

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

Revised 9/20/02

RCRA Corrective Action

Environmental Indicator (EI) RCRA Info code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: John Deere Waterloo Works
Facility Address: 400 Westfield Ave., Waterloo, IA 50704
Facility EPA ID #: IAD005289806

DETERMINATION RESULT: YE

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.

The John Deere Waterloo Works (JDW W) facility is located on about 270 acres in Waterloo, Iowa (see Figure 1). The facility consists of two parts, the John Deere Component Works (JDCW), which is east of Blackhawk Creek, and John Deere Foundry Waterloo (JDFW), which is west of Blackhawk Creek (Black and Veatch Waste Science and Technology Corp [BV] 1991). The facility began operations in 1909 as the Waterloo Gasoline Engine company and was bought by John Deere (JD) in 1918, when operations expanded to include additional farm implements (Roy F. Weston, Inc. [Weston] 2004). The facility expanded to its present size in 1967 with purchase of the property west of Blackhawk Creek. Tractor assembly subsequently was moved offsite.

In 1991, operations at the facility included manufacturing components for assembly of tractors and other agricultural implement. Manufacturing processes included foundry operations, molding operations, machining of cast iron and steel, painting, paint stripping, and electroplating (BV 1991).

As of 2000, the facility generated less than 1,000 kilograms per month of hazardous waste (JDW W 2001). It also stored and treated hazardous waste on site. The JDW W facility has held a U.S. Environmental Protection Agency (EPA) permit to operate a hazardous waste treatment, storage, and disposal facility (TSDF) since 1991 (Weston 1998b). Hazardous waste treated and stored on site was generated on site, off site by other JD facilities, and off site by facilities with other owners. An onsite wastewater treatment plant (WWTP) built by JDW W accepted hazardous aqueous and oil wastes from other facilities – for the most part, wastes from metal finishing operations (BV 1991). JDW W also operated a container storage facility for onsite treatment (by unspecified methods) or for wastes awaiting off-site treatment. These wastes were generated at JDW W and other JD facilities (Weston 1994). By 1998, the facility was disposing of waste-paint solids in the county landfill, sending most of its foundry sand to cement kilns, and disposing of solvents off site or using them as a secondary fuel source (Weston 1998b). In 2000, EPA issued a Class 1 permit modification that eliminated regulated units and most TSDF waste management activities at the JDW W facility. This modification resulted from the clean closure of all regulated units. The facility also stopped accepting hazardous waste from off site (JDW W 2001).

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The JDWW facility has been monitored and investigated since at least 1985, when EPA conducted a preliminary assessment of the site (BV 1991). In 1991, EPA performed a Resource Conservation and Recovery Act (RCRA) facility assessment (RFA) that identified 22 solid waste management units (SWMU) and 5 areas of concern (AOC). As a condition of the 1991 permit, EPA required the facility to conduct a RCRA facility investigation (RFI) to determine the nature and extent of releases from SWMUs and AOCs that had evidence of a release or significant data gaps (BV 1991; Weston 1994) (see Figure 2). Investigations of groundwater, soil, sediment, and surface water contamination have continued at the facility, including investigations to:

- Close the J4 container storage building in 1994 (Ries Environmental Corp. [Ries] 1994)
- Close the M12 container storage area in 2000 (Earth Tech Inc. 2000)
- Characterize SWMUs and prepare for planned expansion of building T-10 and possible expansion of buildings H and Z (Weston 2001b)
- Expand building T-10 in 2001 (Weston 2001a)
- Determine the existence of an additional SWMU in building H3 (JDWW 2004)
- Update existing groundwater data (Weston 2004)

The SWMUs and AOCs characterized in the RFI and subsequent investigations are listed below. For ease of identification, SWMUs and AOCs have been organized into four geographic groups: (1) Chromium and Cyanide Waste Area, (2) JDFW Sand Waste Area, (3) Foundry Settling Pond Area, and (4) Skimmer Pond Area (Weston 1994) (see Figure 2). Compounds detected at concentrations above background at the facility include volatile organic compounds (VOC), semivolatile organic compounds (SVOC), metals, polychlorinated biphenyls (PCB), and dioxins. A limited number of pesticides and herbicides also have been detected. SWMUs and AOCs still under investigation or that have evidence of release are listed below. The 2004 investigation showed that contaminated areas in building H3 were not SWMUs, but the location of incidental small spills; the areas of the spills were cleaned up in 2004 (JDWW 2004).

