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Annual Groundwater Treatment Systems Operation Data Summary Report January through December 2005 Operable Unit 2 Groundwater Remedy Former Fort Ord, California

Volume I

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Annual Groundwater Treatment Systems

Operation Data Summary Report

January through December 2005

Operable Unit 2

Groundwater Remedy

Former Fort Ord, California Volume I

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ACRONYMS AND ABBREVIATIONS

1,1-DCA	1,1-Dicholorethane
1,1-DCE	1,1-Dicholorethene
1,1,1-TCA	1,1,1-Tricholoroethane
1,2-DCA	1,2-Dichloroethane or ethylene dichloride
1,2-DCE	1,2-Dichloroethene
1,2-DCP	1,2-Dichloropropane
µg/L	micrograms per liter (parts per billion [ppb])
ACG	Aquifer cleanup goal
ACL	Aquifer cleanup level
AGSC	AHTNA Government Services Corporation
Army	U.S. Department of the Army
BCT	Base Cleanup Team
bgs	below ground surface
BRACT	Base Re-alignment and Closure Team
Cal/EPA	California Environmental Protection Agency
CTC	Carbon tetrachloride
CDQMP	Chemical Data Quality Management Plan
$CHCl_3$	Chloroform
CH_2Cl_2	Methylene chloride
cis-1,2-DCE	Cis-1,2-Dichloroethene
COC	chemical of concern
Cm	centimeter
EFF	effluent
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
EW	Extraction Well
FFA	Federal Facilities Agreement
FORA	Fort Ord Reuse Authority
GAC	granular activated carbon
gpm	gallons per minute
GTS	Groundwater Treatment System
GWTP	Groundwater Treatment Plant
Harding ESE	Harding ESE, Inc (formerly known as Harding Lawson Associates [HLA])
hrs	hours
IN	Influent
INF	Infiltration
IT	IT Corporation
L	liter
MCL	maximum contaminant level
MDL	Method detection limit
MEK	Methyl Ethyl Ketone
mg/L	milligrams per liter (parts per million [ppm])
MRWPCA	Monterey Regional Water Pollution Control Agency
MSL	mean sea level

n	Mann Kendall total number of data points
OU2	Operable Unit 2
PCE	Perchloroethene or Tetrachloroethene
pH	negative log of hydrogen ion concentration
PZ	Piezometer
QA	Quality assurance
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial investigation/feasibility study
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
S	Mann Kendall statistic
SAP	Sampling and Analysis Plan
TCE	Trichloroethene
TDS	total dissolved solids
TK	Tank
total-1,2-DCE	Total-1,2-Dichloroethene
TS	Treatment System
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
UV	ultraviolet
VC	Vinyl Chloride
VOC	volatile organic compound

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EXECUTIVE SUMMARY

On behalf of the U.S. Army Corps of Engineers (USACE) Sacramento District, Ahtna Government Services Corporation (AGSC) has prepared this evaluation report for the Former Fort Ord Operable Unit 2 (OU2) groundwater remedy for the 2005 annual period. The OU2 groundwater remedy (Plate 1) consists of 22 extraction wells, three injection wells, and the groundwater treatment plant (GWTP).

This report describes the GWTP operations and presents an assessment of the hydraulic capture of groundwater containing chemicals of concern (COCs) for OU2 during the 2005 annual reporting period ("reporting period").

The estimated quantity of water treated by OU2 during the reporting period was 400.9 million gallons. Groundwater treatment at OU2 removed 50.7 pounds of COCs during the reporting period and a cumulative total of 496 pounds of COCs since remediation began in October 1995.

Approximately 98% of the COC mass removed at OU2 consisted of TCE, cis-1,2-DCE, 1,1-DCA, PCE, and chloroform. All COCs were below the allowable treated water discharge limits in samples obtained from OU2 GWTP effluent stream for the entire reporting period.

