

**Documentation of Environmental Indicator Determination  
in accordance with EPA Interim Final Guidance 2/5/99**

**RCRA Corrective Action  
Environmental Indicator (EI) RCRA Info Code (CA750)**

**Migration of Contaminated Groundwater Under Control**

**Facility Name:** Exide Technologies  
**Facility Address:** Highway 111 & Canon Hollow Road, Forest City, MO 64451  
**Facility EPA ID #:** MOD030712822

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.

The Exide Technologies (Exide) facility is located on about 50 acres 4 miles northwest of Forest City, Missouri, in Holt County (see Figure 1). Exide's Canon Hollow plant has been operating since at least 1975 (Foster Wheeler Environmental Corp. [FW] 1995). The facility was originally owned by Schuylkill Metals Corporation (SMC), which became a division of the Exide Corporation in 1996. In 2000, Exide Corporation changed its name to Exide Technologies (Advance GeoServices Corp. [AG] 2001a). Exide is an active facility that recycles lead-acid storage batteries and other lead-bearing raw materials purchased offsite by smelting the material into new lead ingots (AG 2001a). The facility uses four pot furnaces and a blast furnace to smelt the recycled lead components (AG 2001b). Battery acid is also collected, filtered, and recycled, and plastic chips from battery cases are also recycled (AG 2001b).

The Exide facility has been monitored and investigated since at least 1980, when groundwater sampling began to support Exide's Resource Conservation and Recovery Act (RCRA) and National Pollutant Discharge Elimination System (NPDES) permits (AG 2001b). In 1990, the U.S. Environmental Protection Agency (EPA) issued a permit to Exide (then SMC), which required the facility to conduct a RCRA Facility Investigation (RFI) to determine the nature and extent of releases from SWMU and other units (AG 2001a). Investigations of groundwater, soil, sediment, and surface water contamination continued through the 1990s. Most recently, in 2001, Exide's contractor submitted a work plan for additional RFI investigations, and the facility continues to submit annual groundwater monitoring reports (AG 2001a).

Exide's current and past SWMUs and RUs include surface impoundments (SI), lagoons, landfills, and several storage areas. The primary contaminants released to soil, groundwater, sediment, and surface water are metals derived from lead processing, especially cadmium and lead, and inorganic constituents derived from battery acid, such as nitrate and chloride. Figure 2 shows the site layout with monitoring wells and SWMUs. Except where noted, the descriptions of SWMUs are derived from a revised section of the RFI (AG 2001b) and the groundwater characterization report (FW 1995).

**Solid Waste Management Units.** The SWMUs listed below are closed, with the exception of Landfill #2, which is still receiving waste. These areas have been the primary focus of the RFI and other site investigations.

Closed Surface Impoundments #1, #2, #3, and #4 (Areas A, B, C, and D). These unlined SIs were closed when the wastewater treatment plant was constructed in 1983 (Missouri Department of Natural Resources [MDNR] 2000). Before closure, they were used for disposal of neutralized and sedimented effluent of waste battery acid. The two larger SIs, #1 and #2, were estimated to have capacities of 1.6 and 1.3 million gallons, respectively. The lagoons'

contents were removed and treated in the wastewater treatment plant, and the areas were backfilled, capped and seeded/vegetated. Metals have been detected in soil and groundwater samples from the area of the closed SIs, both during and after closure.

Closed Rubber Chip Storage Area (Area E). Rubber chips from broken battery cases were stored at this location in a stockpile until the landfill was opened in 1981, when the most of contents were removed and landfilled. During landfill construction, the area was covered with excavated soil. Metals have been detected in soil and groundwater samples from the vicinity of the closed rubber chip storage area.

Closed Slag Storage Areas #1, #2, and #3 (Areas F, G, and H). These areas, which were used for storage of waste smelter slag, were closed in 1981 when the landfill was constructed. Slag from the blast furnace was deposited in these areas beginning in 1976. Most of the slag has been removed from Areas #1 and #2, and Area #1 was closed with compacted loess. Slag remains in Area #3, which has also been closed with compacted loess (FW 1995). Metals have been detected in soil and groundwater samples from the vicinity of the closed slag storage areas.