Chromium and Cyanide Waste Area. The Chromium and Cyanide Waste Area is on the west end of the JDWW facility and includes two SWMUs.

Cyanide and Chromium Waste Disposal Areas. In this SWMU, chromium and cyanide sludges from plating operations were put in drums and buried (BV 1991). Although the exact dates of operation are unknown, JD memos from the 1960s said that the area had been used for “many years.” The practice of burying drums here was discontinued in 1970 or 1971 (BV 1991). The extent and number of burial sites also is unknown (BV 1991). This SWMU is now under the corner of building 8002. No source characterization was performed at this SWMU for the RFI, although groundwater samples were collected from the area of the SWMU (Weston 1994). No significant groundwater contamination was found in the area of this SWMU.

Electric Arc Furnace Baghouse. This SWMU stored dust collected from the four baghouses serving the foundry. The dust was once stored in waste piles but was later stored in roll-off containers for off-site disposal (BV 1991). This SWMU operated from the early 1970s until 1998 or later (BV 1991; Weston 1998b). No source characterization was performed at this SWMU for the RFI, though groundwater samples were collected from the area of the SWMU (Weston 1994). No significant groundwater contamination was found in the area of this SWMU.

JDFW Foundry Sand Waste Area. The JDFW Foundry Sand Waste Area is at the eastern half of the JDFW facility and includes four SWMUs.

Waste Casting Sand Disposal Areas. This SWMU encompasses about 75 acres and received casting sands from foundry operations (BV 1991). The sands potentially were contaminated with cyanide, phenols, oils, and petroleum-based solvents (BV 1991). The SWMU is overlapped by the other three SWMUs in the area. Dates of operation of the SWMU are unknown, but it was no longer in use after 1979 (BV 1991; Weston 1994). JDWW has

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since built several buildings over the SWMU. Subsurface soils in this area contained VOCs, SVOCs, metals, and PCBs (Weston 1994).

Sludge Drying Ponds. This SWMU included two ponds, each about 100 by 500 feet in area. The ponds received sludges from the settling and skimmer ponds and also were used for temporary storage of iron waste from the foundry (BV 1991). Before the ponds were constructed, the area was used for disposal of foundry sand (Weston 1994). The date of construction is unknown, but in 1993 the west unit was backfilled with foundry waste sand and demolition debris (Weston 1998b). Subsurface soil and pond sediment in this area contained VOCs, SVOCs, PCBs, herbicides, dioxins and furans, and metals (Weston 1994).

Building 1020 and 1021 Disposal Area. This SWMU covered about 5 acres and received foundry waste and sludge from the skimmer pond (BV 1991). Its dates of operation are unknown. Subsurface soil in this area contained VOCs, SVOCs, and metals (Weston 1994).

West Disposal Area. This SWMU covered about 5 acres and now is paved with concrete (BV 1991). It received foundry waste, carbide waste, oil waste, concrete, and sludge from the skimmer pond (BV 1991). At some time, it also was used as an area to rinse trucks (cargo unknown) (Weston 1994). At the time of the RFI, it was still used to store miscellaneous items (Weston 1994). Its dates of operation are unknown. Subsurface soil in this area contained VOCs, SVOCs, PCBs, pesticides, and metals (Weston 1994).

Foundry Settling Pond Area. The Foundry Settling Pond Area is east of Black Hawk Creek and covers most of the JDCW area. It includes four SWMUs and two AOCs. One of the AOCs – the tank area – was identified during the RFA. The other – the north parking lot – was identified later.

Old Foundry Settling Ponds. This SWMU included two unlined settling ponds used to store core sand, air pollution washings, and core washings from the foundry (BV 1991). They were constructed in the mid-1960s and operated until 1986 (BV 1991). In 1986, dredged solids were removed from the ponds and taken to the sludge drying beds, but the ponds still contained an unknown quantity of solids from the foundry (BV 1991). The ponds also received dredged sludge from the skimmer pond in 1992 (Weston 2001b). Small trees and other vegetation have grown in and around the ponds, and the ponds still contain surface water (Weston 2001b). Pond sediment and subsurface soil contained VOCs, SVOCs, PCBs, dioxins, and metals (Weston 1994, 2001b).

