

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

Revised 11/8/00

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

Migration of Contaminated Groundwater Under Control

Facility Name: _____ Dudley Laundry _____
Facility Address: _____ Norfolk, Nebraska _____
Facility EPA ID #: _____ NED035093178 _____

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, GPRRA). 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 [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) 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 results of the initial phase of RFI field work were reported for the above facility in the *RFI Preliminary Information Report*, dated September 11, 2001. During the initial phase of RFI field work, groundwater samples were collected from all site wells in August 2001 and analyzed for volatile organic compounds (VOCs). Site related compounds, those associated with drycleaning activities, are primarily tetrachloroethene (PCE) and associated breakdown products: trichloroethene (TCE), 1,2-dichloroethenes, vinyl chloride.

Table 1 shows the analytical results of the August 2001 groundwater sampling event. Groundwater results were compared to maximum contaminant levels (MCLs) under the Safe Drinking Water Act, where available, since the affected aquifer is currently used as a drinking water supply by the city of Norfolk. The MCLs are listed below the analytical results in Table 1. Groundwater concentrations exceed MCLs for PCE; TCE; vinyl chloride; cis-1,2-dichloroethene; and benzene, toluene, ethylbenzene, and xylenes (BTEX). It is important to note that the effluent from the city water treatment plant (i.e., water that is supplied to the public) has not had VOCs detected at levels above MCLs.

Figure 1 shows sample locations. The BTEX compounds were detected above MCLs only in Wells TMW-1, TMW-2, and TMW-4 which are located several hundred feet southeast of the Dudley facility and in the downgradient groundwater flow direction. The BTEX compounds above MCLs have been determined to result from a underground storage tank (UST) release at a separate facility downgradient from Dudley. The presence of BTEX in groundwater is being managed by the state of Nebraska as a separate investigation. Therefore, site related compounds above MCLs are PCE, TCE, vinyl chloride and cis-1,2-dichloroethene.

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):

According to the *RCRA Facility Investigation Work Plan*, dated June 2001, the shallow stratigraphy in the Dudley area consists generally of Quaternary sand, gravel, and clay, overlying the Cretaceous Niobrara Formation (i.e., shale encountered between 35 to 42 feet below ground surface (bgs)). Site boring logs show fill material over lean clay to clayey sand to sandy silt, over sand, gravel and silty sand. There does not appear to be a hydraulic barrier between the Niobrara Formation and the upper saturated sands. Soil boring SB-6/11/02 (drilled as part of the RFI field work) demonstrated that once the weathered chalk at the top of bedrock is penetrated, the underlying siltstone/claystone/shale is very firm (standard penetration test refusal) from about 49 feet bgs to the bottom of the boring at 75 feet bgs. This bedrock unit does not appear to contain vertical fractures nor sandstone layers and probably limits the vertical migration of contaminated groundwater. Two wells directly downgradient of the Dudley facility, D-5 and D-7, are screened into the bedrock. Contamination was not detected in these wells which supports the theory that the shale limits the vertical migration of contamination in the immediate area of the Dudley facility. However, the city wells further downgradient from Dudley, which are also drilled into the bedrock (total depths below ground surface ranging from 100 to 130 feet) have shown contamination. It is anticipated that contamination is limited to the shallow portion of the aquifer in the immediate area of the Dudley facility, but has been drawn down into the bedrock by the pumping action of the city wells.

Tables 2 and 3 present historical groundwater data, for the Dudley wells (DMW-1 through 8, and D-1 through 10) and downgradient UST investigation/city wells (TMW-1 through 9, and city wells 1 through 5), respectively. These tables present several rounds of data for the majority of the site wells. Although there are some variations in contaminant concentrations, the concentrations are generally stable and do not indicate a significant increase in contamination in any one location. Variations in concentrations may result from the intermittent/seasonal pumping of city wells.

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):

The Dudley facility lies approximately 1500 feet west of the North Fork of the Elkhorn River. The city WTP is located between the Dudley facility and the North Fork. Groundwater flows to the southeast in the area which is towards the North Fork of the Elkhorn River. Therefore, groundwater can be anticipated to discharge into the river.