Closed Battery Case Disposal Area (Area J). In 1975 and 1976, battery cases, whole and broken, were deposited in this area on the southern boundary of the facility. Some dry batteries also may have been deposited in this area. It is now capped with a layer of loess and clay. Metals have been detected in soil samples from the vicinity of the battery area.

Landfills (Landfills #1 and #2). A hazardous waste landfill (Landfill #1) used to dispose of smelter slag, wastewater treatment sludge, and rubber battery case chips was constructed in 1981. Landfill #1 was closed and capped in 1991. The new landfill (Landfill #2) was constructed adjacent to Landfill #1 and continues to receive smelter slag and lime-neutralized sludges from the wastewater treatment plant. Landfill #2 has a double-liner system (MDNR 2000). Metals have been detected in soil and groundwater samples from the vicinity of the landfills.

**Other Units.** The units listed below are active units. They were not investigated in the RFI or other investigations, and the available documentation does not address the possibility of unregulated releases from these units. However, soil and groundwater samples collected for adjacent SWMUs should identify the presence of contamination associated with these units.

Battery Breaking Area #1. In this area, batteries are broken up and separated hydraulically into components of crushed plastic, lead plates, lead metalics, and acid.

Stack. Air emissions from the smelting operations are filtered through the baghouse and then through the sulfur dioxide scrubber before discharge through the scrubber stack.

Seven Containment Building Storage Areas (Slag Storage Area, Mix Room, Battery Plate Storage Area, Miscellaneous Storage, Dock Entry Building, 80x80 Storage Area and South Containment Building). Lead components are temporarily stored inside containment buildings.

Battery Storage Building. This area was formerly battery breaking area #2, but Exide has proposed to change it to a battery storage area (Barr Engineering Company 1999).

Container Storage Area. This area is located in the west side of the South Containment Building. It has a sloped concrete floor and is contained under a roof.

Battery Storage Area. This area is located in the battery breaking building and is used infrequently to store batteries before processing. Batteries are normally processed as they are unloaded.

Stabilization Area. This area consists of a slag crusher and pug mill for stabilization of waste prior to landfilling in landfill #2.

Wastewater Treatment Facilities. In 1983, a wastewater treatment plant, equalization lagoon, and septic lagoon were constructed to treat plant washdown water, stormwater, process wastewater, and effluent from showers, laundry, and restrooms. The wastewater treatment plant, stormwater, process wastewater, and septic lagoons are all serviced by separate NPDES-permitted outfalls.

## **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 RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be “**contaminated**”<sup>1</sup> 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

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<sup>1</sup>“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).

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 Exide facility, formerly the SMC facility, is located on about 50 acres 4 miles northwest of Forest City, Missouri, in Holt County, near the intersection of State Highway 111 and County Highway T (see Figure 1). It is bounded by agricultural and undeveloped property (MDNR 2000).

The facility sits adjacent to the Missouri River floodplain, in the bluffs and highlands making up the eastern side of the floodplain (see Figure 1) (FW 1994). No perennial surface water bodies exist on the property, but Canon Creek, a perennial stream, forms the western boundary of the property. In some documents, the creek is referred to as “Cannon Creek” (MDNR 2000). After passing under Highway 111, Canon Creek merges with Kimsey Creek about 5 miles south of the facility. Kimsey Creek flows into the Missouri River about 6 miles south of the site (FW 1994). The facility maintains a number of permitted outfalls to Canon Creek, including effluent discharge points from the wastewater treatment system and stormwater runoff pathways from the facility (AG 2001b). No public water supply intakes are near the facility (Center for Agricultural, Resource, and Environmental Systems [CARES] 2003).

The surficial geology and hydrogeology of the site is dominated by glacial materials. The geological sequence at the Exide facility consists of, from top to bottom, about 50 to 120 feet of loess, about 7 to 25 feet of mixed clay and silt, about 150 feet of glacial till, and Pennsylvanian-age limestone and shale bedrock (FW 1995; MDNR 2000). The water table is about 100 to 120 feet below ground surface (bgs) in the northern and western parts of the facility, and about 10 to 20 feet bgs near Canon Creek, usually within or near the base of the loess unit (AG 2001b). Groundwater generally flows to the west and north toward Canon Creek with little seasonal variation in direction or rate, and the average estimate velocity is about 26 feet per year (FW 1995). Canon Creek appears to act as a groundwater flow boundary, with groundwater flowing toward the creek from both sides of the creek (FW 1995). Groundwater is not used for drinking water at the facility, which is located in the Holt County Public Water Supply District #1 (CARES 2003). The nearest public water supply wells are about 3 miles away, at Squaw Creek National Wildlife Refuge, and about 4 miles away, in Forest City (AG 2001a; CARES 2003).

