

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: Birken Manufacturing Company
Facility Address: 3 Old Windsor Road, Bloomfield, CT 06002
Facility EPA ID #: CTD 001144062

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).

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.
- 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): See Addendum to Page 2.

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).

APPENDUM TO CA 750 PAGE 2

Ground water monitoring has been conducted at the facility since 1990. The network of monitoring wells has been expanded in stages to the current 40 wells monitoring three levels in the Upper Aquifer and the top of upper level of the lower aquifer (see attach map). The current RCRA ground monitoring program, established by Charter Oak's June 1998 Corrective Action GW Monitoring Plan involves quarterly sampling 7 A-level wells and annual sampling in the spring at two A-level wells and 15 C-level wells for total chromium and chlorinated VOCs. A Post-Closure monitoring program for a set of RCRA units (lagoons) consists of semi-annual sampling of three additional A-level wells and a B-level well for the same constituents as the Corrective Action monitoring. Wells in the lower aquifer (D-level) are currently monitored only for water level because anthropogenic substances were not detected during initial monitoring.

Three ground water plumes are being monitored. Two of these plumes are in the A-level and are from releases on the Birken facility consisting of chromium and certain chlorinated VOCs. The third plume consists of different chlorinated VOCs in the C-level aquifer and it has been demonstrated to be from an upgradient off-site source (see discussion below). Excluding the C-level plume, the following monitoring wells have exceeded one or more RSR GWPC during the last three years (since October 1998):

Well ID	Location	Parameter	Max. Conc. mg/l	Well ID	Location	Parameter	Max. Conc. mg/l
CEE-18A	On-site	Cr	0.088	CEE-40A	On-site	Cr/VOCs	0.143/1.2*
CEE-24A	Off-site	Cr	0.094	GSI-6A	On-site	Cr/VOCs	9.05/1.9*
CEE-26A	On-site	Cr	0.129				* 1,1,1-TCA

In August 1995, Consulting Environmental Engineers submitted to DEP a report entitled Hydrogeologic Report and Investigation of VOCs in Ground Water. This report demonstrated that the source of the VOCs detected in the C-level wells is an upgradient off-site source. The primary elements of this demonstration are as follows:

1. The dominant VOCs in the A-level (1,1,1-TCA, TCE, PCE) are not found in the C-level (1,2-DCA, 1,2-DCP, 1,1,2-TCA), or are found only at trace levels;
2. The degradation daughter products of the dominant A-level VOCs are not found in the C-level or are found only at trace levels;
3. Monitoring wells in the B-level, which are screened beneath the A-level plume typically did not contain detectable VOCs, and always less than the VOC concentrations found in the A-level and C-level.
4. Two C-level monitoring wells (CEE-37C and CEE-38C), which are located approximately 400 feet upgradient of the Birken property contain C-level VOC

contaminants at concentrations similar to on-site C-level contaminant concentrations.

An October 25, 1995 letter from Mr. Michael Fracasso of the DEP Waste Management Bureau, acknowledged that Birken had satisfactorily demonstrated that the C-level ground water contamination was not from a source on Birken's property.

The following documentation is attached:

1. Map of monitoring well locations;
2. Summary of ground water sampling results from October 1998 to the present for all wells in the Corrective Action and Post Closure monitoring programs;
3. The text, tables and most of the figures included in CEE's August 1995 Report; and,
4. The October 1995 DEP letter acknowledging that Birken was not the source of the C-level ground water contamination.

The reports referenced herein, including Annual Summary RCRA Corrective Action Ground Water Monitoring Program reports 1990-2000, and Annual Post-Closure Ground Water Monitoring Reports, are on file at DEP.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 3

3. Has the **migration of contaminated groundwater stabilized** (such that contaminated groundwater is expected to remain with "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): See attached Addendum to Page 3.

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.

