FINAL

Fourth Five-Year Review Report

for

Sacramento Army Depot

Sacramento

Sacramento County, California

July 2012

Prepared by:

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TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

ATTACHMENTS (CONT'D)

7. Applicable or Relevant and Appropriate Requirements Evaluation
8. Risk Assessment and Toxicology Evaluation
9. Vapor Intrusion Screening for the South Post Plume
10. Vapor Intrusion Screening for Parking Lot 3
11. Regulatory Agency Comments with Army Response to Comments

ACRONYMS

1,2-DCA	1,2-Dichloroethane
ARARs	Applicable or Relevant and Appropriate Requirements
Army	U.S. Department of the Army
BAGES	Berry Avenue Groundwater Extraction System
BEC	Base Realignment and Closure Environmental Coordinator
BRAC	Base Realignment and Closure
CAMU	Corrective Action Management Unit
CCl_4	Carbon Tetrachloride
cDCE	cis-1,2-Dichloroethene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Act Information System
CHHSLs	California Human Health Screening Levels
CRUPs	Covenants to Restrict the Use of Property
CVRWQCB	Central Valley Regional Water Quality Control Board
EW	Extraction Well
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Difference
FOST	Finding of Suitability to Transfer
gpm	Gallons per Minute
IDW	Investigation-Derived Waste
LUC	Land Use Covenant
MCL	Maximum Contaminant Level
mg/kg	Milligrams per Kilogram
NCP	National Contingency Plan
NPL	National Priorities List
OU	Operable Unit
PCE	Tetrachloroethene
Plexus	Plexus Scientific Corporation
PRG	Preliminary Remediation Goal
RAB	Restoration Advisory Board
RAOs	Remedial Action Objectives
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SAAD	Sacramento Army Depot, also known as Sacramento Army Depot Activity (abbreviated as SADA in earlier project documents)
SCEMD	Sacramento County Environmental Management Department
SPGES	South Post Groundwater Extraction System
SRCSD	Sacramento Regional County Sanitation District
TCE	Trichloroethene
tDCE	trans-1,2-Dichloroethene
U.S.	United States
VOC	Volatile Organic Compound
µg/L	Micrograms per Liter

Executive Summary

The United States (U.S.) Department of the Army (Army) completed the fourth five-year review of the former Sacramento Army Depot (SAAD; also known as Sacramento Army Depot Activity [SADA]) in Sacramento, California with the purpose of determining whether the implemented remedial actions are protective of human health and the environment. This five-year review is required because hazardous substances remain on-site above the risk-based levels determined in the Record of Decision (ROD), thereby preventing unlimited use and unrestricted exposure. The methods, findings, and conclusions of the review are documented in this report. In addition, this report summarizes issues identified during the review and includes recommendations and follow-up actions for them. Progress on the recommendations from the previous five-year review is discussed. The United States Environmental Protection Agency (EPA) concurred with the Third Five-Year Review Report on September 24, 2007 and thus triggered the preparation of this review.

The former Depot is located approximately 7 miles southeast of downtown Sacramento. The former Depot consisted of approximately 487 acres of land and was bounded on the north by Fruitridge Road, on the east by Florin Perkins Road, on the south by Elder Creek Road, and on the west by the Southern Pacific Railroad tracks. In 1995, SAAD was closed as a part of the Base Realignment and Closure process. Most of the former Depot is now owned by commercial firms and the City of Sacramento, with smaller parcels retained by the Army, the U.S. Navy/Marines, and the California National Guard. All properties in the former Depot are zoned commercial/industrial or agricultural/open space.

The former Depot was an electronics and maintenance facility and was established in 1945. Residues from metal plating and painting operations were disposed of in lagoons and burn pit sites. Contaminated media includes site soils and the groundwater beneath the southwestern portion of the site extending down-gradient approximately 2,000 feet to the south.

Chemical contaminants detected in the soil and groundwater include metals: arsenic, cadmium, chromium (total and hexavalent), and lead as well as volatile organic compounds (VOCs), including carbon tetrachloride (CCl_4), trichloroethene (TCE), tetrachloroethene (PCE), 1,2-dichloroethane (1,2-DCA), and cis-1,2-dichloroethene (cDCE).

The remedies selected for SAAD addressed soil and groundwater contamination. The South Post Burn Pits Operable Unit (OU) was remediated with a combination of soil vapor extraction and soil excavation/stabilization. The Corrective Action Management Unit (CAMU) is sited at the South Post Burn Pits OU and it received soils from this site, as well as the other sites described below. Soil excavation, stabilization, and consolidation in the CAMU were also the remedy chosen for the Oxidation Lagoons OU, the Battery Disposal Well Investigation-Derived Waste (IDW), and the Building 300 Burn Pit. Parking Lot 3 was remediated with a combination of soil vapor extraction, dual-phase extraction, and groundwater extraction with wellhead treatment via carbon adsorption. Groundwater extraction with ultraviolet light and chemical oxidation treatment was the remedy selected for the South Post Groundwater OU.

The soil remedies are complete with all stabilized soils consolidated within the CAMU. Groundwater extraction and treatment has ceased at Parking Lot 3. Groundwater monitoring at Parking Lot 3 continues with only one monitoring well slightly exceeding the Maximum Contaminant Level (MCL) for TCE at that location.

Groundwater extraction continues at the South Post Groundwater OU. Process optimization was performed for the existing groundwater extraction system. The high flow groundwater extraction system that pumped groundwater a rate of 450 gallons per minute (gpm) was replaced with a new more efficient extraction system pumping at approximately 60 gpm. This low flow groundwater extraction system has greatly reduced wasteful extraction of groundwater, while reducing the carbon footprint of the remedial effort through a significant reduction in energy usage. Utility costs, including electricity and sewer usage fees, have been reduced by 83 percent (%). The TCE concentration in the South Post Plume has significantly declined with only three monitoring wells exceeding the MCL in July 2011.

The selected remedy at the South Post Groundwater OU is undergoing further optimization, and the Army is evaluating additional technologies to facilitate achievement of the remedial action objectives (RAOs) set forth in the Basewide ROD. The technology evaluation will be conducted as part of a Focused Feasibility Study planned for 2012.

A five-year review site inspection was conducted on October 24, 2011. The groundwater treatment plant operator was interviewed during the site inspection. The regulatory agency Remedial Project Managers (RPMs) and the Restoration Advisory Board (RAB) Community Co-Chair have also been interviewed for their views regarding the project and current issues.

The selected remedies are considered protective in the short- and long-term because there is no evidence of complete exposure pathways to contaminated soil and groundwater, there are no receptors, and all institutional controls are being maintained.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Sacramento Army Depot		
EPA ID: CA0210020780		
Region: 9	**State:** CA	**City/County:** Sacramento/Sacramento County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** United States Army
Author name: Andrew Van Dyke
Author affiliation: ACSIM ODB PM
Review period: September 24, 2007 – February 6, 2012
Date of site inspection: October 24, 2011
Type of review: Statutory
Review number: 4
Triggering action date: September 24, 2007
Due date *(five years after triggering action date)*: September 24, 2012

Five-Year Review Summary Form Cont'd

Issues/Recommendations				
OU: South Post Burn Pits	**Issue Category: No Issue**			
	Issue: The origin of the cDCE MCL for impacted groundwater at SAAD has not been established in a decision document.			
	Recommendation: Clarify the origin of the cDCE MCL in a ROD Amendment or Explanation of Significant Difference (ESD).			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Army	EPA/State	FY 2013
OU:South Post Groundwater	**Issue Category: Remedy Performance**			
	Issue: Groundwater concentrations of TCE remain above RAOs.			
	Recommendation: .Continue groundwater treatment and monitoring. If concentrations remain above ROD goals (MCLs), then a Focused Feasibility Study will be prepared to evaluate remedial alternatives. The results of the Focused Feasibility Study will then be used to prepare a ROD Amendment or an ESD.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Army	EPA/State	FY 2013
Area of Concern: Parking Lot 3	**Issue Category: Remedy Performance**			
	Issue: Groundwater concentrations of TCE remain above RAOs.			
	Recommendation: Continue monitoring. Prepare either a ROD Amendment or an ESD if MCLs are not achieved by the end of FY 2013.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Army	EPA/State	FY 2013

Five-Year Review Summary Form Cont'd

Protectiveness Statements		
Operable Unit: South Post Burn Pits	*Protectiveness Determination:* Protective	*Addendum Due Date:* *N/A*
Protectiveness Statement: The remedy currently protects human health and the environment in the short-term because contaminated soil exceeding clean-up levels has been excavated, stabilized, and placed in a CAMU at SAAD. However, in order for the remedy to be protective in the long-term, the institutional controls must continue to be enforced and the physical integrity of the soil cover over the CAMU must be maintained.		
Operable Unit: South Post Groundwater	*Protectiveness Determination:* Protective	*Addendum Due Date:* *N/A*
Protectiveness Statement: The remedy currently protects human health and the environment in the short-term because institutional controls prevent exposure to contamination remaining above the clean-up goals. In addition, the South Post Plume is currently under the influence of a groundwater extraction system, which is actively reducing contaminant concentrations and preventing further migration. However, in order for the remedy to be protective in the long-term, the institutional controls restricting groundwater use must continue to be enforced until clean-up goals are achieved.		
Area of Concern: Parking Lot 3	*Protectiveness Determination:* Protective	*Addendum Due Date:* *N/A*
Protectiveness Statement: The remedy currently protects human health and the environment in the short-term because institutional controls prevent exposure to contamination remaining above the clean-up goals. However, in order for the remedy to be protective in the long-term, the institutional controls restricting groundwater use must continue to be enforced until clean-up goals are achieved.		
Site-wide Protectiveness Statement		
Protectiveness Determination: Protective		*Addendum Due Date:* *N/A*
Protectiveness Statement: Because the remedial actions at all OUs are protective, the site is protective of human health and the environment.		

Five-Year Review Report

1.0 INTRODUCTION

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify any issues found during the review, and include recommendations to address the issues.

The Army is preparing this five-year review pursuant to the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA) § 121 and the National Contingency Plan (NCP). CERCLA § 121 states:

> *If the President selects a remedial action that results in any hazardous, substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The EPA interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The Army conducted a five-year review of the remedial actions implemented at the former SAAD in Sacramento, California, from September 2011 through February 2012. This report documents the results of the review.

Plexus Scientific Corporation (Plexus) provided support to the Army in preparation of this report. Plexus was awarded Performance-Based Task 0003 to implement environmental remediation services at SAAD. The task order was issued by the Army Contracting Agency under contract W91ZLK-05-D-0011, with a period of performance from September 24, 2007 to September 23, 2017.

This is the Fourth Five-Year Review Report for SAAD. The triggering action for this review is the date of the EPA's concurrence on the Third Five-Year Review Report dated September 24, 2007. This five-year review report was prepared in accordance with the EPA *Comprehensive Five-Year Review Guidance*, dated June 2001 (EPA 540-R-01-007, OSWER No. 9355.7-03B-P). The five-year review is required because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

Remedy protectiveness in this five-year review report will be evaluated for the following areas: South Post Burn Pits OU, South Post Groundwater OU, and Parking Lot 3 Groundwater. At these locations, hazardous substances, pollutants, or contaminants remain above levels that allow for unlimited use and unrestricted exposure.

Remedial actions are complete at the following locations: Oxidation Lagoons OU, Tank 2 OU, Building 300 Burn Pit, and Battery Disposal Well IDW. Contaminated soil at these locations was excavated, consolidated, and stabilized at the CAMU as detailed in the Basewide ROD. The following table includes a remedial status summary for OUs and areas of concern at SAAD (**Table 1-1**).

Table 1-1. Remedial Status Summary

Location	Remedial Status	CERCLIS OU ID
South Post Groundwater OU	Operation and Maintenance	1, 2[A]
South Post Burn Pits OU / CAMU	Operation and Maintenance	1, 5[A]
Parking Lot 3 Groundwater	Operation and Maintenance	1
Tank 2 OU	Remedial Action Complete / No Further Action	3[A]
Oxidation Lagoons OU	Remedial Action Complete / No Further Action	1, 4[A]
Building 300 Burn Pit	Remedial Action Complete / No Further Action	1
Battery Disposal Well IDW	Remedial Action Complete / No Further Action	1

CERCLIS – Comprehensive Environmental Response, Compensation, and Liability Information System

A – Interim RODs were prepared and executed for these OUs prior to the completion of a Basewide ROD in 1995. The Basewide ROD incorporated all OUs and Areas of Concern where contamination remained such that unrestricted use was prohibited into OU 1. The RAOs of the Interim ROD prepared for OU 3 (Tank 2) were achieved and OU 3 was not incorporated into OU1 in the Basewide ROD.

2.0 SITE CHRONOLOGY

The following table includes a summary of important site events and relevant dates regarding the assessment, investigation, and remediation at SAAD.

Table 2-1. Chronology of Site Events

Event	Date
United States Army Toxic and Hazardous Materials Agency conducted a historical data review to assess areas of potential contamination at SAAD	1978-1979
Army initiated investigation of soil and groundwater at SAAD	Early 1981
Initial Community Relations Plan	August 1986; updated in 1988 and 1992
SAAD placed on National Priorities List with a Hazard Ranking System Score of 44.46	August 1987
Federal Facilities Agreement signed between the Army, State of California, and EPA Region IX	December 1988
South Post Groundwater OU Interim ROD – extraction and treatment of groundwater initiated in November.	October 1989
SAAD placed on Base Realignment and Closure (BRAC) list	1991
Tank 2 OU Interim ROD and Implementation of Remedial Action.	December 1991
South Post Burn Pits OU Interim ROD – soil vapor extraction initiated the following year	March 1993
Oxidation Lagoons OU Interim ROD	September 1993
SAAD Reuse Plan	June 1994
RAB established	June 1994
Remedial Investigation/Feasibility Study completed	November 1994
Final Basewide Proposed Plan	November 1994
Basewide ROD – amended South Post Groundwater OU, Oxidation Lagoons OU, and South Post Burn Pits OU Interim RODs	January 1995
SAAD closed	March 1995
The Army transferred 306 acres of the former SAAD to the City of Sacramento	March 1995
Remedial Design completed.	July 1995
Soil remedial action associated with CAMU	July 1995 – November 1996
First Five-Year Review Report	January 1996

Table 2-1. Chronology of Site Events

Event	Date
Army Independent Review Team groundwater remedy evaluation (a.k.a., Groundwater Extraction Treatment System Effectiveness Review)	June 1999
South Post extracted groundwater no longer treated after concentrations fall below sewer permit discharge limits	January 2000
Groundwater remedy meeting with focus on Parking Lot 3 – decision process established to determine when ROD provisions had been achieved	March 2000
Second Five-Year Review Report	December 2001
Horizontal wells: Extraction Well (EW) 0012 and EW0013 properly abandoned	January 2002
Army transfers Parcel 2A to the City of Sacramento	March 2002
Parking Lot 3 Groundwater extraction wells: EW0008 and EW0009, turned off after concentrations fall below ROD provisions (concentrations subsequently rebound)	June 2002
The EPA and the California Department of Toxic Substances Control (DTSC) conditionally concur with the Close-out and Monitoring Report prepared for Parking Lot 3 Groundwater	August 2002
Groundwater purged from Monitoring Well MW0050 at Parking Lot 3	July and September 2003
Remedial Design Addendum prepared to clarify ROD implementation	March 2004
Fate and Transport Model updated	November 2004
Correspondence between DTSC and the Army regarding the Parking Lot 3 Groundwater remedy	January to March 2005
FedEx property groundwater investigation	October 2005
Army transfers Parcel 2B to the City of Sacramento	April 2006
Draft Final Groundwater Cleanup Optimization Report (including updated Fate and Transport Model) proposes comprehensive revision to the groundwater remedies	March 2007
Third Five-Year Review Report	September 2007
New Groundwater Monitoring Plan Amendment/Technical Memorandum issued by Army for SAAD to optimize groundwater sampling program and reduce costs	June 2009

Table 2-1. Chronology of Site Events

Event	Date
South Post Groundwater Extraction System (SPGES) shutdown and placed in stand-by so that performance of the Berry Avenue Groundwater Extraction System (BAGES) could be evaluated independent of the SPGES over a period of 12 months	October 2009
BAGES on-line and operating continuously at designed extraction rate of approximately 60 gpm	February 2010
DTSC approve Army request to evaluate the performance of a new more efficient groundwater extraction system (BAGES) for treatment of the South Post Groundwater OU; Work Plan for the BAGES installation and operation is finalized; including contingencies for restart of the SPGES	March 2010
The DTSC, EPA, and the Central Valley Regional Water Quality Control Board (CVRWQCB) request from the Army a Technical Memorandum assessing hydraulic capture achieved by the BAGES; the memorandum is also to assess the current nature and extent of affected groundwater in the South Post Groundwater OU	October 2010
The DTSC, EPA, and CVRWQCB request from the Army a Receptor Survey to evaluate downgradient drinking water sources that may be impacted by the South Post Plume	October 2010
Army and Regulators agree to discontinue RAB meetings and presentations	October 2010
Vapor Migration Pathway Assessment Pilot Test is initiated	August 2010
Vapor Migration Pathway Assessment Pilot Test complete following three months of soil vapor extraction from the northern extent of the South Post Plume	December 2010
Draft Final Vapor Migration Pathway Assessment Pilot Test published, including plans for additional vapor extraction technology evaluation; secondary source of soil VOCs ruled out	August 2011
Army presents Draft Final Technical Memorandum to the DTSC, EPA, and CVRWQCB for review	September 2011

3.0 BACKGROUND

The following sections contain background information on SAAD including physical characteristics, including topography, geology, and hydrology, as well as land and resource use and contamination history. In addition, the basis for initiating remedial actions and the initial response are provided.

3.1 Physical Characteristics

The SAAD is located at 8350 Fruitridge Road, Sacramento, California, in central Sacramento County, approximately seven miles southeast of downtown Sacramento (**Figure 1**). The SAAD occupied approximately 486.9 acres of land and was bound on the north by Fruitridge Road; on the east by Florin Perkins Road; on the south by Elder Creek Road; and on the west by the Southern Pacific Railroad tracks. The SAAD was established in 1942 as an electronics maintenance facility primarily responsible for equipment receipt, storage, issue, repair, and disposal. Placement on the BRAC list in 1991 resulted in the closure of the SAAD in 1995. Portions of the property have been transferred at different times after closure for a combination of commercial, state, and federal related reuse. Property transfers are detailed on **Figure 2**.

The topography of SAAD is relatively flat with a slight southwesterly slope of approximately 0.1% to 0.2% from the northeastern corner of the site. The topographic relief is 6.5 feet across the site and varies from an elevation of 42.5 feet above mean sea level in the northeast corner to 36 feet above mean sea level in the southwest corner.

Natural drainage is generally from the northeast to the southwest. Morrison Creek enters the depot from the east and was diverted south, west, and then north around the main compound (outside the fence) in 1946. The old channel of Morrison Creek ("Old Morrison Creek") bisects the facility from east to west and is dry during most of the year. The creek flows west after leaving the depot and then southwest until it discharges into Beach Lake.

The site is located in the Central Valley of California and overlies a thick sequence of alluvial sediments consisting of silt, sand, gravel, and hardpans. These sediments are laterally and vertically discontinuous. In general, the shallow site soils have moderate to very low permeability.

The water bearing zones beneath the SAAD are composed of a series of sand, silty-sand, and sandy-silt units. These units have been grouped into three general water-bearing zones, informally designated as the "A/B", "C", and "D" hydrogeologic zones. The A/B-zone consists of the upper A and the lower B zones which are commonly interconnected. The vadose zone above the shallowest water-bearing zone and the aquitards between the water-bearing zones consist primarily of silt, silty-clay, and clay. The approximate depths of the primary water-bearing zones from ground surface are included in **Table 3-1**.

Table 3-1. Aquifer Zone Summary

Aquifer Zone	Depth Interval (feet below ground surface)
A/B	79 to 148
C	156 to 188
D	195 to 230

The three aquifer zones can be subdivided into two depositional regimes. The upper regime comprising the A/B zone is heterogeneous, and laterally and vertically discontinuous. This regime is composed of silt with interbedded fine-grained arkosic sand lenses. The lower regime is composed of laterally continuous units comprising two distinct water-bearing zones, C and D. These two zones are typically highly productive, consisting of fine- to coarse-grained, moderately graded sand interbedded with silt and clay.

Depth to groundwater beneath the site ranges from approximately 60 to 70 feet. The groundwater in the A/B zone appears to be present under unconfined to semi-confined conditions, and groundwater in the C and D zones is semi-confined to confined.

Historically, the general groundwater flow direction was to the south/southwest, but recent data indicates that groundwater flow direction is currently to the south/southeast. The approximate groundwater gradient, outside of the influence of active groundwater extraction, has remained the same at approximately 0.1% or 0.001 feet/foot. Groundwater gradient southwest of SAAD was altered in 1989 when groundwater extraction began, and the gradient is still under the influence of active groundwater extraction.

3.2 Land and Resource Use

This site was the old California State Fairgrounds prior to establishing the SAAD. It is not known if any contamination pre-dates the depot. The site is currently used for commercial/industrial purposes, as well as by the Department of Defense (Navy/Marine and Army), California Army National Guard and the City of Sacramento.

The SAAD is bounded on all sides by land currently zoned as industrial/commercial. Residential neighborhoods lie to the west of Power Inn Road, approximately ¼- to ½-mile west of the site. There have been no changes to the land use since preparation of the risk assessment and no changes are anticipated in the future. The City of Sacramento has installed a solar array on the land surrounding the CAMU, which is consistent with the institutional controls land use, and does not present any additional risk. There have been no changes to the receptors considered in the original risk assessment.

The former depot is currently fenced with a limited number of controlled entry points. All of the contaminant source areas and the water treatment plant lie within the fenced area. Land use restrictions at the South Post Burn Pits OU place limits on potential development options. The South Post Burn Pits OU was located in Parcel 2B, which was transferred to the City of Sacramento in April 2006 (refer to **Figure 2**).

Regional groundwater is used as a drinking water source. The Florin County Water District extracts groundwater down-gradient of the SAAD. The water district's ten municipal supply wells are screened in water-bearing zone D or deeper, and lie south of the former depot (the closest supply well is located approximately 0.8 miles from the southern edge of the SAAD).

The following table from the *Remedial Design Addendum for SAAD* dated March 2004, delineates the land use restrictions associated with the former installation. These Land Use Covenants (LUCs) are further delineated in the *2-A & 2-B Finding of Suitability to Transfer (FOSTs) Report*, dated December 2000 and March 2004, respectively.

Table 3-2. Sacramento Army Depot Land Use Restrictions

Land Use Covenant	Prohibited Activity
Parking Lot 3 & South Post Groundwater OU	Construction of any well Extraction, use of consumption of groundwater from wells within the boundary of the Property Use of any groundwater within the boundary of the property Construction or creation of any groundwater recharge area, unlined surface impoundment or disposal trenches Any activity that could interfere with or adversely affect the groundwater treatment system, extraction wells, piping systems or groundwater treatment plant
Stabilized Mass Covenant (South Post Burn Pits OU /CAMU)	Any construction of improvements over the Stabilized Mass and associated monitoring system – the monitoring system includes lysimeters and monitoring wells No residential structures shall be allowed on the cover including any mobile home or factory-built housing, constructed or installed for use as residential human habitation, hospital for humans, or public or private school for persons Construction of improvements above either of the stabilized masses that do not meet the following conditions: • The surface drainage shall not be adversely affected in such a way as to cause surface water to pond or to drain improperly • Any change in grading plans shall be subject to review and approval by the Parties and the EPA • Improvements are not to disturb the subsurface Stabilized Mass • Disturbance of the lysimeters is prohibited, unless replacements are installed and approved by the regulatory agencies • Significant surface loads (e.g., construction of buildings or facilities that would normally require a soils report) on the cover shall not be allowed unless a detailed analysis is performed that determines the magnitude and extent of allowable surface loading, if any, that can be tolerated • Vehicle access to the cover area shall be limited to those periods of the year (May through October) when the cover soil can adequately support wheel loading (i.e., access shall not be allowed during and directly after periods of precipitation when the cover soil may be too saturated to adequately support a vehicle as evidence by the formation of tire tracks) • Planting of landscaping on or adjacent to the cover that requires irrigation is to be avoided. However, such materials can be planted (e.g., ball fields) if the irrigation system is properly designed and operated so that it provides adequate moisture for plant growth without adding significantly to the amount of percolation that would be expected from precipitation • Vegetation having root systems that might penetrate the cover to the depth of the Stabilized Mass are prohibited • Groundwater recharge areas (i.e., ponds) are prohibited near, or on top of, the Stabilized Mass

The Army conducts routine inspections to confirm that LUCs are enforced and that there are no activities or issues that may result in human exposure to contaminants associated with the Depot. An annual report is submitted to the DTSC which summarizes results of the Army's routine LUC monitoring.

Applicable LUCs included in **Table 3-2** will be evaluated for potential inclusion into any future ROD amendments or ESDs prepared for the Depot.

3.3 History of Contamination

Soil and groundwater on-site were impacted by the former Depot's repair, maintenance, and storage activities. Contamination was released from underground and aboveground storage tanks, burn pits, unlined wastewater lagoons, and a battery disposal area. Metal plating and painting operations were the primary on-site waste-generating activities. The Army conducted the initial contamination assessments in 1979. The SAAD was placed on the Federal National Priority List (the "Superfund" list or "NPL") in August 1987. For historical reference, the former facility map is included as **Figure 3**.

3.4 Initial Response

Investigations conducted in 1981 by the Army Environmental Health Agency identified the South Post Burn Pits OU as a source of VOC contamination in groundwater. Subsequent groundwater sampling performed by the CVRWQCB southwest of the Depot discovered that contamination had moved beyond the boundaries of the SAAD. The Army then conducted additional investigations with emphasis on sites with the highest potential for releases to the environment. The following were sites determined to represent the greatest threats: the South Post Groundwater, Tank 2, the Oxidation Lagoons, and the South Post Burn Pits. To expedite clean-up, these four sites were addressed as OUs under separate Interim RODs. In 1989, a groundwater extraction and treatment system was installed to address the South Post Groundwater OU. As stipulated in the Interim ROD for the South Post Burn Pits OU, soil vapor extraction was implemented in 1994. A soil washing pilot test was conducted at the Oxidation Lagoons OU in 1993; however, this treatment method was found to be ineffective. Soil vapor extraction was performed at the Tank 2 OU in 1992, clean-up goals were met, and no further action was deemed necessary at this site.

3.5 Basis for Taking Action

The following chemical contaminants were detected in the soil: volatile and semi-volatile organic compounds, pesticides, polychlorinated biphenyls, and metals. Prior to implementation of the soil remedies, the following potentially complete exposure pathways were identified in the site risk assessment: incidental ingestion, dermal adsorption, and inhalation of vapors. No receptors are currently exposed to soil or groundwater contamination. Soil contaminants associated with the SAAD are included in **Table 3-3**, and groundwater contaminants are summarized in **Table 3-4**.

Table 3-3. Soil Contaminant Summary

Contaminant		Location
Metals	Antimony	Burn Pits, Building 300
	Arsenic	Oxidation Lagoons, Burn Pits, Building 300
	Cadmium	Oxidation Lagoons, Burn Pits, Building 300
	Chromium VI	Burn Pits
	Lead	Burn Pits, Battery Disposal Well IDW, Building 300
Organic Compounds	Benzo(a)pyrene	Battery Disposal Well IDW
	Chlordane	Pesticide Mix Area
	4,4'-DDT	Pesticide Mix Area
	Chrysene	Tank 2
	Dieldrin	Tank 2
	Polychlorinated Biphenyls	Burn Pits, Building 300

Table 3-4. Groundwater Contaminant Summary

Contaminant		Location
VOCs	Chloroform	South Post
	CCl_4	South Post, Parking Lot 3
	TCE	South Post, Parking Lot 3
	PCE	South Post, Parking Lot 3
	cDCE	South Post
	trans-1,2-Dichloroethene (tDCE)	South Post
	1,2-DCA	South Post, Parking Lot 3

4.0 REMEDIAL ACTIONS

The Remedial Investigation and Feasibility Study for SAAD were completed in November 1994. Human health and ecological risk assessments were also prepared for the SAAD. This work was followed by the Basewide ROD (January 1995), which addressed all sites and amended three prior Interim RODs (South Post Groundwater OU, South Post Burn Pits OU, and the Oxidation Lagoons OU). The Basewide ROD determined that the remedy for the Tank 2 OU was complete and indicated that no further action was required. The Basewide ROD also addressed the three remaining areas of concern at the SAAD, including the South Post Burn Pits OU, Parking Lot 3 Groundwater, and the South Post Groundwater OU.

The Second Five-Year Review Report determined that, except for the stabilized mass (CAMU), all contaminated soil has been remediated and no longer needs to be included during subsequent five-year reviews.

The LUCs established for the SAAD provide authority to state regulatory agencies (the DTSC and the CVRWQCB) to enforce environmental-based land use restrictions and are outlined in **Table 2-1** and Section 3.2, 4.1.1, 4.2.1, and 4.3.1 of this report and further referenced in the *2-A & 2-B FOSTs*.

4.1 South Post Burn Pits Operable Unit

The following sections detail the RAOs, remedy selection, implementation of the remedial action, and operation and maintenance of the selected remedy.

4.1.1 Remedial Action Objectives

The South Post Burn Pits OU was selected as the location for a CAMU, and soil from three other areas of contamination (Oxidation Lagoons OU, Building 300 Burn Pit, and Battery Disposal Well IDW) were consolidated in a CAMU located at the South Post Burn Pits OU. The selected remedy will prevent future exposure to potential receptor populations through the stabilization of metals-contaminated soil from the South Post Burn Pits OU, Oxidation Lagoons OU, Battery Disposal Well IDW, and the Building 300 Burn Pit.

Residual in-situ soil metal concentrations following excavation of impacted soil at the South Post Burn Pits OU was not to exceed the clean-up level concentrations outlined in **Table 4-1**.

Table 4-1. South Post Burn Pits Operable Unit Clean-up Levels

Metal	ROD Residual Concentration[1] (mg/kg)
Cadmium	88
Total Chromium	112
Chromium VI	16
Arsenic	7.3
Lead	500

1 – Not to exceed in-situ residual soil concentration included in the 1995 Basewide ROD.
mg/kg – milligrams per kilogram

4.1.2 Remedy Selection

The 1993 Interim ROD for the South Post Burn Pits OU identified two remedial actions: in-situ soil vapor extraction for VOCs, and excavation/stabilization of soil containing non-volatile compounds. The 1995 Basewide ROD amended the original remedy by removing the soil vapor extraction clean-up goal as unattainable and shutting off the system. The soil vapor extraction system was successful in removing a large percentage of the VOC mass present in the vapor phase.

The soil stabilization portion of the South Post Burn Pits OU Interim ROD was modified to include soil from three other areas of contamination: Oxidation Lagoons OU, Building 300 Burn Pit, and Battery Disposal Well IDW. Soil from these locations were consolidated, stabilized, and placed under a 10-foot thick layer of clean soil in the CAMU. The South Post Burn Pits OU was selected as the location for the CAMU.

Land Use Covenants were established for the site because residual contamination remains on-site at a level that does not allow for unrestricted use and unlimited exposure following implementation of the selected remedy. The LUC established for the soil at the CAMU prohibits: 1) construction improvements over the stabilized soils or monitoring system, 2) residential homes, schools, or hospitals, 3) construction that results in ponding water, 4) significant surface loads on the stabilized soils, 5) vehicle use during wet weather, 6) planting of vegetation requiring significant irrigation, 7) planting of vegetation with deep roots, and 8) establishing groundwater recharge areas. In addition, groundwater related land use restrictions are the same as those shown below for the South Post Groundwater OU.

4.1.3 Remedy Implementation

The following clean-up activities have been completed at the South Post Burn Pits OU:

- Soil vapor extraction began in May 1994 and concluded on January 1995, and was conducted again from March 1995 to September 1995. Approximately 138 pounds of VOCs were removed from the soil.
- Impacted soil from the South Post Burn Pits OU was excavated in 1995 and placed temporarily on a storage pad for consolidation and stabilization in the CAMU.
- Consolidation, stabilization, and placement of impacted soil in the CAMU derived from the South Post Burn Pits OU, Oxidation Lagoons OU, Building 300 Burn Pit, and the Battery Disposal Well IDW was completed by the fall of 1996.

After two rounds of soil excavation, some confirmation samples indicated that arsenic and lead concentrations still exceeded the agreed upon clean-up levels; however, approval to leave the remaining impacted soil in place was obtained from the U.S. Army Corps of Engineers, EPA, CVRWQCB, and DTSC. With the approval of the regulatory agencies, excavation was discontinued and response complete was attained. Debris found in the soil was removed, decontaminated, and disposed off-site. The CAMU received all designated soil and the site was re-graded in October 1996. Four pairs of lysimeters were installed under the CAMU to monitor for leaching of metals from the stabilized soil. Closure of the remedial action at the South Post Burn Pits OU was approved by the EPA because it was determined that all remedial objectives had been met.

4.1.4 System Operations / Operation and Maintenance

The following monitoring and maintenance activities are conducted to maintain the protectiveness and integrity of the CAMU:

- Lysimeters located under the CAMU are sampled on an annual basis for metals (chromium and lead) and pH;
- The 10-foot soil cover of clean, native fill material over the stabilized mass is inspected and maintained regularly; and
- Land Use Covenants at the site (Parcel 2B) are enforced, including the land use restrictions listed in **Table 3-2**.

Lysimeter sampling was established on a semi-annual basis in the 1995 Basewide ROD; however, modification of the groundwater monitoring program detailed in the 2009 Groundwater Monitoring Plan Amendment (GWMPA) concluded that only annual lysimeter sampling was required . Therefore, lysimeter sampling has been conducted on an annual basis since 2009. Lysimeter sampling results indicate that the stabilized mass within the CAMU is not leaching metals into the vadose zone.

Quarterly inspections of the soil cover have found that it remains in good repair and there is no evidence of settlement, heaving, cracking, or erosion. Documentation of periodic soil cover inspections are kept on file by the Army. Controlled access to the site has prevented violation of the LUCs established for the site that may disturb the stabilized mass and release sequestered contaminants into the environment.

Costs associated with the management of the South Post Burn Pits OU (CAMU) are minimal and include costs associated with periodic lysimeter sampling and soil cover inspection. Since the last five-year review, the CAMU, South Post Groundwater OU, and Parking Lot 3 Groundwater have been managed and maintained under a combined budget. Operational costs associated with all three areas are presented together in **Table 4-2**.

Table 4-2. Site-wide Operational Costs

Year	Cost
FY2007	$81,769.83*
FY2008	$325,324.18
FY2009	$320,211.02
FY2010	$231,594.91
FY2011	$88,130.53

* – Partial year cost

Operational costs were significantly reduced from FY2008 to FY2011 following implementation of a new Performance Based Contract and system optimization. The reduction resulted from the adoption of a new groundwater monitoring plan which significantly reduced sampling frequency and analyte analysis and the modification of the groundwater treatment system which significantly reduced utility costs.

4.2 South Post Groundwater Operable Unit

The following sections detail the RAOs, remedy selection, implementation of the remedial action, and operation and maintenance for the South Post Groundwater OU.

4.2.1 Remedial Action Objectives

The following RAOs were established for the South Post Groundwater OU:

- Modify the existing treatment facility (SPGES) to accept an increased flow rate of 450 gpm;
- Reduce contaminants in the groundwater to concentrations equal to or less than respective MCLs;
- Prevent further migration of the VOC plume off-site through complete capture of groundwater contamination and reduction of plume size[1];
- Capture the contamination detected in aquifer zone C more rapidly; and
- Achieve final remediation goals (MCLs) at the South Post Groundwater OU in nine years (i.e., 2004).

The groundwater clean-up levels as specified in the 1995 Basewide ROD are included in **Table 4-3**.

Table 4-3. South Post Groundwater Operable Unit Clean-up Levels

Constituent	Clean-up Level (µg/L)	Source of Clean-up Level
TCE	5	Federal MCL
PCE	5	Federal MCL
cDCE	6	Federal MCL[1]
1,2-DCA	0.5	State MCL
tDCE	10	State MCL
CCl_4	0.5	State MCL

1 – State MCL; incorrectly cited as Federal MCL in 1995 Basewide ROD.
µg/L – micrograms per Liter

The clean-up level for cDCE was incorrectly cited as a Federal MCL in the 1995 Basewide ROD; the Federal MCL for cDCE is 70 µg/L. This citation will be corrected when either a ROD Amendment or ESD is developed.

4.2.2 Remedy Selection

The 1989 Interim ROD for the South Post Groundwater OU established the remedy of groundwater extraction from aquifer zone A/B and treatment using ultraviolet light and chemical oxidation. The 1995 Basewide ROD amended the original remedy by extending the area of cleanup to include impacted groundwater beyond the southern boundary (off-site) of SAAD and within aquifer zone C.

[1] This RAO was not included in the 1995 Basewide ROD and was first mentioned in the Second Five-Year Review Report dated December 2001.

Land Use Covenants were established because residual contamination remains on-site at a level that does not allow for unrestricted use and unlimited exposure following implementation of the selected remedy. The LUC established for this site prohibits: 1) construction of any well, 2) extraction and use or consumption of groundwater from wells within the parcel boundary, 3) construction of any groundwater recharge areas, or similar, and 4) any activity that could interfere with the groundwater extraction and treatment system.

All required institutional controls agreed to by the Army, the State, and Federal regulators are monitored for compliance as outlined in Section 3.2 and **Table 3.2**.

