

Monitoring Well Decommissioning Work Plan

Former Fort Ord, California



Prepared for:

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Sacramento District
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On behalf of:



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Task No. 10.9

Prepared by:



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Report Use and Limitations

Report Title: **Monitoring Well Decommissioning Work Plan
Former Fort Ord, California**

Prime Contractor: Ahtna Environmental, Inc.

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Ahtna Environmental, Inc. (Ahtna) prepared this report at the direction of the U.S. Army Corps of Engineers (USACE) for the sole use of the U.S. Department of the Army (Army), the intended beneficiary. No other party should rely on the information contained herein without the prior written consent of the Army. This report and its interpretations, conclusions, and recommendations use the information presented in other documents, as cited in the text and listed in the references. Therefore, this report is subject to the limitations and qualifications presented in the referenced documents.

Report Approval

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Acronyms and Abbreviations

µg/L	micrograms per liter
ACL	aquifer cleanup level
AHA	Activity Hazard Analysis
Ahtna	Ahtna Environmental, Inc.
APP	Accident Prevention Plan
Army	U.S. Department of the Army
BLL	black legless lizard
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
CT	carbon tetrachloride
CTS	California tiger salamander
EISB	enhanced in situ bioremediation
ESD	Explanation of Significant Differences
FONR	Fort Ord Natural Reserve
GWMP	Groundwater Monitoring Program
GWTP	groundwater treatment plant
GWTS	groundwater treatment system
HMP	Habitat Management Plan
IDW	investigation-derived waste
MEC	munitions and explosives of concern
MNA	monitored natural attenuation
OU2	Operable Unit 2
OUCTP	Operable Unit Carbon Tetrachloride Plume
PCE	tetrachloroethene
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
ROD	Record of Decision
Sites 2/12	Sites 2 and 12
SSHO	Site Safety and Health Officer
SVE	soil vapor extraction
SVETS	soil vapor extraction and treatment system
TCE	trichloroethene
UC	University of California
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

1.0 Introduction

Ahtna Environmental, Inc. (Ahtna) prepared this *Monitoring Well Decommissioning Work Plan, Former Fort Ord, California* (Work Plan) on behalf of the U.S. Army Corps of Engineers (USACE) Sacramento District per Contract W91238-14-C-0048. This Work Plan describes the monitoring well decommissioning activities to be conducted at Sites 2 and 12 (Sites 2/12), Operable Unit 2 (OU2), and Operable Unit Carbon Tetrachloride Plume (OUCTP) (Figure 1). This Work Plan includes:

- A description of pre-construction, construction, and post-construction activities, including methods and procedures used for monitoring well decommissioning.
- Activity Hazard Analysis (AHA).
- An Environmental Protection Plan.
- Detailed maps showing the location of the wells to be decommissioned and access routes.
- A project schedule.
- A site-specific quality control (QC) program detailing the procedures for inspection, testing, and correction of deficiencies.

1.1 Background

The former Fort Ord, located in northern Monterey County, California (Figure 1) was an active U.S. Army base from 1917 to 1994 encompassing approximately 28,000 acres. The U.S. Environmental Protection Agency added Fort Ord to the National Priorities List primarily because of groundwater contamination discovered in 1990 beneath the Fort Ord Landfills area, which was subsequently designated as OU2. Fort Ord was placed on the Base Realignment and Closure (BRAC) list in 1991. As the lead agency, the U.S. Department of the Army (Army) manages the cleanup of the former Fort Ord in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Activities include conducting risk assessments, remedial investigations, feasibility studies, and implementation of selected remedies for site cleanup of hazardous substances released into the environment as a result of previous Army activities. A remedial alternative and cleanup goals are selected in a decision document, and remedial activities are initiated accordingly. Monitoring of remedial activities ensures the remedy is operating properly and successfully to achieve cleanup goals.

The Fort Ord Basewide Groundwater Monitoring Program (GWMP) began in 1993 as a result of a Basewide Remedial Investigation/Feasibility Study (RI/FS) conducted in accordance with the Federal Facility Agreement. The current GWMP includes monitoring the progress of remedial actions at three sites: Sites 2/12, OU2, and OUCTP (Figure 1). Quarterly and annual reports are issued for each site describing GWMP results and progress toward remedial goals as identified in the Quality Assurance Project Plan (QAPP; Ahtna, 2018a). Significant progress toward remedial goals has been made at Sites 2/12 (Ahtna, 2018c), OU2 (Ahtna, 2018d), and OUCTP (Ahtna, 2018b); therefore, thirteen wells are recommended for decommissioning.

1.1.1 Sites 2/12

The *Final Record of Decision, Basewide Remedial Investigation Sites, Fort Ord, California* (RI Sites ROD; Army, 1997) identifies the Sites 2/12 groundwater chemicals of concern (COCs), their respective aquifer cleanup levels (ACLs), and the remedy for the Upper 180-Foot Aquifer. The prevalent groundwater COCs at Sites 2/12 are tetrachloroethene (PCE) and trichloroethene (TCE). Detected concentrations of PCE and TCE greater than the ACL of 5.0 micrograms per liter (µg/L) are used to define the extent of the groundwater COC plumes at Sites 2/12.

The *Explanation of Significant Differences No. 1, Basewide Remedial Investigation Sites 2 and 12, Former Fort Ord, California* (ESD No. 1; Army, 2016) identify the Sites 2/12 soil gas COCs, their respective soil gas cleanup levels, and remedy for the vadose zone. The soil gas COCs at Sites 2/12 are PCE and TCE. Detected concentrations of PCE and TCE greater than their soil gas cleanup levels are used to define the extent of the soil gas plumes at Sites 2/12.

The RI Sites ROD identifies the Upper 180-Foot Aquifer selected remedy as groundwater extraction and treatment and the Sites 2/12 groundwater treatment system (GWTS) has been in operation since 1999. The ESD No. 1 identifies the vadose zone remedy as soil vapor extraction and treatment and the Sites 2/12 soil vapor extraction and treatment system (SVETS) has been in operation since 2015. Samples are collected from groundwater, soil vapor monitoring, and extraction wells at Sites 2/12 and analyzed for COCs quarterly for the GWMP and soil gas monitoring program to delineate COC plume extents and determine progress toward remedial goals (Ahtna, 2018c).

1.1.2 OU2

The *Record of Decision, Operable Unit 2, Fort Ord Landfills, Fort Ord, California* (OU2 ROD; Army, 1994) and the *Explanation of Significant Differences, Operable Unit 2, Fort Ord Landfills, Fort Ord, California* (OU2 ESD; Army, 1995) identify the OU2 groundwater COCs, their respective ACLs, and the remedies for the A-Aquifer and the Upper 180-Foot Aquifer. The extent of the groundwater COC plumes in the A-Aquifer is characterized by concentrations of five COCs above their respective ACLs: TCE; 1,1-dichloroethane; 1,2-dichloroethane; PCE; and vinyl chloride.

The OU2 ROD and OU2 ESD identify the selected remedy as groundwater extraction and treatment, and the OU2 GWTS has been in operation since 1995. Samples are collected from monitoring and extraction wells at OU2 and analyzed for COCs quarterly for the GWMP to delineate COC plume extents and determine progress toward remedial goals (Ahtna, 2018d).

1.1.3 OUCTP

The *Record of Decision, Operable Unit Carbon Tetrachloride Plume, Former Fort Ord, California* (OUCTP ROD; Army, 2007) identifies the OUCTP groundwater COCs, their respective ACLs, and the remedies for the A-Aquifer, the Upper 180-Foot Aquifer, and the Lower 180-Foot Aquifer. The prevalent COC in all three aquifers is carbon tetrachloride (CT). Detected concentrations of CT greater than the ACL of 0.5 µg/L are used to define the extent of the groundwater COC plumes in all three aquifers.

The OUCTP ROD identifies the selected groundwater remedies for each aquifer and remediation is in progress as described below.¹

- OUCTP A-Aquifer: enhanced in situ bioremediation (EISB) in seven deployment areas (Pilot Study, 1A, 1B, 1C, 2A, and 2B from 2007 to 2012, and 3A from 2016 to 2017) and monitored natural attenuation (MNA). Groundwater in the A-Aquifer is monitored for post-EISB treatment water quality parameters and COCs to assess EISB effectiveness and the viability of MNA.
- OUCTP Upper 180-Foot Aquifer: groundwater extraction and treatment, which has been in operation since 2011 and includes one extraction well (EW-OU2-09-180) connected to the OU2 GWTS where extracted groundwater is treated with granular activated carbon. Groundwater in the Upper 180-Foot Aquifer is monitored for COCs to assess remedy effectiveness.
- OUCTP Lower 180-Foot Aquifer: MNA was implemented as the remedy in March 2011. Groundwater in the Lower 180-Foot Aquifer is monitored for COCs to assess remedy effectiveness. Additionally, there is a contingency plan for wellhead treatment of groundwater (via granular activated carbon or air stripping) at potable water supply wells that are extracting groundwater from the Lower 180-Foot Aquifer if COCs associated with OUCTP are detected at concentrations above the ACLs in these water supply wells.

The OUCTP GWMP data are used to determine progress toward remedial goals and eventual site closeout as described in the QAPP (Ahtna, 2018a) and OUCTP Annual Report (Ahtna, 2018b).

1.2 Rationale

The groundwater monitoring wells proposed for decommissioning have been removed from the GWMP and have been determined to be redundant or unnecessary for the collection of groundwater elevation data in accordance with approved QAPP decision criteria (Ahtna, 2018a). Additionally, analytical data from monitoring wells at Sites 2/12, OU2, and OUCTP were analyzed using the Mann-Kendall statistic (Table 1 and Appendix A). The results were compared to changes in groundwater COC concentrations above ACLs to confirm these wells are no longer needed for the GWMP. The specific rationale for decommissioning monitoring wells at Sites 2/12, OU2, and OUCTP are detailed below.²

Additionally, three soil vapor extraction (SVE) wells at OUCTP are proposed for decommissioning because they are no longer needed for remedial activities as detailed in Section 1.2.3.1.

1.2.1 Sites 2/12

The Sites 2/12 groundwater PCE plume extent has decreased in size due to active remediation. In the last several years the PCE plume has been consistently and sufficiently delineated in an area east of State Highway 1 with the current monitoring well network (Ahtna, 2018c).

¹ The remedies for all three aquifers at OUCTP also include institutional controls (e.g., deed restrictions) to prevent access or use of the groundwater within the OUCTP area for any purpose until cleanup levels are met, and to maintain the integrity of the remediation and monitoring systems (Army, 2007).

² Wells installed before 2012 were analyzed twice; once with the full historical data set through 2017, and once with a smaller data set from 2012 to 2017. Figures in Appendix A use the most recent 2012 to 2017 data in these cases. OU2 wells with multiple COCs analyzed will show the statistically significant increasing COC.

Monitoring well MW-02-12-180 (Table 2 and Figure 2), located on the west side of State Highway 1, is proposed for decommissioning at Sites 2/12. COC concentration data from MW-02-12-180 and neighboring well MW-02-05-180 were analyzed using the Mann-Kendall statistic (Table 1 and Appendix A, Figure A-1). MW-02-12-180 had a statistically significant decreasing TCE concentration trend from 1996 through 2011 when it was removed from the GWMP. MW-02-05-180 is located south of MW-02-12-180 and had a historical statistically significant decreasing TCE trend from 1992 through 2017. However, when calculated using data from 2012 through 2017, the recent Mann-Kendall analysis of MW-02-05-180 had a decreasing trend that was not statistically significant. The TCE concentration at MW-02-05-180 has been below the 5.0 µg/L ACL since 1999, and as of the Third Quarter 2017 this well is on an annual sampling schedule in the GWMP due to low COC concentrations (Ahtna, 2018c). TCE has always been below the ACL at MW-02-12-180, with TCE not detected in the most recent data from 2003 through 2011.

1.2.2 OU2

Four A-Aquifer OU2 monitoring wells (MW-OU2-33-A, MW-OU2-36-A, MW-OU2-59-A, and MW-OU2-60-A shown in Table 2 and Figure 3) are proposed for decommissioning. Figure 3 shows that the wells proposed for decommissioning are well outside the current COC plume contours. COC concentration data from the four wells proposed for decommissioning and four neighboring wells (EW-OU2-03-A, EW-OU2-06-A, MW-OU2-45-A, and MW-OU2-58-A) were analyzed using the Mann-Kendall statistic (Table 1 and Appendix A, Figure A-2).

- MW-OU2-33-A: TCE concentrations at MW-OU2-33-A and EW-OU2-06-A were analyzed. These wells are located at the western extent of Hydraulic Zone 4.³ There was no statistical determination for MW-OU2-33-A because TCE was not detected from 1994 through 2002 when this well was removed from the GWMP. Currently operating extraction well EW-OU2-06-A is located east and upgradient of MW-OU2-33-A. TCE concentrations at EW-OU2-06-A have been below the ACL since 2012, and the Mann-Kendall statistic shows statistically significant decreasing TCE concentration trends from 1995 through 2017 and for the more recent period from 2012 through 2017.
- MW-OU2-36-A: TCE concentrations at MW-OU2-36-A and EW-OU2-03-A were analyzed. These wells are located north of Hydraulic Zone 4. There was a statistically significant decreasing TCE concentration trend at MW-OU2-36-A from 1994 through 2002, when it was removed from the GWMP. Offline extraction well EW-OU2-03-A is located southeast and cross gradient of MW-OU2-36-A. TCE concentrations at EW-OU2-03-A were below the ACL from 1997 through 2013 when this well was removed from the GWMP. EW-OU2-03-A has a decreasing TCE concentration trend that is statistically significant from 1995 through 2013, and not significant from 2001 through 2013.
- MW-OU2-59-A: PCE and TCE concentrations at MW-OU2-58-A and MW-OU2-59-A were analyzed. These wells are located northeast of Hydraulic Zone 2. There was no statistical

³ See the QAPP (Ahtna, 2018a) for descriptions of hydraulic zones. Maps of the hydraulic zones in are presented in Appendix A.

determination for PCE because it was not detected at MW-OU2-59-A from 1997 through 2012 when this well was removed from the GWMP. TCE concentrations at MW-OU2-59-A had a non-significant decreasing trend because there was only one detection of TCE at a concentration below the ACL from 1997 through 2012. MW-OU2-58-A is located northwest of MW-OU2-59-A and had no statistical trend for PCE or TCE because neither COCs were detected from 1997 through 2002 when this well was removed from the GWMP.

- MW-OU2-60-A: PCE and TCE concentrations at MW-OU2-45-A and MW-OU2-60-A were analyzed. These wells are located at the eastern extent of Hydraulic Zone 2. There was no statistical determination for PCE because it was not detected at MW-OU2-60-A from 1997 through 2011 when this well was removed from the GWMP. TCE concentrations at MW-OU2-60-A had a statistically significant decreasing trend, have always been below the ACL, and have not been detected since 2005. MW-OU2-45-A is located northwest of MW-OU2-60-A. TCE concentrations at this well had a statistically significant decreasing trend from 1997 through 2017 and from 2012 through 2017, with TCE concentrations below the ACL since 2012. PCE concentrations at this well have never been above the ACL; however, there are increasing trends that are statistically significant from 1997 through 2017 and not significant from 2012 through 2017. However, this is consistent with PCE concentration trends observed at MW-OU2-27-A located near the groundwater divide (Ahtna, 2018). Additionally, because MW-OU2-45-A is cross gradient from MW-OU2-60-A, the PCE concentration trends at these two wells are not necessarily related.

There are no OU2 Upper 180-Foot Aquifer monitoring wells recommended for decommissioning at this time.

1.2.3 OUCTP

1.2.3.1 Vadose Zone

Three SVE wells (MW-BW-68-A, MW-BW-69-A, and MW-BW-70-A) are proposed for decommissioning (Figure 4 and Table 2). Data from these wells were not statistically analyzed because they are screened in the vadose zone and no groundwater samples were collected from them. These SVE wells were installed as part of a pilot SVETS operated in 2004 during the OUCTP remedial investigation. The SVETS was effective in removing volatile organic compounds, specifically CT, from the soil gas and met the objectives of providing source control for the CT groundwater plume and minimizing the potential for vapor intrusion in the nearby housing area (Shaw, 2010). The OUCTP ROD also concludes the pilot SVET successfully removed the CT source; therefore, no additional remedial action is required for soil gas at OUCTP and these SVE wells are no longer needed.

1.2.3.2 A-Aquifer

Two monitoring wells (MW-BW-62-A and MW-BW-64-A) in Hydraulic Zone 1 are proposed for decommissioning (Figure 4). CT concentrations at these two monitoring wells and neighboring well MW-BW-63-A were analyzed using the Mann-Kendall statistic (Table 1 and Appendix A, Figure A-3).

- MW-BW-62-A: There was a decreasing CT concentration trend at this well, though not statistically significant, from 2003 through 2009 when it was removed from the GWMP. However, CT was not detected at this well from 2004 through 2009.
- MW-BW-63-A: There was a statistically significant decreasing CT concentration trend at this well from 2003 through 2013, when it was removed from the GWMP. Additionally, CT concentrations at this well were less than the ACL since 2005 and CT was not detected since 2007.
- MW-BW-64-A: There was a statistically significant decreasing CT concentration trend at this well from 2003 through 2013, when it was removed from the GWMP. Additionally, CT concentrations at this well were less than the ACL since 2006 and CT was not detected since 2007.

1.2.3.3 Upper 180-Foot Aquifer

There are three Upper 180-Foot Aquifer OUCTP monitoring wells (MW-BW-20-180, MW-BW-22-180, and MW-BW-29-180) proposed for decommissioning north of Hydraulic Zone 6 (Figure 5). The three wells proposed for decommissioning and six neighboring wells (MW-BW-21-180, MW-BW-43-180, MW-BW-45-180, MW-BW-55-180, MP-BW-32-287, and MP-BW-33-272) were analyzed using the Mann-Kendall statistic (Table 1 and Appendix A, Figure A-4).

- MW-BW-20-180: There was no statistical determination for CT at this well because CT was not detected from 1998 through 2003 when it was removed from the GWMP. Nearby MW-BW-43-180 is located west and downgradient of MW-BW-20-180. CT was also not detected at this well from 2003 through 2008 when it was removed from the GWMP; therefore, no statistical trend was determined for this well either.
- MW-BW-22-180: CT concentrations at this well had a statistically significant decreasing trend from 1998 through 2009 and no detections of CT from 2006 through 2009, when it was removed from the GWMP. CT was never detected at adjacent MP-BW-33-272 from 2001 through 2004 when it was removed from the GWMP; therefore, no statistical trend was determined for this well. Cross gradient MW-BW-21-180 is located north of MW-BW-22-180 and had only one detection of CT, which was below the ACL, from 1998 through 2008, when this well was removed from the GWMP.
- MW-BW-29-180: CT was only detected once at a concentration below the ACL at MW-BW-29-180 from 2000 through 2009 when this well was removed from the GWMP. Two wells (MP-BW-32-287 and MW-BW-55-180) located on either side of MW-BW-29-180 had no detections of CT (from 2001 through 2004 and from 2003 through 2009, respectively) and therefore do not have statistical trends.

2.0 Project Oversight

Construction and sampling oversight consist of QC and quality assurance (QA) activities conducted by Ahtna personnel, the Fort Ord BRAC Office, and the USACE. USACE and BRAC Office representatives will be on site during well decommissioning activities, as necessary. The *Accident Prevention Plan, Groundwater Remedies and Monitoring at Operable Unit 2, Sites 2 and 12, and Operable Unit Carbon Tetrachloride Plume, Former Fort Ord, California* (APP; Ahtna, 2015) compliance oversight will be performed by Ahtna personnel.

2.1 Project Schedule

Construction activities in sensitive biological areas are constrained by the presence of special-status species (Section 3.5) and construction must be conducted in FONR areas between June 1 and October 31. Well decommissioning fieldwork typically takes one or two days to complete. Wells located in sensitive biological areas may also require additional biological protection measures that could add time to the field schedule. The table below summarizes the anticipated project schedule.

Anticipated Project Schedule

Task	Task Begins	Task Completed
Well Decommissioning Work Plan	March 2018	August 2018
Wells Decommissioned ⁴	August 2018	October 2018
Well Decommissioning Completion Report	November 2018	April 2019

2.2 Quality Control

QC encompasses the actions that control the attributes of a material, sample, process, component, system, or facility in accordance with predetermined quality requirements. The QC inspection system utilized by Ahtna personnel for the fieldwork is based on three phases of control to cover definable features of onsite work. The three phases are the preparatory phase, initial phase, and follow-up phase as summarized below and detailed in the QAPP (Ahtna, 2018a).

During the preparatory phase, work necessary to initiate the activity is checked before construction or sampling begins. This phase is conducted in a meeting format during the daily pre-work health and safety meeting. Participants include onsite Ahtna personnel, the BRAC Office representative, the USACE representative, and onsite subcontractor personnel as appropriate. During the meeting, information regarding the schedule, procurement, and the status of the related activity is shared and discussed. Lessons learned from previous events are shared and discussed.

Initial phase inspections are conducted after activities began to verify and document that work is being performed as discussed during the preparatory phase inspection. The QC inspector is responsible for

⁴ Well decommissioning within the FONR must be complete by October 31; however, wells outside the FONR may be decommissioned after this date.

monitoring the quality of the work performed. During the initial phase inspection, a representative sample of work is observed to verify the work complies with the specified requirements.

Follow-up phase inspections are performed daily after the initial phase until the completion of the work to verify and document work is being performed according to plans.

2.3 Quality Assurance

QA includes the planned and systematic actions necessary to provide a sufficient confidence level that a structure, system, or component will perform satisfactorily in service. QA includes a multi-disciplinary system of management controls backed by quality verification and overview activities that demonstrate completeness and appropriateness of achieved quality. USACE personnel perform QA inspections of fieldwork and/or sampling to ensure the work is completed as planned and in accordance with this Work Plan and the performance work statement.

QA responsibilities for sampling and chemistry include assessment of performance on project tasks associated with sampling and analysis, including instruction of field personnel in sampling and sample preservation requirements, analytical data review and validation processes, verifying and conformance with quality standards. A detailed discussion of QA processes and procedures are presented in the QAPP (Ahtna, 2018a).

2.4 Site Safety and Health

Work activities will be performed utilizing safe work practices as detailed in the APP (Ahtna, 2015). An AHA for Ahtna supervision of subcontractor monitoring well decommissioning is located in Appendix B. Each day of fieldwork will start with a safety tailgate meeting to review:

- The day's scope of work and discuss safety procedures to be followed for each task
- Personal protective equipment
- Specific site hazards identified in the appropriate AHA
- Safe behaviors (e.g., staying alert throughout the day and stretching before physical activities are conducted)
- Communication procedures
- Expected weather conditions and its effect on work conditions
- Unsafe behavior corrections
- Visitor safety
- Any new emergency procedures and contacts
- Any other specific safety concerns.

Additional safety tailgate meetings will be called for if there is a safety incident that may have a negative impact on project safety. Visitors to the project site will be required to sign in with the onsite Ahtna representative and will be subject to a safety briefing of potential hazards before entering the site. Unauthorized or untrained personnel will not be allowed to enter the site during hazardous work activities.

2.5 Project Organization

Descriptions of project management organization and project objectives are provided in Section 2.0 of the QAPP (Ahtna, 2018a). This section presents the project organization for well decommissioning activities at the former Fort Ord. The names and responsibilities of key project positions related to this Work Plan are summarized below.

2.5.1 USACE Project Manager/Contracting Officer's Representative

The USACE Senior Project Manager and Contracting Officer's Representative, Mr. Duane Balch, has the overall responsibility and authority for project coordination and compliance with the awarded contract requirements.

2.5.2 USACE Technical Lead

The USACE Technical Lead, Mr. Alex Kan, has technical responsibility and authority for the project.

2.5.3 Program Manager

The Program Manager, Mr. Chuck Holman, provides technical and administrative support for the project management of the program and has overall responsibility and authority for project cost, scheduling, and technical quality.

2.5.4 Project Manager

The Project Manager, Mr. Derek Lieberman, is responsible for the technical, cost and schedule control for all project tasks, and serves as an interface between customers, functional elements, government, and non-government agencies.

2.5.5 Technical Manager

The Technical Manager, Mrs. Holly Dillon, is responsible for day-to-day management of the project, oversight of field activities, development and implementation of all delivery order documents, schedule and contract management, and overall project quality.

2.5.6 Quality Control Manager

The QC Manager responsibilities, performed by Mr. Chris Ohland or his designee, include monitoring and verifying overall project quality, implementing the three-phase QC process, preparing daily reports, providing QC review of delivery order documents, and, in coordination with the Project Manager, implementation of corrective actions when deficiencies are identified. Activities include, but are not limited to, confirming preparatory work necessary to initiate well drilling, construction and development is completed, inspecting and monitoring the processes, materials, measurements and overall quality of the work performed through completion.

2.5.7 Certified Industrial Hygienist

The Program Safety/Health Officer & Certified Industrial Hygienist, Mr. Peter Rice, is responsible for program level implementation of the APP (Ahtna, 2015).

2.5.8 Site Safety and Health Officer

The Site Safety and Health Officer (SSHO), Mrs. Holly Dillon, is responsible for implementation of the APP (Ahtna, 2015). The SSHO will conduct periodic inspections to verify compliance with the APP, USACE contract requirements, and applicable California Department of Industrial Relations, Division of Occupational Safety and Health regulations.

2.5.9 Field Services Coordinator

The Field Services Coordinator, Mr. Mark Fisler, is responsible for day-to-day technical operations at the site, including implementation of the three phases of control and field oversight of the drilling and well development contractor(s).

2.5.10 Onsite Biologist

The U.S. Fish and Wildlife Service (USFWS)-approved Onsite Biologist, Denise Duffy and Associates, Inc., is responsible for preparing and implementing a Habitat Checklist (Appendix D) and for overseeing construction activities to minimize impacts to the surrounding habitat and special-status species as described in the Habitat Management Plan (HMP; USACE, 1997) and the Programmatic Biological Opinion (USFWS, 2017).

2.5.11 Personnel Qualifications and Training

Project staff will be qualified to perform their assigned duties. This is accomplished by verifying initial and continued personnel proficiency and, when necessary, implementing a formal training program to achieve and maintain work-related proficiency.

All project staff who may encounter hazardous wastes will have completed Hazardous Waste Operations and Emergency Response Training (40-hour initial training and 8-hour annual refresher course) in accordance with 29 Code of Federal Regulations (CFR) 1910.120.

Due to the former use of Fort Ord as a military installation, proposed well locations may contain munitions and explosives of concern (MEC). The term MEC means specific categories of military munitions that may pose unique explosives safety risks and includes unexploded ordnance, discarded military munitions, or munitions constituents present in high enough concentrations to pose an explosive hazard. MEC does not include small arms ammunition (i.e., ammunition, without projectiles that contain explosives (other than tracers), that is .50 caliber or smaller, or for shotguns).

Project staff participating in onsite activities must receive an Army MEC recognition and safety briefing prior to the commencement of construction activities and thereafter conducted on an as-needed basis for new or additional workers. This briefing will be scheduled by contacting the Fort Ord BRAC Military Munitions Response Program Manager at Natalie.N.Gordon2.ctr@mail.mil or (831) 242-7919. If any

worker encounters or suspects they have encountered a munition on the property, they will (1) immediately stop intrusive or ground-disturbing work in the area and adjacent areas; (2) not attempt to approach, move or disturb it; and immediately notify the City of Marina police department (see APP; Ahtna, 2015).

Prior to site activities in the FONR, onsite project personnel will be given habitat training to recognize special-status plant and animal species and appropriate procedures to take for special-status species that are identified in the site-specific baseline habitat survey and the Habitat Checklist (Appendix D).

3.0 Environmental Protection Plan

Environmental protection is defined as maintaining the environment in its natural state, to the extent possible, during and after fieldwork activities and returning the disturbed site to conditions similar to those present prior to these activities. Environmental protection will consist of protecting air, water, land, and biological resources.

3.1 Air Resources Protection

Fieldwork activities performed as part of this Work Plan will be conducted to minimize the release of airborne particulates within and outside of the boundaries of the site. Dust and particulates will be controlled in accordance with the APP (Ahtna, 2015) to minimize contaminate dispersion and to protect human health and the environment. It is anticipated, based on the proposed activities, that significant dust will not be generated. The use of water to control dust will be minimized to avoid impact to natural resources. Visual air monitoring will be conducted to verify the effectiveness of the program.

3.2 Land Resources Protection

Fieldwork within FONR will be coordinated with the USACE Technical Lead, Onsite Biologist, Fort Ord BRAC Office Biologist, and the University of California (UC), who manages the area, to minimize impact to natural resources and ongoing research projects. Coordination will include:

- Scheduling fieldwork to start after June 1, or after the beginning of the dry season (i.e., outside the primary growing season for rare plants) as determined by the Onsite Biologist and approved by UC and the BRAC Office Biologist, to avoid the flowering periods of special-status species.
- Maintaining site security.
- Defining acceptable and unacceptable work areas, access routes, and turnaround and staging locations in the Habitat Checklist (Appendix D).
- Ensuring implementation of the conservation measures identified in the HMP (USACE, 1997) and Programmatic Biological Opinion (USFWS, 2017).

Prior to any intrusive activities within the FONR, the Onsite Biologist will review existing habitat surveys to determine the quantity and specific location of any threatened or endangered plants and animals within the planned well construction areas. This habitat survey data and any information provided by UC will be used to minimize impact to the habitat and special-status species within FONR. Where practicable, adjustments will be made to construction plans and coordinated with UC to minimize the impact on natural resources.

The field activities will include well decommissioning. The specific locations where these activities will occur are identified in the Habitat Checklist (Appendix D) and Figures 2 and 4. All field personnel will receive training to familiarize them with the site restrictions necessary to minimize impacts to the habitat and special-status species on FONR lands. During each of these activities, staging areas and specific access routes will be established to minimize excess impact to the ground surface such as rutting and erosion. Mats will be used where necessary to protect vegetation and prevent damage to the

ground surface, including activities such as the operation of vehicles off existing roads and creation of new access routes.

The Onsite Biologist will monitor work as necessary to ensure conservation measures are implemented. Baseline and 3-year follow-up monitoring will be conducted to determine if special-status species have been adversely impacted and if corrective measures are recommended. Because the corrective actions will take place in the FONR, which is one of several sites administered by UC, the Onsite Biologist will coordinate with UC, the USACE Technical Lead, and the BRAC Office Biologist prior to implementation.

Following the well decommissioning activities, disturbed land around the wells will be restored as closely as possible to its original condition by limited grading after coordination with the USACE Technical Lead and the BRAC Office Biologist.

3.3 Water Resources Protection

The potential for impact to surface water resources is assumed to be minimal because there is no surface water drainage or storm drains that lead to surface water within the project sites. All equipment maintenance and fueling will be conducted offsite and away from open storm drain inlets.

3.4 Material Handling

Both hazardous and non-hazardous wastes may be generated during fieldwork activities. These wastes will be properly managed to mitigate environmental impacts and to comply with applicable regulations.

Any chemicals brought onsite will be stored in their original containers or containers with the contents clearly marked. A Safety Data Sheet, which should include specific cleanup requirements for each chemical, must be kept onsite for any chemical used onsite. The SSHO will add new Safety Data Sheets to the existing file as new chemicals are brought onsite.

3.5 HMP Species

Project activities undertaken must protect and maintain the special-status species found within FONR. Efforts are taken to avoid or minimize impacts to all HMP species, with emphasis on three federally listed plant species: Monterey spineflower, Monterey gilia, and Yadon's piperia. Special-status species listed in the HMP and Programmatic Biological Opinion (USFWS, 2017) that occur or may occur on FONR include:

- Monterey gilia (*Gilia tenuiflora* ssp. *arenaria*) – federally endangered, state threatened
- Monterey spineflower (*Chorizanthe pungens* var. *pungens*) – federally threatened
- Seaside bird's beak (*Cordylanthus rigidus* ssp. *littoralis*) – state endangered
- Sandmat manzanita (*Arctostaphylos pumila*)
- Monterey manzanita (*A. montereyensis*)
- Monterey ceanothus (*Ceanothus rigidus*)
- Eastwood's goldenbush (*Ericameria fasciculata*)
- Yadon's piperia (*Piperia yadonii*) – federally endangered

- Coast wallflower (*Erysimum ammophilum*)
- California black legless lizard (*Anniella pulchra nigra*; BLL) – state species of concern
- California tiger salamander (*Ambystoma californiense*; CTS) – federally threatened, state threatened
- Monterey ornate shrew (*Sorex ornatus salarius*) – state species of concern

Monterey gilia, Monterey spineflower, Seaside bird's beak, and coast wallflower are annual herb species that may occur within maritime chaparral, coastal scrub, grasslands, dune scrub, or disturbed areas. Sandmat manzanita, Monterey manzanita, Monterey ceanothus, and Eastwood's goldenbush are perennial shrub species that typically occur in maritime chaparral, but individuals can also be found mixed with oak woodland or coastal scrub habitats. Yadon's piperia is a perennial herb that is typically found in maritime chaparral and Monterey pine habitats.

The BLL is a rare variety of the California legless lizard (*A. pulchra*) that inhabits areas with sandy soils on the former Fort Ord. The Monterey ornate shrew is a rare variety of the ornate shrew (*S. ornatus*) found in riparian forest and oak woodland habitats. The CTS is typically found in vernal or seasonal ponds on the former Fort Ord. The CTS may also be found aestivating in small mammal burrows or under logs in upland areas within 2.2 kilometers of vernal ponds.

As identified in the Programmatic Biological Opinion (USFWS, 2017), success criteria for the contaminated groundwater remediation are as follows:

After the final monitoring period for each of the federally listed species or designated Monterey spineflower critical habitat, species reestablishment will be considered successful when:

1. *densities and acreage of HMP annual species are within a normal range compared with information from reference sites, and;*
2. *the number of wells where HMP annual species are detected in follow up surveys will be the same or greater than the number of wells where these species were found in baseline surveys.*

If the success criteria are not met corrective measures have been identified in the Programmatic Biological Opinion (USFWS, 2017) and are as follows:

If populations of HMP annuals or critical habitat are determined to have been adversely affected by remediation activity, based on the evaluation of the monitoring data, corrective measures will be developed and applied on a case-by-case basis in coordination with the [USFWS].

3.6 HMP Species Protection

The Onsite Biologist will identify areas containing populations of Monterey gilia and Monterey spineflower during baseline surveys. Additionally, in the Site 2 area at Fort Ord Dunes State Park, the Onsite Biologist will identify areas containing populations of Buckwheat, which is habitat for federally endangered Smith's blue butterfly (*Euphilotes enopte smithi*). Access routes will be delineated with rope or flagging tape to ensure personnel and equipment stay within designated work areas and prohibit access to protected areas. The Onsite Biologist will ensure conservation measures are implemented

during well decommissioning activities in the FONR to resolve unanticipated resource issues as they arise.

The field activities will include well decommissioning. Ahtna will communicate to all personnel working at the site the resources of concern and habitat protection requirements prior to the start of remediation activities. Staging areas, access routes, and turnaround areas will be clearly delineated and shown to field personnel. All field personnel will be instructed to lock the access gate behind them after each entry to and exit from the FONR. If a BLL or CTS is discovered during the proposed activities, the Onsite Biologist will be immediately notified. The Onsite Biologist will coordinate with the BRAC Office Biologist to confirm appropriate conservation steps, including relocation, if necessary. The Onsite Biologist will fill out the field observation form with the necessary information, and then relocate the individual, if necessary, to suitable nearby habitat. If the Onsite Biologist and/or BRAC Office Biologist are not available onsite during observation of CTS or BLL, onsite personnel may carefully relocate BLL away from fieldwork if harm is imminent and fill out the biological observation form (Appendix D). Work must stop if CTS is observed until an approved Biologist has removed the CTS from the project site.

When driving vehicles and heavy equipment through the inner roads of the northern FONR area, personnel must walk in front of vehicles to ensure there are no Coast Horned Lizards in the road before the vehicle passes. If Coast Horned Lizards are observed, they must be relocated away from the vehicle's path. Observations of Coast Horned Lizards may be reported to UC or the BRAC Office Biologist for tracking purposes. MW-BW-29-180 is located along a well-traveled perimeter road; therefore, walking in front of vehicles accessing this location is not necessary.

Some limited vegetation clearance may be necessary to access well locations. If necessary, vegetation clearance will be coordinated with UC, the BRAC Office Biologist, and USACE Technical Lead, and conducted following standard best management practices to protect the existing oak trees and special-status species. Tree branches may be trimmed as necessary to provide access, but no trees will be removed. Vegetation removed from work areas will be consolidated with other construction debris and taken to an appropriate disposal facility.

4.0 Pre-Construction Activities

4.1 Notification and Access

Property owners will be notified of fieldwork activities at least three days before the start of work. Site users will be coordinated with for any site access, limited access to project site during construction, and scheduling changes. The contact information of property owners for each well location are provided in the table below.

Contact Information

Well Name	Property Owner/User	Contact Name	E-Mail	Phone
MW-02-12-180	State Parks	Amy Palkovic	Amy.Palkovic@parks.ca.gov	831-384-7420
MW-OU2-33-A	Young Nak Presbyterian Church	Jongoh Eun	jongoheun@hotmail.com	831-392-5276
MW-OU2-36-A	City of Marina	Eric Nava	enava@cityofmarina.org	831-809-8561
MW-OU2-59-A	CSUMB	Katie LaPlace	klaplace@csumb.edu	831-582-5189
MW-OU2-60-A				
MW-BW-62-A	City of Marina	Eric Nava	enava@cityofmarina.org	831-809-8561
MW-BW-64-A	City of Marina	Eric Nava	enava@cityofmarina.org	831-809-8561
MW-BW-68-A	City of Marina	Eric Nava	enava@cityofmarina.org	831-809-8561
MW-BW-69-A	City of Marina	Eric Nava	enava@cityofmarina.org	831-809-8561
MW-BW-70-A	I-HELP ⁵	Alan Bilinsky	abilinsky@interiminc.org	831-649-4588
MW-BW-20-180	City of Marina	Eric Nava	enava@cityofmarina.org	831-809-8561
MW-BW-22-180	City of Marina	Eric Nava	enava@cityofmarina.org	831-809-8561
MW-BW-29-180	University of California	Gage Dayton Joe Miller	ghdayton@ucsc.edu jotmille@ucsc.edu	831-459-4867

The Fact Sheet in Appendix C will be onsite with Ahtna personnel for distribution to a member of the public if there are inquiries about the project.

⁵I-HELP: Interfaith Homeless Emergency Lodging Program

4.2 Permitting

Permits for monitoring well decommissioning will be obtained from the Monterey County Department of Health; however, no permit fees are required to be paid because the former Fort Ord is a CERCLA site.

4.3 Habitat Clearance

The Onsite Biologist will survey MW-02-12-180 and MW-BW-29-180 locations, access routes, and staging areas in the FONR prior to fieldwork activities for Monterey gilia, Monterey spineflower, piperia, and Buckwheat. Identified plants will be GPS-located and mapped. The baseline survey will be conducted during the peak blooming period for Monterey gilia and Monterey spineflower. The maps will be used to field-identify and mark areas that personnel may not enter, areas that are permitted to access, stage equipment, and turn vehicles around.

4.4 Traffic Control Plan

All decommissioned monitoring well locations are expected to be in areas with no or low public and/or property user traffic. If there is a need for traffic control, the proper safety delineators and protocol will be adhered to as described in the APP (Ahtna, 2015).

4.5 Support Facilities

Support facilities include lockable containers, chemical toilets, portable containment tanks, and bins with lids. Lockable support facilities will be secured when project personnel are not on site.

Decontamination facilities will consist of portable secondary containment for personnel and an equipment decontamination pad. Decontamination water will be collected in portable tanks for disposal. It is anticipated most of the support facilities will be located near the Ahtna field offices adjacent to the OU2 Groundwater Treatment Plant (GWTP).

5.0 Construction Activities

The specific methods and material requirements for well decommissioning are presented in this section. Well decommissioning will be conducted according to Monterey County Department of Health specifications, including standards found in *Water Well Standards: State of California Bulletin 74-81 and Supplement 74-90* (CDWR, 1981 and 1991).

5.1 Well Decommissioning

A California C-57 licensed drilling company will decommission all monitoring wells. Boring logs and well construction diagrams for the thirteen monitoring wells are provided in Appendix E with well construction details listed in Table 2. The well decommissioning sequence will proceed as follows:

1. Sampling hardware, if any, will be removed and disposed of as investigation-derived waste (IDW).
2. The total well depth will be checked against known well details to confirm there are no obstructions present in the casing. If encountered, obstructions will be removed before filling and sealing efforts begin.
3. The surface completion will be removed, including concrete base pads, flush mount well boxes or vaults, risers, and bollards, if present.
4. For MW-02-12-180 and MW-BW-29-180 located at Fort Ord Dunes State Park and the FONR, respectively, the top 3 to 6 inches of topsoil will be set aside and used as the surface soil layer when re-grading the excavated area.
5. The well will be pressure filled with sealing material consisting of 5 percent bentonite neat cement grout using a tremie or grout pipe from the bottom of the well to within 5 feet below the ground surface.⁶ The sealing material will be free of organic matter. At a minimum, the volume of sealing material placed will equal the calculated volume of the well casing and screen. Excess grout will be placed in portable metal bins or equivalent and disposed of as solid IDW as described in Section 5.2.
6. After the well casing has been filled with sealing material, all well materials, including casing and annular materials, will be removed to 5 feet below ground surface. For MW-02-12-180 and MW-BW-29-180 located at Fort Ord Dunes State Park and the FONR, respectively, well materials will be removed only to 1 foot below ground surface.
7. The grout will be topped off as necessary to reach the desired height of 5 feet below ground surface. Once the well has been sufficiently sealed and grout set, the excavation will be filled with native material and the area regraded to match surrounding topography. In the Fort Ord Dunes State Park and the FONR, the top 3 to 6 inches of topsoil originally set aside will be used as the surface soil layer when re-grading the excavated area.
8. All debris (well casing, excess seal material, and trash) and surface components from the decommissioned well (bollards, well pad, protective casing, and well boxes) will be transported to the staging area(s) pending recycling or proper disposal.

⁶ Bentonite neat cement grout will be a minimum of 9.1 pounds per gallon.

If the decommissioning process at any well location is interrupted before it is completed during the workday and the well must be left unsupervised, the well/borehole opening and any excavation will be covered at the surface to ensure public safety and to prevent entry of foreign material, water, pollutants, and contaminants.

5.2 Investigation-Derived Waste

Solid IDW will be contained in drums or bins onsite and will be disposed of in accordance with applicable laws and regulations. Liquid IDW will be contained in labeled drums or tanks and will be disposed of at the OU2 GWTP. Any onsite storage of IDW will be maintained in appropriate secure containment in a designated staging area as identified in the Habitat Checklist (Appendix D).

All solid non-hazardous waste, such as disposable personal protective equipment and non-reusable sampling equipment, will be disposed of in a waste receptacle located at the Ahtna office at 296 12th Street, Marina, California.

5.3 Reporting

Each day of fieldwork a Project Field Report (Appendix E) will be prepared to describe onsite personnel, visitors, equipment, hours of operation, a summary of activities, quality and safety issues, corrective actions, and photographs. These daily Project Field Reports will be submitted to USACE weekly during fieldwork activities.

6.0 Post-Construction Activities

The requirements for post-construction groundwater monitoring, follow-up habitat monitoring, and reporting are presented in this section.

6.1 Groundwater Monitoring Program

After decommissioning is completed, the monitoring wells will be removed from the GWMP and the next revision of the QAPP.

6.2 Follow-Up Habitat Monitoring

The Onsite Biologist will conduct three years of annual follow-up habitat monitoring in areas of the Fort Ord Dunes State Park and FONR disturbed during well decommissioning field activities. Habitat monitoring will be conducted in accordance with the HMP (USACE, 1997) and the Programmatic Biological Opinion (USFWS, 2017). Follow-up surveys will be conducted during the peak blooming period for the species being monitored (Monterey gilia, Monterey spineflower, and Buckwheat). Each year for the three-year follow-up habitat monitoring period an evaluation report will be prepared and provided to BRAC detailing updated special-status plant species populations and document impacts during the well decommissioning.

6.3 Deliverables and Reporting

A *Monitoring Well Decommissioning Completion Report* (Completion Report) will be prepared following completion of field activities. The Completion Report will describe well decommissioning activities and present well decommission records.

Results of the follow-up habitat monitoring of the special-status plant species in impacted areas will be reported annually for three years after well decommissioning are completed as described in Section 6.2.