Groundwater monitoring data from the 2005 annual period indicate that the A-Aquifer and 180-Foot Aquifer plume sizes, shapes, and compositions are similar to those observed during the previous annual evaluation reports. Annual 2005 analytical results of samples from the Upper 180-Foot Aquifer monitoring wells confirm previous interpretations of this aquifer plume shape.

A Mann Kendall test for trend was conducted on the COC concentration data. Down gradient groundwater sampling results from the extraction wells at OU2 indicate that COC concentrations are generally decreasing or stable.

COC concentration trends within the Upper 180-Foot Aquifer are relatively stable. These results are consistent with previous trend analyses.

The groundwater flow model predicted the A-Aquifer plume to be captured.

The Upper 180-Foot Aquifer OU2 plume was predicted by the model to be captured, with the exception of the eastern portion. Operation of new extraction wells is anticipated to capture this area of the plume.

1.0 INTRODUCTION

On behalf of the USACE Sacramento District, per Contract#DAC05-01-D003, Task Order 0022, AGSC has prepared this annual evaluation report for the Former Fort Ord OU2 groundwater remedy for the January 1 – December 31, 2005 annual period. This 2005 annual evaluation report presents a discussion of OU2 system performance, hydrogeologic information and the 2005 annual evaluation of monitoring data.

The OU2 groundwater remedy addresses organic chemicals originating primarily from the Former Fort Ord landfills. Chemicals associated with the landfill materials have been detected in the underlying A-Aquifer and Upper 180-Foot Aquifer groundwater units. The chemicals are believed to have migrated from the landfill materials as vapors or as solutes in the leachate. Groundwater in the A-Aquifer occurs at approximately 60 to 160 feet below ground surface (bgs) and in the Upper 180-Foot Aquifer at approximately 110 to 220 feet bgs. As specified in the OU2 Record of Decision (OU2 ROD; A*rmy, 1994*) and the subsequent OU2 Explanation of Significant Differences (OU2 ESD; *Army, 1995*), the remedy includes the A-Aquifer and the Upper 180-Foot Aquifer and addresses 11 chemicals of concern (COCs): benzene, Carbon Tetrachloride (CT), chloroform, 1,1-DCA, 1,2-DCA, cis-1,2-DCE, 1,2-DCP, methylene chloride, PCE, TCE, and VC. Table 1 presents the aquifer cleanup levels (ACLs) and treated water discharge levels for the OU2 system COCs that were in effect during the January through December 2005 operational period.

The OU2 groundwater remedy (Plate 1) consists of the groundwater treatment plant (GWTP), 22 extraction wells and three injection wells. Fifteen extraction wells (thirteen in the A-Aquifer and two in the Upper 180-Foot Aquifer) are in the middle and western portion of the plume and are part of the original well network. Seven extraction wells (EW-OU2-14-A, EW-OU2-15-A, EW-OU2-16-A, EW-OU2-03-180, EW-OU2-04-180, EW-OU2-05-180, and EW-OU2-06-180) were installed as part of the OU2 groundwater remedy expansion and are located to the south and east of the plume and original well network. Two Upper 180-Foot Aquifer injection wells and two infiltration galleries are located west of the western edge of the plume. One Upper 180-Foot Aquifer injection well is located north of the plume. The OU2 GWTP is located in the western part of the OU2 plume area (Plate 1).

Although no extraction wells are screened in the Lower 180-Foot or 400-Foot aquifers, the groundwater elevation maps and plume maps are presented herein for these aquifers to illustrate how the lower aquifers are affected by the OU2 groundwater remedy. A Remedial Investigation/Feasibility Study was completed (May 19, 2006) to identify and delineate the extent of carbon tetrachloride (CT) in the area north of OU2. The CT area is identified on some of the illustrations. The groundwater elevation data is used to develop the groundwater contour maps and is presented in detail with the concentration data in the basewide monitoring program annual 2005 report (MACTEC, 2005).