4.2.3 Remedy Implementation

The groundwater extraction and treatment system (SPGES) was installed in 1989. Extraction wells for the SPGES were installed in two phases: EW0001 through EW0007 were installed following the South Post Groundwater OU Interim ROD, and EW0010 through EW0013 were installed following the 1995 Basewide ROD. A total of eleven extraction wells have been installed (refer to **Figure 4**):

- EW0001 to EW0003 were installed (1989) in the A/B zone;
- EW0004 to EW0007 were installed (1989) in the A/B zone;
- EW0010 was installed (1996) off-site in the A/B zone;
- EW0011 was installed (1996) in the C zone; and
- EW0012 and EW0013 (horizontal wells) were installed (1995/1996), beginning on-site and extending off-site in the A/B zone to the west.

The SPGES operated reliably after the initial pump valve problems were resolved. Pumping rates initially ranged from 325 to 340 gpm, and this rate was increased to approximately 440 gpm in 1999. The rate was increased after investigations indicated the plume extent was not fully contained. Contaminant concentrations entering the treatment plant decreased to levels below the permitted Sacramento Regional County Sanitation District (SRCSD) discharge limits, prompting a review, and ultimately a decision in February 2000 to discharge directly to the sanitary sewer system without prior treatment.

Extraction well EW0002 was installed in close proximity to EW0001, and as contaminant concentrations decreased it was no longer efficient to simultaneously operate both wells. Extraction well EW0002 was taken out of service (approximately 1999) after an optimization review was performed. Pumping from EW0011 was stopped in January 2003 as the C-zone was successfully remediated.

The horizontal extraction wells (EW0012 and EW0013) experienced biological fouling problems soon after installation. Rehabilitation of the horizontal extraction wells was attempted but was not successful, and EW0012 and EW0013 were abandoned (November 2001 to January 2002).

Groundwater flow and contaminant transport modeling were conducted to determine the effectiveness of the treatment system in capturing the plume. Groundwater modeling and monitoring reports indicated that the SPGES was effectively controlling the plume. In an attempt to resolve any uncertainty regarding the configuration of the extent of the plume with regard to the 5 µg/L TCE level outlined in the ROD, the Army investigated the extent of the southern edge of the plume in October 2005. The report from this investigation concluded that

the earlier modeling had accurately predicted plume behavior and that the monitoring network was adequate.

Well fouling and reduced production rates have also been observed in EW0010. However, rehabilitation of EW0010 in August 2008 was successful and pumping rate was restored. EW0010 was rehabilitated through a process involving the application of acid, mechanical surging with a surge block, jetting of the well screen, and the application of a biocide to inhibit iron bacteria.

Remedy performance has also been evaluated through periodic groundwater sampling for contaminants of concern as well as other parameters such as dissolved ions, dissolved oxygen, and pH. The first groundwater monitoring wells were installed in 1981, and the last monitoring well was installed in 2009. The monitoring network has been modified over time to adapt to changing plume configuration and decreasing contaminant concentration. A total of 120 groundwater monitoring wells have been installed since 1981 with 88 groundwater monitoring wells currently active and not abandoned (**Figure 5**).

Remedial action operations continue at the South Post Groundwater OU as groundwater concentrations of TCE remain above the MCL of 5 µg/L.

4.2.4 System Operations / Operation and Maintenance

The SPGES was operational from 1989 through 2009. In October 2009, the high-flow SPGES was shut down and placed in stand-by mode to evaluate replacement of the high-flow system with a new, more efficient, low-flow system (BAGES). Currently, the BAGES is extracting groundwater and the SPGES remains shutdown but operational. Operation of the BAGES is further detailed in Section 5.1.2.

Prior to shut-down in 2009, the SPGES extraction wells were maintained in accordance with the site manual and were periodically inspected. Inspections included recording flows at the extraction wells, evaluating well pump and controller integrity, and conducting preventative maintenance.

The treatment plant and extraction wells of the SPGES are inspected and operated periodically to maintain the groundwater extraction system in working order and to conduct groundwater sampling as necessary to maintain the SRCSD permit. Maintenance of the SPGES continues on a preventative basis.

The extraction wells and treatment plant are secured within an 8-foot high fence and a locked gate. The fence and gate are inspected periodically to ensure security is maintained. Security patrols routinely monitor the site.

Costs associated with management of the South Post Groundwater OU include those associated with periodic groundwater sampling, system inspection, operation, and maintenance. The CAMU, South Post Groundwater OU, and Parking Lot 3 Groundwater have been managed and maintained under the same budget. The operational costs associated with all three areas are presented together in **Table 4-2**.

4.3 Parking Lot 3 Groundwater

The following sections detail the RAOs, remedy selection, implementation of the remedial action, and operation and maintenance of the selected remedy.

4.3.1 Remedial Action Objectives

The goal of the selected remedy is to restore groundwater for its beneficial use as a potential drinking water source by reducing contaminant concentrations below MCLs (the more stringent of either the Federal or State levels).

The groundwater clean-up levels included in the 1995 Basewide ROD are included in **Table 4-4**.

Table 4-4. Parking Lot 3 Groundwater Clean-up Levels

Constituent	Clean-up Level (µg/L)	Source of Clean-up Level
TCE	5	Federal MCL
PCE	5	Federal MCL
1,2-DCA	0.5	State MCL
CCl_4	0.5	State MCL

4.3.2 Remedy Selection

The 1995 Basewide ROD established the remedy of extraction and treatment for VOC-affected groundwater at Parking Lot 3. The selected remedy included extraction of groundwater from aquifer zone A/B, treatment using carbon adsorption at the wellhead, and discharge to the sanitary sewer.

Land Use Covenants were established because residual contamination remains on-site at a level that does not allow for unrestricted use and unlimited exposure following implementation of the selected remedy. The LUC established for this site prohibits: 1) construction of any well, 2) extraction and use or consumption of groundwater from wells within the parcel boundary, 3) construction of any groundwater recharge areas, or similar, and 4) any activity that could interfere with the groundwater extraction and treatment system. Groundwater restrictions end upon determination by the Army and regulatory agencies that cleanup standards have been met.

4.3.3 Remedy Implementation

Groundwater monitoring began at Parking Lot 3 in 1981. The monitoring network expanded steadily until 1997, when the last two down-gradient wells were installed to monitor the progress of the groundwater remedy (**Figure 5**).

Contaminated soil at Parking Lot 3 was treated during an air sparging pilot test that was conducted from August 1993 to January 1994. A dual-phase extraction pilot test was conducted from October 1994 to January 1995. Approximately 460 pounds of TCE were removed from the soil and groundwater during these tests.

Two A/B zone groundwater extraction wells (EW0008 and EW0009) were installed at Parking Lot 3 in 1994 (**Figure 4**). The wells began operation in March 1996 with the wellhead treatment system described above. The combined extraction rate was approximately 80 gpm and plume capture was inferred from the cone of depression that developed in the groundwater. Wellhead treatment of extracted groundwater with activated carbon was discontinued in June 2000 after contaminant concentrations decreased below the SRCSD discharge requirements. Extraction well operation continued until June 2002 when the wells were shut-off after meeting the criteria detailed in the *Monitoring and Close-out Plan for Parking Lot 3* (URS, 2002). Over 200 million gallons of groundwater have been extracted from the site.

By January of 2003, groundwater monitoring indicated that TCE concentration exceeded the MCL for the requisite number of quarterly events necessary to reactivate one of the two extraction wells (EW0009; located near MW0050) per the *Monitoring and Closeout Plan for Parking Lot 3*. In an attempt to lower TCE concentrations, the Army purged 5,000-gallons of groundwater directly from MW0050 in July 2003. A second 10,000-gallon extraction was repeated from this same well in September 2003. The two direct groundwater extraction events were unsuccessful because subsequent monitoring indicated that TCE concentration remained above the MCL. Reactivation criteria for the second extraction well (EW0008; located near MW0073) was met in January 2004.

The Army verbally notified the project team that reactivating the groundwater system would not attain the RAOs in a cost effective manner. The project team agreed with this decision. In 2005, the regulatory stakeholders sent a letter to the Army requesting resumption of groundwater extraction, and indicated that a failure to do so constituted a violation of the ROD. The regulatory stakeholders moved away from this position during subsequent project team meetings, and agreed with the Army that resumption of groundwater extraction would not be an effective method for treating the residual groundwater contamination at Parking Lot 3.

Groundwater sampling results from the summer 2011 annual monitoring event indicate that only one monitoring well contains TCE above the MCL at Parking Lot 3. Monitoring well MW0073 reported a TCE concentration of 6.5 µg/L. Monitoring of residual contamination will continue at Parking Lot 3 pursuant to the GWMPA as the groundwater concentration of TCE remains above the MCL of 5 µg/L and RAOs have not been met.

4.3.4 System Operations / Operation and Maintenance

Prior to shut-down in 2002, the extraction wells were maintained in accordance with the site manual and were periodically inspected. Weekly inspections included recording the total flows at the extraction wells, evaluating well pump and controller integrity, and reviewing preventative maintenance requirements to determine any maintenance needs.

EW0008 and EW0009 are inspected and operated periodically to maintain the groundwater extraction system in working order and to conduct groundwater sampling as necessary to maintain the SRCSD permit. Maintenance of both extraction wells continues on a preventative basis.

The extraction wells are secured within an 8-foot high fence and a locked gate. The fence and gate are inspected periodically to ensure security is maintained. Security patrols routinely monitor the site.

Costs associated with the management of the Parking Lot 3 Groundwater are minimal and include those associated with periodic groundwater sampling, system inspection, and maintenance. The CAMU, South Post Groundwater OU, and Parking Lot 3 Groundwater have been managed and maintained under the same budget. The operational costs associated with all three areas are presented together in **Table 4-2**.

5.0 PROGRESS SINCE THE LAST REVIEW

The following protectiveness statements were made in the Third Five-Year Review Report, which indicate that the remedies in place were considered to be protective.

> *"The remedy at OU – South Post Burn Pits currently protects human health and the environment because contaminated soil exceeding cleanup levels has been excavated, stabilized, and placed in the CAMU. However, in order for the remedy to be protective in the long-term, the institutional controls must continue to be enforced and the physical integrity of the soil cover over the CAMU must be maintained."*
>
> *"The remedy at OU – South Post Groundwater currently protects human health and the environment because institutional controls prevent exposure to contamination remaining above the cleanup goals. However, in order for the remedy to be protective in the long-term, the institutional controls restricting groundwater use must continue to be enforced, or the remedial action must be modified to achieve the cleanup goals."*
>
> *"The remedy at Parking Lot 3 Groundwater currently protects human health and the environment because institutional controls prevent exposure to contamination remaining above the cleanup goals. However, in order for the remedy to be protective in the long-term, the institutional controls restricting groundwater use must continue to be enforced, or the remedial action must be modified to achieve the cleanup goals."*

An optimization effort was initiated as part of a performance-based remediation contract awarded by the Army in 2007. This evaluation supplemented and supplanted existing information and efforts, resulting in new activities and reports as detailed in the following sections.

5.1 Groundwater Monitoring Plan Amendment

An amended groundwater monitoring plan was approved by the regulatory agencies and finalized in June 2009. The GWMPA significantly reduced the number of samples required for site-wide groundwater monitoring. The reduction in sample number was achieved through the elimination of unnecessary analytes (metals and major ions) and a reduction in frequency (quarterly to semi-annually or annually, and semi-annually to annually). Groundwater gauging within aquifer zone D was also removed from the groundwater monitoring program since no VOCs in excess of the MCLs have been detected within that aquifer zone.

5.2 South Post Groundwater Operable Unit Remedy Optimization

The Army is currently investigating methods and alternatives to optimize the selected remedy (groundwater extraction) for the South Post Groundwater OU pursuant to the 1995 Basewide ROD.

The Army designed a new extraction system that would more efficiently capture the remaining groundwater impacted above MCLs. Two new extraction wells (EW0015 and EW0016; collectively referred to as the BAGES) and three monitoring wells (MW1038, MW1039, and MW1040) were installed along Berry Avenue in fall 2010 (refer to **Figure 4**).

In preparation for the evaluation of the BAGES, operation of the SPGES was suspended in October 2009. This allowed the groundwater flow regime to return to non-pumping conditions. EW0015 and EW0016 were operating at design capacity by February of 2010. The Army was initially granted permission by the regulatory agencies to evaluate the BAGES without

concurrent SPGES operation for a period of 12 months between March 2010 and March 2011 to allow an evaluation of the BAGES without interference from the operation of the SPGES.

The SPGES shut-down remains contingent upon groundwater TCE concentration within the monitoring network at SAAD remaining below 50 µg/L in any groundwater sampling location within the monitoring network. If TCE concentration exceeds 50 µg/L, then the SPGES will be restarted as soon as practicable.

As part of the BAGES evaluation, the groundwater monitoring program was expanded during the 12-month evaluation period to gather additional data. TCE concentration did not exceed 50 µg/L during the initial 12- month evaluation period of the BAGES. During the June 2011 stakeholder meeting, the Army was granted permission by the EPA to continue operation of the BAGES independent of the SPGES as long as the groundwater TCE concentration does not exceed 50 µg/L.

As of October 2011, no monitoring well within the network exceeded the level defined in the contingency plan. The BAGES continues to operate and the SPGES, although not operating, is maintained in a state of readiness should the need arise to restart the SPGES.

As part of the remedy optimization, the Army is also evaluating additional technologies to facilitate achievement of the RAOs at the South Post Groundwater OU. In August 2010, soil vapor extraction was initiated along the northern extent of impacted groundwater southwest and off-site of the Depot. The soil vapor extraction was conducted to evaluate the potential for a secondary source of soil VOCs (TCE) that may be contributing to the persistence of impacted groundwater at the South Post Groundwater OU. The soil vapor extraction was conducted over a period of three months ending in November 2010. Additional details regarding the soil vapor extraction test that was conducted during the fall of 2010 can be found in the *Draft Final Soil Vapor Testing and Soil Vapor Extraction System Installation Report, Former Sacramento Army Depot, Sacramento, Califonia* dated August 2011.

Analytical data collected from the soil vapor extraction test indicated that groundwater VOC concentrations within the radius of influence of the soil vapor extraction system appeared to decrease significantly while the system was operational. The Army plans to install additional soil vapor extraction wells to continue evaluating this technology as a means to achieve the RAOs set forth in the 1995 Basewide ROD.

5.3 South Post Groundwater Operable Unit Technical Memorandum

In June 2010, the regulators requested a Technical Memorandum from the Army to assess the current nature and extent of the impacted groundwater south and off-site of the Depot as well as to evaluate the effectiveness of the BAGES in capturing the remaining impacted groundwater plume. The results of the assessment indicate that the BAGES is effectively capturing the South Post Plume (**Figure 6**). The Technical Memorandum was submitted to the regulatory agencies as Draft Final in September 2011.

5.4 South Post Groundwater Operable Unit Focused Feasibility Study

A Focused Feasibility Study is planned for the evaluation of alternative remedies for the VOC impacted groundwater located south and off-site of the Depot. This evaluation will commence following the conclusion of the additional soil vapor extraction testing to be conducted by the Army in 2012. Following the Focused Feasibility Study, either an amendment to the 1995 Basewide ROD or an ESD may be developed for the South Post Groundwater OU.

5.5 Status of Recommendations from Third Five-Year Review

The following table includes recommendations from the preceding five-year review (Third Five-Year Review Report) and summarizes the status of those recommendations (**Table 5-1**).

Table 5-1. Status of Recommendations

Recommendations from Third Five-Year Review	Status of Recommendations
Clarify the origin of the cDCE MCL.	Final soil remediation levels as detailed in the 1995 Basewide ROD were met for the South Post Burn Pits OU, Oxidation Lagoons OU, and the Building 300 Burn Pit; therefore, inclusion of final soil cleanup levels and the basis for their selection in a ROD Amendment or ESD is not necessary. The origin of the cDCE MCL will be addressed during development of an ESD or ROD Amendment as appropriate for the Basewide ROD.
Evaluate the risk posed by the remaining contamination at Parking Lot 3. If the level of risk still poses a concern, than evaluate the application of Monitored Natural Attenuation, or other in-situ remedy. Develop an amendment or ESD for the Basewide ROD. Revise the closeout procedures. This is presently under review in the Groundwater Cleanup Optimization Report.	Monitoring of Parking Lot 3 groundwater continues pursuant to the amended groundwater monitoring plan. The Summer 2011 groundwater monitoring event detected TCE above the MCL (5 µg/L) in only one monitoring well (MW0073 at 6.5 µg/L). If MCLs at Parking Lot 3 are not met by the end of FY 2013, then a ROD Amendment or ESD will be prepared, which will include revised closeout procedures.
Complete ongoing update of groundwater flow and contaminant transport model. Evaluate groundwater contamination issues in context of all available modeling, monitoring, treatment, and source information. Presently under review in the Groundwater Cleanup Optimization Report.	The nature and extent of groundwater contamination continues to evolve at the Depot. Extensive data have been collected to evaluate this on an on-going basis. Water level data collected from the field provides sufficient evidence of capture of the South Post Plume and modeling may not necessarily add to this understanding. The Army issued an amendment to the groundwater monitoring program to optimize the groundwater sampling program and reduce costs. The Army submitted a Technical Memorandum (Draft Final) to the regulatory agencies for review in September 2011. The Technical Memorandum evaluates groundwater contamination issues associated with the South Post Groundwater OU.

Table 5-1. Status of Recommendations

Recommendations from Third Five-Year Review	Status of Recommendations
Evaluate the likelihood that the South Post Groundwater OU remedy will successfully meet RAOs if continued. Evaluate and select another remedy if current remedy will not be successful. Presently under review in the Groundwater Cleanup Optimization Report.	The nature and extent of groundwater contamination continues to evolve at the Depot. The Summer 2011 groundwater monitoring event detected TCE above the MCL (5µg/L) in only three off-site monitoring wells: MW1024 (A zone) 5.6 µg/L, MW1027 (B zone) 12 µg/L, and MW1028 (A zone) 9.4 µg/L. The BAGES Work Plan evaluated the likelihood that the South Post Groundwater remedy would successfully meet RAOs if continued and concluded that it would and that attainment of RAOs could be accelerated through remedy optimization. Remedy optimization continues with evaluation of the BAGES. Alternate technologies for achievement of the remedial action objectives set forth in the Basewide ROD for the South Post Groundwater OU will be evaluated during the planned Focused Feasibility Study; testing of soil vapor extraction above the South Post Plume is underway at the Depot.
Prepare document establishing closeout procedures for the South Post Groundwater remedy.	A document establishing closeout procedures for the South Post Groundwater OU will be developed following completion of the Focused Feasibility Study.
Identify logical timeframe to change the Basewide ROD with an ESD or ROD amendment, as appropriate. Include all groundwater remedy changes/updates.	A logical timeframe for the preparation of a ROD Amendment or ESD for the Basewide ROD will be developed following completion of the Focused Feasibility Study.

5.6 Summary of Progress Since Last Five-Year Review

The nature and extent of the contaminated groundwater at SAAD continues to evolve and meaningful progress has been made in achieving the RAOs defined in the 1995 Basewide ROD. In 2007, nine monitoring wells (seven wells in the South Post Plume and two wells in Parking Lot 3) contained TCE in excess of the MCL with concentrations ranging from 5.5 µg/L to 26 µg/L.

As of July 2011, only four monitoring wells contained TCE in excess of the MCL. Three monitoring wells are located in the South Post Plume (South Post Groundwater OU) and ranged in concentration from 5.6 µg/L to 12 µg/L, and one monitoring well is located in Parking Lot 3 (6.5 µg/L). The maximum detected concentration of TCE in July 2011 was 12 µg/L.

Declining site-wide TCE concentrations from July 2007 through July 2011 are graphically presented in **Figure 7**, **7A**, and **7B**. Monitoring wells representing Parking Lot 3 are presented in **Figure 7A** and monitoring wells representing the South Post Plume are presented in **Figure 7B**. In addition, recommendations from the last five-year review have been addressed where possible and appropriate as detailed in **Table 5-1**.

6.0 FIVE-YEAR REVIEW PROCESS

The following sections provide detailed information on the administrative components of the five-year review, including community involvement, document review, data review, and site inspection results. In addition, a summary of information collected from the interview of appropriate project personnel is included.

6.1 Administrative Components

The five-year review team was led by Paul Giller of Plexus, Project Manager for the SAAD, and included the RPMs from EPA Region IX, the DTSC, and the CVRWQCB, as well as the Base Realignment and Closure Environmental Coordinator (BEC).

The review team established the components of the five-year review which included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection;
- Interviews; and
- Five-Year Review Development and Review.

The schedule extended through March 2012.

6.1.1 Community Involvement

The RAB Community Co-Chair was notified of the Army's intent to initiate the five-year review for the Depot. In addition, the Army published notification of the five-year review in the local newspaper (Sacramento Bee) and provided information regarding the date and location of the five-year review public meeting in April 2012.

6.1.2 Document Review

Documents reviewed for the preparation of this report are presented in **Attachment 2**. The RAOs, Applicable or Relevant and Appropriate Requirements (ARARs), and final soil remediation levels were obtained from the 1995 Basewide ROD.

6.2 Data Review

Data from recent and historical groundwater monitoring reports were evaluated as part of the five-year review process. Significant groundwater related trends related to Parking Lot 3 and the South Post Groundwater OU are discussed in the following sections

6.2.1 Parking Lot 3 Groundwater

Groundwater monitoring in Parking Lot 3 continues pursuant to the 2009 Groundwater Monitoring Plan Amendment. TCE is the only remaining contaminant of concern identified in the 1995 Basewide ROD that was detected above the MCL during the sampling event in July 2011. The following table includes TCE concentration data for monitoring wells sampled during the last five annual sampling events conducted from July 2007 through July 2011 at Parking Lot 3 (**Table 6-1**).

Table 6-1. Parking Lot 3 Groundwater Trichloroethene Data Summary

Monitoring Well	Aquifer Zone	July 2007 (µg/L)	July 2008 (µg/L)	July 2009 (µg/L)	July 2010 (µg/L)	July 2011 (µg/L)
MW0050	A	**9.7**	**7.5**	**5.8**	4.5 (J)	2.9
MW0052*	B	< 0.5	< 0.5	NS	NS	NS
MW0053*	A	< 0.5	< 0.5	NS	NS	NS
MW0073	A	**12**	**7.9**	**5.2**	**6.4**	**6.5**
MW0074*	A	< 0.5	< 0.5	NS	NS	NS
MW0075*	B	< 0.5	< 0.5	NS	NS	NS
MW0079*	A	1.7	1.4	NS	NS	NS
MW0080*	A	1.0	0.9	NS	NS	NS
MW0081*	A	1.9	1.3	NS	NS	NS

Bold table entries exceed the MCL of 5 µg/L.
* Sampling modified per the 2009 Groundwater Monitoring Plan Amendment; adopted in June 2009.
J = Result is estimated; analyte was detected at a concentration below the reporting limit but above the laboratory method detection limit.
NS – Not Sampled

The 2009 Groundwater Monitoring Plan Amendment reduced sampling requirements which eliminated the routine sampling of all but two downgradient monitoring wells at Parking Lot 3 (MW0050 and MW0073). Monitoring well locations are presented in **Figure 5**. This reduction in sampling was initiated during the summer 2009 annual sampling event. Histographs providing historical trend information for the identified contaminants of concern at Parking Lot 3 Groundwater are presented in **Attachment 3**.

Data review indicates that the TCE concentration has declined at Parking Lot 3 since the last five-year review was finalized in September 2007. TCE was detected in excess of the MCL in two monitoring wells (MW0050 and MW0073) from July 2007 through July 2009; however, only one monitoring well (MW0073) reported TCE in excess of the MCL in July 2010 and July 2011.

The only contaminant of concern remaining above the MCL is TCE. TCE was detected at 6.5 µg/L in MW0073 during the July 2011 sampling event. The results of the July 2011 groundwater sampling event are presented in **Figure 8**. Monitoring of residual groundwater contamination will continue at Parking Lot 3 pursuant to the amended Groundwater Monitoring Plan.

6.2.2 South Post Groundwater Operable Unit

Groundwater monitoring at the South Post Groundwater OU continues in accordance with the 2009 Groundwater Monitoring Plan Amendment. TCE is the only contaminant of concern identified in the 1995 Basewide ROD that was detected above the MCL during the most recent sampling event in July 2011. The following table includes TCE concentration data for selected monitoring wells sampled during the last five annual sampling events conducted from July 2007 through July 2011 at the South Post Groundwater OU (**Table 6-2**).

Table 6-2. South Post Groundwater Operable Unit Trichloroethene Data Summary

Monitoring Well	Aquifer Zone	July 2007 (µg/L)	July 2008 (µg/L)	July 2009 (µg/L)	July 2010 (µg/L)	July 2011 (µg/L)
MW0004*	A	**5.5**	4.6	NS	1.3	1.0
MW005A	A	< 0.5	< 0.5	< 0.5	1.1	1.5
MW0009	B	< 0.5	< 0.5	2.5	1.3 (J)	1.2
MW0016	A	< 0.5	0.6	< 0.5	< 0.5	< 0.5
MW1004	B	**26**	**22**	**27**	4.7	1.8
MW1005	A	**22**	**15**	**13**	2.3	0.5
MW1015	B	1.7	1.4	1.1	0.6	0.5
MW1016	A	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MW1023	B	**19**	**15**	**13**	**20**	1.3
MW1024	A	**24**	**18**	**12**	**9.9**	**5.6**
MW1027	B	**25**	**21**	**13**	**17**	**12**
MW1028	A	**15**	**12**	**9.3**	**10**	**9.4**
MW1030	B	< 0.5	< 0.5	1.0	0.7	1.1
MW1031	A	< 0.5	0.8	1.2	1.3	1.5
MW1032	B	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MW1033	A	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MW1034	B	< 0.5	0.6	0.6	0.7	0.6
MW1035	A	0.6	0.6	0.6	0.7	0.6
MW1036	B	1.2	1.2	0.9	0.9	0.8
MW1037	A	< 0.5	0.6	< 0.5	0.6	0.6
MW1038**	B				4.7	4.1
MW1039**	B				1.9	1.2

Bold table entries exceed the MCL of 5 µg/L.
* Sampling ceased at this well following adoption of 2009 Groundwater Monitoring Plan Amendment; sampling reinitiated after the July 2009 sampling event in support of the BAGES evaluation.
** Constructed in fall 2009 in support of the BAGES evaluation.
J - Result is estimated; analyte was detected at a concentration below the reporting limit but above the laboratory method detection limit.
NS - Not Sampled

Monitoring well locations are presented in **Figure 5**. Histographs depicting contaminant of concern concentration versus time are included in **Attachment 3**. Histographs provide historical trend information for the identified contaminants of concern at Parking Lot 3.

Data review indicates that the concentration of TCE has decreased at the South Post Groundwater OU since the last five-year review was finalized in September 2007. The only contaminant of concern remaining above the MCL (5 µg/L) is TCE.

During the summer of 2007, TCE concentrations exceeded the MCL in seven monitoring wells at concentrations ranging from 5.5 µg/L to 26 µg/L. Of these seven monitoring wells, six monitoring wells contained TCE in excess of 12 µg/L.

The summer 2011 annual groundwater monitoring event detected TCE greater than the MCL in only three monitoring wells in the South Post Plume at concentrations equal to or less than 12 µg/L: MW1024 (5.6 µg/L), MW1027 (12 µg/L), and MW1028 (9.4 µg/L). The results of the July 2011 groundwater sampling event are presented in **Figure 8**.

Monitoring of the South Post Groundwater OU continues and optimization of the selected remedy (groundwater extraction) is currently under evaluation. In addition to remedy optimization, the Army is evaluating alternative technologies (i.e., soil vapor extraction) to facilitate achievement of the RAOs included in the 1995 Basewide ROD. A Focused Feasibility Study is planned for the South Post Groundwater OU. The results of the Focused Feasibility Study will be utilized to evaluate alternative remedies for the remaining impacted groundwater southwest and off-site of the Depot. Selection of an alternate remedy will be addressed in a ROD Amendment or ESD.

6.2.3 Potential Changes to the Monitoring Program

The Army revised the groundwater monitoring program for the Depot in June 2009. The revisions included a significant reduction in the analytes collected (including metals and major ions), and reduced sampling frequency. The rationale for these changes is included in the 2009 Groundwater Monitoring Plan Amendment. No changes in the immediate future are planned for the long-term groundwater monitoring program at the Depot; however, the soil vapor extraction evaluation scheduled for 2012 (South Post Groundwater OU) will require the collection of additional groundwater samples outside of the program defined in the 2009 Groundwater Monitoring Plan Amendment for approximately one year.

6.3 Site Inspection

A site inspection was conducted on October 24, 2011 by the BEC (refer to **Attachment 4**). The purpose of the inspection was to assess the protectiveness of the remedy, including the presence of fencing to restrict access, the integrity of the CAMU's soil cover, and the condition of the information repository stored on-site.

No significant issues were identified regarding the CAMU's soil cap or the access restricting fencing. The institutional controls that are in place include prohibitions on the use of groundwater until cleanup levels are achieved, disturbance of the soil cap, and any other activities or actions that may interfere with the implemented remedies. No activities were observed that violated the institutional controls. The soil cap and surrounding area were undisturbed, and no new uses of groundwater were observed. Site photographs are presented in **Attachment 5**.

In addition, the Sacramento County Environmental Management Department (SCEMD) was contacted regarding the enforcement of institutional controls regarding off-site groundwater restrictions. The SCEMD verified that institutional controls are in effect and enforced. A copy of this five-year review will be provided to the SCEMD.

6.4 Interviews

Plexus interviewed the BEC; the RPMs from EPA, DTSC, and the CVRWQCB; the RAB Community Co-Chair; the Plexus Project Manager; and the treatment system operator to gather information on the site. The site interview response forms are included in **Attachment 6**. The following table includes a list of individuals that were interviewed (**Table 6-3**).

Table 6-3. Interview Summary

Name	Title	Organization	Date/Method of Interview
Scott Armstrong	BEC	U.S. Army	Feb. 10, 2012; phone interview
Martin Hausladen	RPM	EPA	Feb. 8, 2012; phone interview
Theresa McGarry	RPM	DTSC	Feb. 15, 2012; phone interview
Conny Mitterhoffer	RPM	CVRWQCB	Feb. 13, 2012; phone interview
Robert Chambers	Environmental Technician	Johnson Controls	Feb. 8, 2012; phone interview
Dick Walker	Community Co-Chair	RAB	March 20, 2012; phone interview
Paul Giller	Project Manager	Plexus	Feb. 7, 2012; phone interview
Melissa Anguiano	Economic Development Manager	City of Sacramento	Feb. 21, 2012; phone interview

7.0 TECHNICAL ASSESSMENT

This section of the five-year review provides the framework for the protectiveness determinations in Section 10.0. The Technical Assessment is divided into three sections that are associated with the South Post Burn Pits OU, South Post Groundwater OU, and the Parking Lot 3 Groundwater. Per the Second Five-Year Review, remedy assessments for the Oxidation Lagoons OU, Building 300 Burn Pit, and the Battery Disposal Well IDW are no longer required and will not be conducted as the remediation is completed and cleanup levels were achieved at these three sites.

7.1 Corrective Action Management Unit / South Post Burn Pits Operable Unit

The following sections present an assessment of the selected remedy for the South Post Burn Pits OU, including its function and current applicability and protectiveness.

7.1.1 Question A:

Is the remedy functioning as intended by the decision documents?

7.1.1.1 Remedial Action Performance and Operations

Consolidation and stabilization of metals-impacted soil within a CAMU was selected as the remedy for the South Post Burn Pits OU in the 1995 Basewide ROD. This remedy amended the remedy selected in the Interim ROD prepared for the South Post Burn Pits OU in 1993. The CAMU also includes metals-impacted soil from the Building 300 Burn Pit, Oxidation Lagoons OU, and the Battery Disposal Well IDW. The existing CAMU is functioning as designed. Lysimeter monitoring has not indicated that metal migration from the stabilized mass is occurring. The soil cover is in good condition and shows no signs of deterioration. Containment of the stabilized soil under the soil cover is effective.

7.1.1.2 Operational Costs

Operational costs associated with the South Post Burn Pits OU have been included in **Table 4-2**.

7.1.1.3 Opportunities for Optimization

No opportunities for optimization have been identified at this time.

7.1.1.4 Implementation of Institutional Controls

Institutional controls have been set in place through the use of deed restrictions or Covenants to Restrict the Use of Property (CRUPs) as detailed in the *2-A & 2-B FOSTs*. Soil-related institutional controls have been established for the CAMU. Institutional controls also restrict the use of VOC impacted groundwater underlying the South Post Burn Pits OU. The institutional controls have been enforced and no prohibited activities have occurred. The remedy is functioning as intended in the decision documents.

7.1.1.5 Early Indicators of Potential Issues

No potential issues have been identified at this time.

7.1.2 Question B:

Are the exposure assumptions, toxicity data, clean-up levels, and remedial action objectives at the time of the remedy selection still valid?

7.1.2.1 Changes in Standards, Newly Promulgated Standards, and Items to be Considered

All Applicable or Relevant and Appropriate Requirements (ARARs) listed in the 1995 Basewide ROD (and clean-up levels as modified in subsequent work plans) were complied with during the construction phase associated with soil remediation activities. Currently, only the ARARs associated with the CAMU require evaluation because the other listed ARARs do not carry over to current operations. The ARAR evaluation is located in **Attachment 7**.

The information provided in Table 1 of **Attachment 8** is pertinent to the remediation objectives stated in the 1995 Basewide ROD. Table 1 provides a list of chemicals and the soil cleanup levels as they were established as well as any subsequent modifications. The 1995 groundwater and soil clean-up levels are compared to current Regional Screening Levels (RSLs) and California Human Health Screening Levels (CHHSLs) for soil-related chemicals, and to MCLs for groundwater-related chemicals. Soil clean-up standards are risk-based and not promulgated. Arsenic concentrations are naturally elevated at this site and exceed both the residential and industrial CHHSLs. Therefore, the arsenic action level was based on local background concentrations. The action levels established in the Basewide ROD for chromium VI and cadmium fall below both the residential and industrial CHHSLs. The action levels for lead fall below the industrial CHHSL but above the residential CHHSL. However, the remaining concentrations are low and it is expected that the remaining risk would still fall within the EPA target risk range for the soil related sites. All of the groundwater related MCLs have remained unchanged.

The Human Health Risk Assessment method and results for the Depot are detailed in, "*Basewide Human Health Risk Assessment, Sacramento Army Depot, Sacramento California"* (Kleinfelder, 1997). Directly comparing toxicity values, then (1993) and now, is an efficient method through which to screen for changes in the level of protectiveness.

Table 2 of **Appendix 8** provides a direct comparison between the 1993 toxicity values and current RSL toxicity values for 11 chemicals assigned action levels in the 1995 Basewide ROD. A total of 35 chemicals were included in the risk assessment. RSLs are used in place of EPA Region IX Preliminary Remediation Goals (PRGs). The EPA Region IX PRGs have been harmonized with similar risk-based screening levels used by EPA Region III and Region VI into a single table: "RSLs for Chemical Contaminants at Superfund Sites," located on EPA's website. The chemicals listed are compiled from Table 4-11 of the Human Health Risk Assessment. Of 11 chemicals listed in Table 1 of **Appendix 8**, toxicity values have been revised or newly developed for nine chemicals. The revised or newly developed values are shaded in Table 2 of **Appendix 8**. In some cases the values used in the risk assessment are more protective than the current EPA Region IX RSLs.

The soil-related chemicals of concern in the ROD are cadmium, total chromium, chromium VI, arsenic, and lead. Toxicity values for three of these soil-related chemicals have been changed and indicate somewhat greater estimated hazards and risks. However, the chemical concentrations remaining after completion of the soil excavations are low,

and it is expected that the remaining risk, even considering the changes in some toxicity values, would still fall within the EPA risk range for the various sites. One soil-related chemical, arsenic, is found in the area naturally at elevated concentrations. A regulatory value is no longer listed for total chromium. The total chromium concentrations in soil are below the new regulatory values for trivalent chromium, but above the regulatory value for hexavalent chromium. Speciation of the chromium in the soil would be required to evaluate current toxicity values. However, as there are no complete exposure pathways for chromium-contaminated soil, this evaluation is not necessary because the remedy is protective of human health and the environment.

The protectiveness of the soil remedies is based on meeting ARARs and implementing institutional controls to prevent exposure. Even considering the changes in toxicity values, there are no complete exposure pathways based on placement of the soil cover, site fencing, and enforcement of the institutional controls at the CAMU. Therefore, the remedy is still considered protective.

7.1.2.2 Changes in Risk Assessment Methods

Since the publication data of the Third Five-Year Review, "*Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual"* (Part F; Supplemental Guidance for Inhalation Risk Assessment, 2009) was updated. Standardized risk assessment methodologies have not changed in a manner that may affect the protectiveness of the remedy.

7.1.2.3 Expected Progress Toward Meeting Remedial Action Objectives

During implementation of the remedy, soil containing contaminant concentrations above the clean-up levels was removed, stabilized, and placed in the CAMU. Institutional controls and the CAMU soil cover prevent exposure to stabilized soil. RAOs for the soil remedy have been met.

7.1.3 Question C:

Has any other information come to light that could call into question the protectiveness of the remedy?

The outside physical setting has not changed and there have been no catastrophic weather events that have affected the remedy. There have also been no changes in exposure pathways or land use, and no new contaminants, contaminant sources, or remedy by-products have been identified at the site. In addition, no changes to the ecological risk assessment guidance have occurred since the last five-year review.

