

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: Akrion Systems LLC
Facility Address: 6330 Hedgewood Drive, Suite 150, Allentown, PA 18106
Facility EPA ID #: PA0000928812

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.

OCT 6 2011

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).

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 2

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.

 X 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):

Akrion Systems is a leading supplier of advanced surface preparation systems used in the manufacture of solar, semiconductor and related devices. Their systems are used in numerous steps during the manufacturing process to remove contaminants from the surface of the silicon wafers on which these devices are built. The facility (company headquarters) is ISO 9001:2000 and ISO 14001:2004 certified, and operates under a Permit-By-Rule (PBR). Current operations are conducted only at the 6330 Hedgewood Drive location, which is owned by Liberty Property Limited Partnership and leased to Akrion Systems. The facility is situated in an industrial/office complex at the corner of Hedgewood Drive and Hickory Lane. The property is surrounded by a complex of buildings, except toward the north/northeast, across Hickory Lane, where a recreational park and residential subdivisions are present. The facility is located approximately 0.35 miles north of Old US Route 22 and approximately 0.7 miles north of Interstate 78.

SubMicron Systems’ (previous owner) Application Lab uses chemicals to conduct testing on the wafers. The chemicals are dispensed by hand into chemical dispense cabinets, which mixed the chemicals with deionized water into different solutions. Test chemicals used in 1993 (and expected in 1994) included:

- Hydrochloric acid (7 gallons)
- Hydrofluoric acid (4 gallons)
- Sulfuric acid (27 gallons)
- Hydrogen peroxide (171 gallons)
- Ammonium hydroxide (40 gallons)
- Isopropyl alcohol (40 gallons)

The test chemicals listed above are still currently used by Akrion Systems in the Applications Lab, although in smaller quantities. Other chemicals are used on an as-needed basis, depending on client needs. An inventory of chemicals provided during the 2011 site visit included:

- | | |
|------------------------------|--|
| • Acetic acid | • Diethylene glycol monobutyl ether |
| • Organic amine | • Tetramethyl ammonium hydroxide (TMA) |
| • Ammonium acetate | • Ammonium fluoride |
| • Dimethylacetamide | • 1H-benzotriazole |
| • Methyl-2-pyrrolidinone, 1- | • Hydrofluoric acid |
| • Sulfuric acid | • Propylene glycol |
| • Ammonium phosphate dibasic | • Hydrochloric acid |
| • Hydrogen peroxide | • Isopropyl alcohol |
| • Nitric acid | • Phosphoric acid |
| • Anhydrous ammonia | • Potassium hydroxide |

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).

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

Page 3

- Tetrahydrothiophene, 1-dioxide
- 2-Hydroxypyridine
- Amine salt
- Boric acid
- Triethanolamine (TEA)
- Catechol
- Hydroxyethylidene-1,1-diphosphonic acid
- Glycerol
- Methyldiethanolamine (MDEA)
- Monoethanolamine (MEA)
- Alkanoamine
- Solvent

The solutions are then injected into chemical baths for processing. Once the baths reached their useful life and were considered "dirty", the baths were discharged via gravity to the elementary neutralization unit (ENU [waste treatment system]). Solutions are carried from the process baths into a 2,000-gallon aboveground holding tank (also identified as 1,500 gallons by a facility representative and 2,100 gallons in documents). On a periodic basis, the waste chemical solutions are transferred to a 500-gallon tank where 250 gallons of solution are adjusted (automatically) for pH using sulfuric acid and sodium hydroxide. Both waste tanks are monitored (automatically) for high level and pH.

The Application Lab also utilizes an exhaust system to control vapors coming off the hot bath. The exhaust passes through a scrubber and is also treated in the ENU.

There are no floor drains on the floor of the Applications Lab or the Applications Lab Mechanical Room. The Applications Lab has a raised floor approximately three feet off the epoxy coated cement flooring. The Applications Lab Mechanical Room is where the hazardous chemicals are stored, dispensed to the Applications Lab, treated for pH and discharged to the sanitary sewer. There are no process sludges generated at the facility for treatment and discharged into the sanitary sewer.

Spills in the Application Lab or the Application Lab Mechanical Room are cleaned up using absorbent or a vacuum. Absorbent materials are disposed of via a contracted hazardous waste hauler. Vacuumed materials are discharged into the ENU.

Finished product testing, fabricating, and shipping/receiving use only DI water.

No incidents of any releases have been reported by the facility. No SWMUs or AOCs have been identified at the facility.

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

Page 4

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):

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):

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.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 5

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):

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

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

Page 6

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.

_____ 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.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 7

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):


**Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 8**



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 Akrion Systems LLC facility, EPA ID # PA0000928812, located at 6330 Hedgewood Drive, Suite 150, Allentown, PA 18106. 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)  Date 10/13/11
 (print) Tracey L. McGurt
 (title) Facilities Supervisor

Supervisor (signature)  Date 10/18/11
 (print) Edward G. Dudick, Jr.
 (title) Env. Eng. Manager
 (EPA Region or State) PA 

Locations where References may be found:

USEPA Region III
Waste and Chemical Mgmt. Division
1650 Arch Street
Philadelphia, PA 19103

PADEP
North East Regional Office
2 Public Square
Wilkes-Barre, PA 18701

Contact telephone and e-mail numbers

(name) _____
 (phone#) _____
 (e-mail) _____

11-3-11

Facility Name:
EPA ID#
City/State

Akrion Systems LLC
PA0000928812
Allentown, PA 18106

MIGRATION OF CONTAMINATED GROUNDWATER UNDER CONTROL (CA 750)