Waste Casting Sand Disposal Areas. Waste casting sand also was disposed of in the Foundry Settling Pond Area. This SWMU covered about 75 acres and received casting sands from foundry operations (BV 1991). The sands potentially were contaminated with cyanide, phenols, oils, and petroleum-based solvents (BV 1991). The SWMU is overlapped by the three other SWMUs in the area. The dates of operation of the SWMU are unknown, but it was no longer used after 1979 (BV 1991; Weston 1994). JDWW has since built several buildings over the SWMU. Subsurface soils in this area contained VOCs, SVOCs, metals, and PCBs (Weston 1994, 2001a).

Paint Sludge Disposal Areas. In this SWMU, the JDWW facility burned waste paint containing chromium and lead in pits (BV 1991). Its dates of operation are unknown. Subsurface soil in this area contained VOCs, SVOCs, PCBs, and other metals (Weston 1994, 2001a).

Rubbish Pits. This SWMU includes two pits – one 200 by 50 feet and the other 500 by 200 feet – both now covered by concrete or buildings (BV 1991). Materials disposed of in the pits are unknown, but they included wood, cardboard, and paper (BV 1991; Weston 1994). Construction dates are unknown, but the pits primarily were used in the late 1950s (BV 1991). Subsurface soil in this area contained VOCs, SVOCs, and metals (Weston 1994).

Underground Tanks (Oil Field). Underground storage tanks (UST) were located throughout the JDWW facility (BV 1991). Records indicate the removal of 25 USTs from various locations and 25 10,000-gallon USTs from this AOC (Weston 1994). USTs in the oil field contained diesel, gasoline, oil, antifreeze, and unknown chemicals.

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When removed from the oil field, the majority of USTs were leaking (BV 1991). Free product has been detected in two monitoring wells in the immediate area of the oil field, and product recovery systems still are operating in the area (Weston 1994; IT Group 2002a, 2002b). No soil samples were collected in this area (Weston 1994).

North Parking Lot Area. This AOC was identified during installation of monitoring well GW-9, when oil waste was reported (Weston 1994). The area of stained soil is about 200 by 600 feet in area and may have been part of the foundry settling ponds or an associated pond before it was filled and paved in 1978 (Weston 1994). Subsurface soil in the area contained VOCs, SVOCs, PCBs, dioxins and furans, pesticides, and other inorganic contaminants (Weston 1994).

Skimmer Pond Area. The Skimmer Pond Area is at the northeast corner of JDWW, directly south of River Road. It includes seven SWMUs and one AOC. The AOC – the rubbish pit where chromium waste was spilled – was identified after the RFA.

J-4 Container Storage Area. This SWMU was a paved storage pad, about 75 feet by 63 feet in area, where drummed hazardous and non-hazardous waste was stored for both on- and off-site processing (BV 1991). The area was constructed in 1976 and paved in 1983 (BV 1991; Ries 1994). The RFA did not recommend additional investigation at this SWMU, and it was not included in the RFI. However, closure sampling in 1994 revealed elevated levels of metals at concentrations higher than surrounding areas with the same fill (Weston 1998b). As a result, it will be included in future corrective action, and it was one of the areas included in the 2001 supplemental investigation (Weston 2001b).

Skimmer Pond. This SWMU was an 8-acre pond, constructed in dredged sand deposits and foundry sand refuse in the early 1960s (BV 1991). It was used for gravity separation of suspended solids in process water, and skimmers in the pond collected free-floating oil. The pond also received storm water runoff and cooling water (Weston 1994). Subsurface soil and pond sediment in this area contained VOCs, SVOCs, PCBs, dioxins, and metals (Weston 1994).

Waste Casting Sand Disposal Areas. Waste casting sand also was disposed of in the Skimmer Pond Area. This SWMU covered about 75 acres and received casting sands from foundry operations (BV 1991). The sands potentially were contaminated with cyanide, phenols, oils, and petroleum-based solvents (BV 1991). The dates of operation of the SWMU are unknown, but it was no longer in use after 1979 (BV 1991; Weston 1994). JDWW has since built several buildings over the SWMU. Subsurface soils in this area contained VOCs, SVOCs, pesticides, metals, and PCBs (Weston 1994).