7.2 South Post Groundwater Operable Unit

The following sections present an assessment of the selected remedy for the South Post Groundwater OU, including its function and current applicability and protectiveness.

7.2.1 Question A:

Is the remedy functioning as intended by the decision documents?

7.2.1.1 Remedial Action Performance and Operations

Groundwater extraction and treatment were selected as the remedy for VOC-impacted groundwater at the South Post Groundwater OU in the 1989 Interim ROD. This remedy was amended in the 1995 Basewide ROD to include impacted groundwater southwest and off-site of the Depot. Optimization of the selected remedy is currently in progress and under evaluation. The SPGES was shut-down in October 2009 for the evaluation of an alternate extraction well configuration that would provide an equivalent level of protection while using significantly less resources. Two new extraction wells were installed and brought on-line in February 2010 as the BAGES. A Technical Memorandum regarding the effectiveness of the BAGES was prepared by the Army and recently submitted to the regulatory agencies for review (Plexus, 2011). The document also includes an assessment of the current nature and extent of impacted groundwater located south and off-site of the Depot. Data indicate that the BAGES is effectively capturing the plume and is an effective replacement for the SPGES (refer to **Figure 6**); therefore, the remedy is functioning as intended.

7.2.1.2 Operational Costs

Operational costs associated with the South Post Groundwater OU have been included in **Table 4-2**.

7.2.1.3 Opportunities for Optimization

As discussed previously, the Army is currently conducting an optimization evaluation of the BAGES. The optimization will reduce operating costs and improve remedy efficiency while preserving limited groundwater resources within the Sacramento River Basin and reducing both energy requirements and the carbon footprint. In addition, a Focused Feasibility Study is planned for the evaluation of alternative remedies for the VOC impacted groundwater located southwest and off-site of the Depot. This alternative evaluation is designed to facilitate achievement of the RAOs set forth in the 1995 Basewide ROD.

7.2.1.4 Implementation of Institutional Controls

Institutional controls have been set in place through the use of deed restrictions and land use controls included in all installation property transfers. Institutional controls have been enforced and no well installation, use of groundwater, or disturbance to the treatment system has occurred. Well permits in this area are issued by the SCEMD. The SCEMD has been provided with information regarding the extent of groundwater impacts on- and off-site of the Depot and will also be provided a copy of this five-year review to guide their decision making in regard to well installation.

7.2.1.5 Early Indicators of Potential Issues

No potential issues have been identified at this time.

7.2.2 Question B:

Are the exposure assumptions, toxicity data, clean-up levels, and remedial action objectives at the time of the remedy selection still valid?

7.2.2.1 Changes in Standards, Newly Promulgated Standards, and Items to be Considered

The ARARs listed in the 1995 Basewide ROD were based on meeting the more stringent of Federal or State MCLs. The ARAR evaluation is located in **Attachment 7**.

The information provided in Table 1 of **Attachment 8** is pertinent to the remediation objectives stated in the 1995 Basewide ROD. Table 1 provides a list of chemicals and the soil clean-up levels established by the 1995 Basewide ROD and any subsequent modifications. The 1995 groundwater and soil clean-up levels are compared to current RSLs and CHHSLs for soil related chemicals, and to MCLs for groundwater-related chemicals. All of the groundwater-related MCLs have remained unchanged.

Table 2 of **Attachment 8** provides a direct comparison between the 1993 toxicity values and current RSLs for 11 chemicals assigned action levels in the 1995 Basewide ROD. A total of 35 chemicals were included in the risk assessment. RSLs are used in place of EPA Region IX PRGs. The EPA Region IX PRGs have been harmonized with similar risk-based screening levels used by EPA Region III and Region VI into a single table: "RSLs for Chemical Contaminants at Superfund Sites," located on EPA's website. The chemicals listed are compiled from Table 4-11 of the *Human Health Risk Assessment* (Kleinfelder, 1997). Of 11 chemicals listed in Table 1 of **Attachment 8**, toxicity values have been revised or newly developed for nine chemicals. The revised or newly developed values are shaded in Table 2 of **Attachment 8**. In some cases the values used in the risk assessment are more protective than the current EPA Region IX RSLs.

The groundwater related chemicals of concern are 1,2-DCA, CCl_4, cDCE, TCE, and PCE. As shown in Table 2 of **Attachment 8**, toxicity values for each of the groundwater-related chemicals have been changed and indicate somewhat greater estimated hazards and risks. At this time, concentrations corresponding to risks greater than 1×10^{-6} do remain on site. However, institutional controls are in place and there is no complete exposure pathway for groundwater. Although some concentrations corresponding to risks greater than 1×10^{-6} remain on site, the current remedy, based upon MCLs and institutional controls, prohibits completion of exposure pathways and ensures the remedy is still protective.

The short and long-term protectiveness of the remedy is based on meeting ARARs and implementation of institutional controls to prevent exposure.

The risk posed by vapor intrusion was first evaluated in the Third Five-Year Review Report following a request by the EPA; however, in an effort to address this continually evolving issue, the Army conducted an additional screening level investigation to determine if vapor intrusion is a viable exposure pathway in relation to the groundwater contamination at SAAD.

The Army thoroughly reviewed EPA guidance, DTSC guidance, Army guidance, and the Johnson & Ettinger model and utilized the DTSC automated screening tool to evaluate vapor intrusion risk with respect to the groundwater in the South Post Plume at SAAD. In addition, this screening evaluation utilized the recently released (September 2011) toxicological data for TCE available at www.epa.gov/ncea/iris/subst/0199.html. The screening process and data are provided in **Attachment 9**.

The results of the evaluation still indicate that groundwater contamination associated with the South Post Groundwater OU does not pose an unacceptable vapor intrusion risk due to the depth of groundwater, low concentration of contaminants, and prevailing soil characteristics and geology. The remedy is considered protective.

Reassessment of TCE toxicity was recently completed and new toxicity factors have been developed by the EPA. As a result, the MCL for TCE may be revised by the EPA in the future. If the MCL is revised by the EPA, then remedy protectiveness will be re-evaluated with respect to the agreed upon cleanup standards in the ROD.

7.2.2.2 Changes in Risk Assessment Methods

Since the publication data of the Third Five-Year Review, *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual* (Part F; Supplemental Guidance for Inhalation Risk Assessment, 2009) was updated. Standardized risk assessment methodologies have not changed in a manner that may affect the protectiveness of the remedy.

7.2.2.3 Expected Progress Toward Meeting Remedial Action Objectives

Groundwater concentrations have decreased at most monitoring wells, but RAOs have not yet been achieved. A Focused Feasibility Study is being conducted to evaluate alternative methods designed to achieve RAOs.

7.2.3 Question C:

Has any other information come to light that could call into question the protectiveness of the remedy?

The outside physical setting has not changed and there have been no catastrophic weather events that have affected the remedy. There have also been no changes in exposure pathways or land use, and no new contaminants, contaminant sources, or remedy by-products have been identified at the site. In addition, no changes to the ecological risk assessment guidance have occurred since the last five-year review.

7.3 Parking Lot 3 Groundwater

The following sections present an assessment of the selected remedy for groundwater at Parking Lot 3, including its function and current applicability and protectiveness.

7.3.1 Question A:

Is the remedy functioning as intended by the decision documents?

7.3.1.1 Remedial Action Performance and Operations

Groundwater extraction and treatment through wellhead carbon adsorption was selected as the remedy for VOC-impacted groundwater at Parking Lot 3 in the 1995 Basewide ROD. The selected remedy operated from March 1996 through June 2002. In June 2002, following approval from the regulatory agencies, groundwater extraction was discontinued as criteria included in the monitoring and closeout report (URS, 2002) prepared for Parking Lot 3 were met. Subsequent groundwater monitoring indicated that VOC concentration (TCE) had increased to levels above the MCL in MW0050 and MW0073. Discussions between the regulatory agencies and the Army concluded that

reactivation of the groundwater extraction system would not attain the RAOs in a cost effective manner, and all parties agreed to continue groundwater monitoring without active extraction. Sampling results from the summer 2011 annual groundwater monitoring event indicated that Parking Lot 3 contains only one monitoring well with a TCE concentration in excess of the MCL. TCE was detected at a concentration of 6.5 µg/L in MW0073.

7.3.1.2 Operational Costs

Operational costs associated with Parking Lot 3 have been included in **Table 4-2**.

7.3.1.3 Opportunities for Optimization

No opportunities for optimization have been identified at this time.

7.3.1.4 Implementation of Institutional Controls

Institutional controls have been set in place through the use of deed restrictions or CRUPs as detailed in the *2-A & 2-B FOSTs*. The institutional controls have been enforced and no well installation, use of groundwater, or disturbance to the treatment system has occurred.

7.3.1.5 Early Indicators of Potential Issues

Groundwater at Parking Lot 3 has not been restored to beneficial use as a potential drinking water source as stipulated in the 1995 Basewide ROD, and the selected remedy is not in operation. Groundwater sampling conducted in July 2011 detected TCE in excess of the MCL in only one monitoring well at Parking Lot 3. TCE was detected at a concentration of 6.5 µg/L in MW0073. Recent data suggests that TCE concentrations are declining at Parking Lot 3. If the TCE concentration at Parking Lot 3 has not declined below the MCL by the end of FY2013, then this issue will be addressed in a ROD Amendment or an ESD.

7.3.2 Question B:

Are the exposure assumptions, toxicity data, clean-up levels, and remedial action objectives at the time of the remedy selection still valid?

7.3.2.1 Changes in Standards, Newly Promulgated Standards, and Items to be Considered

The ARARs listed in the 1995 Basewide ROD were based on meeting the more stringent of Federal or State MCLs. The ARAR evaluation is located in **Attachment 7**.

The information provided in Table 1 of **Attachment 8** is pertinent to the remediation objectives stated in the 1995 Basewide ROD. Table 1 provides a list of chemicals and the soil clean-up levels established by the 1995 Basewide ROD and any subsequent modifications. The 1995 groundwater and soil clean-up levels are compared to current RSLs and CHHSLs for soil related chemicals, and to MCLs for groundwater related chemicals. All of the groundwater-related MCLs have remained unchanged.

Table 2 of **Attachment 8** provides a direct comparison between the 1993 toxicity values and current RSLs for 11 chemicals assigned action levels in the 1995 Basewide ROD. A total of 35 chemicals were included in the risk assessment. RSLs are used in place of EPA Region IX PRGs. The EPA Region IX PRGs have been harmonized with similar

risk-based screening levels used by EPA Region III and Region VI into a single table: "RSLs for Chemical Contaminants at Superfund Sites," located on EPA's website. The chemicals listed are compiled from Table 4-11 of the *Human Health Risk Assessment* (Kleinfelder, 1997). Of 11 chemicals listed in Table 1 of **Attachment 8**, toxicity values have been revised or newly developed for nine chemicals. The revised or newly developed values are shaded in Table 2 of **Attachment 8**. In some cases the values used in the risk assessment are more protective than the current EPA Region IX RSLs.

The groundwater related chemicals of concern are 1,2-DCA, CCl_4, cDCE, TCE, and PCE. As shown in Table 2 of **Attachment 8**, toxicity values for each of the groundwater-related chemicals have been changed and indicate somewhat greater estimated hazards and risks. At this time, concentrations corresponding to risks greater than 1×10^{-6} do remain on site. However, institutional controls are in place and there is no complete exposure pathway for groundwater. Although some concentrations corresponding to risks greater than 1×10^{-6} remain on site, the current remedy, based upon MCLs and institutional controls, prohibits completion of exposure pathways and ensures the remedy is still protective.

The short and long-term protectiveness of the remedy is based on meeting ARARs and implementation of institutional controls to prevent exposure.

The risk posed by vapor intrusion associated with the contaminated groundwater at Parking Lot 3 was evaluated during this five-year review. Hypothetical building scenarios were utilized for this evaluation as no buildings are present and land use restrictions prevent future building construction at Parking Lot 3. The evaluation used a conservative approach and site-specific data.

The Army thoroughly reviewed EPA guidance, DTSC guidance, Army guidance, and the Johnson & Ettinger model and utilized the DTSC automated screening tool to evaluate vapor intrusion risk with respect to the groundwater at Parking Lot 3. In addition, this screening evaluation utilized the recently released toxicological data (September 2011) for TCE available at www.epa.gov/ncea/iris/subst/0199.html. The screening process and data are provided in **Attachment 10**.

The results of the evaluation indicate that groundwater contamination at Parking Lot 3 does not pose an unacceptable vapor intrusion risk due to the depth of groundwater, low concentration of contaminants, and prevailing soil characteristics and geology. The remedy is considered protective.

Reassessment of TCE toxicity was recently completed, and revised toxicity factors have been developed by the EPA. As a result, the MCL for TCE may be revised by the EPA in the future.

7.3.2.2 Changes in Risk Assessment Methods

Since the publication data of the Third Five-Year Review, *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual* (Part F; Supplemental Guidance for Inhalation Risk Assessment, 2009) was updated. Standardized risk assessment methodologies have not changed in a manner that may affect the protectiveness of the remedy.

7.3.2.3 Expected Progress Toward Meeting Remedial Action Objectives

Action levels had been achieved when the groundwater treatment system was shut down. Contaminants removal rates often decline asymptotically with groundwater pump and treat systems. Concentration increases commonly occur after the system is shut down. Contaminant concentrations have rebounded at this site to levels near or above the MCLs, and back below the MCLs several times; however, recent data suggest that contaminant concentrations are declining.

7.3.3 Question C:

Has any other information come to light that could call into question the protectiveness of the remedy?

The outside physical setting has not changed and there have been no catastrophic weather events that have affected the remedy. There have also been no changes in exposure pathways or land use, and no new contaminants, contaminant sources, or remedy by-products have been identified at the site. In addition, no changes to the ecological risk assessment guidance have occurred since the last five-year review.

7.4 Technical Assessment Summary

According to the data reviewed, the site inspection results, and the site interview responses, the remedies are functioning for the South Post Burn Pits OU, the South Post Groundwater OU, and the Parking Lot 3 Groundwater, as intended by the 1995 Basewide ROD. There have been no changes in the physical conditions of these sites and there have been no changes to the standardized risk assessment methodology that would affect remedy protectiveness. There is no other information that calls into question remedy protectiveness at SAAD.

8.0 ISSUES

Issues related to current site operations, conditions, and activities that may prevent the selected remedies from being protective are listed in **Table 8-1**.

Table 8-1. Issues

Issues	Affects Current Protectiveness (Yes/No)?	Affects Future Protectiveness (Yes/No)?
1. The origin of the cDCE MCL for impacted groundwater at SAAD has not been established in a decision document.	No	No
2. Groundwater concentrations of TCE remain above RAOs at the South Post Groundwater OU.	No	No
3. Groundwater concentrations of TCE remain above RAOs at Parking Lot 3.	No	No

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Recommended improvements to current site operations and activities are presented in **Table 9-1**.

Table 9-1. Recommendations and Follow-up Actions

Issues	Recommendations	Party Responsible	Oversight Agency	Milestone Date
1.	Clarify the origin of the cDCE MCL in a ROD Amendment or ESD.	Army	EPA and DTSC	FY 2013
2.	Continue groundwater treatment and monitoring at the South Post Groundwater OU. If contaminant concentrations remain above ROD goals (MCLs), then prepare a Focused Feasibility Study to evaluate remedial alternatives. The results of the Focused Feasibility Study will then be used to prepare a ROD Amendment or ESD.	Army	EPA and DTSC	FY 2013
3.	Continue groundwater monitoring. Prepare a ROD Amendment or ESD for Parking Lot 3, if MCLs are not achieved by the end of FY 2013.	Army	EPA and DTSC	FY 2013

10.0 PROTECTIVENESS STATEMENTS

The following sections contain protectiveness statements regarding the selected remedies at the South Post Burn Pits OU, the South Post Groundwater OU, and the Parking Lot 3 Groundwater. The protectiveness statements were prepared according to EPA guidance.

10.1 South Post Burn Pits Operable Unit Protectiveness Statement

The remedy currently protects human health and the environment in the short-term because contaminated soil exceeding cleanup levels has been excavated, stabilized, and placed in a CAMU at SAAD. However, in order for the remedy to be protective in the long-term, the institutional controls must continue to be enforced and the physical integrity of the soil cover over the CAMU must be maintained.

10.2 South Post Groundwater Operable Unit Protectiveness Statement

The remedy currently protects human health and the environment in the short-term because institutional controls prevent exposure to contamination remaining above the cleanup goals. In addition, the South Post Plume is currently under the influence of a groundwater extraction system which is actively reducing contaminant concentration and preventing further migration. However, in order for the remedy to be protective in the long-term, the institutional controls restricting groundwater use must continue to be enforced until clean-up goals are achieved.

10.3 Parking Lot 3 Groundwater Protectiveness Statement

The remedy currently protects human health and the environment in the short-term because institutional controls prevent exposure to contamination remaining above the clean-up goals. However, in order for the remedy to be protective in the long-term, the institutional controls restricting groundwater use must continue to be enforced until clean-up goals are achieved.

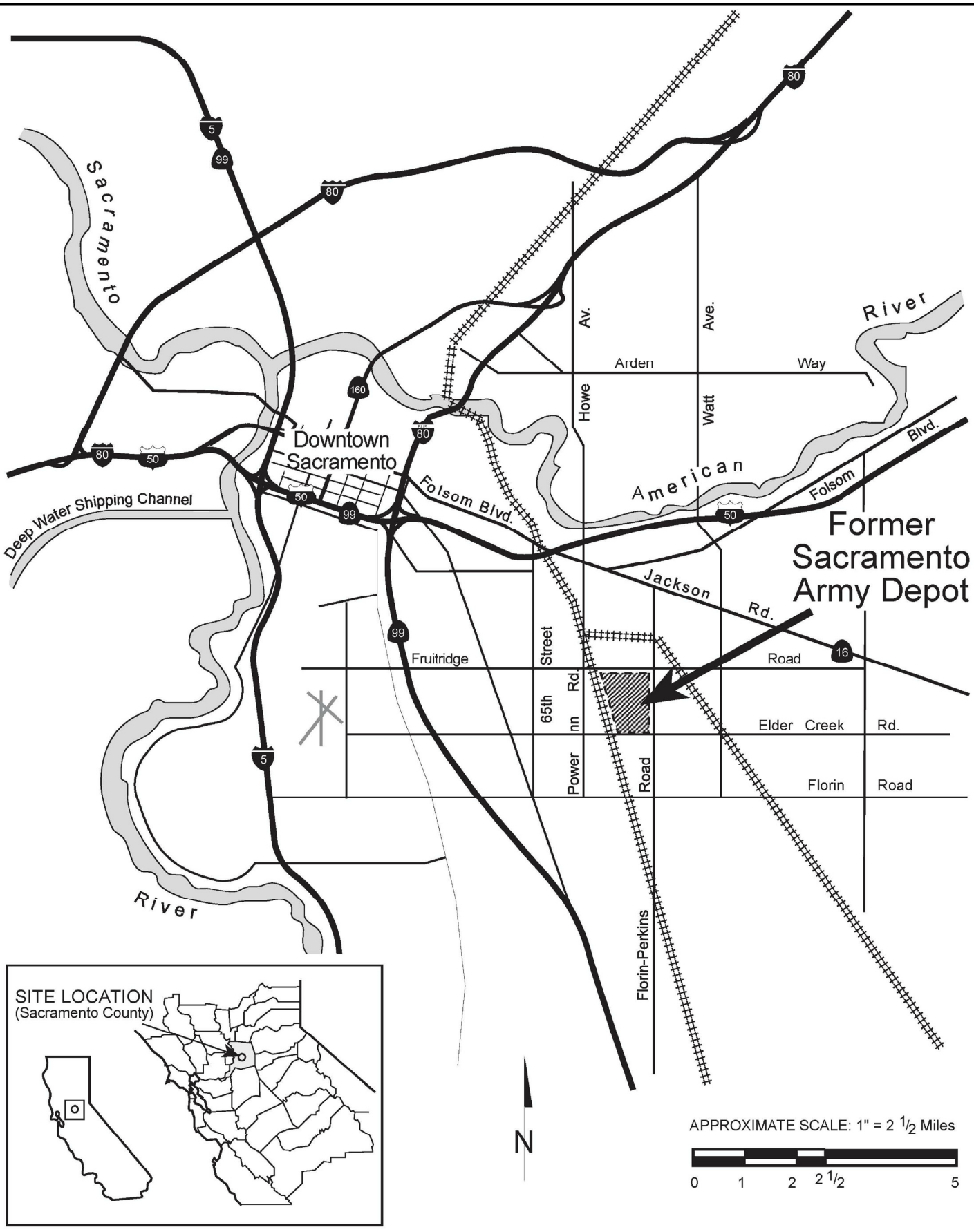
10.4 Site-wide Protectiveness Statement

Because the remedial actions are protective, the site is protective of human health and the environment.

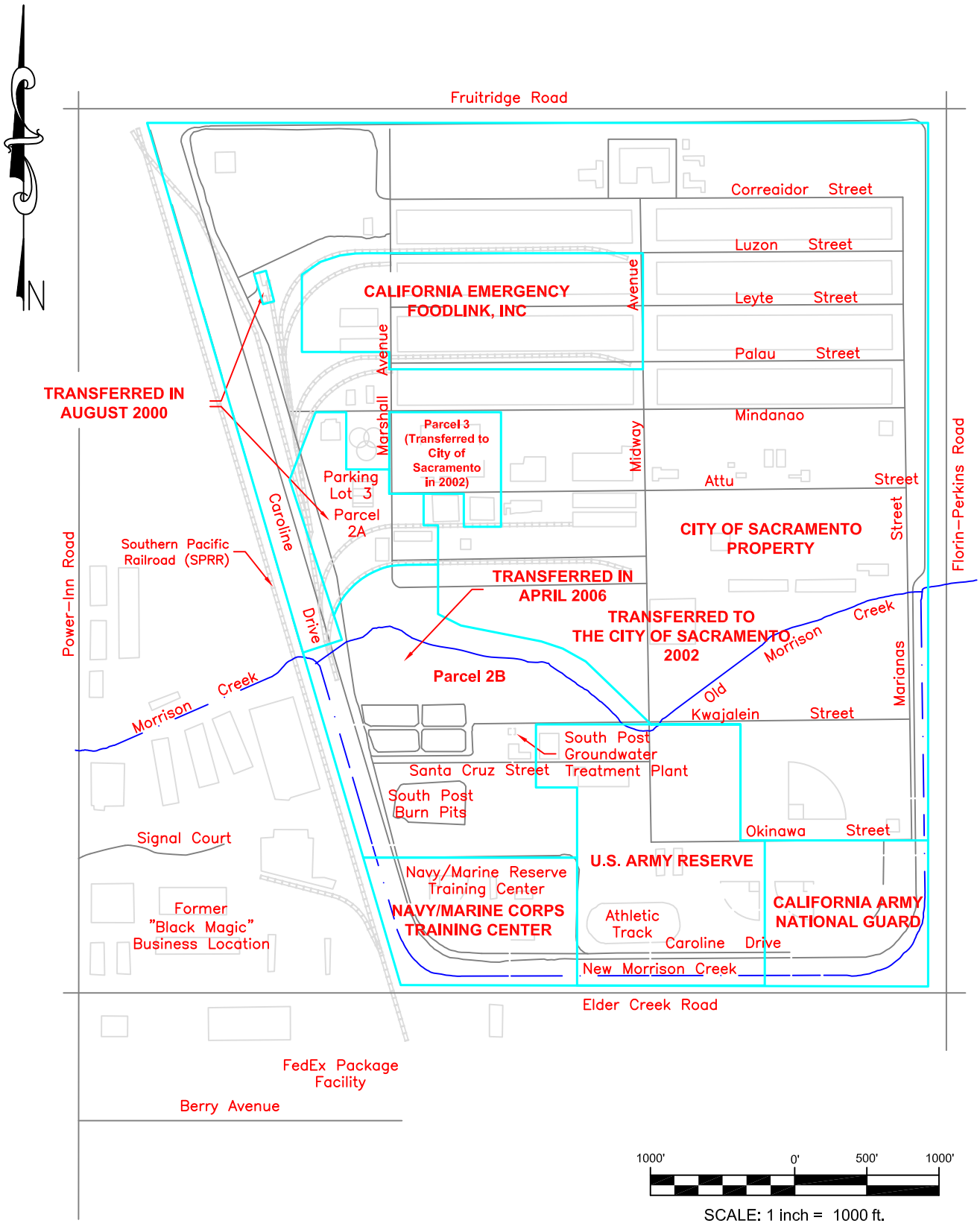
11.0 NEXT REVIEW

The next five-year review will be conducted in 2017 and will be due no later than September 24, 2017.

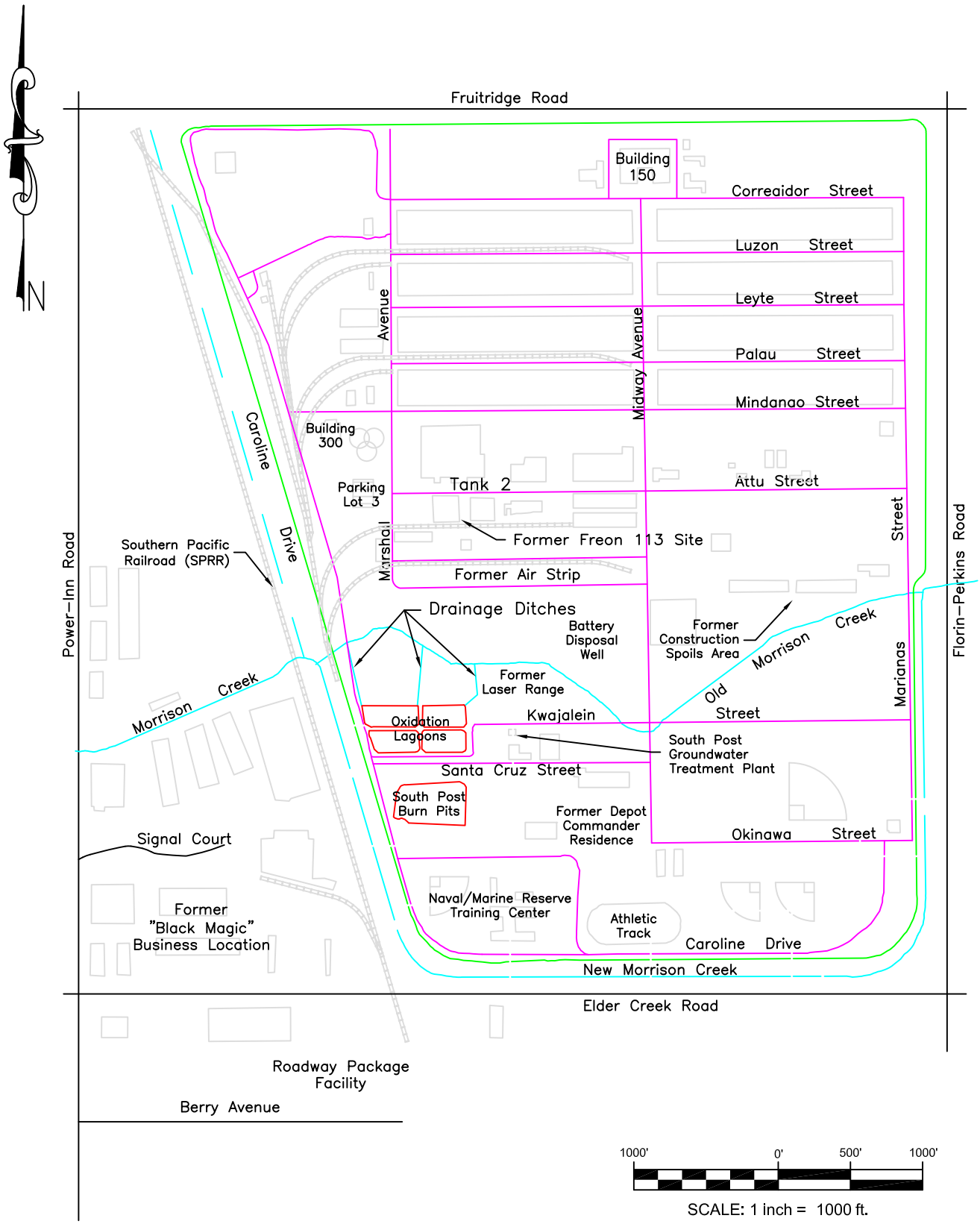
Attachment 1
Figures



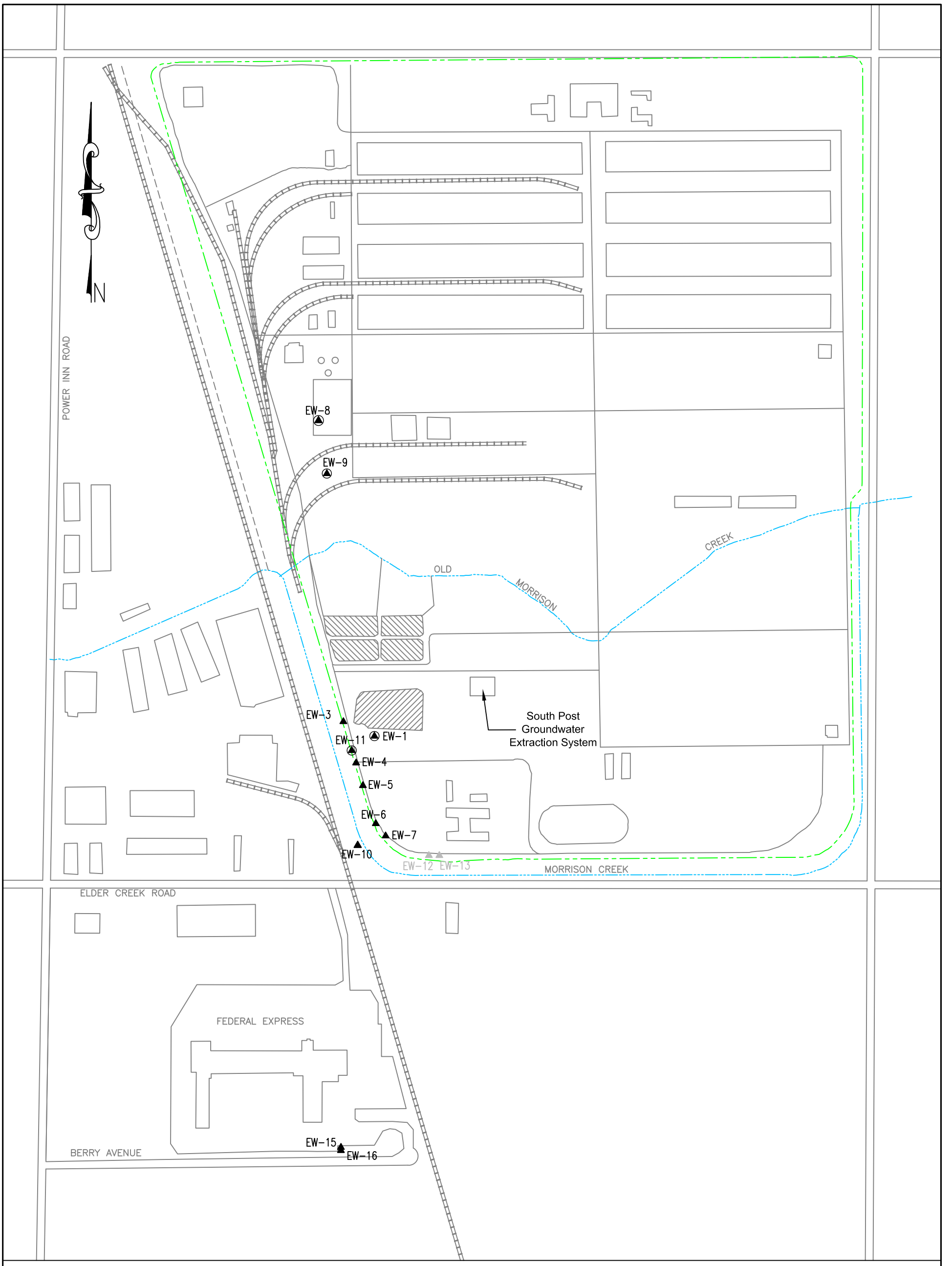
25 years of excellence PLEXUS scientific	Drawn By: PLEXUS Project No.: 8119-3BJ Date: 09-23-11 Filename: Figure1*.dwg	SITE LOCATION MAP FOURTH FIVE-YEAR REVIEW FORMER SACRAMENTO ARMY DEPOT SACRAMENTO, CALIFORNIA	FIGURE 1



25 years of excellence PLEXUS scientific	Drawn By: PLEXUS Project No.: 8119-3BJ Date: 07-20-11 Filename: Figure2*.dwg	PROPERTY TRANSFER MAP FOURTH FIVE-YEAR REVIEW FORMER SACRAMENTO ARMY DEPOT SACRAMENTO, CALIFORNIA	FIGURE 2



25 years of excellence PLEXUS scientific	Drawn By: PLEXUS Project No.: 8119-3BJ Date: 09-23-11 Filename: Figure3*.dwg	FORMER FACILITY MAP FOURTH FIVE-YEAR REVIEW FORMER SACRAMENTO ARMY DEPOT SACRAMENTO, CALIFORNIA	FIGURE 3



LEGEND

▲	EW-3	EXTRACTION WELL LOCATION
◭	EW-1	EXTRACTION WELL NOT USED
▲	EW-12	DESTROYED/ABANDONED EXTRACTION WELL LOCATION

600' 0' 300' 600'

SCALE: 1 inch = 600 ft.

Note: Property lines illustrated are approximate and not based on land survey.

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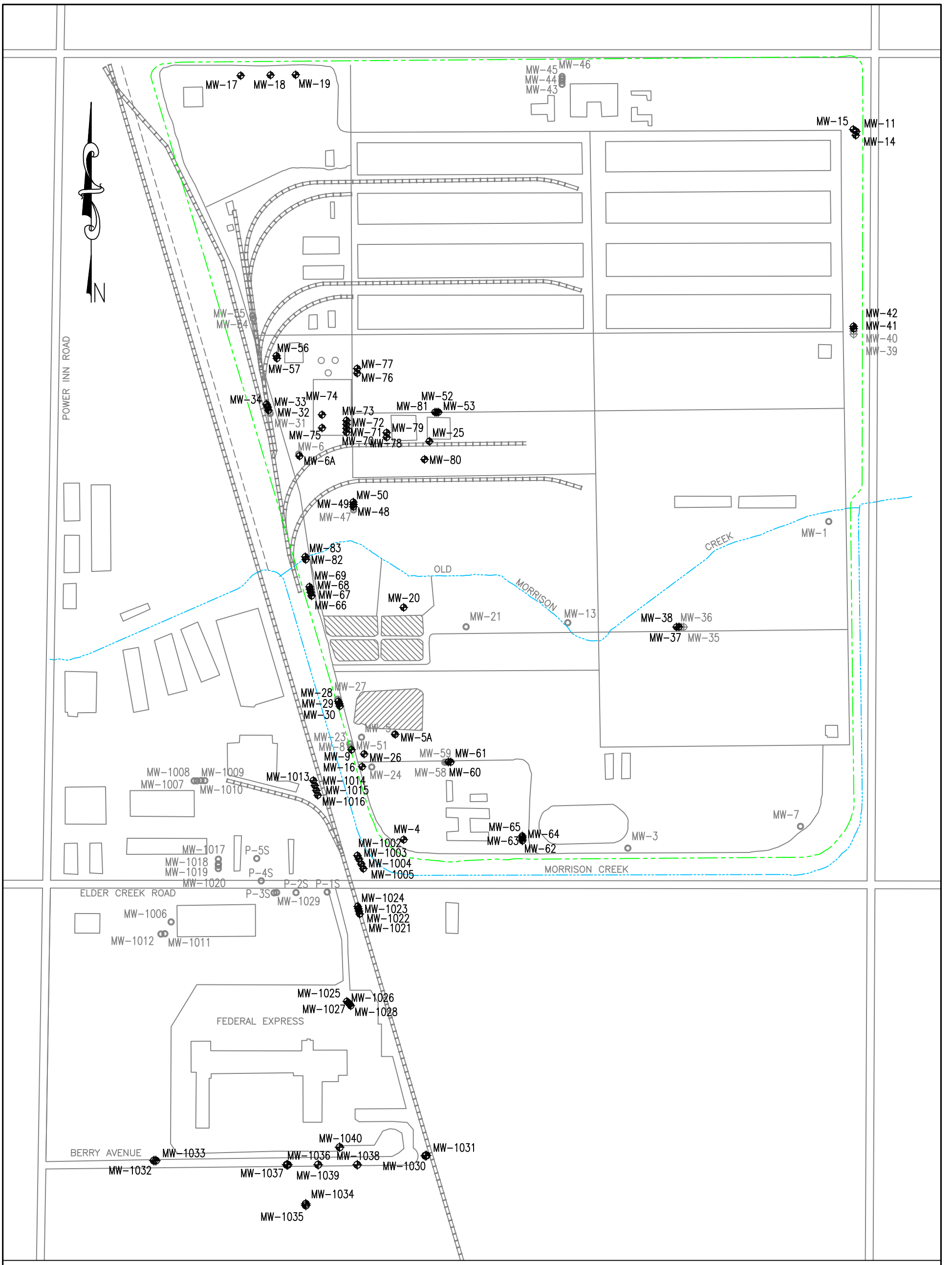
PLEXUS scientific

Drawn By:	PLEXUS
Project No.:	8119-3BJ
Date:	03-15-12
Filename:	Figure4*.dwg

EXTRACTION WELL LOCATION MAP
FOURTH FIVE-YEAR REVIEW

FORMER SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE
4



LEGEND

MW-1029	GROUNDWATER MONITORING WELL LOCATION
MW-40	ABANDONED GROUNDWATER MONITORING WELL LOCATION
MW-1	DESTROYED GROUNDWATER MONITORING WELL LOCATION
P-1S	DESTROYED PIEZOMETER LOCATION

600' 0' 300' 600'

SCALE: 1 inch = 600 ft.

