgradient areas.

Although the report is still being reviewed by NJDEP, using a site-specific solute retardation factor of 18.8, Aristech has determined that benzene contamination in well MW-1A will travel approximately 11 feet in the downgradient direction before concentrations fall below the NJ GWQC over the next 4.4 years (Ref. 8). Since well MW-1A is located at a distance of approximately 175 feet from the nearest downgradient site boundary, groundwater contamination is expected to remain fully within Aristech property lines while at concentrations above applicable NJ GWQC. To allow for early detection of changing environmental conditions, Aristech will continue to monitor groundwater quality in source area well MW-1A and in downgradient well MW-8. Well MW-7 will also continue to be monitored for residual impacts migrating from the area of well MW-4A, even though contamination in this source area has now dropped below applicable standards. If NJ GWQC exceedances are reported in wells MW-7 or MW-8, NJDEP will require Aristech to install additional monitoring wells further downgradient to ensure that the plume can be adequately monitored (Ref. 6).

As stated previously, vertical contaminant migration at the Aristech site is limited by the observed upward vertical head, and downward contaminant migration is not a concern for the Aristech groundwater (Ref. 3).

Rationale for Decreasing Concentrations and Shrinking Areal Extent

As stated previously, reductions in groundwater contaminant levels are associated with both natural attenuation processes and engineered treatment in suspected source areas. During the last six quarterly groundwater sampling rounds, geochemical and biological parameters (e.g., dissolved oxygen, chemical oxygen demand, temperature, total viable and nonviable organisms) have been measured. As a result of this testing, Aristech has determined that conditions in the subsurface are favorable for continued aerobic and anaerobic microorganism growth and activity (Ref. 8). Carbon dioxide and total viable organism concentrations increased after the ORC injections, suggesting increased biological activity and metabolism of organic compounds in groundwater. Corresponding to decreases in contaminant levels, the number of viable organisms has decreased over time but remain generally higher than organism concentrations measured prior to the ORC injections. Other geochemical parameters remained substantially the same. The pH level of groundwater is relatively stable at 7, and groundwater temperature is slightly higher than 55 degrees Fahrenheit. Since benzene is readily biodegradable, concentrations of this constituent should continue to decline naturally. Aristech has proposed a natural attenuation remedy for the remaining COC concentrations (Ref. 8).

Previous treatment operations at the site have also contributed to declining COC concentrations and plume extent. To eliminate potential source areas, Aristech removed a leaking styrene tank from the site in 1987 and excavated contaminated soil in the vicinity of well MW-4A in 1995 (Refs. 3 and 5). To further reduce potential VOC hot spots in soil and groundwater, Aristech implemented an ORC injection

program in November 2000 (Ref. 7). ORC is a commercially available magnesium peroxide product designed to breakdown in the environment, releasing oxygen to the subsurface (Ref. 5). The injections were conducted in the vicinity of wells MW-3 and MW-13A and upgradient of well MW-4A in the location of former AOC G, as shown on Figure 1 from Ref. 8. By increasing the amount of available oxygen in the subsurface, the Aristech treatment program successfully stimulated increased biodegradation. Table 2 below presents maximum ethylbenzene and benzene concentrations before and after the treatment program. Ethylbenzene concentrations declined between 68 and 100 percent following ORC injections, with all concentrations now below the NJ GWQC of 700 µg/L. Benzene concentrations dropped between 38 and 48 percent following ORC injections. Although benzene concentrations remain slightly above the NJ GWQC of 1 µg/L, Aristech proposes natural attenuation for reduction of remaining concentrations (Ref. 8).

Table 2. Detected Concentrations of Total Benzene and Ethylbenzene in Groundwater (µg/L) Before and After November 2000 ORC Injection Program

Well	Max. Conc. Before ORC	Max. Conc. After ORC	Percent Decrease
ETHYLBENZENE			
MW-1A	ND	ND	NA
MW-3/3A	8,760	452	95%
MW-4A	841	272	68%
MW-7	5,120	ND	100%
MW-8	6,580	213	97%
MW-11	10.6	ND	100%
MW-13A	2,890	567	80%
BENZENE			
MW-1A	7.6	4.7	38%
MW-8	4	2.1	48%

Source: Ref. 8

Planned Institutional Controls

To minimize contact with impacted groundwater until concentrations drop below applicable NJ GWQC, Aristech submitted a proposal for establishment of a CEA and WRA in the vicinity of well MW-1A. Figure 3 from Ref. 8 graphically shows the proposed CEA/WRA location. The horizontal location is consistent with Aristech's determination that contamination in the subject well will travel only 11 feet downgradient before decreasing to and below the NJ GWQC of 1 µg/L (Ref. 8). The CEA will extend vertically through shallow portions of the water table aquifer to an approximate depth of eight feet bgs (Ref. 5). The expected duration of the CEA (based on current benzene concentrations in well MW-1A) is 4.4 years (Ref. 8). NJDEP has encouraged the facility to establish these controls, but the proposal remains under regulatory review at this time.

