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SEPTEMBER 2008 SEMI-ANNUAL CORRECTIVE ACTION EFFECTIVENESS REPORT

OLD DRUM STORAGE AREA, ALUM SLUDGE BASIN, ACID-LIME SLUDGE AREA, LOCOMOTIVE SHOP AREA, LOCOMOTIVE PAINT and AIR BRAKE SHOP

Post Closure Care Permit No. HW-049(D)
Ware County, Waycross, Georgia
CSX Transportation, Inc.
#9415589

ARCADIS

September 2008 Semi-Annual Corrective Action Effectiveness Report

Permit No. HW-049(D)
Waycross, Georgia
#9415589

This report was prepared and reviewed in accordance with the guidelines established by the Georgia Environmental Protection Division, by or under the direct supervision of the Georgia Registered Professional Geologist whose certification, signature, and affixed seal appear below.

"I certify that I am a qualified ground-water scientist who has received a baccalaureate or post-graduate degree in the natural sciences or engineering, and have sufficient training and experience in ground-water hydrology and related fields, as demonstrated by state registration and completion of accredited university courses, that enable me to make sound professional judgments regarding ground-water monitoring and contaminant fate and transport. I further certify that this report was prepared by myself or by a subordinate working under my direction."

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EXECUTIVE SUMMARY

Operation and maintenance of groundwater recovery/treatment systems, system performance monitoring, semi-annual monitoring, and post-closure monitoring/maintenance were conducted in accordance with the requirements of Resource Conservation and Recovery Act (RCRA) facility permit number HW-049(D) during the period April 2008 through September 2008. This report provides a summary and interpretation of the groundwater monitoring, surface water monitoring, and recovery/treatment system data collected between April 2008 and September 2008 at the Old Drum Storage Area (ODSA), Alum Sludge Basin (ASB), Acid-Lime Sludge Area (ALSA), Locomotive Shop Area (LSA), and Locomotive Paint and Air Brake Shop (LPABS) at CSX Transportation, Inc.'s (CSXT's) Rice Yard in Waycross, Georgia. In addition, this report provides an evaluation of the effectiveness of the groundwater corrective action program at the facility.

Operation & maintenance (O&M) of the operating groundwater recovery/treatment systems during the reporting period consisted primarily of addressing iron fouling of pumps, piping, tanks, and the air stripper. Iron precipitation is most prevalent in the ODSA area groundwater as evidenced by frequent fouling of pumps and piping. The iron introduced into the groundwater treatment system from the ODSA contributes a significant portion of the total iron that precipitates in the air stripper.

Inspections of the ODSA and ASB final covers and site control measures during the reporting period indicated no significant cover integrity problems. Cover maintenance during the reporting period consisted of the application of pesticide for fire ants, repair of minor ruts from fertilizer application on ASB, and periodic mowing. Waste unit markings and monitoring systems were in good condition and required no major repairs.

The groundwater, surface water, and treatment/recovery system data collected during this semi-annual monitoring period indicate the following:

- Defined cones of depression were maintained by the operation of the LPABS (HWW-1) and ASB (HWW-2) horizontal recovery wells and recovery systems. Radii of influence from operation of the LPABS and ASB groundwater recovery systems are estimated at 990 feet (ft) by 720 ft and 810 ft by 510 ft, respectively, with drawdowns up to 7.5 ft. Localized drawdowns were observed near ODSA (up to 1.5 ft) and LSA (up to 0.5 ft) recovery systems. Overall, the groundwater recovery systems at ODSA and LSA have a smaller area of hydraulic influence on the water table as compared to the ASB and LPABS systems.

- The low concentrations of Groundwater Contaminant Constituents (GWCCs) in the Waycross Canal surface water and the considerable reductions in GWCC concentrations in the LPABS wells south of the Waycross Canal demonstrate the effectiveness of the horizontal wells in hydraulically controlling the facility groundwater.

- The presence of cis-1,2-DCE, trans-1,2-DCE, and VC in groundwater from the Solid Waste Management Unit (SMWU) areas indicate that natural reductive dechlorination of CVOCs continues to occur even under increased aerobic conditions induced by groundwater pumping operations.