Note: Property lines illustrated are approximate and not based on land survey.

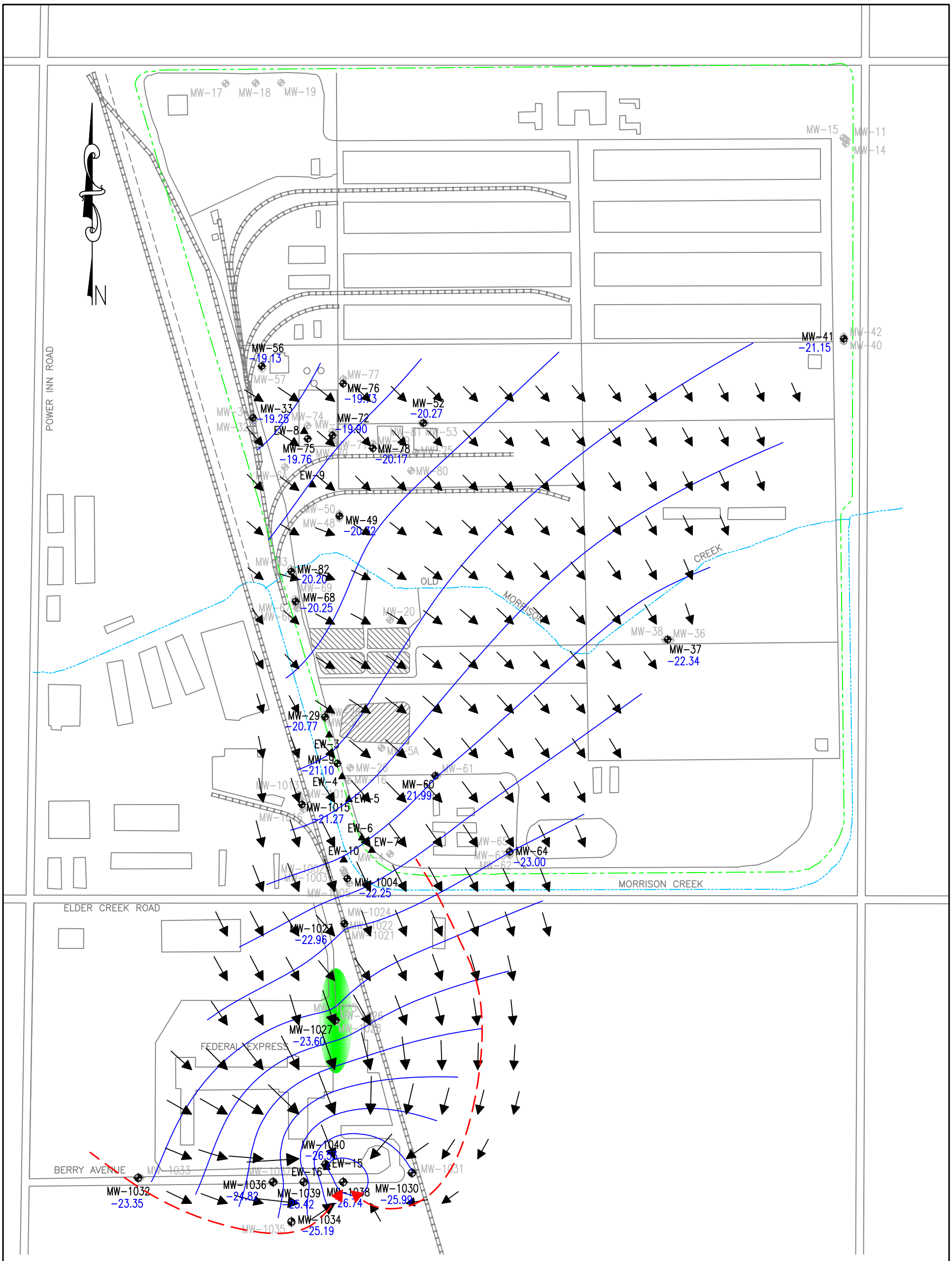
25 years of excellence PLEXUS scientific

Drawn By:	PLEXUS
Project No.:	8119-3BJ
Date:	03-15-12
Filename:	Figure5*.dwg

MONITORING WELL LOCATION MAP
FOURTH FIVE-YEAR REVIEW

FORMER SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE 5



LEGEND

MW-1035	GROUNDWATER MONITORING WELL LOCATION - AQUIFER ZONE A
MW-1034	GROUNDWATER MONITORING WELL LOCATION IN THE B, C, or D AQUIFER
EW-7	GROUNDWATER EXTRACTION WELL LOCATION
-23'	GROUNDWATER ELEVATION CONTOUR (Mean Sea Level ~ feet)
-26.40	GROUNDWATER ELEVATION (Mean Sea Level ~ feet)
	BOUNDING GROUNDWATER FLOW LINE
	SOUTH POST PLUME (TRICHLOROETHENE IN EXCESS OF THE MAXIMUM CONTAMINANT LEVEL)

600' 0' 300' 600'

SCALE: 1 inch = 600 ft.

Note: Water level data used to generate this contour map were collected on April 7, 2011.

PLEXUS scientific

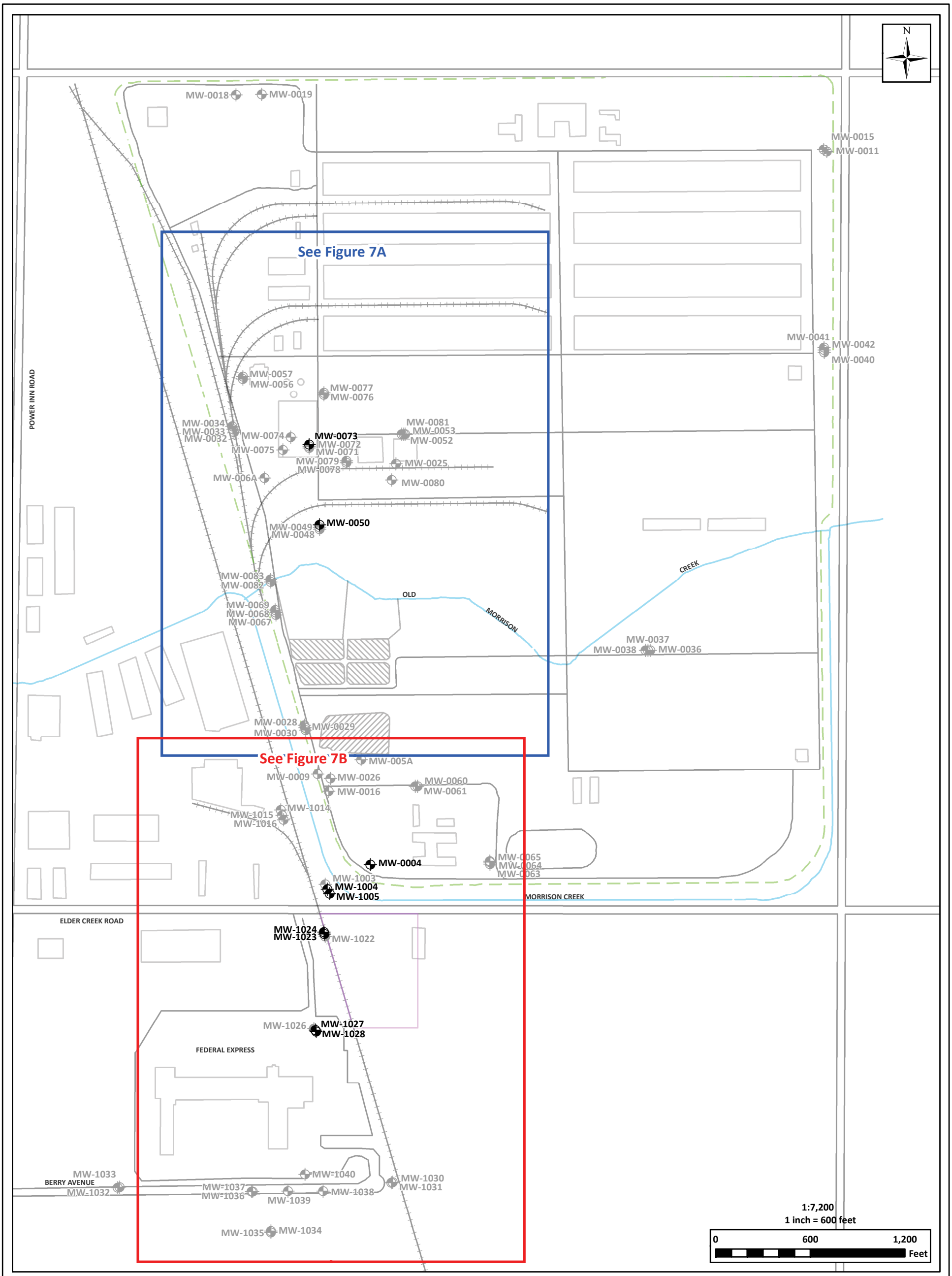
Drawn By:	PLEXUS
Project No.:	8119-3CD
Date:	05-17-12
Filename:	Figure6*.dwg

BERRY AVENUE GROUNDWATER EXTRACTION SYSTEM CAPTURE ZONE

FORMER SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE

6



Map Key:

- Groundwater Monitoring Wells
- Depot Boundary
- Railroad
- Creek

Abbreviation Key:
µg/L: micrograms per liter

Declining Site-Wide Trichloroethene Concentration July 2007 through July 2011

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PLEXUS scientific

Figure 7

Former Sacramento Army Depot Sacramento, California

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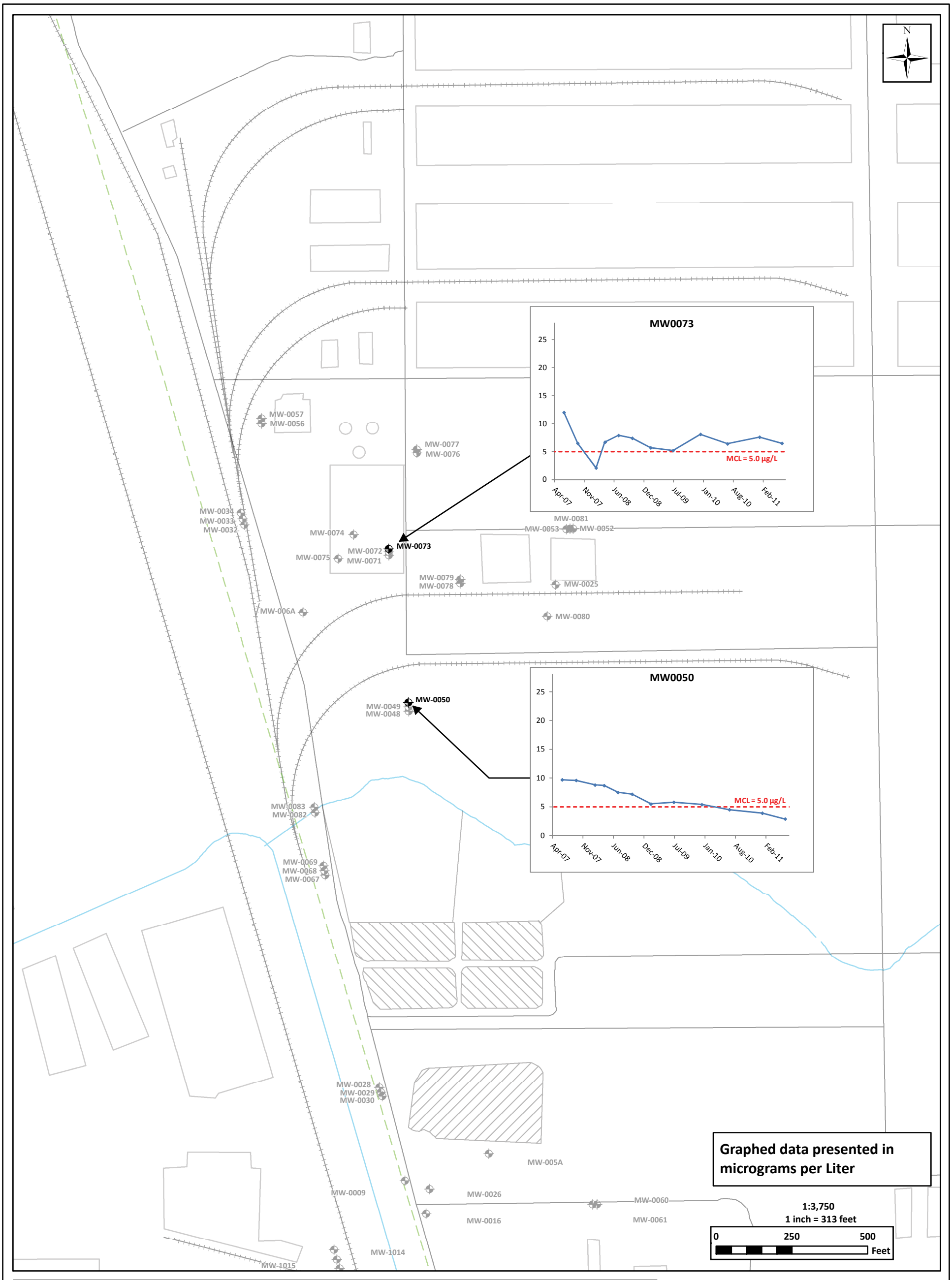

Map Key:

- Groundwater Monitoring Wells
- Depot Boundary
- Railroad
- Creek

Declining Site-Wide Trichloroethene Concentration July 2007 through July 2011 Parking Lot 3

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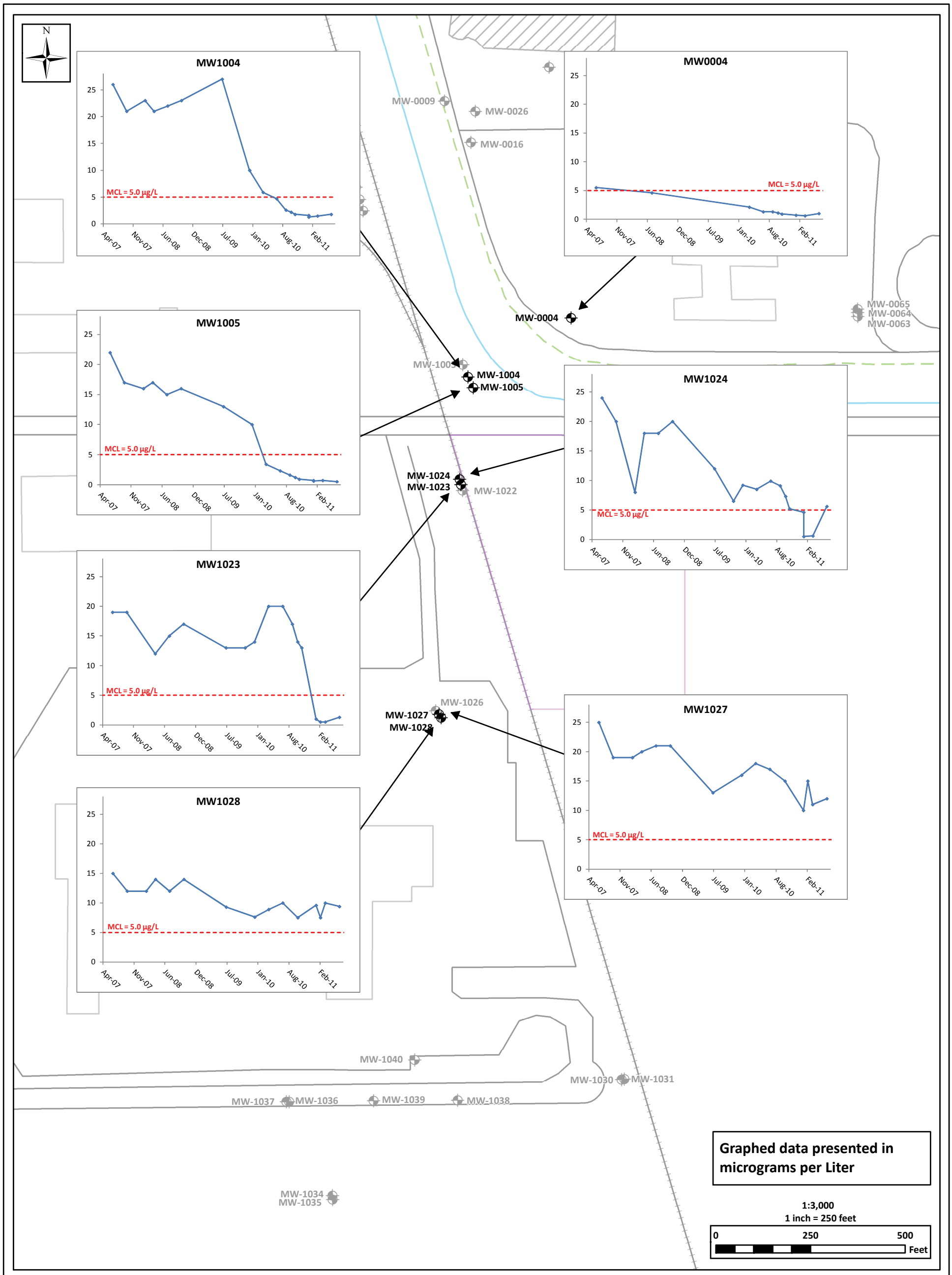
Figure 7A

Former Sacramento Army Depot Sacramento, California



Map Key:

- Groundwater Monitoring Wells
- Depot Boundary
- Railroad
- Creek

Declining Site-Wide Trichloroethene Concentration July 2007 through July 2011 South Post Plume

25 years of excellence PLEXUS scientific

Figure 7B

Former Sacramento Army Depot Sacramento, California

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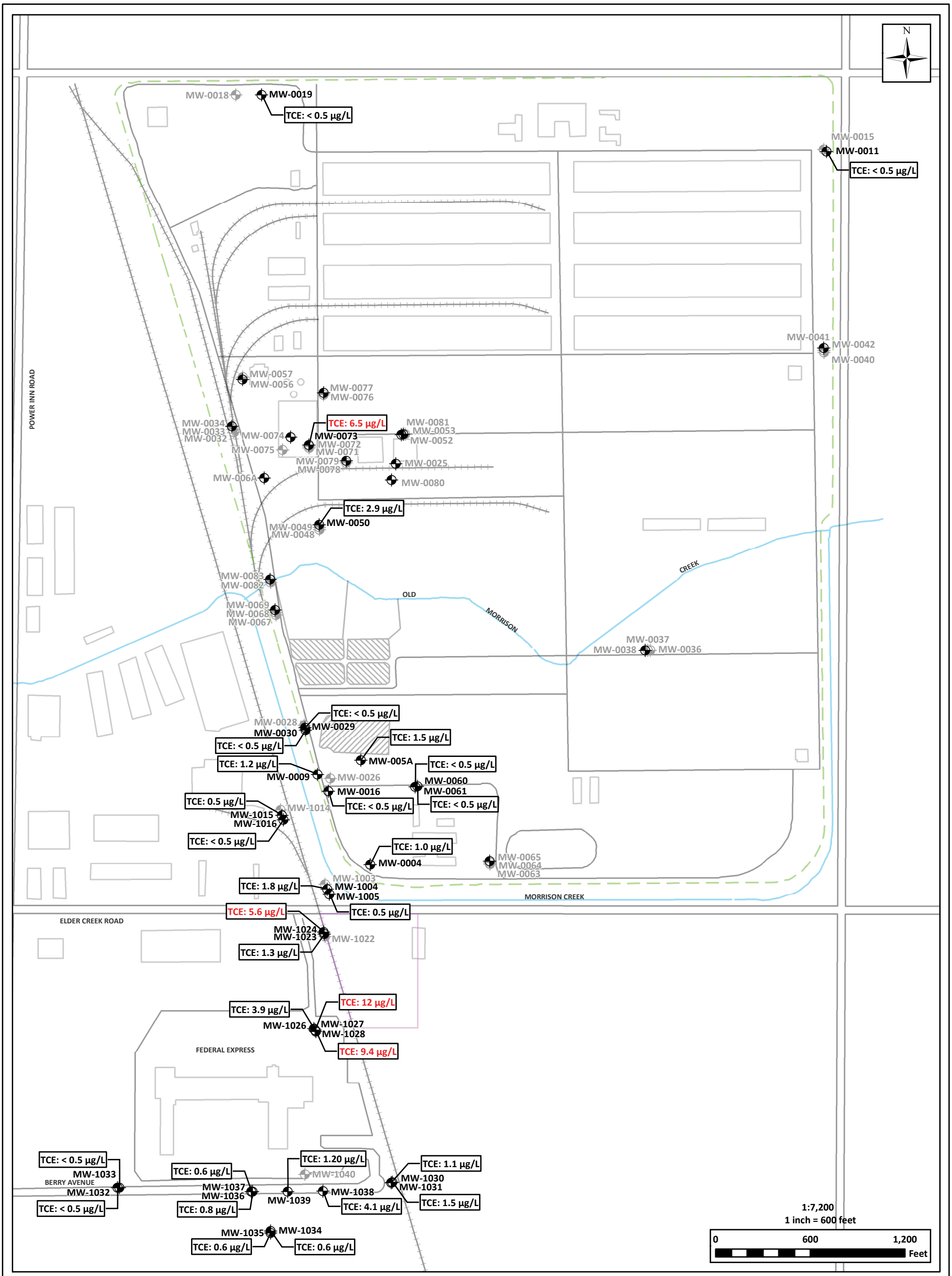

Map Key:

- Groundwater Monitoring Wells Sampled During the July 2011 Event
- Depot Boundary
- Railroad
- Creek

Abbreviation Key:
TCE: Trichloroethene
µg/L: micrograms per liter

Trichloroethene Concentration Map July 2011 Annual Sampling Event

25 years of excellence
PLEXUS scientific

Figure 8

Former Sacramento Army Depot Sacramento, California

K:\GIS_PRJ\Sacramento\MXD\Figure7-July2011_TCE

Drawn by: Plexus Project Number: 8119-3CD Date: 05/17/2012 15:47

Attachment 2
List of Documents Reviewed

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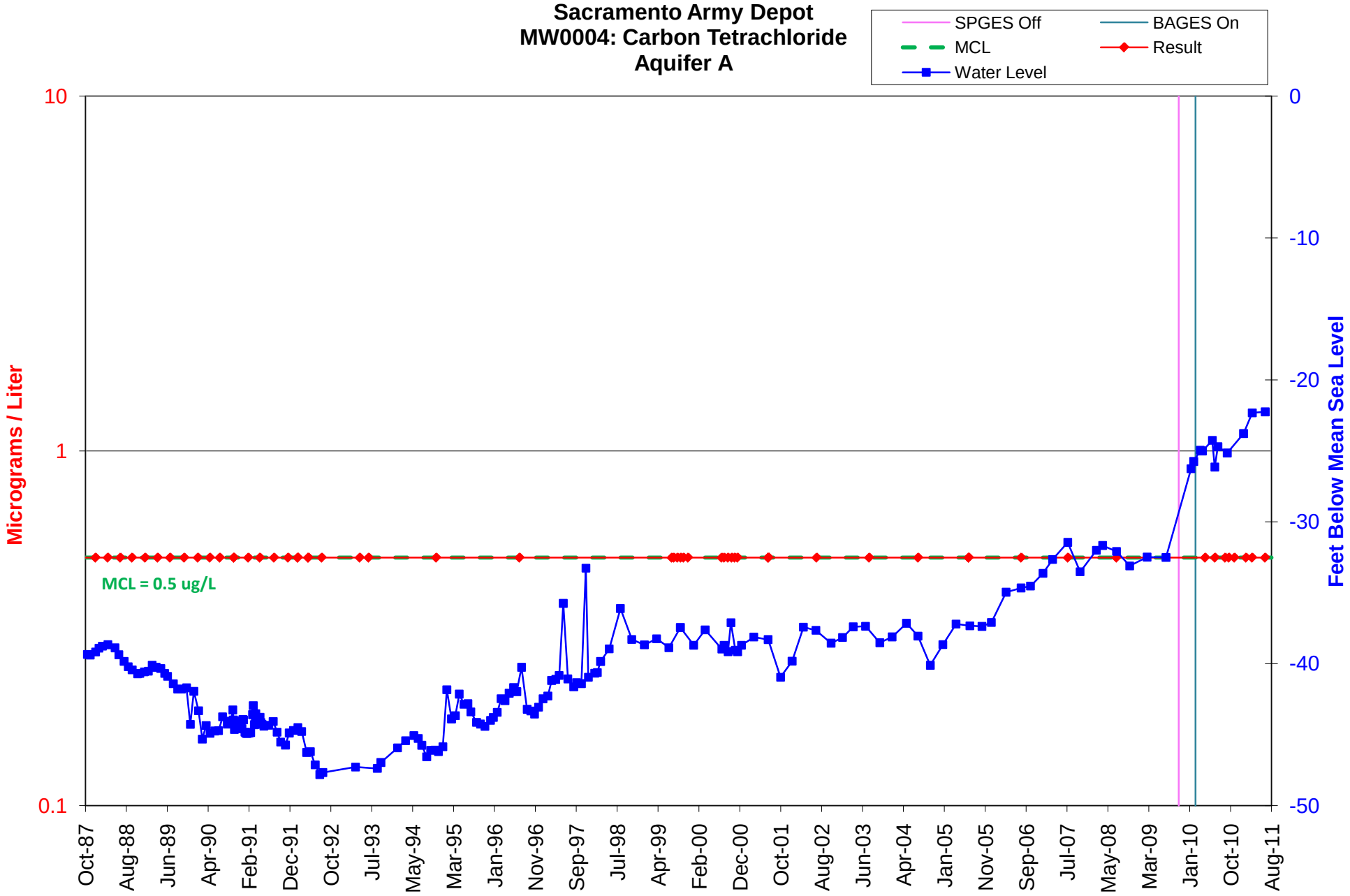
Attachment 3
Histographs



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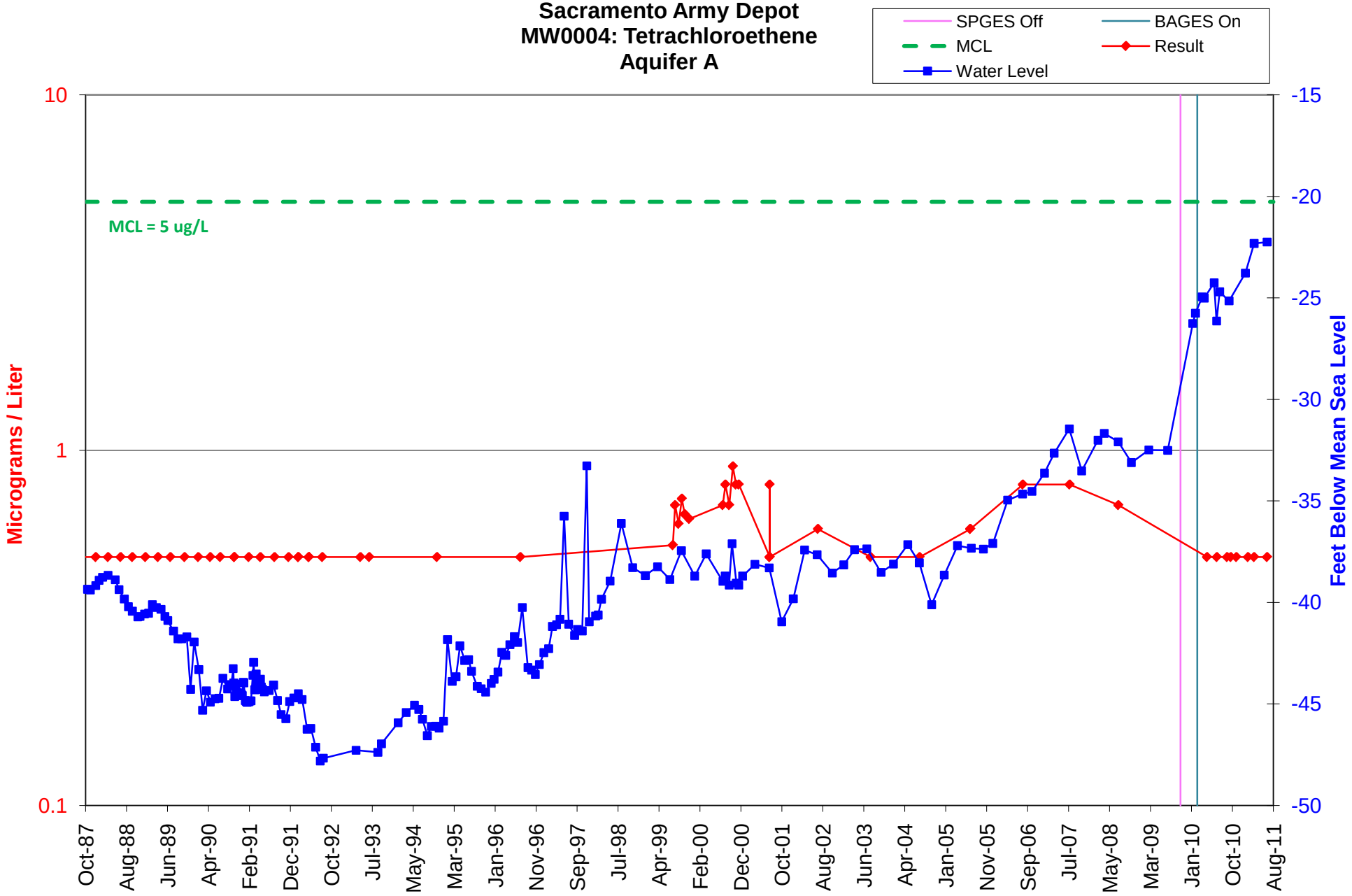
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0004: Tetrachloroethene
Aquifer A



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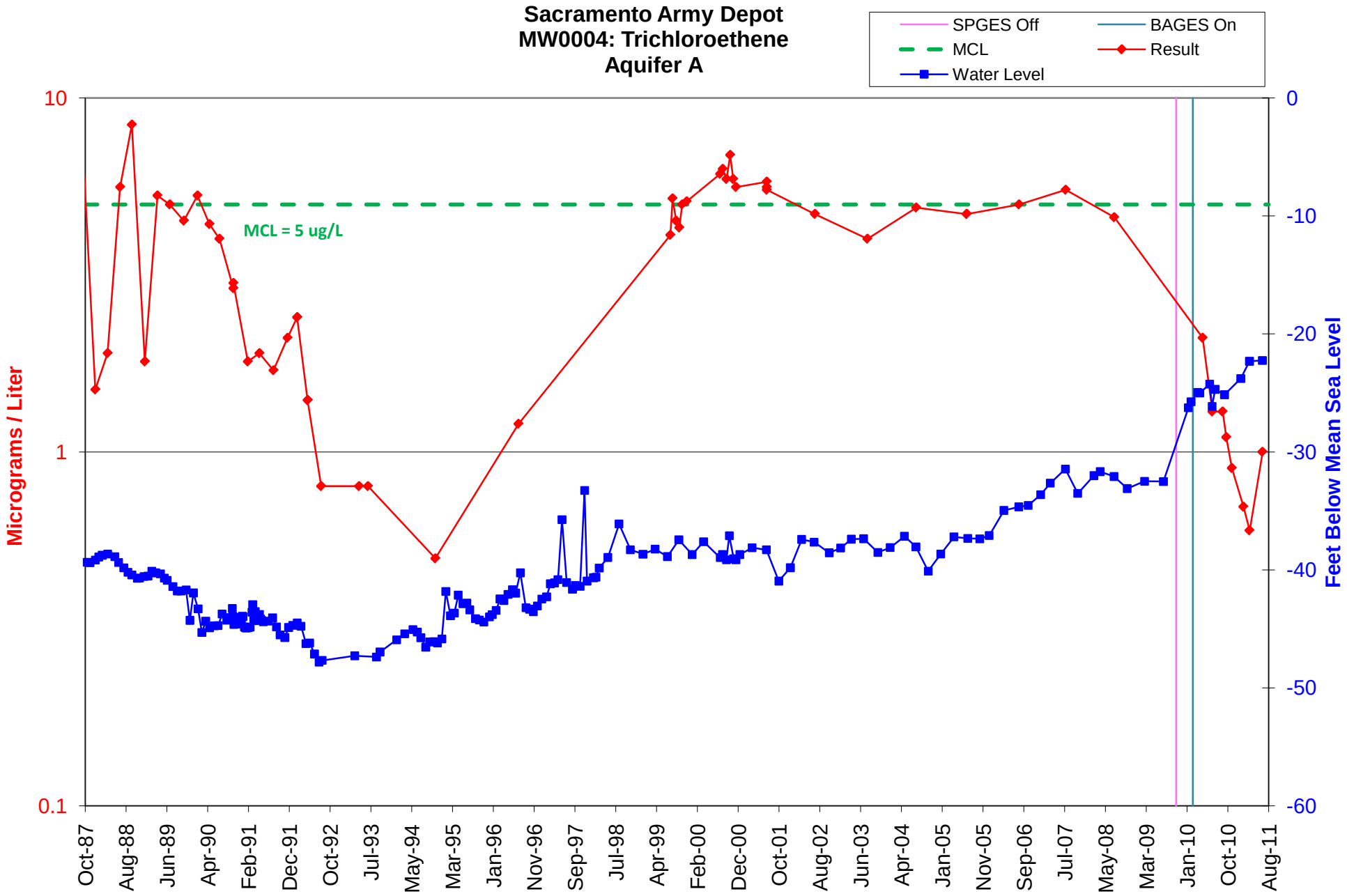

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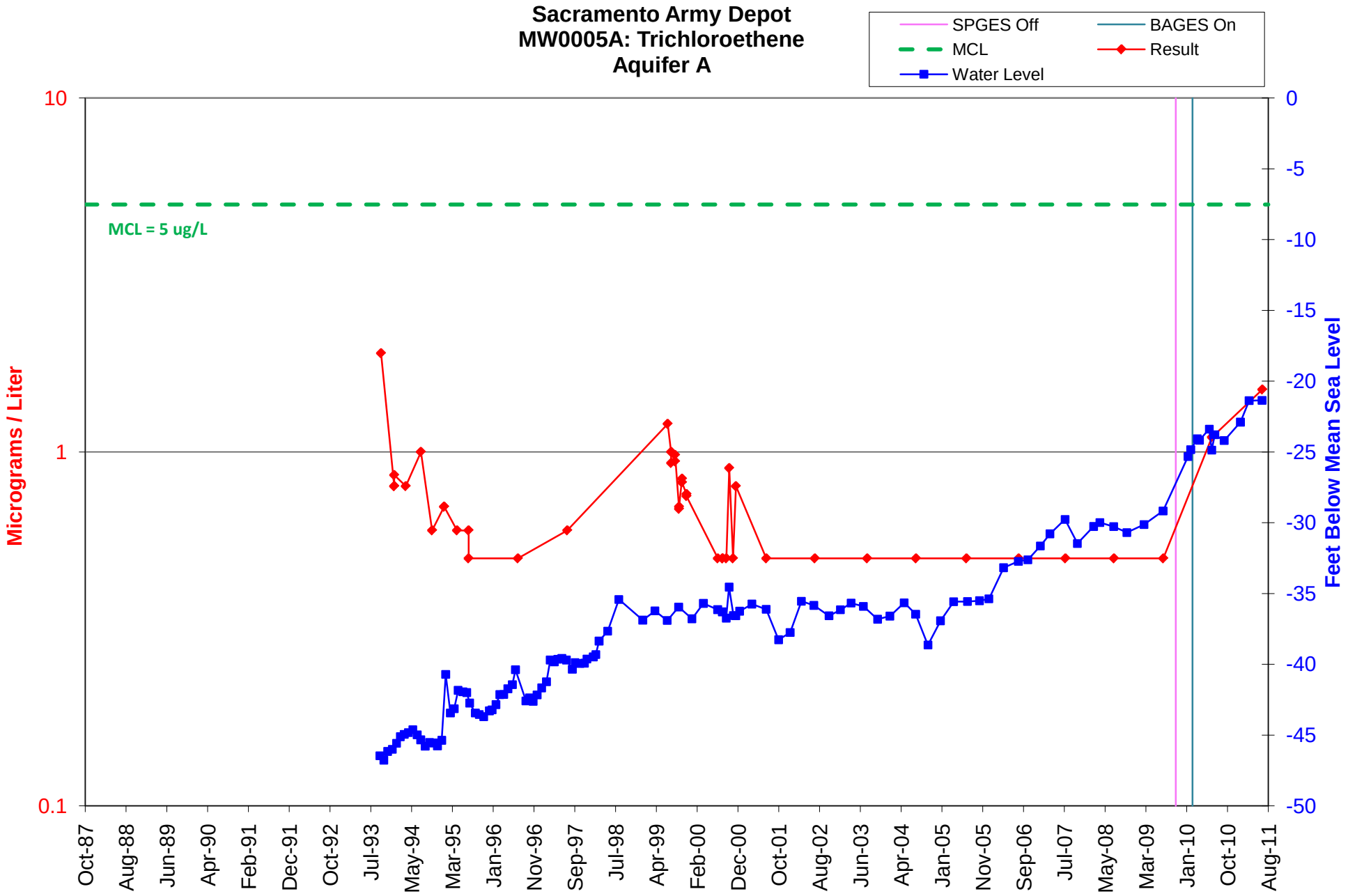

