

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

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

Migration of Contaminated Groundwater Under Control

Facility Name: Crompton Corp.-Petrolia Plant (Witco Chemical Corp., CK Witco)
Facility Address: Route 269, Petrolia, PA 16050
Facility EPA ID #: PAD004388500

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?

- 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.

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 "Migration of Contaminated Groundwater Under Control" EI

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

Relationship of EI to Final Remedies

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

Duration / Applicability of EI Determinations

EI 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).

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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?

- 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 and Reference(s):

The primary sources of data and information regarding contaminant levels at, or from, the facility as identified in this Environmental Indicator (EI) include a Preliminary Conceptual Site Model (CSM) and Proposed Groundwater Investigation Workplan Report (Environmental Strategies Corporation, June 13, 2001); a Project Plan Report (Environmental Strategies Consulting LLC, July 9, 2004); Development of Ambient Water Quality Criteria for Benzene Metadisulfonic Acid, Benzene Monosulfonic Acid, p-Phenol Sulfonic Acid, and Resorcinol (AMEC Earth & Environmental, March 8, 2004); DEP and Crompton – Consent Order and Agreement (Commonwealth of Pennsylvania Department of Environmental Protection (PADEP), October 2, 2003); and October 2004 groundwater, soil, surface water, and waste material sampling results for sulfonic acids and resorcinol. Within the CSM and Project Plan, groundwater investigation results are compared to Act 2 medium-specific concentrations (MSCs) and U.S. Environmental Protection Agency (EPA) Region 3 Risk-based Concentrations (RBCs) for tap water. For the purpose of this EI determination, all results were first compared to EPA Maximum Contaminant Levels (MCLs) or EPA RBCs if an MCL does not exist, or other available guidelines or criteria, as necessary. While the investigation activities have yet to be completed, data in the documents referenced are sufficient to evaluate whether the migration of contaminated groundwater has stabilized, and will remain within the original area of contaminated groundwater subject to RCRA corrective action.

The CSM and Project Plan summarize site conditions based on data collected to date. They identify 20 areas of concern (AOCs) and 2 former operations areas, which are grouped into 9 groundwater management areas (MAs) based on location, local hydrogeology, and the regulated substances present within each area. In 2001, 30 monitoring wells were installed to supplement the 33 existing monitoring wells, and three site wide groundwater sampling and characterization events were undertaken in January 2002, April 2003, and October 2004. Sampling has confirmed that benzene is present in wells MW-16B, OW-6, 903, 904 (abandoned), and 904R at the facility exceeding EPA’s MCL of 5 ug/l. Benzene concentrations have also been detected in wells MW-12 and MW-27 at 90 µg/l and 780 µg/l, respectively.

The only semi-volatile organic compound detected above EPA standards is bis(2-Ethylhexyl)phthalate. The detected concentrations range from 3.6J to 11 ug/l and appear to be associated with MAs 7 & 9 on the eastern and southern sides of the site.

Sample results have also shown that groundwater concentrations exceed MCLs or RBCs for certain metals, including aluminum, arsenic, beryllium, boron, cadmium, chromium, cobalt, iron, lead, manganese, and nickel. Metals contaminated groundwater is found in wells 901, 902, 903, 904, 904R, MW-2, MW-4, MW-8, MW-11, MW-12, MW-14, MW-16B, MW-17, MW-20, MW-21, MW-22, MW-23, MW-27 OW-1, and OW-6. In most cases, the January 2002 sampling event revealed more metals exceeding MCLs or RBCs and the subsequent sampling events showed a decrease in metals concentrations, attributable to implementing low stress purging and sampling, which better represents groundwater conditions in the aquifer and suggests suspended particles accounted for most of the previous exceedances. Not all metals listed above were detected in each monitoring well. More importantly, secondary contaminants (manganese and iron) make up the majority of the contamination and are thought to be attributed to regional groundwater conditions (see rationale for question 6 for further discussion regarding regional groundwater conditions) because wells throughout the site displayed similar concentrations with the exception of wells MW-16B, 903, 904, 904R. In addition to iron and manganese, wells MW-16B, 903, 904, and 904R showed significantly increased concentrations of aluminum; monitoring wells OW-1, OW-5, OW-6, MW-903, and MW-904R exhibited concentrations of arsenic above the MCL; wells 903, MW-2, MW-23, MW-27,