- The total volume of groundwater recovered by the operating recovery systems during the period of April 2008 to September 2008 was approximately 13,724,870 gallons; 681,640 gallons at ODSA, 7,051,380 gallons at ASB, 1,191,170 gallons at LSA, and 4,800,680 gallons at LPABS. During the September 2008 monitoring event, the recovered groundwater reportedly contained 790 micrograms per liter (μg/L) of trichloroethene (TCE), 2,200 μg /L of cis-1,2-dichloroethene (cis-1,2-DCE), 27 μg /L of trans-1,2-dichloroethene (trans-1,2-DCE), 34 μg /L of 1,1-dichloroethene (1,1-DCE), 44 μg /L of vinyl chloride (VC), and 41 μg /L of 1,1-dichloroethane (1,1-DCA). In addition, during the September 2008 monitoring event, the recovered groundwater contained trace concentrations of naphthalene (0.61 μg/L), acenaphthene (0.42 μg/L), acenaphthylene (0.057 μg/L), anthracene (0.033 μg/L), fluorene (0.33 μg/L), 1-methylnaphthalene (0.22 μg/L), 2-methylnaphthalene (0.093 μg/L), and phenanthrene (0.084 μg/L), with all reported concentrations being well below established background concentration limits. No detectable concentrations of organic constituents were reported in the system effluent during the reporting period, indicating the groundwater treatment system operated at nearly 100 percent efficiency during the reporting period.

1. INTRODUCTION

In accordance with 40 CFR §264.100(g) and Post Closure Care Facility Permit No. HW-049(D), this semi-annual monitoring report provides groundwater and surface water monitoring data, groundwater recovery and treatment system data, and an evaluation of the effectiveness of the groundwater corrective action program at the

ODSA, the ASB, the ALSA, the LSA, and the LPABS at CSXT's Rice Yard in Waycross, Georgia. This report covers the semi-annual corrective action effectiveness monitoring period from April 2008 through September 2008.

1.1 SITE LOCATION

The Rice Yard is a rail yard owned and operated by CSXT in Waycross, Ware County, Georgia. The facility is located in the southwestern portion of the City of Waycross, and is situated in the southeastern part of the lower Coastal Plain. The facility extends approximately five miles along U.S. Highway 84. Figure 1 shows the location of the facility with topography and surface drainage features.

1.2 SITE REGULATORY HISTORY

In accordance with a June 30, 1986 consent order, CSXT performed an environmental assessment of the Waycross facility to characterize solid and hazardous waste streams generated by the current operations and to identify where land disposal or spills of solid or hazardous materials had occurred. This assessment was documented in the report "Waste Identification Survey - Waycross, Georgia Facility - August 1986."

Three locations [the ODSA, ASB, and Wastewater Treatment Plant/Grit Collection Area (WWTPA)] were identified where land disposal of hazardous wastes had occurred after 1980. The three hazardous waste management units ODSA, ASB, and WWTPA ceased operations in 1985.

Since the three hazardous waste management units were subject to regulation under the Resource Conservation and Recovery Act (RCRA), a RCRA Part A permit application was submitted to the Georgia Environmental Protection Division (GAEPD) on August 29, 1986, for their proper closure. The permit was finalized in December 1986.

CSXT submitted a revised Part B - Post-Closure Permit Application in August 1987. On September 28, 1987, the GAEPD issued Hazardous Waste Facility Permit No. HW-049(D) for the post-closure care of the ODSA and ASB. The WWTPA was clean closed and reclassified as a solid waste management unit (SWMU) in 1989.

In October 1993, CSXT submitted the "Revised Part B - Post-Closure Permit Modification Application, Waycross, Georgia, Facility, Volume I, Section 9.0 (Adding the Acid-Lime Sludge Area SWMU)." The Hazardous Waste Facility Permit No. HW-

049(D) was amended on January 7, 1994, to incorporate the corrective action plan for remediating the ALSA SWMU.

In June 1995, CSXT submitted the "Part B - Post-Closure Permit Modification Application (Volume I, Section 10.0, adding the Locomotive Shop Area), Waycross, Georgia." The Hazardous Waste Facility Permit No. HW-049(D) was amended on September 29, 1995, to incorporate the corrective action plan for remediating the LSA SWMU.

On April 29, 1997, CSXT submitted the 10-year permit renewal application, which included revised corrective action plans for addressing the groundwater impacts at the ODSA and ASB. In response to the GAEPD's June 4, 1997 comments, the permit renewal application was modified and resubmitted on July 25, 1997. Final modifications to the permit renewal application were submitted on August 6, 1997. The RCRA Part B Permit No. HW-049(D) was reissued to CSXT on September 30, 1997.

Based on the findings reported in the March 9, 1999 Corrective Action Assessment for the Alum Sludge Basin and Verification Investigation Reports for the Old Refuse Area No. 2 and the Old Runoff Pond Area, the corrective action plan for the impacted groundwater east of the ASB was modified and a permit modification application with the revised corrective action plan was submitted to the GAEPD on October 29, 1999.