Groundwater at the Exide facility was contaminated with metals and other inorganic constituents at the time of the RFI sampling in 1993, and at least one well at the facility (OW-3) still has concentrations of lead and cadmium that exceed EPA maximum contaminant levels (MCL) or action levels (FW 1995; AG 2001b; Layne 2003).

Groundwater samples at the Exide facility have been collected since at least 1980 as a condition of the facility’s RCRA and NPDES permits. At the time of the RFI, 37 monitoring wells were at the facility, 6 of which had been abandoned (FW 1995) (see Figure 2). These wells were installed in stages in the 1980s and 1990s (FW 1995). Currently, the facility monitors 6 wells in the area of the former SIs (OW-1, -3, -4, -6, -207, and -208) and 12 wells in the area of the landfills (OW-201, -202A, -203A, -204B, -205, -206, -209, -210, -211, -212, -213, and -13) (AG 2001b; Layne 2002). Samples collected near the former SIs are analyzed for dissolved metals (cadmium, lead, and nickel) and inorganic constituents (nitrate, chloride, and sulfate). Both unfiltered (total metal) and filtered (dissolved metal) groundwater samples are analyzed for metals around the landfills.

The most contaminated groundwater samples collected during the RFI sampling in 1993 were from OW-3, OW-4, and OW-301, all downgradient from and closest to the former SIs (see Figure 2). Table 1 shows the maximum concentrations of metals in groundwater collected during the RFI sampling in 1993, including all constituents that exceeded EPA MCLs or MDNR target concentrations for groundwater. Values in bold exceed the MCL or target concentration (EPA 2002; MDNR 2001). These samples had concentrations of total/dissolved antimony (33 and 28 micrograms per liter [ $\mu\text{g}/\text{l}$ ], respectively), total/dissolved cadmium (40 and 30  $\mu\text{g}/\text{l}$ , respectively), total/dissolved lead (415 and 43  $\mu\text{g}/\text{l}$ , respectively), and total/dissolved nickel (300 and 290  $\mu\text{g}/\text{l}$ , respectively) that exceeded EPA MCLs or MDNR target concentrations. Samples collected in 2002 and 2003 from OW-4 were below MCLs or other EPA action levels for dissolved cadmium, dissolved lead and dissolved nickel (see Table 2). Samples collected from OW-3 continue to have elevated concentrations of dissolved cadmium and dissolved lead (maximum concentrations in 2003 of 12  $\mu\text{g}/\text{l}$  and 162  $\mu\text{g}/\text{l}$ , respectively). OW-301 has not been sampled since 1993.

Of the recent in-stream monitoring under the NPDES permit, there was only one exceedance of total lead taken from Canon Creek downstream at the railroad bridge. Canon Creek is sampled for total and dissolved lead and nickel only and Kimsey Creek is sampled for total lead only. The sample was taken July 2001 with a result of 16 ppb total lead. The dissolved lead sample was <5 ppb. There have been no other exceedances of lead in Canon Creek or Kimsey Creek since that time.