7.0 References⁷

- Ahtna Environmental, Inc. (Ahtna), 2015. *Accident Prevention Plan, Groundwater Remedies and Monitoring at Operable Unit 2, Sites 2 and 12, and Operable Unit Carbon Tetrachloride Plume; and Soil Gas Remedy and Monitoring at Sites 2 and 12, Former Fort Ord, California*. March.
- Ahtna, 2017. *Final Operable Unit Carbon Tetrachloride Plume Fourth Quarter 2015 through Third Quarter 2016 Groundwater Monitoring Report, Former Fort Ord, California*. February 24. AR# [OUCTP-0075A](#).
- Ahtna, 2018a. *Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix A, Final Revision 6, Groundwater Remedies and Monitoring at Operable Unit 2, Sites 2 and 12, and Operable Unit Carbon Tetrachloride Plume (QAPP)*. March 19. AR# [BW-2785F](#).
- Ahtna, 2018b. *Final Operable Unit Carbon Tetrachloride Plume Fourth Quarter 2016 through Third Quarter 2017 Groundwater Monitoring Report, Former Fort Ord, California*. March 23. AR# [OUCTP-0081A](#).
- Ahtna, 2018c. *Final Sites 2 and 12 Fourth Quarter 2016 through Third Quarter 2017 Groundwater and Soil Gas Monitoring and Treatment System Report, Former Fort Ord, California*. March 23. AR# [BW-2840A](#).
- Ahtna, 2018d. *Final Operable Unit 2 Fourth Quarter 2016 through Third Quarter 2017 Groundwater Monitoring and Treatment System Report, Former Fort Ord, California*. April 13. AR# [OU2-710A](#).
- California Department of Water Resources (CDWR), 1981. *Water Well Standards: State of California Bulletin 74-81*. December.
- CDWR, 1991. *California Well Standards, Water Wells, Monitoring Wells, Cathodic Protection Wells, Bulletin 74-90 (Supplement to Bulletin 74-81)*. June.
- Shaw Environmental, Inc. (Shaw), 2010. *Final Interim Remedial Action Completion Report, Operable Unit Carbon Tetrachloride Plume, Former Fort Ord, California*. April 29. AR# [OUCTP-0040E](#).
- U.S. Army Corps of Engineers (USACE), 1997. *Installation-Wide Multispecies Habitat Management Plan (HMP) for Former Fort Ord, California (HMP)*. April 1. AR# [BW-1787](#).
- U.S. Department of the Army (Army), 1994. *Record of Decision, Operable Unit 2, Fort Ord Landfills, Fort Ord, California*. July 15. AR# [OU2-480](#).
- Army, 1995. *Explanation of Significant Differences, Operable Unit 2, Fort Ord Landfills, Fort Ord, California*. August 3. AR# [OU2-406](#).
- Army, 1997. *Final Record of Decision, Basewide Remedial Investigation Sites, Fort Ord, California (RI Sites ROD)*. January 13. AR# [RI-025](#).

⁷ At the end of references included in the Fort Ord Administrative Record are the Administrative Record Numbers (AR#s) (e.g. BW-1234). To find the referenced document, this number may be typed into the Online Search tool at: <http://www.fortordcleanup.com/documents/search/>. Please note the referenced documents were available in the Fort Ord Administrative Record at the time this document was issued; however, some may have been superseded by more current versions and were subsequently withdrawn.

Army, 2007. *Record of Decision, Operable Unit Carbon Tetrachloride Plume, Former Fort Ord, California*. November 2. AR# [OUCTP-0021D](#).

Army, 2016. Explanation of Significant Differences No. 1, Basewide Remedial Investigation Sites 2 and 12, Former Fort Ord, California. February 1. AR# [BW-2794](#).

U.S. Fish and Wildlife Service (USFWS), 2017. Reinitiation of Formal Consultation for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (Original Consultation #8-8-09-F-74, 81440-2009-F-0334) (Programmatic Biological Opinion). June 7. [BW-2747A](#).

TABLES

Table 1. Monitoring Well COC Trend Statistical Analysis Summary

Well ID	Aquifer	COC	Number of Events ¹	Data Starts	Data Ends	Statistically Significant ²	CT M-K Trend	CT M-K S	OLS Regression Slope	2017-3Q COC Concentration (µg/L)
Sites 2/12										
MW-02-05-180	U	TCE	85	1992	2017	Yes	Down	-2,269	-0.387	0.11
			23	2012	2017	No		-23	-0.001	
MW-02-12-180	U	TCE	46	1996	2011	Yes	Down	-153	-0.017	NS
OU2										
EW-OU2-03-A	A	TCE	48	1995	2013 ³	Yes	Down	-822	-0.092	NS
			26	2001		No		-64	-0.006	
EW-OU2-06-A	A	TCE	89	1995	2017	Yes	Down	-3,257	-0.197	3.3
			24	2012				-169	-0.084	
MW-OU2-33-A	A	TCE	30	1994	2002 ³	No	-	0	0.000	NS
MW-OU2-36-A	A	TCE	30	1994	2002 ³	Yes	Down	-127	-0.024	NS
MW-OU2-45-A	A	PCE	83	1997	2017	Yes	Up	1,671	0.011	0.63
			24	2012		No		58	0.006	
		TCE	83	1997	2017	Yes	Down	-2,297	-0.482	0.26
			24	2012				-70	-0.047	
MW-OU2-58-A	A	PCE TCE	16	1997	2002 ³	No	-	0	0.000	NS
MW-OU2-59-A	A	PCE	37	1997	2012 ³	No	-	0	0.000	NS
		TCE					Down	-20	0.000	
MW-OU2-60-A	A	PCE	46	1997	2011 ³	No	-	0	0.000	NS
		TCE				Yes	Down	-738	-0.047	
OUCTP										
MW-BW-62-A	A	CT	22	2003	2009 ³	No	Down	-48	-0.009	NS
MW-BW-63-A	A	CT	35	2003	2013 ³	Yes	Down	-396	-0.033	NS
MW-BW-64-A	A	CT	35	2003	2013 ³	Yes	Down	-385	-0.029	NS
MW-BW-20-180	U	CT	22	1998	2003 ³	No	-	0	0.000	NS
MW-BW-21-180	U	CT	27	1998	2008 ³	No	Up	2	0.000	NS
MW-BW-22-180	U	CT	42	1998	2009 ³	Yes	Down	-403	-0.103	NS
MW-BW-29-180	U	CT	32	2000	2009 ³	No	Up	17	0.001	NS
MW-BW-43-180	U	CT	23	2003	2008 ³	No	-	0	0.000	NS
MW-BW-45-180	U	CT	23	2003	2009 ³	No	-	0	0.000	NS
MW-BW-55-180	U	CT	22	2003	2009 ³	No	-	0	0.000	NS
MP-BW-32-287	U	CT	8	2001	2004 ³	No	-	0	0.000	NS
MP-BW-33-272	U	CT	8	2001	2004 ³	No	-	0	0.000	NS

Notes:¹ The highest COC concentration was used for multiple sample depths analyzed in a single sample event² Non-detect data evaluated as 10 percent of the limit of quantitation (LOQ) and duplicate data not evaluated³ Removed from the groundwater monitoring program due to low COC concentrations**Acronyms and Abbreviations:**

-: all data was not detected and therefore had a trendline that was flat with an S of 0 (monotonic trend)

µg/L: micrograms per liter

A: A-Aquifer

COC: chemical of concern

CT: carbon tetrachloride

ft bgs: feet below ground surface

M-K: Mann-Kendall

NS: not sampled

OLS: ordinary least squares

OU2: Operable Unit 2

OUCTP: Operable Unit Carbon Tetrachloride Plume

PCE: tetrachloroethene

S: Statistic

TCE: trichloroethene

U: Upper 180-Foot Aquifer

Table 2. Monitoring Well Decommissioning Details

Well ID	Site	Aquifer	Bio Sensitive	Location and Access	Last DTW	Last Sample	Notes	Northing	Easting
MW-02-12-180	Sites 2/12	Upper	Yes	Unimproved road	ongoing	2011	TCE always below ACL	2137991.00	5735908.55
MW-OU2-33-A	OU2	A	No	Commercial	ongoing	2002	TCE always ND	2137374.05	5738654.58
MW-OU2-36-A	OU2	A	No	Residential	ongoing	2002	TCE always below ACL	2139579.50	5739394.85
MW-OU2-59-A	OU2	A	No	Oak woodland	ongoing	2012	TCE always below ACL	2136830.16	5750924.76
MW-OU2-60-A	OU2	A	No	Oak woodland	ongoing	2011	TCE always below ACL	2135729.64	5750438.98
MW-BW-62-A	OUCTP	A	No	Residential	ongoing	2009	CT always below ACL	2137725.50	5748172.09
MW-BW-64-A	OUCTP	A	No	Residential	ongoing	2013	CT below ACL since 2006	2138018.00	5748548.70
MW-BW-68-A	OUCTP	SVE	No	Unimproved road	N/A	2004 (air)	SVE well*	2138039.84	5748076.57
MW-BW-69-A	OUCTP	SVE	No	Unimproved road	N/A	2004 (air)	SVE well*	2138139.54	5748326.23
MW-BW-70-A	OUCTP	SVE	No	Unimproved road	N/A	2004 (air)	SVE well*	2137680.98	5748431.32
MW-BW-20-180	OUCTP	Upper	No	Unimproved road	ongoing	2003	CT always ND	2140645.12	5747685.23
MW-BW-22-180	OUCTP	Upper	No	Unimproved road	ongoing	2009	CT ND since 2006	2140553.48	5748198.84
MW-BW-29-180	OUCTP	Upper	Yes	Unimproved road	ongoing	2009	CT always below ACL	2140951.74	5747985.78

Notes:

* Screened in vadose zone.

Acronyms and Abbreviations:

ACL: aquifer cleanup level

bgs: below ground surface

btoc: below top of casing

CT: carbon tetrachloride

DTW: depth to water

ft: feet

in: inches

MSL: mean sea level

ND: not detected

TCE: trichloroethene

TD: total depth

TOC: top of casing

SVE: soil vapor extraction well

Table 2. Monitoring Well Decommissioning Details

Well ID	Site	Aquifer	Boring Log	Surface Completion	Ground Elevation	TOC (ft MSL)	Screen Top (ft bgs)	Screen Bottom (ft bgs)	Screen length (ft)	Silt trap (ft)	TD Install (ft bgs)
MW-02-12-180	Sites 2/12	Upper	No	Stovepipe	-	60.18	113	128	15	6	134.00
MW-OU2-33-A	OU2	A	Yes	Flush vault	120	120.93	120	150	30	1.2	151.20
MW-OU2-36-A	OU2	A	Yes	Flush vault	94	94.39	123	133	10	2	135.00
MW-OU2-59-A	OU2	A	Yes	Stovepipe	171.7	173.34	93	122	29	2.3	124.30
MW-OU2-60-A	OU2	A	Yes	Stovepipe	172.6	174.24	88	117	29	1	118.00
MW-BW-62-A	OUCTP	A	Yes	Flush vault	183.12	180.39	98	128	30	0	128.00
MW-BW-64-A	OUCTP	A	Yes	Flush vault	177.43	177.26	97.5	127.5	30	0.5	128.00
MW-BW-68-A	OUCTP	SVE	Yes	Flush vault	-	-	61	91	30	1	92.00
MW-BW-69-A	OUCTP	SVE	Yes	Flush vault	-	-	61	91	30	1	92.00
MW-BW-70-A	OUCTP	SVE	Yes	Stovepipe	-	-	61	91	30	1	92.00
MW-BW-20-180	OUCTP	Upper	Yes	Stovepipe	145.1	146.51	177.5	197.5	20	0	197.50
MW-BW-22-180	OUCTP	Upper	Yes	Stovepipe	152.86	154.76	177.5	197.5	20	0	197.50
MW-BW-29-180	OUCTP	Upper	Yes	Stovepipe	146.3	148.80	200	220	20	1	221.00

Notes:

* Screened in vadose zone.

Acronyms and Abbreviations:

ACL: aquifer cleanup level

bgs: below ground surface

btoc: below top of casing

CT: carbon tetrachloride

DTW: depth to water

ft: feet

in: inches

MSL: mean sea level

ND: not detected

TCE: trichloroethene

TD: total depth

TOC: top of casing

SVE: soil vapor extraction well

Table 2. Monitoring Well Decommissioning Details

Well ID	Site	Aquifer	TD 2017-3Q (ft btoc)	DTW 2017-3Q (ft btoc)	Casing Diam (in)	Installer	Install Date
MW-02-12-180	Sites 2/12	Upper	128.90	56.63	4	IT Corporation	2/26/1996
MW-OU2-33-A	OU2	A	148.77	115.63	5	Dames & Moore	2/26/1992
MW-OU2-36-A	OU2	A	135.00	87.91	5	Dames & Moore	11/12/1993
MW-OU2-59-A	OU2	A	124.27	99.27	5	HLA	11/17/1997
MW-OU2-60-A	OU2	A	119.50	93.98	5	HLA	11/19/1997
MW-BW-62-A	OUCTP	A	126.20	103.61	5	MACTEC	5/29/2003
MW-BW-64-A	OUCTP	A	127.40	100.89	5	MACTEC	6/4/2003
MW-BW-68-A	OUCTP	SVE	-	-	4	Shaw	3/2/2004
MW-BW-69-A	OUCTP	SVE	-	-	4	Shaw	3/2/2004
MW-BW-70-A	OUCTP	SVE	-	-	4	Shaw	3/1/2004
MW-BW-20-180	OUCTP	Upper	198.50	156.17	5	HLA	7/22/1998
MW-BW-22-180	OUCTP	Upper	198.72	164.65	5	HLA	7/24/1998
MW-BW-29-180	OUCTP	Upper	220.85	158.26	5	HLA	6/1/2000

Notes:

* Screened in vadose zone.

Acronyms and Abbreviations:

ACL: aquifer cleanup level

bgs: below ground surface

btoc: below top of casing

CT: carbon tetrachloride

DTW: depth to water

ft: feet

in: inches

MSL: mean sea level

ND: not detected

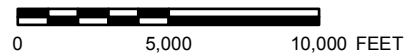
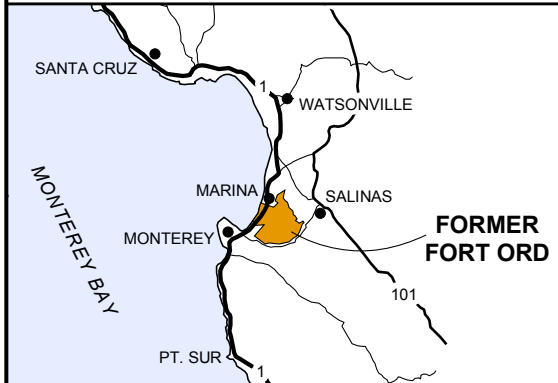
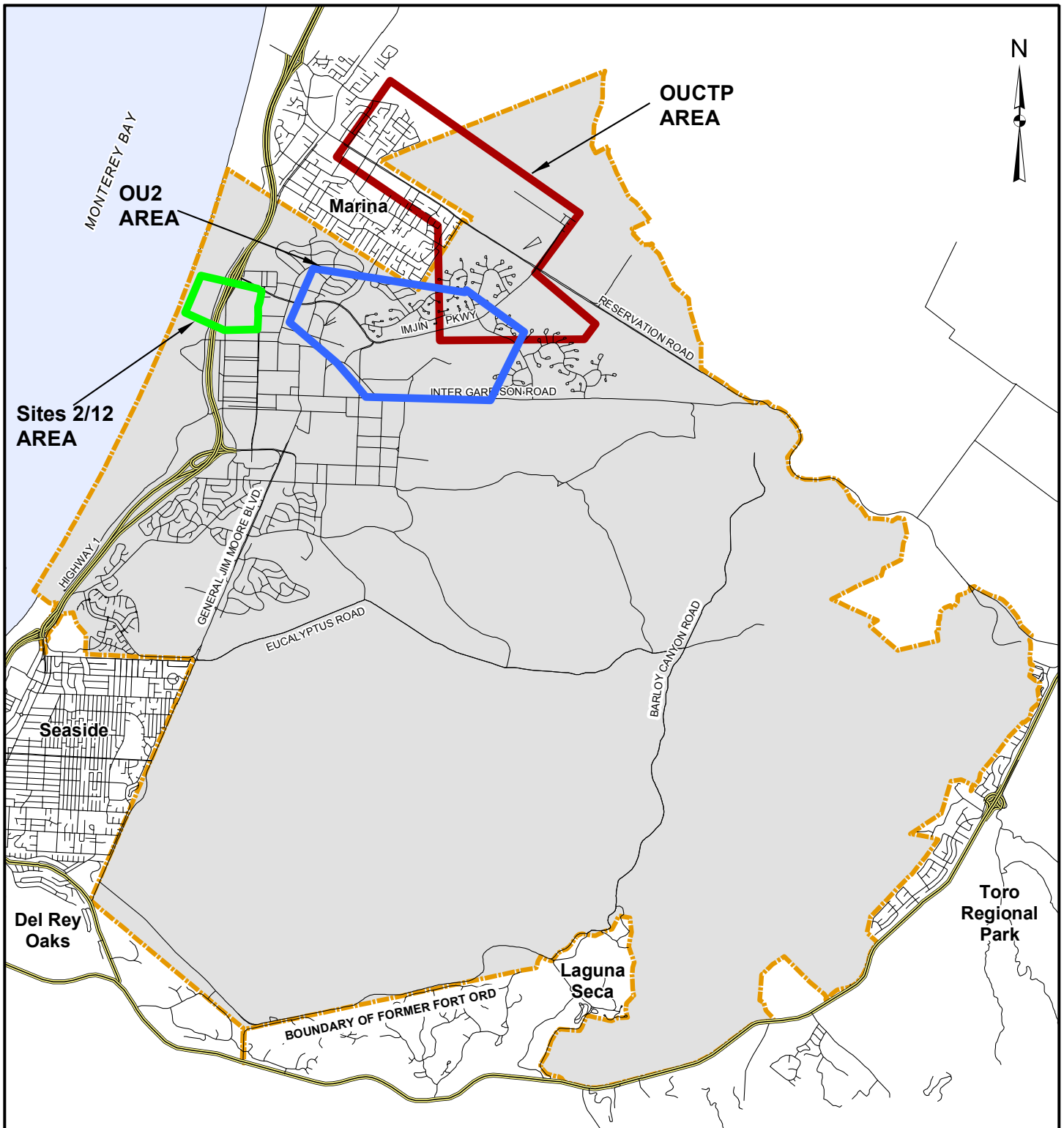
TCE: trichloroethene

TD: total depth

TOC: top of casing

SVE: soil vapor extraction well

FIGURES



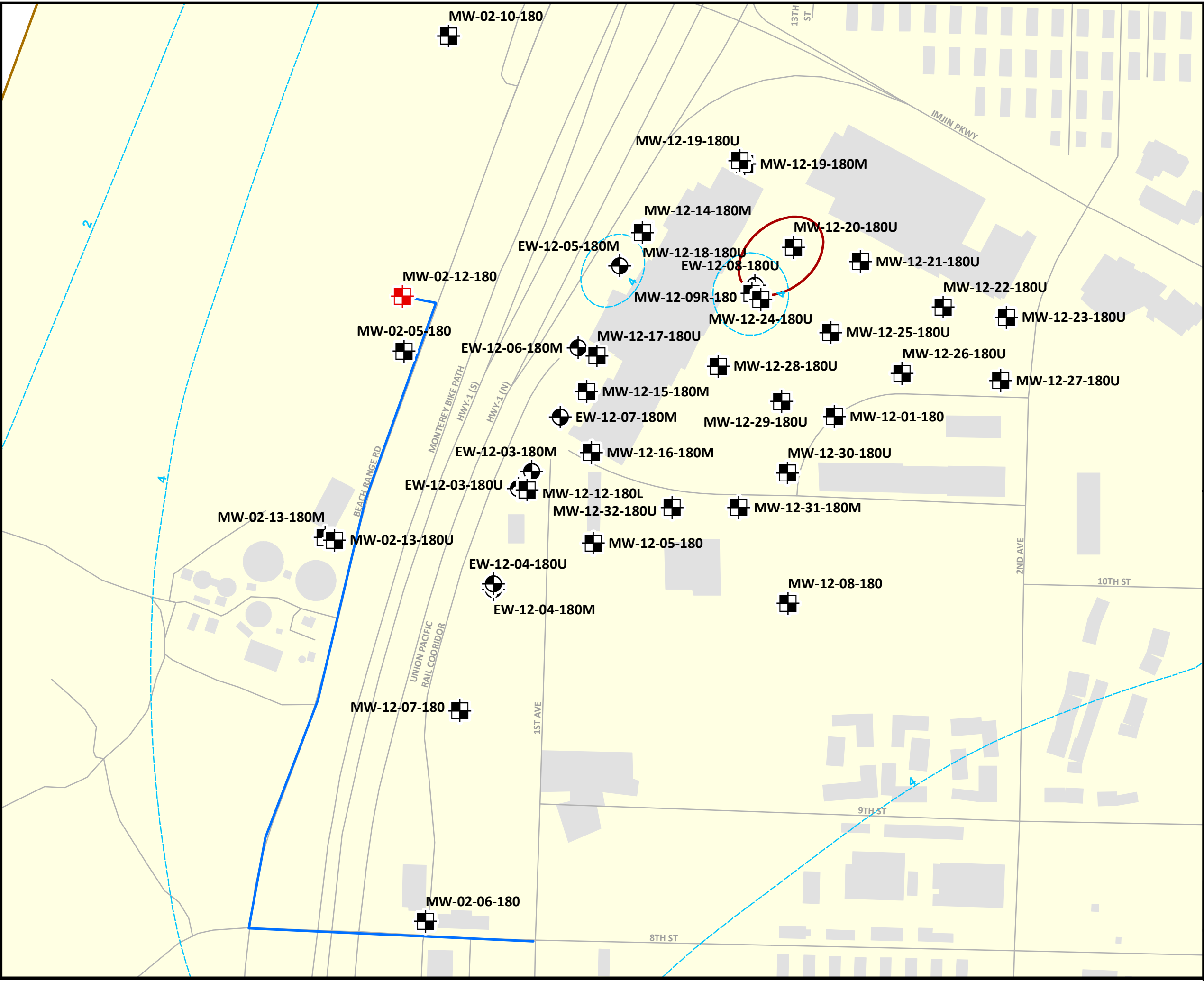
Site Vicinity

Well Decommissioning Work Plan
Former Fort Ord, California

Ahtna

Figure

1

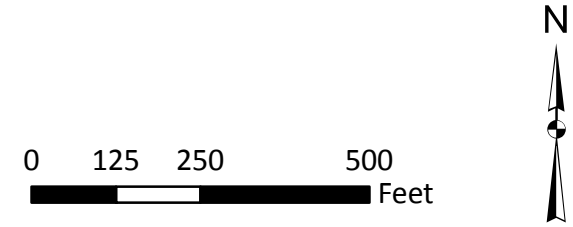


Legend

- Roads
- Access Route
- PCE (5 ug/L) 2017-4Q
- - - Groundwater Elevation (ft MSL) 2017-4Q
- Former Fort Ord Boundary
- Buildings

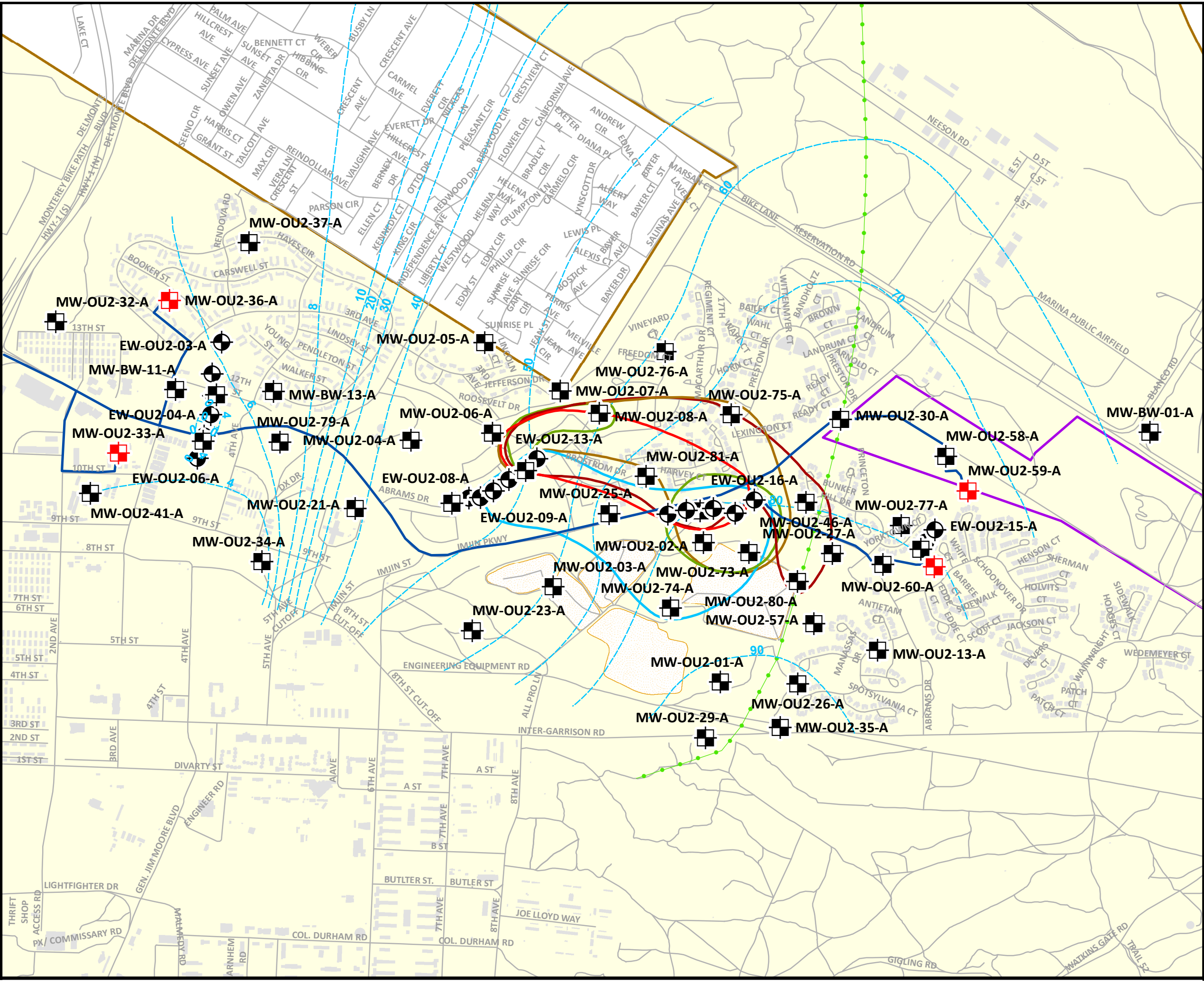
Sites 2/12 Well Type

- Extraction Well
- Monitoring Well
- Monitoring Well - To Decommission



**Sites 2/12 Monitoring Well
Decommissioning Location**

Well Decommissioning
Work Plan
Former Fort Ord, California



Legend

Groundwater Divide

Access Routes

COC ACL Exceedance 2017-4Q

1,1-DCA (5 ug/L)

1,2-DCA (0.5 ug/L)

PCE (3 ug/L)

TCE (5 ug/L)

VC (0.1 ug/L)

Groundwater Elevation (ft MSL) 2017-4Q

Roads

Buildings

FONR Boundary

Former Fort Ord Boundary

OU2 Landfills

OU2 A-Aquifer Well Type

Extraction Well

Monitoring Well

Monitoring Well - To Decommission

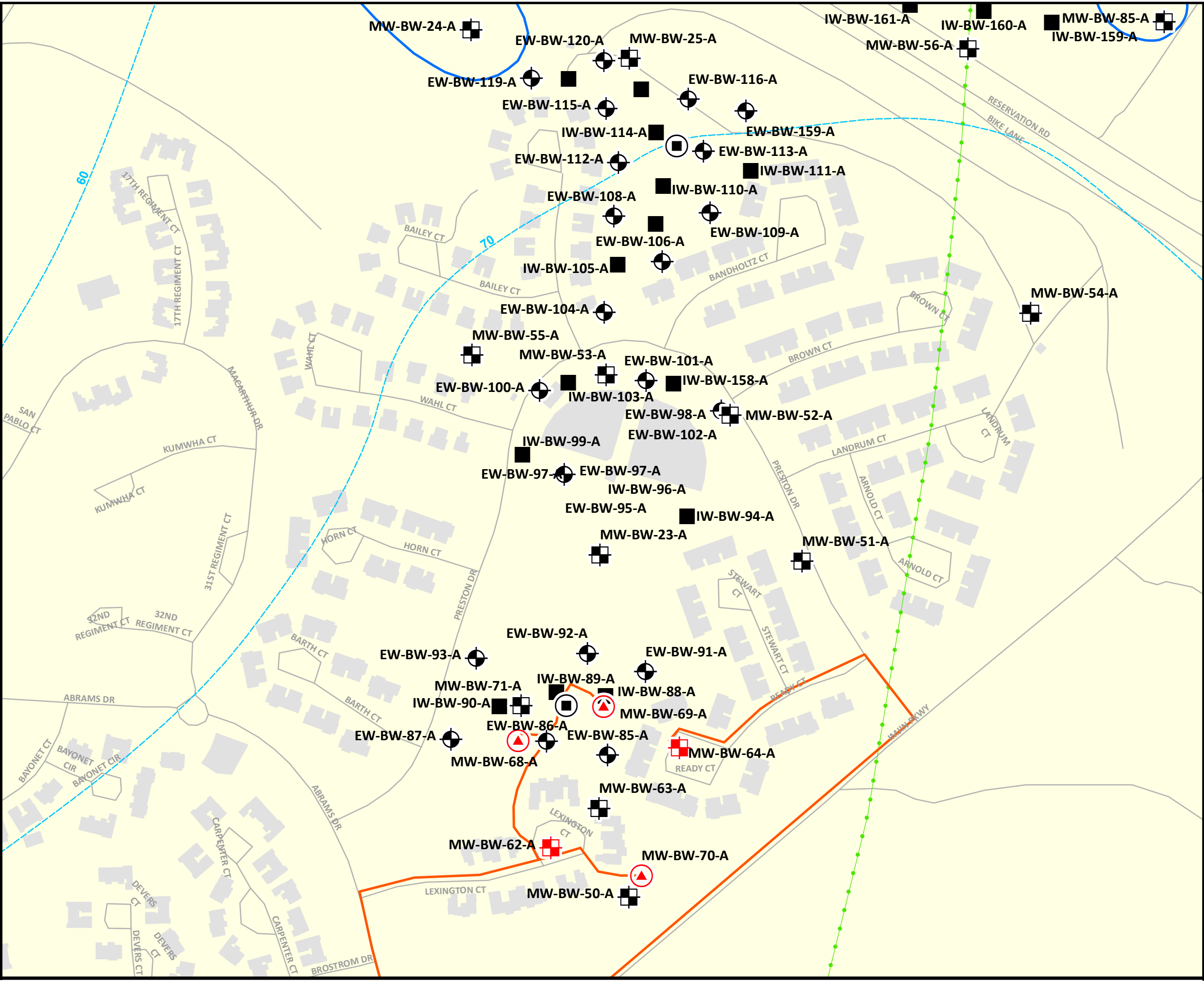
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Feet

N

**OU2 A-Aquifer
Monitoring Well
Decommissioning Locations**

Well Decommissioning
Work Plan
Former Fort Ord, California



Legend

Groundwater Divide

Carbon Tetrachloride (0.5 ug/L) 2017-4Q

Groundwater (ft MSL) 2017-4Q

Access Routes

Roads

OU2 Landfills

Buildings

Former Fort Ord Boundary

A-Aquifer Well Types

EISB Extraction Well

Multi-Port Well (Westbay)

Monitoring Well

Monitoring Well - To Decommission

OUCTP EISB Wells

Extraction Well

Injection Well

SVE Well - To Decommission

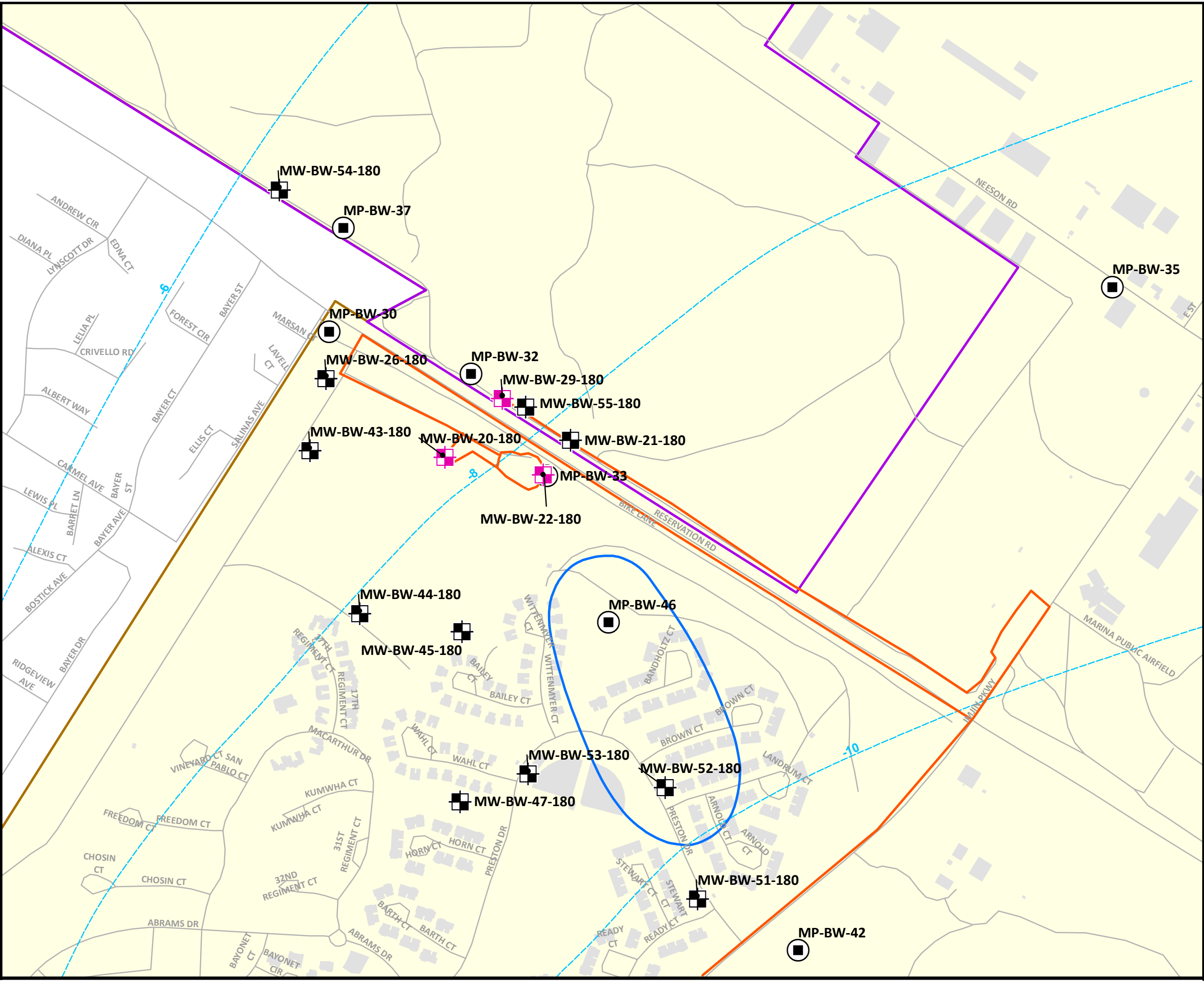
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Feet

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**OUCTP A-Aquifer
Monitoring Well and
Soil Vapor Extraction Well
Decommissioning Locations**

Well Decommissioning
Work Plan
Former Fort Ord, California

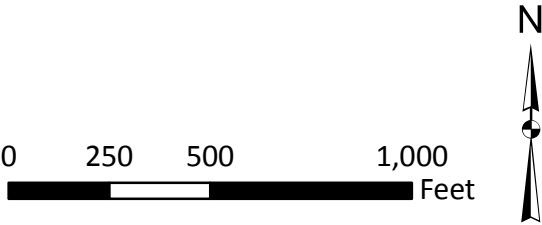


Legend

- Roads
- Access Routes
- Carbon Tetrachloride (0.5 ug/L) 2017-4Q
- Groundwater Elevation (ft MSL) 2017-4Q
- Former Fort Ord Boundary
- FONR Boundary
- Buildings

OUCTP Upper 180-Foot Aquifer Well Type

- Extraction Well
- Monitoring Well
- Multi-Port Well (Westbay)
- Monitoring Well - To Decommission



OUCTP Upper 180-Foot Aquifer Monitoring Well Decommissioning Locations

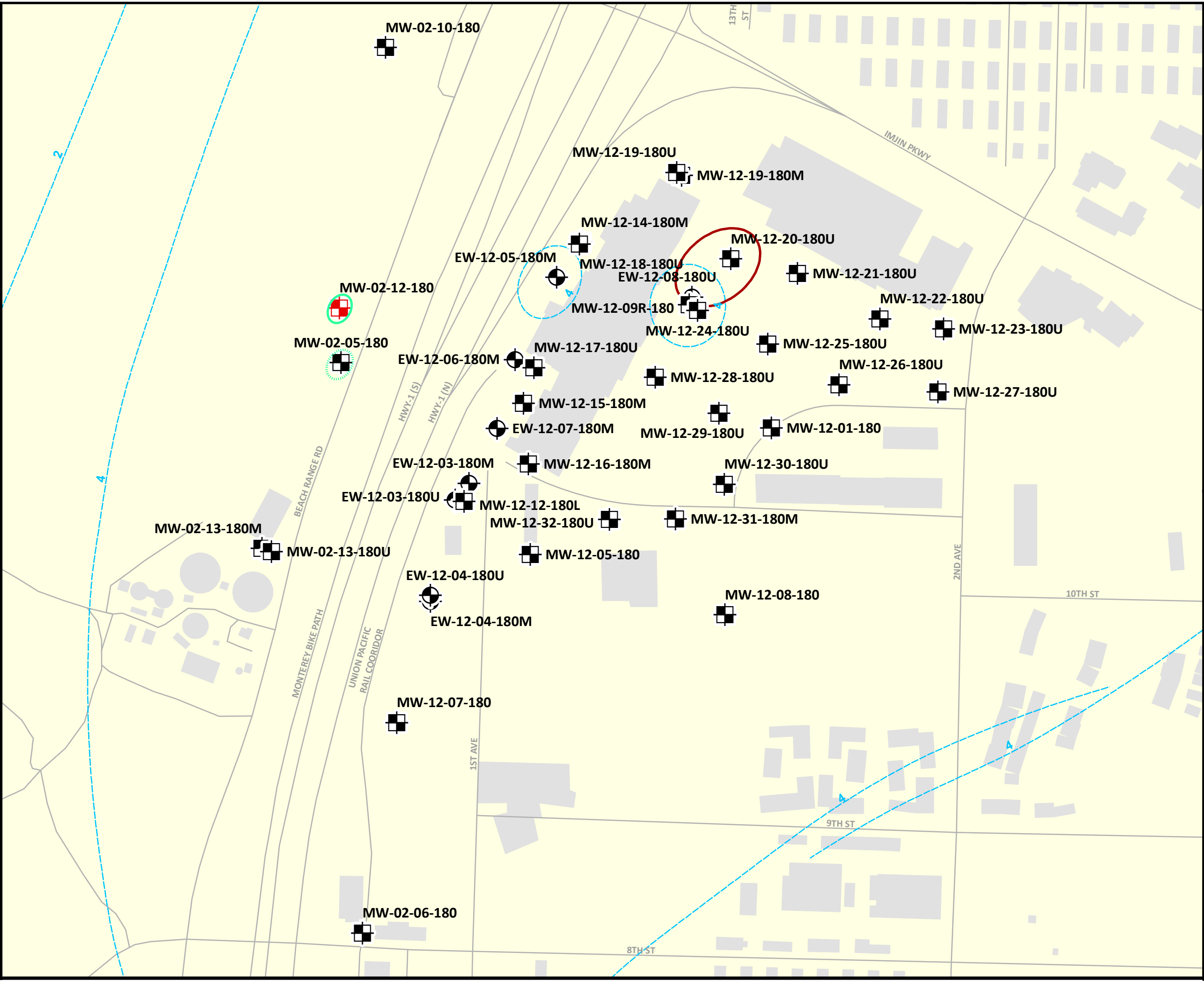
Well Decommissioning Work Plan
Former Fort Ord, California



APPENDICES

APPENDIX A

Monitoring Well COC Trend Statistical Analysis



Legend

Roads

PCE (5 ug/L) 2017-4Q

Groundwater Elevation (ft MSL) 2017-4Q

Former Fort Ord Boundary

Buildings

Sites 2/12 Well Type

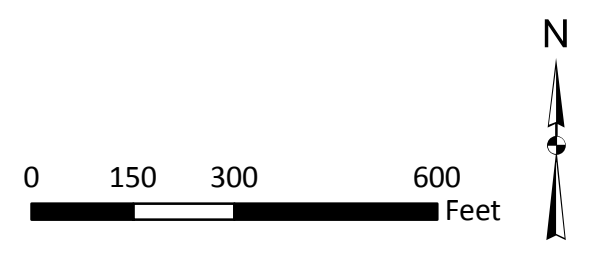
Extraction Well

Monitoring Well

Monitoring Well - To Decommission

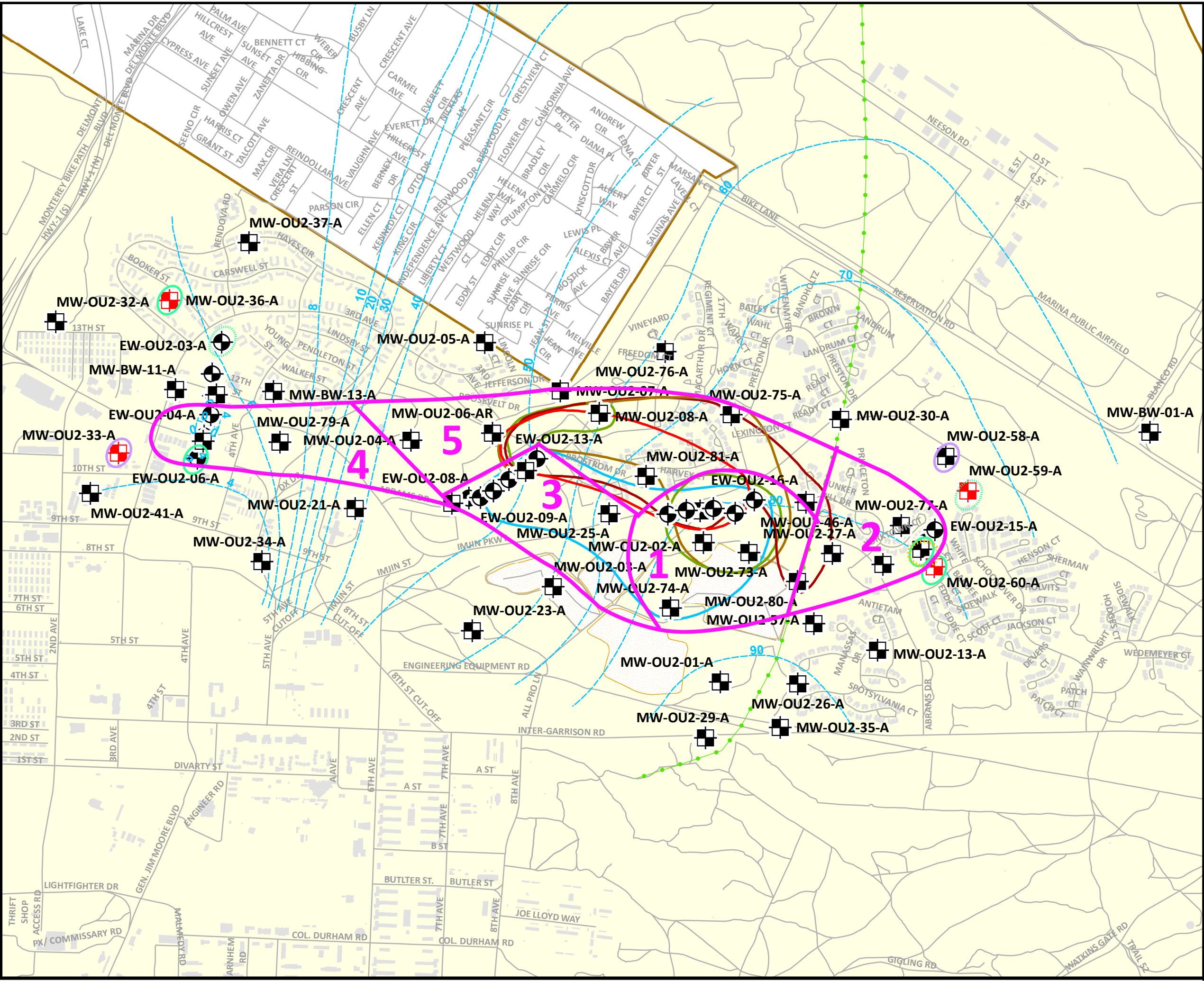
Decreasing Trend - Not Significant

Significantly Decreasing Trend



**Mann-Kendall COC
Trend Analysis Results
Sites 2/12 Fourth Quarter 2017**

Well Decommissioning
Work Plan
Former Fort Ord, California



Legend

Groundwater Divide

1,1-DCA (5 ug/L)

1,2-DCA (0.5 ug/L)

PCE (3 ug/L)

TCE (5 ug/L)

VC (0.1 ug/L)