Untreated extracted groundwater flow to the OU2 GWTP began on October 23, 1995. Diversion of treated groundwater effluent to the Sites 2/12 GWTP injection system was initiated on June 23, 1999. Installation of the seven additional extraction wells was completed during March 2000. Continuous operation of all seven additional extraction wells began during the latter half of September 2000. System operation at increased flow rates began on April 23, 2001, following completion of the treatment system expansion activities. The entire OU2 groundwater remedy was operational for the reporting period, as further described in Section 2.0 of this report.

2.0 OU2 TREATMENT PLANT OPERATIONS

This section of the annual groundwater evaluation report describes the OU2 treatment plant operations and interprets monitoring data and system performance for the 2005 annual period. Included are treatment configurations, operating performance, monitoring data summary, contaminant recovery, treatment operations, extraction and injection well performance, recommendations for future actions, and recommendations for changes to approved plans.

2.1 OU2 TREATMENT CONFIGURATION

The GWTP consists of four 20,000-pound granular activated carbon (GAC) vessels. During treatment, groundwater is pumped from the extraction wells and piped in parallel directly through two sets of two 20,000-pound GAC beds operated in series to remove COCs. The treated water flows into an effluent storage tank that discharges, with the aid of variable frequency drive pumps, to groundwater infiltration and injection structures located at OU2 and Sites 2/12. Capacity of the GWTP with the GAC beds in series is approximately 1,000 gallons per minute (gpm). The capacity is the practical maximum flow rate at which the inlet pressure to the GAC vessels does not exceed the allowable operating limit. Schematic diagrams of the equipment arrangements and sampling locations during the reporting period are shown on Plate 2. Chemical concentrations are monitored at up to seven sampling locations. The sample station designations are listed in the table below:

OU2 Sample Station Designations

Station Designation	Description
TS-OU2-INF	Composite of untreated influent water for monitoring treatment effectiveness and for calculating total contaminant removal.
TS-OU2-600-A TS-OU2-600-B	Effluent from GAC beds 600A and 600B for monitoring contaminant breakthrough. The beds alternate between lead and lag positions.
TS-OU2-600-C TS-OU2-600-D	Effluent from GAC beds 600C and 600D for monitoring contaminant breakthrough. The beds alternate between lead and lag positions.
TS-OU2-INJ	Following combination of two effluent streams (TS-OU2-EFF1 and TS-OU2-EFF2 – not sampled) from parallel GAC systems.

2.2 OU2 OPERATING PERFORMANCE

Operating performance is discussed below in terms of treatment flow rates and totals, injection flow rates and totals, online effectiveness, non-routine operations, and indirect waste stream production.

2.2.1 OU2 Treatment Flow

From January through December 2005, the GWTP operated continuously in the automatic control mode with four GAC treatment vessels online. Total volume of treated water for the 2005 annual period was approximately 400.9 million gallons (Table 2). The average flow rate for the period was 765 gpm (Table 2). The maximum weekly flow rate during the annual period, 844 gpm, occurred during the week ending August 26, 2005. Historical cumulative treated water flow since startup on October 23, 1995, through December 31, 2005, is approximately 3.349 billion gallons (Table 2).

The average weekly flow rate is the total volume pumped, averaged over the reporting period, with measurements having been taken every 7 days. The reported average weekly flow rate varies depending on individual well flow rates and any downtime at the plant or extraction wells. Non-routine interruptions are discussed in Section 2.2.3. Total system flow rates are shown graphically on Plate 3.

2.2.2 OU2 Injection Flow

Treated water was discharged into the Upper 180-Foot aquifer during the reporting period at three separate locations during the reporting period. Treated water was discharged at two separate OU2 injection wells with infiltration galleries and the Site 2 injection well and infiltration gallery system.

The OU2 recharge locations (IW-OU2-01-180, INF-OU2-01-180, IW-OU2-02-180, and INF-OU2-02-180) are shown on Plate 1. The OU2 injection well IW-OU2-03-180 did not receive any water during the reporting period and has been turned off since September 19, 2000. The average weekly injection flow rates for the 2005 annual period are presented in Table 3.