and MW-31 showed concentrations of lead above the MCL; and MW-16B showed concentrations of nickel, cobalt, chromium, beryllium, and vanadium above the MCLs.

The compounds detected in groundwater at concentrations greater than their appropriate regulated groundwater levels are listed below with their respective concentration ranges.

	<u>PADEP</u> MSC	<u>EPA</u> RBC (MCL)	Detected Concentrations (a)
Organics (µg/l)			
Benzene	5	0.34 (5)	5.3 – 2,600
Bis(2-Ethylhexyl)phthalate	6	4.8 (-)	3.6 J – 11
Metals (mg/l)			
Aluminum	0.2	37 (-)	0.252 – 5,470 L
Arsenic	0.05	0.000045 (0.010)	0.00207 J – 0.175
Beryllium	0.004	0.073 (0.004)	0.0044 – 0.157 J
Boron	0.6	7.3 (-)	2.32 – 2.65
Cadmium	0.005	0.018 (0.005)	0.0069 J – 0.008 J
Chromium	0.1	0.11 (0.1)	0.181 – 3.24
Cobalt	2	0.73 (-)	2.22
Iron	0.3	11 (-)	0.362 L – 5,950 L
Lead	0.005	- (0.015)	0.0056 – 0.753
Manganese	0.3	0.73 (-)	0.14 – 351
Nickel	0.1	0.73 (-)	0.105 – 0.228

(a) J = estimated concentration; concentration detected below laboratory reporting limit; L= reported value may be biased low; K = reported value may be biased high.

Additionally, two site-wide groundwater and surface water sampling events for sulfonic acids and resorcinol were conducted in October 2004 and May 2005. The May 2005 results have not yet been received and were unavailable for review during the preparation of this document. Groundwater samples were collected for benzene sulfonic acid (BSA), meta-benzene disulfonic acid (m-BDSA), para-phenol sulfonic acid (p-PSA), and resorcinol. Sulfonic acid compounds (BSA, m-BDSA, and p-PSA) were detected in monitoring and production wells; however, resorcinol was not detected above the laboratory method detection limit.

BSA was detected in groundwater from monitoring wells at concentrations ranging from 0.001 to 80.6 J mg/l, m-BDSA was detected at concentrations ranging from 0.008 to 1.2 mg/l, and p-PSA was detected at concentrations ranging from 0.005 to 36.5 J mg/l. Groundwater samples from onsite production wells (non-potable water) contained sulfonic acid concentrations ranging from 0.065 to 0.226 mg/l (BSA), 0.025 to 0.062 mg/l (m-BDSA), and 0.005 to 0.02 mg/l (p-PSA). South Branch of Bear Creek surface water sampling results ranged from 0.001 to 0.006 mg/l (BSA), 0.003 to 0.007 mg/l (m-BDSA), and 0.002 to 0.005 mg/l (p-PSA). Sulfonic acids were detected in surface water samples at locations upstream of, proximate to, and downstream of the facility, at low concentrations of less than 0.008 mg/l. Currently, there are no MSCs, MCLs, RBCs, or other promulgated standards or screening criteria for the sulfonic acid compounds detected at the facility.

Light non-aqueous phase liquid (LNAPL) is present in well MW-28 at a thickness of approximately 2.0 feet. No constituents of interest were detected in volatile and semi-volatile organic compound analysis of the LNAPL above MSCs or RBCs. Fingerprint and distillation analysis indicate the LNAPL resembles a mixture of two or more neutral oil feedstocks used in plant production.