In response to the GAEPD's December 16, 1999 comments on the permit modification application, CSXT submitted a revised permit modification application and "Groundwater and Surface Water Hydraulic Interaction Report and Pilot Test Work Plan" on February 28, 2000.

On May 2, 2000, the GAEPD approved the permit modification application. In accordance with Class 3 permit modification requirements, the public notice for the permit modification application was issued on June 20, 2000. On October 19, 2000, the amended hazardous waste facility permit became effective.

On March 29, 2002, CSXT submitted a permit modification application, which proposed a new groundwater corrective action system at the ASB to better control GWCC migration in this area and modifications to the groundwater corrective action effectiveness monitoring program.

On February 19, 2003, the GAEPD approved the permit modification application. In accordance with Class 3 permit modification requirements, the public notice for the permit modification application was issued in March 2003. On May 7, 2003, the amended hazardous waste facility permit became effective.

On March 30, 2007, CSXT submitted a 10-year permit renewal application which provided updated groundwater recovery system specifics and proposed revisions to the corrective measures monitoring system and protocol. On March 14, 2008, CSXT submitted Revision 1 of the 10-year permit renewal application.

2. SWMU DESCRIPTIONS AND CALCULATED BACKGROUND CONCENTRATIONS LIMITS (BCLs)

2.1 OLD DRUM STORAGE AREA (ODSA)

The ODSA is one of the permitted hazardous waste management units at the CSXT's Rice Yard in Waycross, Georgia and was closed in accordance with RCRA requirements. The ODSA is presently a vacant field west of the LPABS (see Figure 1). The site is approximately 550 feet long by 95 feet wide. Before 1985, as many as 4,000 empty drums were temporarily stored at the site awaiting sale to off-site drum recovery vendors. The empty drums, had stored various solvents used in railroad equipment maintenance operations and some contained residual hazardous materials. Drum handling activities resulted in spills that impacted surface and subsurface soils. The ODSA layout and current monitoring well network are shown on Figure 2. ODSA monitor and recovery well construction details are summarized in Appendix A. Condition III.A.1 of the permit lists monitoring wells MW-11, MW-12, and MW-13 as the current point of compliance (POC).

The ODSA background concentration limits (BCLs) were established by sampling upgradient monitoring well MW-32 for four quarters and analyzing for the GAEPD-approved GWCC parameters. The analytical results from the four sampling events were used to calculate the mean and variance values to establish the BCL for each GWCC. The ODSA BCL values are summarized in Table 1. The BCLs are compared to downgradient monitoring data to evaluate corrective action effectiveness.

2.2 ALUM SLUDGE BASIN (ASB)

The ASB is one of the permitted hazardous waste management units at the CSXT's Rice yard in Waycross, Georgia and was closed in accordance with RCRA requirements. The ASB is east-southeast of the Maintenance Shop Area. This former surface impoundment was approximately 250 ft long by 200 ft wide and approximately six ft deep (see Figure 1). The site was used through January 1985 to deposit sludge from the wastewater treatment plant operations and had a maximum waste storage capacity of approximately 7,500 cubic yards. The ASB layout and current monitoring well network are shown on Figure 2. ASB monitor and recovery well construction details are summarized in Appendix A.

The ASB BCLs were established by sampling upgradient monitoring well MW-17 for four quarters and analyzing for the GAEPD-approved GWCC parameters. The analytical results from the four sampling events were used to calculate the mean and variance values to establish the BCL for each GWCC. The ASB BCL values are summarized in Table 1. The BCLs are compared to downgradient monitoring data to evaluate corrective action effectiveness.

2.3 ACID-LIME SLUDGE AREA (ALSA)

The ALSA is a SWMU located northeast of the Locomotive Shop Area at the CSXT's Rice Yard in Waycross, Georgia (see Figure 1). The ALSA consists of the Refined Oil Acid Pit (Acid Sludge Pit) and the Acetylene-Lime Sludge Pit. For an unknown period of time up to 1969, a lubrication oil purification facility was operated by CSXT in the Locomotive Shop of the Waycross facility. Spent lubrication oil was refined using a stripper compound that incorporated sulfuric acid. This process generated a sludge that was deposited in the Acid Sludge Pit. The ALSA layout and current monitoring well network are shown on Figure 2. ALSA monitor well construction details are summarized in Appendix A.