2.2.3 OU2 System Operability and Non-routine Operations and Maintenance

The OU2 GWTP was operational 99.52% of the time in the 2005 annual period. Downtime includes all scheduled and unscheduled operational outages, including maintenance and construction.

The OU2 GWTP weekly operability percentages for the 2005 annual period are summarized in Table 4. During the reporting period the OU2 GWTP had only six weeks of less than 100% operability. Outages were due to routine operations and maintenance activities, including planned system shutdowns associated with routine maintenance (such as change-out of GAC vessels). The non-routine system shutdowns were due to power outages and to electrical problems at the OU2 GWTP related to a problem with EW-OU2-01-180.

The dates and period of the shutdowns are listed in Section 2.4.

2.3 OU2 MONITORING DATA SUMMARY

This section presents an evaluation of monitoring data from January through December 2005. Sections 2.3.1 through 2.3.4 describe the COCs, the mass removed, the effluent monitoring and the GAC performance monitoring, respectively. Treatment plant operations and extraction well analytical data for the OU2 COCs are presented in Tables 5 and 6, respectively. Please note in Table 6 that as per the approved sampling schedule, not all groundwater monitoring wells are sampled quarterly. The quality control summary reports for these data are presented in the AGSC's *Semiannual Groundwater Treatment Systems, Operation Data Summary Reports* for the periods of January through June 2005 and July through December 2005.

2.3.1 OU2 Influent Monitoring

The combined OU2 GWTP influent is sampled at TS-OU2-INF prior to entering the GAC units. Table 5 summarizes influent data during the 2005 annual period; historical summary of influent COC concentrations is presented in Appendix A (Table A3) and shown graphically on Plate 4. In 2005, the highest concentration of any COC in the influent samples was TCE, which in 2005 varied between 6.2 micrograms per liter (µg/L) and 12 µg/L. The second highest COC concentration was cis-1,2-DCE, which varied between 1.2 µg/L, and 2.9 µg/L.

2.3.2 COC Mass Removed

The cumulative mass of COCs removed by the OU2 GWTP as of the end of the reporting period was approximately 496 pounds (Table A3 of Appendix A). The total mass of COCs removed during the reporting period was 50.7 pounds. TCE represents 62.46%; cis-1,2-DCE represents 14.47%; 1,1-DCA represents 7.71%, PCE represents 7.76%, and chloroform represents 4.37% by weight, respectively, of the total COCs in the untreated influent, integrated over the entire annual operational period (as illustrated on Plate 5). The remaining 3.23% are a combination of 1,2-DCP, 1,2-DCA, methylene chloride, CT, and VC.

2.3.3 OU2 Injection Monitoring

Injection monitoring during normal operations is conducted to document compliance with treated discharge water requirements for aquifer reinjection. Injection monitoring samples are collected at TS-OU2-INJ, as described in Section 2.1 and shown on Plate 2. The Sampling and Analysis Plan (SAP, AGSC, 2004) specifies an injection monitoring frequency that has remained constant at once per week since April 1997. All COCs were below discharge limits in all samples obtained from TS-OU2-INJ sampling point (Table 5).

2.3.4 OU2 GAC Performance

Treatment system monitoring activities during the reporting period included GAC performance monitoring. During the reporting period, the OU2 GWTP operated with all four 20,000-pound GAC beds. During treatment, groundwater is pumped from the extraction wells and piped in parallel directly through two sets of two 20,000-pound GAC beds (Plate 2). The OU2 system incorporates two GAC beds, TK-600-A and TK-600-B, operating in series in the eastern containment berm and two GAC beds, TK-600-C and TK-600-D, operating in series in the northern containment berm. The streams between the GAC beds (lead bed effluent sample point TS-OU2-600-A or TS-OU2-600-B, and TS-OU2-600-C or TS-OU2-600-D) are sampled and analyzed to monitor for contaminant breakthrough. Data from the lead bed outlets, reported in Table 5, show up to seven of the 11 COCs breaking through prior to the GAC change-out. These compounds are: 1,1-DCA, 1,2-DCA, 1,2-DCP, chloroform, cis-1,2-DCE, methylene chloride, and TCE.