**Table 1 – Maximum Concentrations of Constituents in Groundwater, from the RFI**

| Constituent                   | Concentration (µg/l) | Well   | Date          | EPA MCL |
|-------------------------------|----------------------|--------|---------------|---------|
| <b>Metals</b>                 |                      |        |               |         |
| Antimony, dissolved           | <b>28</b>            | OW-3   | May 1993      | 6       |
| Antimony, total               | <b>33</b>            | OW-3   | May 1993      | 6       |
| Arsenic, total                | 14                   | OW-301 | February 1993 | 50      |
| Barium, total                 | 630                  | OW-7   | February 1993 | 2,000   |
| Cadmium, dissolved            | <b>30</b>            | OW-3   | May 1993      | 5       |
| Cadmium, total                | <b>40</b>            | OW-3   | February 1993 | 5       |
| Chromium, total               | 25                   | OW-303 | May 1993      | 100     |
| Copper, dissolved             | 41                   | OW-207 | May 1993      | 1,300*  |
| Copper, total                 | 130                  | OW-307 | May 1993      | 1,300*  |
| Lead, dissolved               | <b>43</b>            | OW-301 | February 1993 | 15*     |
| Lead, total                   | <b>415</b>           | OW-301 | February 1993 | 15*     |
| Nickel, dissolved             | <b>290</b>           | OW-4   | May 1993      | 100**   |
| Nickel, total                 | <b>300</b>           | OW-4   | May 1993      | 100**   |
| Zinc, dissolved               | 50                   | OW-1   | May 1993      | 2,000** |
| Zinc, total                   | 100                  | OW-301 | February 1993 | 2,000** |
| <b>Inorganic Constituents</b> |                      |        |               |         |
| Chloride (mg/l)               | <b>1,372</b>         | OW-305 | February 1993 | 250***  |
| Nitrate (mg/l)                | <b>26.3</b>          | OW-303 | March 1993    | 10      |
| Sulfate (mg/l)                | <b>9,000</b>         | OW-303 | May 1993      | 250***  |

**Notes:**

Table derived from the 1995 groundwater characterization report (Foster Wheeler Environmental Services 1995).

Values in bold exceed the MCL or MDNR target concentration.

\* EPA specifies an action level for lead and copper, rather than an MCL (EPA 2002).

\*\* EPA does not specify a MCL for this constituent (EPA 2002). This value is MDNR target concentration for groundwater (MDNR 2001).

\*\*\* EPA does not specify a primary MCL for this constituent (EPA 2002). This value is secondary MCL

EPA = U.S. Environmental Protection Agency

MCL = Maximum contaminant level

MDNR = Missouri Department of Natural Resources

µg/l = micrograms per liter

RFI = Resource Conservation and Recovery Act Facility Investigation

**Table 2 – Recent Concentrations of Constituents Detected in Groundwater**

| Well      | Date       | Cadmium, dissolved (µg/l) | Chromium, total (µg/l) | Chromium, dissolved (µg/l) | Lead, total (µg/l) | Lead, dissolved (µg/l) | Nickel, dissolved (µg/l) | Zinc, total (µg/l) | Zinc, dissolved (µg/l) |
|-----------|------------|---------------------------|------------------------|----------------------------|--------------------|------------------------|--------------------------|--------------------|------------------------|
| EPA MCL   | ---        | 5                         | 100                    | 100                        | 15*                | 15*                    | 100**                    | 2,000**            | 2,000**                |
| OW-1      | July 2003  | < 1                       | NA                     | NA                         | NA                 | < 5                    | 33                       | NA                 | NA                     |
| OW-3      | April 2003 | <b>12</b>                 | NA                     | NA                         | NA                 | <b>162</b>             | 20                       | NA                 | NA                     |
| OW-3      | July 2003  | <b>9</b>                  | NA                     | NA                         | NA                 | <b>70</b>              | 24                       | NA                 | NA                     |
| OW-4      | July 2003  | <1                        | NA                     | NA                         | NA                 | 8                      | 18                       | NA                 | NA                     |
| OW-6      | July 2003  | < 1                       | NA                     | NA                         | NA                 | < 5                    | < 5                      | NA                 | NA                     |
| OW-13     | Dec. 2002  | < 1                       | 13                     | 10                         | < 5                | < 5                    | < 5                      | 11                 | 12                     |
| OW-200*** | Dec. 2002  | < 1                       | 9                      | 5                          | 6                  | < 5                    | < 5                      | 10                 | < 10                   |
| OW-201    | Dec. 2002  | < 1                       | < 5                    | 5                          | 10                 | 5                      | < 5                      | 11                 | < 10                   |
| OW-202A   | Dec. 2002  | < 1                       | 6                      | 5                          | 9                  | < 5                    | < 5                      | < 10               | 13                     |
| OW-203A   | Dec. 2002  | < 1                       | 7                      | < 5                        | 9                  | < 5                    | < 5                      | < 50               | 10                     |
| OW-204B   | Dec. 2002  | < 1                       | 8                      | < 5                        | < 5                | < 5                    | < 5                      | < 10               | < 10                   |
| OW-205    | Dec. 2002  | < 1                       | 9                      | 8                          | 6                  | < 5                    | < 5                      | < 10               | < 10                   |
| OW-206    | Dec. 2002  | < 1                       | < 5                    | < 5                        | 6                  | 6                      | < 5                      | < 10               | < 10                   |
| OW-207    | July 2003  | < 1                       | NA                     | NA                         | NA                 | < 5                    | 15                       | NA                 | NA                     |
| OW-208    | July 2003  | < 1                       | NA                     | NA                         | NA                 | 5                      | 23                       | NA                 | NA                     |
| OW-209    | Dec. 2002  | < 1                       | 6                      | 6                          | < 5                | < 5                    | < 5                      | < 10               | < 10                   |
| OW-210    | Dec. 2002  | < 1                       | 9                      | 6                          | 5                  | < 5                    | < 5                      | < 10               | < 10                   |
| OW-211    | Dec. 2002  | < 1                       | 5                      | < 5                        | 5                  | < 5                    | < 5                      | 12                 | 14                     |
| OW-212    | Dec. 2002  | < 1                       | 6                      | < 5                        | 14                 | < 5                    | < 5                      | 12                 | < 10                   |
| OW-213    | Dec. 2002  | < 1                       | < 5                    | < 5                        | < 5                | < 5                    | < 5                      | < 10               | < 10                   |