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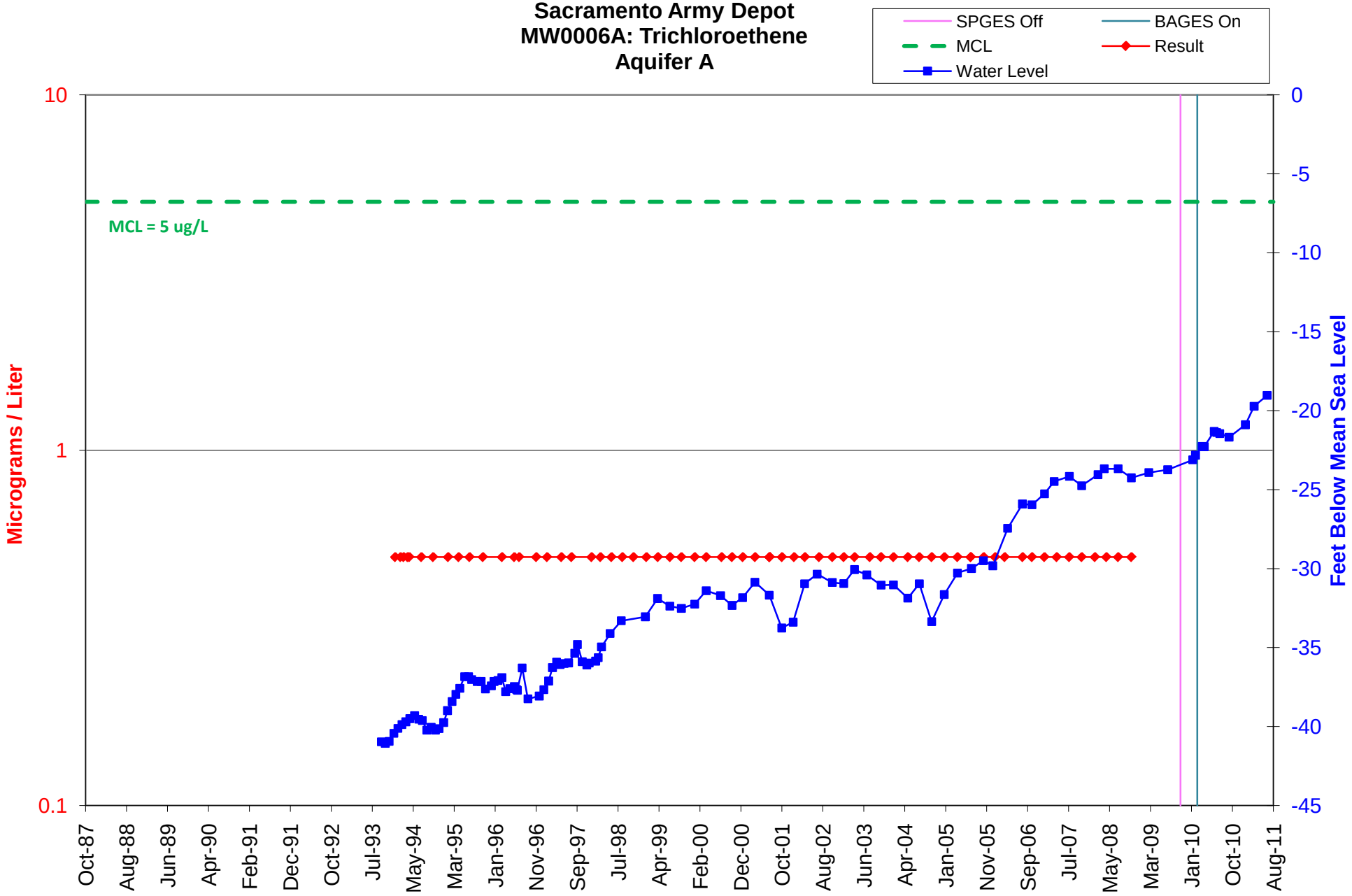
Sacramento Army Depot
MW0006A: Trichloroethene
Aquifer A



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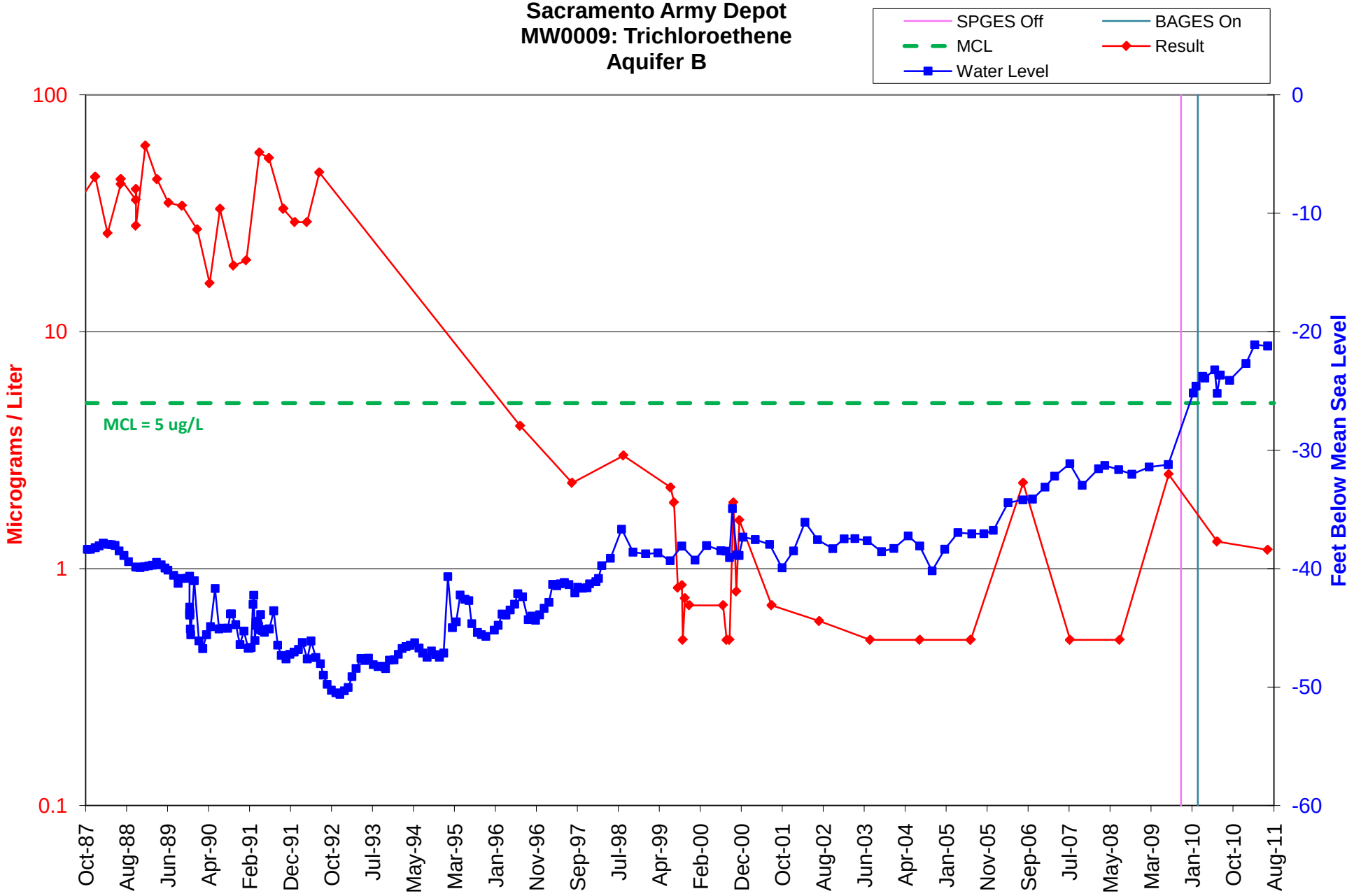
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0009: Trichloroethene
Aquifer B



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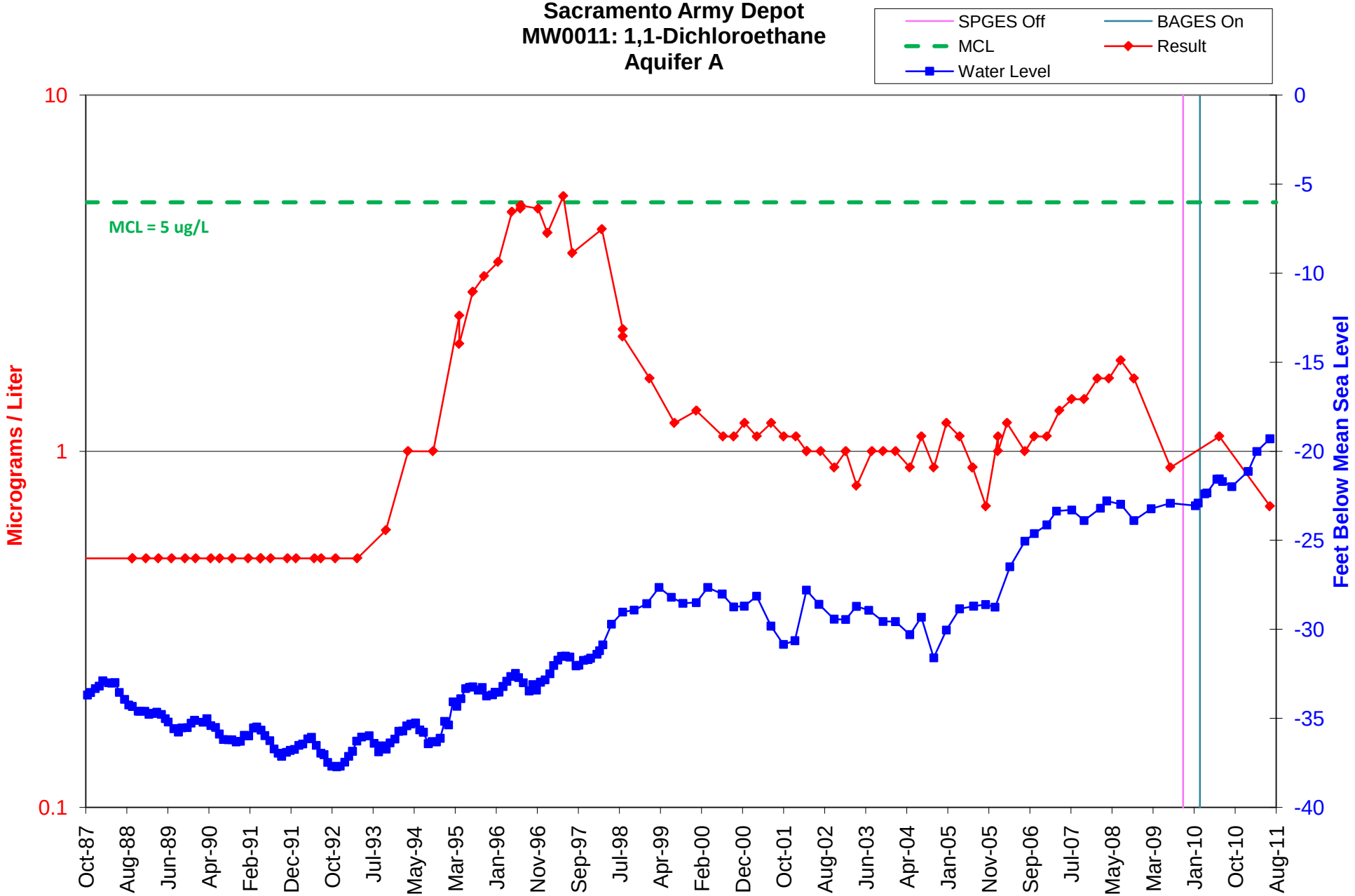
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0011: 1,1-Dichloroethane
Aquifer A



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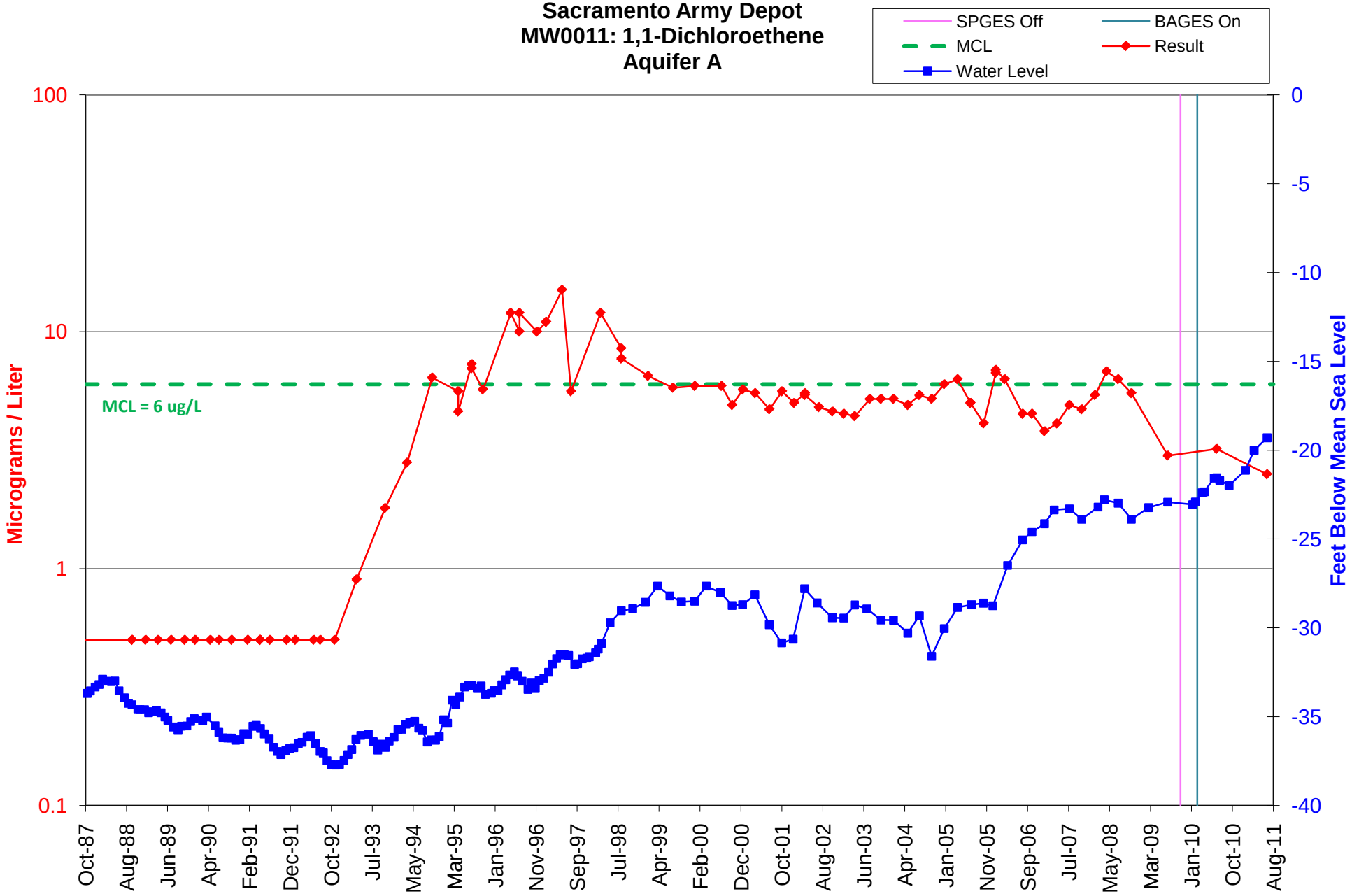
Sacramento Army Depot
MW0011: 1,1-Dichloroethene
Aquifer A



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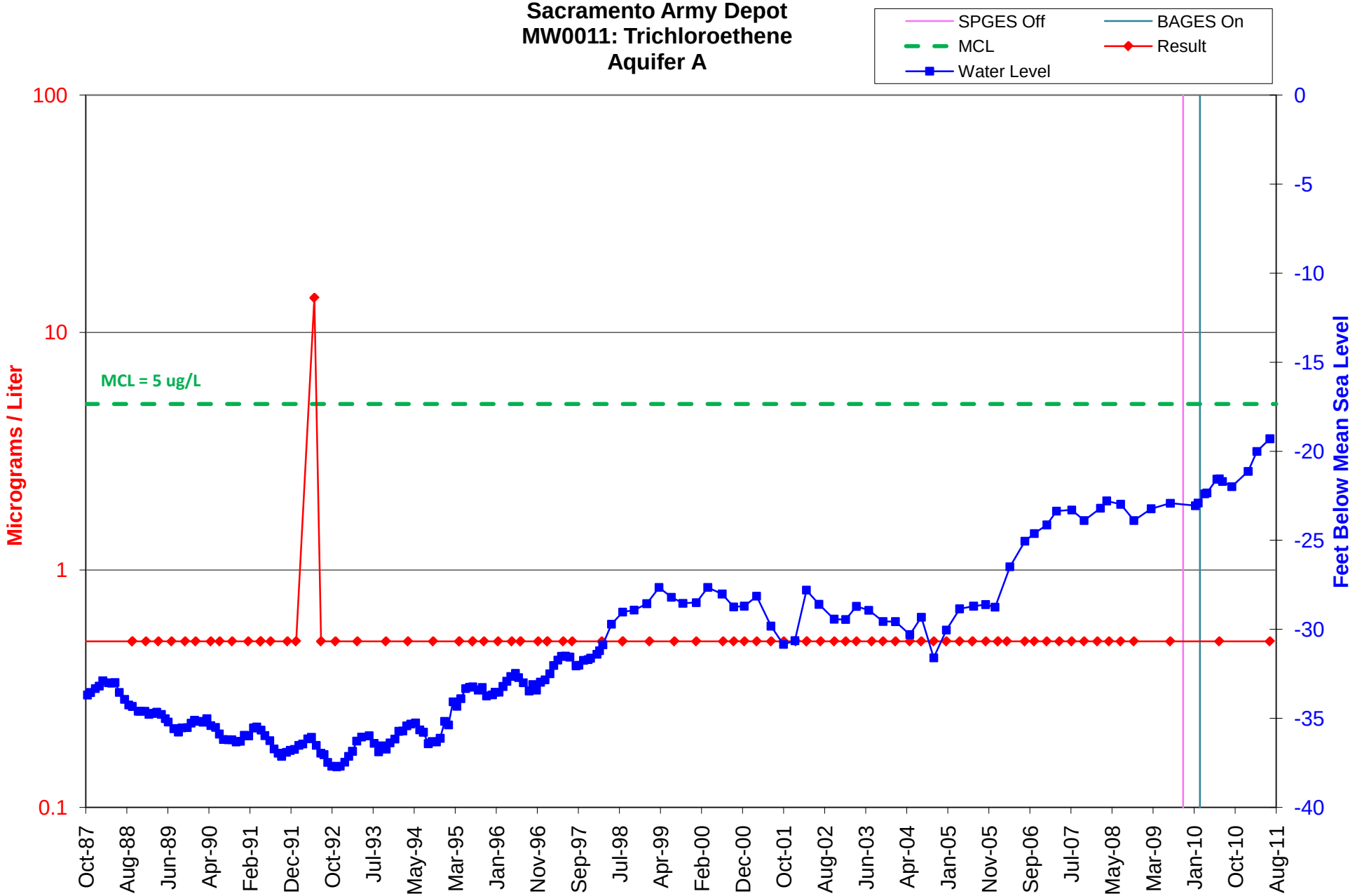
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0011: Trichloroethene
Aquifer A



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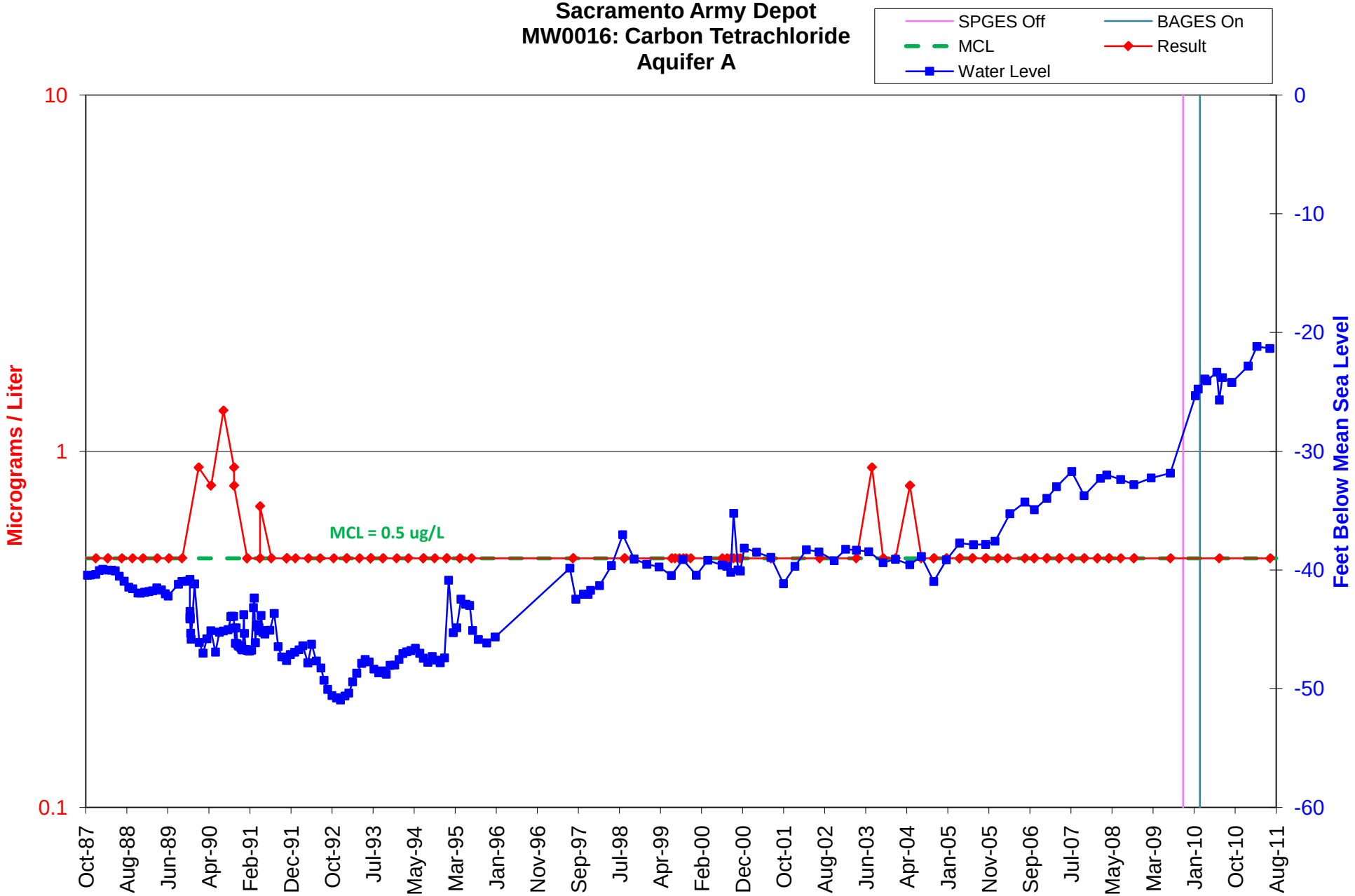
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0016: Carbon Tetrachloride
Aquifer A



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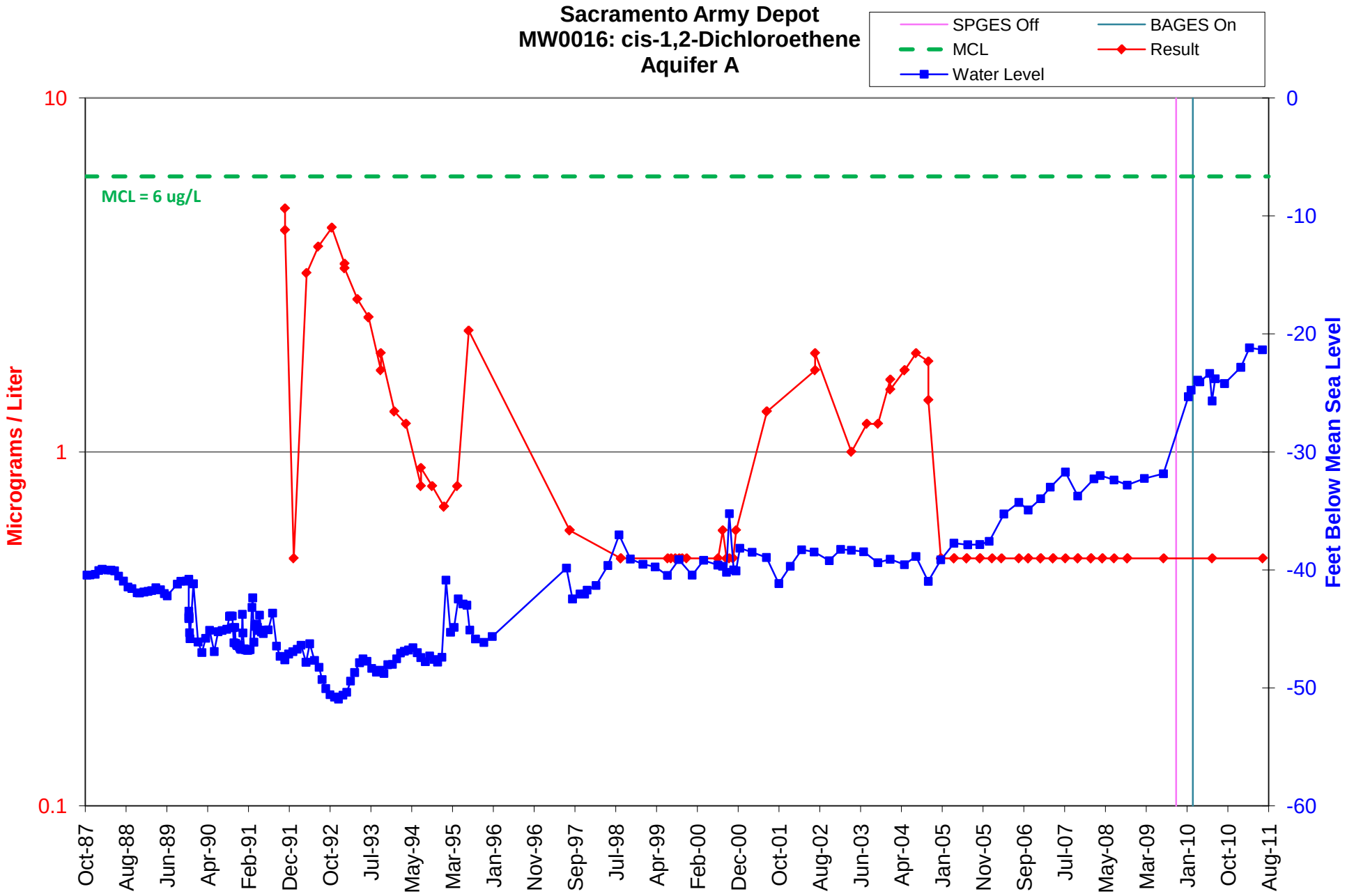

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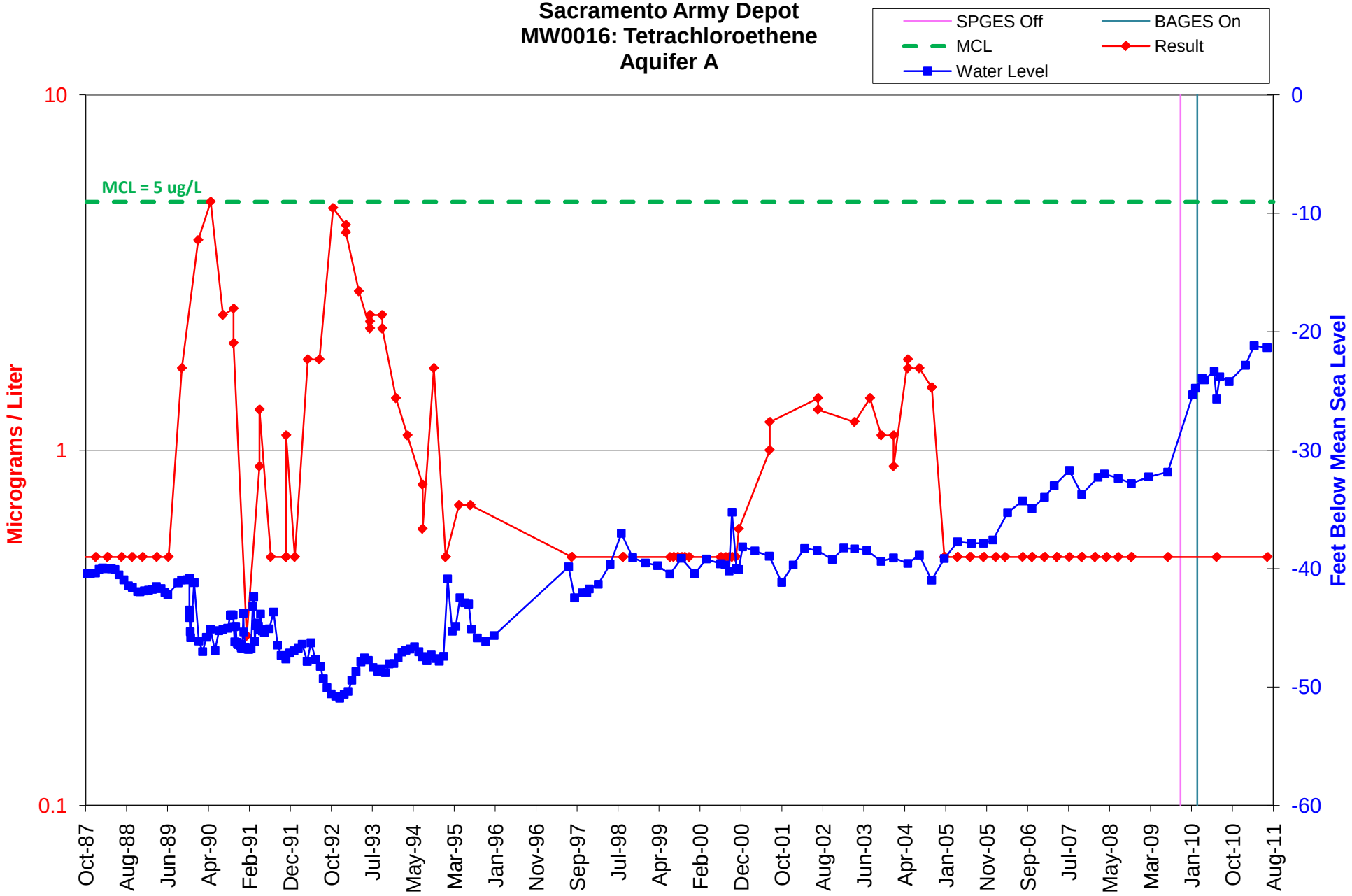
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0016: Tetrachloroethene
Aquifer A



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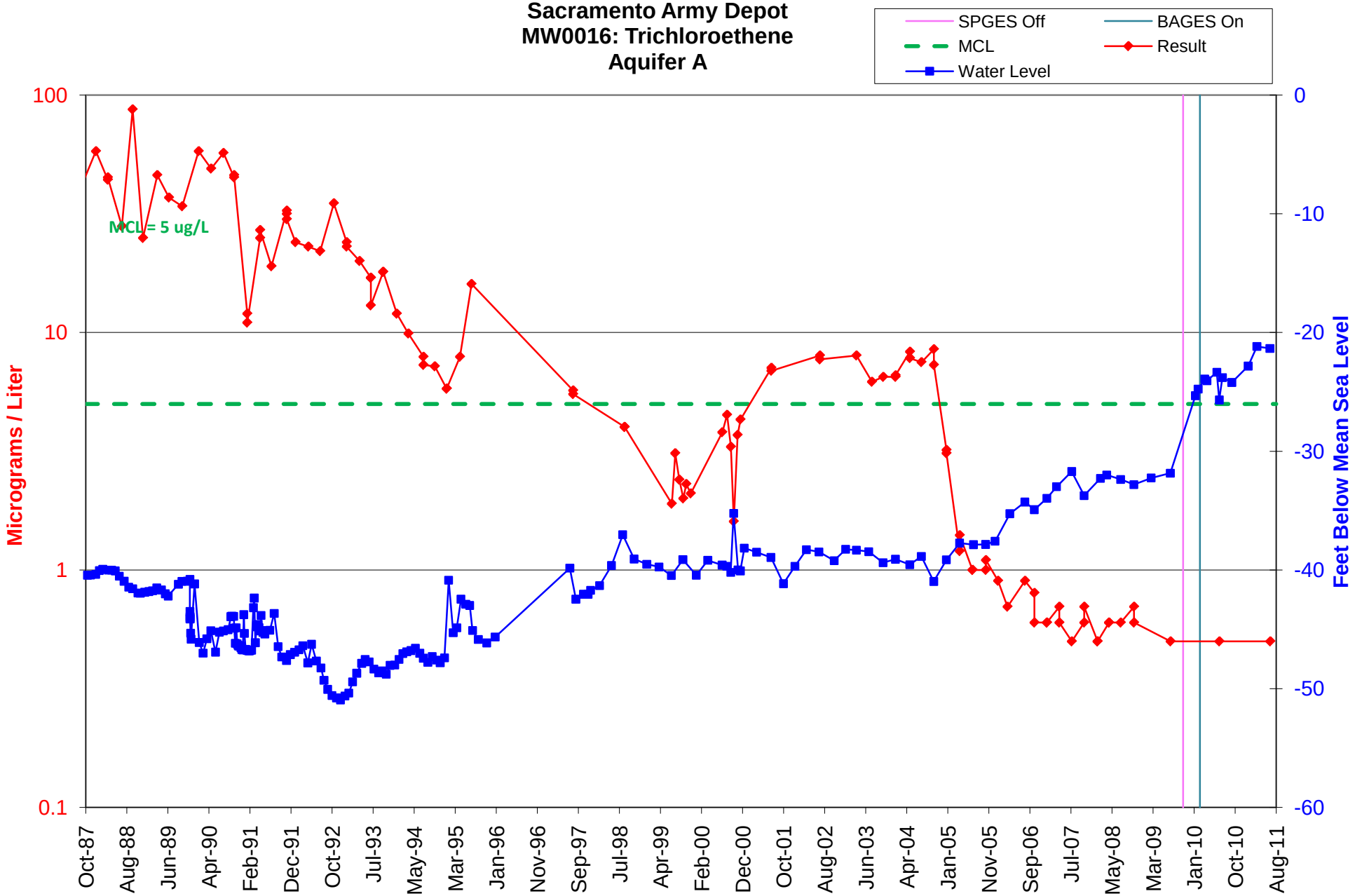
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0016: Trichloroethene
Aquifer A



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Sacramento Army Depot
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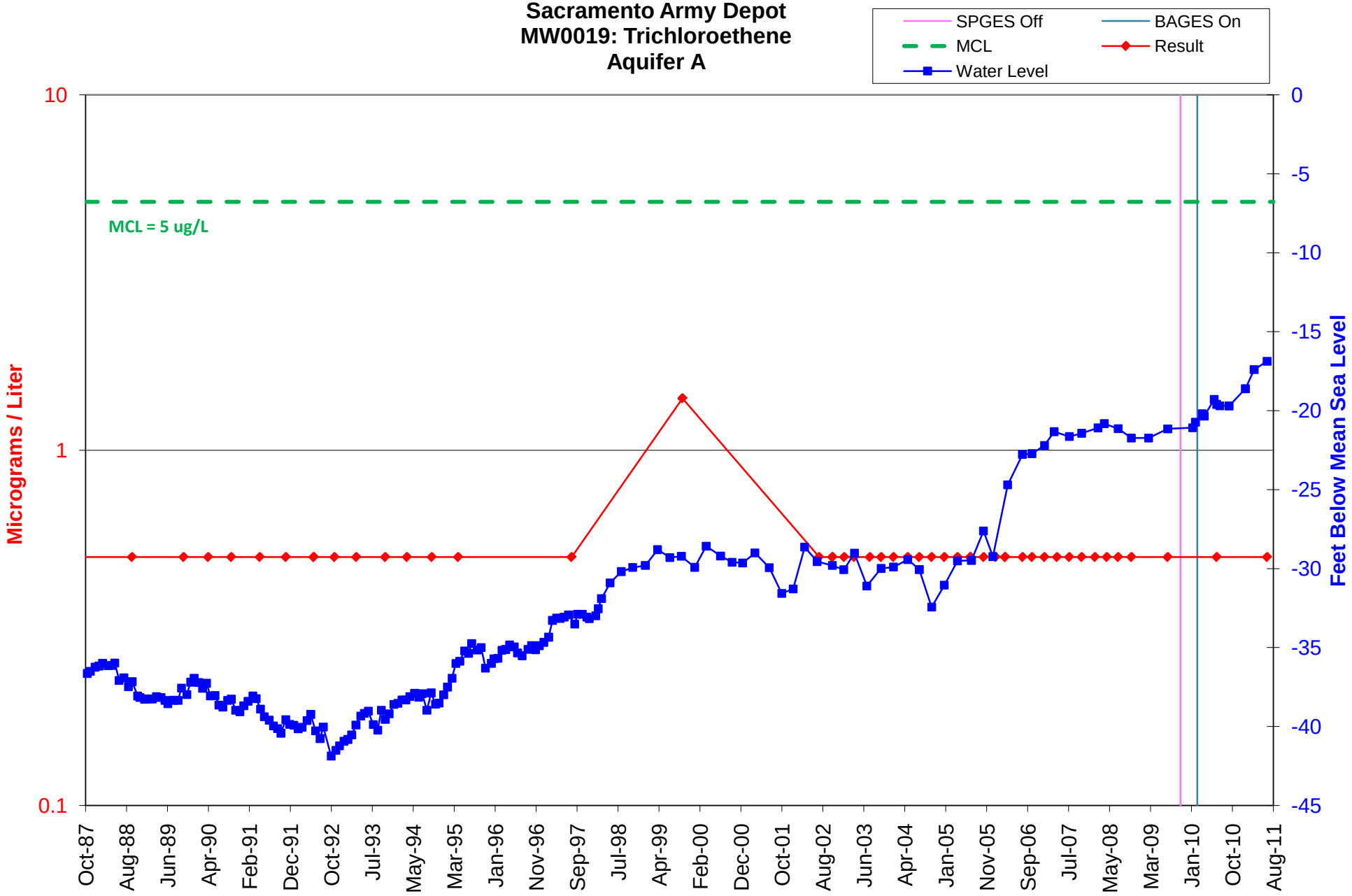