The ALSA BCLs were established by sampling upgradient monitoring well MW-37 for four quarters and analyzing for the GAEPD-approved GWCC parameters. The analytical results from four sampling events were used to calculate the mean and variance values to establish the BCL for each GWCC. The ALSA BCL values are summarized in Table 1. The GAEPD's March 19, 1997 letter requested that VC be added to the GWCC list for the ALSA. CSXT is using the BCL of 1.0 micrograms/liter (µg/L) for vinyl chloride at the ALSA, which is consistent with established VC BCL at the LSA. The BCLs are compared to downgradient monitoring data to evaluate corrective action effectiveness.

2.4 LOCOMOTIVE SHOP AREA (LSA)

The LSA is a SWMU located northwest of the ASB and southwest of the ALSA at the CSXT's Rice Yard in Waycross, Georgia. The Locomotive Shop building is used for the maintenance and repair of locomotives. The LSA shop once contained a parts-cleaning vat, approximately eight-feet by eight-feet, in which TCE was used as a cleaning and degreasing agent. A portion of the vat was five to six feet below grade. Before the parts-cleaning vat was removed, the vat may have leaked or the contents may have been spilled resulting in a release. The use of the parts-cleaning vat is suspected of being a primary source for the TCE and related constituents found in downgradient groundwater. The LSA layout and current monitor and recovery well network are shown on Figure 2. LSA monitor and recovery well construction details are summarized in Appendix A.

The LSA BCLs were established by sampling upgradient monitoring well MW-3 for four quarters and analyzing for the GAEPD-approved GWCC parameters. The analytical results from the four sampling events were used to calculate the mean and variance values to establish the BCL for each GWCC. The LSA BCL values are summarized in Table 1. The BCLs are compared to downgradient monitoring data to evaluate corrective action effectiveness.

2.5 LOCOMOTIVE PAINT AND AIR BRAKE SHOP (LPABS)

The LPABS is a SWMU located southwest and north of the LSA and the Old Engine House (OEH), respectively (see Figure 1). The LPABS building is approximately 330 feet long by 165 feet wide with a northwest to southeast orientation. The original structure is made of red brick and has a peaked roof. There is an approximately 75-foot wide by 125-foot long by 2-foot deep locomotive transfer pit to the east of the LPABS building for transferring locomotives to and from the Fabrication Shop. In 1986 an assessment was conducted to investigate a potential hazardous waste release. The release may have occurred from frequent small quantity solvent spills that were reported in the southern portion of the locomotive transfer pit, outside the old Air Brake Shop. Further investigations revealed a patched concrete floor area, approximately five feet by five feet, near the southeast end of the LPABS building. Facility personnel indicated that a parts-cleaning vat was formerly located in this area, in which TCE was used as a cleaning and degreasing agent during the former Air Brake Shop operations. The LPABS layout and current monitor and recovery well network are shown on Figure 2. LPABS monitor and recovery well construction details are summarized in Appendix A.

2.6 SURFACE WATER

The Waycross Canal is a surface water drainage feature that runs along the southern and eastern boundaries of the facility (see Figure 1). The shop area ditch feeds into Waycross Canal just west of the ASB. Both surface water bodies receive runoff and groundwater from the operational areas of the railyard. The surface water background levels for the Waycross Canal were established by sampling the surface water in the Waycross Canal for four quarters at a sample location upstream of the ODSA (CW-14/W-30) located 150 feet west of MW-4 (see Figure 2). The analytical results from the four sampling events were used to calculate the mean and variance values to establish the surface water background levels. The surface water background values are included in Table 1.

3. WORK PERFORMED DURING THE REPORTING PERIOD

The work performed during this reporting period includes daily and monthly inspections of groundwater corrective action systems, regular operational maintenance of the corrective action systems, semi-annual post-closure care inspections of the ODSA and ASB, and semi-annual groundwater/surface water monitoring to ensure the effective operation of the groundwater recovery and treatment system as prescribed in the permit.

3.1 DAILY INSPECTION AND MAINTENANCE

Daily inspection events currently consist of the recording of recovery and treatment system operating data and inspection of groundwater recovery and treatment systems. Daily inspection/repair records were prepared during the monitoring period and were used to document the groundwater recovery rates, system downtime, and system maintenance. Records of inspection and maintenance are maintained at the facility. Maintenance logs from the reporting period are provided in Appendix B.

Based on the operation and maintenance (O&M) logs since groundwater recovery and treatment began at the facility, it is apparent that a significant portion of the O&M is associated with iron fouling of pumps, piping, tanks, and the air stripper. Iron precipitation is most prevalent in the ODSA area groundwater as evidenced by frequent fouling of pumps and piping. The iron introduced into the groundwater treatment system from the ODSA contributes a significant portion of the total iron that precipitates in the air stripper.