After a change-out, the sequence of the beds is reversed (i.e., the previous lead bed filled with freshly activated GAC becomes the lag bed and the bed previously used in lag position becomes the lead bed). Thus, the residual loading of the polishing bed chemicals is immediately detected as lead bed breakthrough after a GAC change-out. The OU2 breakthrough chemicals detected from the lead bed after a GAC change-out are typically 1,1-DCA; chloroform; cis-1,2-DCE; and 1,2-DCA.

Four GAC change-outs were performed in the 2005 annual period for a total of four 20,000 pound canisters, as summarized in the table below. The change-out services and 8 x 30 mesh GAC replacements were supplied by U.S. Filter. The spent GAC from the change-outs was transported by U.S. Filter to their facility in Red Bluff, California, for regeneration. The spent GAC in Tanks TK-600-A and TK-600-D were removed on February 11, 2005, and replaced with regenerated GAC from previous change-outs. The spent GAC in Tanks TK-600-B and TK-600-C were removed on September 12, 2005 and replaced with regenerated GAC from previous change-outs.

The following table presents the carbon change-out dates, volume of treated groundwater during period of each carbon cycle, and the total COCs mass removed during each carbon cycle:

Volume of Groundwater and Total Mass of COCs Removed per Carbon Change-out Cycle

GAC Change-out Date [1, 2]	Tanks Changed out	Volume Treated During Period (gallons) [3]	Total Mass of COCs Removed During Period (lb) [3]
February 11, 2005	TK-600-A		
February 11, 2005	TK-600-D		
September 12, 2005	TK-600-B		
September 12, 2005	TK-600-C		
Period End [4]			
Annual Period		**400,856,862**	**50.7**

Notes:
1. Meter typically read each Friday. If Friday data is not available, next closest complete set of meter readings is used. The volume of water is extrapolated to the nearest day.
2. Period start is 1/1/05.
3. Volumes treated and mass removed were estimated to the nearest weekend.
4. Period end is 12/30/05.

Spent OU2 GWTP GAC is returned to the GAC vendor as non-RCRA hazardous waste on the basis of a self-determination test (i.e. a test performed at the direction of the generator to demonstrate the characteristics of the waste as not hazardous).

2.4 OU2 SYSTEM SHUTDOWN EVALUATION

The evaluation summarizes system shutdowns affecting system performance and a description of the shutdowns is provided in section 2.4.1. The following table summarizes the events resulting in OU2 GWTP downtime during the reporting period:

OU2 GWTP Downtime

Date	Event	Duration
February 11, 2005	GAC change-out	4 hours
May 11, 2005	Regional power outage	2 hours
August 1, 2005	Power outage	15 minutes
August 29-30, 2005	Electrical problems – EW-OU2-01-180	30 hours
September 12, 2005	GAC change-out	6 hours
December 26, 2005	Power outage	3 hours 15 minutes

2.4.1 Description of OU2 System and Well Operational Shutdowns

Operational shutdowns consisting of three power outages, a GAC change-out and one electrical problem related to EW-OU2-01-180, resulted in a total of 45.5 hours of system downtime during the reporting period. Unscheduled operational shutdowns consisted of power failures and electronic component failures, which are generally outside of the control of system operation. The system downtime associated with the three power outages and electronic component failure was approximately 35.5 hours, which is judged to be acceptable and not to warrant corrective actions.

Scheduled operational shutdowns consisted of 10 hours of downtime due to GAC change-out.

3.0 OU2 GROUNDWATER MONITORING AND HYDRAULIC CAPTURE EVALUATION

The OU2 groundwater extraction system performance for the 2005 annual period was evaluated through:

- Monitoring the distribution of COCs in groundwater.
- Statistically evaluating the concentration trends of COCs in the extracted groundwater over time.
- Conducting groundwater flow modeling of system operations using average OU2 system pumping rates for the reporting period. Groundwater flow model results are then used to estimate the aquifer plume areas captured as a result of extraction system operation.