Groundwater Elevation (ft MSL) 2017-4Q

Roads

Buildings

Former Fort Ord Boundary

OU2 Landfills

COC ACL Exceedance 2017-4Q

OU2 A-Aquifer Well Type

Extraction Well

Monitoring Well

Monitoring Well - To Decommission

No Trend - Not Detected

Increasing Trend - Not Significant

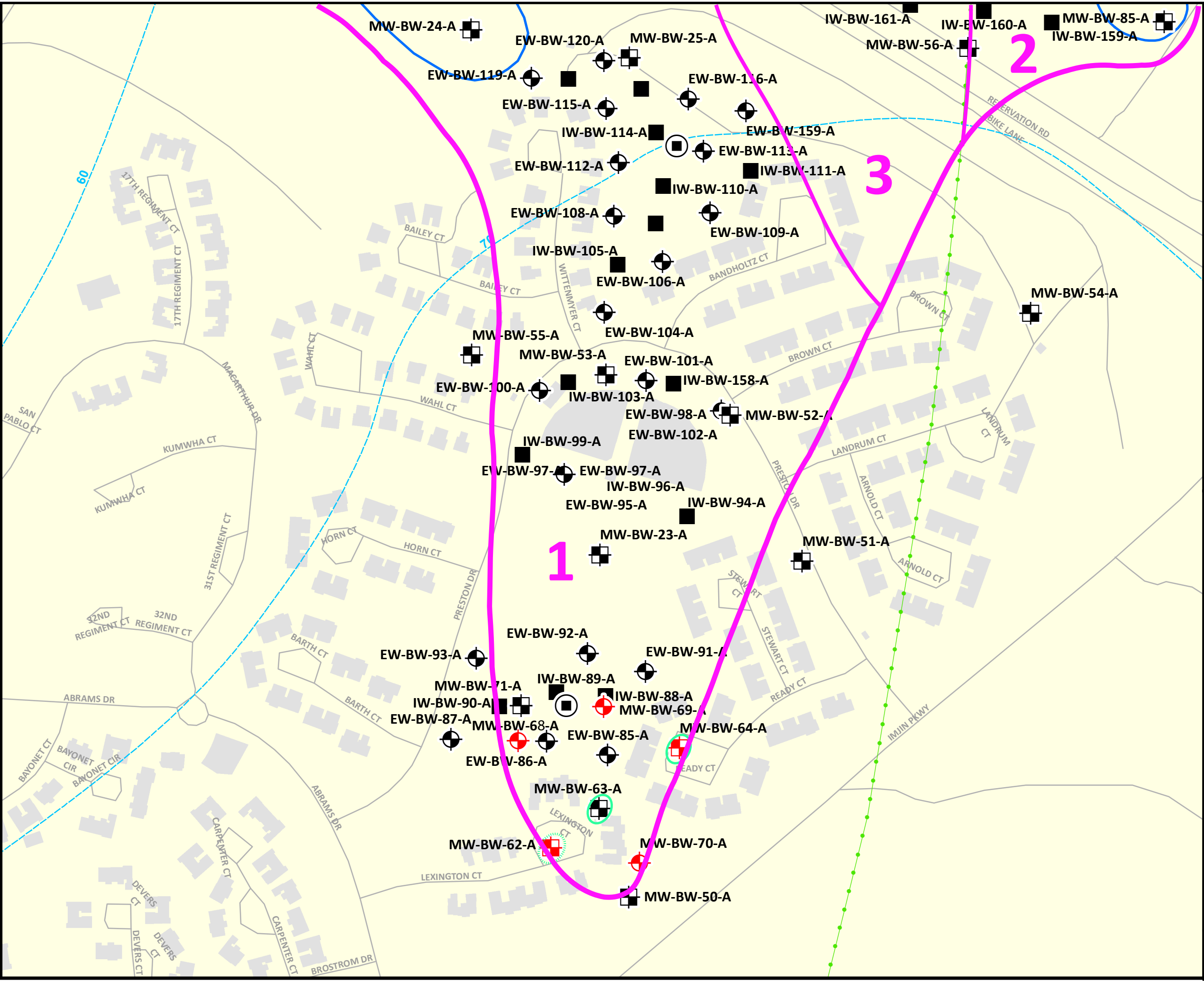
Significantly Decreasing Trend

Decreasing Trend - Not Significant

07501,5003,000

Feet

N



Legend

- Groundwater Divide
- Carbon Tetrachloride (0.5 ug/L) 2017-4Q
- Groundwater (ft MSL) 2017-4Q
- Roads
- OU2 Landfills
- Buildings
- Former Fort Ord Boundary

A-Aquifer Well Types

- EISB Extraction Well
- Multi-Port Well (Westbay)
- Monitoring Well
- Monitoring Well - To Decommission

OU2TP EISB Wells

- Extraction Well
- Injection Well
- SVE Well - To Decommission
- Significantly Increasing Trend
- Increasing Trend - Not Significant
- Significantly Decreasing Trend
- Decreasing Trend - Not Significant
- Hydraulic Zone 1

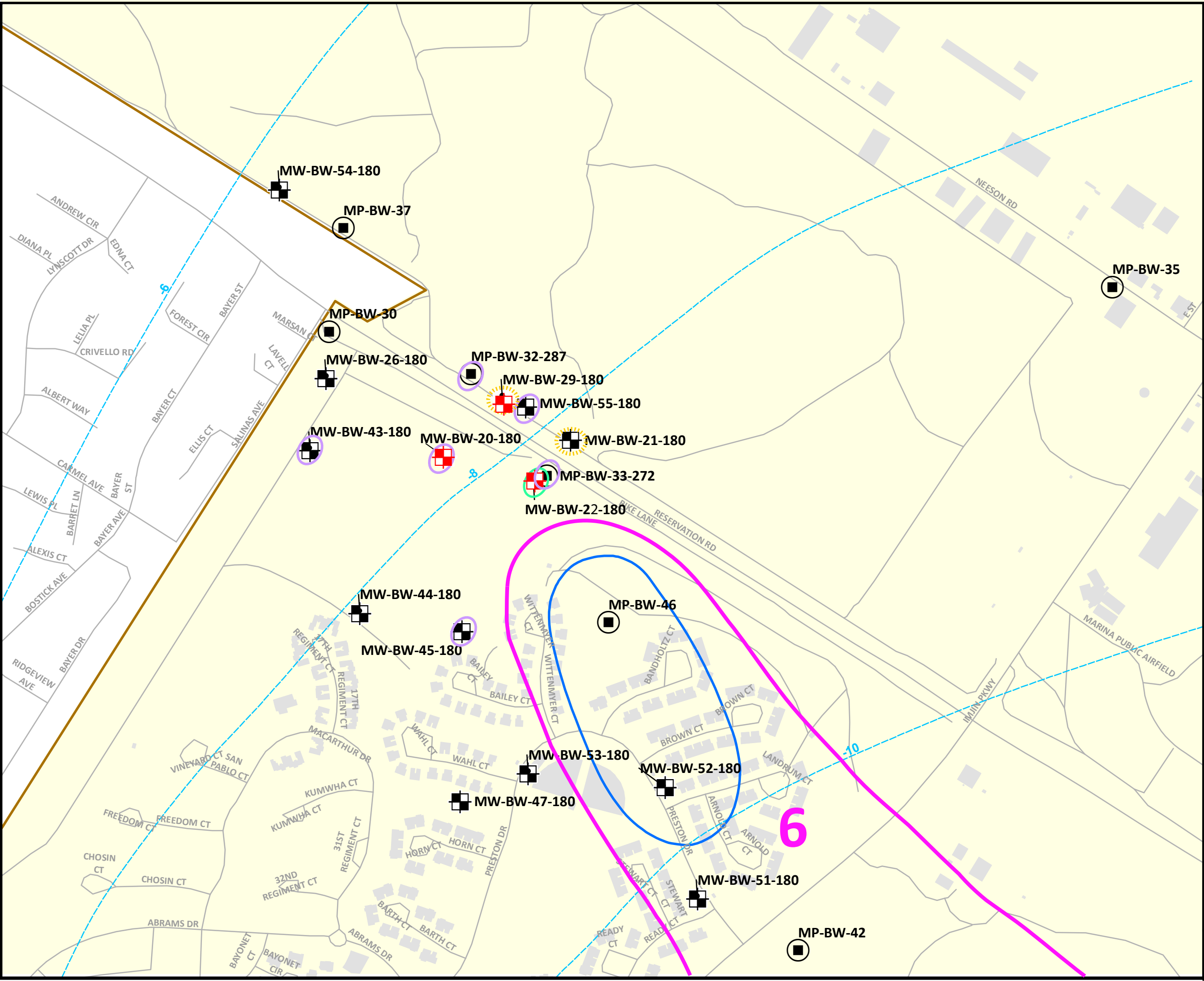
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N

Mann-Kendall COC
Trend Analysis Results
OU2TP A-Aquifer
Fourth Quarter 2017
Well Decommissioning
Work Plan
Former Fort Ord, California

Ahtna

Figure:
A-3



Legend

No Trend - Not Detected

Increasing Trend - Not Significant

Significantly Decreasing Trend

Decreasing Trend - Not Significant

1

Hydraulic Zone

Roads

Carbon Tetrachloride (0.5 ug/L) 2017-4Q

Groundwater Elevation (ft MSL) 2017-4Q

Former Fort Ord Boundary

Buildings

OUCTP Upper 180-Foot Aquifer Well Type

Extraction Well

Monitoring Well

Multi-Port Well (Westbay)

Monitoring Well - To Decommission

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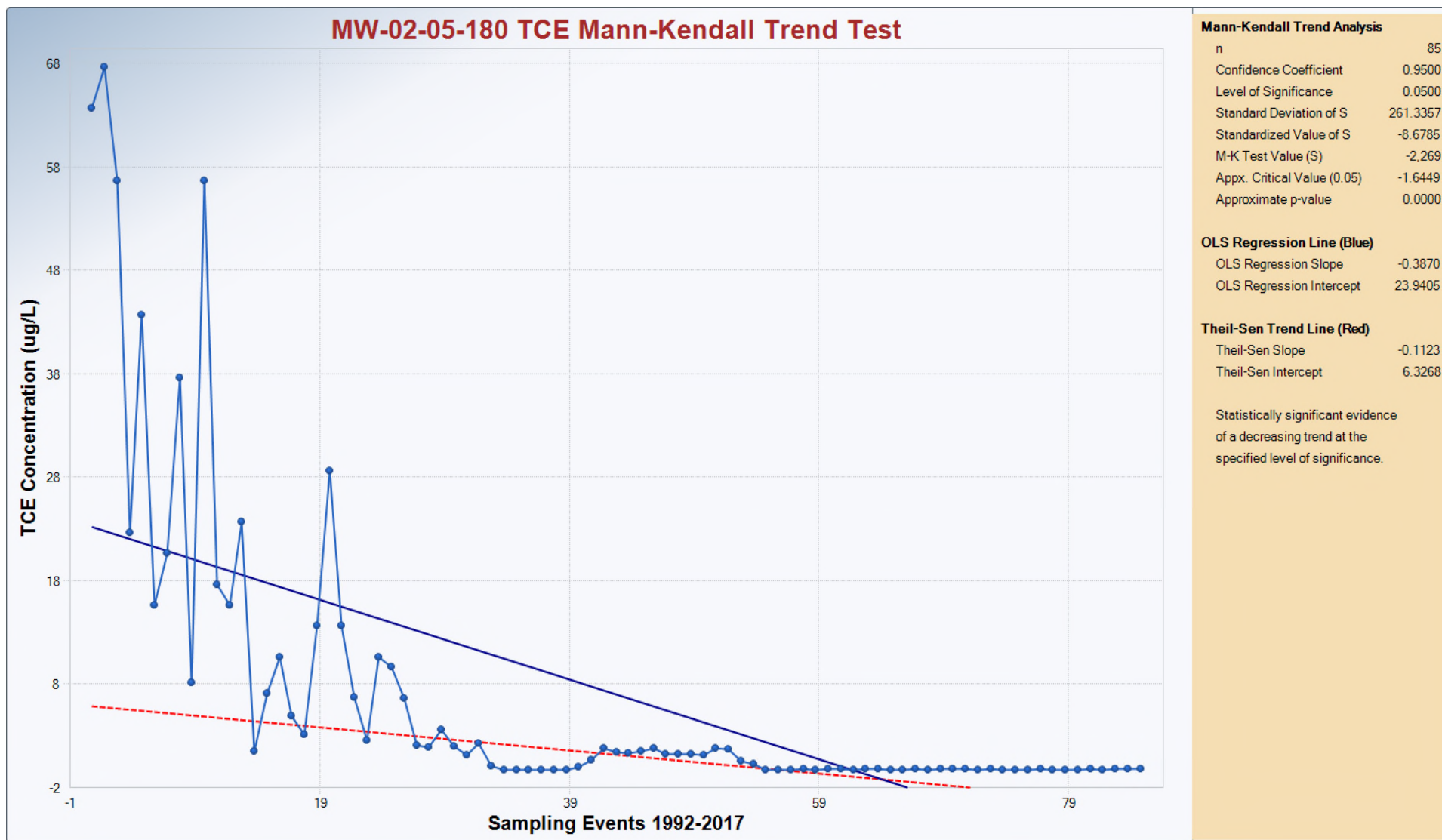
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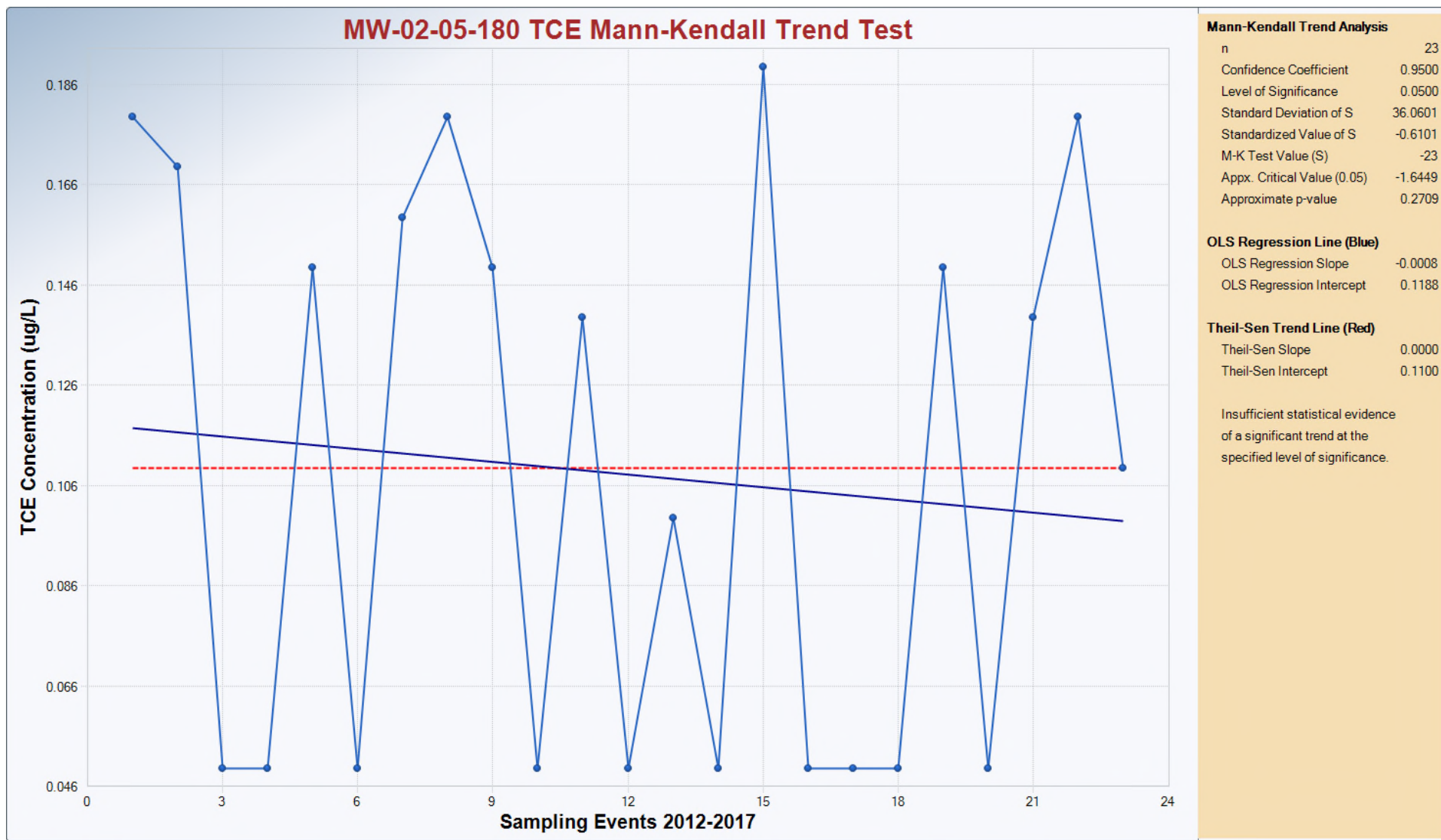
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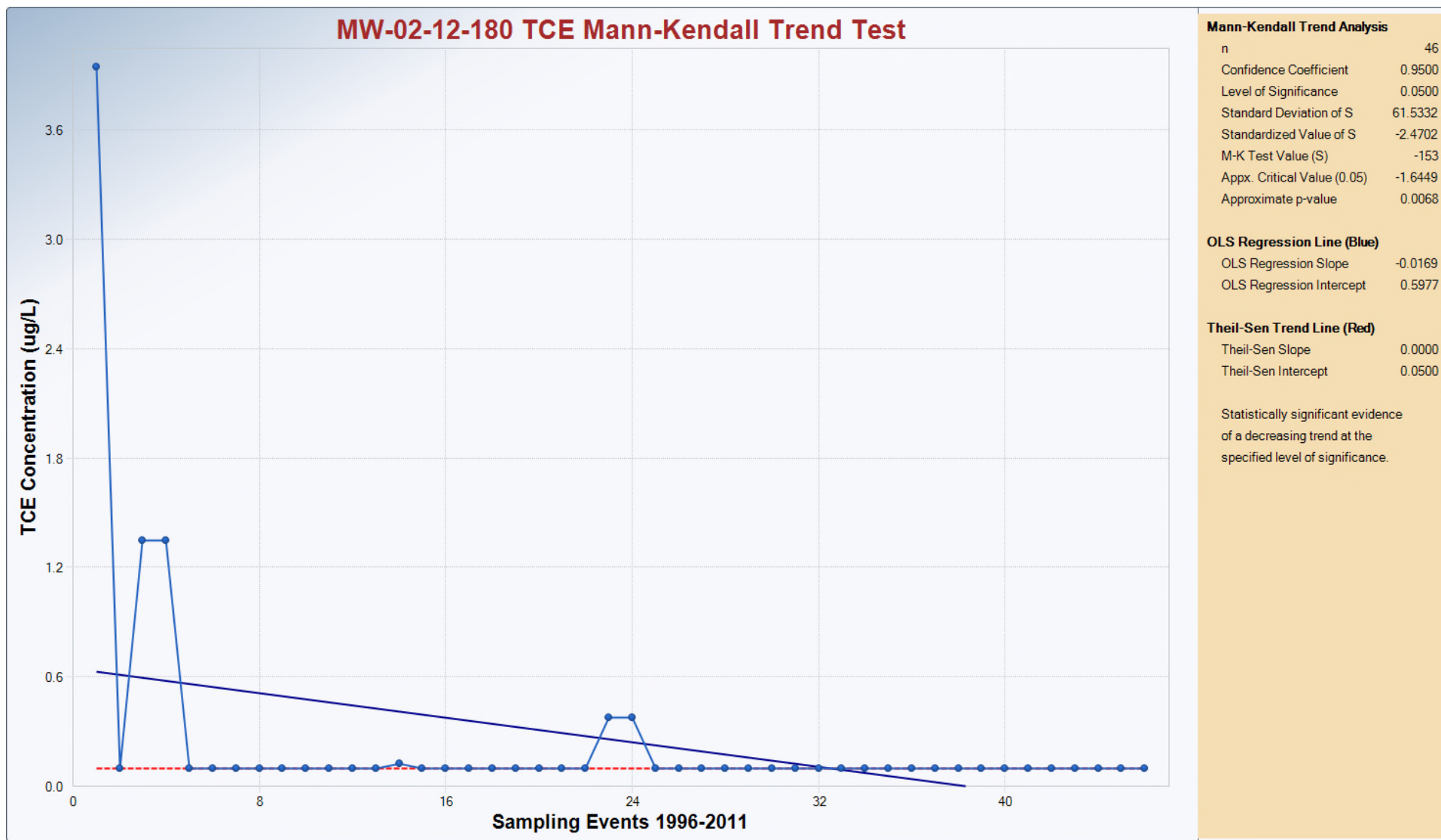
**Mann-Kendall COC
Trend Analysis Results
OUCTP Upper 180-Foot Aquifer
Fourth Quarter 2017**

Well Decommissioning
Work Plan
Former Fort Ord, California

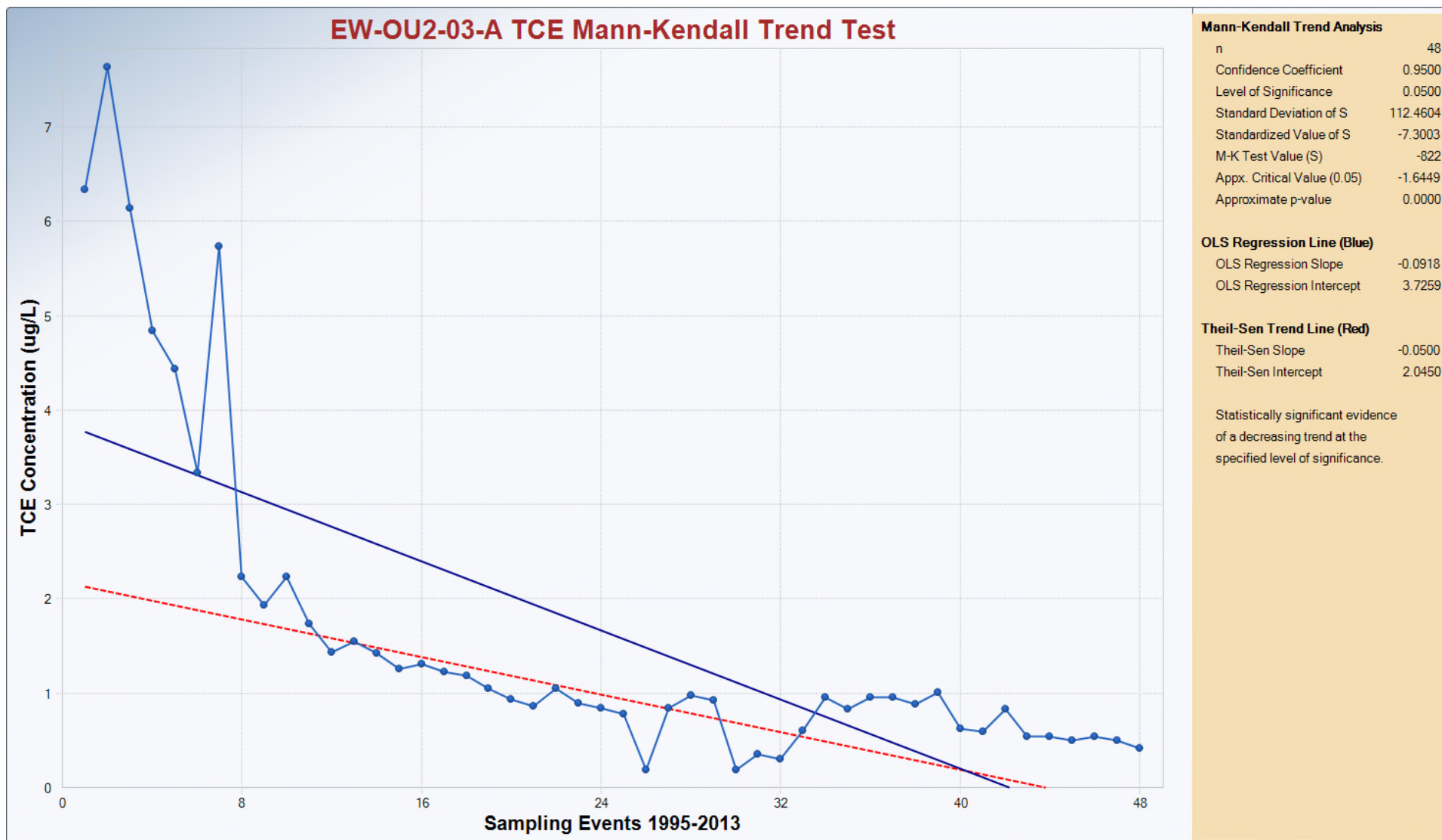
Sites 2/12
Mann-Kendall Chemical of Concern
Trend Analysis Graphs

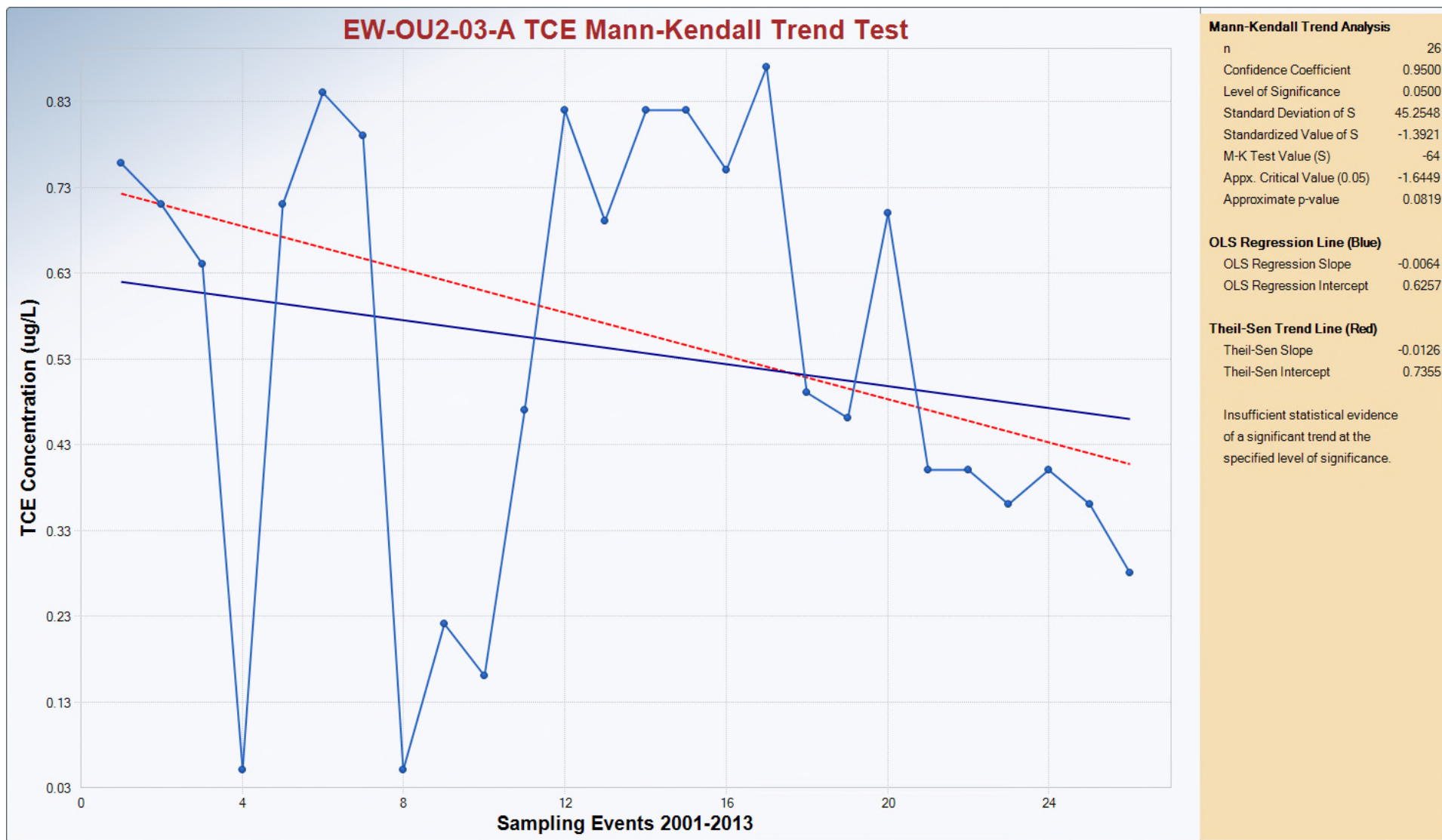


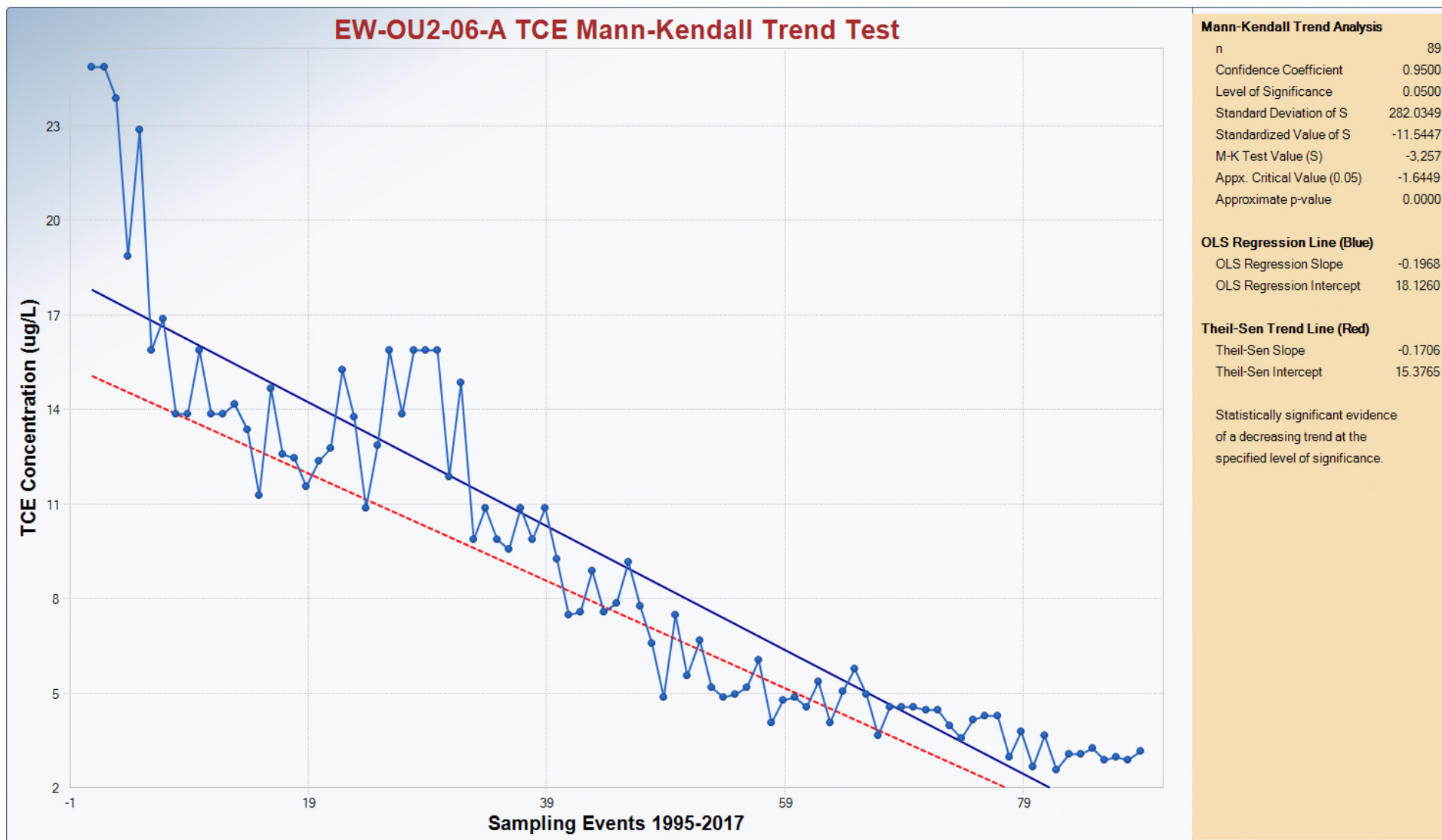


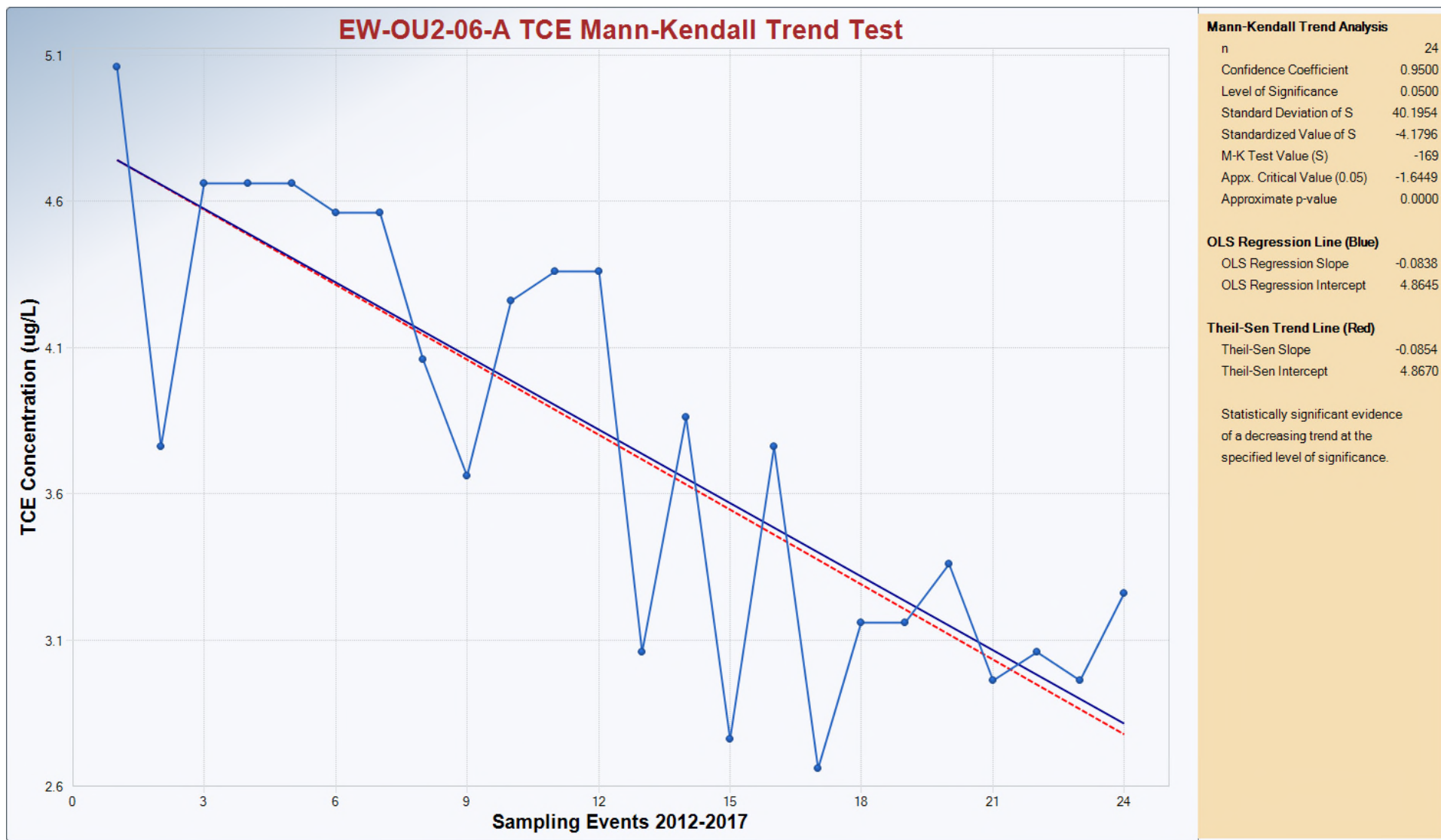


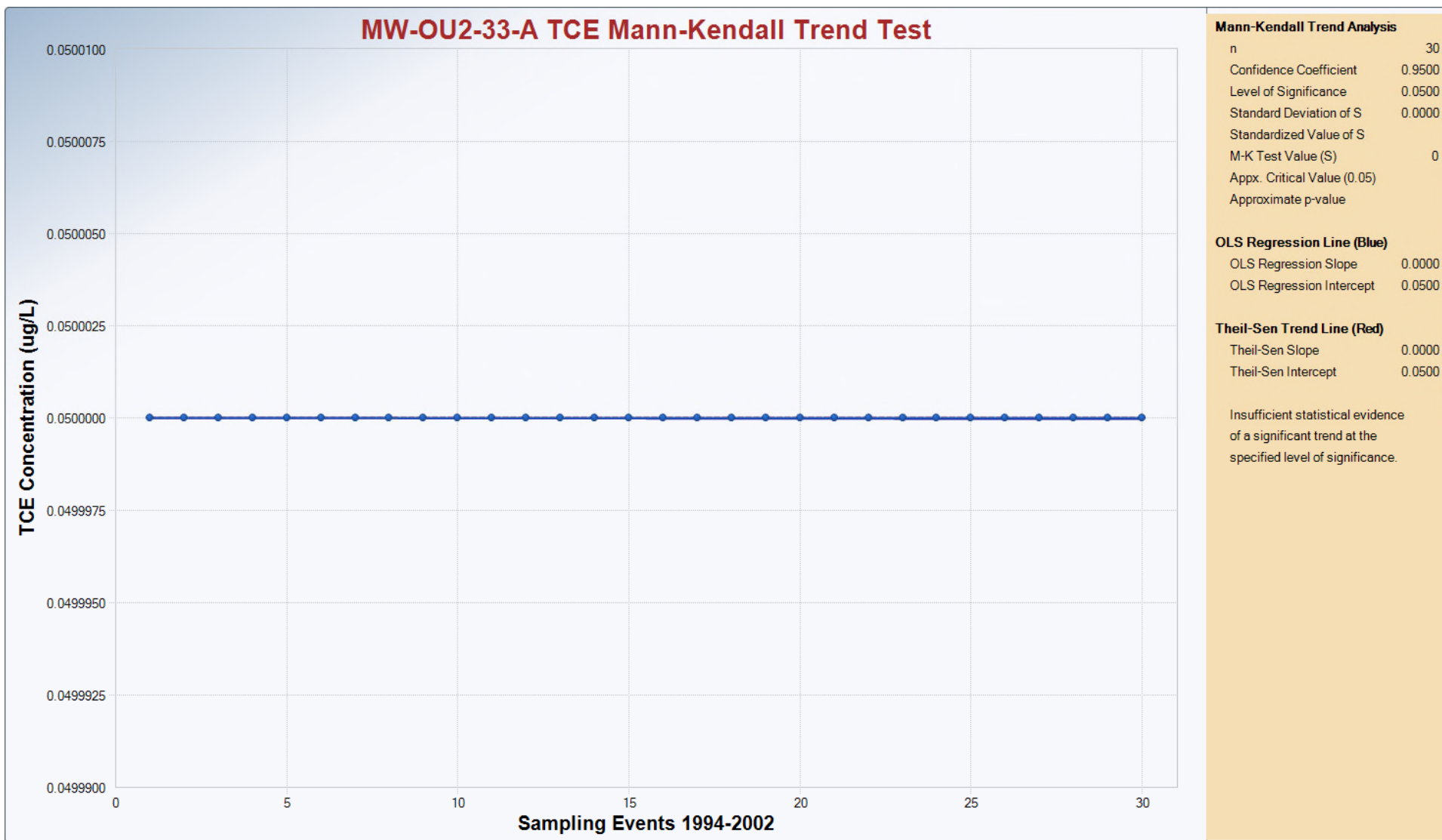
OU2
Mann-Kendall Chemical of Concern
Trend Analysis Graphs

