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:	Great Lakes Chemical Corporation Central Plant
Facility Address:	2226 Haynesville Hwy., El Dorado, AR 71730
Facility EPA ID #:	ARD043195429

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 is 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).

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):

The Cockfield Aquifer has been determined to be impacted by facility operations resulting in contaminant concentrations in excess of MCLs or other interim values. The extent of contamination was identified during implementation of the Final Report 1993 *Groundwater Quality Assessment RCRA Pt. B Permit 18H*, May1993 initially required by ADEQ *CAO LIS 85-073*. Key contaminants were re-evaluated for Appendix IX constituents and lower detection limits during implementation of the *RFI Workplan*, May 1993 as revised November 1995, as required by ADEQ *Permit 18-H*. Routine groundwater monitoring is conducted as part of a site-wide monitoring program established under *Permit 18-H* and is reported in *Annual Groundwater Monitoring Reports*. Constituents were screened against "appropriate levels" in *the Risk Evaluation Report Corrective Action Strategy*, August 2001 as revised by the 5-21 response to comments. See Attachment Table C-3 Water Screen Results Summary.

Footnotes:

[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).

TABLE C-3
WATER SCREEN RESULTS SUMMARY
RISK EVALUATION REPORT COMMENT RESPONSES
GREAT LAKES CHEMICAL CORPORATION
CENTRAL PLANT, EL DORADO, ARKANSAS

Compound	Range of Detections in Ground Water (ug/L) (IBU over MSC)	Well with Maximum (IBU over MSC)	Number of Locations Detected	MCL (ug/L)	Tap Water (ug/L) Risk 10^{-4} or HQ=10	Tap Water (ug/L) Risk 10^{-6} or HQ=1	EQL	Solubility (ug/L)
Benzene	5.14 - 11,700 2.17 - 30.8	NS-003 SW-48	15	5	42	0.42	1	1.8E+06
Bromobenzene	2.42 - 7,610 6.11 - 44.2	GM-10U NS-046	10	–	200	20	1	4.7E+05
Bromoform	229 - 10,000 3,120	IP-16 IP-17	5	100	850	8.5	1	3.1E+06
Chloroform	10.4 - 3,880 2.14 - 18.2	NS-003 PM-08A	7	100	6.2	0.16	1	7.9E+06
1,2 Dibromoethane (EDB)	0.444 - 2440000 0.676 - 36200	PW-15 TR-18	28	0.05	0.076	0.00076	0.5*	3.4E+06
1,2 Dichloroethane (EDC)	2.59 - 107000 1.46 - 76900	PW-15 GW-17	46	5	12	0.12	1	8.5E+06
1,2-Dichloropropane	19.6	SD-31 (IBU)	1	5	16	0.16	1	2.8E+06
Methylene Chloride	1,130 - 299,000 5.35 - 2,320	IP-42 IP-17	16	5	430	4.3	5	1.3E+07
Toluene	2.46 - 1,660 4.89 - 186	GM-10U PM-08A&B	7	1000	7200	720	1	5.3E+05
2,4,6-Tribromophenol	119 - 23,000 55.6 - 4,010	IP-16 TR-18	16	–	1100000	11000000	10	7.0E+04
3-Methylphenol	34.4 - 532 14.5 - 18.6	NS-009R IP-17	6	–	18000	1800	10	2.3E+07
4-Methylphenol	34.4 - 532 14.5 - 18.6	NS-009R IP-17	6	–	1800	180	10	2.2E+07
Phenol	11.4 - 2,040 14.5 - 185	IP-16 PM-08A	14	–	220000	22000	10	8.3E+07
3-Bromophenol	29.1	IP-17 (MSC)	1	–	1100000	11000000	**	2.3E+07
2,6-Dibromophenol	93.1	IP-17 (MSC)	1	–	1100000	11000000	**	1.2E+05
Barium	96 - 30,900 59 - 44,000	NS-009R NS-034	86	2000	7700	2600	10	4.1E+07
Chromium (total)	29 - 2,810 64 - 10,400	TB-01 PM-20	31	100	1100 (Cr VI)	110 (Cr VI)	20	–
Lead	17 - 1,400 77 - 1,400	SW-43 GW-37	18	15	15	15	15	5.0E+07
Nickel (and compounds)	37 - 2,010 23 - 7,110	GW-32 PM-20	47	100	7300	730	20	2.5E+07
Zinc	26 - 11,500 55.9 - 21,500	SW-43 IP-40	56	–	33000	11000	20	4.3E+07

Notes:

Performance standard for ground water:

Statutory and Regulatory Performance Standard: The statutory and regulatory performance standard shall be to contain/recover ground water such that Maximum Contaminant Levels for constituents in ground water will not be exceeded at the property boundaries. Final Risk Goal Performance Standard: For constituents without a published MCL, the performance standard will be to contain/recovery ground water such that the appropriate risk level concentration will not be exceeded at the property boundaries.

Concentrations exceed one or more screening levels.

* "J" flagged between 0.05 and 0.5 ug/L.