Paint Sludge Disposal Areas. Paint sludges also were burned in at least two locations in the Skimmer Pond Area. In this SWMU, the JDWW facility burned waste paint containing chromium and lead in pits (BV 1991). Its dates of operation are unknown. Subsurface soil in this area contained VOCs, SVOCs, herbicides, dioxin, and metals (Weston 1994, 2001b).

Former Settling Pond. This SWMU was used primarily before the mid-1950s for disposal of all types of waste and fill material (Weston 1994). It was replaced by the skimmer pond and currently does not hold surface water (BV 1991; Weston 1994). Subsurface soil in the area contained VOCs, SVOCs, dioxins/furans, and other inorganics (Weston 1994).

Carbide Pit. This SWMU – about 50 feet in diameter – was used to dispose of calcium hydroxide wastes produced by the generation of acetylene (BV 1991; Weston 1994). Its dates of operation are unknown, but it was no longer in use in 1991 (BV 1991). Subsurface soil in this area contained VOCs, SVOCs, and other inorganics (Weston 1994).

Sludge Pit. This SWMU – about 50 feet in diameter – was used to dispose of all types of liquid waste and sludge. The types of wastes and dates of operation are unknown, but the SWMU was used primarily during the 1950s (Weston 1994). Subsurface soil in this area contained VOCs, SVOCs, PCBs, pesticides, and metals (Weston 1994).

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Waste Pit. The source and types of wastes disposed of in this 1,000-square foot SWMU are unknown. Its dates of operation also are unknown, but it was no longer in use in 1991 (BV 1991). Subsurface soil in this area contained VOCs, SVOCS, PCBs, and metals (Weston 1994, 2001b).

Rubbish Pit/Chromium Rinse Water Spill Area. This SWMU included two pits – one 200 by 50 feet, the other 500 by 200 feet – both now covered by concrete or buildings (BV 1991). Materials disposed of in the pits were unknown (BV 1991). The construction date is also unknown, but the pits were used primarily in the late 1950s (BV 1991). In 1985, an underground line carrying chromium rinse water past the SWMU sprang a leak (Weston 1994). Subsurface soil in the area contained VOCs, SVOCS, and metals (Weston 1994, 2001b).

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).

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2. Is **groundwater** known or reasonably suspected to be “**contaminated**”¹ above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

 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 JDWW facility is in Waterloo, Iowa, adjacent to the Cedar River (see Figure 1). Although the facility is zoned for heavy industrial uses, the surrounding land is used for a mix of residential, recreational, commercial, and light industrial activities (Weston 1994). The facility is bordered on the north and east by the Cedar River and on the south and west by railroad tracks and U.S. Highway 218 (BV 1991). The closest residential neighborhoods are about 0.25 mile south and west of the facility (BV 1991). The facility itself is covered by a mix of buildings and pavement, with very little exposed soil, and surrounded by a security fence (Weston 1994). Security guards monitor the facility 24 hours per day (Weston 1994).

The JDWW facility is in the 500-year floodplain of the Cedar River (Weston 1994). It is bisected by Blackhawk Creek, which runs into the Cedar River on the northeastern boundary of the property (BV 1991). However, levees confine both the Cedar River and Blackhawk Creek, and the facility was not flooded during the major 1993 floods (Weston 1994). The Cedar River has a number of intensely-used recreational facilities near the JDWW facility, including those directly across the river, 0.25 mile upstream, and 0.5 mile downstream (Weston 1994). The facility also has three manmade surface water features – two inactive foundry settling ponds and the skimmer pond (Weston 1994). The skimmer pond receives stormwater runoff and process wastewater that then is discharged into the Cedar River by permitted outfalls (BV 1991).