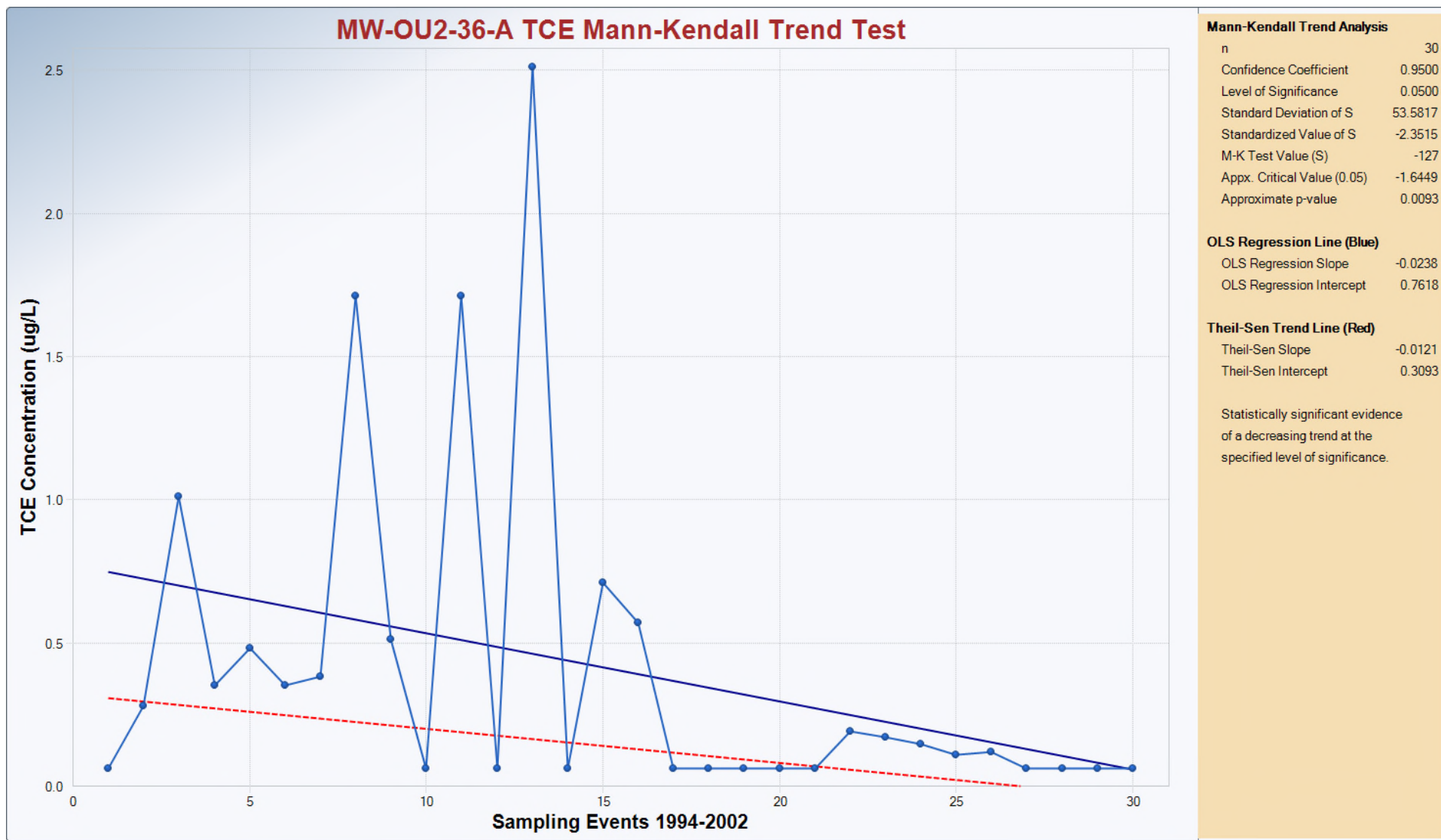


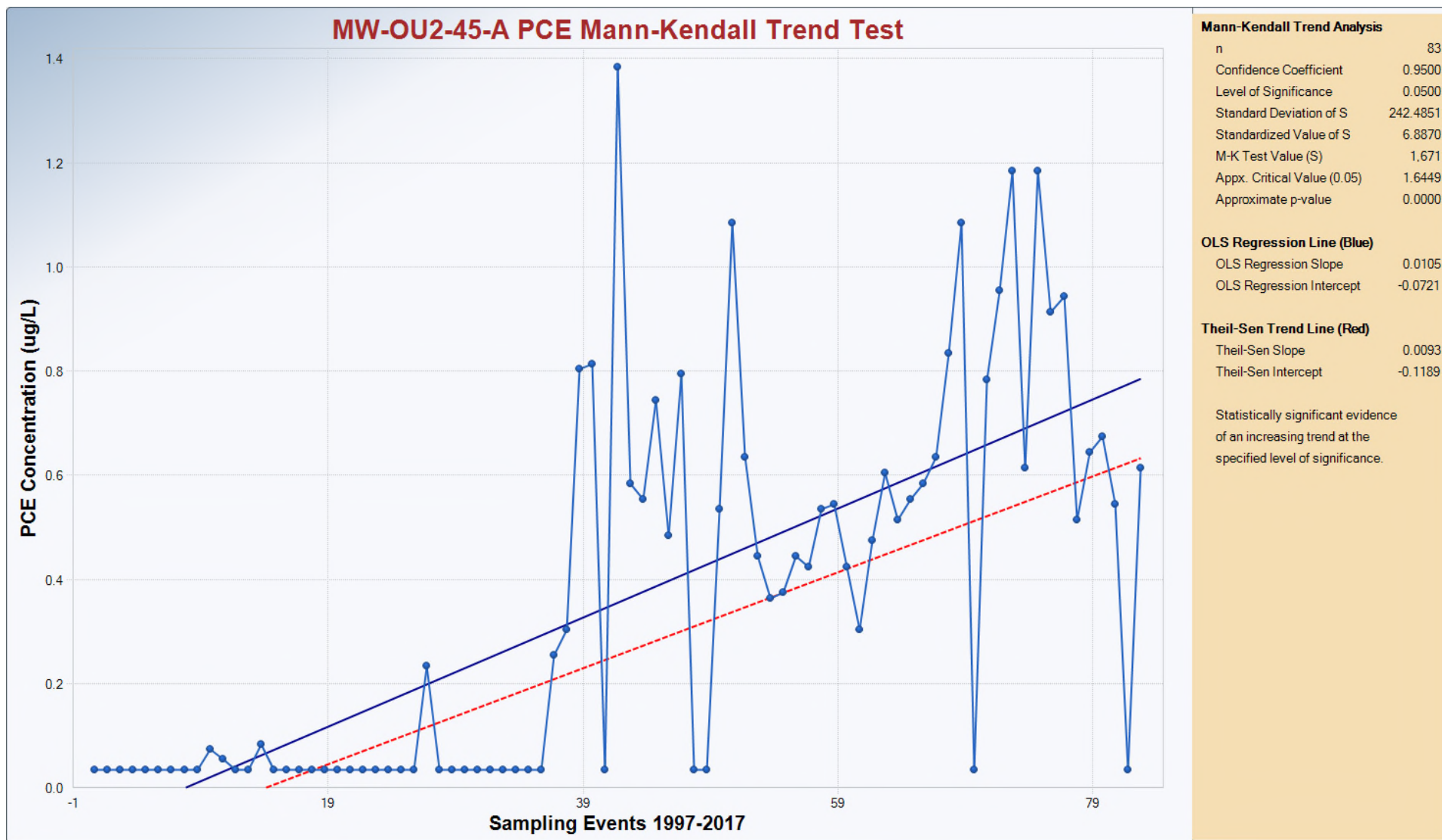


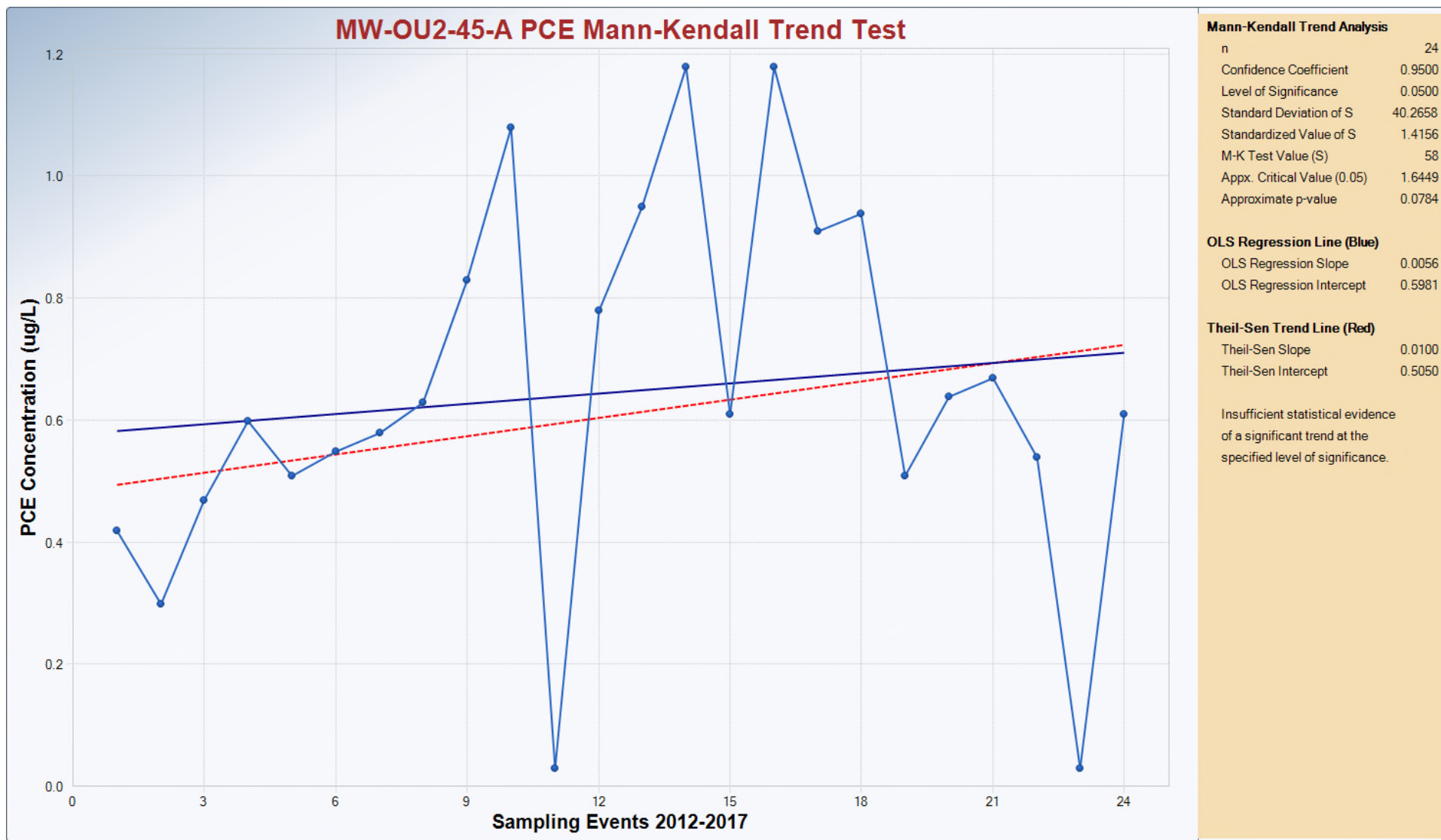


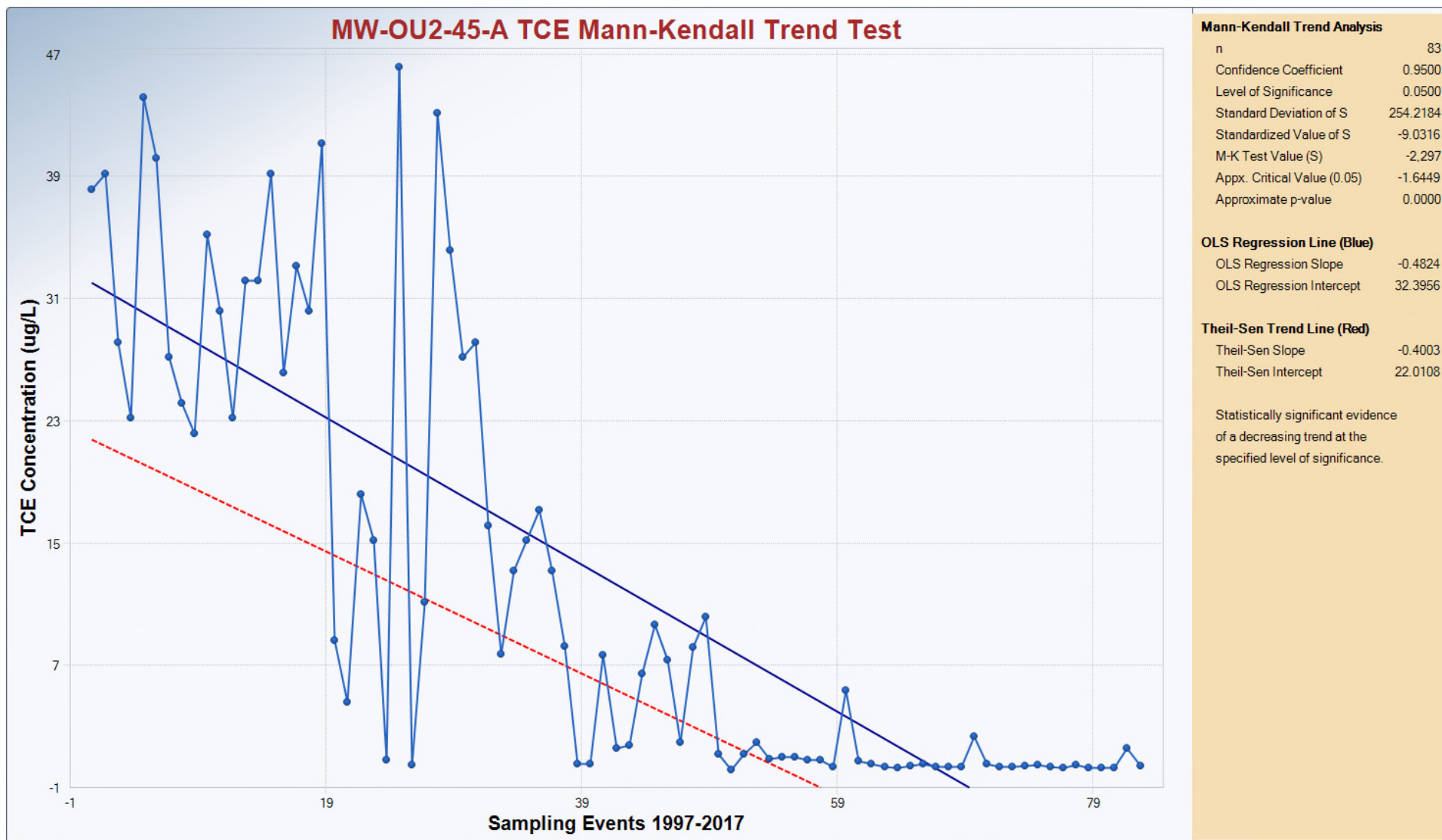


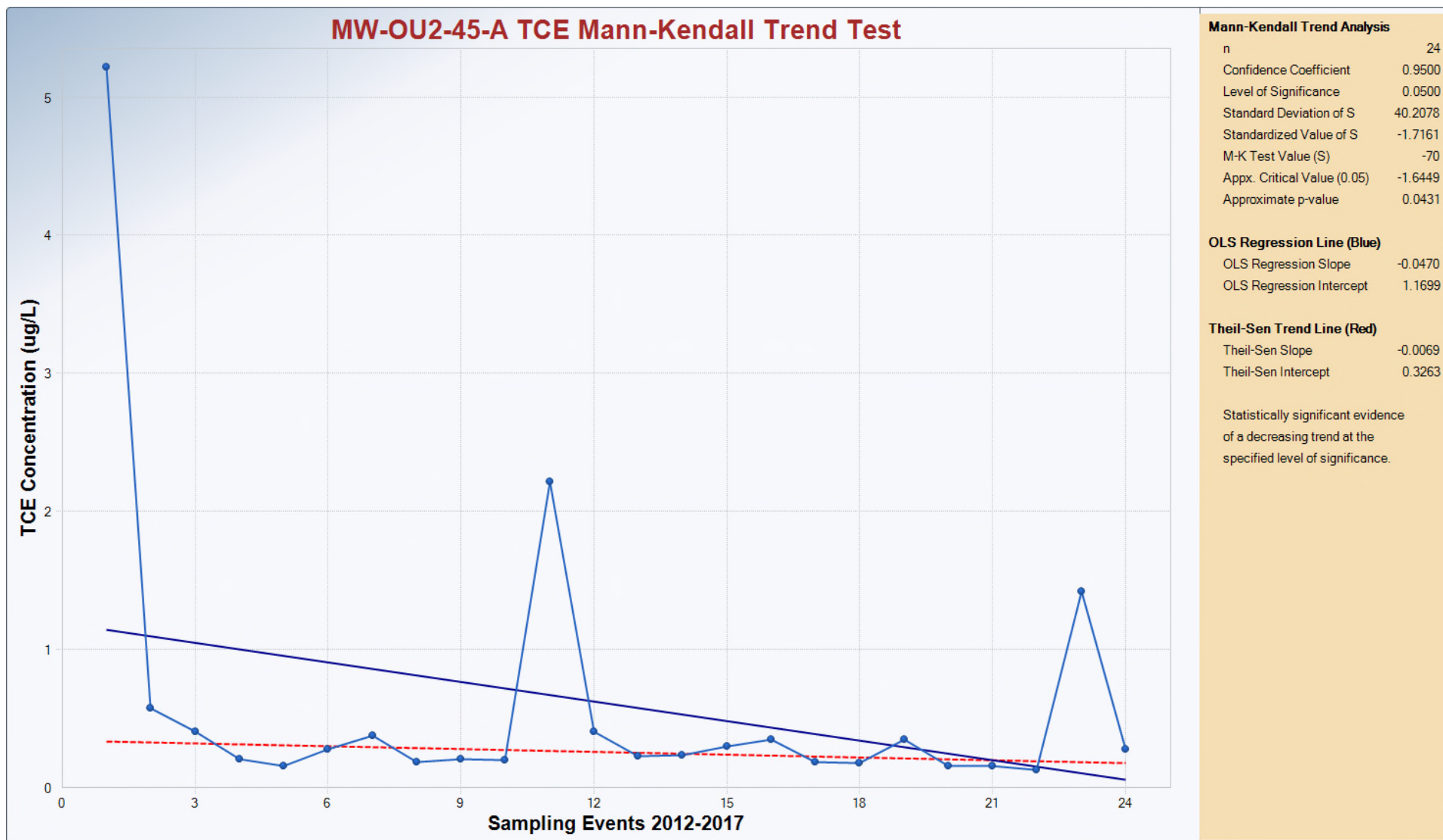


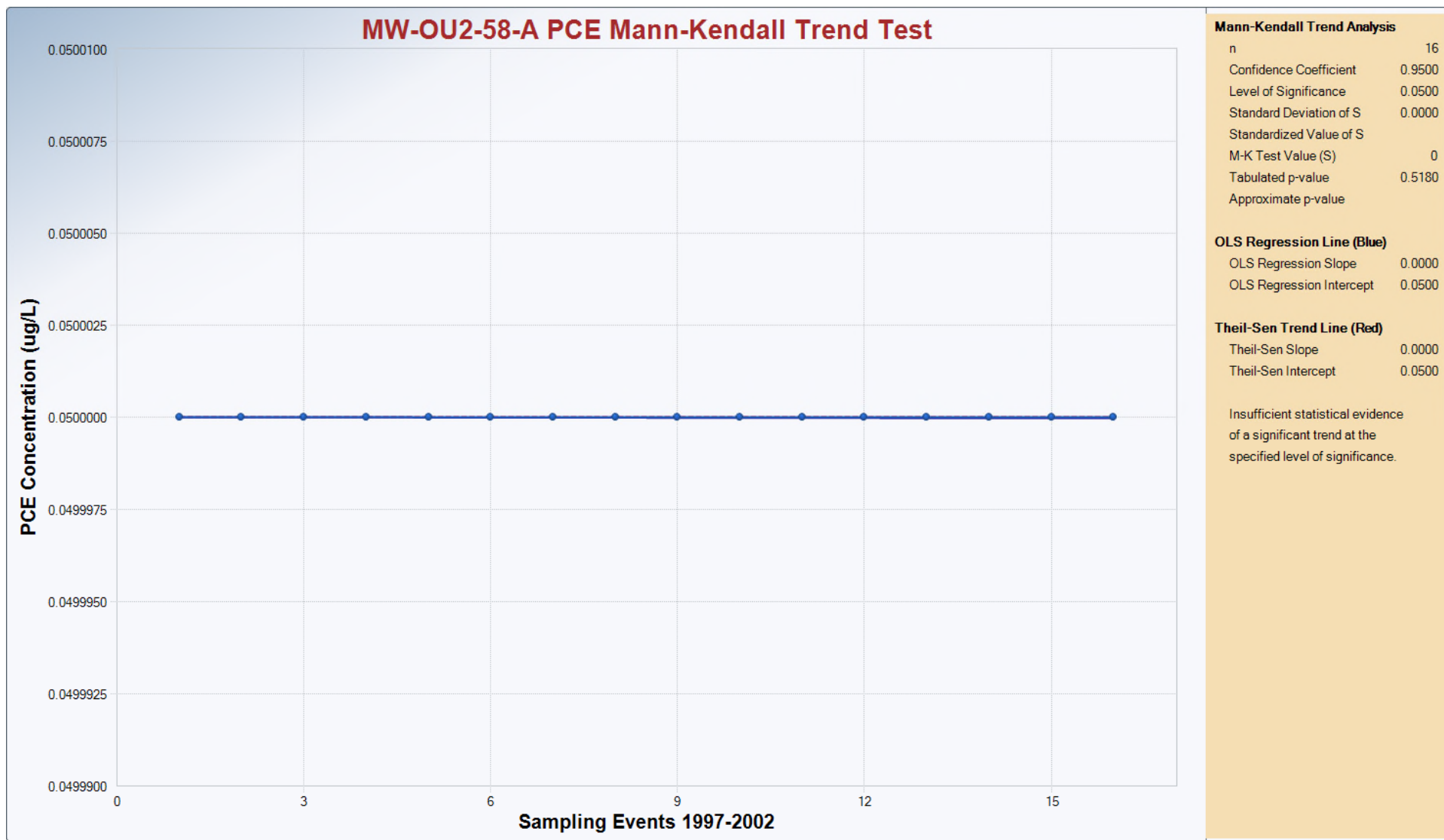


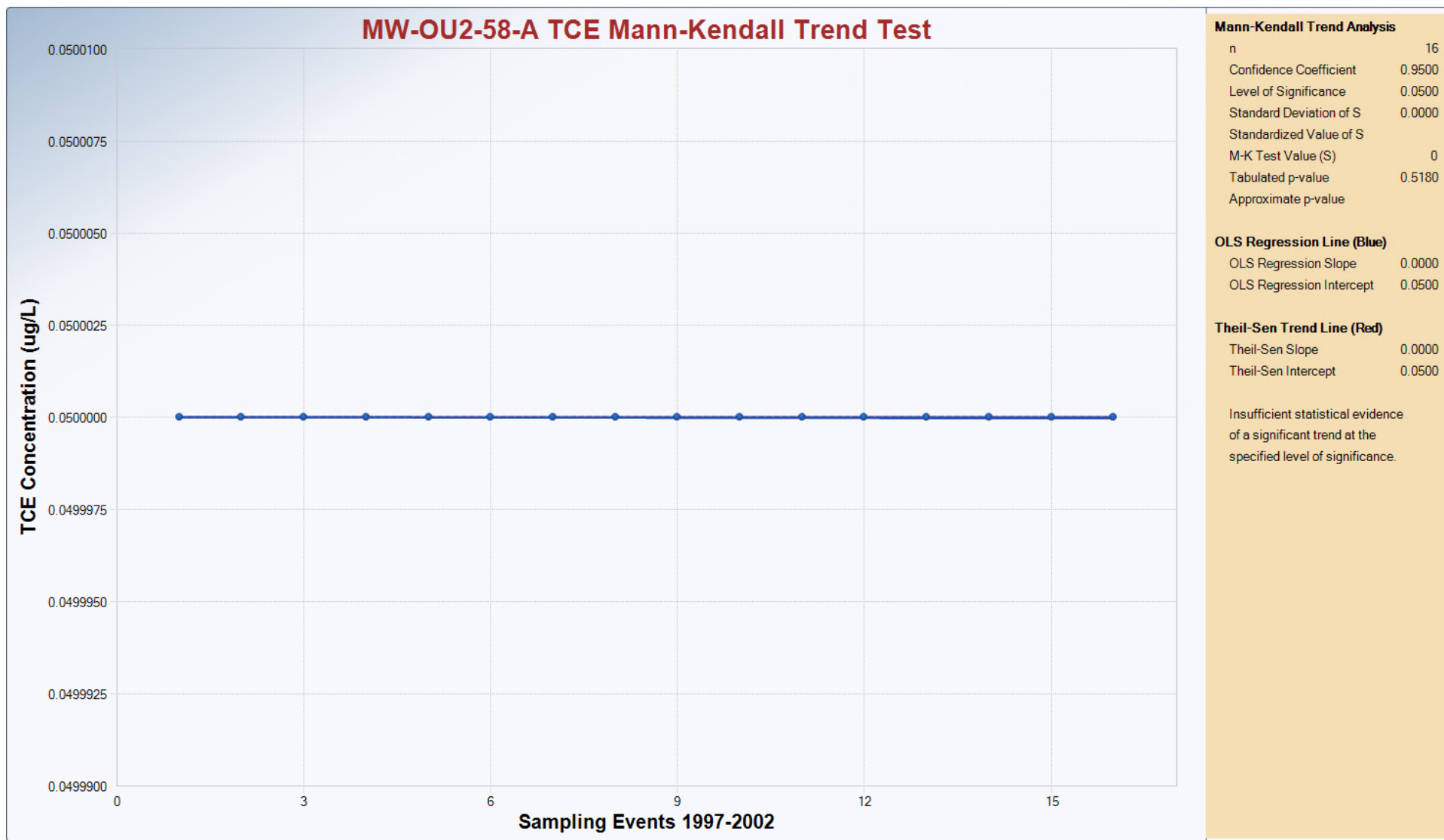


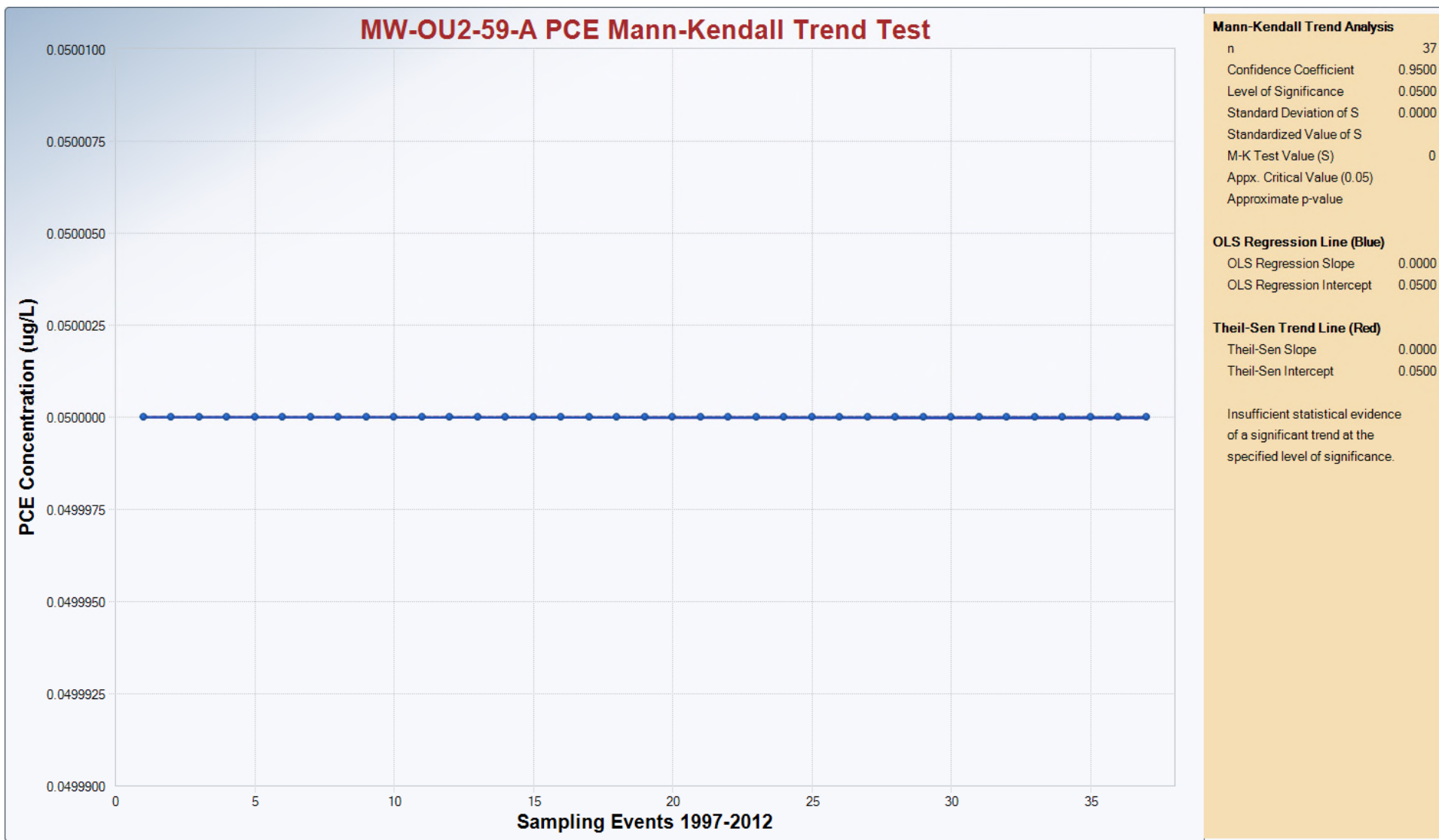


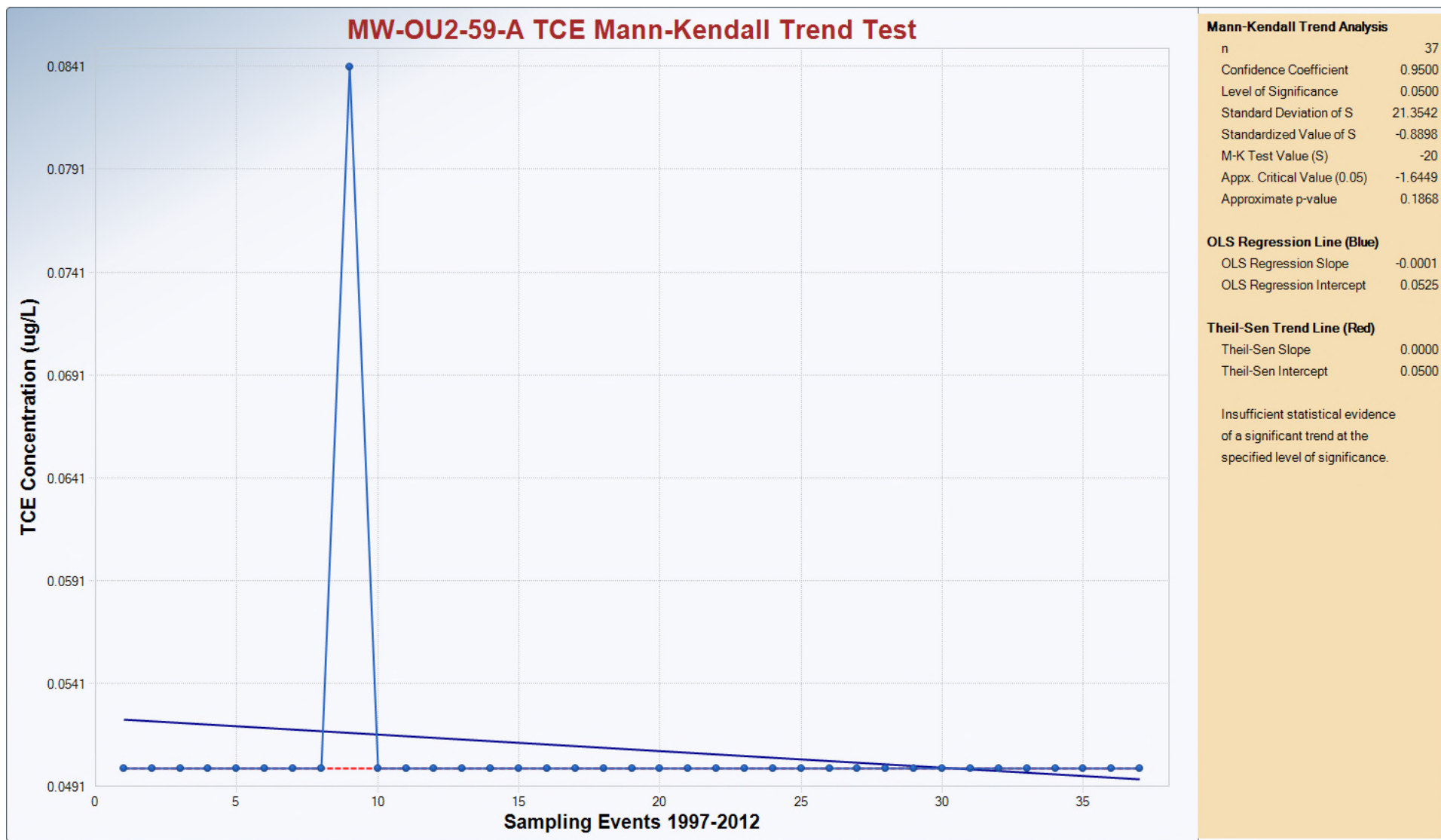


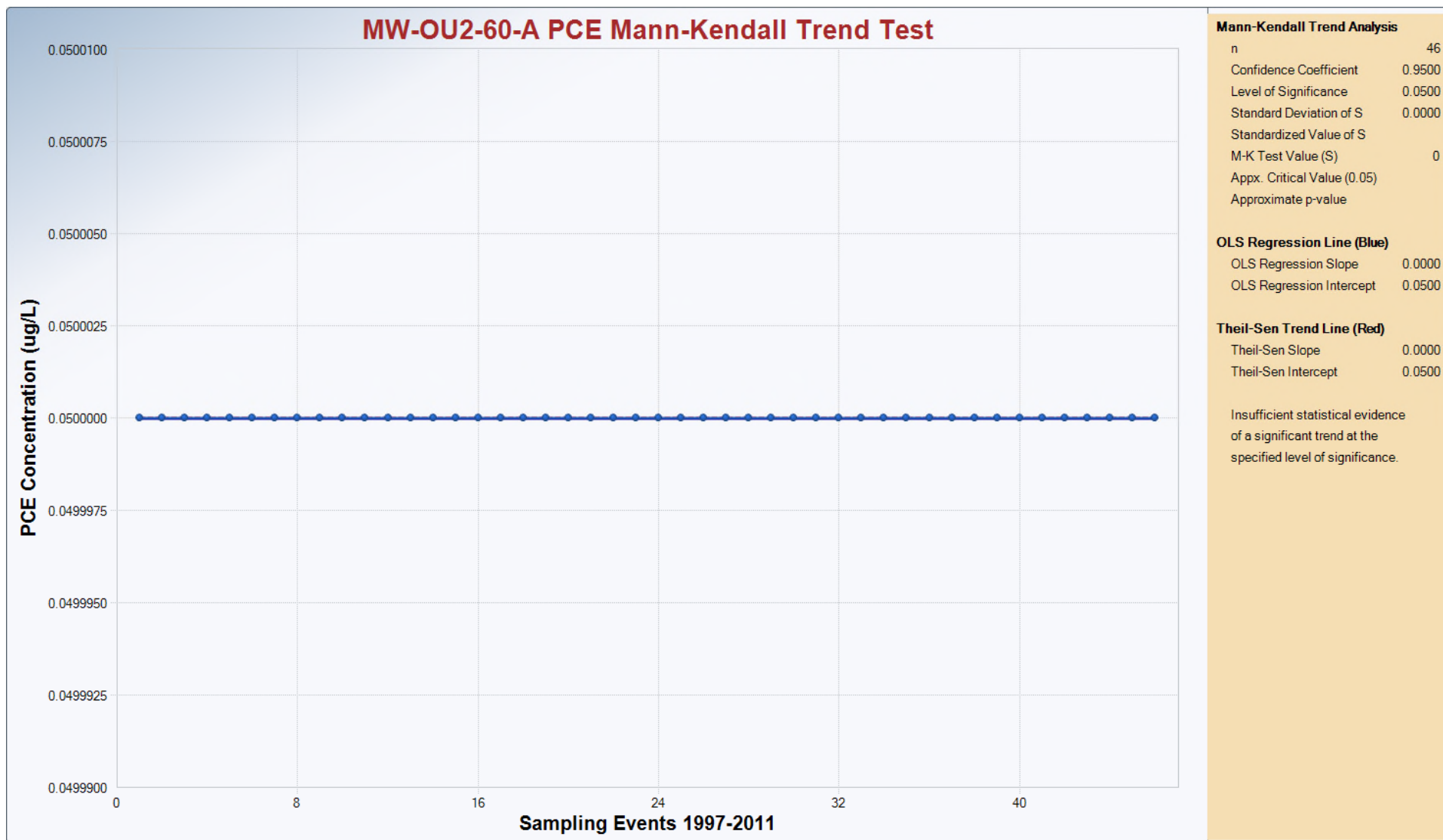


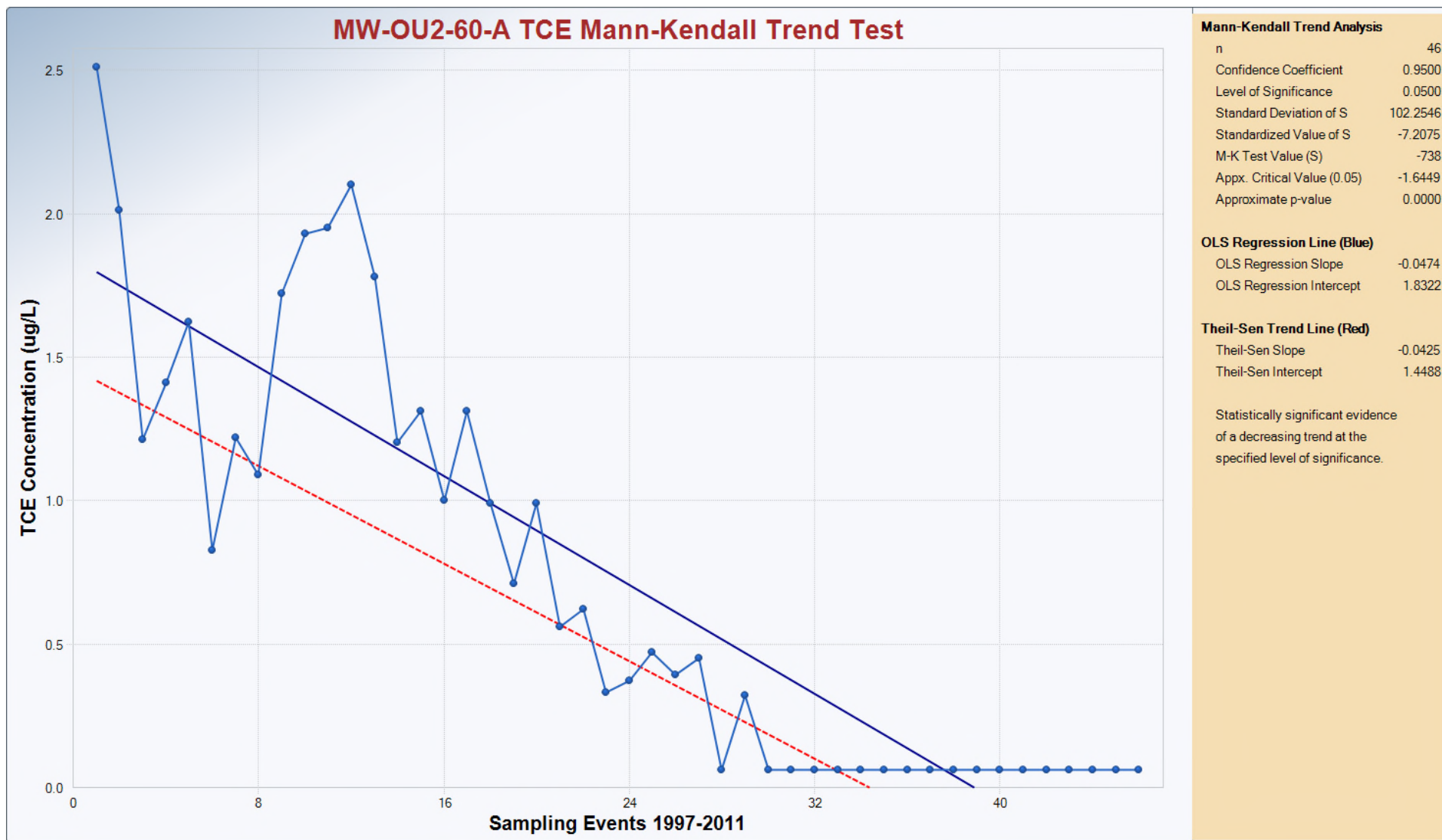




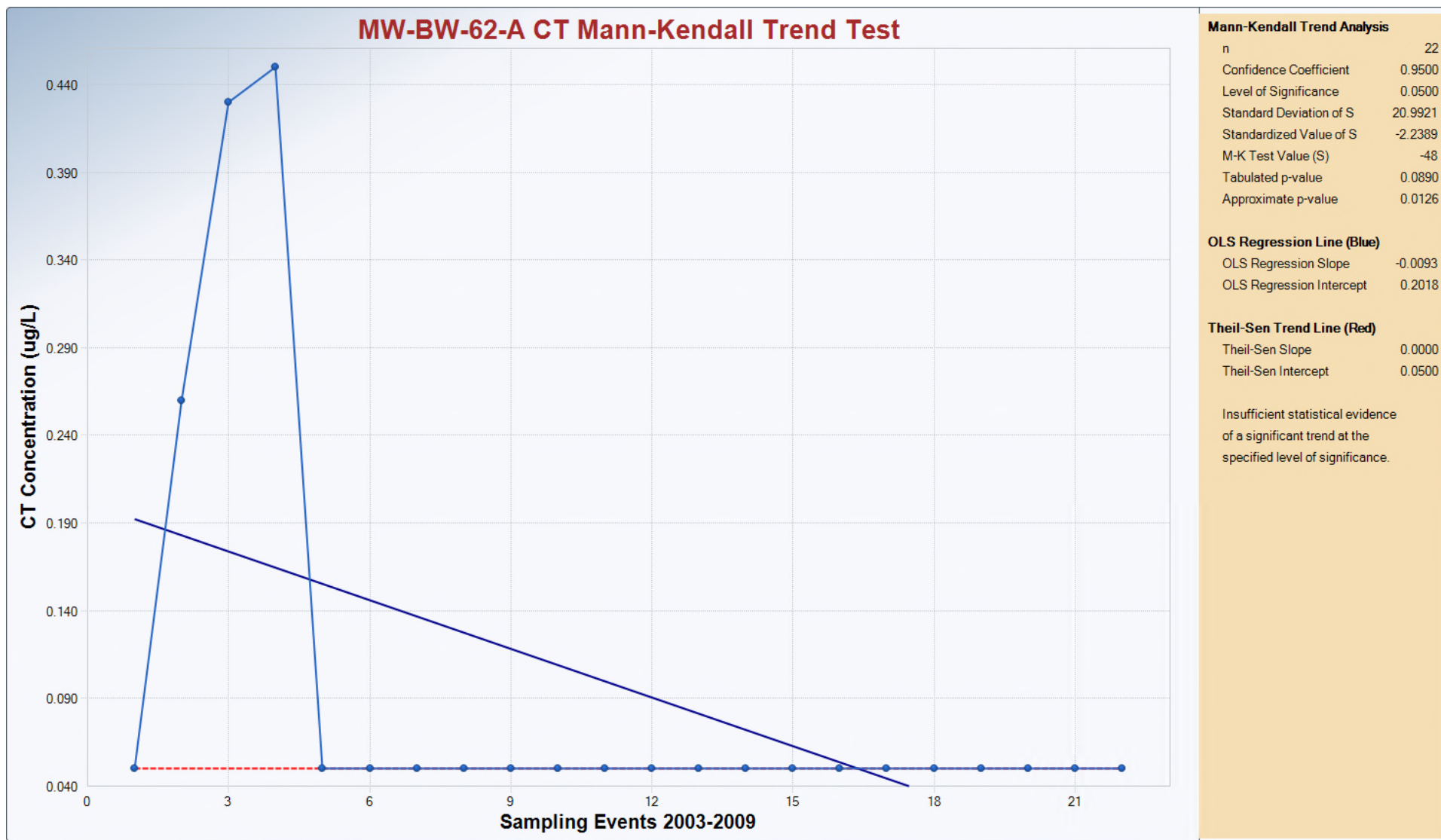


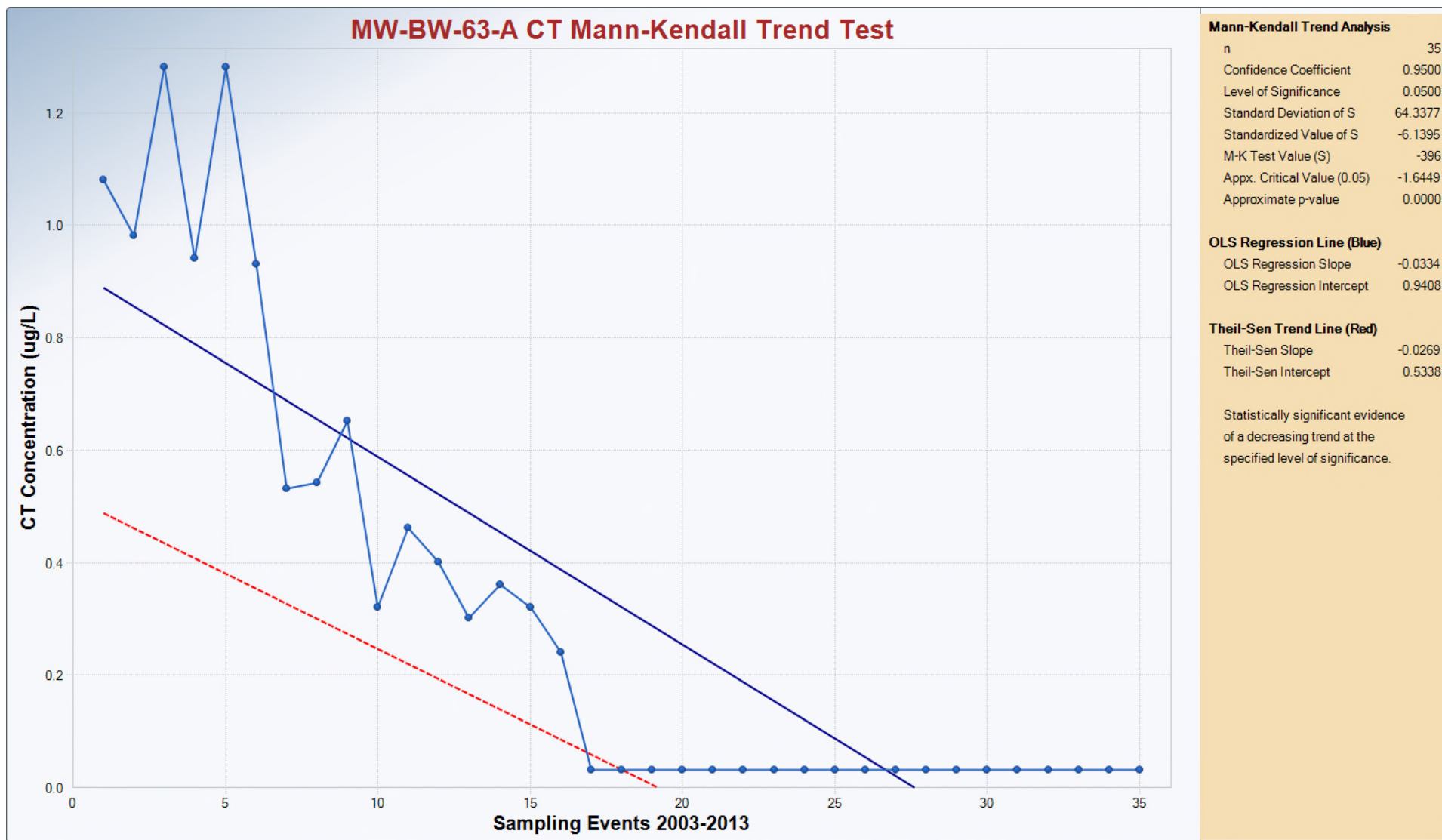


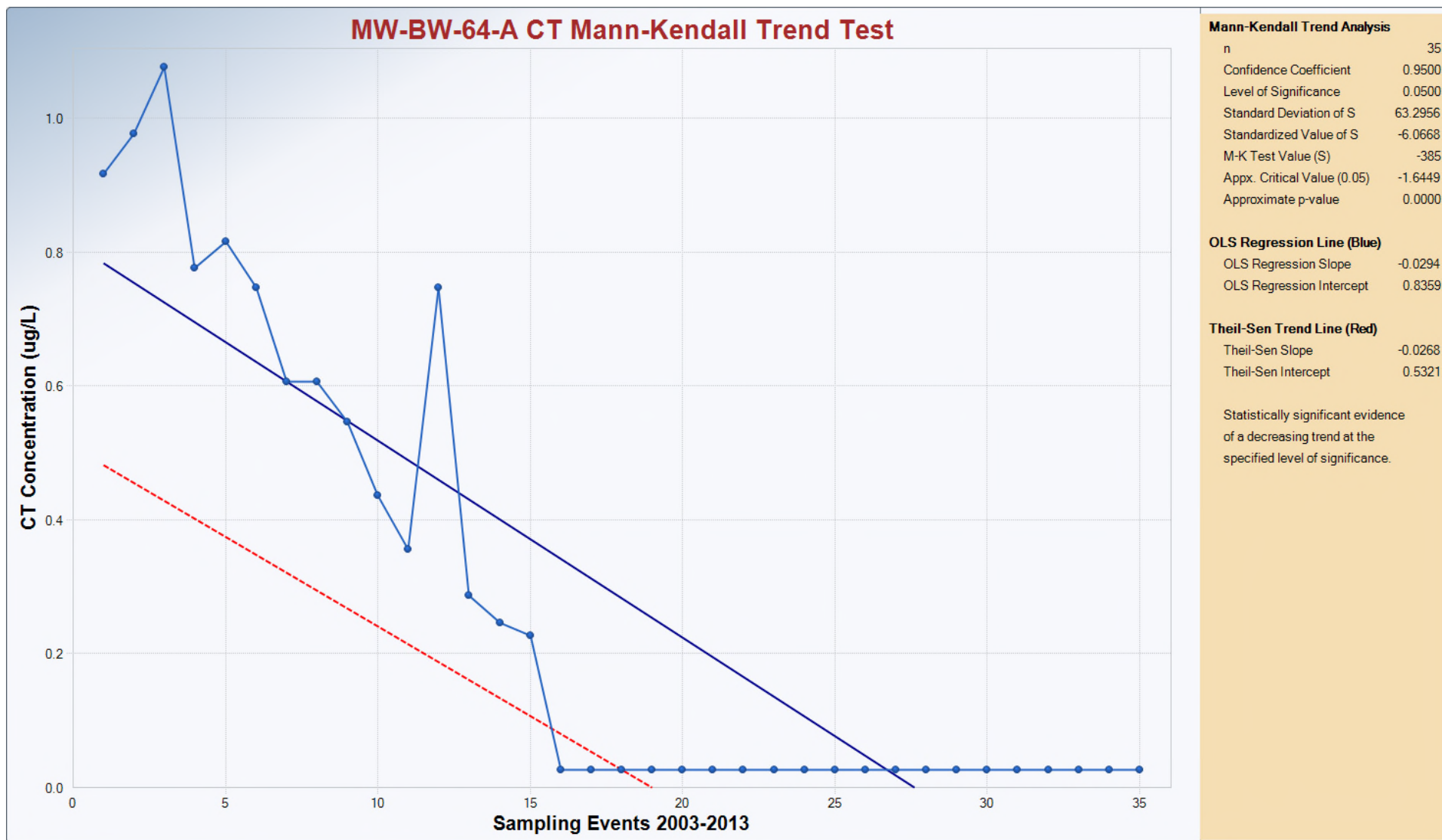


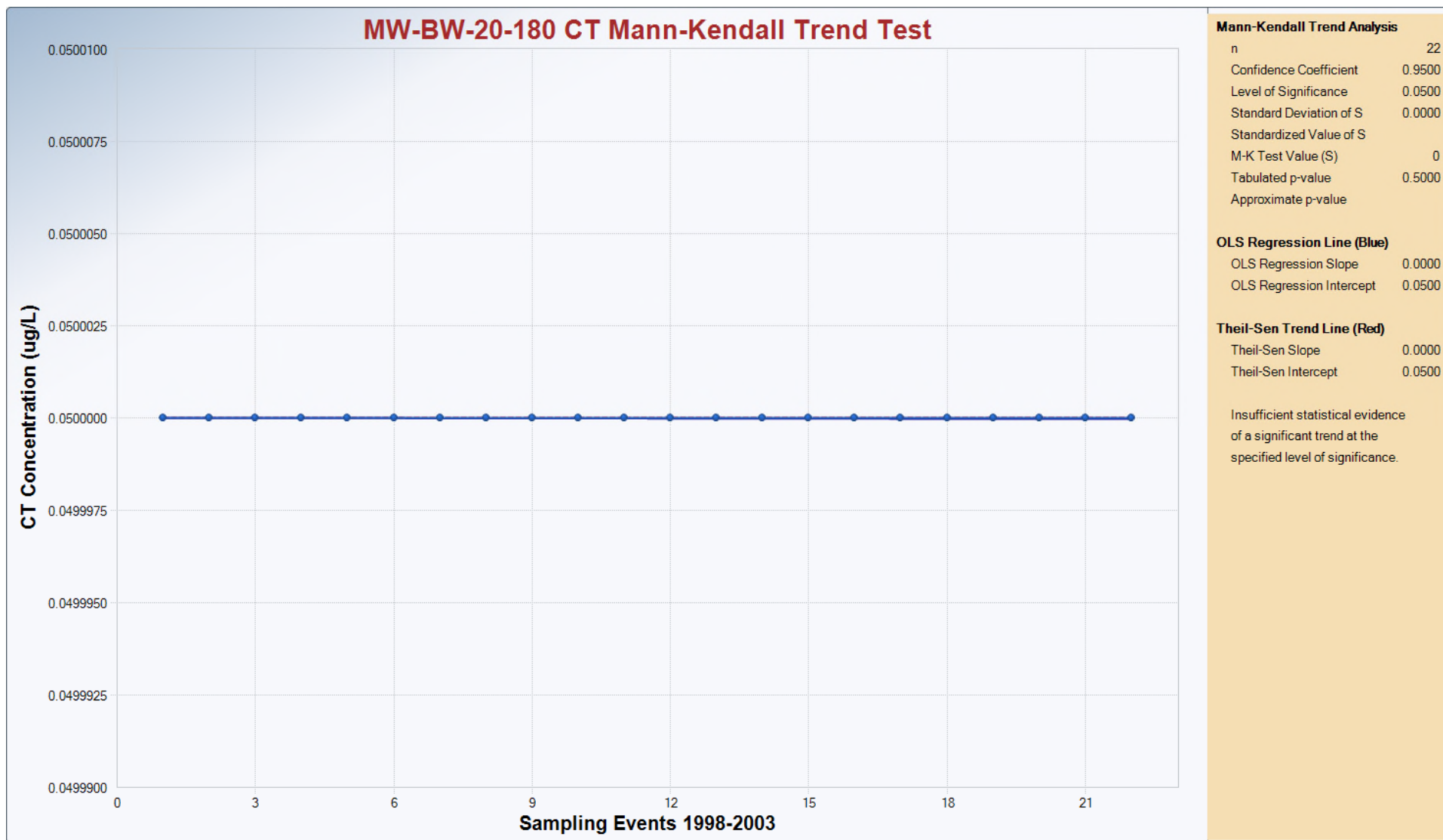


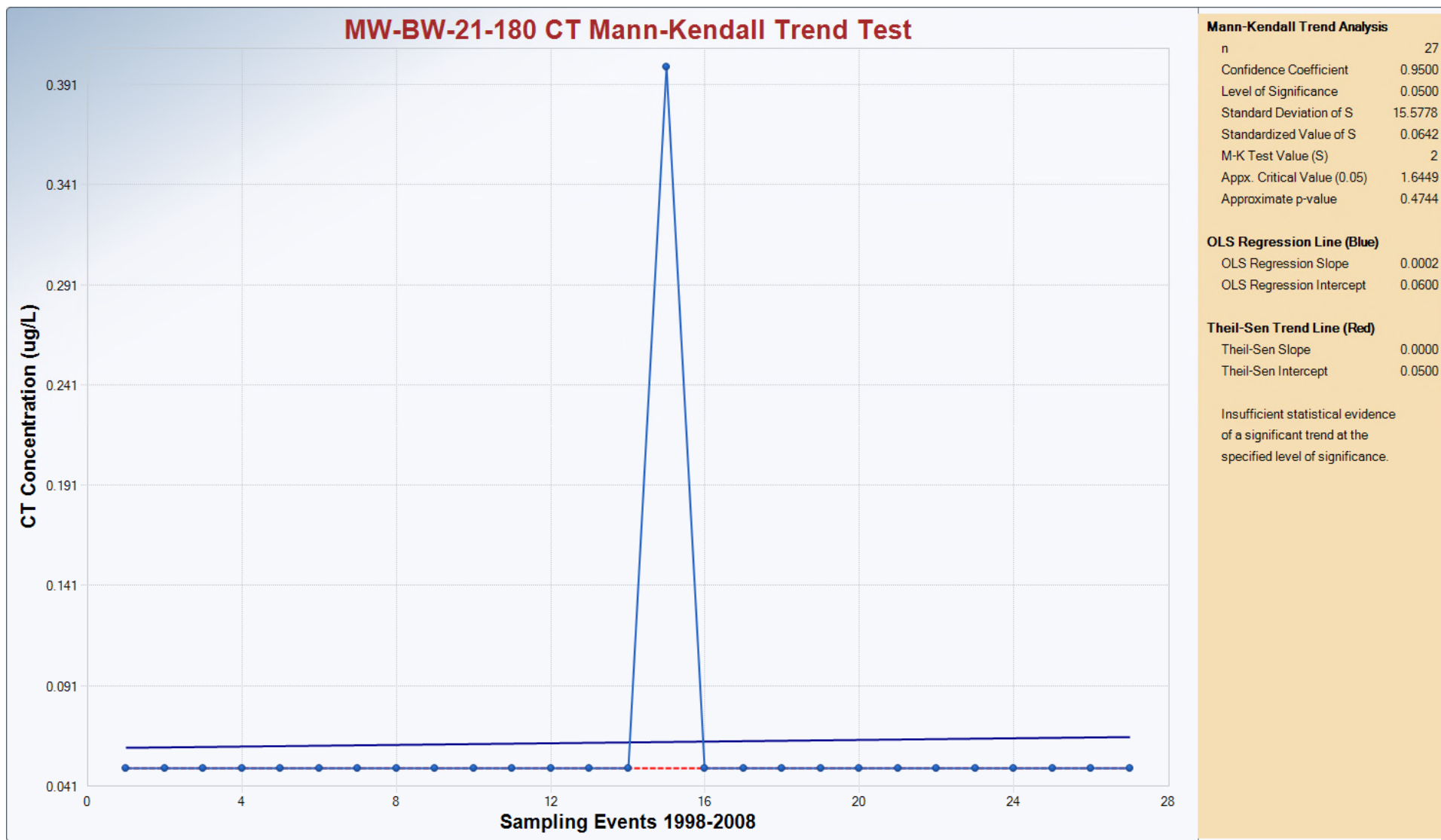
OUCTP
Mann-Kendall Chemical of Concern
Trend Analysis Graphs

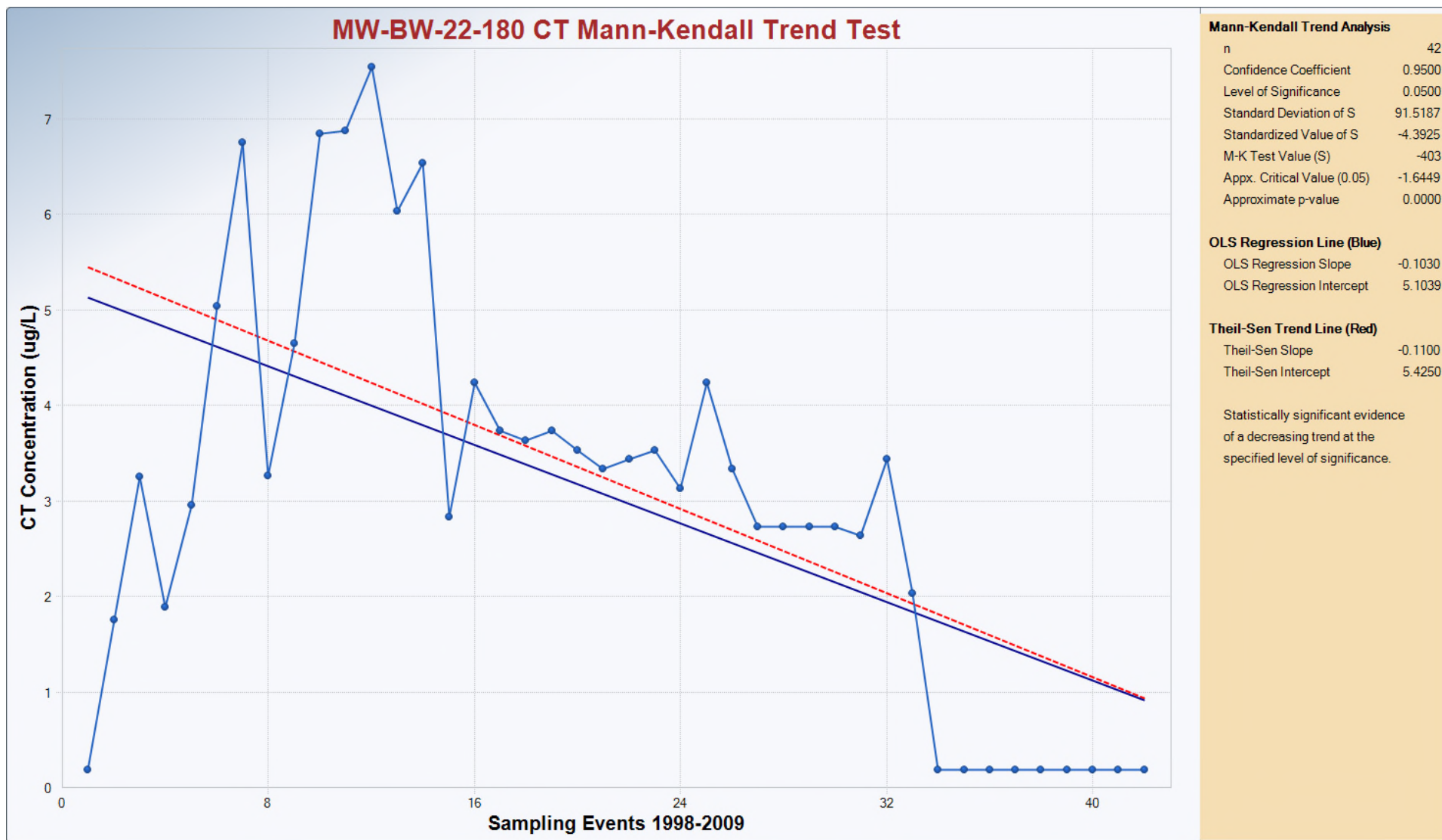


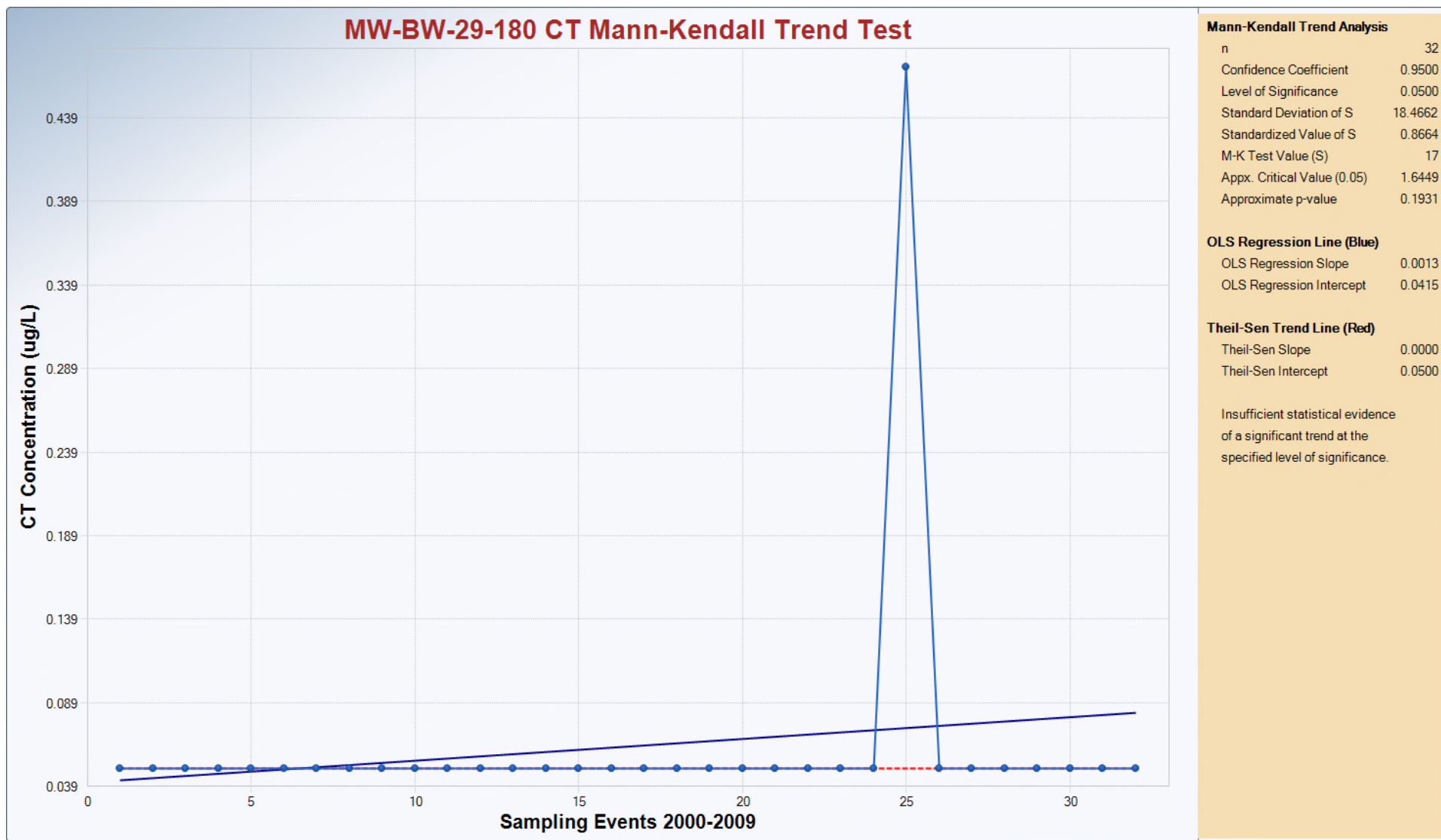


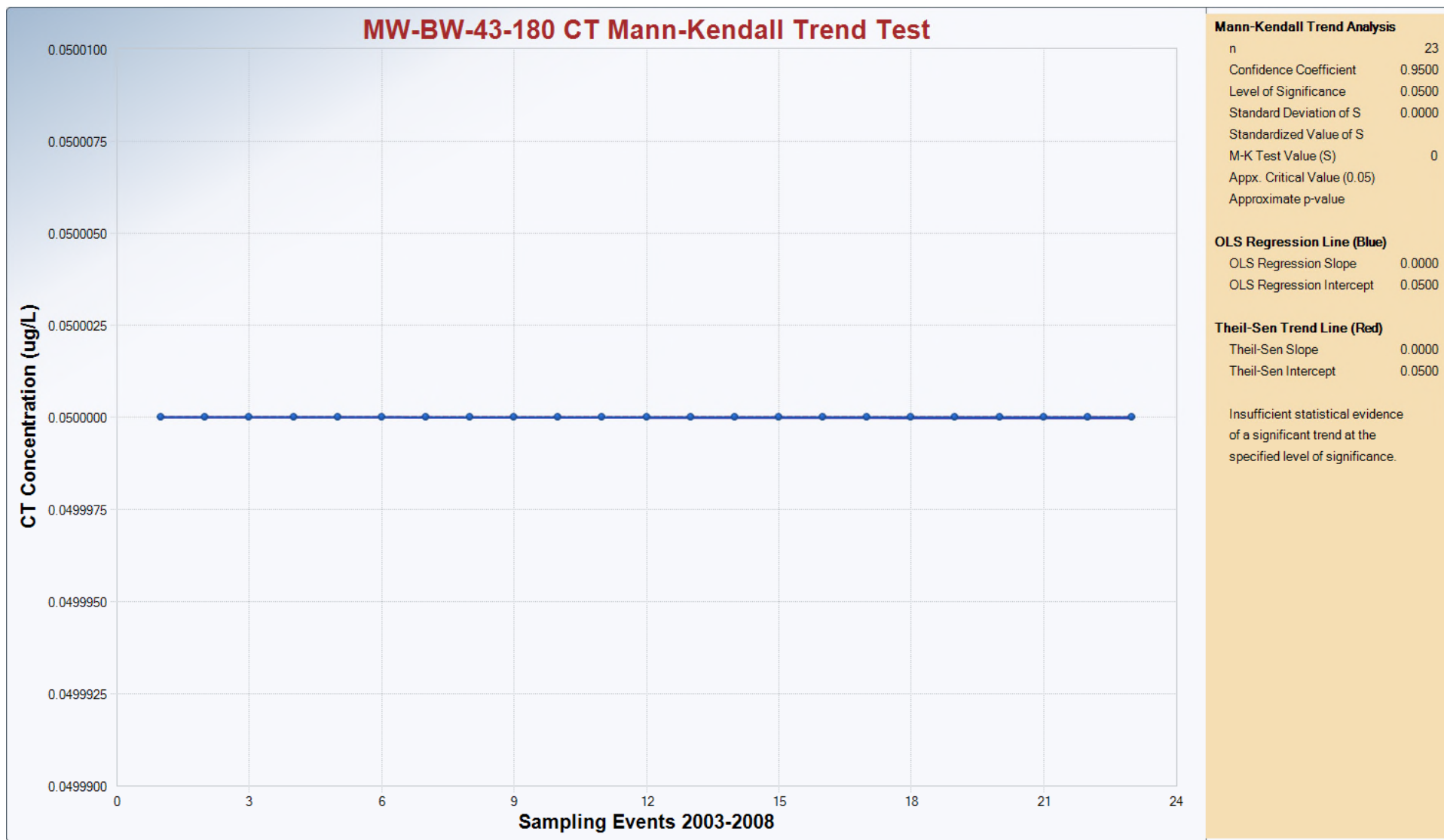


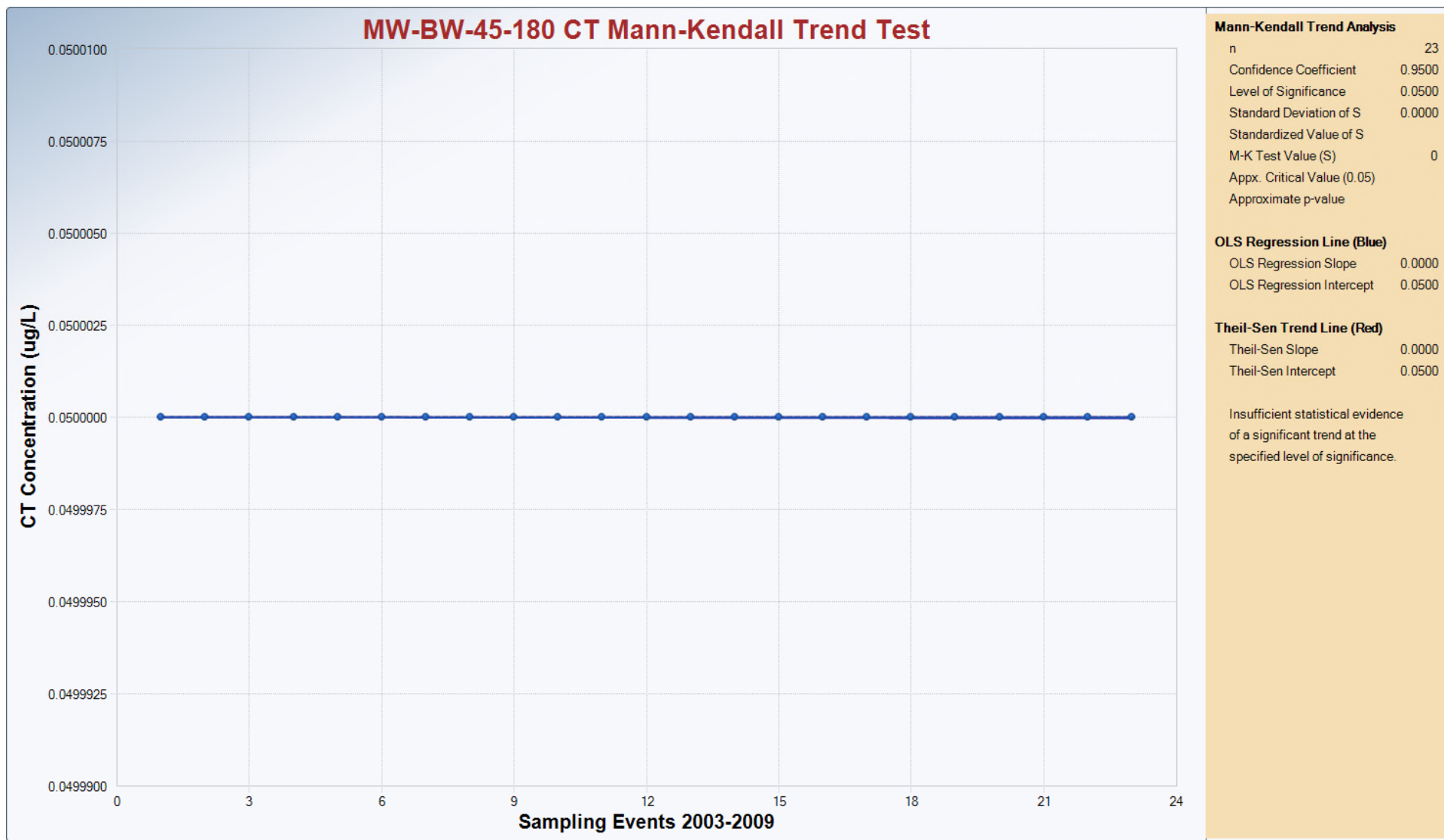


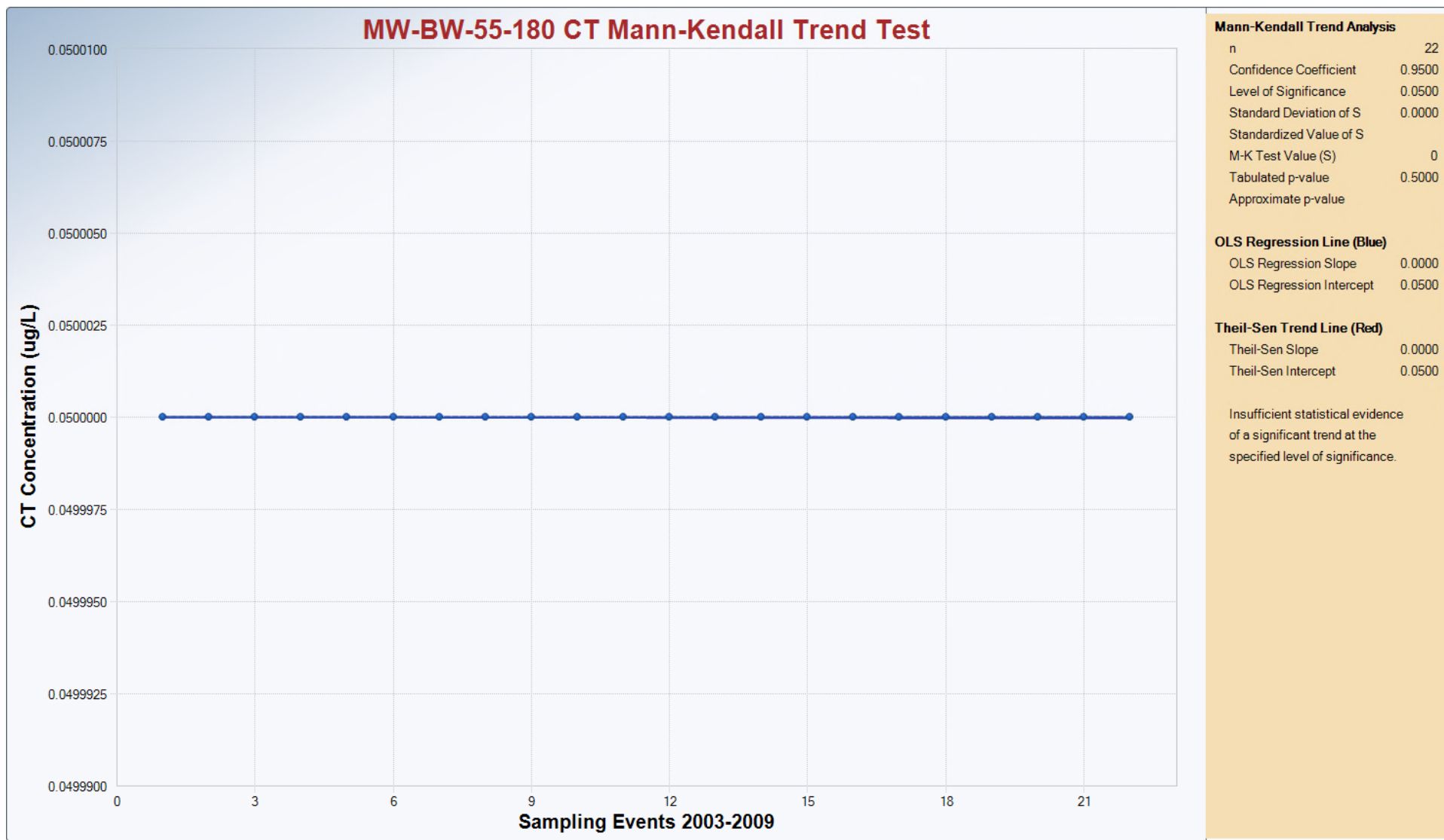


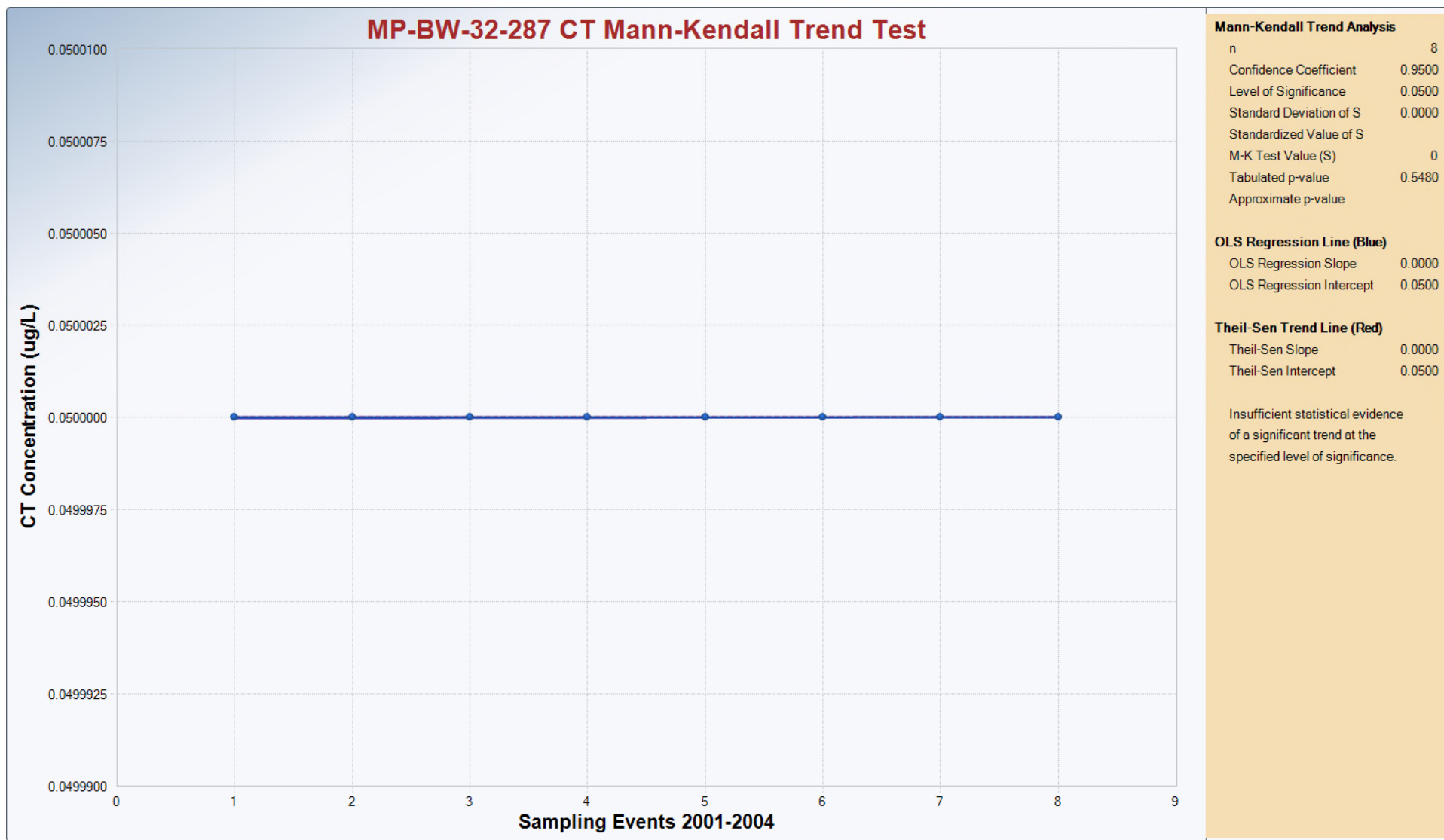


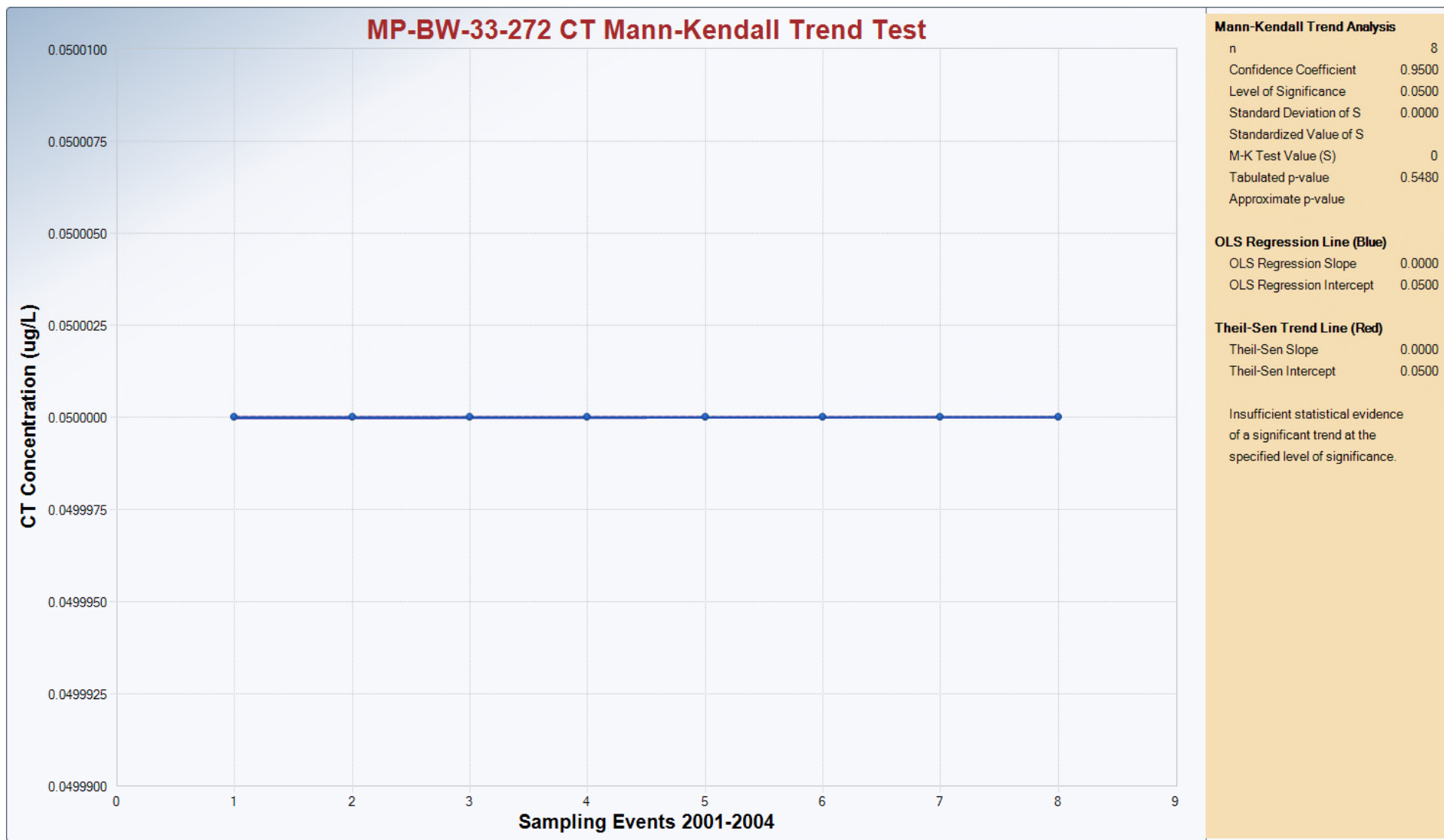












APPENDIX B

Activity Hazard Analysis (AHA)

- Groundwater Monitoring Well Decommissioning



Activity Hazard Analysis (AHA) Former Fort Ord

Activity/Work Task: Groundwater Monitoring Well Abandonment	Overall Risk Assessment Code (RAC) (Use highest code)					M
Project Location: Former Fort Ord, California	Risk Assessment Code (RAC) Matrix					
Contract Number: W91238-14-C-0048	Severity	Probability				
Date Prepared: March 2018 (Revision #0)		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: Holly Dillon, Site Safety and Health Officer	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by (Name/Title): Derek Lieberman, Project Manager	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.) Primary references for this AHA are those specified in EM 385-1-1 (USACE, 2014) Sections 5 and 33, and applicable sections of Federal OSHA and Cal/OSHA.	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)					RAC Chart E = Extremely High Risk H = High Risk M = Moderate Risk L = Low Risk
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.					
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible					
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.					
Site Safety and Health Officer (SSHO)	Alternate SSHOs					
Holly Dillon (831) 384-3735 office (831) 324-3299 cell	Derek Lieberman (831) 384-3735 office (831) 224-3327 cell Mark Fisler (831) 384-3735 office (831) 224-3133 cell					
Collateral Duty Safety Officer (CDSO)	Competent or Qualified Persons					
Mark Fisler (831) 224-3133 cell	Holly Dillon and Mark Fisler					

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person.

Activity Hazard Analysis Former Fort Ord

AHA Title: Groundwater Monitoring Well Abandonment

DATE: March 2018 Revision #: 0

PRINCIPAL STEPS	POTENTIAL SAFETY/ HEALTH HAZARDS	RECOMMENDED CONTROL	RISK ASSESSMENT CODE
Supervision of Site Setup	<ul style="list-style-type: none"> Bystander safety Physical (e.g., slips, trips, falls, traffic vehicles, mechanical equipment, utilities, uneven terrain) Biological (e.g., rodents, poison oak, bees, or spiders) Hot or cold weather conditions 	<ul style="list-style-type: none"> Establish exclusion zone (EZ) barrier around area of drill rig and forklift operations. Clearly delineate EZ to keep unauthorized persons from entering the area. Only properly trained personnel may enter EZ. Upon entering the EZ personnel are required to wear personal protective equipment (PPE): hard hat, high visibility safety vest, safety glasses, steel toe boots, and hearing protection as necessary. Conduct daily safety tailgate meeting reviewing safety protocols with personnel onsite prior to start of day's operations. Conduct safety inspections throughout work day to ensure safety protocols are being followed. Authorized site visitors with proper PPE must also receive a site safety briefing prior to site entry. Observe the terrain and nearby hazards when maneuvering in the well installation area. Observe the area for overhead hazards, such as utilities or vegetation, before moving equipment into the well installation area. Monitor the area prior to and during drilling activities for biological hazards. If necessary, remove vegetation (including poison oak) if authorized to do so and with proper precautions, tools, and PPE. Monitor the local weather forecast for temperatures above 70°F or below 40°F. Follow the Heat and Cold Stress Monitoring Plan in the Accident Prevention Plan (APP). If precipitation is forecasted ensure personnel have suitable rain gear. Discuss with the drilling company the wind speed that would require shut down of drilling operations (typically 30 mph) and monitor for such conditions. It is not expected that wind speed would reach the limits necessary for shutdown. Monitor for thunderstorms, if lightning is present within 10 miles of the work site, all drilling and field work shall stop until 30 minutes after the last thunder or lightning was observed. The distance (miles) from the storm may be estimated by counting the number of seconds between the visible lightning flash and the audible thunder and dividing by five. 	L

Activity Hazard Analysis Former Fort Ord

AHA Title: Groundwater Monitoring Well Abandonment

PRINCIPAL STEPS	POTENTIAL SAFETY/ HEALTH HAZARDS	RECOMMENDED CONTROL	RISK ASSESSMENT CODE
		<ul style="list-style-type: none"> Review drilling company AHAs prior to start of operations. 	