**Notes:**

Table derived from the most recent annual groundwater report (Layne Geosciences 2003) and the 2001 response to comments (Advance GeoSciences Corp. 2001b).

Values in bold exceed the MCL or MDNR target concentration.

\* EPA specifies an action level for lead and copper, rather than an MCL (EPA 2002).

\*\* EPA does not specify a MCL for this constituents (EPA 2002). This value is MDNR target concentration for groundwater (MDNR 2001).

\*\*\* OW-200 is a split of OW-210

EPA = U.S. Environmental Protection Agency

MCL = Maximum contaminant level

MDNR = Missouri Department of Natural Resources

µg/l = micrograms per liter

NA = Not analyzed

2Q 2001 = Second quarter of 2001

3Q 2001 = Third quarter of 2001

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within “existing area of contaminated groundwater”<sup>2</sup> 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”<sup>2</sup>).

\_\_\_\_\_ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the “existing area of groundwater contamination”<sup>2</sup>) - 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):

Although groundwater at Exide is contaminated with metals, levels of contamination do not appear to be increasing over time. Moreover, the most downgradient wells at the facility have undetectable or low concentrations of contaminants, suggesting that contaminated groundwater is not migrating horizontally. Based on the physical and chemical properties of the mixed clay and silt layer (the “central cohesive unit”) that underlies the loess aquifer, vertical migration of contaminants is not expected to be significant.

Analytical data collected as part of Exide’s ongoing groundwater monitoring program suggests that the horizontal migration of contaminated groundwater at Exide has stabilized. Wells OW-1, -5, -6, -7, -13, -207, -208, -210, and -308 define the perimeter of the facility (see Figure 2). Of these wells, OW-1, -6, -13, -207, -208, and -210 are part of the ongoing monitoring program. The remainder were sampled during the RFI in 1993. Of the wells sampled recently, none of them had exceedances for the three dissolved metals (cadmium, nickel, and lead) analyzed. Of the wells that are not regularly sampled (OW-5, -7, and -308), samples collected during the RFI sampling in 1993 did have concentrations of cadmium in unfiltered samples that exceeded the EPA MCL of 5 µg/l (average concentrations in 1993 of 13 µg/l, 15 µg/l, and ND (.01) µg/l, respectively) (FW 1995). OW-5 had a detection of dissolved lead at 0.017 ppm which is above the MCL. OW-207 also had dissolved nickel above the MCL’s with an average of 0.128 ppm.