The surficial geology and hydrogeology of the site is dominated by alluvial materials and weathered bedrock. Unconsolidated materials at the facility consist of interbedded clay, silt, sand, and gravel (BV 1991). The depth to bedrock ranges from 8 feet near the southeast corner of the site to 83 feet near a bedrock channel north of the property (Weston 1994). The uppermost bedrock is fractured Devonian limestone that has been weathered at its surface (BV 1991). The Devonian bedrock is underlain by Silurian bedrock (BV 1991). Both the unconsolidated materials and the Devonian bedrock are used as aquifers. The unconsolidated aquifer serves as a potable water source for the city, with six municipal wells in this aquifer about 4,000 feet north of the facility. The Devonian aquifer also is used as a drinking water source, with eight municipal wells within a 2-mile radius of the facility (BV 1991). The eight process wells at the facility are completed in the Devonian aquifer (Weston 1998b). Monitoring wells at the facility are completed in the unconsolidated material and the top of the bedrock, and in 1992 and 1993, the depth to groundwater in these wells ranged between 5 and 25 feet below ground surface (bgs) (Metcalf & Eddy [M&E] 1994). When the process wells are not pumping during maintenance or groundwater investigations,

¹“Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

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groundwater flows to the south and southeast (Weston 1994). When operating, the process wells generally control gradients, keeping contaminated groundwater on site (M&E 1994; Weston 2004). The production wells appear to operate more-or-less continuously (Weston 2004).

Groundwater samples at the JDWW facility were collected in two phases during the RFI, in four rounds over the period from 1992 to 1993 (Weston 1994). Immediately following the RFI, the facility had 38 monitoring wells at a range of depths (M&E 1994). Groundwater was analyzed for all 40 Code of Federal Regulations (CFR) Part 264 Appendix IX parameters during the first round of sampling. Analytes for subsequent sampling events were based on the results of this first round (Weston 1994). Metals were analyzed both for total and dissolved concentrations (Weston 1994). In general, unfiltered samples have higher concentrations of metals because of the contribution of metal in suspended sediment. Four wells at the western end of the facility (GW-14, GW-15, GW-18, GW-19) were designated as background wells. The background wells were arranged in two-well nests, each with one well screened at the top and one at the bottom of the alluvial aquifer (Weston 1994). In 1994, nine additional wells were installed for a free-product delineation study (Weston 1998b). Groundwater samples were collected again in 2004, at the request of EPA (Weston 2004). The free-product recovery system is still operating (Weston 2004). Monitoring well locations are shown on Figure 3.

Reconnaissance groundwater samples also were collected during the RFI using Geoprobe[®] samplers and lead-screen augers (Weston 1994). Reconnaissance samples were collected at the hypothetical lateral edge of the plume, as determined by field screening with photoionization detectors. Reconnaissance samples were analyzed only for VOCs or total petroleum hydrocarbons (Weston 1994). Reconnaissance sample locations also are shown on Figure 3.

At the time of the RFI, groundwater at the facility was contaminated with metals, VOCs, SVOCs, and PCBs. In 2004, groundwater continued to be contaminated with VOCs, SVOCs, and PCBs. Groundwater also contained detectable concentrations of dioxins and furans for which no EPA maximum contaminant levels (MCL) or preliminary remediation goals (PRG) have been established. Table 1 shows the maximum concentrations of a range of constituents detected at the facility, and Table 2 shows the maximum concentrations of the same constituents during the June 2004 sampling event. During the RFI, background wells contained benzene and carbon disulfide but at concentrations below the MCL (benzene) or PRG (carbon disulfide) (Weston 1994). In addition, several total metals exceeded MCLs in the background well, but dissolved concentrations were below MCLs except for one mercury detection. However, because total mercury for this sample was below the detection limit, dissolved mercury concentrations may have resulted from laboratory contamination (Weston 1994). Neither VOCs nor mercury were detected in the background wells in 2004 (Weston 2004).

During the RFI, groundwater in the JDFW Foundry Sand Waste Area was contaminated with VOCs (1,2-dichloroethene, trichloroethene [TCE], and tetrachloroethene [PCE]), SVOCs (bis[2-ethylhexyl]phthalate [DEHP]), and one dissolved metal (arsenic) (Weston 1994). Groundwater in the Foundry Settling Pond Area was contaminated with one SVOC (DEHP), one PCB (Aroclor-1254), and one dissolved metal (lead). Groundwater in this area also contained dioxin and furans for which no MCL or PRG has been established (Weston 1994). Groundwater in the Skimmer Pond Area was contaminated with VOCs (PCE, TCE, and benzene), one SVOC (DEHP), one PCB (Aroclor-1254), and dissolved metals (lead and mercury) (Weston 1994). Groundwater in the Chromium and Cyanide Waste Area was not contaminated (Weston 1994).