Supervision of Well Abandonment	<ul style="list-style-type: none"> Struck by mechanical equipment, augers, casing, or vehicles Falling objects Exposure to debris or airborne particulates Cuts, abrasions, or strains. 	<ul style="list-style-type: none"> Before drilling operations begin establish safety protocols including barriers, PPE requirements, communication requirements, and emergency procedures for an incident. Locate the drill rig emergency shut off switches. Review the days' work expectations before work begins as to limit the need for communication during drilling operation. Maintain communication with the drill rig operator when it is necessary to be within the area of moving equipment and materials including before entering the area. Do not enter the area if not necessary. Have the drill rig operator temporarily stop operations if communications are necessary and cannot be established safely, or relay messages from the drill rig helpers to the operator. Do not allow drillers to remove more than one flight of augers at a time from the borehole during auger removal. Observe the work area for potential hazards, such as debris in the path of workers. Help maintain and require good housekeeping. Keep large heavy duty garbage bags on hand for debris. Do not allow overfilling of the soil hopper, which may cause spillage during movement. Keep a clear path for the forklift to enter the area to pick-up the soil hopper and a clear path for the forklift to dump the soil into the soil bin. Monitor for visible dust caused by drilling operations. If visible dust persists in the breathing zone and cannot be mitigated by engineering controls, such as water application, then dust masks may be worn as necessary. It is not expected that airborne particulates will accumulate in the breathing zone. When removing well materials, pieces of casing and screen may be too long to transport and need to be cut for disposal, or pieces may be cut leaving sharp edges. Wear proper gloves when handling these materials and take care while moving and cutting materials to avoid cuts, abrasions, or strains. If a mishap incident or near miss occurs, immediately stop drilling operations. If necessary, seek medical attention. Determine the root cause of the incident and corrective action procedures to prevent recurrence. Observe corrective action is in place or corrective behavior is understood prior to restart of drilling operations. Follow the mishap reporting procedures identified in the APP. 	M

Activity Hazard Analysis Former Fort Ord

AHA Title: Groundwater Monitoring Well Abandonment

PRINCIPAL STEPS	POTENTIAL SAFETY/ HEALTH HAZARDS	RECOMMENDED CONTROL	RISK ASSESSMENT CODE
		<ul style="list-style-type: none"> Ensure drillers are wearing proper PPE for grout mixing operations, such as mask and face shield, according to driller's AHA requirements. 	
Equipment Breakdown and Site Cleanup	<ul style="list-style-type: none"> Struck-by or falling object hazards Chemical exposure Strain Trip hazard 	<ul style="list-style-type: none"> Dispose of any well water in a proper receptacle, such as a drum, for removal and treatment at the OU2 or Sites 2/12 groundwater treatment plant. Water in the soil bin should also be removed for treatment prior to moving the bin as necessary and practicable. If the soil and or water bins are to remain onsite, the cover must be closed at the end of the day. Personnel in the EZ must have hard hat on until the drill rig mast is down and secure, and forklift operations have ceased. If an open well must be left overnight it should be secured at the surface to prevent a mishap or tampering by covering and delineation. All equipment and materials shall be stored properly and secured. Ensure gated areas are secured prior to departure. 	L

Activity Hazard Analysis Former Fort Ord

AHA Title: Groundwater Monitoring Well Abandonment

EQUIPMENT TO BE USED/ TRAINING REQUIRED:

EQUIPMENT	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Vehicle	Inspect daily prior to use.	Defensive driving training (Ahtna only) and valid state driver's license.
PPE (steel toe boots, hard hat, safety glasses, high visibility vest, and chemical resistant disposable gloves)	Inspect daily prior to use for effectiveness and wear or tear. Do not reuse disposable gloves.	PPE donning/doffing, uses, limitations, and replacement
Sampling equipment including sampling bottles with preservative	Inspect before each use for leaks while wearing chemical resistant gloves.	Onsite SOP training required.
Drilling equipment and materials	See drilling company AHAs.	Only properly trained drilling company personnel may operate equipment and handle materials.
Forklift	See manufacturer guidelines or contractor AHA.	Only properly trained and certified personnel may operate a forklift.

Notes:

AHA = Activity Hazard Analysis

PPE = Personal protective equipment

Cal OSHA = California Occupational Safety and Health Administration

°F = degrees Fahrenheit

mph = miles per hour

APP = Accident Prevention Plan

Note: It is critically important to recognize that all hazards CANNOT be recognized and addressed in the documented Activity Hazard Analysis, as site conditions may be different than anticipated. The on-site team member(s) are responsible to survey the area to recognize site hazards, report identified and potential hazards to the SSHO or Forman, evaluate those hazards, in cooperation with the SH&EP to control those hazards, document those hazards and controls on the field copy of the AHA.