APPENDUM TO CA 750 PAGE 3

The movement of A-level contaminants is controlled by a ground water recovery and treatment system. The history of the system is as follows:

- March 1993: Recovery well R-1 installed adjacent to monitoring well GSI-6A (see attached figure), the area of greatest chromium contamination, and operated at an average pumping rate of 5.4 gpm. Recovered ground water is treated in two resin columns to remove chromium prior to discharge to the sanitary sewer under SPDES Permit SP0000791.
- August 1997: Recovery well R-2 is added to the system and the average pumping rate increases to 12.6 gpm.
- August 2001: Recovery well R-3 is added to the system, recovery well R-1 is replaced with R-1R and recovery well R-2 is re-developed. Currently the system is pumping 18 gpm.

Seven to ten years of quarterly ground water monitoring data at three representative down gradient monitoring wells CEE-24A, 26A, 33A (see attached analytical data tables for these wells) indicate that migration of chromium and VOCs is stabilized:

- The attached plots of chromium and 1,1,1-TCA concentrations in monitoring well CEE-24A illustrate the effectiveness of the recovery system to prevent off-site migration of chromium and VOCs. The abrupt decrease in chromium concentration corresponds to the start up of R-1 and the decrease in VOCs corresponds to the start up of recovery well R-2.
- Monitoring well CEE-33A is located downgradient of the A-level chromium and VOC plumes. VOCs have not be detected in this well above 1.0 ppb since sampling began in October 1994. A short-lived peak in chromium concentration is observed between June 1996 and January 1997 (max. conc. 0.096 mg/l). However concentrations have decreased to below the GWPC (0.05 mg/l) and are typically below the detection limit of 0.01 mg/l.
- A short-lived peak in chromium concentration occurred at CEE-26A between February and April 1994 (max. conc. 0.367 mg/l) and has subsequently decreased while exhibiting apparent seasonal fluctuations (see attached analytical data table and concentration plot). Typically, VOCs are not detected in this monitoring well.

See the attached data summary tables for these three downgradient A-level wells. Annual Corrective Action Ground Water Monitoring Reports are on file at DEP.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 4

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): Beamans Brook, a tributary to the North Branch of the Park River.

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)?

Yes 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 judgment/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): See attached Addendum to Page 5

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

APPENDUM TO CA 750 PAGE 5

Risk-based criteria for ground water discharging to surface water are established for the constituents of concern in the A-level aquifer. For steady-state plumes the criteria are applied to sample results from wells located so as to be representative of contaminated ground water discharging to the surface water body. Monitoring wells CEE-26A and CEE-33A are the two A-level wells that are closest to Beamans Brook, the receiving water body. The surface water protection criteria (SWPC) and constituents of concern and the maximum concentrations detected in these two wells since October 1998 are as follows:

Constituent of Concern	CEE-26A (mg/l)	CEE-33A (mg/l)	SWPC (mg/l)
Total Chromium	0.129	0.028	0.11
1,1,1 Trichloroethane	<0.001	0.0006	62.0
Trichloroethylene	<0.001	<0.001	2.34
Tetrachloroethylene	<0.001	<0.001	0.088
1,1 Dichloroethylene	<0.001	<0.001	0.096

Surface water protection criteria are established for trivalent and hexavalent chromium, but not total chromium. The hexavalent chromium SWPC (0.11 mg/l) is less than the trivalent SWPC (1.2 mg/l). Comparison of the total chromium results to the hexavalent SWPC is conservative. The average chromium concentration detected in CEE-26A over the last three years is 0.075 mg/l and the maximum concentration was 0.129 mg/l. The attached concentration versus time plot for total chromium in this well shows that the concentrations are decreasing over time.

This well is 450 feet upgradient from Beamans Brook. Further dilution of the total chromium concentrations by recharge over that distance will cause the ground water discharging to the Brook to be well below the hexavalent chromium SWPC.

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): _____

⁴Note, 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.

⁵The 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): Quarterly ground water sampling at down gradient monitoring wells CEE-24A, 26A, and 33A as well as at various on-site monitoring wells will continue. The monitoring of on-site monitoring wells will continue. The ground water monitoring program is described in a June 1998 document on file at DEP entitled, "Revised Plan, Ground Water Monitoring Program, RCRA Corrective Action Investigation".