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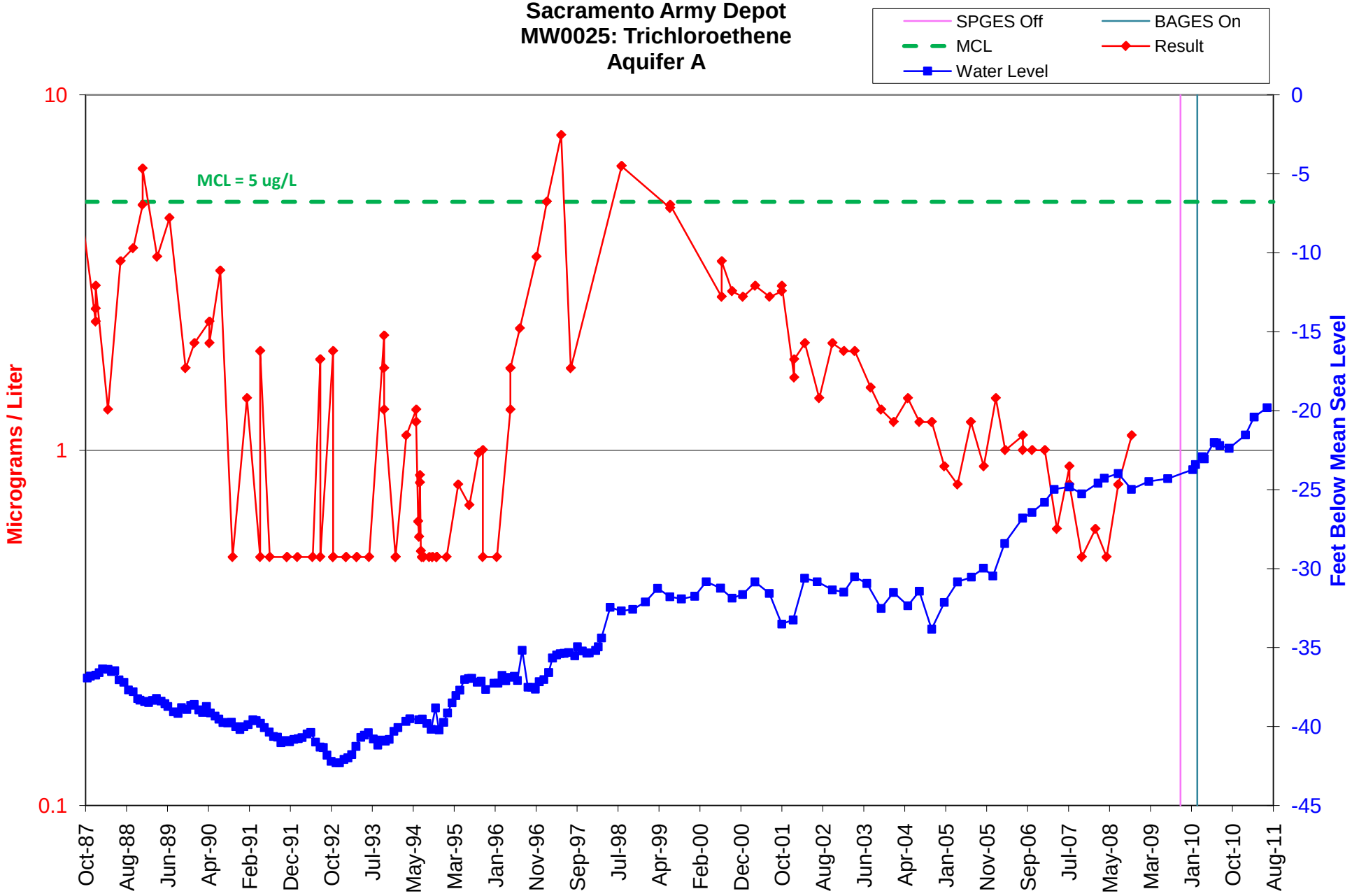
Sacramento Army Depot
MW0025: Trichloroethene
Aquifer A

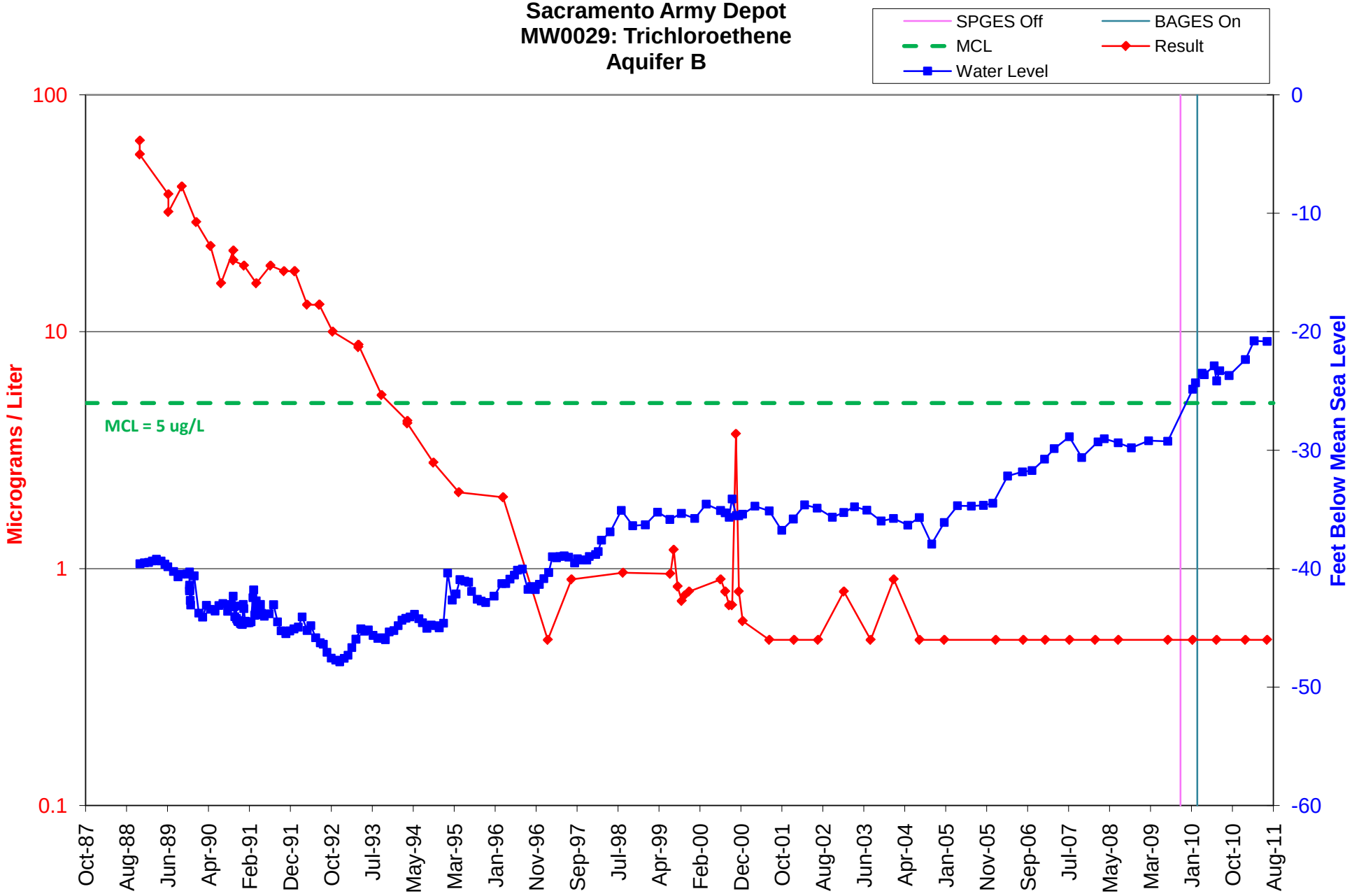


11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0029: Trichloroethene
Aquifer B



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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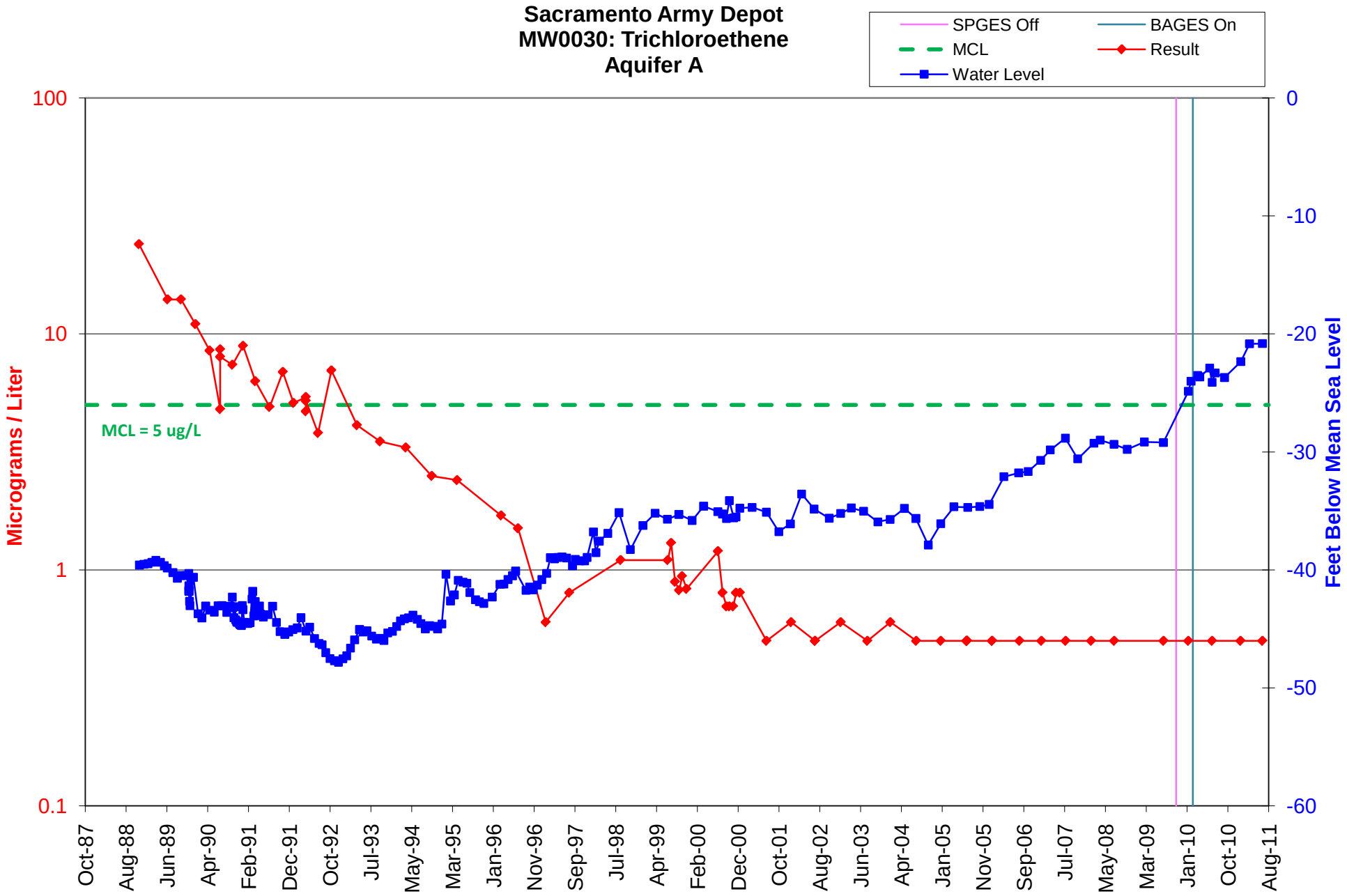
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



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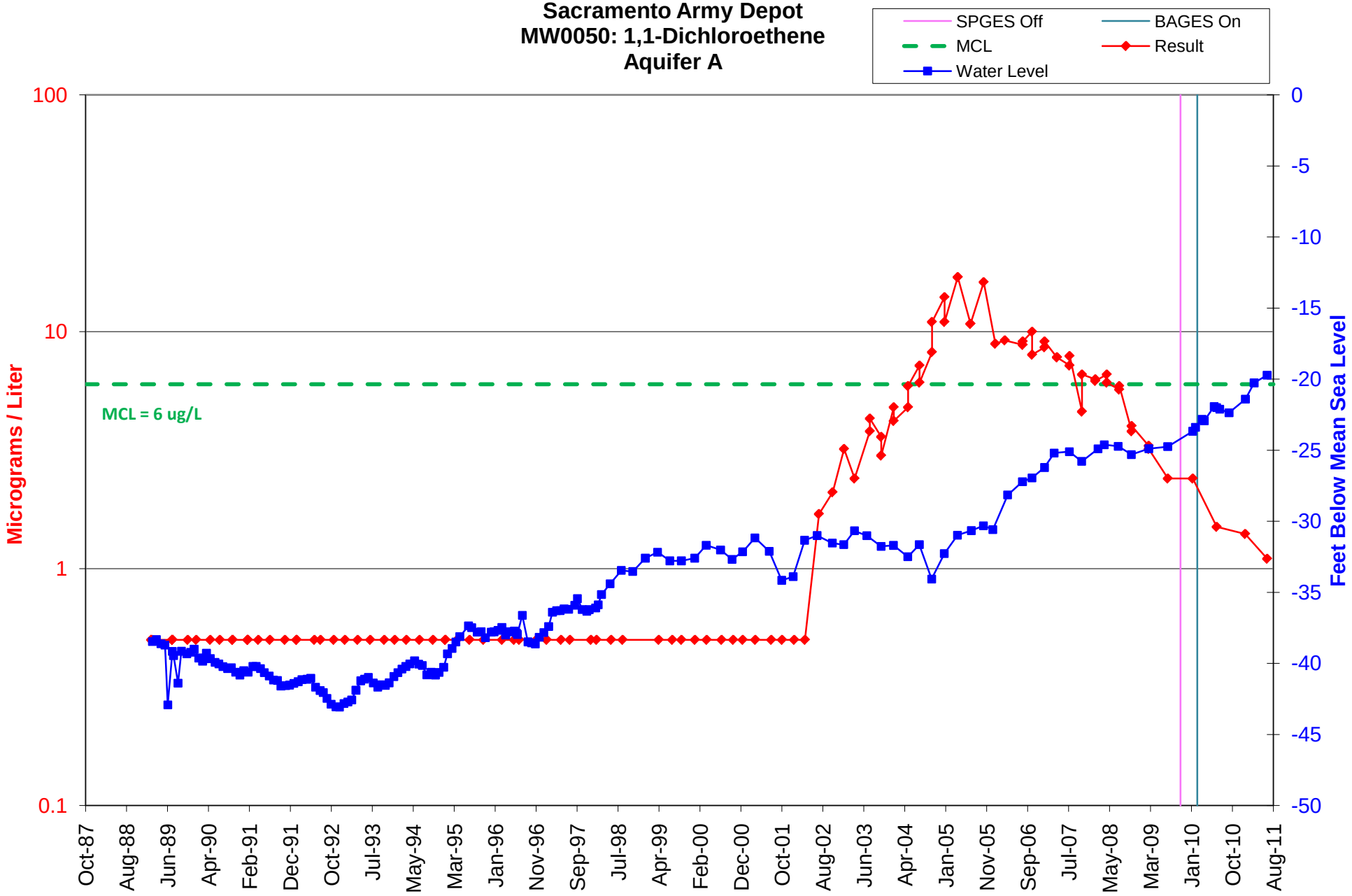
3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0050: 1,1-Dichloroethene
Aquifer A



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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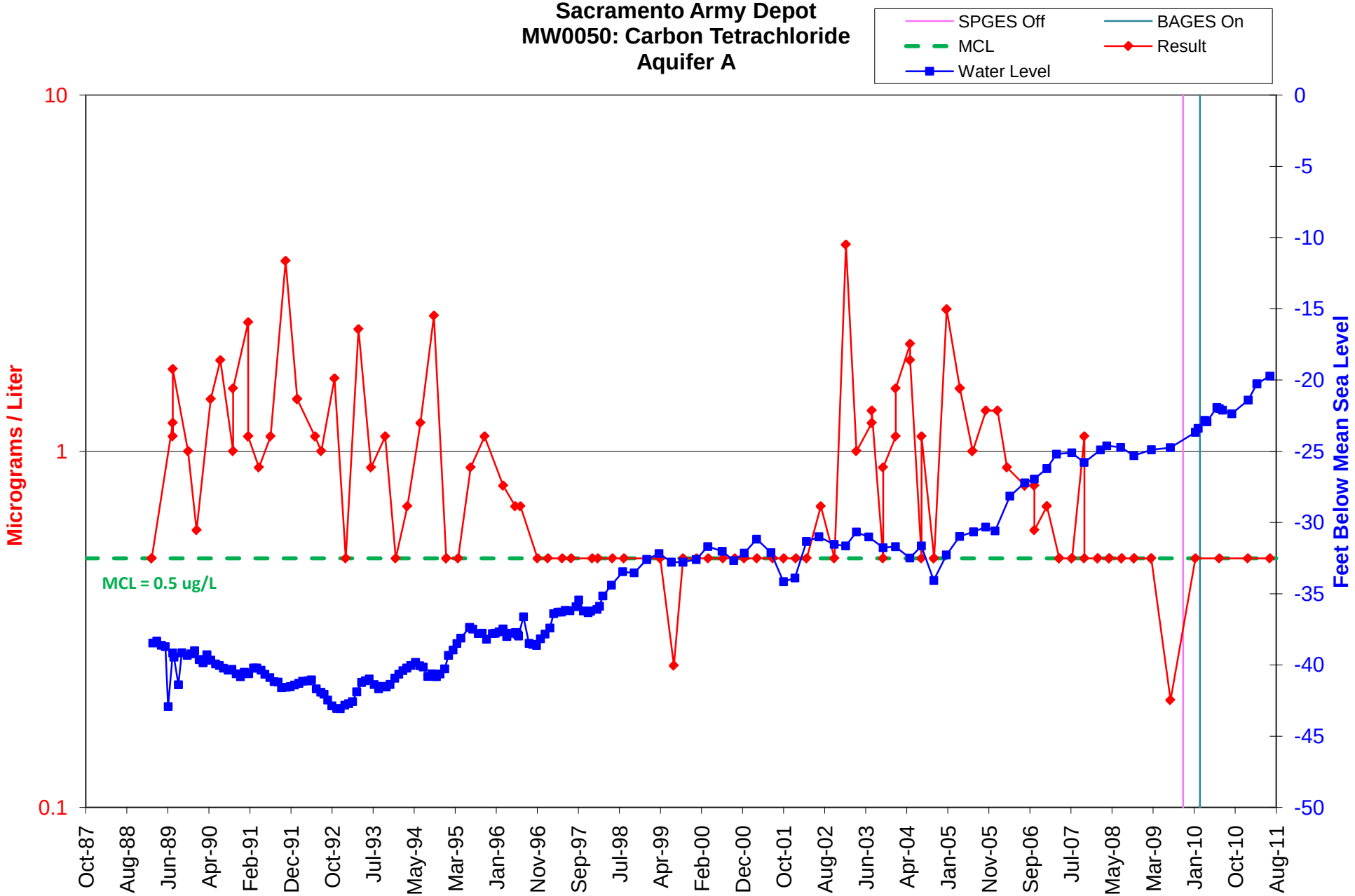
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0050: Carbon Tetrachloride
Aquifer A



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3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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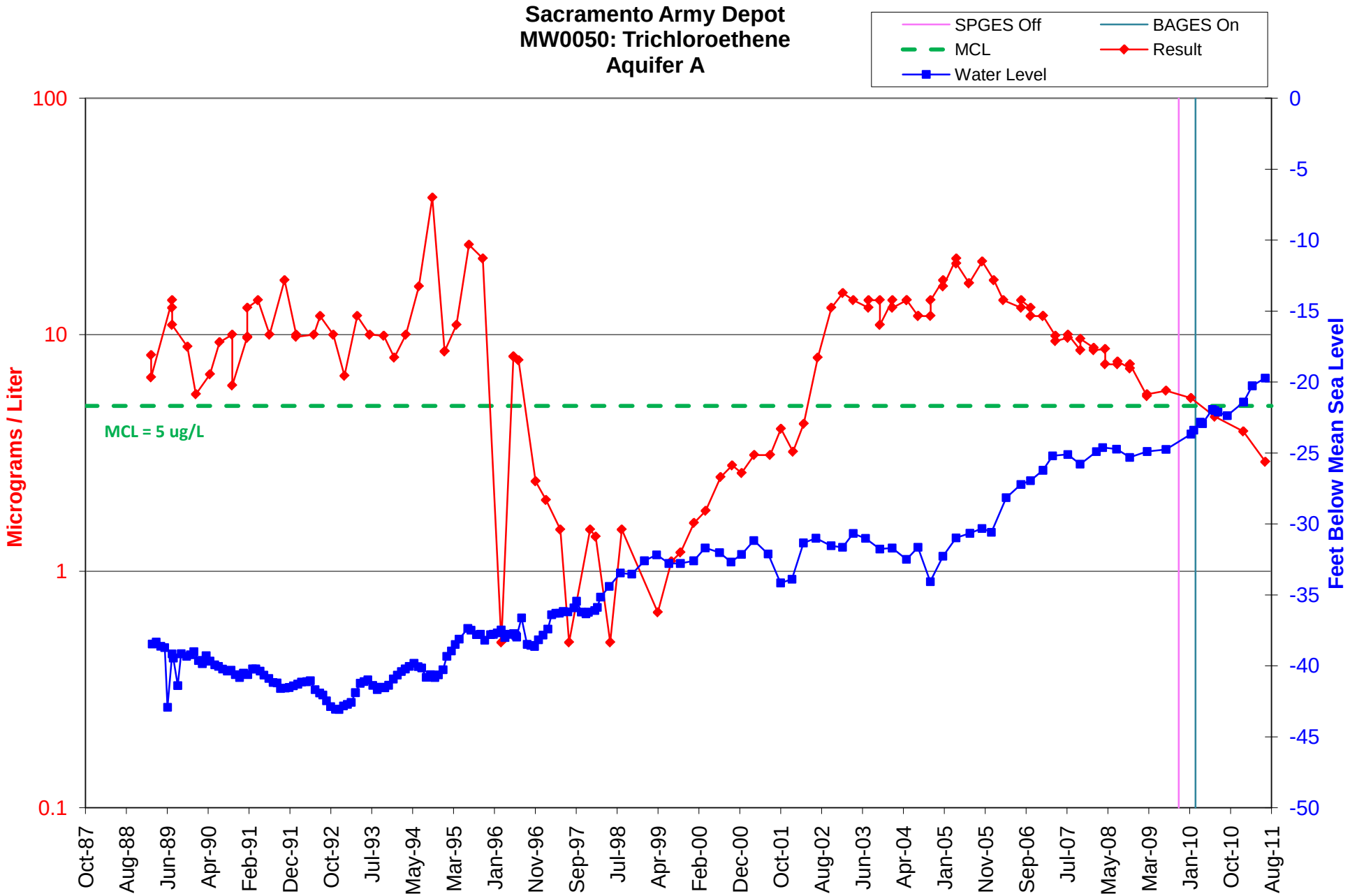
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



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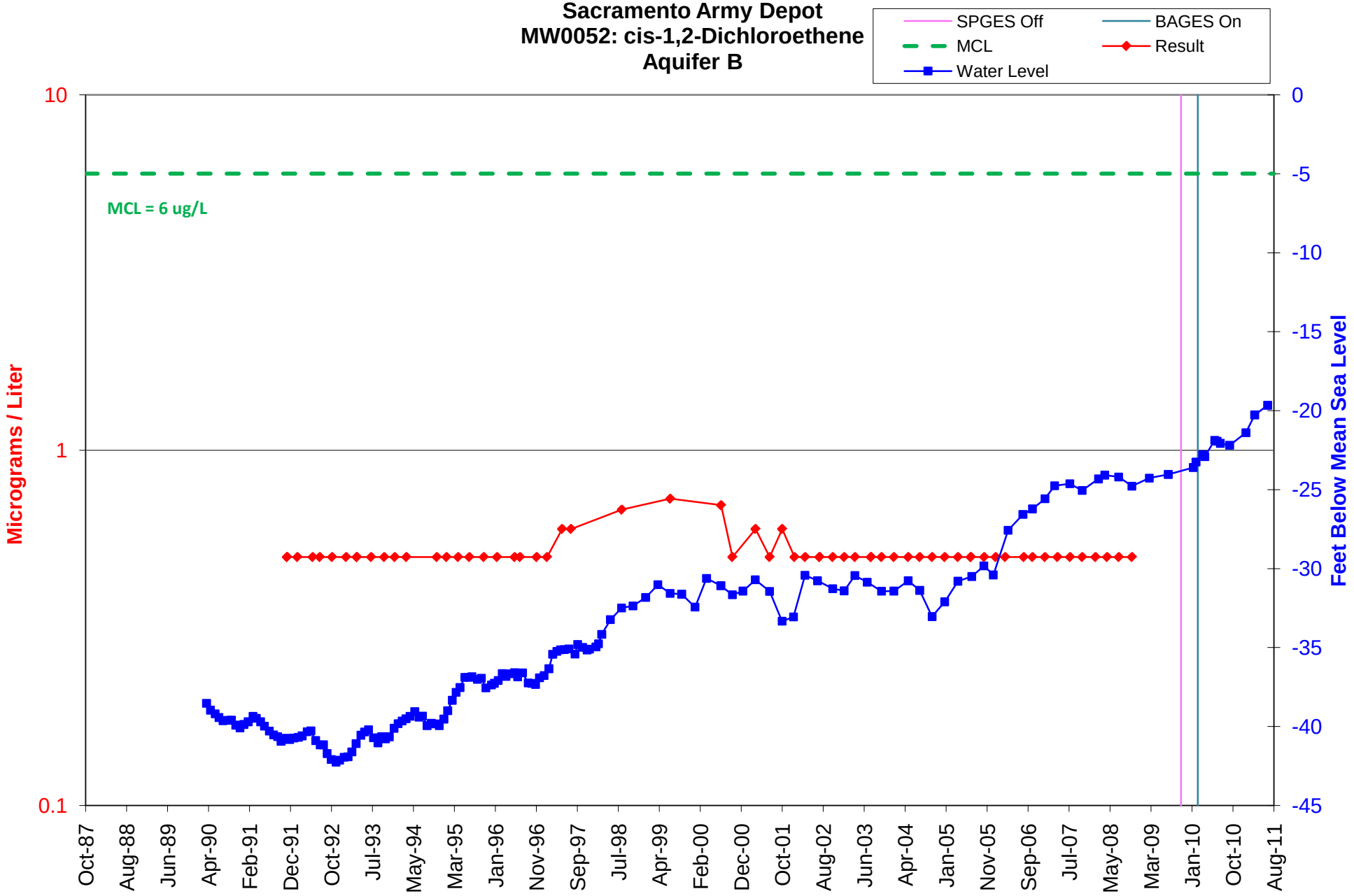
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0052: cis-1,2-Dichloroethene
Aquifer B



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
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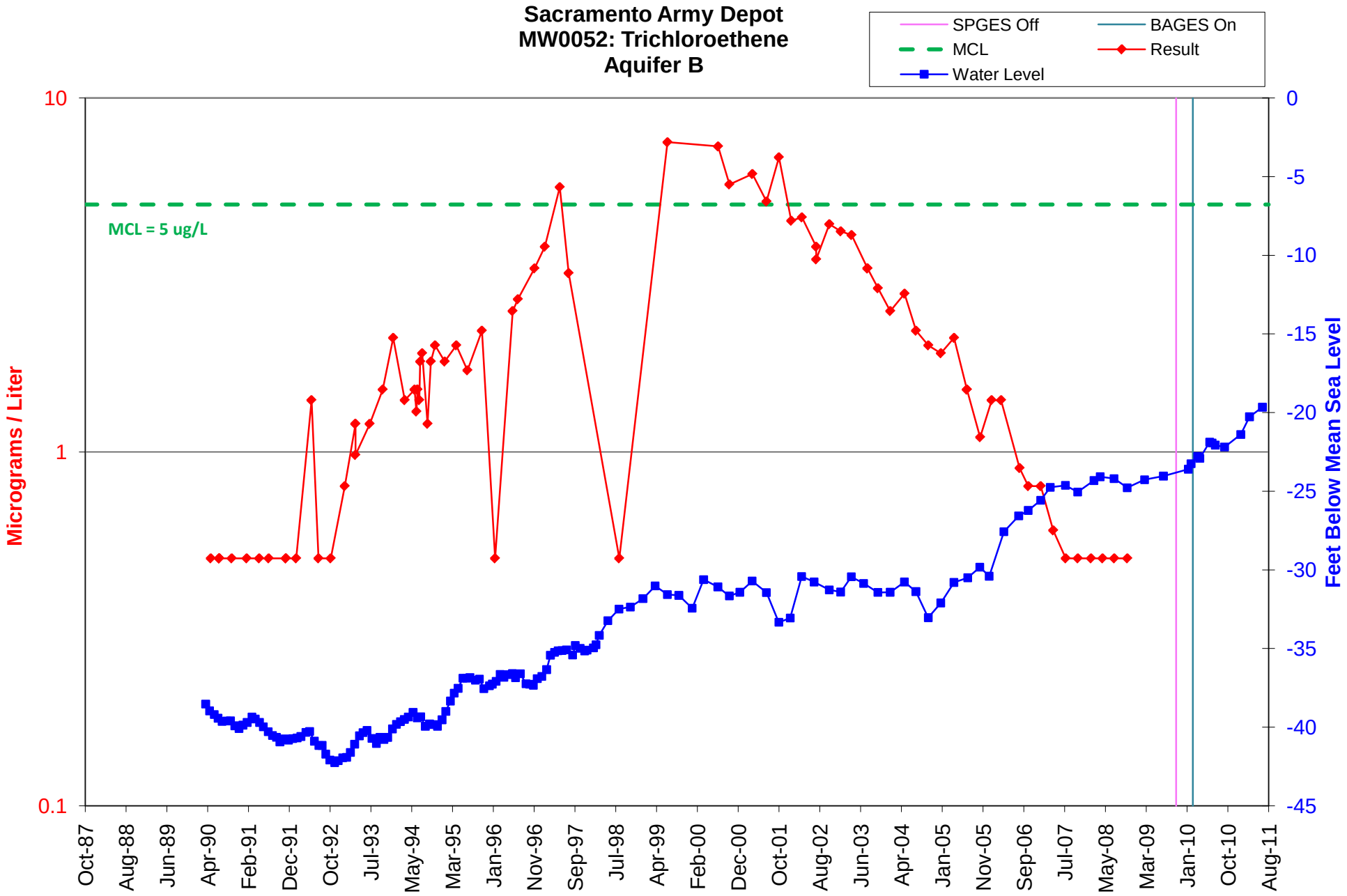
3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



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3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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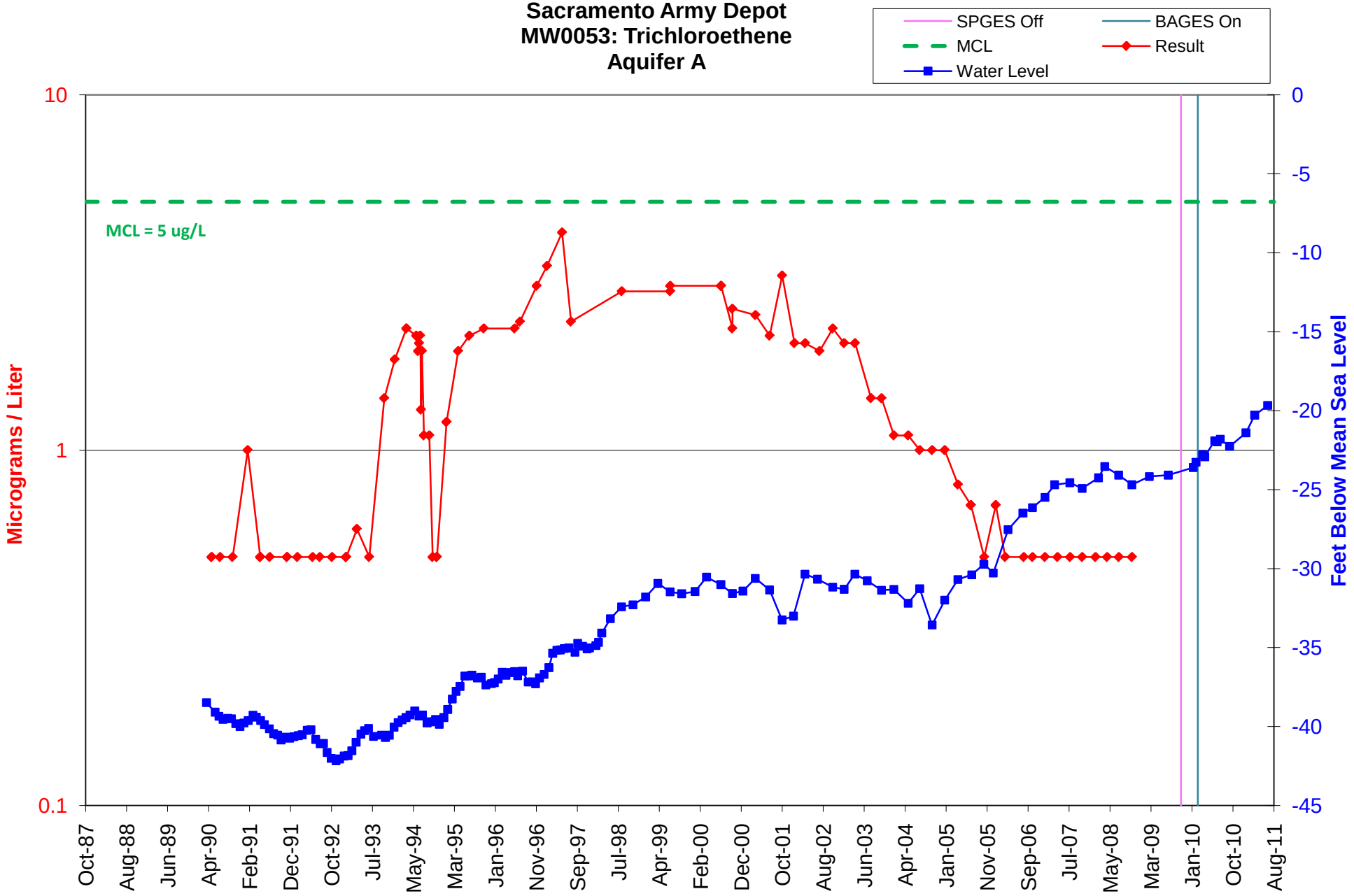
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0053: Trichloroethene
Aquifer A