In response to the VOC contamination, the City of Norfolk modified the treatment system and well pumping scheme for the East Well Field to enhance the removal of VOCs. As part of this modification, the discharge from City Well 1 is piped directly to the storm sewer system and does not enter the public water supply. Well 1 is pumped continuously to discharge during peak demand months, approximately April to October. From October to March, Well #1 is pumped 20 days on and 10 days off to maximize the soil vapor extraction (SVE) system directly upgradient that is being used to cleanup the BTEX contamination.

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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): As discussed above, the discharge from City Well 1 is piped directly to the storm sewer (i.e., surface water) system and does not enter the public water supply. Concentrations of benzene in the discharge from Well 1 are monitored by an NPDES permit, #NE0132438 with effective date August 1, 1999, that specifies a daily maximum of 400 micrograms per liter. VC, TCE, cis and trans 1,2-dichloroethene have been detected in the discharge from City Well 1; however, at concentrations below the MCL. Therefore, the discharge to surface water from this well can be considered insignificant.

The modifications to the water treatment system (i.e., improvements to remove volatile organics) have effectively reduced the concentrations of chlorinated VOCs below the associated MCLs in the groundwater stream utilized by the public, i.e., water treatment plant effluent.

The Well Head Protection Area (WHPA) 2.0 2-dimensional model was run for a scenario of the five city wells pumping. The results are presented in the *Preliminary Subsurface Assessment Report*, dated May 13, 1998. The results of this model indicate that City Wells #5 and #1 capture the area of chlorinated solvent contamination. However, these wells are not pumped on a continual basis, as the East Well Field is primarily utilized for high demand periods, primarily summer. It is possible that contamination has passed the city wells and migrated towards the North Fork.

Groundwater data are presented in Figure 2 from the following sources. A complete round of groundwater samples (except for City Well 2 and two temporary wells, TW-1 and TW-2) was collected in August 2001 and is presented in the *RFI Preliminary Information Report*, dated September 11, 2001. City Well 2 was not sampled in August 2001, but was sampled in June 2002 (see *Interim Measures Report*, dated July 8, 2002). Two temporary wells (TW-1 and TW-2) were sampled in May 1998 (see *Additional Subsurface Assessment/ Preliminary Remedial Implementation Report*, dated June 19, 1998). On Figure 2, the site related chemical concentrations in wells exceeding MCLs are circled in red. The TMW wells are generally screened from 15 to 35 feet below ground surface, across the water table, and not into the shale. The temporary wells TW-1 and 2, downgradient from an MCL exceedance in Well TMW-4, were screened from

approximately 12 feet to 22 feet bgs, across the water table. Based on available data, the downgradient extent of site related compound concentrations above MCLs appears to have been defined for wells that screen the water table by the following wells located along the east side of the affected area, i.e., TMW-7, TMW-9, TMW-10, TMW-6, TMW-8, TW-1, and TW-2. Boring logs and screen intervals are not available for the city wells (except for City Well 5), but they are drilled to a depth of approximately 100 to 130 feet, which is into the shale. Based on available data, the downgradient extent appears to have been defined for wells drilled into the shale by City Wells 1, 2, 3, and 4, since site related compounds have not been detected above MCLs in any of these wells. Based on the above information and although not proven to exist, any potential discharge into surface water would be considered insignificant.

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):

While the east well field water treatment plant is in operation, the interim measures (see report dated April 22, 1999) requires sampling of the influent and effluent at startup and monthly; groundwater from City Wells 2, 3, 4, and 5 prior to startup and quarterly; groundwater discharge from City Well 1 after startup and monthly; and groundwater from Wells TMW- 1, TMW-2, TMW-5, TMW-6, TMW-8, and TMW-9 at startup and quarterly. The samples are analyzed for site related VOCs using a drinking water analytical method. Additional monitoring may be required as part of the remediation efforts.

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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 **Dudley Laundry** facility, EPA ID # **NED035093178**, located at **Norfolk, NE**. 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) Original signed by _____ Date 9/4/02_
(print) **Mary Reilly Grisolano**
(title) **Project Manager**

Supervisor (signature) Original signed by _____ Date 9/4/02_
(print) **John Smith**
(title) **Chief, RCRA Corrective Action and Permits Branch**
(EPA Region or State) **EPA, Region 7**

Locations where References may be found:

U.S. EPA Records Center, 901 N. 5th St., Kansas City, KS 66101

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