** Laboratory library search

– No published screening level or data

Values calculated using reference dose of 0.03 mg/kg-day (Great Lakes Chemical Corporation Toxicologist), see Attachment B

Solubility values from Region 6 table, Syracuse Research Corporation databases, Superfund Chemical Data Matrix or Risk Assessment Information System (RAIS)

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 and Reference(s):

Significant site stabilization efforts have been implemented through interim measures. Stabilization efforts include closure of various SWMU (source elimination), re-construction of new replacement facilities, pump and treat groundwater remediation systems, and a soil vapor extraction system. Pump and treat groundwater remediation systems have been operational for more than 10 years and are described in the *Final Report Groundwater Recovery Plan RCRA Permit 18 H GLCC Central Plant*, December 1993. The pump and treat systems were evaluated in the *Groundwater Recovery Effectiveness Evaluation GLCC Central Plant*, June 1995, and were deemed effective. A Site-Wide Monitoring Program consisting of several groundwater monitoring programs is required by *Permit 18 H* and is designed to evaluate the effectiveness of individual SWMU closures, site-wide contaminant monitoring, groundwater recovery effectiveness monitoring, and perimeter monitoring. Additionally, the Site-Wide Monitoring Program establishes "trigger levels" that are designed to require certain actions including additional assessments and modifications to recovery programs where deemed necessary. Groundwater monitoring data from all programs are submitted in *Annual Groundwater Monitoring Reports* required by *Permit 18H*. Many years of data show that the groundwater has stayed within the "existing area of groundwater contamination". Final corrective actions will be established through a *Corrective Action Strategy Pilot Program* involving GLCC, ADEQ and EPA Region IV. A *Risk Evaluation Report Corrective Action Strategy*, August 2001 as revised by the 5-21 response to comments, further supports stabilization.

[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.

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 and Reference(s):

Potential areas of groundwater to surface water discharges exist in a low area of poor drainage east of the facility. However, contaminated groundwater has not been indicated to directly discharge into the surface water body. Contaminated groundwater is being contained by a pump and treat remediation system described in the *Final Report Groundwater Recovery Plan RCRA Permit 18 H GLCC Central Plant*, December 1993. A Site-Wide Monitoring Program consisting of several groundwater monitoring programs is required by *Permit 18 H* and is designed to evaluate the effectiveness of individual SWMU closures, site-wide contaminant monitoring, groundwater recovery effectiveness monitoring, and perimeter monitoring. Additionally, the Site-Wide Monitoring Program establishes "trigger levels" that are designed to require certain actions including additional assessments and modifications to recovery programs where deemed necessary. Groundwater monitoring data from all programs are submitted in *Annual Groundwater Monitoring Reports* required by *Permit 18H*. . A *Risk Evaluation Report Corrective Action Strategy*, August 2001 as revised by the 5-21 response to comments, further evaluated potential groundwater to surface water interactions and was eliminated from further consideration by the *Risk Evaluation Report Ecological Exclusion Criteria Worksheet and Ecological Assessment Checklist*. See Attachment A Ecological Exclusion Criteria Worksheet and Ecological Assessment Checklist.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] 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 concentration[3] 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 concentration[3] 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 concentrations[3] 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):

[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 eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

- 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.

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

Rationale and Reference(s):

[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.

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 and Reference(s):

A Site-Wide Monitoring Program consisting of several groundwater monitoring programs is required by *Permit 18 H* and is designed to evaluate the effectiveness of individual SWMU closures, site-wide contaminant monitoring, groundwater recovery effectiveness monitoring, and perimeter monitoring. Additionally, the Site-Wide Monitoring Program establishes "trigger levels" that are designed to require certain actions including additional assessments and modifications to recovery programs where deemed necessary. Groundwater monitoring data from all programs are submitted in *Annual Groundwater Monitoring Reports* required by *Permit 18H*. Surface water discharges from the plant are through NDEDS permitted outfalls. See Attachment Table F-1 Site Wide Monitoring Program Wells and Table F-2 Site Wide Monitoring Program Parameters and Frequency. Available upon request

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 Great Lakes Chemical Corporation Central Plant facility , EPA ID # ARD043195429, located at 2226 Haynesville Highway, ElDorado, AR; 71730. 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)	David S. Hartley	Date	09/30/03
	(print)	David S. Hartley		
	(title)	Geologist, P.G.		

Supervisor	(signature)		Date	09/30/03
	(print)	Jim Rigg		
	(title)	Geologist Supervisor		
	(EPA Region or State)	Arkansas Department of Environmental Quality		

Locations where References may be found:
Arkansas Dept. of Environmental Quality Central Records Section 8001 National Drive Little Rock, AR 72219

Contact telephone and e-mail numbers

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final note: the human exposures ei is a qualitative screening of exposures and the determinations within this document should not be used as the sole basis for restricting the scope of more detailed (e.g., site-specific) assessments of risk.

Attachment A
Ecological Exclusion Criteria Worksheet
And
Ecological Assessment Checklist

Available upon request