Activity Hazard Analysis Former Fort Ord

AHA Title: Groundwater Monitoring Well Abandonment

ACTIVITY HAZARD ANALYSIS ACKNOWLEDGEMENT

I have been informed on the hazards and safe work practices associated with this Activity Hazard Analysis to include training and protective equipment requirements. I have also been given the opportunity to ask questions and receive informed answers.

NAME	DATE	COMPANY	SIGNATURE

APPENDIX C

Public Fact Sheet

Environmental Cleanup Activities

Groundwater Monitoring Well Installation and Decommissioning June – Oct 2018

The Army will be installing seven groundwater monitoring wells and decommissioning thirteen existing groundwater monitoring wells. Typical equipment will include drilling and other heavy construction equipment, such as backhoes, forklifts and trucks. Photos of typical drilling equipment are shown below.



During drilling, you may see some small areas closed off with traffic cones or barricades to allow for the safe operation of equipment and to protect workers and the public. Additionally, there may be very brief periods of loud sounds from the drill rig. Maps of the locations where the construction will occur are shown on the attached pages.

FOR MORE INFORMATION: Results of previous groundwater sampling events are available online in the Administration Record (www.FortOrdCleanup.com).

QUESTIONS

Fort Ord Community Relations Office, U.S. Army Fort Ord BRAC Office (www.FortOrdCleanup.com)

Melissa.M.Broadston.ctr@mail.mil or (831) 393-1284

Para obtener una copia en español, llamada (831) 393-1284

APPENDIX D

Habitat and Biological Monitoring Forms

- Habitat Checklist Example
- Habitat and Biological Monitoring Training Fact Sheet
- Biological Observation Form – CTS/BLL

SITE HABITAT CHECKLIST

The following are requirements to minimize biological disturbances to protected species and habitat. Please notify the Ahtna Biologist (Denise Duffy and Associates) at 831-373-4341 *before* proceeding, if work tasks or work boundaries change, additional vegetation removal is necessary, vegetation cutting methods change, or any other conditions change.

SITE:	University of California – Fort Ord Natural Reserve - North	Date:	XX-XX-2015
Work to be conducted:	Drilling and Installation of A- Aquifer Monitoring Wells, Operable Unit Carbon Tetrachloride (OUCTP)		

1. LAND USE:	<input checked="" type="checkbox"/> Habitat Reserve	<input type="checkbox"/> Development Area	<input type="checkbox"/> Other (specify):
2. LAND OWNER:	<input type="checkbox"/> Army	Location:	
	<input type="checkbox"/> BLM	Location:	
	<input checked="" type="checkbox"/> Other:	Location:	University of California, Santa Cruz

3. ENDANGERED SPECIES/	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Flagged/Marked
HMP Listed Species:			
Location:			
Grid Numbers:			
Restrictions: <ul style="list-style-type: none"> • Restrict all vehicle access and staging to designated flagged routes, and staging areas. • Stay on roads. • Report all black legless lizard or California Tiger Salamander encounters to Ahtna field supervisor and biologist immediately. • Coordinate with biologist first, if additional areas are needed for access or staging of equipment or vehicles. • Contact number for Ahtna Biologist (Denise Duffy and Associates) is 831-373-4341. • Contact number for the BRAC Office Biologist is 831-242-7918 			

4. VERNAL POOLS/PONDS PRESENT	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Flagged/Marked
Location:			
Grid Numbers:			
Work Can Proceed in Pools/Ponds:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Restrictions:			

5. VEGETATION REMOVAL

<input type="checkbox"/> No Removal Needed	Location:
<input type="checkbox"/> Manual Removal Needed	Location:
Restrictions:	
<input type="checkbox"/> Mechanical Removal Needed:	Location:
Mechanical Removal Restrictions:	

6. EROSION CONCERNS/SITE RESTORATION:**7. SITE ACCESS:****8. ADDITIONAL SITE CONCERNS:**

This checklist has been read, approved, and signed by the following:

☐ Ahtna Biologist: _____
☐ Ahtna Field Supervisor: _____
☐ Army Natural Resources Specialist: _____

Date: _____

Date: _____

Date: _____

Fort Ord Species of Concern Identification and Procedures

Fort Ord Animal Species of Concern

California Tiger Salamander (CTS) and Black Legless Lizard (BLL) are species of concern at Fort Ord. CTS are endemic to California and are a threatened species. CTS larvae are yellowish gray typically habitat in vernal pools and metamorphisms into adults in summertime growing to a 3 to 5 inch salamander with yellow spots. As adults during the day CTS spends time underground in animal burrows. BLLs are a California protected species that are small slender lizards 4 to 7 inches long with no legs which forages in loose soil, sand, and leaf litter during the day and may come to the surface at dusk and night. If a CTS or BLL is found, notify Base Realignment and Closure (BRAC) Biologist Bart Kowalski at (831) 595-5569 who will coordinate an approved Biologist to visit the site and handle and remove the CTS as necessary from the work area. BLL may be relocated by onsite personnel.

CA Tiger Salamander



Black Legless Lizard



Coast Horned Lizard

The California species of concern Coast Horned Lizard has a 4-inch rounded flat body, blunt snout, tail, and toad-like body with horns. When moving vehicles or heavy equipment into the inner roads of the northern FONR, have personnel walk in front of the vehicle as directed by UCSC to scare out Coast Horned Lizards that may be in the roadway before the vehicle passes. Notify Bart Kowalski of observances who will notify UCSC. Work does not need to be stopped if encountered, just relocated away from moving vehicles.



FONR Plant Species of Concern

There are two plant species in the Fort Ord Natural Reserve (FONR) which is owned by University of California, Santa Cruz (UCSC) with monitored populations, Sand Gilia and Monterey Spineflower. Stay on the driving paths in the FONR, do not drive where prohibited and try not to walk on species of concern plants. Both plants are annual herbs that are native and endemic to California and typically bloom starting in March/April through June/July, but depending on weather conditions may bloom earlier. FONR questions may be directed to Gage Dayton with UCSC at (831) 227-5887.

Monterey Spineflower



Sand Gilia



BIOLOGICAL OBSERVATION FORM – CTS/BLL

If a California tiger salamander (CTS) or black legless lizard (BLL) is found, notify Bart Kowalski, the BRAC Office Biologist. Only service approved biologist should fill out the CTS field observation form, and only service approved biologist can handle and move CTS out of the way. If CTS is encountered all work needs to stop until service approved biologist gets to the location and relocates the CTS. After completing this form attach a photograph of the specimen (if possible) and a map showing the location of the sighting, and return to BRAC:

Mr. Bart Kowalski
Building 4463, Gigling Rd, Rm 101, Monterey, CA 93944-5004
Office: (831) 242-7918 Cell: (831) 595-5569

Location _____ **Date/Time** _____
(OE site, Range # etc)

Grid # _____ **Northing/Easting or**
Approx. Coordinates (ft) _____

Type of Activity (check one or write in)

- ☐ Well Installation/Drilling
☐ Vegetation clearance
☐ Other _____

Weather: Air Temp. _____ Wind _____ Sunny/Cloudy _____

Depth if known _____

Habitat Description (e.g. Maritime chaparral, oak woodland, grassland, vegetation height, presence of surface litter/debris, soil type, plant species where specimen found, etc.):

Description of specimen (live/ injured/ dead, color, condition, behavior etc.):

Length (inches): _____

Other Notes: _____

Disposition: Found by: _____

- ☐ Observed, released to same location or adjacent habitat
☐ Observation form completed By: _____
☐ Injured or killed (placed in a Ziploc or plastic bag, and refrigerated)
☐ Other _____

Attachments: ☐ Location map ☐ Photograph (specimen and habitat in which found)

APPENDIX E

Well Decommissioning Information and Forms

- Project Field Report
- Well Decommissioning Details Form
- Monitoring Well Logs⁸

⁸ The well log for MW-02-12-180 is not available.



PROJECT FIELD REPORT

GENERAL	
1) USACE Contract No.:	2) Date:
3) Program Manager	4) Report No.:
5) Project Manager:	6) SSHO (Designee):
7) Superintendent:	8) QC Manager:
9) Weather:	10) Temperature:

SUMMARY	
11) Work Performed:	
12) Project Issues:	
13) Unresolved Issues:	
14) Hours Worked:	15) Accumulated Hours:

CONTRACTOR PERSONNEL			
16) Prime Contractor and Subcontractor Onsite:			
Name	Company	Position/Title	Hours

GOVERNMENT PERSONNEL			
17) Government Personnel Onsite:			
Name	Company	Position/Title	Arrive/Depart (Day)

VISITING PERSONNEL			
18) Visitors Onsite:			
Name	Company	Position/Title	Arrive/Depart (Day)

DETAIL			
19) Equipment Status:	MOB'D	ACTIVE	DEMOB'D
1.			
2.			
3.			
4.			
20) Work Planned for Following Workday: None			
1.			
2.			
21) Safety Issues:			



Photos:	
Description:	
Description:	
Description:	
Description:	

Well Destruction Form

Location: _____ Project: _____ Event: _____ Completed by: _____ Date: _____

Grouting information	Well/boring information						
Well/boring ID							
Date							
Site							
Diameter							
Total depth							
Estimate of grout volume							
Amount of water (gallons)							
Amount of cement (bags)							
Amount of bentonite (lbs)							
Grout weight (lbs/gallon)							
Grout volume used (gallons)							

Volume calculation formula: **Gal x Depth(ft) = Estimated grout volume**

Diameter	Gal	Diameter	Gal
2"	0.2	8"	2.6
4"	0.7	9"	3.3
5"	1.0	10"	4.1
6"	1.5	11"	5.0
7"	2.0	12"	5.9

Top of Casing
Elev. 147.28

GROUND SURFACE

TOP OF
CASING at
2.2 ft above
ground
surface

CEMENT/
BENTONITE
SEAL: 0 to
168 ft.

Blows/foot
Recovery
(inches)
QVM Reading
(ppm)
Sample
Number

Depth (ft.)
Sample

0
5
10
15
20
25
30
35
40

Equipment Speed Star - Arch
10"-diameter

Elevation 145.10 ft. (grnd) Date 7/22/98

DARK BROWN WELL GRADED SAND WITH SILT
(SW) (7.5YR 3/2): Loose, dry, 90% fine to coarse
sand, 10% silt.

@ 5 feet: Change color to brown (10YR 4/3),
100% fine to coarse sand.

@ 12 feet: Change color to yellowish brown
(10YR 5/4), coarse sand decreasing (30-40%)

@ 20 feet: Change to increasing coarse sand
(40-50%)

@ 30 feet: Change color to light yellowish brown
(10YR 6/4)

@ 38 feet: Change color to yellowish brown
(10YR 5/4)

FTO



Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring and Well Completion MW-BW-20-180^{LATE}

Carbon Tetrachloride Investigation
Former Fort Ord, California

A7

DRAWN JOB NUMBER
EBH 36088 010210

APPROVED

DATE
9/98

REVISED DATE

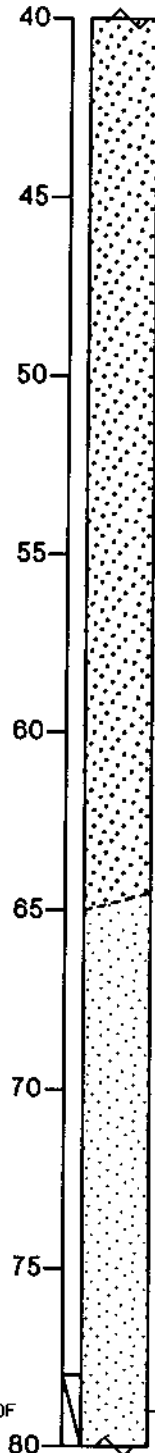
5" DIAMETER
SCHEDULE
40 PVC
BLANK
CASING: +2.0
to 177.5 ft.

Blows/foot
Recovery
(inches)
OVM Reading
(ppm)
Sample
Number

Equipment Speed Star - Arch
10"-diameter

Elevation 145.10 ft. (grnd) Date 7/22/98

Depth (ft.)
Sample



@ 40 feet: Decrease in coarse sand

@ 45 feet: Increase in coarse sand

@ 60 feet: Moist

LIGHT YELLOWISH BROWN POORLY GRADED
SAND (SP) (10YR 6/4): Loose, moist, 100% fine to
medium sand.

@ 77 feet: Color change to dark yellowish brown
(10YR 4/6)

@ 78 feet: Wet

Hydropunch from 78 to 80 ft.

983080BW100F

FTO



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Log of Boring and Well Completion MW-BW-20-180 LATE

Carbon Tetrachloride Investigation
Former Fort Ord, California

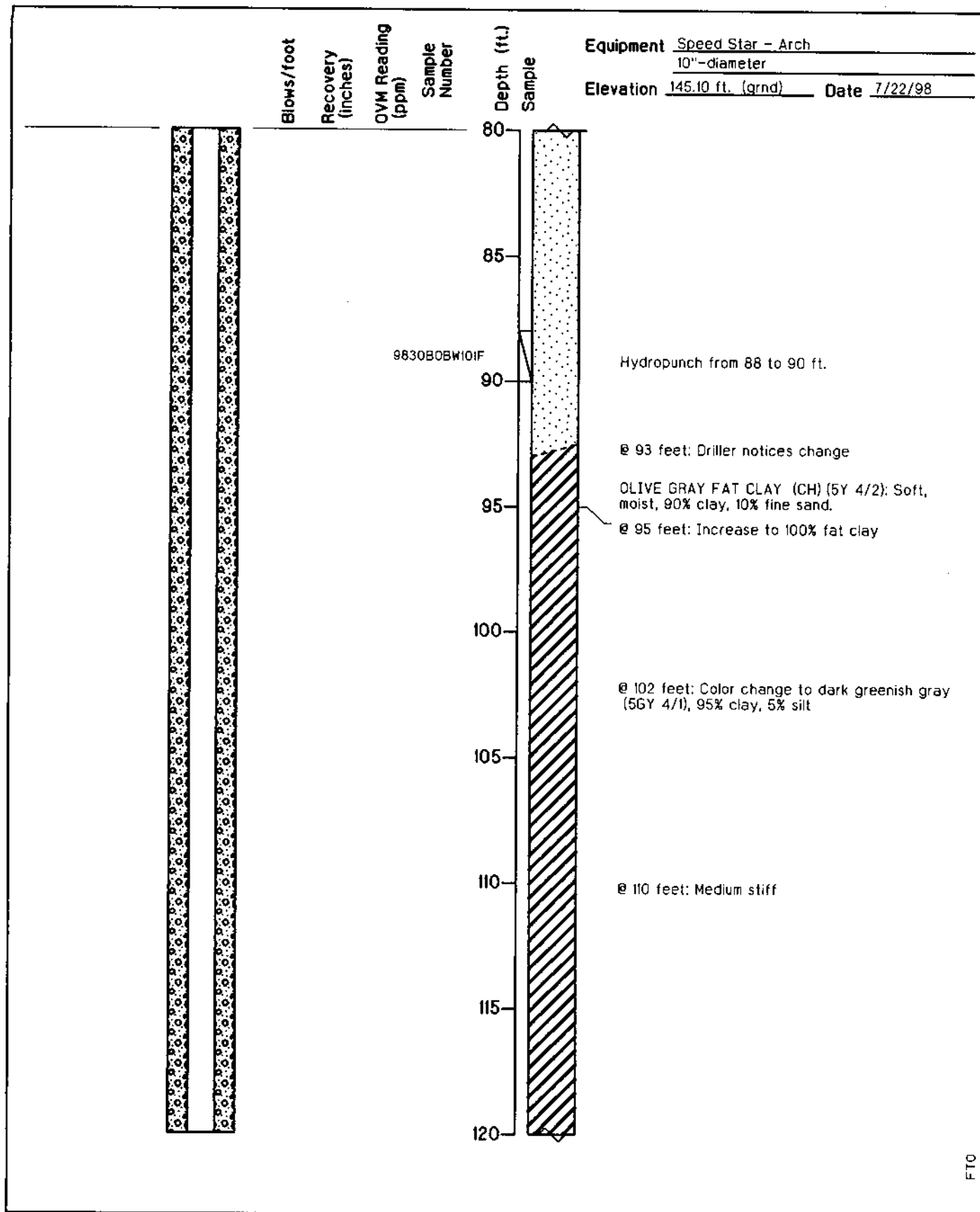
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APPROVED

DATE
9/98

REVISED DATE



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Log of Boring and Well Completion MW-BW-20-180 LATE

Carbon Tetrachloride Investigation
Former Fort Ord, California

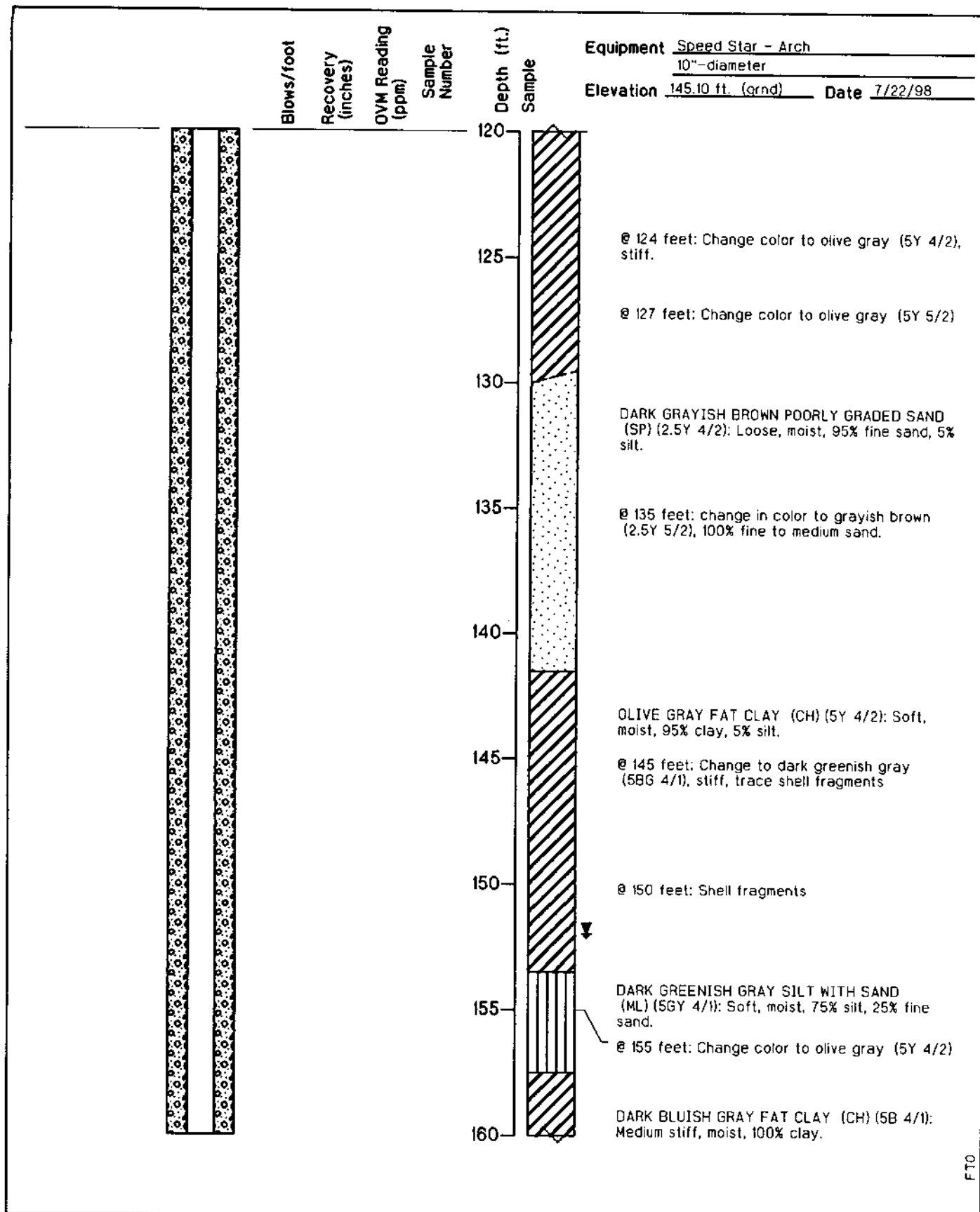
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DATE **9/98**

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Log of Boring and Well Completion MW-BW-20-180^{LATE}

**Carbon Tetrachloride Investigation
Former Fort Ord, California**

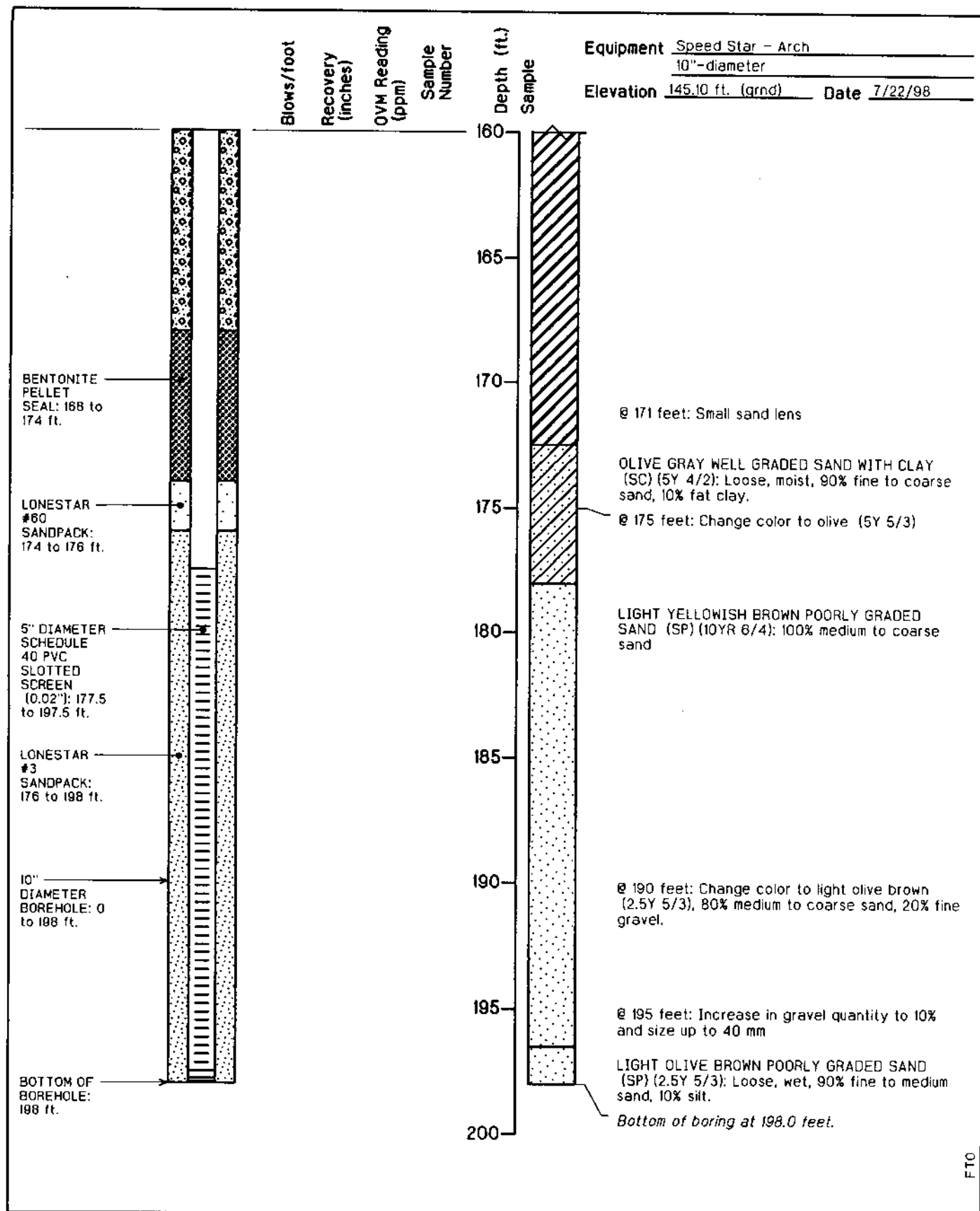
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DATE **9/98**

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Log of Boring and Well Completion MW-BW-20-180^{LATE}

**Carbon Tetrachloride Investigation
Former Fort Ord, California**

A7

DRAWN
EBH

JOB NUMBER
38086 010210

APPROVED

DATE
9/98

REVISED DATE

Top of Casing
Elev. 155.66

GROUND SURFACE

TOP OF
CASING at
2.8 ft above
ground
surface

CEMENT/
BENTONITE
SEAL: 0 to
170 ft.

Blows/foot
Recovery
(inches)
OVM Reading
(ppm)
Sample
Number

Depth (ft.)
Sample

0
5
10
15
20
25
30
35
40

Equipment Speed Star - Arch
10"-diameter

Elevation 152.86 ft. (grnd) Date 7/24/98

BROWN POORLY GRADED SAND (SP) (10YR 4/3):
Loose, moist, 90% fine to medium sand, 10% silt.

@ 5 feet: Change color to yellowish brown
(10YR 5/4), 100% fine to medium sand, trace silt.

@ 32 feet: Change color to yellowish brown
(10YR 5/6), Medium dense, 95% fine to medium
sand, 5% silt.

FTO



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Log of Boring and Well Completion MW-BW-22-180^{LATE}

Carbon Tetrachloride Investigation
Former Fort Ord, California

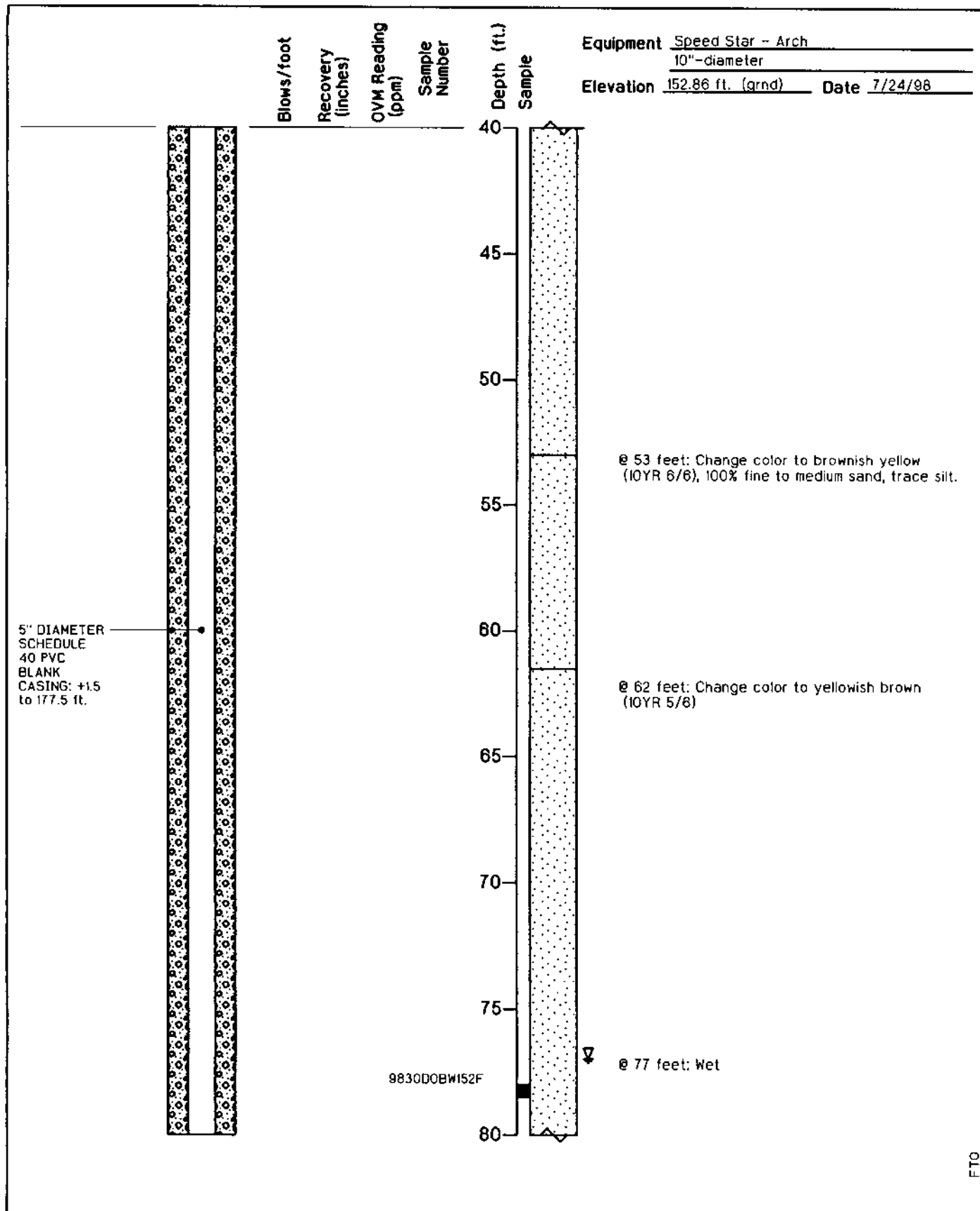
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DRAWN JOB NUMBER
EBH 36086 010210

APPROVED

DATE
8/98

REVISED DATE



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Log of Boring and Well Completion MW-BW-22-180^{LATE}

**Carbon Tetrachloride Investigation
Former Fort Ord, California**

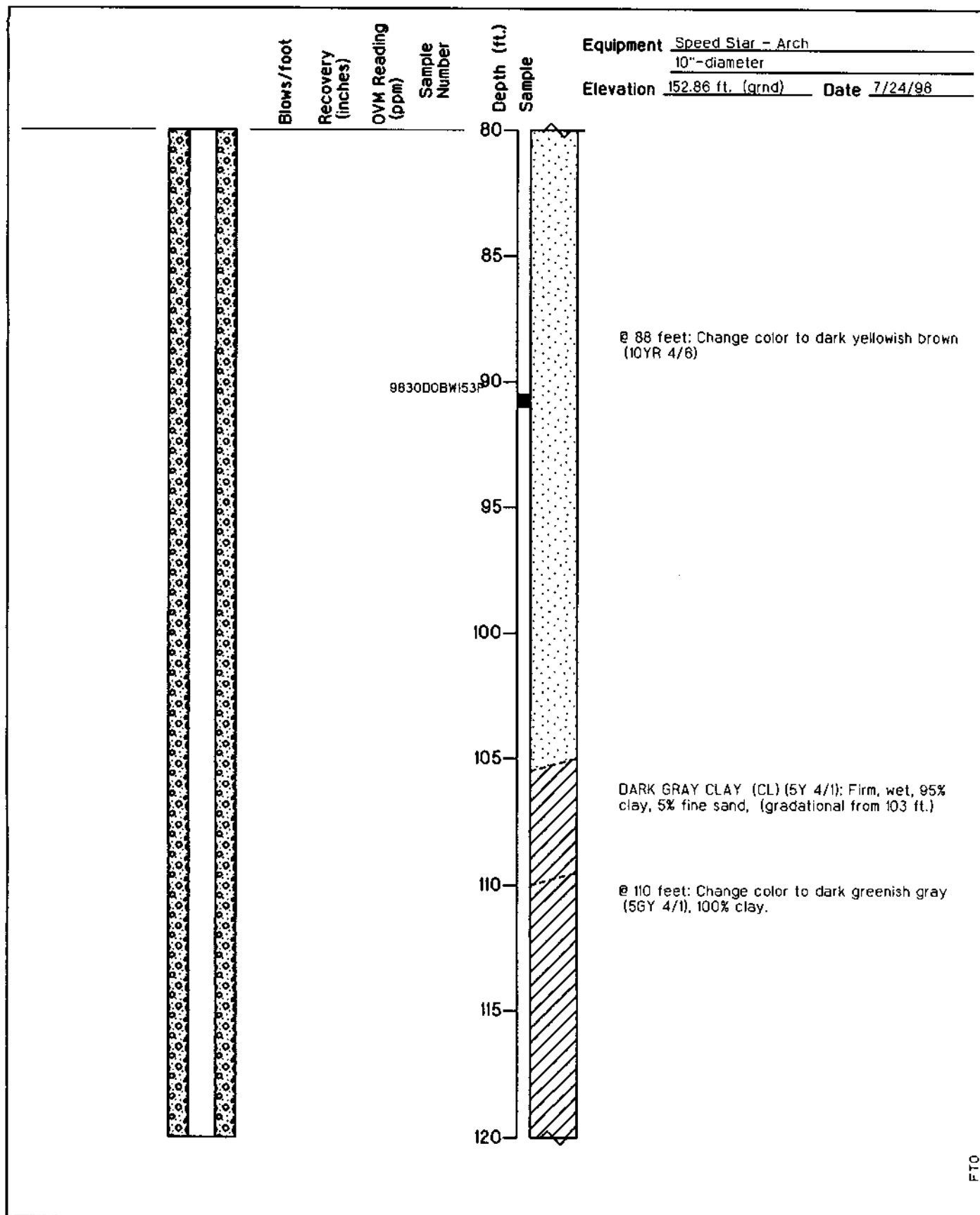
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APPROVED

DATE **9/98**

REVISED DATE



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Environmental Services

Log of Boring and Well Completion MW-BW-22-180 LATE

Carbon Tetrachloride Investigation
Former Fort Ord, California

A9

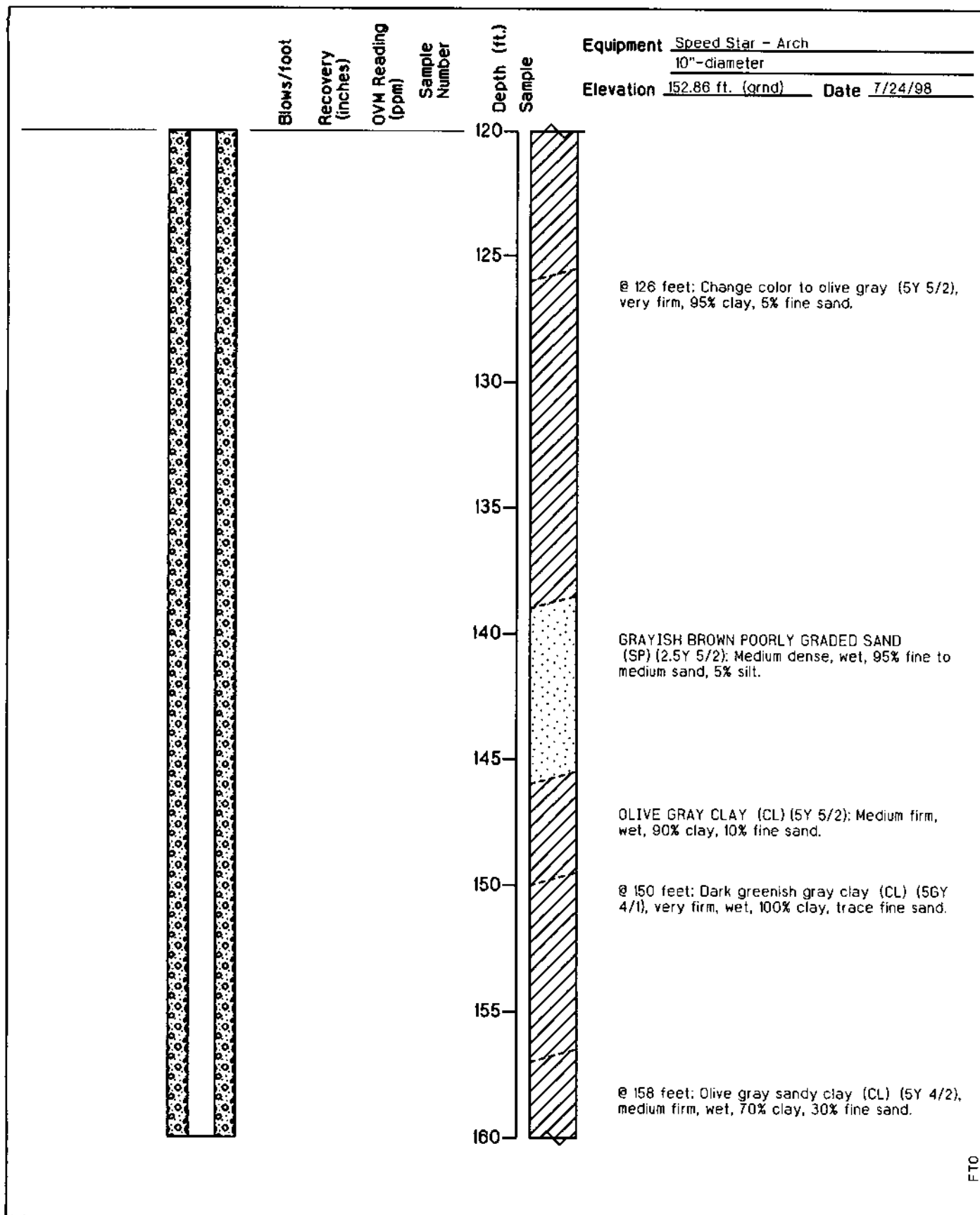
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JOB NUMBER
38086 010210

APPROVED

DATE
9/98

REVISED DATE



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Log of Boring and Well Completion MW-BW-22-180^{LATE}

Carbon Tetrachloride Investigation
 Former Fort Ord, California

A9

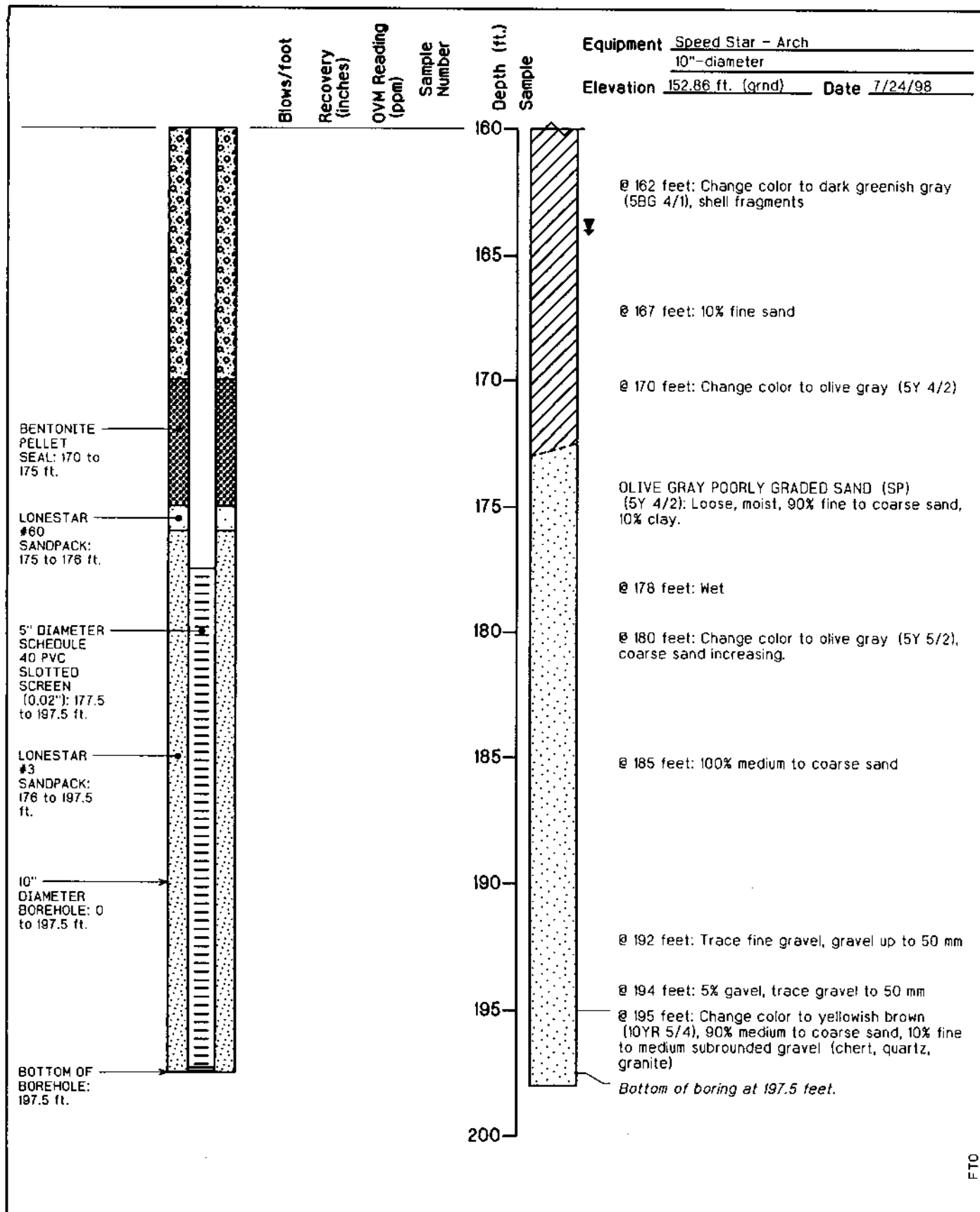
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DATE
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Log of Boring and Well Completion MW-BW-22-180^{LATE}

Carbon Tetrachloride Investigation
Former Fort Ord, California

A9

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EBH

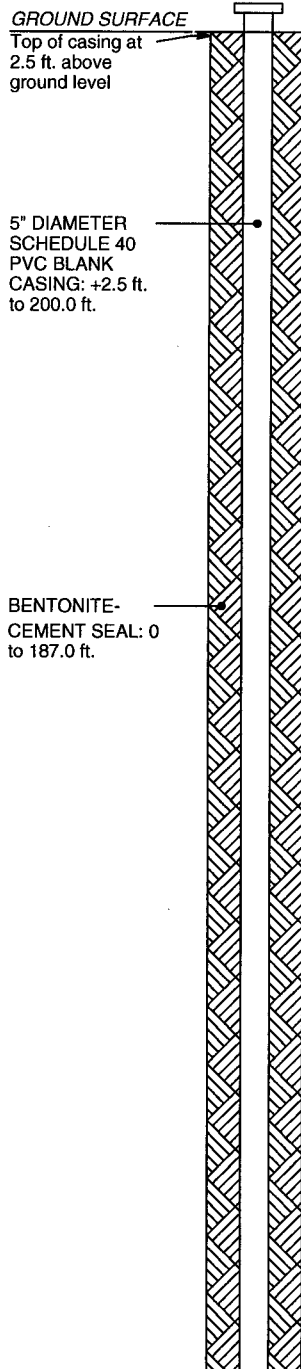
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APPROVED

DATE
9/98

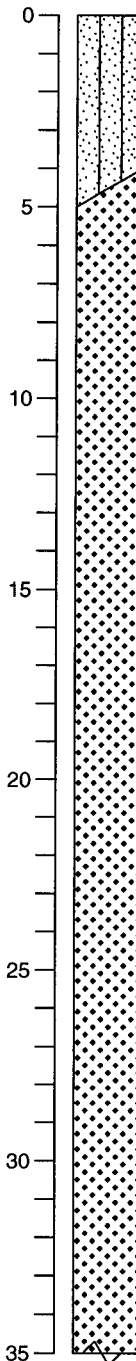
REVISED DATE

BORING_WELL_36086.GPJ GEOL.GDT 10/10/00



Equipment Speed Star ARCH - Mud Fluid
Hole Diameter 105/8 in.
Surface Elevation 146.30 ft. Date 6/29/00
Reference Datum 148.80