Groundwater plume monitoring data collected during OU2 operation activities and basewide groundwater monitoring activities are presented in Section 3.1; a statistical trend evaluation of the extracted groundwater COC concentrations is presented in Section 3.2; and an evaluation of the OU2 extraction system hydraulic capture of the A-

Aquifer and Upper 180-Foot Aquifer groundwater plumes is summarized in Section 3.3 and details are described in Appendix B, Volume II.

3.1 OU2 GROUNDWATER PLUME MONITORING

Organic chemical data and groundwater elevation data generated during the January through December 2005 quarterly monitoring events, have been reported in four quarterly basewide groundwater monitoring reports (*MACTEC*), are summarized in Table 6 and have been presented graphically on the above mentioned quarterly reports. Please note (see Table 6) that in accordance with the approved-schedule not all wells are sampled quarterly. Extraction well inorganic analytical data is below the discharge limits and is presented in Table 7. All analytical data generated during this review period was subject to data validation as described in the Chemical Data Quality Management Plan (CDQMP) and project SAP, and were considered overall to be acceptable and suitable for use. The quality control summary report (QCSR) for these data can be found in the Appendices to the two *Semiannual Groundwater Treatment Systems Operations Data Summary Reports January through June 2005 and July through December 2005.*

Plates presented in the 2005 quarterly reports display all COCs detected above ACLs, TCE concentrations with isoconcentration contours; and groundwater elevations. Each set of plates includes a plate showing the A-Aquifer, a plate showing the Upper 180-Foot Aquifer and a plate showing the Lower 180-Foot/400-Foot Aquifers.

Historically, TCE was used as an indicator compound to approximate the OU2 groundwater plume in the isoconcentration plots because TCE is the most widespread and consistently detected compound. Based on available data, in 2005 the ACLs were exceeded in ten of the twenty-two extraction wells (EW-OU2-01-180, EW-OU2-01-A, EW-OU2-02-A, EW-OU2-02-A, EW-OU2-03-A, EW-OU2-04-180, EW-OU2-04-A, EW-OU2-07-A, EW-OU2-14-A, EW-OU2-15-A).

3.2 OU2 EXTRACTED GROUNDWATER COC TREND EVALUATION

Extraction well COC data were evaluated by trend analysis to identify whether COC concentrations are likely increasing or decreasing at each well. As chemical mass is removed from the aquifers, COC concentrations are expected to exhibit a decreasing trend, especially for compounds that exceed ACLs. If COC concentrations are consistently increasing at a well, significant chemical mass may be upgradient of the well and additional extraction from the well or other upgradient wells may be warranted. Trend analyses will also be used in the future to identify wells that are appropriate to shut off because the COC concentrations are below ACLs and decreasing.

3.2.1 OU2 Statistical Evaluation Method

A statistical analysis was conducted of COC concentration data for extraction wells using the Mann Kendall test for trend. The Mann Kendall test for trend is a nonparametric statistical evaluation that uses only the relative magnitudes of the data rather than actual data values to evaluate the probability that a trend exists (*Gilbert*, *1987*).

The data are ordered by time, and each data point is compared to data points corresponding to earlier sampling dates. The number of earlier data points that are higher or lower than each data point evaluated is used to calculate the Mann Kendall statistic (S). The statistic is used, in conjunction with the total number of data points (n), to look up the probability that a trend (positive or negative) exists. However, the statistic does not indicate the magnitude (rate of increase or decrease) of the trend. Chemical data are considered to show a significant concentration trend (i.e., a trend very likely exists) when the Mann Kendall probability exceeds 95%.

The general formula used to calculate the Mann Kendall statistic:

$$S = \sum_{k=1}^{n-1} \sum_{j=k+1}^{n} \text{sign}(x_j - x_k)$$

Where: $\text{sign}(x_j - x_k)$ is dependent on the number of positive and negative sums for each data comparison and j and k are simply variable names for each data point (and $j > k$).