References:

1. Report of Findings for the Phase II ECRA Investigation at USX Corporation. Prepared by Keystone Environmental Resources, Inc. Dated February 1992.
2. Revised Cleanup Plan for USX Corporation Site. Prepared by ELM. Dated May 27, 1992.
3. Remedial Investigation Report, Remedial Action Selection Report & Remedial Action Workplan Report for the USX Corporation Site. Prepared by ELM. Dated August 1, 1996.
4. Remedial Action Report for Lots 18 and 19 of the USX Corporation Facility. Prepared by ELM. Dated June 25, 1997.
5. Remedial Action Workplan Addendum #2 for Lots 20 and 21. Prepared by ELM, Inc. Dated January 13, 2000.
6. Memorandum from David Haymes, NJDEP, to Joe Goliszewski, NJDEP, re: Review of Remedial Action Workplan Addendum #2 for Lots 20 and 21. Dated August 17, 2000.
7. Letter from Mark Fisher, ELM, to Joseph Goliszewski, NJDEP, re: Remedial Action Workplan Addendum #2 for Lots 20 and 21. Dated August 13, 2001.
8. Letter from Mark Whitaker, ELM, to Joseph Goliszewski, NJDEP, re: Results of Groundwater Remediation/Monitoring Program and Request for No Further Action for Groundwater with Establishment of a CEA. Dated April 10, 2002.

4. Does “contaminated” groundwater **discharge** into **surface water** bodies?

___ If yes - continue after identifying potentially affected surface water bodies.

X 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:

Groundwater beneath the Aristech site flows northward and northwestward toward Morses Creek, the nearest downgradient surface water body, located approximately 4,000 feet from the site. Although the record file indicates that water table groundwater may discharge into the creek, Aristech estimates that contamination currently found at the site will not migrate beyond the Aristech site and, therefore, will have no impact on surface water quality. According to the Revised Cleanup Plan from May 1992 (Ref. 1), groundwater from the site would take more than 100 years to reach the creek, given the reported flow velocity of 27.6 feet per year. Based on site-specific hydrogeological factors, Aristech has determined that the only remaining site-related COC – benzene – should drop below the NJ GWQC within the next four to five years (Ref. 2), migrating a distance of only 11 feet downgradient of monitoring well MW-1A before dropping below 1 µg/L. Given this estimated distance, groundwater exceedances are not expected to reach downgradient wells on site, and would certainly not be present in groundwater at the time of discharge into Morses Creek.

There are no other suspected or confirmed groundwater to surface water discharge points in the vicinity of the Aristech site (Ref. 1).

References:

1. **Revised Cleanup Plan for USX Corporation Site. Prepared by ELM. Dated May 27, 1992.**
2. **Letter from Mark Whitaker, ELM, to Joseph Goliszewski, NJDEP, re: Results of Groundwater Remediation/Monitoring Program and Request for No Further Action for Groundwater with Establishment of a CEA. Dated April 10, 2002.**

5. Is the **discharge** of “contaminated” groundwater into surface water likely to be **“insignificant”** (i.e., the maximum concentration³ 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 ecosystems at these concentrations)?

- ___ If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ 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 judgement/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 ecosystem.
- ___ If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ 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 concentrations³ 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:

Question not applicable. See response to Question #4.

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

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 ecosystems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

- ___ 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 ecosystems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment⁵, appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialist, including an ecologist) adequately protective of receiving surface water, sediments, and ecosystems, 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, use/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 ecosystem.
- ___ If unknown - skip to 8 and enter “IN” status code.

Rationale:

Question not applicable. See response to Question #4.

⁴ 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.

⁵ 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 ecosystems.

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:

A quarterly groundwater monitoring program was initiated at the Aristech site in October 1998 and continues to date. The program currently involves collection of samples on a quarterly basis from source area wells MW-3, MW-4A, and MW-13A; plume monitoring wells MW-1A and MW-11; and downgradient compliance/sentinel wells MW-7 and MW-8. All of the other monitoring wells at the Aristech site have been decommissioned with NJDEP approval (Refs. 3 and 4). If NJ GWQC exceedances are reported in wells MW-7 or MW-8, NJDEP will require Aristech to install additional monitoring wells further downgradient to ensure that the plume can be adequately monitored (Ref. 3). Groundwater samples are analyzed for the presence of benzene and ethylbenzene, as well as for specific geochemical and biological parameters indicative of ongoing natural attenuation in the subsurface (Ref. 5).