Given their chemical and physical properties, the layers underlying the loess aquifer would be expected to slow the vertical migration of contaminants in groundwater. Because all wells at the facility are screened in the uppermost part of the aquifer (FW 1995; Layne 2001), vertical migration cannot be determined by comparing concentrations of contaminants in shallow wells to those in deeper wells. However, the central cohesive unit has a hydraulic conductivity that is one-tenth that of the loess layer ( $5 \times 10^{-5}$  centimeters per second [cm/s] and  $5 \times 10^{-4}$  cm/s, respectively). Although the clay layers in the central cohesive unit are not continuous, this layer likely would slow the flow of groundwater (FW 1995; MDNR 2000). Moreover, the low-permeability shale bedrock does serve as a

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<sup>2</sup> “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.

confining layer (FW 1995). In addition to these physical properties, the vertical migration of contaminants in groundwater is slowed further by the tendency of metals to be adsorbed onto clay minerals such as those found in the central cohesive layer and the shale bedrock (FW 1995). These physical and chemical properties, taken together, suggest that vertical migration of contaminants would not be significant at the Exide facility.

4. Does “contaminated” groundwater **discharge** into **surface water** bodies?

\_\_\_\_\_ If yes - continue after identifying potentially affected surface water bodies.

**X** If no - skip to #7 (and enter a “YE” status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater “contamination” does not enter surface water bodies.

\_\_\_\_\_ If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

Groundwater from the Exide facility does discharge into Canon Creek, but water discharging into the creek has not contain dissolved metals at concentrations that exceed EPA MCLs or MDNR criteria for designated uses (drinking water or aquatic life) (10 CSR 20–7) since third quarter 2001. Canon Creek is identified as a groundwater flow boundary. Therefore, groundwater is expected to discharge into the stream (FW 1995). The RFI revealed a number of locations along Canon Creek where groundwater was seeping into the creek (FW 1994). Of the groundwater collected from wells nearest the creek (OW-1, -5, -6, -7,-207 -208, and –308), samples have been collected since 1996 from all wells but OW-5,-7 and -308. From the wells nearest the creek that are continually sampled, OW-1, -6, -207, and –208 no samples have contained dissolved metals at concentrations above EPA action level or MDNR criteria since third quarter 2001. A sample collected from OW-1 during the second quarter of 2001 had a dissolved lead concentration of 15 µg/l, which is the EPA action level for this metal. This value also exceeds the chronic exposure level for aquatic life for water with hardness less than 125 (9 µg/l). However, the samples collected the last nine quarters from OW-1 have not had exceedances of lead or any other metal (AG 2001b). Because of the low concentrations of contaminants in groundwater nearest the stream, groundwater with concentrations in excess of groundwater standards likely is not discharging into Canon Creek.

5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration<sup>3</sup> 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<sup>3</sup> 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.

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

\_\_\_\_\_ If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> 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<sup>3</sup> 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):

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<sup>4</sup>)?

\_\_\_\_\_ 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<sup>5</sup>, 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):

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<sup>4</sup> 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.

<sup>5</sup>The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the “existing area of contaminated groundwater?”

  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):

As outlined in its NPDES and RCRA permits, Exide will continue to monitor groundwater and surface water in the area around the landfills and in the area of the closed SIs (AG 2001b).

8. Check the appropriate RCRA Info 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 Exide Technologies facility, EPA ID # MOD030712822, located at Highway 111 & Canon Hollow Road, Forest City, Missouri. 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: Original signed by \_\_\_\_\_ Date 9/30/03  
John Delashmit, P.E.  
Project Manager, RCRA Corrective Action & Permits Branch  
EPA Region 7

Supervisor: Original signed by \_\_\_\_\_ Date 9/30/03  
John Smith  
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Completed by: Original signed by \_\_\_\_\_ Date 9/30/03  
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Missouri Department of Natural Resources-Hazardous Waste Program

Supervisor: Original signed by \_\_\_\_\_ Date 9/30/03  
Richard A. Nussbaum, P.E., R.G.  
Acting Chief, Land Disposal/PCB Unit  
Missouri Department of Natural Resources-Hazardous Waste Program

Locations where References may be found:

EPA Region 7 Headquarters  
RCRA Files  
901 North 5<sup>th</sup> Street  
Kansas City, Kansas 66101

Missouri Department of Natural Resources  
1738 East Elm St. Lower Level  
Jefferson City, Missouri 65101

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**FIGURES**

(3 pages)