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: **Aqualon Company, a Division of Hercules Incorporated and a Delaware Partnership**
Facility Address: **1111 Hercules Road, Hopewell, VA 23860**
Facility EPA ID #: **VAD003121928**

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?

   __X__ 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 groundwater 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?

__X__ 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 October 2001 Facility Lead Corrective Action Agreement Workplan identified 34 Solid Waste Management Units (SWMUs) at the Hercules – Aqualon facility (Facility). After a review of the operational histories and current status of the units, ten (10) SWMUs were identified as needing further investigative activities. The remaining 24 SWMUs were designated as No Further Action (NFA) units; specific unit descriptions and supporting evidence for the NFA designations can be found in the October 2001 Workplan previously submitted to and approved by USEPA. Characterization efforts for the Facility's Environmental Indicators have therefore been focused on these ten units. Hercules – Aqualon proposed and implemented two phases of field activities for the investigation of nine (9) of the ten (10) units. The 10th SWMU, the Natrosol Lagoon, was well characterized through a series of investigations performed subsequent to its closure in 1995.

The Phase I Investigation was conducted in December 2001, and included the collection of environmental samples at five SWMUs, including the collection of groundwater samples from the monitoring wells surrounding SWMU #8 / #29, the Reten/Aqualon Basin/Anoxic Basin (RAB). A summary of the sampling results from Phase I was provided to USEPA in the February 2002 SWMU Summary Information Report – Phase I Investigation.

The Phase II Investigation was conducted in November 2002, and included the installation and sampling of nine new groundwater monitoring wells associated with the two Whitewater Lagoons (WWL), SWMUs #3 & #4, and the Landfills (LF), SWMU #5. A summary of the sampling results from Phase II was provided to USEPA in the April 2003 SWMU Summary Information Report – Phase II Investigation.

All monitoring wells sampled during the two phases of investigation (RAB-series, WWL-series, and LF-series) are screened entirely in the uppermost aquifer at the site property.

Groundwater sampling data from the two phases of work were initially screened against primary drinking water Maximum Contaminant Levels (MCLs) and April 2003 USEPA Region III Risk-based Concentrations (RBCs) for

[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).

Tap Water (using a hazard coefficient of 0.1 for noncarcinogens). The following constituents were detected above the Region III Tap Water RBC screening criteria in site monitoring wells:

Volatile Organic Compounds (VOCs):

- Methylene chloride,
- Chloroform,
- 1,2-dichloroethane,
- 1,4-dioxane,
- Ethyl ether, and
- Trichloroethylene.

Alcohols

- 2-butoxyethanol,
- Tert-butyl alcohol, and
- Ethanol.

Semivolatile Organic Compounds (SVOCs):

- Bis (2-ethylhexyl) phthalate, and
- Bis (2-chloroethyl) ether.

Inorganics:

- Aluminum,
- Arsenic,
- Barium,
- Chromium,
- Cobalt,
- Iron,
- Manganese,
- Thallium, and
- Vanadium.

However, the detections of 1,2-dichloroethane, trichloroethylene, arsenic, barium, and chromium do not exceed their respective MCLs, and have not been retained for further evaluation under this EI. Only the detections of thallium in monitoring wells WWL-2 and WWL-3U are above the MCL.

Several detected compounds that do not have published MCLs or RBCs have also been included above for consideration: tert-butyl alcohol and ethanol. Detection tables showing all of the screening exceedances are attached as ***Tables 1, 2, and 3. Figure 1*** also shows the locations of the various monitoring wells sampled during the two phases of field investigations.

In addition, the historical investigations of the Natrosol Lagoon (NAT) included the monitoring of groundwater impacts through the installation and sampling of four monitoring wells (NAT-1 to NAT-4) surrounding the unit. Quarterly groundwater monitoring events of these monitoring wells have indicated detections of tert-butyl alcohol as high as 105,000 mg/L. The four NAT monitoring wells are also screened entirely in the uppermost aquifer.

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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)?

__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):

Descriptions of the regional geology in the literature indicate the presence of coarser terrace deposits underlain by fine-grained marine sediments of the Yorktown formation. Observations during the various subsurface investigations at the site confirm the presence of an upper silty sand aquifer, varying in thickness from approximately 10 to 30 feet. This upper aquifer is underlain by a low-permeability blue-gray marine clay layer (varying in thickness from approximately 10 to 18 feet) which appears to be laterally continuous across the site; the presence of the marine clay was verified in the vast majority of the monitoring wells installed at the site. In a few of the monitoring wells (LF-2 and LF-4) located in close proximity to the deeply incised onsite creeks), both the upper silty sand aquifer and underlying marine clay appear to have been eroded away. Deep monitoring wells installed in the central portion of the site (MW-5D and MW-8D) have also identified a lower aquifer beneath the marine clay unit; however, vertical migration of contamination appears to be limited by the low permeability and pervasiveness of the marine clay layer, and the presence of an upward vertical gradient between the two aquifers.