3.2 MONTHLY INSPECTION, MONITORING, AND REPORTING

Monthly inspection and monitoring events currently consist of the collection of a treatment system effluent sample, recording of recovery and treatment system operating data, groundwater recovery and treatment system inspections, and inspections of the final covers of the ODSA and ASB. The monthly recovered groundwater volumes and effluent sample analytical results are used to prepare a monthly self-monitoring report as required under National Pollution Discharge Elimination System (NPDES) Permit No. GA0046680. Self monitoring reports were prepared and submitted to the GAEPD during the monitoring period. Copies of the reports are maintained at the facility and included in Appendix C.

3.3 SEMI-ANNUAL EFFECTIVENESS MONITORING

Groundwater quality samples were collected from each recovery well and select monitor wells at each area during September 2008 to monitor the relative concentration changes of TCE and associated transformation products/impurities in the groundwater. In addition, the semi-annual monitoring was used to evaluate the effectiveness of the recovery system. Groundwater samples were collected in September 2008 and forwarded to TestAmerica Laboratories, Inc. in Savannah, Georgia. Below is a list of the analytical parameters, recovery wells, monitor wells, and surface water locations for each area:

- ODSA: Groundwater samples were collected from monitor wells MW-71 and MW-78 and analyzed for select chlorinated volatile organic compounds (CVOCs) using Environmental Protection Agency (EPA) SW-846 Method 8260, and lead and zinc using EPA SW-846 Method 6010.

- ASB: Groundwater samples were collected from monitor wells MW-27, MW-31, MW-46, and MW-85 and analyzed for select CVOCs using EPA SW-846 Method 8260, and chromium and vanadium using EPA SW-846 Method 6010.

- ALSA: Groundwater samples were collected from monitor wells MW-18, MW-19, MW-38, MW-39, MW-41, MW-52, MW-119, and MW-122 and analyzed for select CVOCs and vanadium using EPA SW-846 Method 8260 and 6010B, respectively.

- LSA: Groundwater samples were collected from monitor wells MW-39, MW-45, MW-58, MW-60, MW-61, MW-64, MW-65, MW-67, and MW-70 and analyzed for select CVOCs using EPA SW-846 Method 8260.

- LPABS: Groundwater samples were collected from monitor wells MW-91, MW-99, MW-100, MW-101, MW-103, MW-104, and MW-109 and analyzed for select CVOCs using EPA SW-846 Method 8260.

- Surface Water: Surface water was collected at sample locations CW-1, CW-2, CW-3, W-6, W-10, W-12, W-15, W-25, W-26, W-28, W-33, W-36, and W-45 and analyzed for volatile organic compounds (VOCs) using EPA SW-846 Method 8260.

- Recovery Wells: Samples from the combined stripper influent, and ODSA, ASB, LSA, and LPABS treatment system influents were collected and analyzed for select CVOCs using EPA SW-846 Method 8260. In addition, a sample from the combined stripper influent was collected and analyzed for target SVOCs/PAHs.

Monitor wells were purged of three well volumes using a disposable bailer or low flow sampling techniques in general accordance with USEPA *Field Branches Quality System and Technical Procedures*, Region IV, Athens, Georgia (QSTP) until field indicator parameters (pH, specific conductance, and temperature) stabilized. A new disposable bailer or sample tubing were used during sample collection from each well. In addition, the sampling team donned new, disposable nitrile gloves prior to purging and sample collection. Field sampling logs are provided in Appendix D.

3.4 SEMI-ANNUAL POST CLOSURE CARE INSPECTION

In accordance with Sections II and III of the Post Closure Care Facility Permit No. HW-049(D), an inspection of the ODSA and ASB final covers and site control measures were conducted in September 2008. No deficiencies were noted during the September 2008 inspection of the ODSA and ASB final covers and site control measures.

In accordance with Section III of the Post Closure Care Facility Permit No. HW-049(D), monitoring and recovery wells were inspected and repaired as necessary in March 2008. No deficiencies were noted during the September 2008 monitoring well inspection. The cover and well inspection forms for the monitoring period are provided in Appendix E.

4. GROUNDWATER FLOW DIRECTION AND RATE

Depths to groundwater level measurements were recorded from monitor wells at ODSA and ASB wells specified in Condition III.A.1, III.A.2, and III.A.3 of the permit, Group 1 and 2 wells located at the ALSA and LSA, and LPABS wells located both north and south of the Waycross Canal during the September 2008 monitoring event. Water levels were measured in each well on 15 September 2008 under pumping conditions. Measured water levels were converted to elevation in feet mean sea level by inputting the measured depths to groundwater in the groundwater database. Water level data are provided in Table 2 and discussed below.