Depth (ft.)
Sample



Harding Lawson Associates
Engineering and
Environmental Services

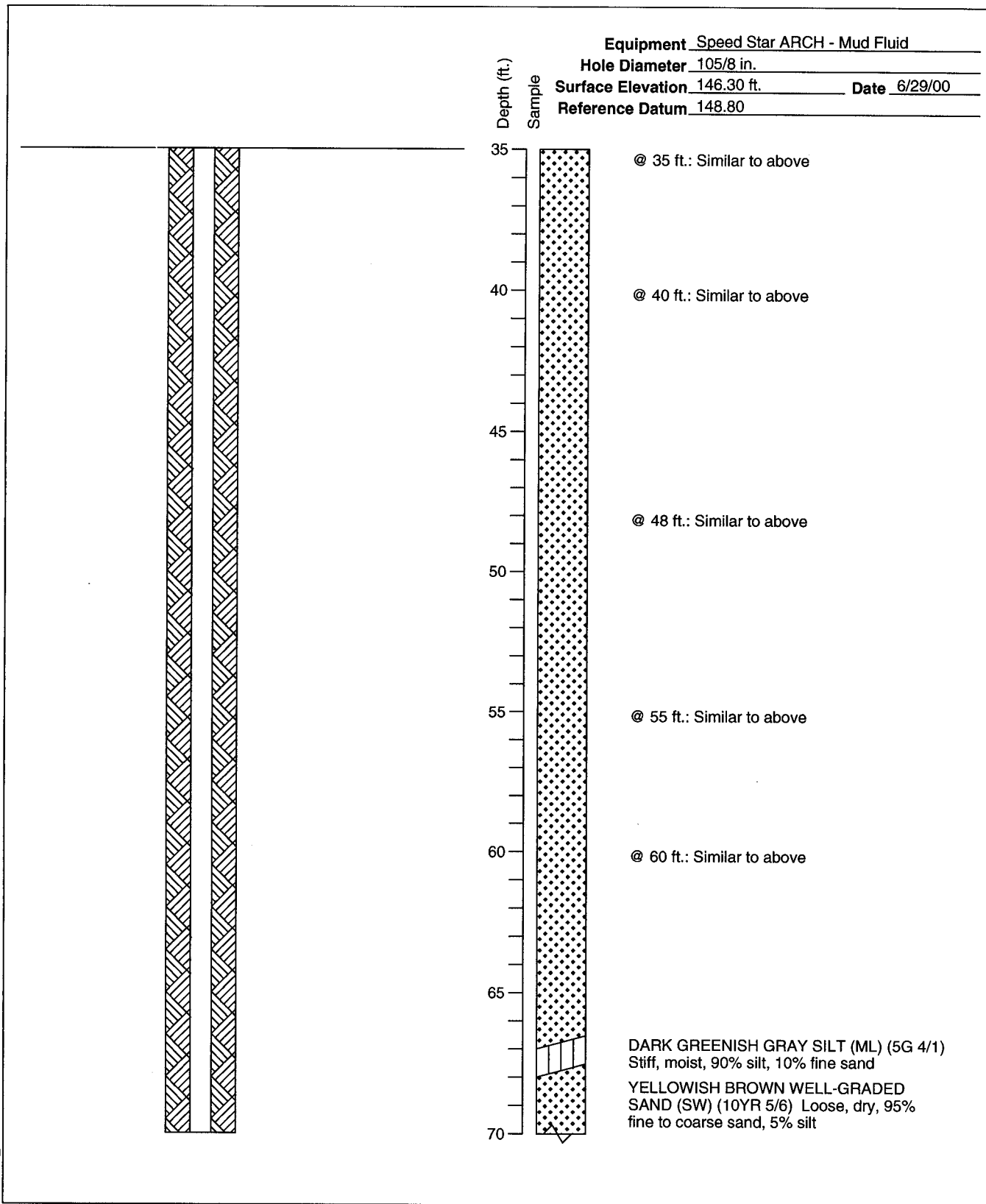
Log of Boring MW-BW-29-180
Carbon Tetrachloride Investigation
Former Fort Ord
Marina, California

PLATE

A10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
CSN	36086 010216		10/00	

BORING_WELL_36086.GPJ GEOL.GDT 10/10/00



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Engineering and
Environmental Services

Log of Boring MW-BW-29-180

Carbon Tetrachloride Investigation
Former Fort Ord
Marina, California

PLATE

A10

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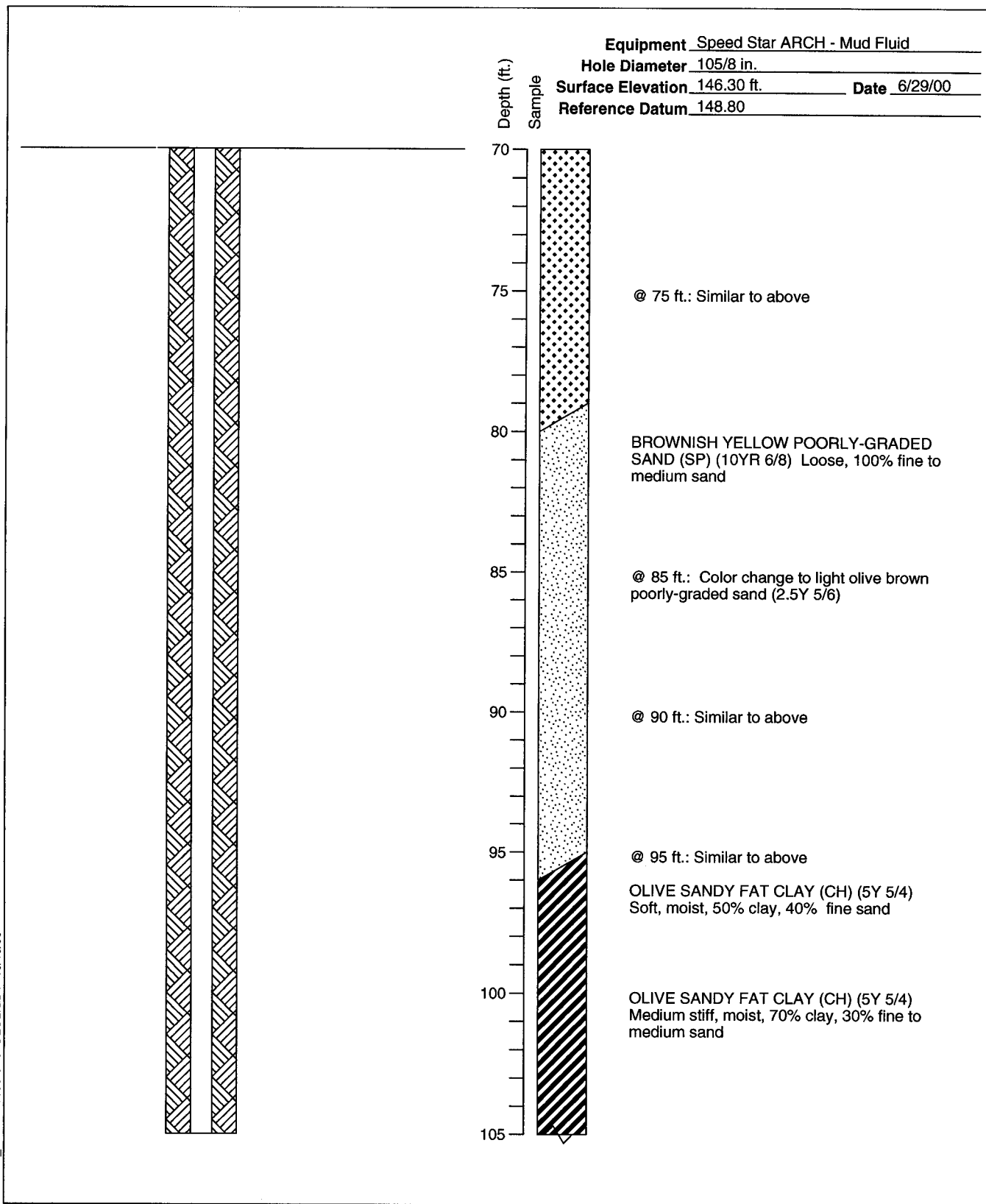
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APPROVED

DATE
10/00

REVISED DATE

BORING_WELL_36086.GPJ GEOL.GDT 10/10/00



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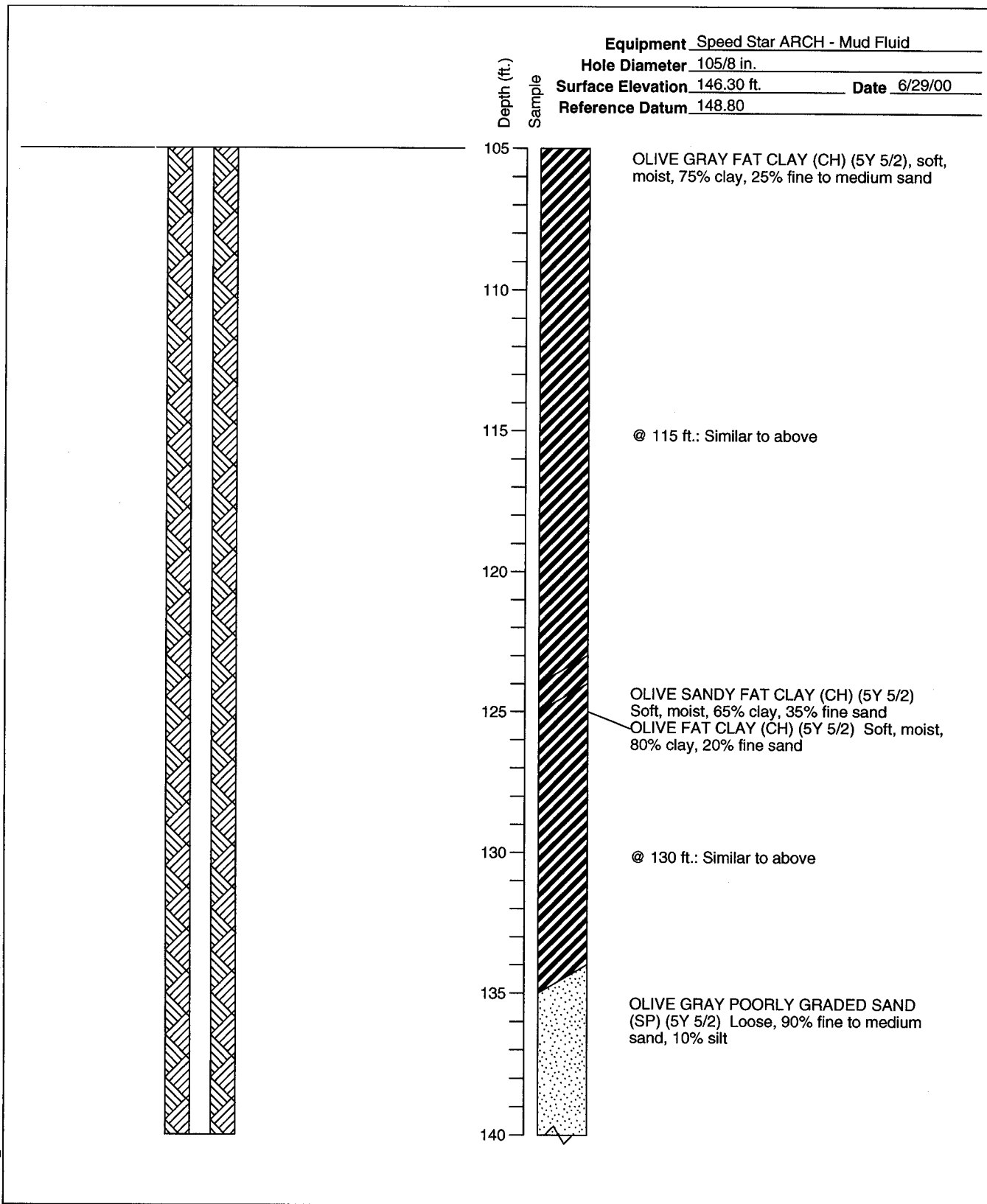
Log of Boring MW-BW-29-180
Carbon Tetrachloride Investigation
Former Fort Ord
Marina, California

PLATE

A10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
CSN	36086 010216		10/00	

BORING_WELL_36086.GPJ GEOL_GDT 10/10/00



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Log of Boring MW-BW-29-180

Carbon Tetrachloride Investigation
Former Fort Ord
Marina, California

PLATE

A10

DRAWN

JOB NUMBER

APPROVED

DATE

REVISED DATE

CSN

36086 010216

10/00

BORING WELL 36086.GPJ GEOL.GDT 10/10/00

Equipment Speed Star ARCH - Mud Fluid
Hole Diameter 105/8 in.
Surface Elevation 146.30 ft. Date 6/29/00
Reference Datum 148.80

Depth (ft.)
Sample

140
145
150
155
160
165
170
175

@ 140 ft.: Similar to above

OLIVE GRAY WELL GRADED SAND (SW)
(5Y 5/2) Loose, 95% fine to coarse, sand,
5% silt

@ 150 ft.: Similar to above

OLIVE GRAY CLAYEY SAND (SC) (5Y 4/2)
Loose, 60% fine to medium sand, 40% clay

DARK BLUISH GRAY FAT CLAY (CH) (5B
4/1) Medium stiff, moist, 90% clay, 10% fine
sand

OLIVE GRAY CLAYEY SAND (SC) (5Y 4/2)
Loose, 85% fine to coarse sand, 15% clay

OLIVE GRAY WELL-GRADED SAND (SW)
(5Y 4/2) Loose, 95% fine to coarse sand,
5% silt



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Engineering and
Environmental Services

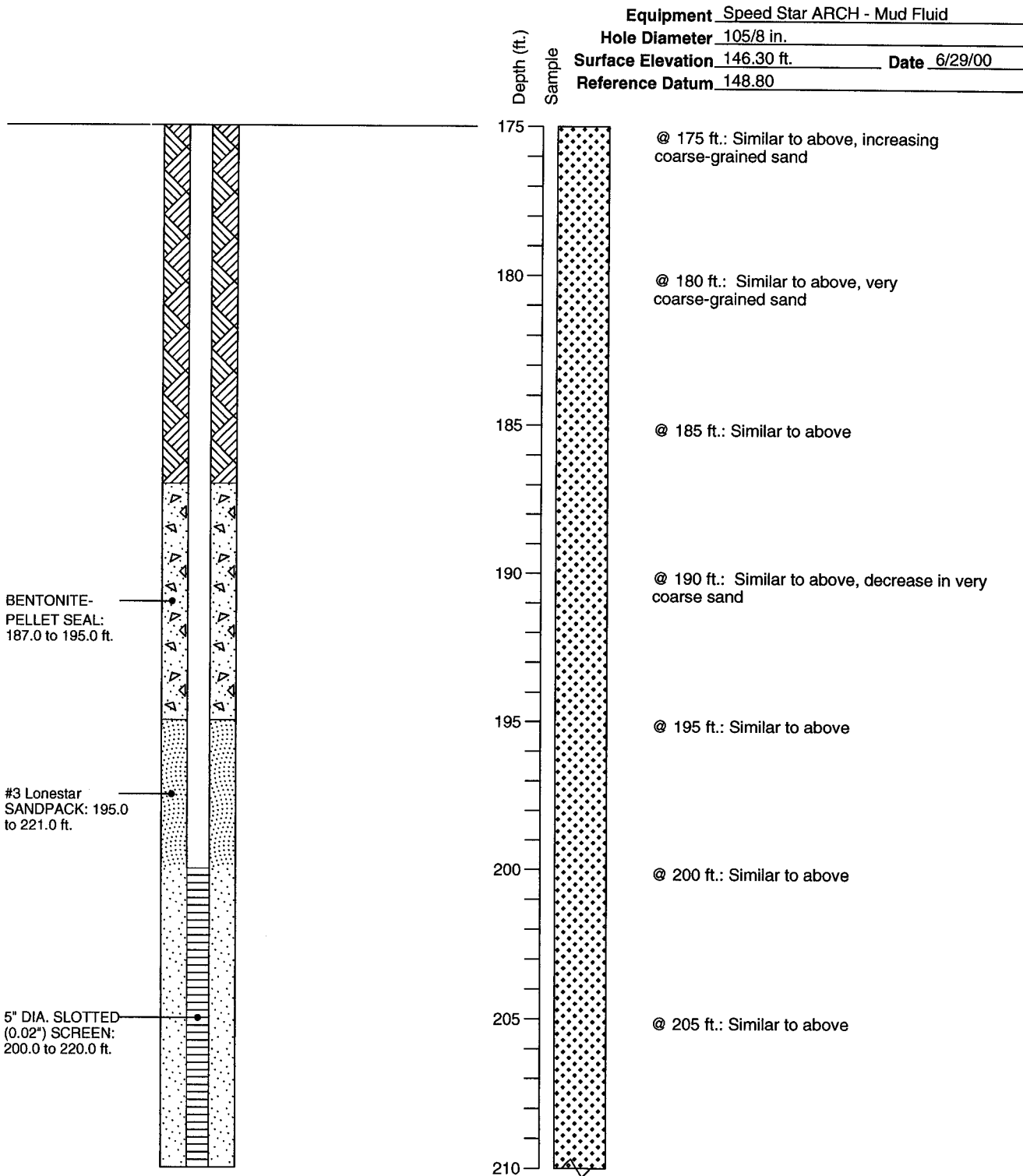
Log of Boring MW-BW-29-180
Carbon Tetrachloride Investigation
Former Fort Ord
Marina, California

PLATE

A10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
CSN	36086 010216		10/00	

BORING_WELL_36086.GPJ GEOL.GDT 10/10/00



Harding Lawson Associates
Engineering and
Environmental Services

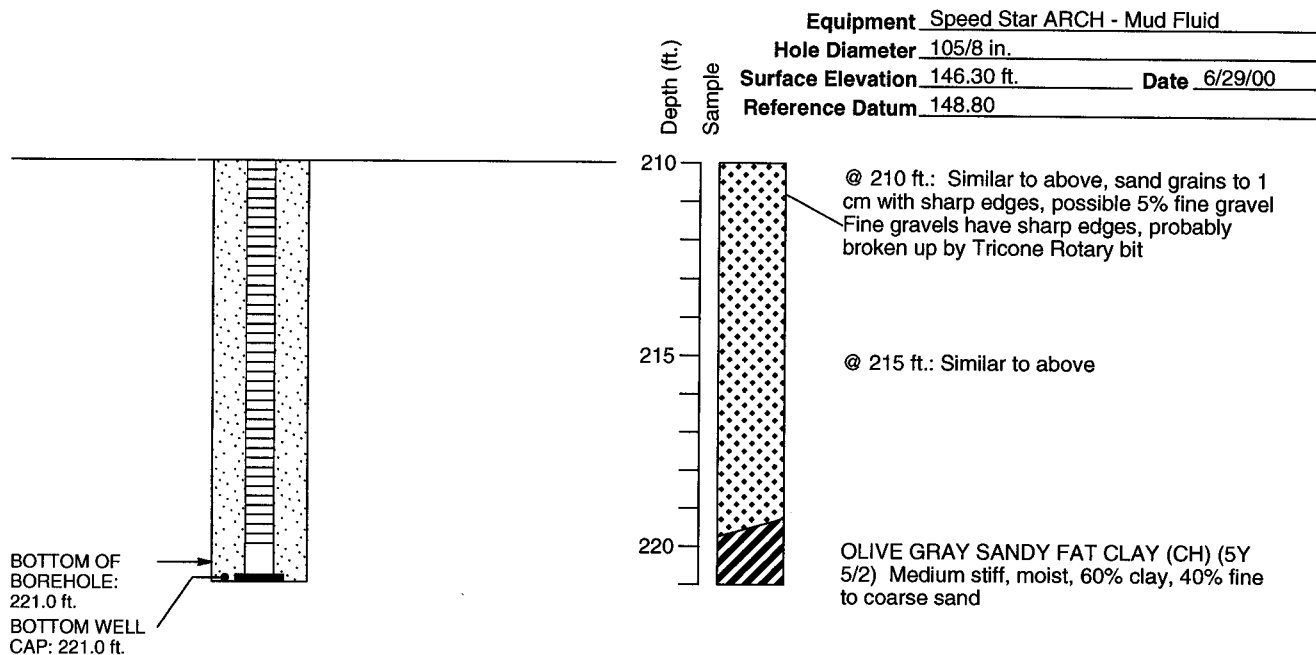
Log of Boring MW-BW-29-180
Carbon Tetrachloride Investigation
Former Fort Ord
Marina, California

PLATE

A10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
CSN	36086 010216		10/00	

BORING_WELL_36086.GPJ GEOL.GDT 10/10/00



Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring MW-BW-29-180
Carbon Tetrachloride Investigation
Former Fort Ord
Marina, California

PLATE

A10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
CSN	36086 010216		10/00	

Top of PVC Casing
Elev. 183.00 ft.
CHRISTY
BOX

GROUND SURFACE

5 in. DIAMETER
SCHEDULE 80
PVC BLANK
CASING: 0.5 to
130 ft.

10 in. DIAMETER
BOREHOLE: 0 to
134 ft.

BENTONITE-
CEMENT SEAL: 0
to 50
ft.redo
after Jim
straightens
screwups

Completion Date 5/28/2003

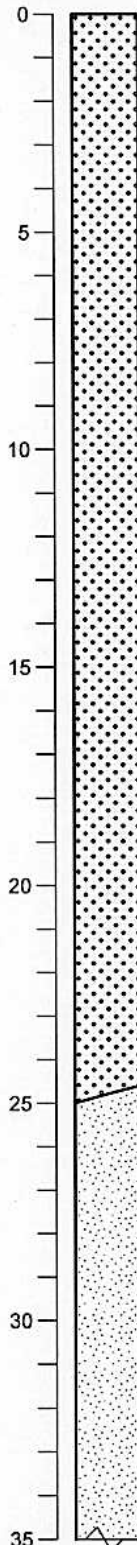
Drilling Method ARCH/mud rotary

Logged by J. Newman

Surface Elevation 183.12 ft. Hole Dia. 10 in.

Northing 2137725.5 Easting 5748172.1

Depth (ft.)
Sample



BROWN WELL GRADED SAND (SW)
(10YR 5/3) Loose, dry, 90% fine to medium
sand, 10% silt

@ 8 ft.: Change to YELLOW (2.5Y 7/6) 95%
fine to medium sand, 5% silt

@ 15 ft.: Change to OLIVE YELLOW (2.5Y
6/6) Medium dense, moist, 95% fine to
medium sand, 5% silt

@ 20 ft.: Change to LIGHT OLIVE BROWN
(2.5Y 5/6)

LIGHT OLIVE BROWN POORLY GRADED
SAND (SP) (2.5Y 5/6) Medium dense,
moist, 95% fine sand, 5% silt

@ 30 ft.: Similar to above

BORING_WELL_OUCTP OUCTPV6.GPJ FTO_OUCTP.GDT 1/17/05



MACTEC

Well Construction Details and
Log of Boring MW-BW-62-A
OUCTP

Fort Ord, California

PLATE

A85

DRAWN
MBP

JOB NUMBER
55596 001701

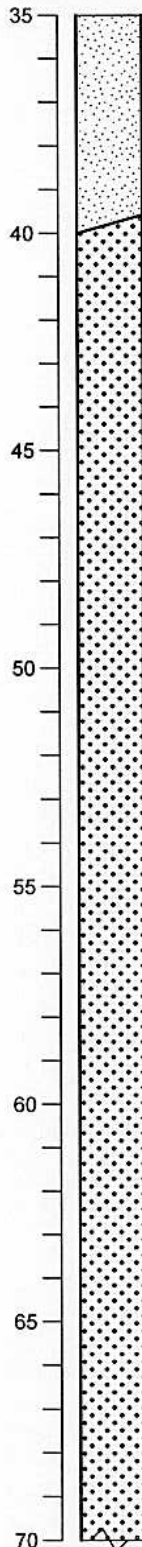
APPROVED
MDT / cm

DATE
1/05

REVISED DATE

Completion Date 5/28/2003
 Drilling Method ARCH/mud rotary
 Logged by J. Newman
 Surface Elevation 183.12 ft. Hole Dia. 10 in.
 Northing 2137725.5 Easting 5748172.1

Depth (ft.)
Sample



@ 35 ft.: Similar to above

LIGHT OLIVE BROWN WELL GRADED SAND (SW) (2.5Y 5/6) Medium dense, moist, 95% fine to medium sand, 5% silt

@ 45 ft.: Similar to above

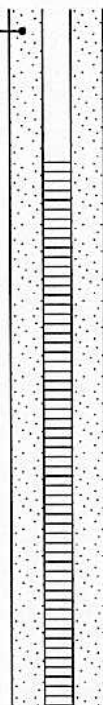
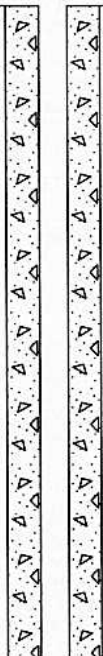
@ 50 ft.: Change to YELLOWISH BROWN (10YR 5/6)

@ 55 ft.: Similar to above

@ 60 ft.: Similar to above

@ 65 ft.: Similar to above

#3 SANDPACK: 54 to 93 ft.



BORING_WELL_OUCTP_OUCTPV6.GPJ FTO_OUCTP.GDT 1/17/05



MACTEC

Well Construction Details and
Log of Boring MW-BW-62-A
OUCTP

Fort Ord, California

PLATE

A85

DRAWN
MBP

JOB NUMBER
55596 001701

APPROVED
MDT / cm

DATE
1/05

REVISED DATE

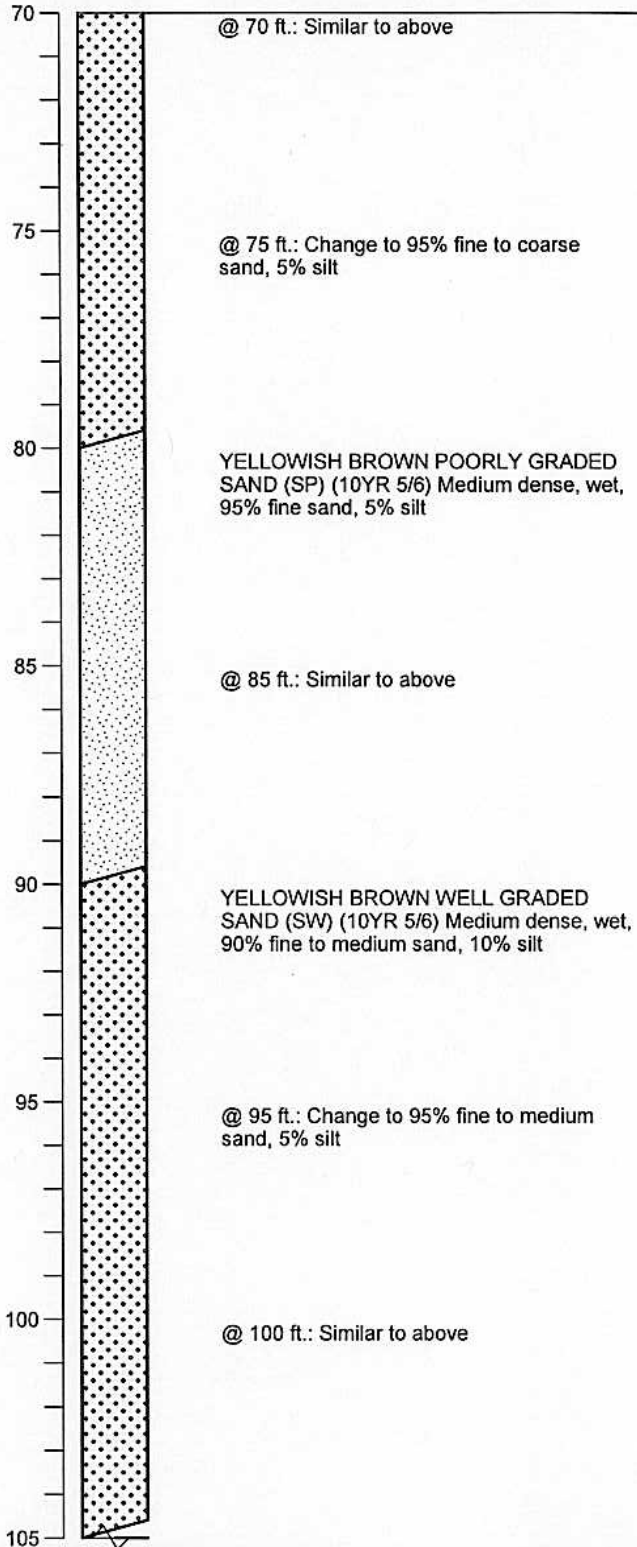
Completion Date 5/28/2003
 Drilling Method ARCH/mud rotary
 Logged by J. Newman
 Surface Elevation 183.12 ft. Hole Dia. 10 in.
 Northing 2137725.5 Easting 5748172.1

Depth (ft.)
 Sample

5 in. DIAMETER
 SLOTTED (0.020
 in.) SCREEN: 57.5
 to 89.5 ft.

BENTONITE
 PELLET SEAL: 93
 to 97 ft.
 10 ft. of blank
 casing between
 screens

#3 SANDPACK: 97
 to 135 ft.



BORING_WELL_OUCTP_OUCTPV6.GPJ FTO_OUCTP.GDT 1/17/05



MACTEC

Well Construction Details and
 Log of Boring MW-BW-62-A
 OUCTP

PLATE

A85

Fort Ord, California

DRAWN
 MBP

JOB NUMBER
 55596 001701

APPROVED
 MDT / cm

DATE
 1/05

REVISED DATE

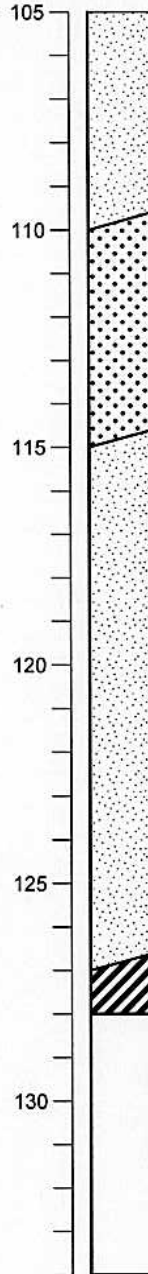
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 Drilling Method ARCH/mud rotary
 Logged by J. Newman
 Surface Elevation 183.12 ft. Hole Dia. 10 in.
 Northing 2137725.5 Easting 5748172.1

Depth (ft.)
 Sample

#3 SANDPACK: 97
 to 135 ft.
 5 in. DIAMETER
 SLOTTED (0.020
 in.) SCREEN: 89.5
 to 129.5 ft.

End cap to bottom
 of screen: 5 in.
 BOTTOM WELL
 CAP: 130 ft.

#3 SANDPACK:
 130 to 135 ft.



YELLOWISH BROWN POORLY GRADED
 SAND (SP) (10YR 5/6) Medium dense, wet,
 95% fine sand, 5% silt

YELLOWISH BROWN WELL SAND (SW)
 (10YR 5/6) Medium dense, wet, 95% fine to
 medium sand, 5% silt

YELLOWISH BROWN POORLY GRADED
 SAND (SP) (10YR 5/6) Medium dense, wet,
 95% fine sand, 5% silt

@ 120 ft.: Change to YELLOWISH BROWN
 (10YR 5/4) 90% fine sand, 10% silt

@ 125 ft.: Change to 95% fine sand, 5% silt

OLIVE FAT CLAY (CH) (5Y 5/6) Dense,
 moist, 95% clay, 5% fine sand

Bottom of boring at 134 ft. redrilling
 necessary after difficulty installing well

BORING_WELL_OUCTP OUCTPV6.GPJ FTO_OUCTP.GDT 1/17/05



MACTEC

Well Construction Details and
 Log of Boring MW-BW-62-A
 OUCTP

Fort Ord, California

PLATE

A85

DRAWN
 MBP

JOB NUMBER
 55596 001701

APPROVED
 MDT / can

DATE
 1/05

REVISED DATE

Top of PVC Casing
Elev. 177.26 ft.
CHRISTY
BOX

GROUND SURFACE

5 in. DIAMETER
SCHEDULE 80
PVC BLANK
CASING: 0.5 to
128 ft.

10 in. DIAMETER
BOREHOLE: 0 to
134 ft.

BENTONITE-
CEMENT SEAL: 0
to 47 ft.

Completion Date 6/4/2003

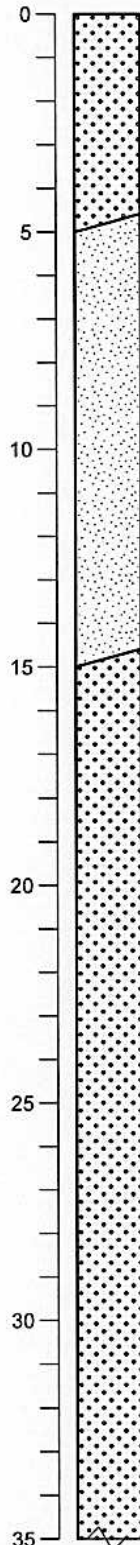
Drilling Method ARCH/mud rotary

Logged by J. Newman

Surface Elevation 177.43 ft. Hole Dia. 10 in.

Northing 2138018 Easting 5748548.7

Depth (ft.)
Sample



YELLOWISH BROWN WELL GRADED
SAND (SW) (10YR 5/8) Loose, dry, 88%
fine to coarse sand, 10% silt, 2% gravel
@ 2 ft.: Change to DARK YELLOWISH
BROWN (10YR 4/6) 90% fine to medium
sand, 10% silt, Trace organics
@ 3 ft.: Change to DARK BROWN (10YR
3/3) Loose, barely moist, 95% fine to
medium sand, 5% silt
BROWNISH YELLOW POORLY GRADED
SAND (SP) (10yr 6/8) Loose, moist, 95%
fine sand, 5% silt

@ 10 ft.: Similar to above

@ 12 ft.: Similar to above

LIGHT OLIVE BROWN WELL GRADED
SAND (SW) (2.5Y 5/6) Loose, moist, 95%
fine to coarse sand, 5% silt

@ 20 ft.: Similar to above

@ 25 ft.: Similar to above

@ 30 ft.: Similar to above

BORING_WELL_OUCTP OUCTPV6.GPJ FTO_OUCTP.GDT 11/24/04



MACTEC

Well Construction Details and
Log of Boring MW-BW-64-A
OUCTP

PLATE

Fort Ord, California

DRAWN
MBP

JOB NUMBER
55596 001701

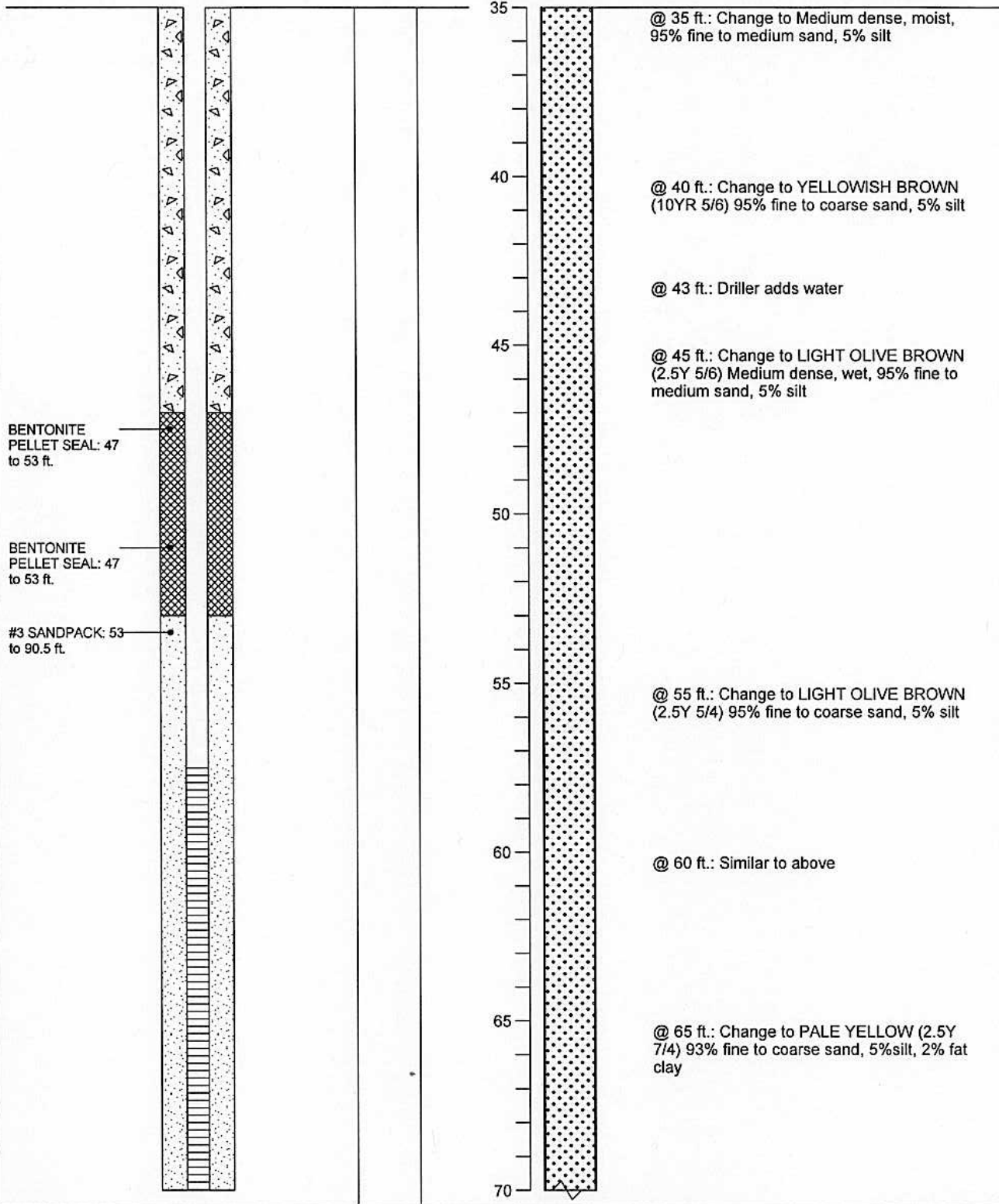
APPROVED
MDT/cmr

DATE
11/04

A87
REVISED DATE

Completion Date 6/4/2003
 Drilling Method ARCH/mud rotary
 Logged by J. Newman
 Surface Elevation 177.43 ft. Hole Dia. 10 in.
 Northing 2138018 Easting 5748548.7

BORING WELL_OUCTP OUCTPV8.GPJ FTO_OUCTP.GDT 11/24/04



MACTEC

**Well Construction Details and
Log of Boring MW-BW-64-A**
OUCTP

PLATE

Fort Ord, California

DRAWN
MBP

JOB NUMBER
55596 001701

APPROVED
MDT/cmr

DATE
11/04

A87
REVISED DATE

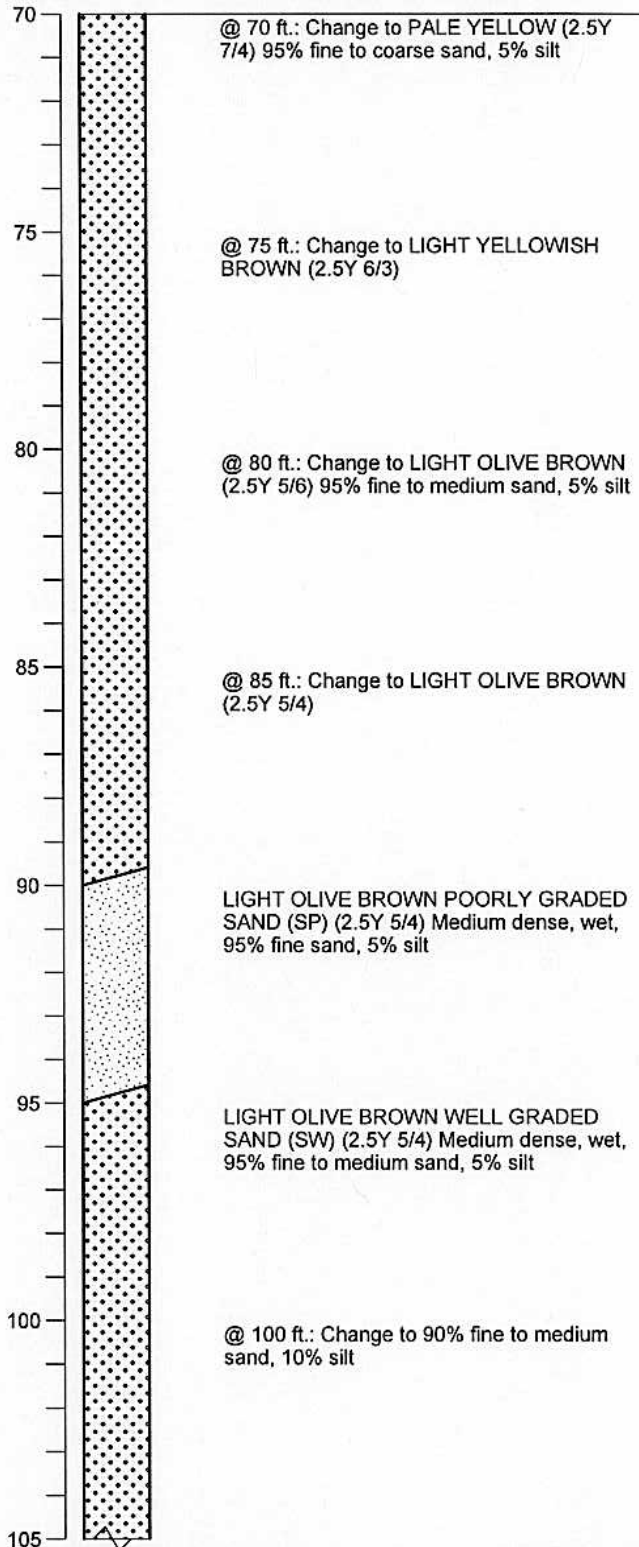
Completion Date 6/4/2003
 Drilling Method ARCH/mud rotary
 Logged by J. Newman
 Surface Elevation 177.43 ft. Hole Dia. 10 in.
 Northing 2138018 Easting 5748548.7

Depth (ft.)
 Sample

5 in. DIAMETER
 SLOTTED (0.020
 in.) SCREEN: 57.5
 to 87.5 ft.

BENTONITE
 PELLET SEAL:
 90.5 to 95 ft.
 10 ft. of blank
 casing between
 screens

#3 SANDPACK: 95
 to 134 ft.



BORING_WELL_OUCTP OUCTPV6.GPJ FTO_OUCTP.GDT 11/24/04



MACTEC

Well Construction Details and
 Log of Boring MW-BW-64-A
 OUCTP

PLATE

Fort Ord, California

DRAWN
 MBP

JOB NUMBER
 55596 001701

APPROVED
 MDT/Car

DATE
 11/04

A87
 REVISED DATE

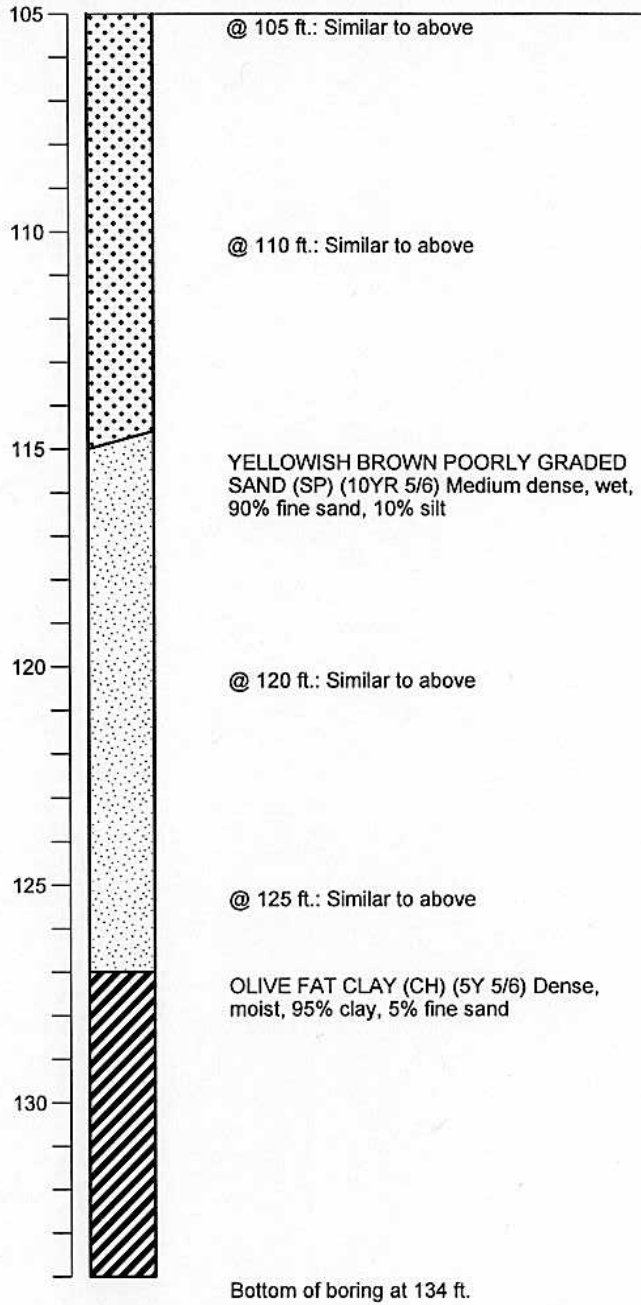
Completion Date 6/4/2003
 Drilling Method ARCH/mud rotary
 Logged by J. Newman
 Surface Elevation 177.43 ft. Hole Dia. 10 in.
 Northing 2138018 Easting 5748548.7

Depth (ft.)
 Sample

#3 SANDPACK: 95
 to 134 ft.
 5 in. DIAMETER
 SLOTTED (0.020
 in.) SCREEN: 97.5
 to 127.5 ft.

End cap to bottom
 of screen: 5 in.
 BOTTOM WELL
 CAP: 128 ft.

#3 SANDPACK:
 128 to 134 ft.