In 2004, groundwater continued to be contaminated, with increases in some compounds. In the JDFW Foundry Sand Waste Area, groundwater was contaminated with VOCs (chloroethane, vinyl chloride) and SVOCs (DEHP and 1,4-dioxane) (Weston 2004). Groundwater in the Foundry Settling Pond Area was contaminated with one SVOC (DEHP) and one PCB (Aroclor-1254). Groundwater in this area also contained dioxin and furans for which no MCL or PRG has been established (Weston 2004). Groundwater in the Skimmer Pond Area was contaminated with one VOC (chloroethane), two SVOCs (DEHP and 1,4-dioxane), and one PCB (Aroclor-1254) (Weston 2004). Groundwater in the Chromium and Cyanide Waste Area was not contaminated (Weston 2004). Between the RFI

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sampling and 2004, vinyl chloride concentrations increased to concentrations above the MCL, and the number of wells contaminated with DEHP and 1,4-dioxane also has increased.

Investigations at the site also have found free floating product in wells near the old foundry settling ponds and skimmer ponds. The free product appeared to be light hydraulic oil containing PCBs, with thicknesses ranging from 0.14 to 0.77 feet (Weston 1998b). As recently as 2004, the facility continued to recover product in wells GW-08 and GW-24 (Weston 2004).

Table 1 – Maximum Concentrations of Constituents in Groundwater

Constituent	Concentration (µg/l)	Sample Location	Date	EPA MCL (µg/l)	Other Locations Exceeding MCL
Metals					
Arsenic, dissolved	36	MW-06B	11/1992	50	
Lead, dissolved	65 J	MW-04B	7/1993	15*	GW-09, GW-05, MW-02B
Mercury, dissolved	2.8	GW-14	7/1992	2	LS-09
Volatile Organic Compounds					
Acetone	88	MW-03B	6/2004	610	
Benzene	82.0	LS-09	4/1993	5	
Carbon disulfide	27.0	GW-07	7/1992	1,000**	
Chloroethane	900	GW-12	7/1992	4.6**	GW-09, GW-05, MW-03B, MW-04B, MW-06B
Chloroform	3.0 J	GW-03	4/1993	6.2**	
1,1-Dichloroethane	840	GW-12	11/1992	810**	
1,2-Dichloroethane	6.0	GW-05	7/1993	5	GW-12
1,1-Dichloroethene	6.0	GW-12	7/1992	340	
1,2-Dichloroethene (total)	420	MW-03B	7/1992	70***	
Ethylbenzene	110	LS-09	4/1993	700	
Methyl ethyl ketone	20	MW-03B	6/2004	1,900**	
Methyl isobutyl ketone	16.0 J	MW-03B	4/1993	160	
Tetrachloroethene	17.0	MW-03B	11/1992	5	GW-07
Toluene	8.0	GW-14	7/1992	1,000	
1,1,1-Trichloroethane	190	MW-03B	11/1992	200	
Trichloroethene	100	MW-03B	11/1992	5	GW-07

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Table 1 – Maximum Concentrations of Constituents in Groundwater

Constituent	Concentration (µg/l)	Sample Location	Date	EPA MCL (µg/l)	Other Locations Exceeding MCL
Vinyl chloride	2.1	MW-03B	6/2004	2	
Xylene	480 J	LW-09	4/1993	10,000	
Semivolatile Organic Compounds					
Acenaphthene	5	GW-09	7/1993	370**	
Anthracene	210 J	GW-09	4/1993	1,800**	
Benzo(a)anthracene	230 J	GW-09	4/1993	0.092**	
Chrysene	180 J	GW-09	4/1993	9.2	
2,4-Dimethylphenol	23	GW-09	7/1993	730**	
1,4-Dioxane	2,000	GW-22	7/1993	6.1**	GW-12, MW-02B, MW-03B, MW-04B, MW-06B
bis(2-Ethylhexyl)phthalate	250 J	GW-09	4/1993	6	GW-05, GW-10, GW-20, GW-21, MW-02B, LS-12
Fluoranthene	440	GW-09	4/1993	1,500**	
Fluorene	85 J	GW-09	4/1993	240**	
2-Methylphenol	7.5	GW-21	6/2004	1,800**	
4-Methylphenol	9.7	GW-21	6/2004	180**	
Naphthalene	16	LS-09	4/1993	6.2**	GW-09, GW-21
5-Nitro-o-toluidine	12 J	LS-12	4/1993	NA	
N-Nitroso-di-n-propylamine	73 J	GW-09	7/1992	0.096**	
Ortho-Cresol	29	GW-09	7/1993	NA	
Phenanthrene	210 J	GW-09	4/1993	NA	
Phenol	370	GW-22	7/1993	2,200**	
Pyrene	580	GW-09	4/1993	180	
2,4,5-Trichlorophenol	2.5 J	GW-21	6/2004	3,600**	
Polychlorinated Biphenyls					
Aroclor 1254	1,900	GW-09	4/1993	0.5	GW-08, GW-21, LS-12

