

US EPA ARCHIVE DOCUMENT

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final (2/5/99)

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

Facility Name: Former Tecumseh Products Company (Tecumseh Compressor) Facility
Facility Address: 100 E. Patterson, Tecumseh, MI
Facility EPA ID #: MID005049440

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 #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 "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?

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 and Reference(s):

Soils and groundwater are contaminated with hazardous and non-hazardous wastes throughout the site. A groundwater monitoring program was implemented in 2009 during a property transaction between Tecumseh Products and a prospective purchaser, and has continued with modifications and additional monitoring wells through the present. Investigation was originally initiated in 2008 by the prospective purchaser. Investigation work is ongoing and the extent of soil and groundwater contamination has not yet been characterized. The primary contaminants are volatile organic compounds (VOCs), including tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-DCE), trans-1,2-dichloroethene (trans-DCE), and vinyl chloride. Levels of TCE in the groundwater were detected at concentrations up to 7,500 ug/L at the north property line (MW-4S), and up to 5,400 ug/L at the southeast property line (B-50) during investigation completed through 2014. Contamination extends off-site to the northeast and east into residential areas. TCE levels 1,000 feet east of the site (MW-21) increased from 730 ug/L to 1,600 between 2009 and 2014. Vinyl chloride levels in the monitoring well 1,000 feet northeast of the site (MW-23) increased from 3.2 ug/L to 120 ug/L between 2009 and 2014, but was previously identified at 430 ug/L at deeper intervals that are not being monitored. Additional investigation requested by EPA and completed in 2015 identified TCE up to 12,000 ug/L off-site to the north of the property, and PCE up to 32,000 ug/L in the southeast corner of the property. Vinyl chloride was found at levels up to 2,600 ug/L one block north of the site, and up to 1,400 ug/L two blocks north of the site where shallower intervals were being monitored (MW-23). TCE was also found up to 2,800 ug/L 1,000 feet off-site to the east, south of MW-21, and at 1,200 ug/L immediately adjacent to the wetland during additional GSI evaluation in August 2015. The standards for groundwater are the Federal Maximum Contaminant Levels (MCLs); 5.0 ug/L for TCE and 2.0 ug/L for vinyl chloride.

REFERENCES: (a) Remedial Investigation and Groundwater Environmental Indicator Report, September 2012 (TRC); (b) Supplement to the Current Human Exposures Environmental Indicator Report and Proposed Extension Pursuant to Paragraph 21 of the AOC; RCRA 3008(h) Administrative Order on Consent (AOC) (RCRA-05-2010-0012), September 30, 2013 (TRC); (c) EPA’s Response to Tecumseh Products Company’s September 30, 2013 Supplemental Submission to the Human Exposure Environmental Indicator Report (MID005049440), January 31, 2014 (US EPA); (d) Fourth Quarter 2014 Progress Report – MID 005-049-440, January 15, 2015 (TRC); (e) Supplement to Remedial Investigation and Environmental Indicator Report, RCRA 3008(h) Administrative Order on Consent (RCRA-05-2010-0012), July 31, 2015.

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).

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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.

X_____ **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):

The extent of groundwater contamination is not defined, and the monitoring network does not meet the criteria specified below². There are insufficient permanent monitoring wells to evaluate a plume of this size and magnitude, and many monitoring wells are positioned at improper depths to define the extent of contamination in three dimensions². In September 2012, the facility submitted a Remedial Investigation and Groundwater Environmental Indicator Report that included, *Figure 20 – Extent of VOCs above Part 201 Criteria*, showing the extent of groundwater contamination at the time the facility submitted their Groundwater EI determination. In July 2013, the facility submitted a quarterly monitoring report that included, *Figure 9 – Extent of VOCs above Part 201 Criteria*, showing that the extent of groundwater contamination had expanded since the time of their original determination. The demonstrated expansion of the plume by the facility was documented in EPA’s June 9, 2014 correspondence letter as Figures 13 and 14. Increasing contaminant concentrations in certain wells (MW-23 and MW-21, among others) since the time of the facility’s attempted Groundwater EI demonstration further support the interpretation that the plume is expanding and/or migrating. In August 2015, EPA prepared a revised TCE isoconcentration map, vinyl chloride isoconcentration map, and extent of groundwater contamination map based on MIP/HRSC investigation data from 2015 that further demonstrated the expansion of the plume beyond the area of contaminated groundwater defined by the facility in 2012.