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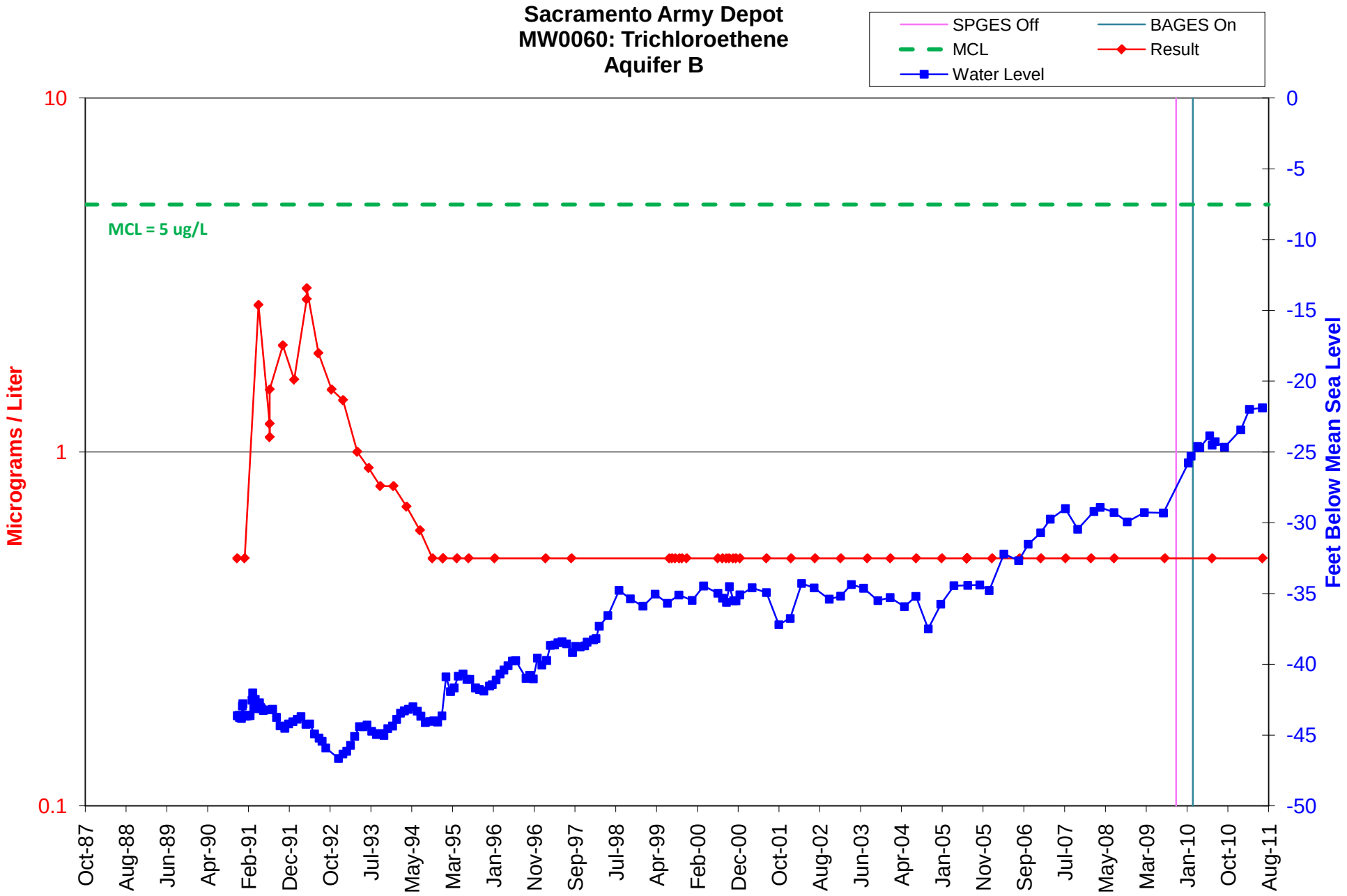
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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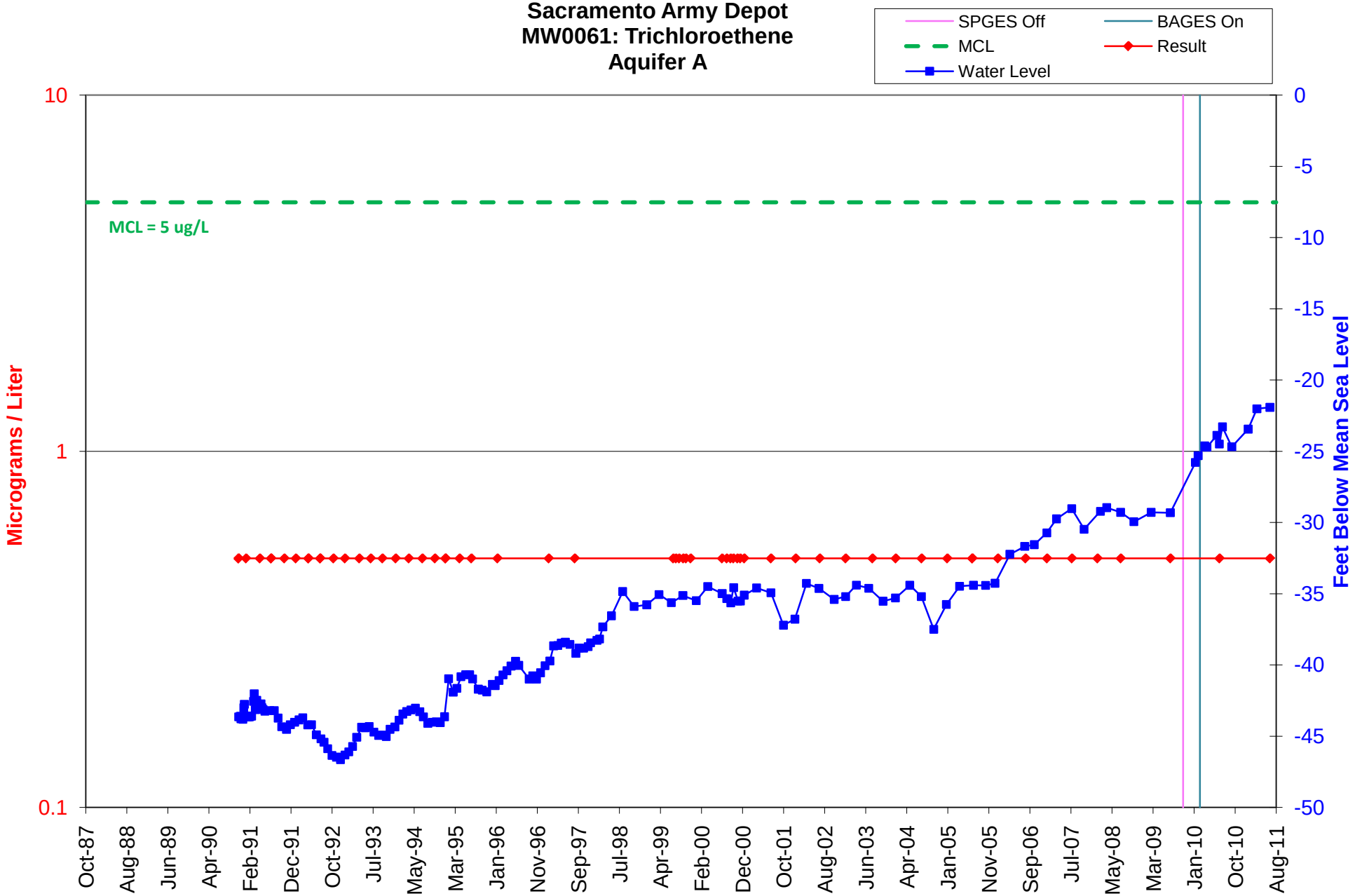
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0061: Trichloroethene
Aquifer A



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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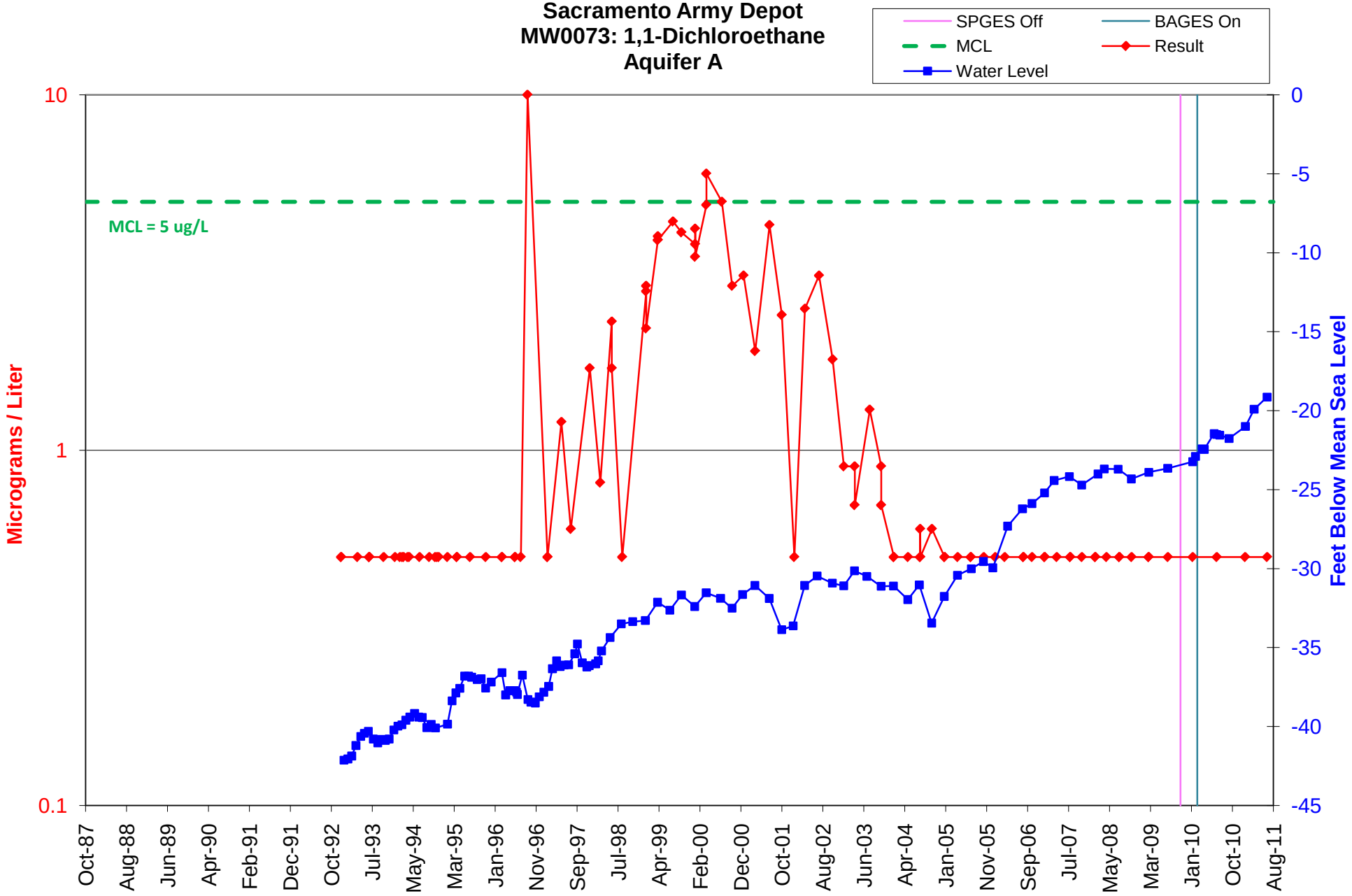
3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0073: 1,1-Dichloroethane
Aquifer A



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5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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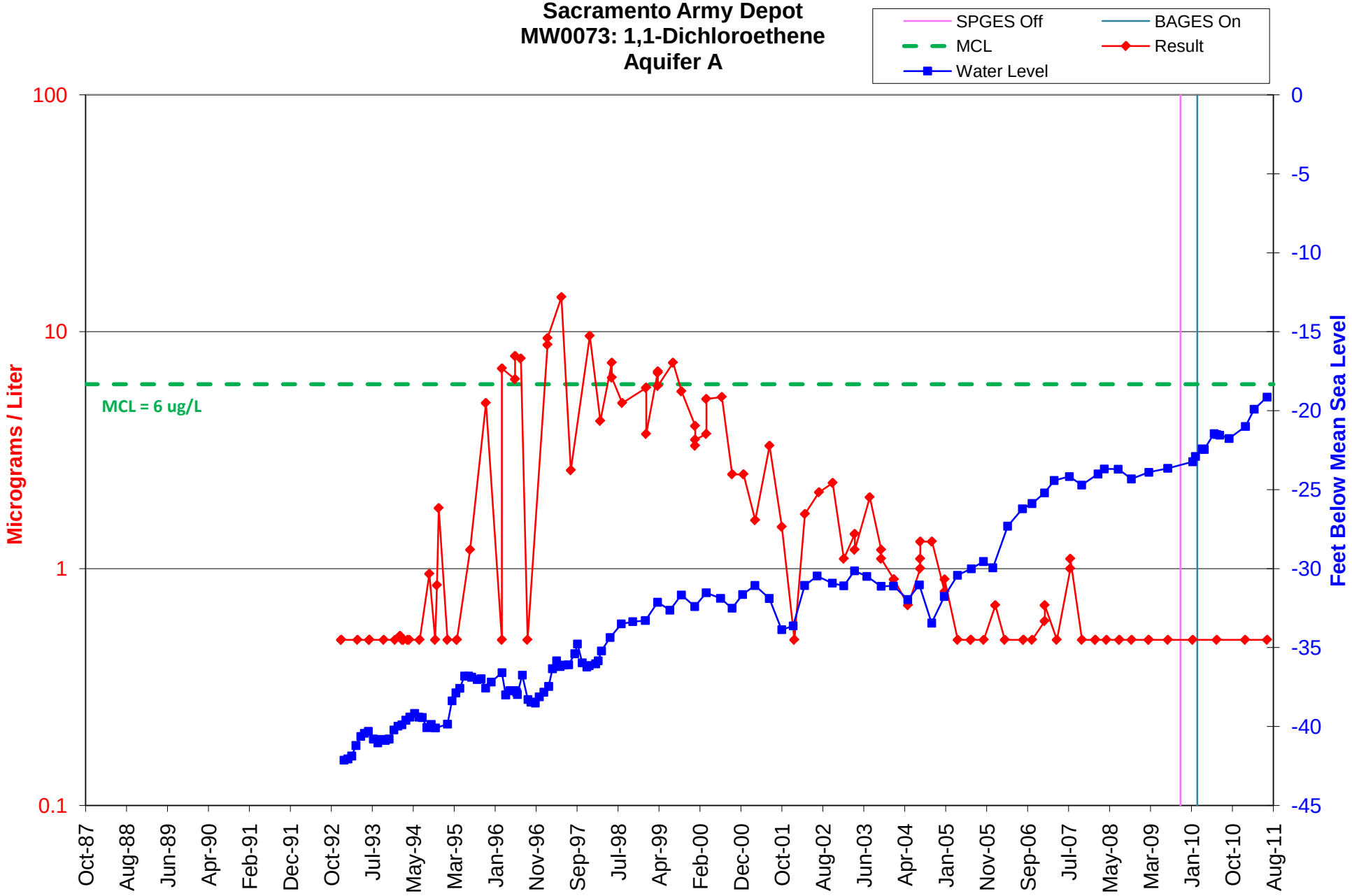
10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0073: 1,1-Dichloroethene
Aquifer A



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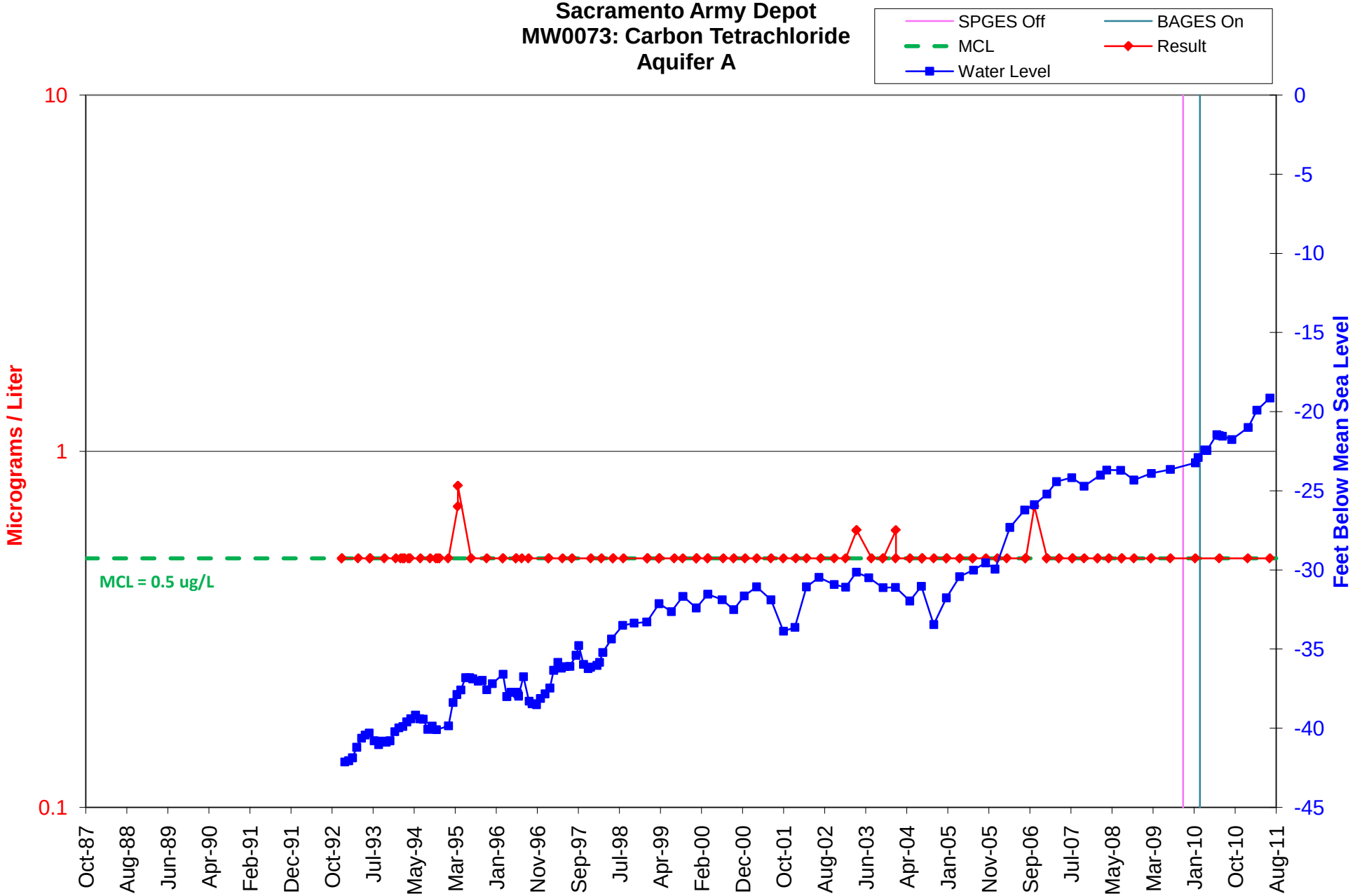
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0073: Carbon Tetrachloride
Aquifer A



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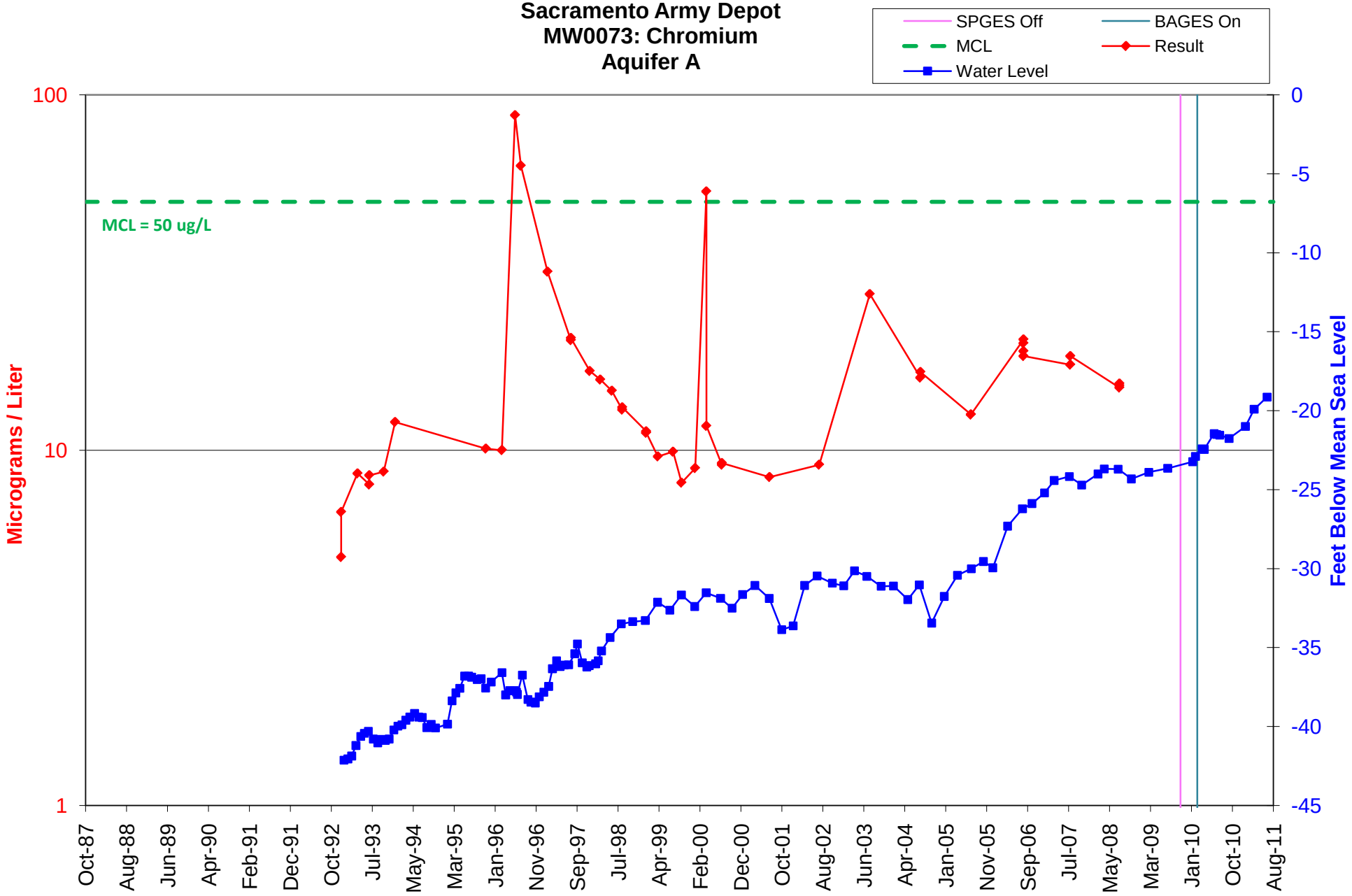
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0073: Chromium
Aquifer A



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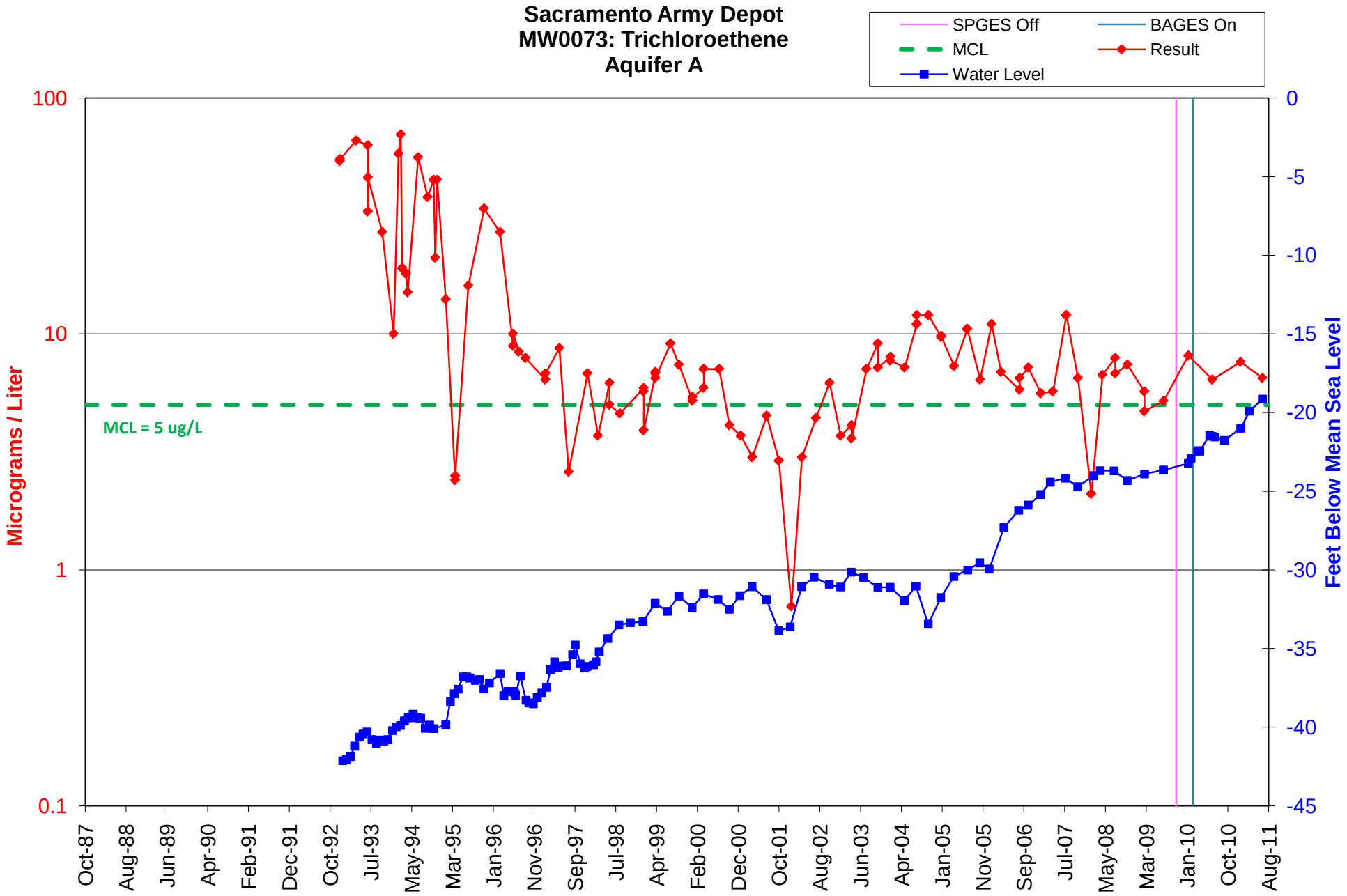
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



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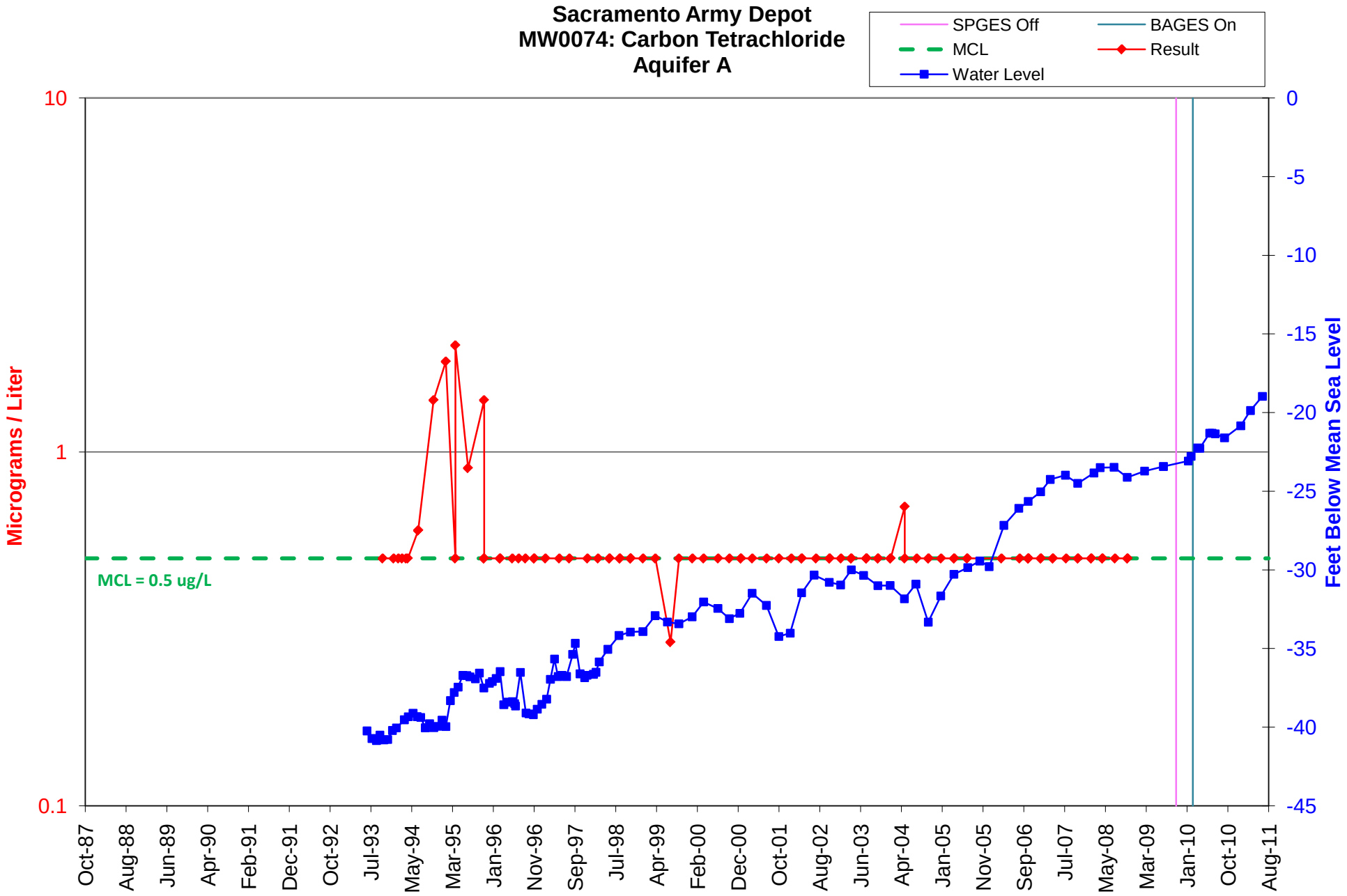
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



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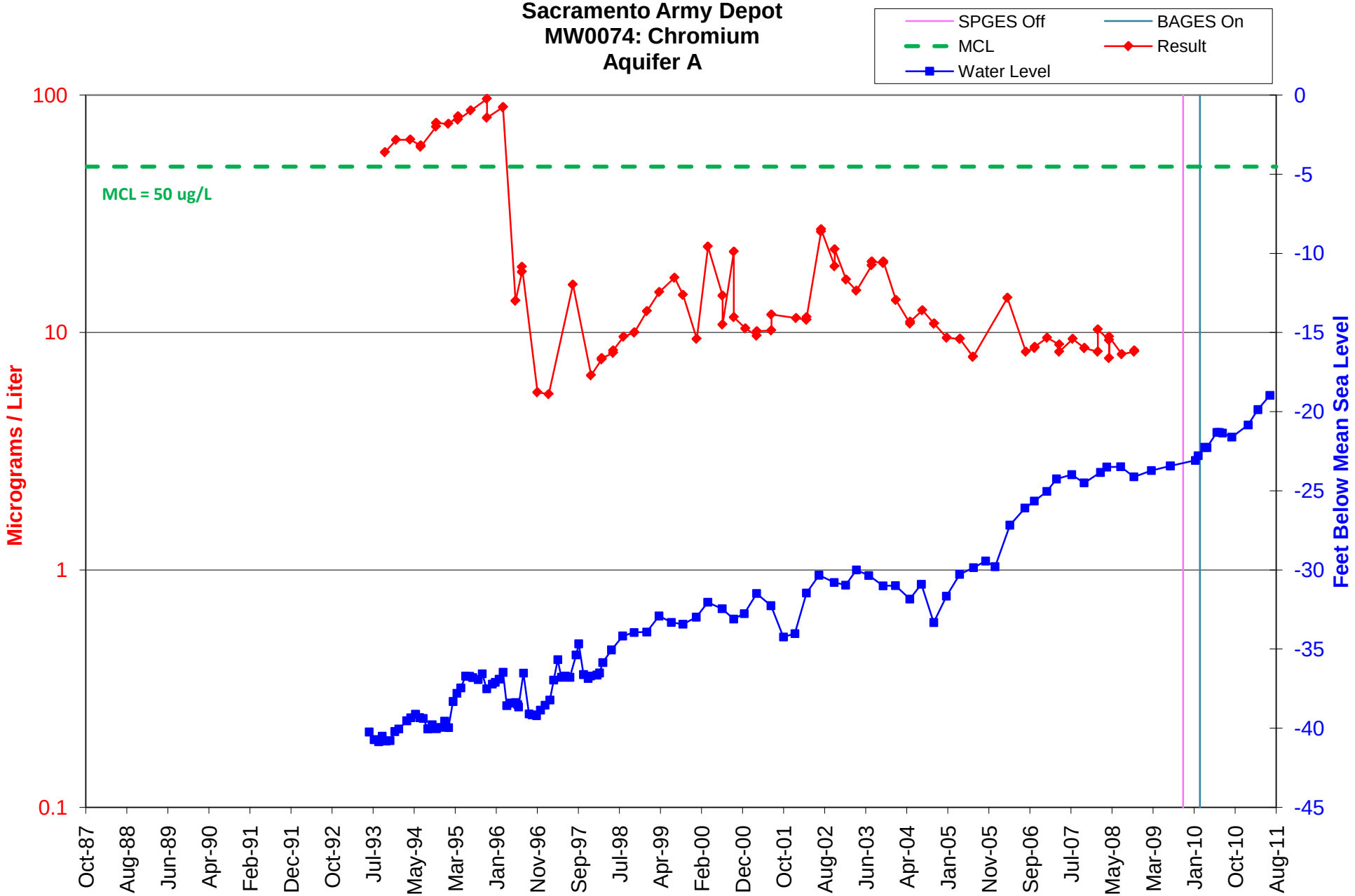
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0074: Chromium
Aquifer A



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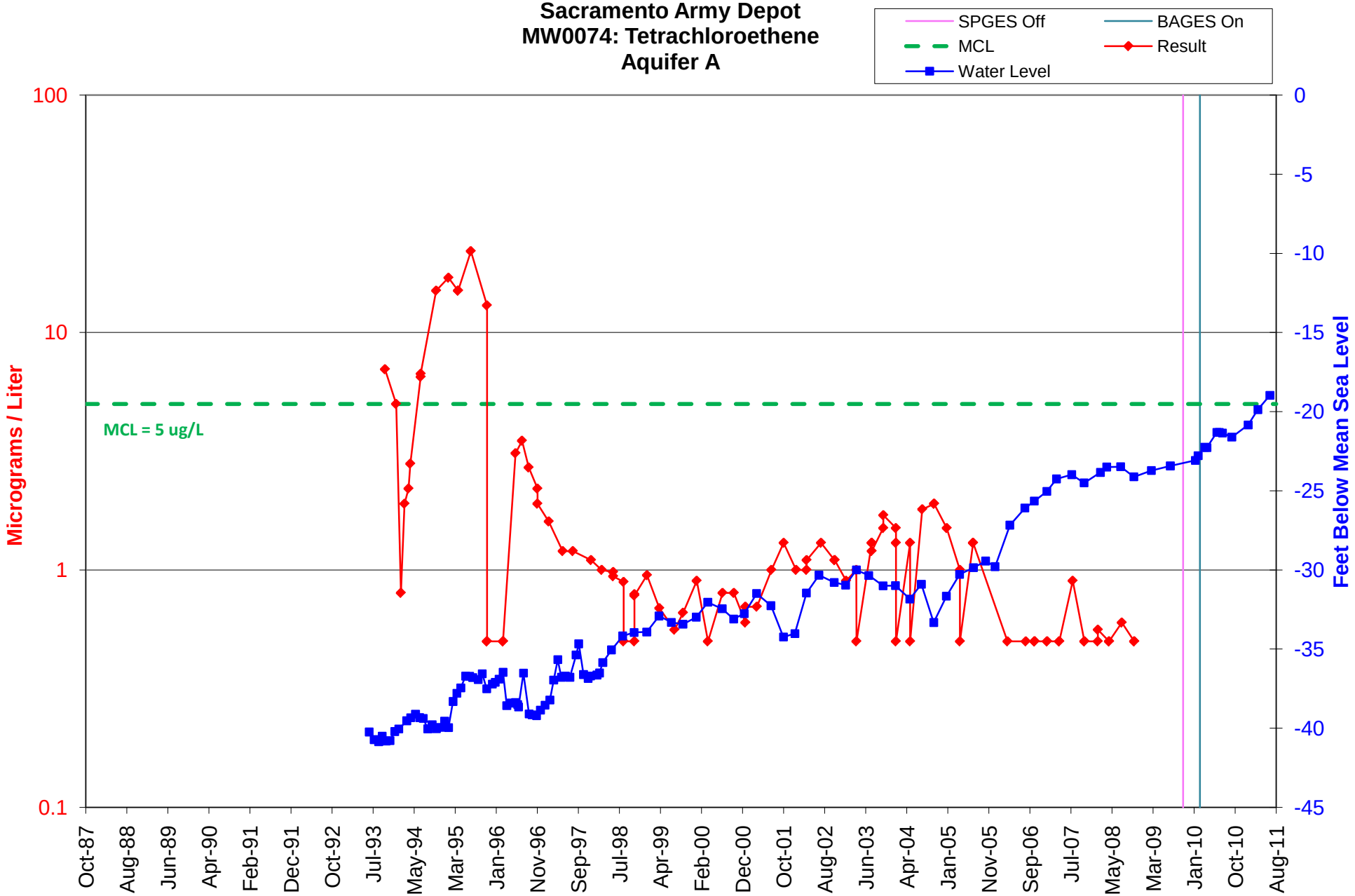
10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0074: Tetrachloroethene
Aquifer A