Observations from the installation of the WWL-series monitoring wells (downgradient of the two Whitewater Lagoons, SWMUs #3 and #4) and LF-series monitoring wells (downgradient of the landfill, SWMU #5) indicate that as you approach Bailey and Cattail Creeks along the southern property boundary of the site, 1) the upper silty sand aquifer appears to "pinch out" completely, and 2) the marine clay layer is found at shallower depths (<20 feet). Correspondingly, groundwater in the upper aquifer appears to flow along the underlying low-permeability marine clay, and discharge directly into the adjacent creeks. Comparisons between groundwater levels in the LF-series of monitoring wells (which are screened in the upper aquifer) and surface water levels in the creeks (as measured at fixed surface water monitoring points) also confirm a direct hydraulic connection. Liquid level data from the November 2002 groundwater sampling event are shown graphically on the groundwater contour map in ***Figure 2*** and the cross-sections on ***Figure 3***. Cross-section B-B' in ***Figure 3*** also shows the relationship between the upper aquifer and the underlying marine clay from MW-10 in the central portion of the site to LF-3 immediately adjacent to the creeks.

Additional information regarding the regional and site-specific geology was previously submitted to USEPA in the June 2002 *Hydrogeologic Evaluation*, the February 2002 *SWMU Summary Information Report – Phase I Investigation*, and the April 2003 *SWMU Summary Information Report – Phase II Investigation*. These reports and various historical investigations performed at the facility conclude that Cattail / Bailey Creeks are the ultimate discharge points for groundwater from both the upper and lower aquifers beneath the facility. Based on this information, the "existing area of contaminated groundwater" is located entirely on the Facility site within the upper silty sand aquifer, or discharges into the onsite streams. The potential for vertical migration is limited by the pervasive marine clay layer, and the potential for lateral migration is limited by the hydraulic barrier of Bailey and Cattail Creeks.

[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?

__X__ 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):

Figure 2 shows site-wide groundwater contours and flow-paths for the upper aquifer, and water level elevations for the lower aquifer (where available), based on liquid levels collected during the November 2002 groundwater sampling event. As shown, groundwater beneath the Facility discharges into:

1) the onsite receiving steams of West Bear Creek and East Bear Creek,
2) the unnamed receiving stream on the western portion of the site property, or
3) directly into Cattail / Bailey Creek running along the southern property boundary.

West Bear Creek, East Bear Creek, and the unnamed stream themselves also eventually discharge into Cattail / Bailey Creek, making it the ultimate surface water discharge point for the site property. Based on the analytical detections identified in the LF-series of monitoring wells, "contaminated" groundwater could discharge into Cattail / Bailey Creek.

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5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] 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 concentration[3] 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.

__X__ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] 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 concentrations[3] 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):

The groundwater monitoring analytical results summarized in ***Tables 1, 2, and 3*** identify several compounds with maximum detected concentrations greater than 10 times the project screening criteria (MCL, or Tap Water RBC if no MCL exists), including bis(2-chloroethyl) ether, 2-butoxyethanol, 1,4-dioxane, ethyl ether, iron, and manganese. However, the majority of these 10X exceedances were identified in monitoring wells located at significant distances from discharge into off-site surface water, and not in groundwater prior to entry to the hyporheic zone directly adjacent to the receiving surface water body. Of the compounds exceeding 10 times the screening level, only iron and manganese are present in site monitoring wells at concentrations greater than 100 times the project screening criteria.

- Groundwater monitored by the NAT and RAB monitoring wells discharges to the onsite receiving stream of East Bear Creek, which then flows onsite more than 1,500 feet before discharging to Bailey Creek at the edge of the site property.
- Groundwater monitored by the WWL monitoring wells flows 600 to 900 feet (depending on the individual monitoring well location) to the southeast before discharging to Cattail / Bailey Creek.