3.2.2 OU2 Statistical Evaluation Results

OU2 down gradient groundwater sampling results from the extraction wells at OU2 indicate that COC concentrations are generally decreasing or stable.

Wells EW-OU2-08-A and EW-OU2-13-A, down gradient from Cell F of the Fort Ord Landfills, did show statistically increasing COC concentrations of benzene and 1,1-DCA (respectively). Despite the increase, these concentrations are still low. These results suggest Cell F remains a significant source of COCs to groundwater in the underlying A-Aquifer.

3.3 OU2 GROUNDWATER CAPTURE EVALUATION

Groundwater flow modeling was used to evaluate the OU2 groundwater extraction/injection system hydraulic capture of the A-Aquifer and Upper 180-Foot Aquifer areas impacted by COCs. Hydraulic capture was estimated using the updated Former Fort Ord groundwater flow model to simulate aquifer water levels and

groundwater flow paths resulting from system operations. Appendix B (in Volume II) describes the origin and development of the Fort Ord groundwater flow model and the groundwater modeling process, and summarizes the results of the groundwater hydraulic capture evaluation.

The groundwater flow model predicted the A-Aquifer plume to be captured (Appendix B, Volume II); however, a portion of the A-Aquifer plume near Cell F, between wells MW-OU2-02-A and MW-OU2-73-A and lying in a stagnant or low flow area, will require a greater period of time to remediate using current extraction well configurations.

The Upper 180-Foot Aquifer OU2 plume was predicted by the model to be captured, with the exception of the eastern portion, located approximately one thousand feet down gradient and east of extraction wells EW-OU2-05-180 and EW-OU2-06-180. Operation of new extraction wells (EW-OU2-07-180 and EW-OU2-08-180) is anticipated to capture this area of the plume.

4.0 SYSTEM EVALUATION SUMMARY OF FINDINGS AND RECOMMENDATIONS

4.1 SUMMARY OF FINDINGS

The OU2 system was operational from January through December 2005. The cumulative flow of treated groundwater is 3.349 billion gallons. The OU2 GWTP had an operability of 99.52% for the reporting period. Groundwater treatment removed 50.7 pounds of COCs during the 2005 annual period. All COCs were below the allowable treated water discharge limits in samples obtained from OU2 GWTP injection stream for the entire reporting period.

OU2 down gradient groundwater sampling results from the extraction wells at OU2 indicate that COC concentrations are generally decreasing or stable. Wells EW-OU2-08-A and EW-OU2-13-A, down gradient from Cell F, did show statistically increasing COC concentrations of benzene and 1,1-DCA (respectively). Despite the increase, these concentrations are still low. These results suggest Cell F remains a significant source of COCs to groundwater in the underlying A-Aquifer.

Other wells with statistically significant increases in concentrations (e.g. EW-OU2-06-A) are doing so with COC concentrations below cleanup limits and, as such, are of less importance, but should continue to be evaluated. COC concentration trends within the Upper 180-Foot Aquifer are relatively stable. These results are consistent with previous trend analyses.

The groundwater flow model predicted the A-Aquifer plume to be captured (Appendix B, Volume II); however, a portion of the A-Aquifer plume near Cell F, between wells MW-

OU2-02-A and MW-OU2-73-A and lying in a stagnant or low flow area, will require a greater period of time to remediate using current extraction well configurations.

The Upper 180-Foot Aquifer OU2 plume was predicted by the model to be captured, with the exception of the eastern portion, located approximately one thousand feet down gradient and east of extraction wells EW-OU2-05-180 and EW-OU2-06-180. Operation of new extraction wells (EW-OU2-07-180 and EW-OU2-08-180) is anticipated to capture this area of the plume.

4.2 RECOMMENDATIONS

Based on the results of this evaluation report, the existing OU2 groundwater remedy is operating effectively and the USACE should continue extraction and injection at the design flow rates while evaluating the following:

- Increasing trends of COCs in selected wells.

- Capture of the leading edge of the COC plume in the Upper 180-Foot Aquifer.

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