Well Construction Details and
 Log of Boring MW-BW-64-A
 OUCTP

PLATE



MACTEC

Fort Ord, California

DRAWN
 MBP

JOB NUMBER
 55596 001701

APPROVED

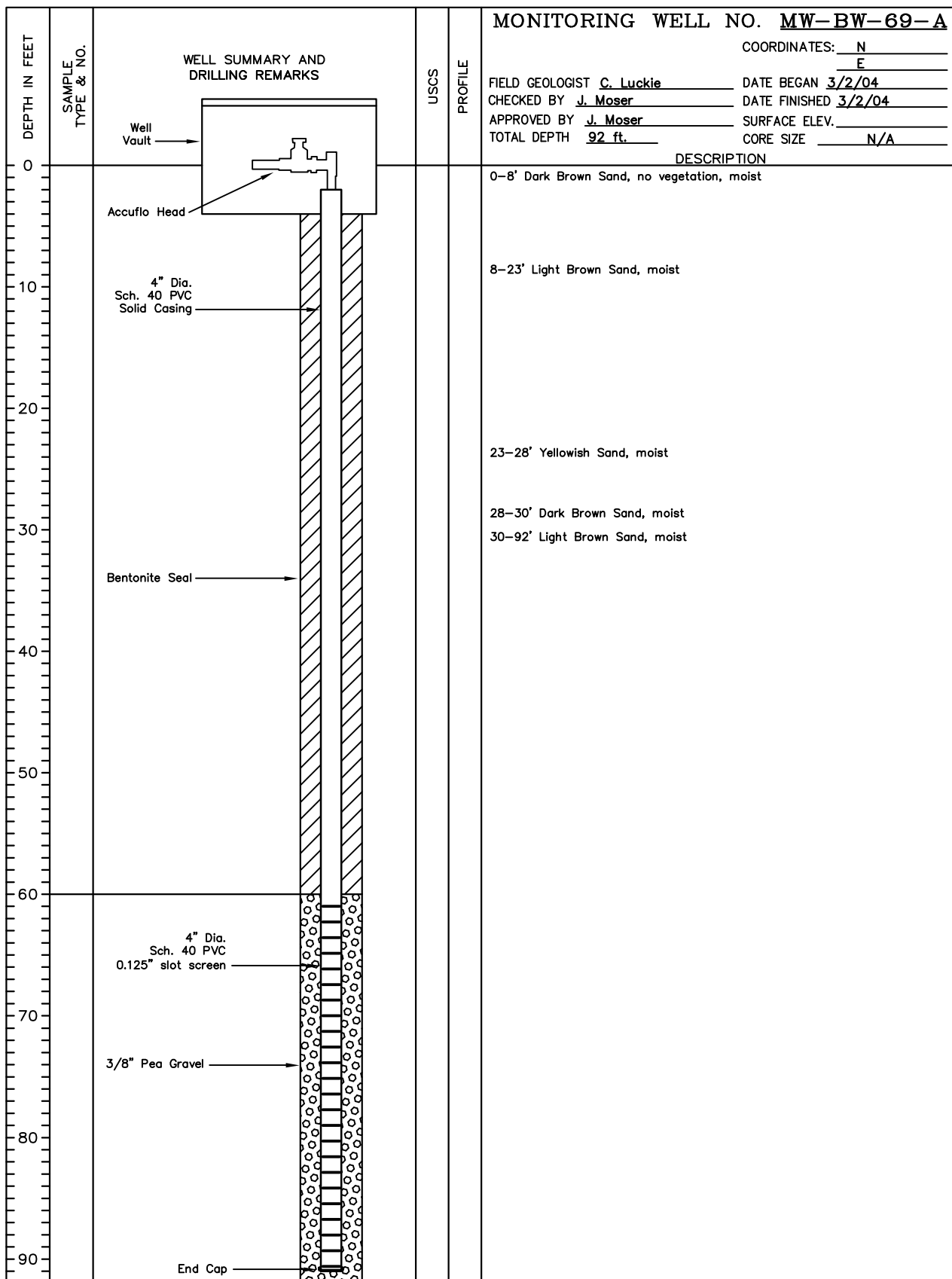
MDT/cwr

DATE
 11/04

REVISED DATE

A87

DEPTH IN FEET		SAMPLE TYPE & NO.	WELL SUMMARY AND DRILLING REMARKS	USCS	PROFILE	MONITORING WELL NO. <u>MW-BW-68-A</u>
						COORDINATES: <u>N</u> <u>E</u> FIELD GEOLOGIST <u>C. Luckie</u> DATE BEGAN <u>3/1/04</u> CHECKED BY <u>J. Moser</u> DATE FINISHED <u>3/2/04</u> APPROVED BY <u>J. Moser</u> SURFACE ELEV. _____ TOTAL DEPTH <u>92 ft.</u> CORE SIZE <u>N/A</u>
						DESCRIPTION
0 10 20 30 40 50 60 70 80 90						0-6" Dark Brown Soil / Organics 6"-3' Dark Brown Sand, moist 3-7' Yellowish Brown Sand, moist 7-16' Medium Brown Sand, moist 16-75' Light Brown Sand, moist 75-92' Medium, Light Brown Sand mix, moist
DRILLING CO. : Woodward Drilling DRILLING METHOD : 8" Hollow Stem Auger LOCATION : CTP Site, Former Fort Ord, California PROJECT NO. : 783751						Bottom of Boring = 92' Hand augered to 5' Logged by tailings
DRAWN BY <u>K. Black</u> CHECKED BY _____ DATE <u>6/1/04</u> APPROVED BY _____						FILE NAME & DISK NUMBER <u>MW-BW-68-A</u>
Shaw® Shaw Environmental, Inc.						



Bottom of Boring = 92'
 Logged by tailings

PAGE 1 OF 1

DRILLING CO. : Woodward Drilling
 DRILLING METHOD : 8" Hollow Stem Auger
 LOCATION : CTP Site, Former Fort Ord, California
 PROJECT NO. : 783751

DRAWN BY	K. Black	CHECKED BY		FILE NAME & DISK NUMBER	MW-BW-69-A
DATE	6/1/04	APPROVED BY			

MONITORING WELL:

L-33-A

JOB NAME:

FORT ORD LANDFILLS

JOB NUMBER:

13848-007-043

DATE COMPLETED:

2/28/92

DRILLING METHOD:

HOLLOW STEM AUGER

SURFACE ELEVATION:

TOP OF PVC WELL:

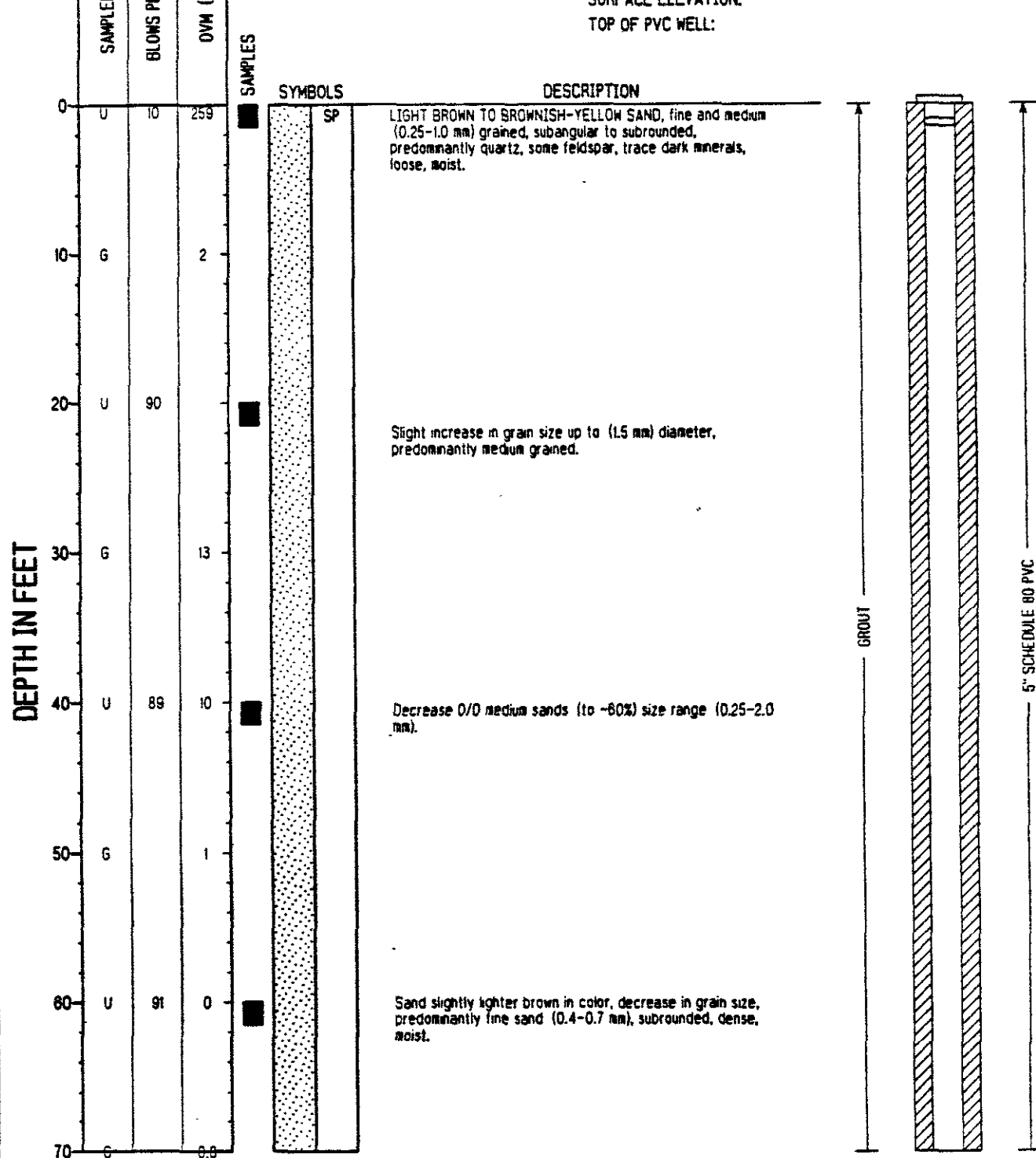
WELL LOG
Dames & Moore

PLATE A-6

MONITORING WELL:

L-33-A

JOB NAME:

FORT ORD LANDFILLS

JOB NUMBER:

13846-007-043

DATE COMPLETED:

2/26/92

DRILLING METHOD:

HOLLOW STEM AUGER

SURFACE ELEVATION:

TOP OF PVC WELL:

DEPTH IN FEET	SAMPLING			SAMPLES	SYMBOLS
	SAMPLER TYPE	BLOWS PER FOOT	QVM (ppm)		
70					SP
80	U	50/5	0	■	
90	G		1		
100	U	50/5		■	
110	G		0.8		
120	U			■	
130					
140	U		0		

DESCRIPTION

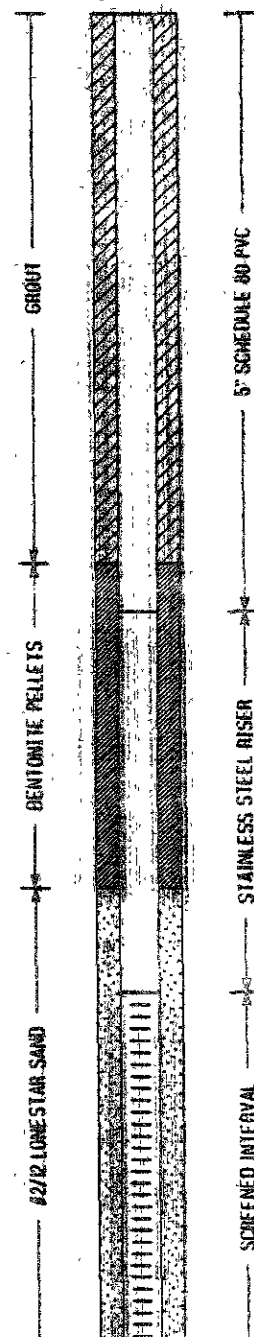
Color change to brownish-yellow, increase in grain size to fine and medium (0.1-1.5 mm), subangular to subrounded, slight increase in moisture.

Some sand up to 2 mm diameter.

Slightly lighter brown color, decrease in grain size to fine and medium sand (0.4-0.7 mm).

Some sand up to 1.5 mm diameter.

Water encountered in boring at 119 feet.
Color change to brown, predominantly medium grained (0.25-2.0 mm), some coarse sand (2.5 mm), trace subrounded gravel up to (5 mm) diameter, loose, wet.

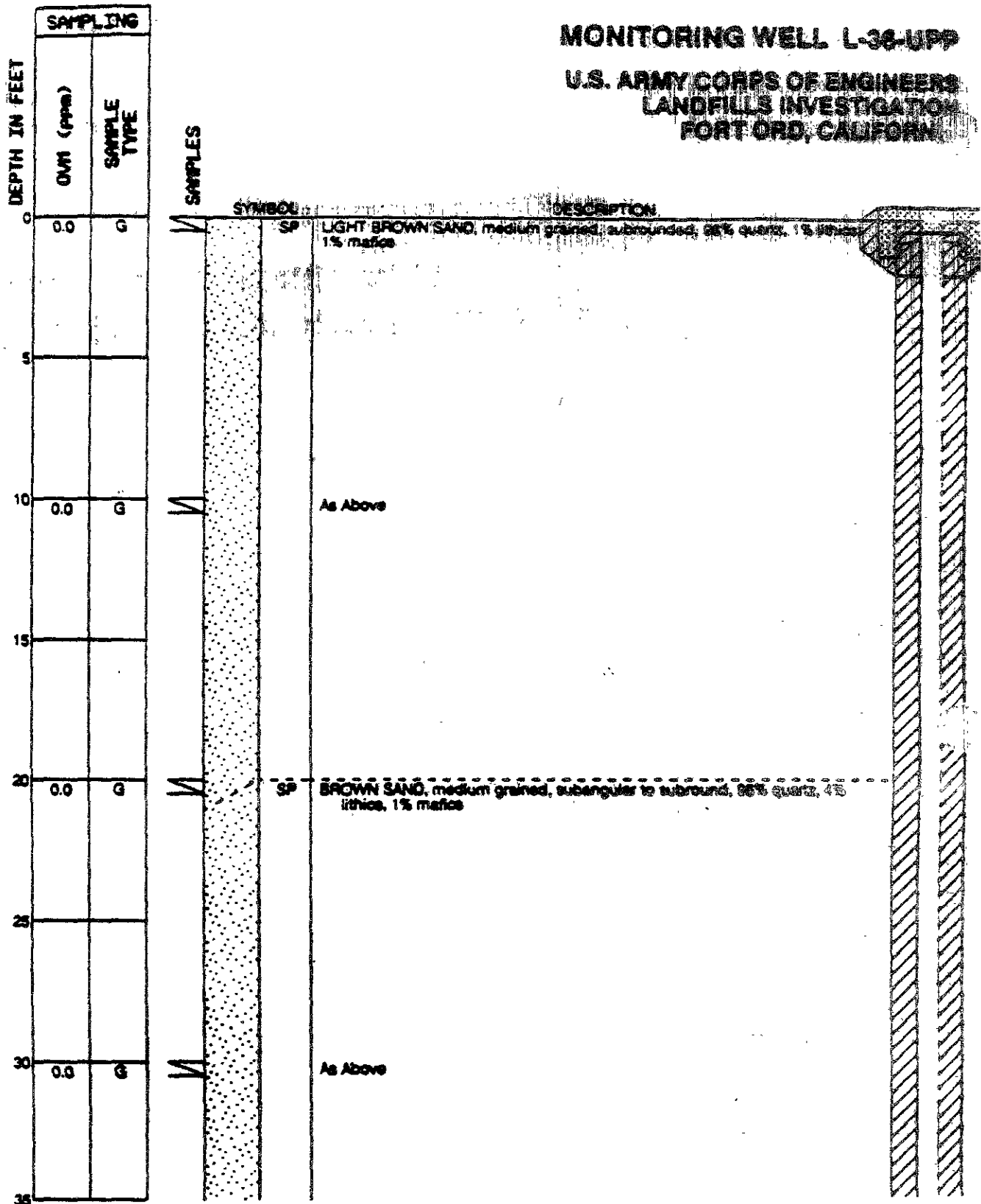


WELL LOG
Dames & Moore

PLATE A-3

MONITORING WELL L-38-UPP

U.S. ARMY CORPS OF ENGINEERS
LANDFILLS INVESTIGATION
FORT ORD, CALIFORNIA



See Plate A-1 for general log notes and explanation of the terms and symbols.

Continued Next Page

Job No.: 13848-007-043 Ser. No.: L-38-UPP	Dames & Moore			Log of Boring	
Date Completed: 11/12/93 Boring Depth: 139.0 ft.	Grade Elev: 94.80 FT MSL Coordinates: 498163.54 N; 1177988.40 E 1927 Zone IV	Location: FORT ORD, CA			
Top of Casing Elev: 94.39 ft. MSL PVC Casing Depth: 135.0 ft.	Casing Type: Sch 80 PVC Casing Diam: 5.0 in.	Screened Interval: 123.0-133.0 ft. Effective Interval: 120.0-133.0 ft.	Sleeve Size: 0.020 in. Sand Pack: #2/12		

Log Template: WELLS

March 21, 1994

PAGE 1 OF 4

MONITORING WELL L-36-UPP

U.S. ARMY CORPS OF ENGINEERS
LANDFILLS INVESTIGATION
FORT ORD, CALIFORNIA

DEPTH IN FEET	SAMPLING		SAMPLES	SYMBOL	DESCRIPTION		
	CON (ppm)	SAMPLE TYPE					
35							
40	0.0	G	W		As Above		
45							
50	0.0	G	W		As Above		
55							
60	0.0	G	W		As Above		
65							
70							

Continued Next Page

See Plate A-1 for general log notes and explanation of the terms and symbols.

Job No.: 13846-007-043
Ser. No.: L-36-UPP

Dames & Moore

Log of Boring

Log Template: WELL3

March 21, 1984

PAGE 2 of 4

MONITORING WELL L-38-UPP

U.S. ARMY CORPS OF ENGINEERS
LANDFILLS INVESTIGATION
FORT ORD, CALIFORNIA

DEPTH IN FEET	SAMPLING		SAMPLES	SYMBOL	DESCRIPTION	
	QUM (ft/min)	SAMPLE TYPE				
70	0.0	G	✓		As Above	
75						
80	0.0	G	✓		With increasing fine sand	
85						
90	0.0	G	✓		As Above	
95						
100	0.0	G	✓		As Above	
105						

Continued Next Page

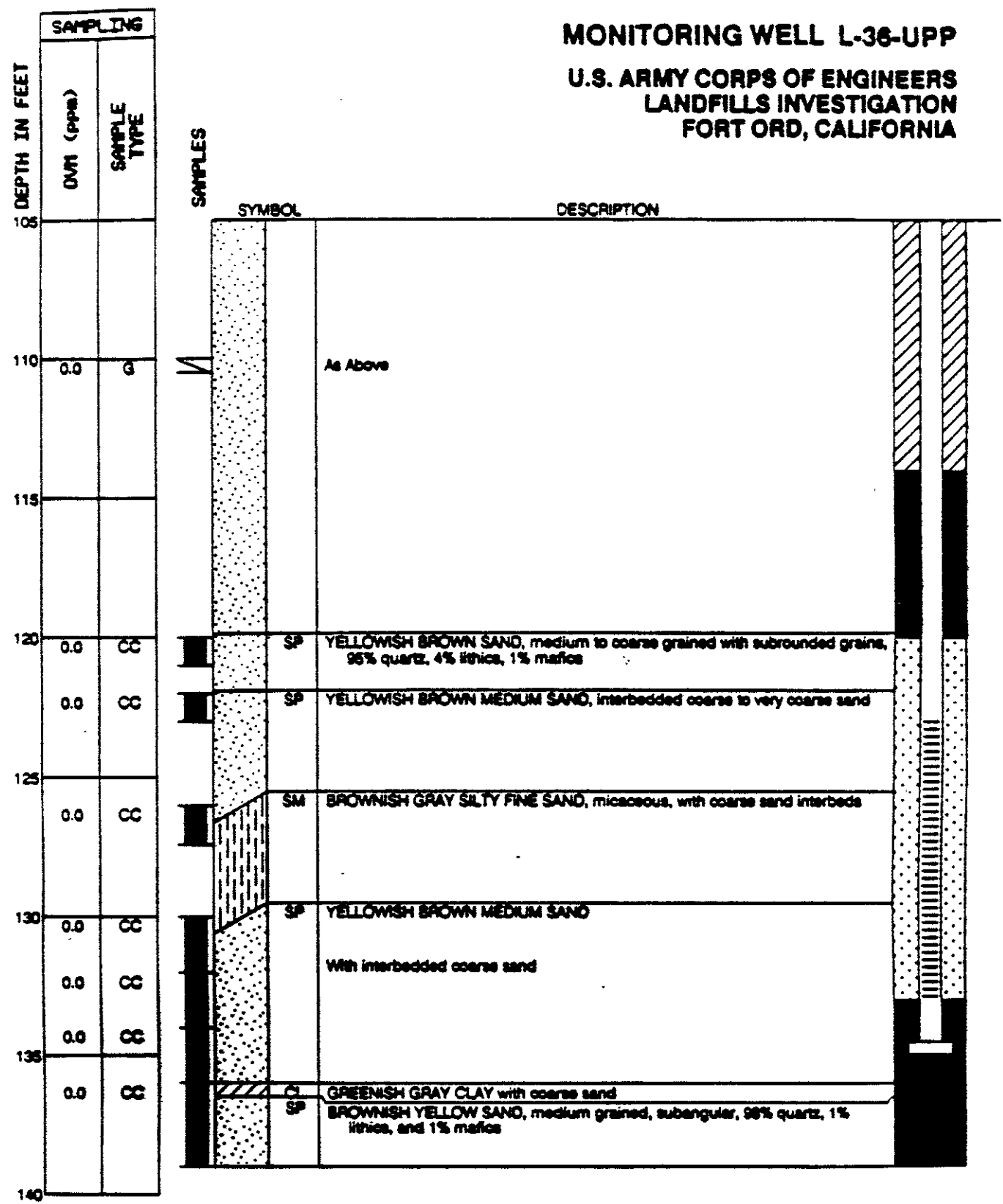
See Plate A-1 for general log notes and explanation of the terms and symbols.

Job No.: 13846-007-043
Ser. No.: L-38-UPP

Dames & Moore

Log of Boring

MONITORING WELL L-36-UPP
U.S. ARMY CORPS OF ENGINEERS
LANDFILLS INVESTIGATION
FORT ORD, CALIFORNIA



Note: Bentonite backfill from 139 to 133 feet.

See Plate A-1 for general log notes and explanation of the terms and symbols.

Top of PVC Casing
Elev. 173.34 ft.

GROUND SURFACE

TOP OF
CASING at 1.5
ft. above
ground
surface

12" DIAMETER
BOREHOLE: 0
to 123.5 ft.

CEMENT/
BENTONITE
SEAL: 0 to
84 ft.

5" DIAMETER
SCHEDULE
80 PVC
BLANK
CASING: +1.5
to 94 ft.

Blows/foot
Recovery
(inches)
PID Reading
(ppm)
Sample
Number

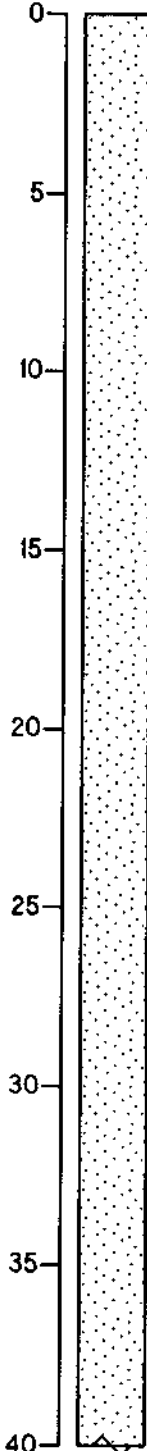
Depth (ft.)
Sample

Equipment Hollow Stem Auger (CME 95)

12"-diameter

Elevation 171.70 ft. GS

Date 11-17-97



DARK YELLOWISH BROWN SAND (SP) (10YR3/4):
loose, moist, 90% fine sand, 10% silt.

Color change to brownish yellow (10YR6/6) at
5.5 ft. Dry, 95% fine to medium sand, 5% silt.

Change to moist at 20 ft.

Color change to yellowish brown (10YR5/6) at 30
ft.

Color change to yellowish brown (10YR5/8) at 35
ft.

FTO



Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring and Well Completion MW-0U2-59-A
OU 2 Plume Delineation
Investigation Report
Fort Ord, California

PLATE

A 16

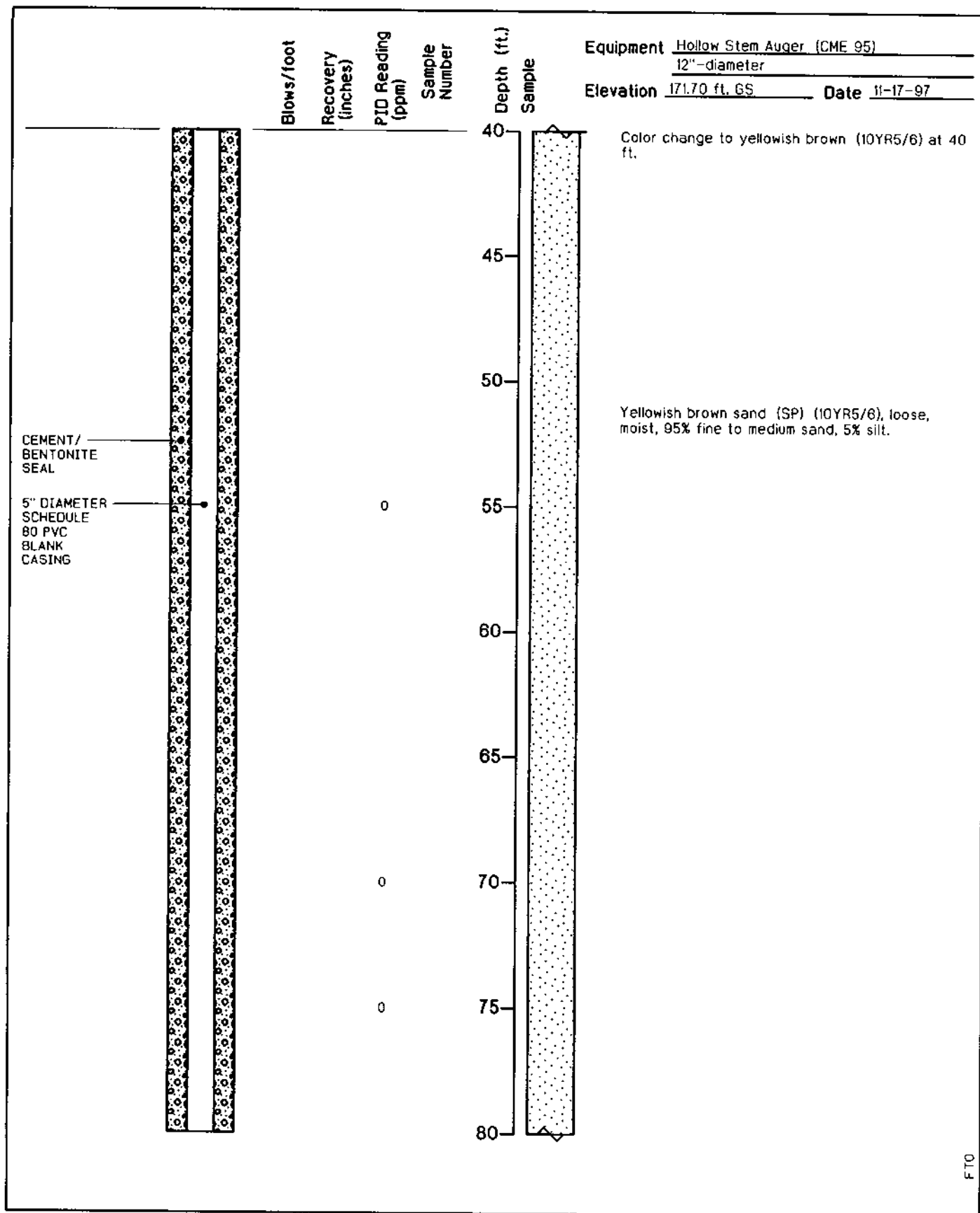
DRAWN
TAC

JOB NUMBER
36086 01020701

APPROVED

DATE
12/97

REVISED DATE



Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring and Well Completion MW-OU2-59-A
OU 2 Plume Delineation
Investigation Report
Fort Ord, California

PLATE

A16

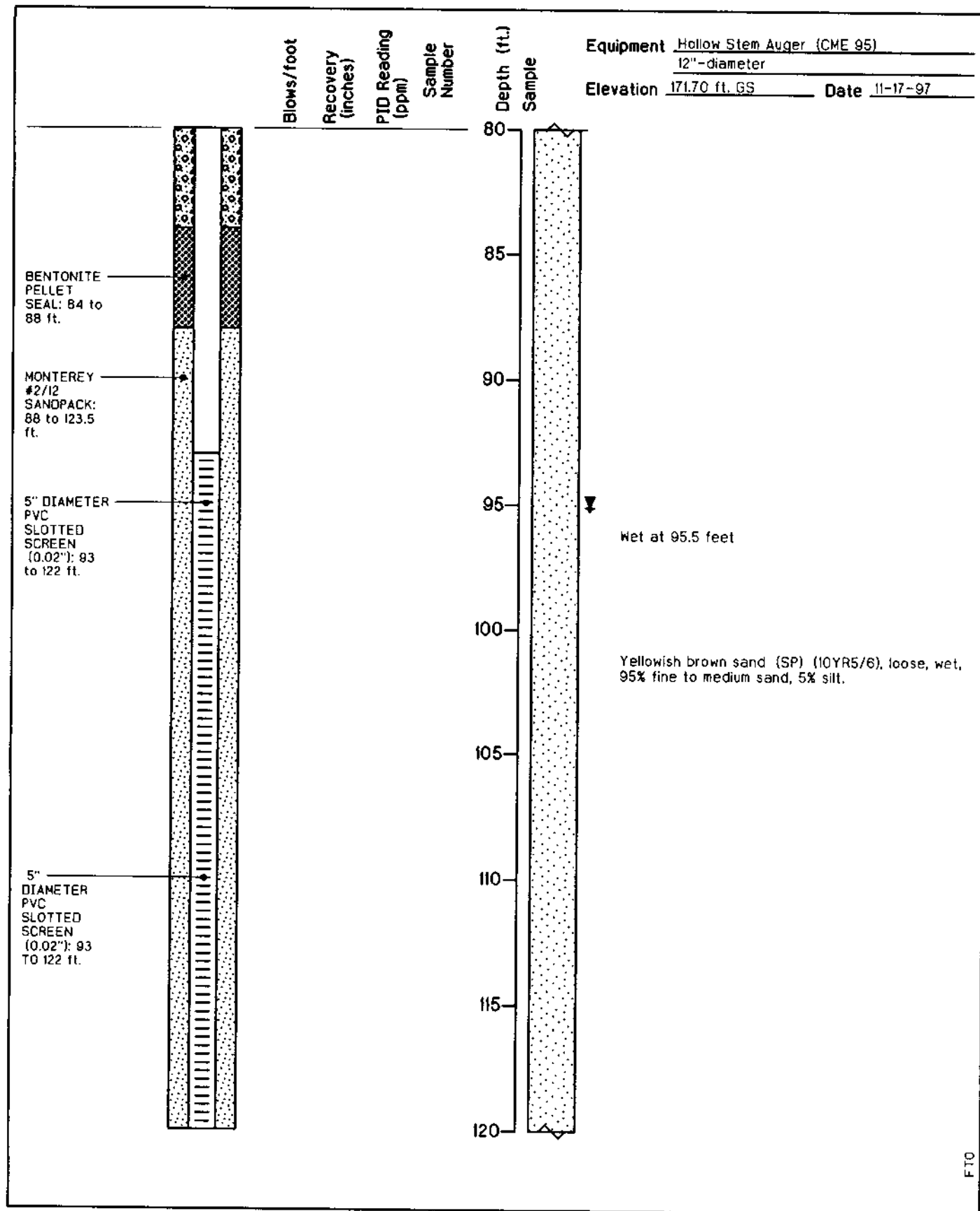
DRAWN
TAC

JOB NUMBER
36086 01020701

APPROVED

DATE
12/97

REVISED DATE



Harding Lawson Associates
 Engineering and
 Environmental Services

Log of Boring and Well Completion MW-OU2-59-A
 OU 2 Plume Delineation
 Investigation Report
 Fort Ord, California

PLATE

A16

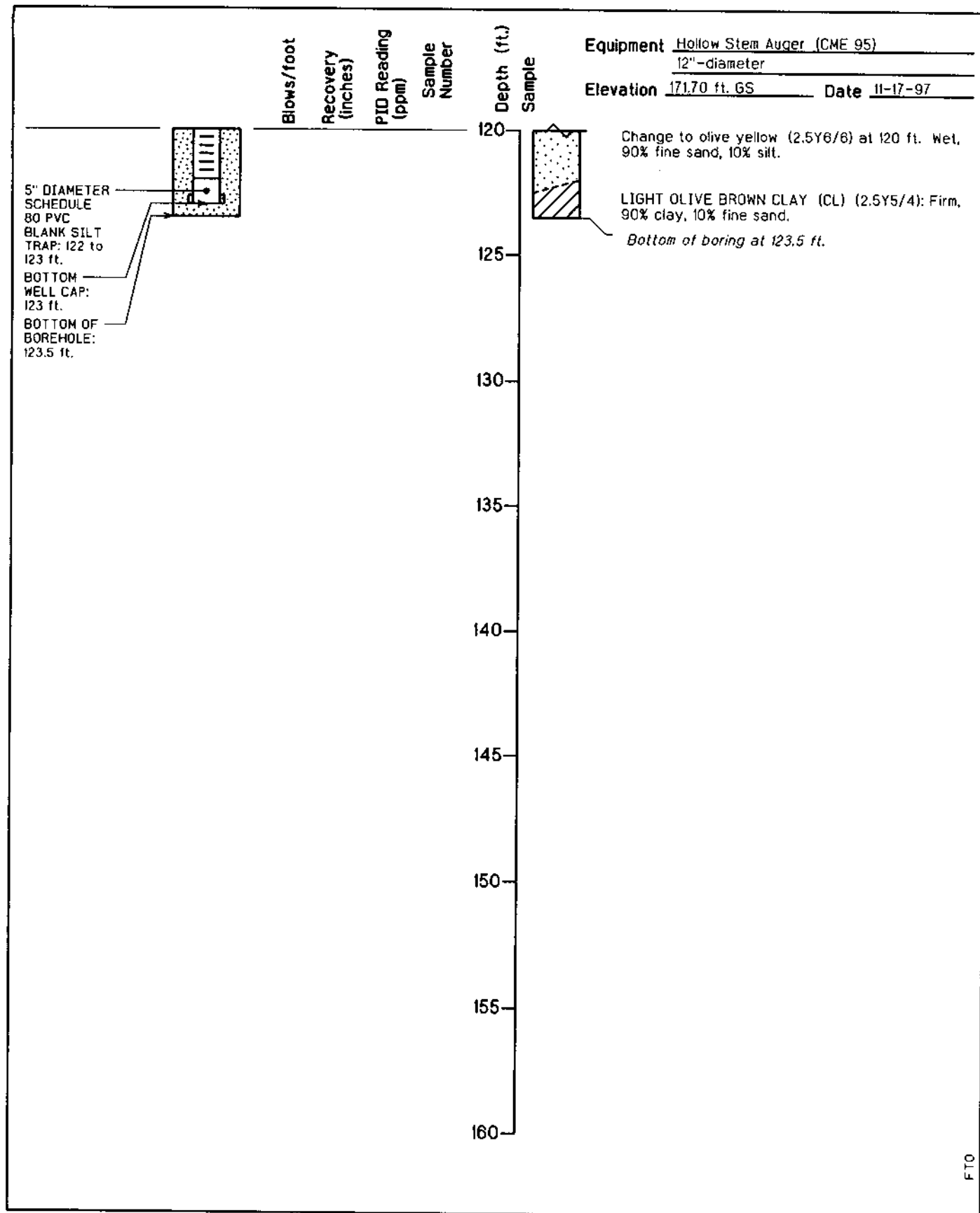
DRAWN
 TAC

JOB NUMBER
 36086 01020701

APPROVED

DATE
 12/97

REVISED DATE



Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring and Well Completion MW-OU2-59-A
OU 2 Plume Delineation
Investigation Report
Fort Ord, California

PLATE

A 16

DRAWN TAC
JOB NUMBER 36086 01020701

APPROVED

DATE 12/97

REVISED DATE

Top of PVC Casing
Elev. 174.24 ft.

GROUND SURFACE

TOP OF
CASING at 1.5
ft. above
ground
surface

12" DIAMETER
BOREHOLE: 0
to 119 ft.

CEMENT/
BENTONITE
SEAL: 0 to
79 ft.

5" DIAMETER
SCHEDULE
80 PVC
BLANK
CASING: +1.7
to 88 ft.

Blows/foot

Recovery
(inches)

PID Reading
(ppm)

Sample
Number

Depth (ft.)
Sample

Equipment Hollow Stem Auger (CME 95)

12"-diameter

Elevation 172.60 ft. GS

Date 11-19-97

BROWN SAND (SP) (10YR4/3): loose, moist, 90%
fine to medium sand, 10% silt.

Color change to yellowish brown (10YR5/4) at
3.2 ft.

Color change to dark yellowish brownish
(10YR4/6) at 7 ft.

Color change to yellowish brown (10YR5/6) at 11
ft. 95% fine sand, 5% silt.

Color change to brownish yellow (10YR6/6) at 32
ft.

FTO



Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring and Well Completion MW-OU2-80-A
OU 2 Plume Delineation
Investigation Report
Fort Ord, California

PLATE

A17

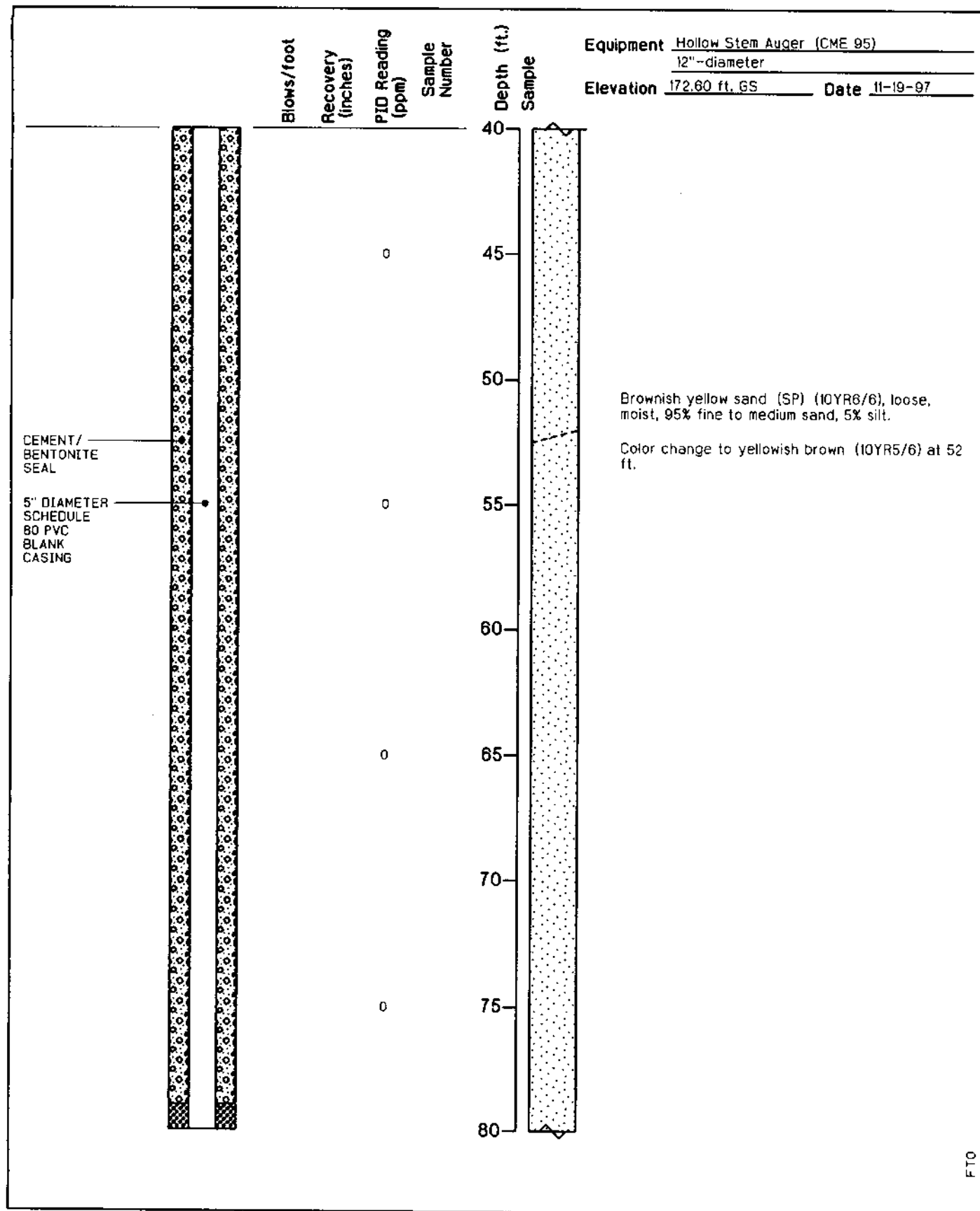
DRAWN
TAC

JOB NUMBER
36086 01020701

APPROVED

DATE
12/97

REVISED DATE



Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring and Well Completion MW-OU2-80-A PLATE
OU 2 Plume Delineation
Investigation Report
Fort Ord, California

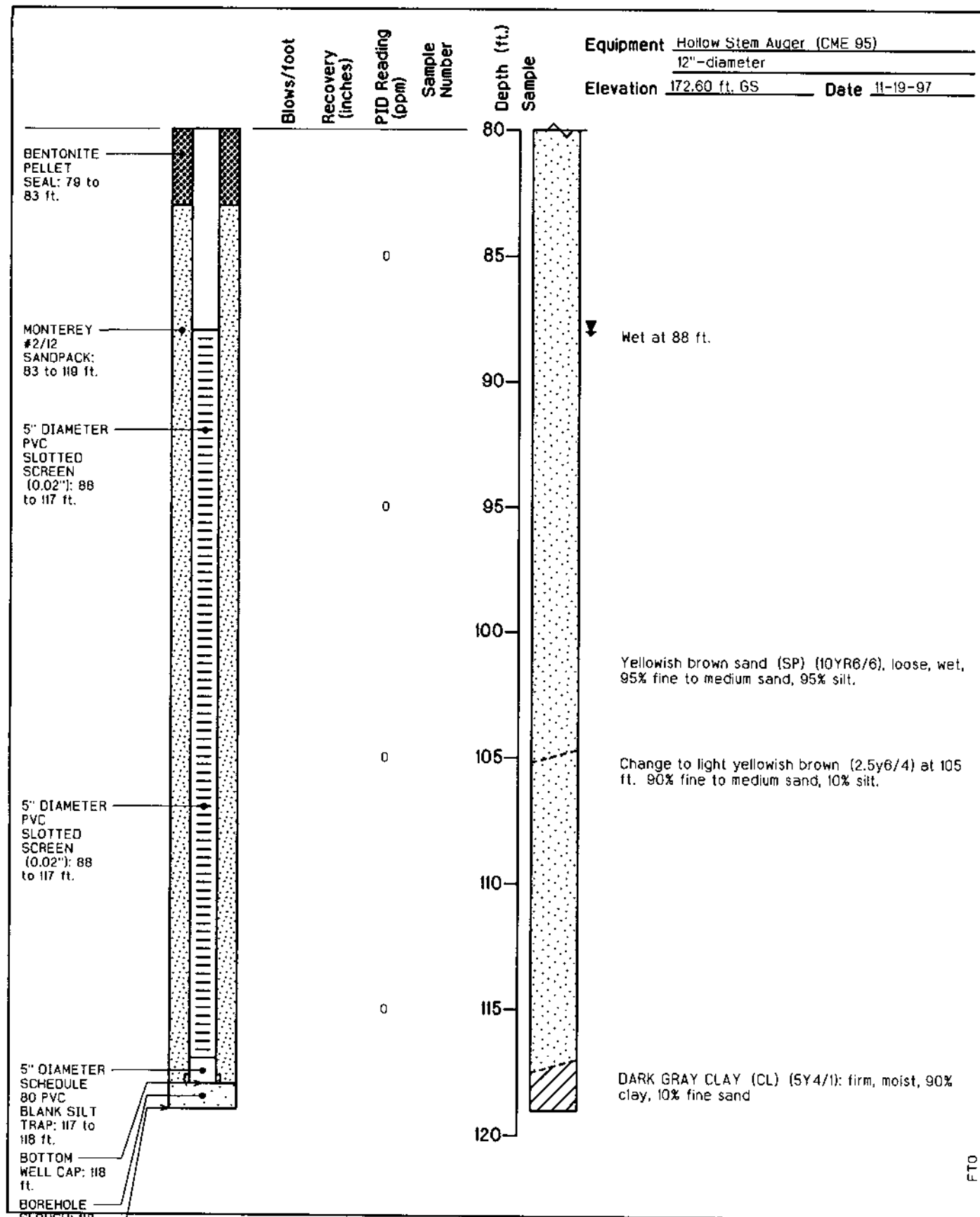
A17

DRAWN TAC JOB NUMBER 36086 01020701

APPROVED

DATE 12/97

REVISED DATE



Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring and Well Completion MW-OU2-80-A PLATE
OU 2 Plume Delineation
Investigation Report
Fort Ord, California

A17

DRAWN TAC
JOB NUMBER 36086 01020701

APPROVED

DATE 12/97

REVISED DATE