The groundwater concentrations at the hyporheic zone are expected to be significantly lower due to the effects of dilution from the advection / dispersion / diffusion transport processes. For example, groundwater / surface water sampling performed in 1999-2000 for the Natrosol Lagoon, and documented in the October 2000 *Annual Monitoring Report – Natrosol Lagoon (September 1999 through June 2000)* shows significant reductions in concentrations for a variety of compounds over the 200-foot distance between the NAT monitoring wells and surface water monitoring

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

points NAT-SWMP-1 and NAT-SWMP-2 for the discharge into East Bear Creek; see ***Figure 1***. Exhibit 1 below summarizes the tert-butyl alcohol (TBA) reductions in concentrations from the 2nd Quarter 2000 sampling:

Exhibit 1

		NAT-1	**NAT-2**	**NAT-3**	**NAT-4**	**NAT-SWMP-1**	**NAT -SWMP-2**
Approximate distance from southern edge of Natrosol Lagoon						150 feet	200 feet
Tert-butyl alcohol	*mg/L*	0.316	56	107	14.5	1.2	0.052

The concentrations of other organic and inorganic constituents from the 2nd Quarter 2000 sampling show similar reductions (one to two orders of magnitude) between groundwater and surface water, as documented in the full report which was previously submitted to USEPA as an attachment to the Current Human Exposures Under Control Environmental Indicator. Correspondingly, the detections identified in the RAB monitoring wells and WWL monitoring wells are expected to undergo similar reductions in concentration as groundwater flows to the hyporheic zone. Therefore, with the exception of manganese, none of the organic or inorganic compounds exceeding 10 times the screening level in groundwater are expected to reach the surface water bodies at concentrations exceeding 10 times the screening levels.

Based on the foregoing evaluation, only the detection of manganese of 10,900 ug/L in monitoring well LF-3 (downgradient of SWMU #5) may exceed 100 times the project screening criteria in the hyporheic zone. Using the average concentration of manganese of 4,433 ug/L from monitoring wells LF-1, LF-2, and LF-3, and the estimated flow of 0.15 cfs (documented in the attached Dilution Factor Calculation Worksheet), the estimated total mass loading being discharged into Cattail / Bailey Creek is 59.4 kg/yr. This estimated loading is conservatively based on the assumption that the average manganese concentration is present along the full length and depth of the groundwater discharge from SWMU #5.

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 implemented[4])?

__X__ 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):

As described above, the proximity of SWMU #5 to Cattail / Bailey Creek may potentially allow the discharge of contaminants from groundwater to surface water. Initial evaluation of the potential impacts to surface water was performed by comparing the detections in groundwater to 10x the National Recommended Water Quality Criteria (November 2002) for Organisms and Water + Organisms. ***Tables 1, 2, and 3*** show the calculated criteria and resulting screening. Of the constituents exceeding the project groundwater criteria, only one SVOC, bis(2-chloroethyl) ether, and two (2) inorganics, iron and manganese, exceed at least one of the modified Water Quality

[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.

criteria. However, as described above, only the concentrations present in the LF-series of monitoring wells are expected to discharge to surface water due to their proximity to the nearest surface water body (25 to 200 feet). Since bis(2-chloroethyl) ether was only detected in monitoring well WWL-3L (900 feet from surface water), only the two inorganics of iron and manganese will undergo continued evaluation.

The actual dilution capacities of Cattail and Bailey Creeks are believed to be significantly greater than provided by the generic 10x dilution criteria. Although direct stream gauging data is not available, the Virginia Water Control Board Office of Water Quality Assessments calculated 7Q10 flows of 0.330 cfs for Cattail Creek and 1.860 cfs for Bailey Creek based on comparisons with other streams of similar type, size, and drainage area. Based on the available data regarding site hydrogeology (hydraulic gradients and hydraulic conductivities) and the waste materials identified in SWMU #5, an estimate of the actual dilution capacities of the two creeks can be calculated. The dilution factor calculation worksheet, including documentation of assumptions and information sources, is attached. Use of the 7Q10 flows for calculation of dilution also neglects the effects of the tidal influences on Bailey and Cattail Creeks. Previous estimates of the range of tides in Bailey Creek have been as high as 2.6 feet. Since the tides operate independently of the low flow of the stream (which is dependent on precipitation, surface water flows, and groundwater recharge), the actual dilution capacities are even greater than that calculated. Neglecting these potential tidal effects, the calculated dilution from groundwater into Bailey Creek is 127X. Exhibit 2 summarizes the anticipated concentrations of the two subject compounds that were detected (iron, and manganese) in the LF-series of monitoring wells, based on the 127X dilution.