Footnotes:

(10/11/2005)

r“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).

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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)?
- 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 and Reference(s):

Benzene contaminated groundwater is limited to monitoring wells immediately downgradient of former waste handling or disposal areas. Benzene is present in wells MW-12, MW-16B, MW-27, OW-6, 903, 904 (abandoned), and 904R. All of these wells are located in the unconsolidated material except for MW-12 which is located in the Upper Worthington Sandstone unit. The closest downgradient wells are non-detect for benzene which shows the migration has remained stable over the three groundwater sampling events.

The only semi-volatile organic compound detected above PADEP or EPA standards is bis(2-Ethylhexyl)phthalate. The detected concentrations range from 3.6J to 11 ug/l and appear to be associated with wells surrounding Management Area's 7 & 9 on the eastern and southern sides of the site. The wells that bis(2-Ethylhexyl)phthalate has been detected in include OW-1, OW-3, OW-5, MW-11, MW-12, and MW-31. These wells are located in the unconsolidated, upper, and shallow formation aquifers and downgradient wells are non-detect showing migration stabilization.

Due to the fact that 16A, which monitors the next aquifer below 16B, and downgradient wells show very low or non-detect concentrations of the dissolved phase of metals found in this well, stabilization exists at MW-16B. Similarly, monitoring wells OW-1, OW-5, OW-6, MW-2 and MW-31 exhibit similar characteristics and are considered stabilized. Monitoring wells 903, 904, 904R, MW-23, and MW-27 are located adjacent to Bear Creek and potentially discharge into the creek. Metals contaminated groundwater is considered stabilized from these wells due to discharge to the stream and surrounding wells within the same unconsolidated layer showing very low or non-detect concentrations of the contaminants.

Monitoring wells L-1, L-2, L-3, L-4, and L-5 were installed to delineate the extent of the LNAPL in MW-28 and to evaluate the stability of the LNAPL plume. Based on several monitoring events, the LNAPL appears to be stable and confined within a 50-foot radius of MW-28 and east of the South Branch of Bear Creek. Crompton has implemented a LNAPL recovery program.

Groundwater samples have been analyzed for sulfonic acids during two sampling events (October 2004 and May 2005). The results of the May 2005 sampling event were not yet received at the time of this EI analysis. The results of the October 2004 sampling event indicate the presence of sulfonic acids in shallow aquifers underlying and immediately downgradient of MAs 1, 2, and 6. In the event these compounds were released at the facility, based on limited data, the precise horizontal and vertical extent of this contamination is unknown. However, per the consent Order and Agreement (CO&A) between Crompton and PADEP dated October 2, 2003, groundwater used as a water supply within an area defined as “Bear Creek Chemical Site Boundary” is being monitored for these compounds by Crompton and PADEP and an alternative potable water supply is being provided by PADEP in any case where these compounds are detected in the potable water supply. This boundary is based on PADEP's evaluation of a Bear Creek Chemical Area groundwater quality data base and available hydrogeologic data and is designed to include any groundwater potentially impacted by the facility. Since any sulfonic acid impacted groundwater from the facility is not expected to migrate outside the Bear Creek Chemical Site Boundary, for the purposes of this EI, any such contamination is expected to remain within the dimension of the “existing area 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.

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

- If yes - continue after identifying potentially affected surface water bodies.
- If no - skip to #7 (and enter a “YE” status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater “contamination” does not enter surface water bodies.
- If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

The South Branch of Bear Creek is located on the east side of the facility. The creek flows south to north. The site conceptual model along with fate and transport modeling results indicate that contaminated groundwater potentially discharges to the Creek (Environmental Strategies 2004).

