

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

Migration of Contaminated Groundwater Under Control

Facility Name: Aerojet General Corporation
Facility Address: P. O. Box 1036, Camden, AR 71711-1036
Facility EPA ID #: ARD091688283

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 AMigration 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?

- 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 principal Contaminant of Concern (COC) is Perchlorate. No other COCs require further evaluation with regard to human health impacts. Perchlorate is found in a facility-wide groundwater plume with the highest concentrations in the Thermal Treatment Unit (TTU) and Building 52 Areas.

Perchlorate exceeds Appropriate Standards:

Perchlorate: Standard: EPA Region 6 Human Health Medium Specific Screening Levels (Dec 2009):
Tap Water <0.026 mg/l

Documentation Referenced:

RCRA Facility Investigation – Final Report (March 27, 2009)

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).

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):

Aerojet General Corporation has put in the following controls to stabilize the migration of Perchlorate. Ongoing monitoring results for shallow wells near the downgradient facility boundary exhibit low level fluctuations near the laboratory method detection level of 0.004 mg/l at some locations. At other locations on the down-gradient boundary, the results are consistently non-detect.

Building 52: Aerojet reinjected / recirculated collected surface water within the retention basin to an infiltration trench located upgradient of the impacted zones; and added electron donors to the water.

TTU-1: Aerojet removed contaminated soils within the former drainage path to minimize potential leaching of Perchlorate to groundwater that could occur during future rain events. Aerojet conducts quarterly monitoring for groundwater, surface water, the fire pond and along the northern drainage pathway (if water is present).

A-Area: Aerojet installed four passive Permeable Reactive Biobarrier Trenches (PRBTs) in the observed down gradient direction of the Perchlorate contaminated groundwater. The PRBTs are designed to create an anaerobic treatment zone for groundwater passing through the barrier trenches preventing Perchlorate contaminated groundwater from migrating offsite.

Building M125: Aerojet installed three active recirculation trenches that develop anaerobic conditions capable of reducing Perchlorate. Discharge water from Building 125E Sump has been directed to the three active recirculation trenches for in-situ anaerobic treatment.

Documentation Referenced:

RCRA Facility Investigation – Final Report (March 27, 2009)
Summary / Progress Semi-Annual Report (February 26, 2010)

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):

The facility is subject to regional precipitation trends of an annual dry and wet season of varying lengths. These precipitation trends affect the infiltration of surface water and vertical leakage of perched groundwater into the shallow groundwater aquifer. These seasonal trends affect the transport of perchlorate from surface water and perched groundwater into shallow groundwater.

Vertical shallow groundwater hydraulic gradients may be reversed (from net downward to net upward head with respect to the perched water) briefly during the year (during the height of the wet season), allowing for mixing or communication of shallow groundwater with perched groundwater (and potentially to surface water). Mixing of shallow groundwater with the overlying perched groundwater that might occur would tend to create a dilution effect in the surface water.

The following controls were put into place by Aerojet General Corporation to control contaminated groundwater from discharging into surface water bodies.

Building 52: Aerojet regraded the area surrounding Building 52; then redirected the surface water flow around Building 52 into a wet retention basin; the surface water collected within the retention basin was reinjected and/or recirculated into an infiltration trench located upgradient of the impacted zones.

TTU-1: Aerojet regraded the area surrounding TTU-1 to minimize surface water flow out of the impacted area; then redirected surface water flow to the adjacent fire pond to contain and minimize migration of perchlorate contaminated surface water; created an anaerobic environment within the fire pond to encourage the degradation of Perchlorate

A-Area: Aerojet installed four passive Permeable Reactive Biobarrier Trenches (PRBTs) in the observed down gradient direction of the Perchlorate groundwater contamination.

Building M125: Discharge water from Building 125E Sump has been directed to the three active recirculation trenches for in-situ anaerobic treatment.

Documentation Referenced:

RCRA Facility Investigation – Final Report (March 27, 2009)
Summary / Progress Semi-Annual Report (February 26, 2010)

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.

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.

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):

This facility is currently operating under RCRA Hazardous Waste Permit No. 8H-RN1-M003 (Module XII(b) Special Conditions for Corrective Action Related to Solid Waste Management Units).

The permit requires continued corrective action groundwater monitoring as well as interim measures should they be warranted.

Reference:

RCRA Hazardous Waste Permit No. 8H-RN1-M003 - Module XII(b)

- 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 Aerojet General Corporation facility, EPA ID # ARD091688283, located at **P. O. Box 1036, Camden, AR 71711-1036**. 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) Catherine Clegg-Riley Date May 7, 2010
 (print) Catherine Clegg-Riley
 (title) Geologist

Supervisor (signature) Jim Rigg Date 5-7-10
 (print) Jim Rigg
 (title) Geology Supervisor
 (EPA Region or State) Arkansas

Locations where References may be found:

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