Exhibit 2

Compound		**Water Quality Criteria – Water + Organism**	**Water Quality Criteria - Organism**	**Anticipated Maximum Surface Water Concentration**
Iron	*ug/L*	300	N/A	60.9
Manganese	*ug/L*	50	100	85.2

Further assessment of potential impacts to ecological receptors was explored through the preparation of the attached *Proposed Aquatic Life Benchmarks for Chemicals Detected at the Hercules-Aqualon Hopewell, Virginia Site* report (Report). It uses a step-by-step process to derive appropriate aquatic life benchmarks for the constituents of concern based on 1) existing criteria from federal or state regulatory agencies, 2) existing criteria from published studies, or 3) calculated criteria based on Quantitative Structure Activity Relationships (QSARs). Additional information regarding the derivation of the criteria is included in the attached Report. Table 1 of the Report summarizes the criteria from the various sources, and provides an initial comparison against the maximum detected concentrations for the subject constituents. As shown in Table 1 of the Report, all of the evaluated maximum organic detections are well below the relevant aquatic life benchmarks.

Exhibit 3 below further evaluates the aquatic life benchmarks for the inorganic compounds iron and manganese against the anticipated concentrations based on the calculated 127X dilution. As shown, none of the anticipated surface water concentrations exceed the calculated aquatic life criteria.

Exhibit 3

Compound		**Aquatic Life Benchmark**	**Anticipated Maximum Surface Water Concentration**
Iron	*ug/L*	1,000	60.9
Manganese	*ug/L*	120	85.2

Based on these evaluations to human and ecological receptors, the potential discharge of "contaminated" groundwater from the Facility is believed to be acceptable, and to not negatively impact human health or the environment. Based on the above-described evaluations and assumptions, the surface water concentrations of manganese may exceed water quality criteria (water + organism). However, the anticipated concentrations of manganese are believed to be currently acceptable based on the magnitude of the exceedance, and the low risk / lack of potential exposure. The two water quality criteria, (water + organism, and organism only), are based on exposure through ingestion of contaminated groundwater / surface water, and ingestion of contaminated organisms (e.g. fish). There are no known users of groundwater or surface water as drinking water in the immediate vicinity of the site, and no public surface water intakes downstream of the site. The receiving surface water body (Cattail / Bailey

Creek) is also not a readily fishable water body due to its small size, the presence of the beaver dams both upstream and downstream of the site property, and its location among the various industrial facilities in eastern Hopewell. Based on these factors, the overall potential for exposures and the intensity of such exposures are quite low; further information regarding the potential exposures to inorganic concentrations in Cattail / Bailey Creek was provided in the Current Human Exposures Under Control Environmental Indicator previously submitted to USEPA.

Therefore the potential discharge of "contaminated" groundwater into surface water is currently acceptable.

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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?"

__X__ 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):

Additional liquid level measurements and groundwater samples will be collected from the nine (9) monitoring wells installed during the Phase II investigation: WWL-1 through WWL-3L/3U, and LF-1 through LF-5. The list of analyzed constituents will be based on the list used for the Phase I and II sampling events, but may be modified to eliminate previously undetected compounds. Although the frequency and timing of sampling will be impacted by the progress of the Corrective Action program under the Facility Lead Agreement (FLA), sample collection is expected to occur at least annually.

The sampling of the above-described nine monitoring wells will be sufficient to verify the lack of migrating groundwater beneath the facility. However, additional monitoring wells may also be installed and sampled as part of continuing characterization or monitoring efforts associated with SWMUs under the FLA. During any groundwater sampling event, side-wide groundwater and surface water elevation data will also be collected from all existing groundwater monitoring wells and surface water monitoring points (SWMPs).

In addition, the Facility will also continue to sample and monitor its existing surface water outfalls in accordance with the requirements of its VPDES permit. Monitoring performed at facility outfalls includes outfalls 005 (East Bear Creek) and 006 (West Bear Creek); outfall locations are shown on ***Figure 1***.

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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).

__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 **Aqualon** facility, EPA ID # **VAD003121928**, located at **1111 Hercules Road, Hopewell, Virginia**. 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 /s/ Date 09/23/04

Michael Zickler

Remedial Project Manager

Supervisor /s/ Date 09/27/04

Robert E. Greaves

Chief, General Operations Branch

Waste and Chemicals Management Division

Locations where References may be found:

All references have been included as attachments to this document.

Contact telephone and e-mail numbers

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LIST OF ATTACHMENTS:

Attachment A:

Figure 1: Site Map

Figure 2: Groundwater Contour Map

Figure 3: Geologic Cross-sections

Attachment B:

Table 1: WWL Monitoring Well Detection Table

Table 2: LF Monitoring Well Detection Table

Table 3: RAB Monitoring Well Detection Table

Attachment C: Dilution Factor Calculation Worksheet

Attachment D: *Proposed Aquatic Life Benchmarks for Chemicals Detected at the Hercules-Aqualon Hopewell, Virginia Site*