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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 eco-systems 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 eco-system.
- If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected 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 and Reference(s):

The potential organic constituent of interest identified in groundwater is benzene. The specific areas with benzene detections include MAs 1,2,5,6, and 9. Due to proximity to Bear Creek, concentrations below 10x the MCL, or downgradient wells exhibiting concentrations below MCLs, only wells around MAs 5 & 6 have the potential to discharge contaminated groundwater greater than 100 times their appropriate groundwater level into surface water. This is discussed further below.

Bis(2-Ethylhexyl)phthalate was only identified in wells around MAs 7 & 9 and concentrations do not exceed 10 times their appropriate groundwater level. The wells that bis(2-Ethylhexyl)phthalate has been detected in include OW-1, OW-3, OW-5, MW-11, MW-12, and MW-31. These wells are located in the unconsolidated, upper, and shallow formation aquifers and downgradient wells are non-detect showing that discharge to surface water is not likely.

Wells OW-1, OW-5, OW-6, MW-903, and MW-904R exhibited concentrations of arsenic above the MCL after implementation of the low stress purging and sampling procedures. These wells monitor MA's 6 & 9 which include former landfills or lagoons that could be attributing to the groundwater exceedances. Discharge of contaminated groundwater into surface water from wells OW-5 and OW-6 is insignificant due to the distance to Bear Creek and concentrations below 10x the MCL. However, well OW-1 continually demonstrated a concentration of arsenic greater than 10x the MCL with a maximum concentration of 175 ug/l. It was determined that OW-1 contamination was insignificant because it is located approximately 1000 feet from Bear creek and downgradient wells exhibit concentrations below MCLs indicating that contamination from this well does not reach surface water. Wells 903, 904R, and 904 (removed before low stress purging and sampling) are located adjacent to, and may discharge to, Bear Creek. Well 904 previously showed concentrations of arsenic similar to OW-1. It was found that well 904 was situated in the waste sludge and was not representative of groundwater conditions. The replacement well, 904R, and MW-903 arsenic concentrations have been below 10x the MCL, therefore, discharge of from these wells is not likely to be significant.

MW-16B was the only other well with elevated arsenic concentrations and, in addition, it had elevated lead and chromium levels. These concentrations were from the April 2003 and October 2003 sampling events and were in total metals and

direct comparison to MCL values was not applicable. However, the January 2002 sampling event did provide dissolved phase concentrations and lead and chromium were in exceedance while arsenic was non-detect at an elevated detection level. Due to its proximity to Bear Creek (900 feet) and the fact that 16A, which monitors the next aquifer below 16B, and downgradient wells show very low or non-detect concentrations of the dissolved phase of each constituent signifies that discharge to surface waters from this well was not a concern.

Remaining beryllium, boron, cadmium, chromium, cobalt, lead, and nickel maximum concentrations are less than 10 times their appropriate groundwater level.

Compounds that are considered significant and may discharge into the surface water at concentrations greater than 100 times their appropriate groundwater level have the estimated total discharge mass provided below. To determine the potential mass, the PADEP Act 2 spreadsheet model SWLOAD5B was used to estimate the average groundwater concentration, plume flow, and mass loading of these constituents to surface water from diffuse groundwater discharges. Benzene and metals including aluminum, iron, and manganese were detected at some of the highest concentrations in monitoring well 904R. Therefore, well 904R was used as representative of the maximum concentrations in groundwater that potentially discharge to a surface water body.

	Detected Concentrations (a)		
	Standard (b)	Maximum Concentration	Mass Discharge (kg/year)
Organics (µg/l)			
Benzene	5 (500)	2,600	0.29
Metals (mg/l)			
Aluminum	0.2 (--)	316	103.2
Iron	0.3 (--)	1,250	408.1
Manganese	0.3 (30)	33.6	10.97

(a) Concentration in 904R; NA = not greater than 100 times level.

(b) Value in parentheses represents Act 2 MSC for groundwater collected from wells with TDS greater than 2,500 µg/l; (--) indicates preceding value is EPA SMCL, Act 2 MSC for high TDS does not exist.