NJDEP requires that Aristech conduct a minimum of eight quarterly groundwater monitoring rounds following the ORC injections (Ref. 3). NJDEP also requires that the facility “demonstrate a statistically valid decreasing trend in contaminant concentrations in all impacted monitoring wells in order to discontinue groundwater sampling” (Ref. 3). The required statistical analysis must be based on results of eight consecutive quarterly sampling rounds completed after implementation of all active remedial actions. To date, Aristech has completed and documented only five of the required quarterly groundwater monitoring rounds (Ref. 5). Thus, groundwater monitoring at the Aristech site is expected to continue for at least the next three quarters. Furthermore, given minor fluctuations in benzene concentrations in well MW-1A over the last year of sampling (as shown in the table in the response to Question 2), as well as the questionable quality of ethylbenzene data contained in the April 2002 monitoring report (Refs. 5 and 6), it may be difficult for the facility to show statistically significant contaminant-specific decreases over the initial eight quarterly sampling rounds. In that case, quarterly groundwater monitoring will be carried over for future quarters until a significant decreasing trend is established.

In the most recent groundwater monitoring report from April 2002 (Ref. 5), Aristech discussed overall plans for establishing a final CEA and WRA at the site and possibly terminating the groundwater monitoring program. Citing current NJDEP guidance and policy, Aristech believes that no further sampling will be required as part of the final CEA and WRA because the site is located in a non-groundwater use area. NJDEP expects to review this proposal by the end of 2002 (Ref. 7). No

determination has yet been made by NJDEP, however it is unlikely that groundwater monitoring will be discontinued until the requirements discussed in the previous paragraph have been addressed.

References:

1. Memorandum from David Haymes, NJDEP, to Joe Goliszewski, NJDEP, re: Review of Remedial Investigation Report and Remedial Action Workplan. Dated April 30, 1998.
2. Remedial Action Workplan Addendum #2 for Lots 20 and 21. Prepared by ELM, Inc. Dated January 13, 2000.
3. Memorandum from David Haymes, NJDEP, to Joe Goliszewski, NJDEP, re: Review of Remedial Action Workplan Addendum #2 for Lots 20 and 21. Dated August 17, 2000.
4. Letter from Mark Fisher, ELM, to Joseph Goliszewski, NJDEP, re: Remedial Action Workplan Addendum #2 for Lots 20 and 21. Dated August 13, 2001.
5. Letter from Mark Whitaker, ELM, to Joseph Goliszewski, NJDEP, re: Results of Groundwater Remediation/Monitoring Program and Request for No Further Action for Groundwater with Establishment of a CEA. Dated April 10, 2002.
6. Memorandum from Haydar Erdogan, NJDEP, to Karen Lesto, NJDEP, re: Review of Results of Groundwater Remediation/Monitoring Program and Request for No Further Action for Groundwater with Establishment of a CEA. **Dated May 13, 2002.**
7. Email from Karen Lesto, NJDEP, to Kristin McKenney, Booz Allen Hamilton, re: Aristech Chemical Corporation Additional Information Needs Request Relative to the Groundwater EI (CA750). Dated September 16, 2002.

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 Aristech Chemical Corporation (formerly USX Corporation) site, EPA ID #NJD001724988, located at 1711 West Elizabeth Avenue, Linden, New Jersey. 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 if 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: _____
Michele Benchouk
Engineering Consultant
Booz Allen Hamilton

Date: _____

Reviewed by: _____
Pat Shanley
Geologist
Booz Allen Hamilton

Date: _____

Also reviewed by: _____
Alan Straus, RPM
RCRA Programs Branch
EPA Region 2

Date: _____

Andrew Park, Acting Section Chief
RCRA Programs Branch
EPA Region 2

Date: _____

Approved by: Original signed by: _____
Barry Tornick, Acting Chief
RCRA Programs Branch
EPA Region 2

Date: 9/20/2002

Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at the USEPA Region 2, RCRA Records Center, located at 290 Broadway, 15th Floor, New York, New York, and the NJDEP office located at 401 East State Street, Records Center, 6th Floor, Trenton, New Jersey.

Contact telephone number and e-mail address:

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Attachments

The following attachment has been provided to support this EI determination.

- ▶ Attachment 1 - Summary of Media Impacts Table

Attachment 1 - Summary of Media Impacts Table
Aristech Chemical Corporation, 1711 West Elizabeth Avenue, Linden, NJ 07036

	GW	Air (Indoors)	Surface Soil	Surface Water	Sediment	Subsurface Soil	Air (Outdoors)	Corrective Action Measures	Key Contaminants
PCBs in Groundwater	Yes	NA	NA	NA	NA	NA	NA	<ul style="list-style-type: none"> Excavation of impacted soil at well MW-4A in 1995 Concentrations now below NJ GWQC of 0.5 µg/L No ongoing monitoring program planned 	PCBs
VOCs in Groundwater	Yes	NA	NA	NA	NA	NA	NA	<ul style="list-style-type: none"> Excavation of impacted soil at wells MW-3 and MW-13A in February 2002 Placement of a durable asphalt and concrete cover at Lots 20 and 21 in July 2002 to reduce infiltration Injection of ORC near wells MW-3 and MW-13A to stimulate biodegradation Only benzene concentrations remain above NJ GWQC of 1 µg/L CEA proposed for area surrounding well MW-1A; under regulatory review Ongoing monitored natural attenuation 	Benzene Ethylbenzene Styrene