

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRAInfo code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Boeing Plant 2

Facility Address: 7755 East Marginal Way, Seattle, WA

Facility EPA ID #: WAD009256819

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):

Groundwater at select Remedial Areas (RAs) in the uplands portion of the facility remain contaminated at levels above the current (12/2017) proposed Final Remedial Cleanup levels. Maps delineating the areas of exceedances of various constituents of concern are documented in Attachment S4B of the 2017 Corrective Measures Study Volume X. Constituents of concern exceeding proposed FMCLs include arsenic, copper, zinc, nickel, cadmium, various chlorinated VOCs, BTEX (generally as surrogates for petroleum hydrocarbons), PCBs, and Bis (2-ethylhexyl) phthalate.

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).

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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):

Existing groundwater monitoring results indicate that interim measures have been successful in reducing contaminants of concern in soil, and in groundwater. For organics, current interim measures are significantly reducing the total mass of contaminants. As organic contaminant reduction continues, the aquifer is expected to return to more normal geochemical conditions, resulting in reduced solubility and mobility of metal contaminants, such that metal contaminants are expected to continue to diminish. See the 2017 Corrective Measures Study Volume X, the CMS Phase Quarterly Shoreline Groundwater Monitoring Results May 2017 report and the CMS Phase Semiannual Shoreline Groundwater Monitoring Report March 2017.

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):

Groundwater at Boeing Plant 2 generally discharges to the Lower Duwamish Waterway. EPA has determined that the highest and best use of groundwater at Boeing Plant 2 is discharge to surface water. See "Uplands Corrective Measures Study Volume I: Conceptual Hydrogeologic Model – Plant 2, March, 2017."

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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):

Current shoreline groundwater monitoring results, as documented in the CMS Phase Quarterly Shoreline Groundwater Monitoring Results May 2017 report and the CMS Phase Semiannual Shoreline Groundwater Monitoring Report March 2017 indicate either compliance with current proposed FMCLs, or where exceedances exist, are within 10 times the current proposed FMCLs. Trend analysis of constituents of concern at shoreline monitoring wells generally indicate either downward trends, or no statistically discernable trend. In a very limited number of circumstances, upward trends have been identified, but at levels already below current proposed FMCLs.

EPA anticipates changes to the FMCL for groundwater for PCBs to reflect revised water quality standards. However, EPA lacks data of sufficient sensitivity to evaluate compliance with such a revised standard, and has not made a decision on the pathway for achieving and demonstrating compliance with such a revised FMCL. This issue will be addressed in the Statement of Basis for uplands corrective measures, and will be revisited through an adaptive management framework. EPA will similarly revisit this groundwater environmental indicator determination and revise accordingly.

See "Uplands Corrective Measures Study Volume I: Conceptual Hydrogeologic Model – Plant 2, March 2017."

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.

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.

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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):

Boeing will be required to continue existing shoreline groundwater monitoring activities, as well as monitoring associated with current interim measures at uplands Remedial Areas, and as part of expected final corrective measures pursuant to the Boeing 3008(h) corrective action administrative order on consent. These data will be used to document continued progress toward full compliance with groundwater FMCLs, and to verify the expectation that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.

Although not specifically considered as part of the Boeing Plant 2 Migration of Contaminated Groundwater Under Control Environmental Indicator (CA750), EPA notes that detections of contaminants from the Boeing Electronics Manufacturing Facility (EMF), located upgradient of the Plant 2 facility, have been historically detected in shoreline monitoring wells associated with the EMF facility. These shoreline monitoring wells are located downgradient of the former 2-40s building within the Boeing Plant 2 facility. Contaminants of concern associated with the Boeing EMF facility include trichloroethene (TCE), and associated breakdown products including dichloroethene and vinyl chloride. Current monitoring data from Boeing EMF shoreline wells indicate constituents associated with the EMF facility are mostly at non-detect levels. Although detections of vinyl chloride have been found above the current water quality standard used as the basis for the Boeing EMF groundwater cleanup level, these levels are expected to trend downward, consistent with migration of groundwater from the EMF being effectively controlled.

Because the Boeing EMF facility is being managed under authority of the Comprehensive Environmental Responsibility, Cleanup and Liability Act (CERCLA), EPA is not making an EI determination for it. However, for purposes of providing a more complete picture of the impacts of nearby facilities on groundwater discharging to the Lower Duwamish Waterway, EPA is including this information in the Boeing Plant 2 EI determination. For further information on the Boeing EMF facility and associated data reports, see the Boeing EMF link on the Region 10 Lower Duwamish Waterway web page at <https://yosemite.epa.gov/r10/cleanup.nsf/sites/lduwamish>.

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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 Boeing Plant 2 facility, EPA ID # WAD 00925 68, located 7755 East Marginal Way, Seattle, WA.

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 Bartus Date 12/12/2017

(print) David Bartus

(title) Project Coordinator

Supervisor (signature) [Signature] Date

(print) Lisa McArthur

(title) Unit Manager, Corrective Action, Permits and PCB Unit

(EPA Region or State) EPA Region 10

Locations where References may be found:

EPA Region 10 RCRA files

Contact telephone and e-mail numbers

(name) David Bartus

(phone #) (206) 553-2804

(e-mail) bartus.dave@epa.gov