Concentrations of the above contaminants have been shown to be stable or decreasing in site groundwater, therefore, there is no evidence that the concentrations or mass discharge loadings are increasing.

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

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6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and 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 eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR
2) providing or referencing an interim-assessments, appropriate to the potential for impact that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, 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 eco-systems.
- If unknown - skip to 8 and enter “IN” status code.

Rationale and Reference(s):

To determine possible benzene concentrations in surface water, samples were collected upstream and downstream of MA 6 in November 2000. There were no detections of benzene in the South Branch of Bear Creek. However, Act 2 guidance mandates that the effects on surface water from diffuse discharge of groundwater be evaluated under low flow conditions. To determine the potential effects, the PADEP has prepared a spreadsheet, SWLOAD5b¹, to estimate the average groundwater concentration, plume flow, and mass loading of a constituent to surface water from diffuse groundwater discharges for determining surface water compliance with Act 2. Based on an edge criterion concept (a constituent-specific criterion based on the MSCs), and the likelihood that the plume, if any, will discharge into a surface body at a concentration greater than the edge criterion, the discharge may be further evaluated using PENTOXSD², a surface water-mixing model. If no portion of the plume is entering the surface water at the time the maximum average concentration exceeds the edge criterion, no further demonstration of surface water attainment is needed.

The SWLOAD5B model was conducted for benzene at MA 6. The results of the model indicated that further evaluation using the PENTOXSD model was required. The input parameters for PENTOXSD were obtained from the current NPDES permit for the facility (e.g., stream flow, elevations, drainage areas, reach characteristics). The results of the PENTOXSD model indicated that the loading of benzene (0.85 ug/L) to the South Branch of Bear Creek was within acceptable limits, using the most stringent governing criterion, the human health cancer risk level for benzene. Further strengthening this

¹ Based on “An Analytical Model for Multidimensional Transport of a Decaying Contaminant Species”, by P.A. Domenico, Journal of Hydrology, 91:49-58, 1987.

<http://www.dep.state.pa.us/dep/deputate/airwaste/wm/landrecy/manual/Manual.htm>

² Technical Reference Guide (TRG) PENTOXSD for Windows PA Single Discharge Wasteload Allocation Program for Toxics Version 2.0. 391-2000-011 Bureau of Water Supply and Wastewater Management TRG 391-2000-011 <http://www.dep.state.pa.us/dep/deputate/airwaste/wm/landrecy/manual/Manual.htm>

decision is that the model predictions are below PADEP's fish and aquatic life criteria of 128 ug/L (EPA does not have a water quality criteria value for benzene); and the model predictions are verified by non-detect instream sample results.

The EPA has documented in the Current Human Exposures Under Control EI RCRIS Code (CA725) dated 9/25/2003 that use of the South Branch of Bear Creek downstream of the facility appears to be minimal and human exposure to any surface water and sediment potentially impacted from the facility is likely to be insignificant and, therefore, the pathway is considered to be incomplete. For this reason, from this point forward human exposure is not considered and the potential impacts that will be shown to be currently acceptable are eco-system related. This results in a comparison of data to water quality criteria and diverts from comparison to MCLs or RBCs.

Constituent levels from wells mentioned previously that are adjacent to Bear Creek and have the potential to discharge contaminated groundwater into the creek were reevaluated and compared to water quality criteria which represent surface water quality and not groundwater criteria as discussed per the previous EI questions. The results remain consistent with the prior findings in that data from the wells do not exceed 10x the water quality criteria for contaminants with the exception of benzene, aluminum, iron, and manganese. Benzene was discussed previously in this section and was found to be currently acceptable.