REFERENCES: (a) Remedial Investigation and Groundwater Environmental Indicator Report, September 2012 (TRC); (b) Second Quarter 2013 Progress Report – MID 005-049-440, July 15, 2013 (TRC); (c) Summary of Additional Investigative Work to be Performed Following May 12, 2014 Meeting, Pursuant to Administrative Consent Order, MID005049440, June 9, 2014 (US EPA); (d) Fourth Quarter 2014 Progress Report – MID 005-049-440, January 15, 2015 (TRC); (e) Supplement to Remedial Investigation and Environmental Indicator Report, RCRA 3008(h) Administrative Order on Consent (RCRA-05-2010-0012), July 31, 2015; (f) Electronic correspondence with attachments, August 4, 2015 (EPA).

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.

X _____ If unknown - skip to #8 and enter "IN" status code.

_____ Rationale and Reference(s):

The Facility has made a determination that contaminated groundwater discharges to the River Raisin, located between 1,700 and 2,700 feet east of the facility. The facility submitted a Request to MDEQ for Mixing Zone-Based GSI Criteria on June 19, 2012 based on their interpretations of the extent of contamination. The facility later submitted a second request for Review of Site-Specific GSI Criteria on August 29, 2013 to MDEQ. On December 10, 2013, MDEQ informed the facility that: 1) the flow path and fate of the impacted groundwater had not been adequately delineated; 2) there is no data regarding whether groundwater is discharging directly into the River Raisin or first into the wetland; 3) impacted groundwater discharging into a wetland is afforded no dilution or mixing, so only the generic GSI criteria apply; 4) the volume of impacted groundwater discharging to the wetland and the volume of impacted groundwater discharging to the River Raisin must be quantified before evaluating the mixing zone or de minimis determination; and 5) the facility's site-specific GSI criteria was found to be inadequate. MDEQ's comments that "discharges to wetlands are afforded no dilution" is consistent with EPA's discussions with the facility during our October 2012 meeting, in which we discussed the need to address impacts to ecological receptors. To date the facility has not provided any additional information, but developed a scope of work to address MDEQ's comments, provided as an attachment to the July 31, 2015 Supplemental Groundwater Environmental Indicator Report. There are contaminants in wells adjacent to the wetland and River Raisin, at levels exceeding MDEQ's default GSI screening criteria that are increasing in concentrations. This criteria is marked unknown because the facility has not determined if contaminated groundwater exceeding the default GSI criteria is impacting the wetland or the river, or if concentrations within the contaminant plume will continue to increase. The facility interprets that concentrations above MDEQ's Final Acute Values will not impact the River Raisin, and therefore, has not made efforts to control the groundwater plume, but has also not monitored the migration of contamination within the plume core to determine if that interpretation is accurate.

REFERENCES: (a) Remedial Investigation and Groundwater Environmental Indicator Report, September 2012 (TRC); (b) Action Items from the October 2012 Project Meeting for Environmental Work Associated with the Former Tecumseh Products Company Site (RCRA-05-2010-0012), December 5, 2012; Revised December 19, 2012 (TRC), (c) Request for Mixing Zone-Based GSI Criteria, June 19, 2012 (TRC); (d) Review of Site-Specific GSI Criteria, August 29, 2013 (TRC); (e) Electronic Correspondence, December 10, 2013 (MDEQ); (f) Electronic Correspondence, August 20, 2015 (EPA).

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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 judgment/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.