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Table 1 – Maximum Concentrations of Constituents in Groundwater

Constituent	Concentration (µg/l)	Sample Location	Date	EPA MCL (µg/l)	Other Locations Exceeding MCL
Dioxins and Furans					
Hexachlorodibenzodioxins	0.035	GW-09	7/1992	NA	
Hexachlorodibenzofurans	0.036	GW-09	7/1992	NA	

Notes:

Concentrations in bold exceed the MCL or PRG (EPA 2002a, 2002b). Table derived from the 1994 RFI and June 2004 sampling (Roy F. Weston, Inc. 1994, 2004).

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

** EPA does not specify a MCL for this compound (EPA 2002a). This value is the EPA Region 9 PRG for drinking water (EPA 2002b).

*** The MCL for *cis*-1,2-dichloroethene is used here.

EPA = U.S. Environmental Protection Agency

J = Estimated

MCL = Maximum contaminant level

µg/l = Micrograms per liter

NA = Not applicable. PRGs have not been established for this constituent.

PRG = Preliminary remediation goal

RFI = Resource Conservation and Recovery Act Facility Investigation

Table 2 – Maximum Concentrations of Constituents in Groundwater, June 2004

Constituent	Concentration (µg/l)	Sample Location	EPA MCL (µg/l)	Other Locations Exceeding MCL
Metals				
Arsenic, total	13	GW-07	50	
Lead, total	9	GW-09	15*	
Mercury, total	0.31	MW-04B	2	
Volatile Organic Compounds				
Acetone	88	MW-03B	610	
Benzene	2.5	GW-22	5	
Carbon disulfide	ND		1,000**	
Chloroethane	460	GW-12	4.6**	GW-22, MW-03B
Chloroform	ND		6.2**	
1,1-Dichloroethane	44	GW-12	810**	
1,2-Dichloroethane	1.1	GW-12	5	
1,1-Dichloroethene	1.9	GW-12	340	
1,2-Dichloroethene (total)	ND		70***	

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Table 2 – Maximum Concentrations of Constituents in Groundwater, June 2004

Constituent	Concentration (µg/l)	Sample Location	EPA MCL (µg/l)	Other Locations Exceeding MCL
Ethylbenzene	28	GW-21	700	
Methyl ethyl ketone	20	MW-03B	1,900**	
Methyl isobutyl ketone	1.4 J	GW-21	160	
Tetrachloroethene	ND		5	
Toluene	2.2	GW-21	1,000	
1,1,1-Trichloroethane	ND		200	
Trichloroethene	1.3	MW-03B	5	
Vinyl chloride	2.1	MW-03B	2	
Xylene	180	GW-21	10,000	
Semivolatile Organic Compounds				
Acenaphthene	ND		370**	
Anthracene	ND		1,800**	
Benzo(a)anthracene	ND		0.092**	
Chrysene	ND		9.2	
1,2-Dichlorobenzene	1.9 J	GW-21	600	
2,4-Dichlorophenol	1.1	GW-21	110**	
2,4-Dimethylphenol	9.8 J	GW-21	730**	
1,4-Dioxane	270	GW-22	6.1**	GW-12, MW-02B, MW-03B, MW-04B, MW-06B
bis(2-Ethylhexyl)phthalate	230 J	GW-20	6	GW-05, GW-10, GW-20, GW-21
Fluoranthene	1.1	GW-09	1,500**	
Fluorene	ND		240**	
2-Methylphenol	7.5	GW-21	1,800**	
4-Methylphenol	9.7	GW-21	180**	
Naphthalene	5.1	GW-21	6.2**	
5-Nitro-o-toluidine	ND		NA	
N-Nitroso-di-n-propylamine	ND		0.096**	
Ortho-Cresol	ND		NA	