Comparison of the configuration of the potentiometric surface of shallow groundwater under pumping conditions (Figure 3) to historical non-pumping conditions indicates significant drawdown of the water table from groundwater recovery at horizontal well HWW-1 (LPABS) and moderate drawdown at HWW-2 (ASB). The general direction of shallow groundwater flow is south-southeast towards the Waycross Canal. Measured water levels indicate that the operation of well HWW-1 is responsible for approximately 7.5 ft of drawdown in vicinity of the pump intake (near MW-101). Drawdown resulting from groundwater recovery at HWW-1 is observed over an area approximately 990 ft by 720 ft.

The influence of groundwater recovery from well HWW-2 is less than observed at HWW-1 with maximum drawdowns of approximately 6 ft. The drawdown resulting from groundwater recovery at HWW-2 is observed over an area of approximately 810 ft by 510 ft.

Groundwater recovery operations at ODSA and LSA were observed to result in drawdowns of approximately 1.5 ft and 0.5 ft, respectively. Overall, the groundwater recovery systems at ODSA and LSA have a smaller area of hydraulic influence on the water table as compared to HWW-1 and HWW-2.

5. GROUNDWATER AND SURFACE WATER QUALITY

5.1 GROUNDWATER

The laboratory analytical reports for the September 2008 semi-annual effectiveness monitoring event are presented in Appendix F and summarized in Tables 3, 4, 5, 6, 7, and 8. Figures 4, 5, and 6 illustrate the distribution of TCE, cis-1,2-DCE, and VC (target CVOCs), respectively. In addition, plots of target CVOC concentrations versus time are provided in Appendix G.

5.1.1 ODSA

Table 3 summarizes the groundwater analytical data for the ODSA. CVOC, lead, and zinc concentrations in ODSA groundwater from the September 2008 monitoring event are discussed below.

1,1-DCE was detected at monitor well MW-71 (1.4 µg/L) at a concentration below the established BCL. Reported CVOCs concentrations in monitor well MW-78 were all below method detection limits. Reported lead and zinc concentrations in ODSA groundwater were all below established BCLs and GWPS' during the September 2008 monitoring event.

5.1.2 ASB

Table 4 summarizes the groundwater analytical data for the ASB. The occurrence and distribution of CVOCs, chromium, and vanadium in ASB groundwater from the September 2008 monitoring event are discussed below.

CVOCs concentrations in ASB groundwater during the September 2008 sampling event were below method detection limits. Reported chromium concentrations ranged from 1.2 µg/L (MW-85) to 93 µg/L (MW-27) and with the exception of MW-27, were below the GWPS. Vanadium concentrations ranged from 1.8 µg/L (MW-27 and MW-85) to 6.4 µg/L (MW-31) and were all below established ASB BCLs.

5.1.3 ALSA

Table 5 summarizes groundwater analytical data for the ALSA. Reported CVOC and vanadium data of ALSA groundwater from the September 2008 monitoring event are discussed below.

Detectable concentrations of CVOCs (TCE, cis-1,2-DCE, trans-1,2-DCE, and VC) were reported in ALSA groundwater during the September 2008 monitoring event. Reported TCE concentrations ranged from 15 µg/L (MW-119) to 62 µg/L (MW-41), reported cis-1,2-DCE concentrations ranged from 1.4 µg/L (MW-18) to 820 µg/L (MW-41), and trans-1,2-DCE (25 µg/L) and VC (370 µg/L) were both reported at MW-41. TCE concentrations decreased in monitor well MW-38 (100 µg/L to 17 µg/L), but increased in monitor wells MW-39 (<1 to 21 µg/L), MW-41 (39 µg/L to 62 µg/L), and MW-119 (<1 to 15 µg/L). The presence of cis-1,2-DCE, trans-1,2-DCE, and VC indicates that natural reductive dechlorination is occurring in ALSA groundwater.

Vanadium was detected in ALSA monitor wells MW-38 and MW-39 at concentrations of 29 µg/L and 13 µg/L, respectively. The reported concentration of 29 µg/L is above the BCL and is consistent with historical data.

5.1.4 LSA

Table 6 summarizes the groundwater analytical data for the LSA. CVOC and vanadium concentrations in LSA groundwater from the September 2008 monitoring event are discussed below.