X _____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

On December 10, 2013, MDEQ informed the facility that the facility's site-specific GSI criteria was found to be inadequate. The facility has not appropriately evaluated the criteria outlined below³. At present contaminant concentrations adjacent to the river and wetland are less than 10 times the default GSI criteria under MDEQ's Part 201 regulations, and more than 10 times EPA's MCLs. However, monitoring wells located upgradient from groundwater source areas contained TCE at levels that suggest the potential presence of free-phase solvent in source areas. Groundwater source areas were identified during membrane Interface Probe (MIP) investigation in 2014, and assessed in HRSC transects in 2015. Confirmation sampling identified concentrations in groundwater at or above 1% solubility, further suggesting the presence of free-phase NAPL, with the potential to migrate. The aquifer is primarily sand, and there are insufficient monitoring wells downgradient from perimeter source areas to track the potential migration of contamination. Areas of heaviest groundwater contamination are centered on former abandoned sewer lines in the north and southeast portions of the site. Monitoring wells positioned at great distances downgradient have increasing contaminants trends downgradient from these unmonitored source areas.

REFERENCES: (a) Electronic Correspondence, December 10, 2013 (MDEQ); (b) MIP Investigation Report and Workplan for High Resolution Site Characterization, December 31, 2014 (TRC); (c) Electronic Correspondence, January 29, 2015 (EPA).

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-assessment,⁵ 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.

X If unknown - skip to 8 and enter "IN" status code.

— Rationale and Reference(s):

Discharges have not been fully assessed (see 5).

REFERENCES: (a) Electronic Correspondence, December 10, 2013 (MDEQ); (b) Summary of Additional Investigative Work..., June 9, 2014 (US EPA).

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

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 eco-systems.

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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.

X

— If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

It is unclear when a sufficient monitoring well network will be established to demonstrate that the migration of contaminated groundwater plumes from the Tecumseh facility is stable. The facility was required to demonstrate that the migration of contaminated groundwater was under control by September 2012. The facility was granted an extension by EPA in October 2012 because the monitoring network was determined to be insufficient. The new deadline for the EI determination was July 2015. The facility was informed in January 2014 that additional work would be required, and that it had not met its obligations under Paragraph 11, Paragraph 13.a., and Paragraph 13.b., under Administrative Order on Consent (RCRA-05-1010-0012), dated March 29, 2010. Between the time of the meeting in May 2014 and May 2015, the facility has collected only screening level MIP data, with the exception of certain samples from SB-MIP-01 and SB-MIP-03. Sampling from temporary locations was completed in May and June 2015, but the facility failed to meet the monitoring requirements by the July 2015 deadline because the magnitude and extent of impacts has not been determined, and the stability of the plume has not been demonstrated.

REFERENCES: (a) EPA's Response to Tecumseh Products Company's September 30, 2013 Supplemental Submission to the Human Exposure Environmental Indicator Report (MID005049440), January 31, 2014 (US EPA); (b) Summary of Additional Investigative Work to be Performed Following May 12, 2014 Meeting, Pursuant to Administrative Consent Order, MID005049440, June 9, 2014 (US EPA); (c) Electronic Correspondence, January 29, 2015 (EPA).

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

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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 (facility). 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.
- X —
- NO - Unacceptable migration of contaminated groundwater is observed or expected at the former Tecumseh Products Company site, 100 E. Patterson, Tecumseh, MI (MID005049440).
-
- IN - More information is needed to make a determination.

Completed by	(signature)		Date	
	(print)	Joseph Kelly		10/5/15
	(title)	Corrective Action Project Manager		
Supervisor	(signature)		Date	
	(print)	Michael Beedle		10.5.15
	(title)	Chief, Corrective Action Section 1		
	(EPA Region or State)	U.S. EPA, Region 5		

Locations where References may be found:
US EPA Region 5 RCRA Records Center, 77 West Jackson Blvd., Chicago, IL 60604
Corrective Action Site Web Page: http://www.epa.gov/region5/cleanup/rcra/tecumseh/
Tecumseh District Library, Tecumseh Products Information Repository, 215 N. Ottawa Street Tecumseh, MI 49286

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