The EPA has evaluated the aluminum, iron, and manganese concentrations and has determined that they are currently acceptable for the following reasons. The 10/29/04 downstream surface water samples (Documentation of Environmental Indicator Determination, Beazer/INDSPEC Properties, July 15, 2005) obtained from INDSPEC (located approximately 1000 feet immediately downstream from Crompton) reveal aluminum and iron concentrations below their respective Criterion Continuous Concentration (CCC) water quality criteria which is the highest concentration an aquatic community can be exposed to indefinitely without resulting in an unacceptable effect. Manganese does not have published CCC water quality criteria. However, it is known that the Bear Creek is historically impacted by acid mine drainage and the consistent downstream levels are believed to be attributed to this and not a result of possible localized affects from Crompton. The presence of iron and manganese in the remaining wells is likely due to the regional geology and the regional, historical mining activities. A study by the US Geological Survey (USGS)² noted that metals and trace elements were naturally present in the rocks and soils in the basin, and that widespread detection of these metals indicates natural sources not associated with a specific land use. Generally, the water quality in this basin was not significantly different from water quality in similar shale and sandstone aquifers located throughout Pennsylvania and any impacts to surface water should be considered background in nature. Under these circumstances, any impacts to eco-receptors by metals released from the facility can be mitigated by corrective measures to be selected as part of the final remedy and are considered acceptable.

AMEC Earth & Environmental (AMEC)¹ performed a study to determine and propose ambient water quality (AWQC) criteria for sulfonic acids which have not been established, to date. The AMEC study was essentially a bioassay performed on several species to determine an appropriate no-effect and a toxicity threshold to be used as ambient water quality criteria. The resulting acute and chronic proposed AWQC values are substantially higher than on-site concentrations in the groundwater.

The highest groundwater concentrations of BSA, m-BDSA, and p-PSA are 80.6 mg/L, 1.2 mg/l, and 36.5 mg/l, respectively. The proposed chronic and acute AWQC are:

Compound	CMC (acute AWQC) mg/L	CCC (chronic AWQC) mg/L
m-BDSA	2,592	1,639
BSA	1,956	1,139
p-PSA	3,482	1,364

The October 2004 sulfonic acid and resorcinol sampling results report the highest surface water concentrations of BSA, m-BDSA, and p-PSA as 6.9 ug/l, 7.0 ug/l, and 5.1 ug/l, respectively. These values are many orders of magnitude below the proposed AWQC and verify that surface water contamination of these constituents is acceptable. EPA is performing an internal toxicological review of the proposed AWQC criteria. If significant changes to the proposed AWQC are recommended, this portion of the EI will be reevaluated.

⁴Note, 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.

⁵The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

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1. Development of Ambient Water Quality Criteria for Benzene Metadisulfonic Acid, Benzene Monosulfonic Acid, p-Phenol Sulfonic Acid, and Resorcinol, AMEC, March 2004
 2. "Quality of Ground Water at Selected Sites in the Upper Mahoning Creek Basin, Pennsylvania", Fact Sheet 176-96, July 1996.

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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?”

If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.”

If no - enter “NO” status code in #8.

If unknown - enter “IN” status code in #8.

Rationale and
Reference(s):

The final remedy for the site has not been developed. Thus, the groundwater monitoring program has not been specified. Additional groundwater monitoring will be conducted in accordance with the attainment and post-closure monitoring requirements of Act 2 and in general conformance with RCRA Corrective Action.

**Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)**

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).

- 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 Crompton Corporation Petrolia facility, EPA ID # PAD004388500, located at Route 269, Petrolia, Pennsylvania 16050. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.
- NO - Unacceptable migration of contaminated groundwater is observed or expected.
- IN - More information is needed to make a determination.

Completed by (signature) _____ /s/ _____ Date 9/29/2005
 (print) _____
 (title) _____

Supervisor (signature) _____ /s/ _____ Date 9/29/2005
 (print) _____
 (title) _____
 (EPA Region or State) _____

Locations where References may be found:

US EPA Region III
 Waste & Chemicals Management Division
 1650 Arch Street
 Philadelphia, PA 19103

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