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Table 2 – Maximum Concentrations of Constituents in Groundwater, June 2004

Constituent	Concentration (µg/l)	Sample Location	EPA MCL (µg/l)	Other Locations Exceeding MCL
Phenanthrene	0.59 J	GW-08	NA	
Phenol	53	GW-21	2,200 **	
Pyrene	1.1	GW-09	180	
2,4,5-Trichlorophenol	2.5 J	GW-21	3,600 **	
Polychlorinated Biphenyls				
Aroclor 1254	19	GW-09	0.5	GW-08
Dioxins and Furans				
Hexachlorodibenzodioxins	0.0027	GW-09	NA	
Hexachlorodibenzofurans	0.0022	GW-09	NA	

Notes:

Concentrations in bold exceed the MCL or PRG (EPA 2002a, 2002b). Table derived from the June 2004 sampling (Roy F. Weston, Inc. 2004).

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

** EPA does not specify a MCL for this compound (EPA 2002a). This value is the EPA Region 9 PRG for drinking water (EPA 2002b).

*** The MCL for *cis*-1,2-dichloroethene is used here.

EPA = U.S. Environmental Protection Agency

J = Estimated

MCL = Maximum contaminant level

µg/l = Micrograms per liter

NA = Not applicable. PRGs have not been established for this constituent.

ND = Not detected

PRG = Preliminary remediation goal

RFI = Resource Conservation and Recovery Act Facility Investigation

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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):

Because of the high volume of groundwater extracted by the eight production wells, migration of contaminated groundwater from the facility is stabilized. Water level measurements at the facility have shown a consistent pattern of groundwater flow toward the interior of the facility. Potentiometric surface maps from 1992, 1993, 1997, 1998, and 2004 show that groundwater gradients are controlled by high-volume wells on the facility, containing groundwater under the facility (see Appendix A) (Weston 1994, 1998a, 2004).

Chemical analyses of groundwater collected from the facility support the assertion that migration of contaminated groundwater has stabilized. Between the RFI sampling and the 2004 groundwater sampling, concentrations of most compounds declined (Weston 1994, 2004). The appearance of vinyl chloride at a concentration that exceeds its MCL likely is the result of degradation of other compounds such as PCE and TCE.

² “existing area of contaminated groundwater” is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of “contamination” that can and will be sampled/tested in the future to physically verify that all “contaminated” groundwater remains within this area, and that the further migration of “contaminated” groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

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

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

 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):

Because groundwater flows toward the center of the JDWW facility (see Appendix A), away from Cedar River and Blackhawk Creek, it is unlikely to discharge in significant volume into either of these surface water bodies.

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5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater “level,” and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_____ If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater “levels,” the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter “IN” status code in #8.

Rationale and Reference(s):

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

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6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site’s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment⁵, appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of “contaminated” groundwater can not be shown to be “**currently acceptable**”) - skip to #8 and enter “NO” status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter “IN” status code.

Rationale and Reference(s):

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

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.

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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):

The JDWW facility currently does not have an ongoing program of groundwater monitoring, but monitoring is anticipated in the future. The facility’s permit does not require regular sampling and analysis of groundwater at the facility, and an order at the facility is not anticipated (Tetra Tech 2003). However, the corrective measure recommended by the facility in the CMS calls for installation of sentinel wells around the facility and periodic monitoring (Weston 1998b). At a minimum, samples would be collected annually (Weston 1998b).

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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 John Deere Waterloo Works facility, EPA ID #IAD005289806, located at 400 Westfield Ave., Waterloo, Iowa. 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 _____ Date _____
(signature)
Wray Rohrman
Project Manager, RCRA Corrective Action & Permits Branch
EPA Region 7

Supervisor _____ Date _____
(signature)
Jody Hudson,
Associate Director of RCRA
EPA Region 7

Locations where References may be found:

EPA Region 7 Headquarters
RCRA Files
901 North 5th Street
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FIGURES

(3 pages)

APPENDIX A

(9 pages)