Three CVOCs were detected in the LSA groundwater at concentrations above method detection limits. Reported TCE concentrations ranged from 27 µg/L (MW-67) to 440 µg/L (MW-70), cis-1,2-DCE concentrations ranged from 2 µg/L (MW-64) to 480 µg/L (MW-45), and VC was reported in well MW-45 at 50 µg/L. TCE concentrations increased in monitor wells MW-39, MW-45, MW-58, MW-60, MW-61, MW-64, MW-65, MW-67, and MW-70. Cis-1,2-DCE was also reported in a majority of these wells which indicate natural reductive dechlorination of CVOCs in LSA groundwater.

5.1.5 LPABS

Table 7 summarizes the groundwater analytical data for the LPABS. CVOC and vanadium concentrations in LPABS groundwater from the September 2008 monitoring event are discussed below.

TCE and its degradation products, cis-1,2-DCE, and VC, are the primary CVOCs in the LPABS groundwater, with the highest reported CVOC concentrations during the September 2008 monitoring event being reported at monitor well MW-104. Other CVOCs were present at concentrations above method detection limits including chlorobenzene and 1,1-DCA. Although GWCCs have not been finalized for the LPABS, the extended list of CVOCs selected for analyses during the September 2008 monitoring event is consistent with prior sampling events.

Reported TCE concentrations ranged from 1 µg/L (MW-101) to 30,000 µg/L (MW-104), reported cis-1,2-DCE concentrations ranged from 3.9 µg/L (MW-99) to 3,900 µg/L (MW-104), and reported VC concentrations ranged from 1.2 µg/L (MW-100) to 32 µg/L (MW-99). Detectable concentrations of 1,1-DCE were reported at MW-99 (29 µg/L), MW-100 (2.1) µg/L, and MW-101 (8.5 µg/L). CVOCs in LPABS groundwater during the September 2008 monitoring event are similar or lower than previous data and show an overall decreasing trend. The presence of cis-1,2-DCE and VC indicate ongoing natural reductive chlorination in LPABS groundwater.

5.2 SURFACE WATER

The laboratory analytical reports for surface water samples collected from the Waycross Canal and the Shop Area Ditch during September 2008 are presented in Appendix F and summarized with the historical data in Table 8. Figure 7 illustrates the distribution of reported CVOC concentrations in the surface water during the September 2008 monitoring event.

CVOCs detected in the Shop Area Ditch include TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride with reported concentrations generally decreasing in a downgradient direction from W-10 to W-6. Low concentrations of TCE and cis-DCE were detected at only one location (W-6 at point of Shop Area Ditch discharge) in the Waycross Canal.

Time versus concentration plots (Appendix G) of reported TCE and cis-1,2-DCE concentrations in the Waycross Canal indicate CVOC concentrations quickly decreased in late 2001 to early 2002 immediately following start-up of groundwater recovery via horizontal wells HWW-1 and HWW-2. The reported low TCE and cis-1,2-DCE concentrations for the September 2008 monitoring event are consistent with fluctuations observed at each of the sampling locations since 2002.

6. GROUNDWATER RECOVERY AND TREATMENT

The groundwater recovery and treatment systems operating in the four areas were inspected and maintained during the reporting period as described in Sections 3.1 and

3.2. Following is a summary of the groundwater recovery/treatment operations and efficiency during the period.

6.1 GROUNDWATER RECOVERY

The volume of groundwater withdrawal is currently recorded during daily and monthly inspections of ODSA recovery wells WW-43 through WW-48; ASB recovery well HWW-2; LSA recovery wells WW-19 through WW-26, WW-28 through WW-32, and WW-35; and LPABS recovery well HWW-1. The total volume of groundwater recovered from the ODSA during the reporting period (April 2008 through September 2008) was 681,640, which represents an average continuous withdrawal of approximately 2.5 gallons per minute (gpm). The total volume of groundwater recovered from the ASB during the reporting period was 7,051,380, which represents an average continuous withdrawal of approximately 26.7 gpm. The total volume of groundwater recovered from the LSA during the reporting period was 1,191,170, which represents an average continuous withdrawal of approximately 4.5 gpm. The total volume of groundwater recovered from the LPABS during the reporting period was 4,800,680, which represents an average continuous withdrawal of approximately 18.2 gpm.

The total volume of groundwater recovered (Table 9) during the period of April 2008 to September 2008 was 13,724,870 gallons. The total volume of groundwater recovered and treated since start-up of five recovery systems (includes ALSA from 1994 to 2000) from October 1993 through September 2008, is approximately 339,457,016 gallons.

6.2 GROUNDWATER TREATMENT

Recovered groundwater from the four current recovery areas is pumped to an equalization tank and then transferred to a low-profile, shallow-tray air stripper for treatment. The treated water is discharged to Outfall No.002 of NPDES Permit No. GA0046680. An effluent sample is collected every month during periods of discharge and analyzed for select parameters specified in NPDES Permit No. GA0046680.

6.2.1 Influent

Groundwater treatment system samples from the individual and combined system influents from ODSA, ASB, LSA, and LPABS were collected during the September 2008 monitoring event. The ODSA influent contained TCE (21 µg/L), cis-1,2-DCE

(130 µg/L), and VC (13 µg/L); the ASB influent contained TCE (730 µg/L), cis-1,2-DCE (89 µg/L), and 1,2-DCB (7.4 µg/L); the LSA influent contained TCE (2,600 µg/L), cis-1,2-DCE (510 µg/L), and VC (43 µg/L); and the LPABS influent contained TCE (210 µg/L), cis-1,2-DCE (4,200 µg/L), trans-1,2-DCE (56 µg/L), 1,1-DCE (94 µg/L), VC (88 µg/L),and 1,1-DCA (96 µg/L). The combined groundwater influent to the treatment system contained TCE (790 µg/L), cis-1,2-DCE (2,200 µg/L), trans-1,2-DCE (27 µg/L), 1,1-DCE (34 µg/L), VC (44 µg/L), and 1,1-DCA (41 µg/L). Historic and current CVOC concentrations in ODSA, ASB, LSA, LPABS, and combined influent are summarized in Table 10.

The influent data are used to calculate the estimated mass recovery of TCE and related transformation products by multiplying the volume of recovered groundwater (semi-annual total) times the total reported CVOC concentrations in the influent concentration. Total estimated CVOC mass recovered for the reporting period is 359 pounds, and the total estimated mass recovered since April 1999 is approximately 8,286 pounds.

At the request of the GAEPD, the combined influent sample was also analyzed for target PAHs. Reported naphthalene (0.61 µg/L), acenaphthene (0.42 µg/L), acenaphthylene (0.057 µg/L), anthracene (0.033 µg/L), fluorene (0.33 µg/L), 1-methylnaphthalene (0.22 µg/L), 2-methylnaphthalene (0.093 µg/L), and phenanthrene (0.084 µg/L) concentrations were all well below established BCLs.

6.2.2 Effluent

No detectable concentrations of CVOCs were reported in the system effluent during the reporting period. Based on these data, the groundwater treatment system operated at nearly 100 percent efficiency during the reporting period. Monthly NPDES discharge monitoring reports for the monitoring period are provided in Appendix C.

6.3 Groundwater Recovery/Treatment System Effectiveness

The effectiveness of the groundwater recovery system is determined by evaluating the relative change in concentrations of the constituents present in recovered groundwater and by evaluating the hydraulic control the groundwater recovery systems have on shallow groundwater and surface water at the facility. The relative change in CVOC concentrations in system influent over time was determined by plotting the concentration of individual and total CVOCs versus time (Appendix H) in each of the groundwater recovery systems. Overall, total CVOC concentrations in combined system influent have decreased since start-up of recovery wells HWW-1 and HWW-2 in 2002. Time versus concentration plots for individual recovery systems indicate decreasing concentrations in ASB and LPABS influents, and fluctuating but stable concentrations in ODSA and LSA influents,

Reported total CVOC concentrations during the September 2008 monitoring event indicate 164 µg/L in ODSA influent, 826 µg/L in ASB influent, 3,153 µg/L in LSA influent, and 4,744 µg/L in LPABS influent. The LPABS influent contained approximately 54 percent of the total CVOCs in recovered groundwater.

Comparison of groundwater recovery rates from LPABS and ASB to ODSA and LSA systems indicate that horizontal recovery wells HWW-1 and HWW-2 were responsible for approximately 86 percent of the recovered groundwater at the facility during the reporting period (see Table 9). Overall, the groundwater recovery systems at ODSA and LSA have a smaller area of hydraulic influence on the water table as compared to recovery wells HWW-1 and HWW-2.

The small concentrations of CVOCs detected in the surface water samples and the elimination and/or considerable reductions in CVOC concentrations detected in groundwater downgradient from the HWMU/SWMU areas and south of the Waycross Canal, suggest that the current groundwater recovery systems are effectively controlling migration of GWCCs.

7. GROUNDWATER RECOVERY AND TREATMENT SYSTEM MODIFICATIONS

There were no system modifications implemented during the reporting period. System downtime during the reporting period was attributed primarily to iron fouling in the air stripper, flow meters, and transfer pumps. Several pumps in the ODSA and LSA recovery systems were pulled and cleaned during the reporting period due to iron fouling.