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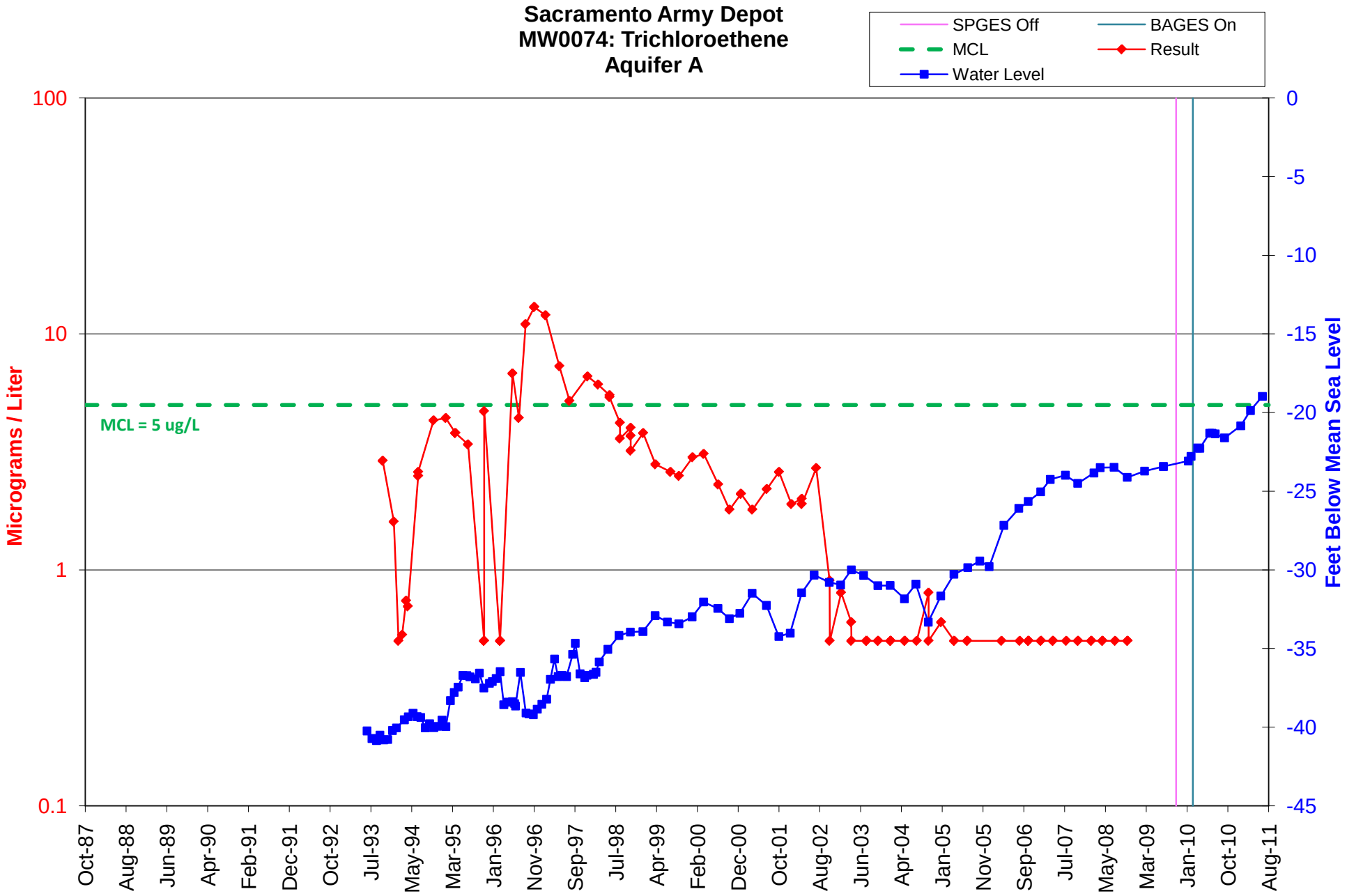
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



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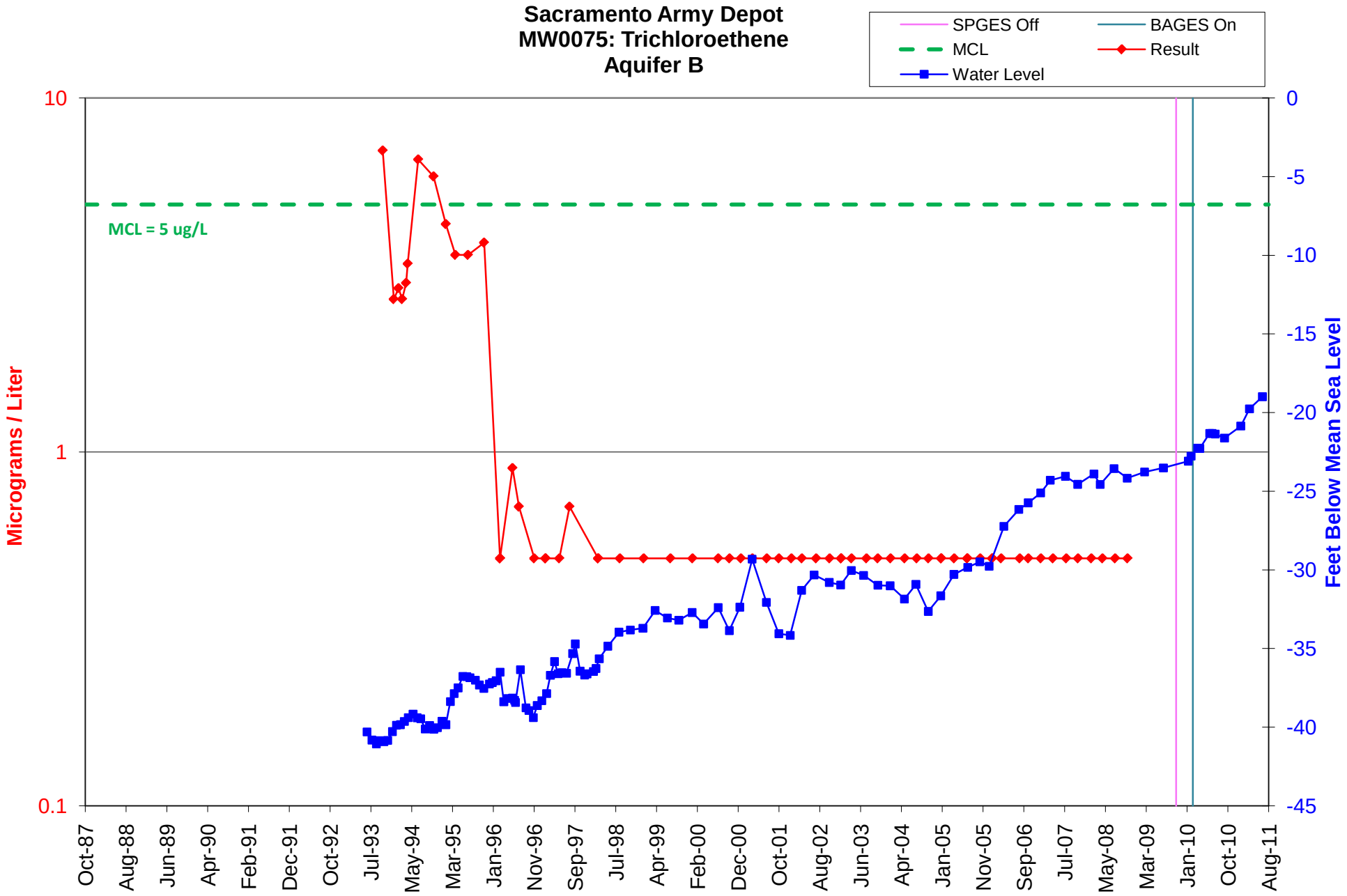
2/2010 - BAGES Turned On



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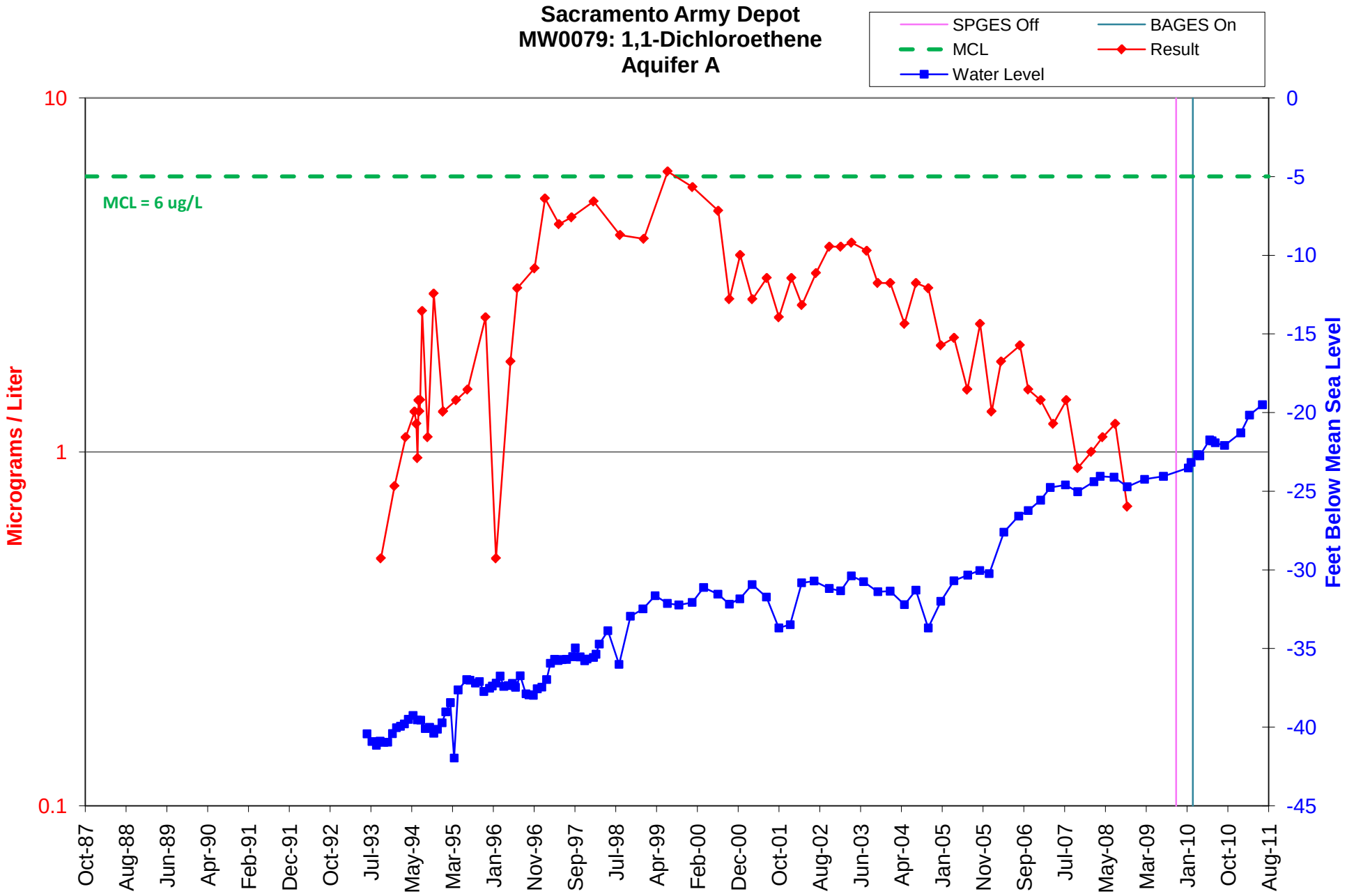
2/2010 - BAGES Turned On



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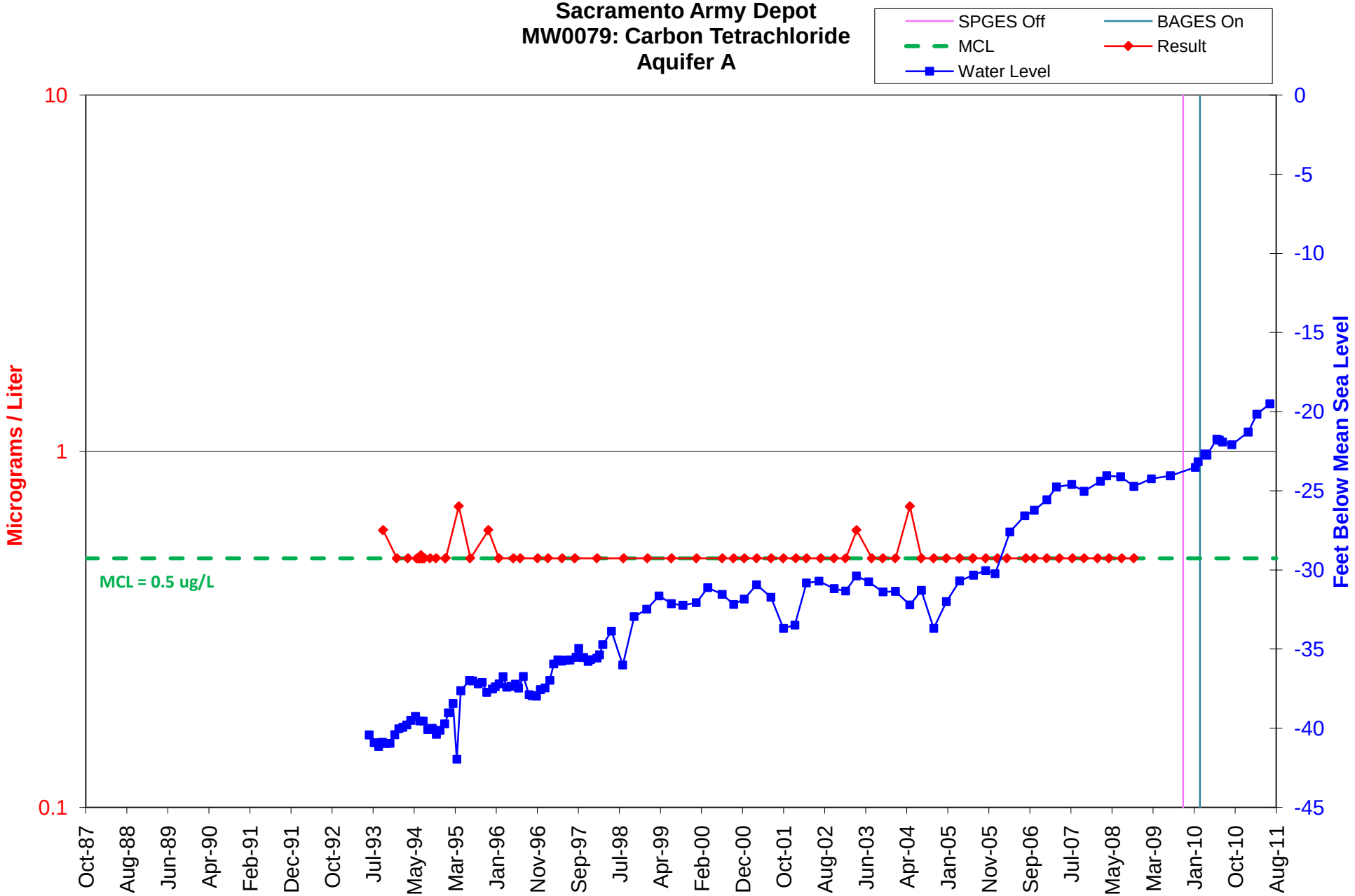
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0079: Carbon Tetrachloride
Aquifer A



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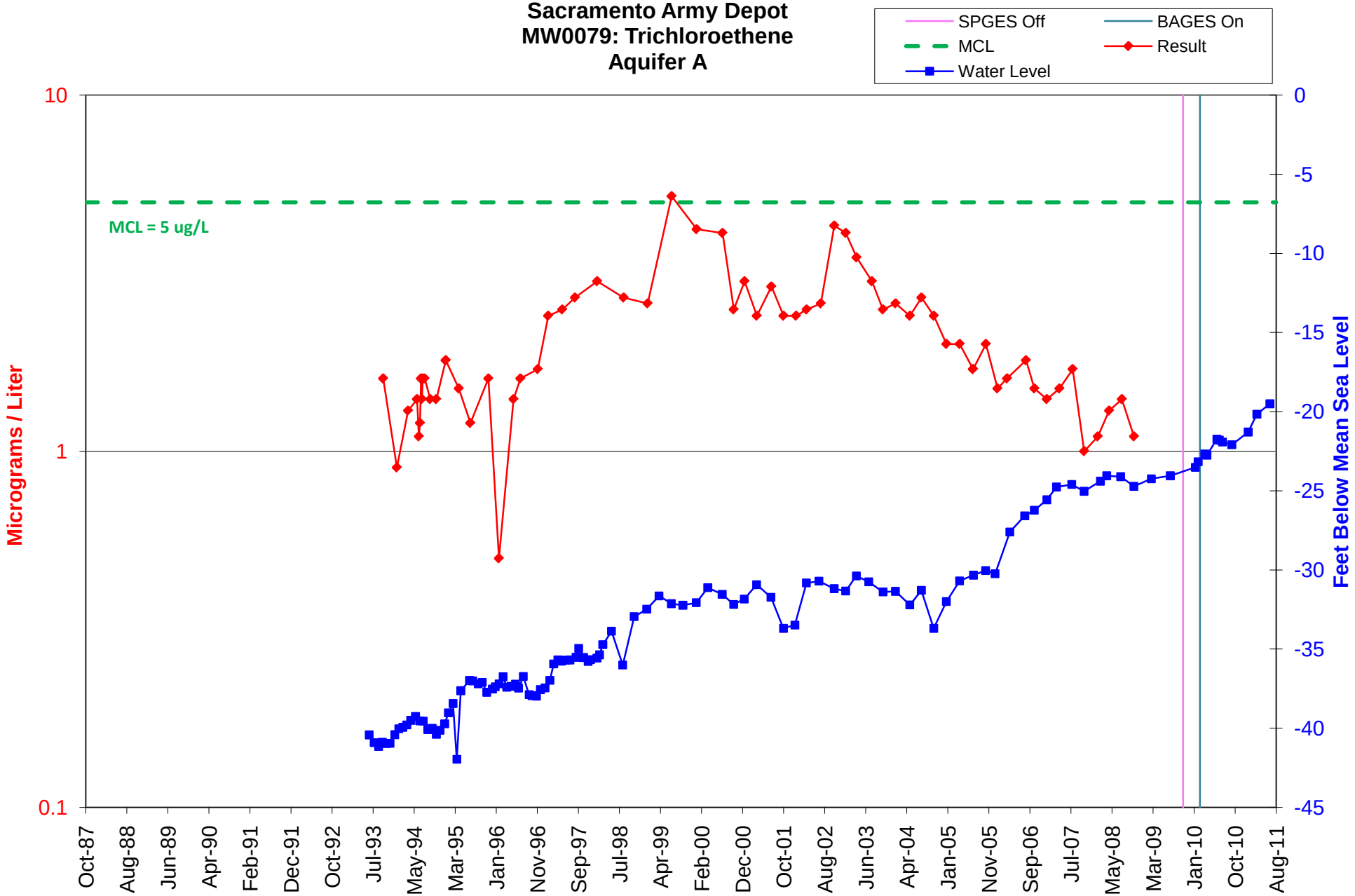
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0079: Trichloroethene
Aquifer A



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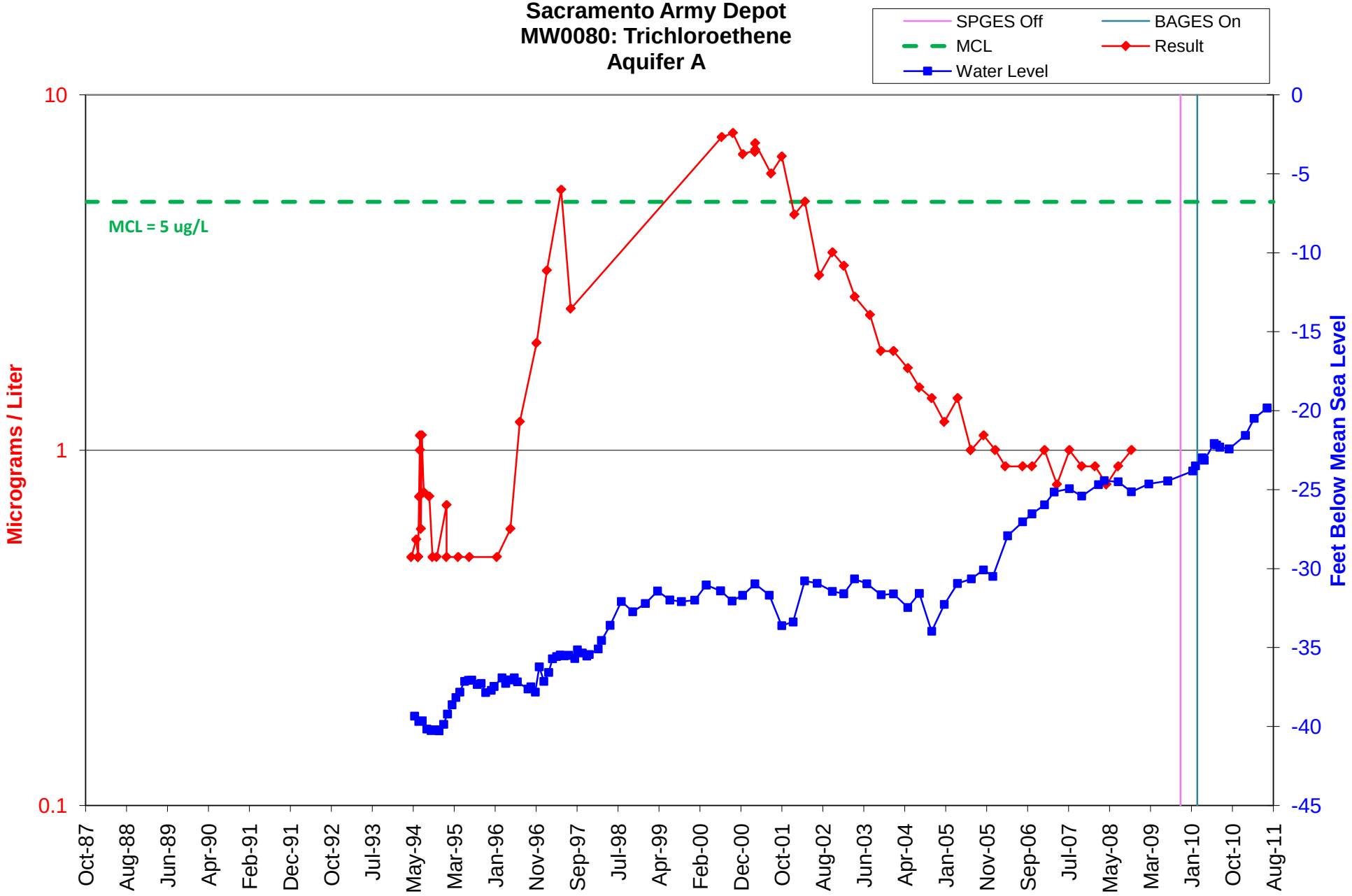
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0080: Trichloroethene
Aquifer A



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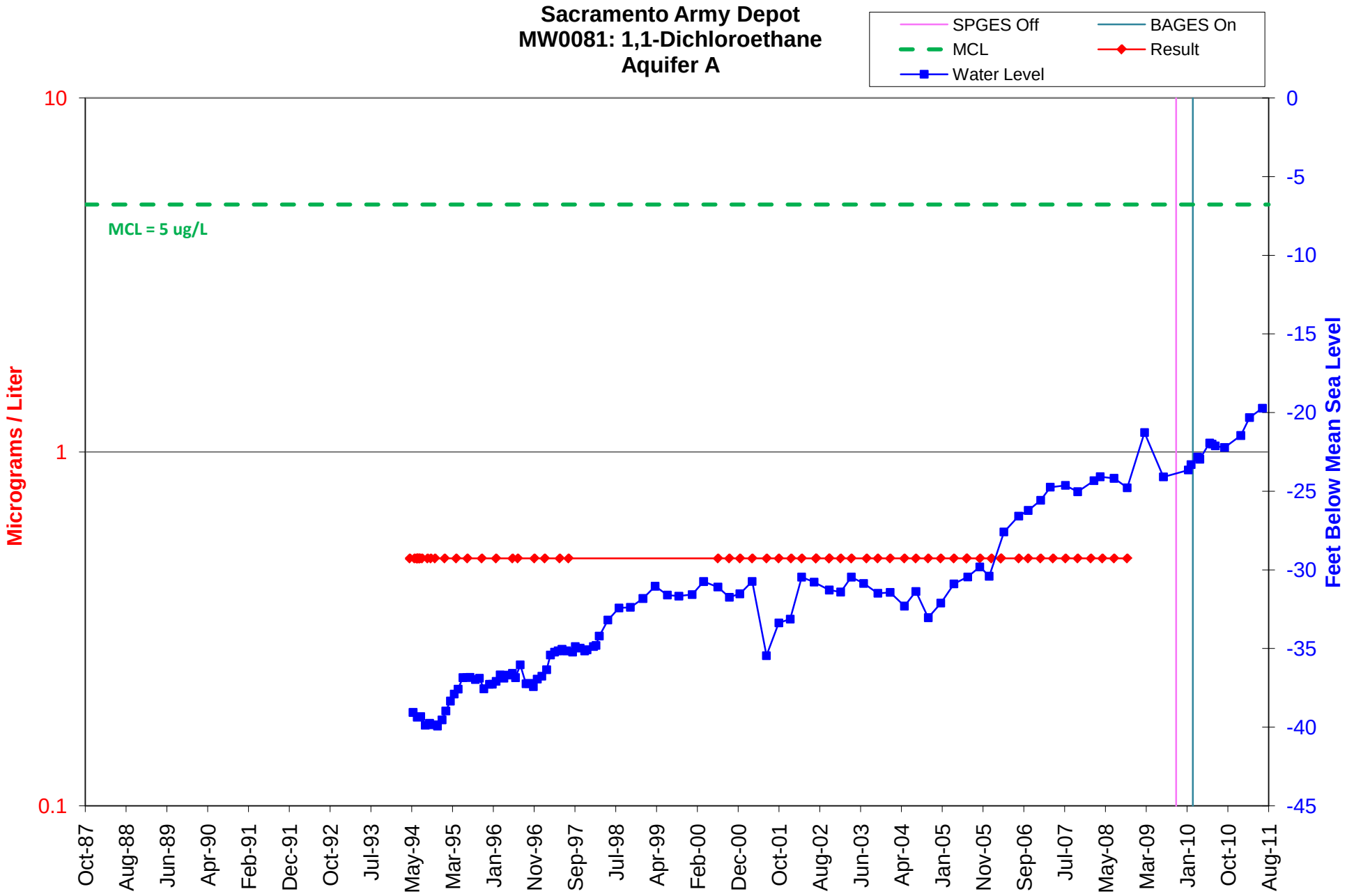

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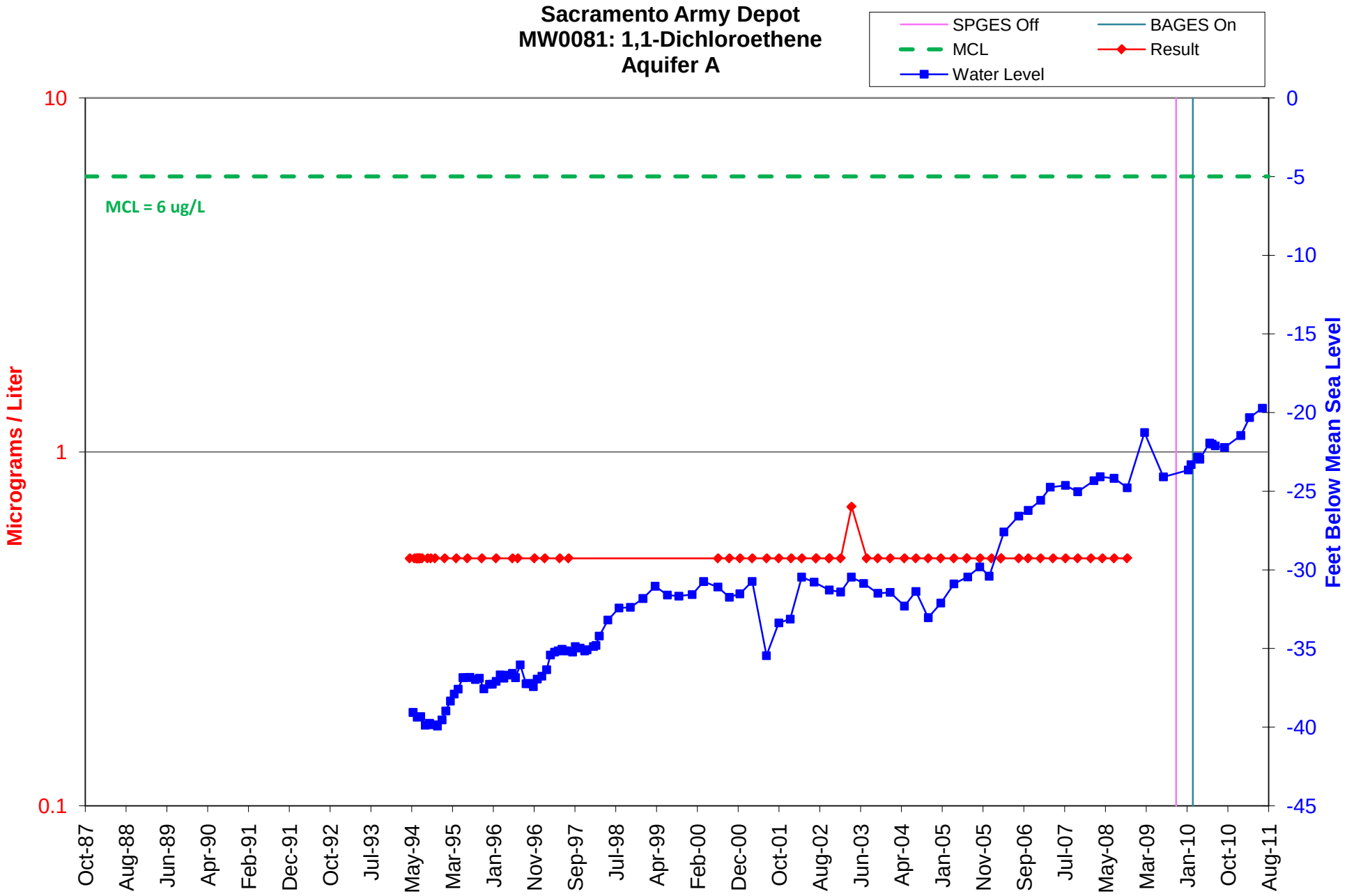
2/2010 - BAGES Turned On



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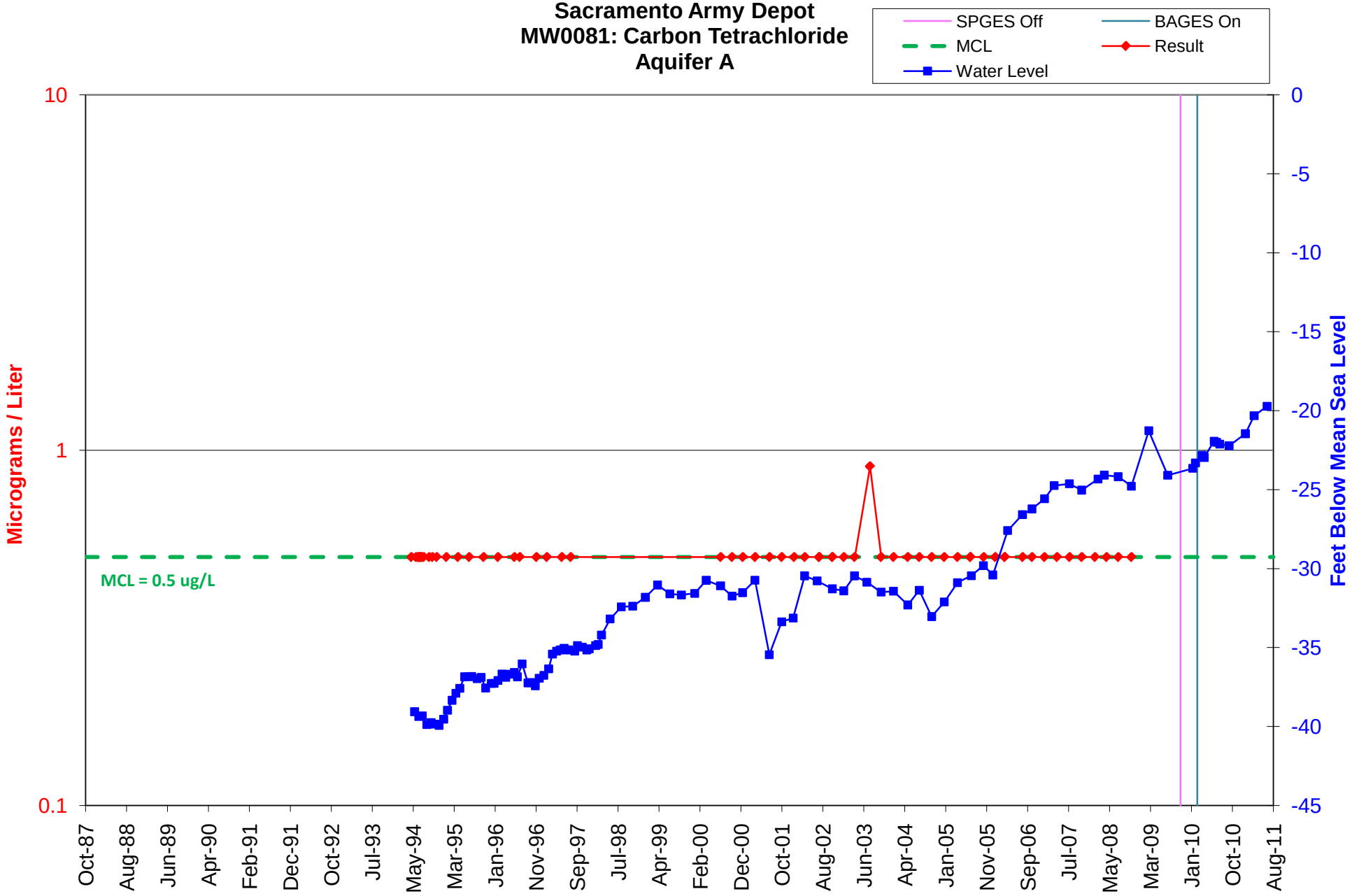
10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0081: Carbon Tetrachloride
Aquifer A



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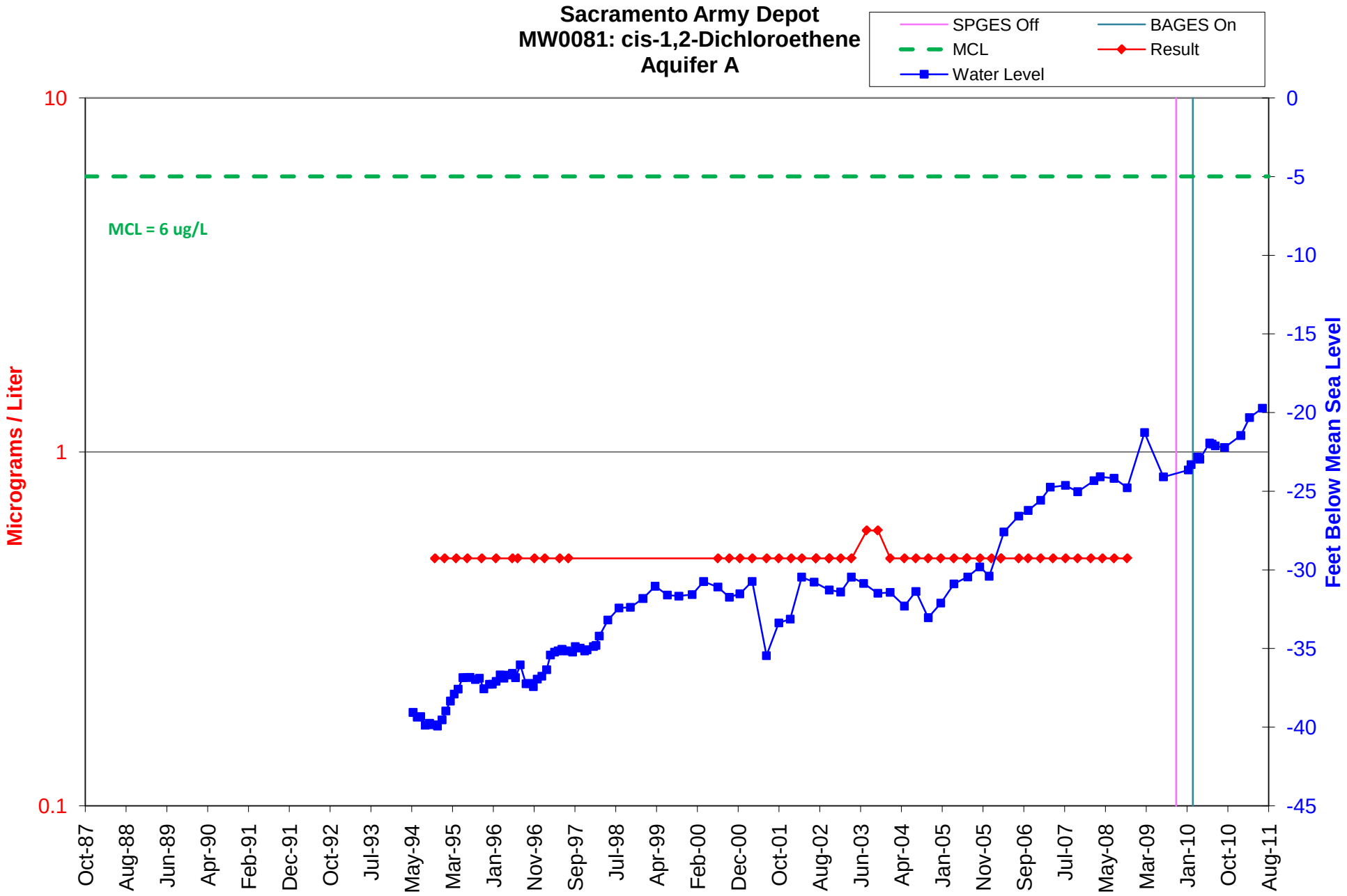
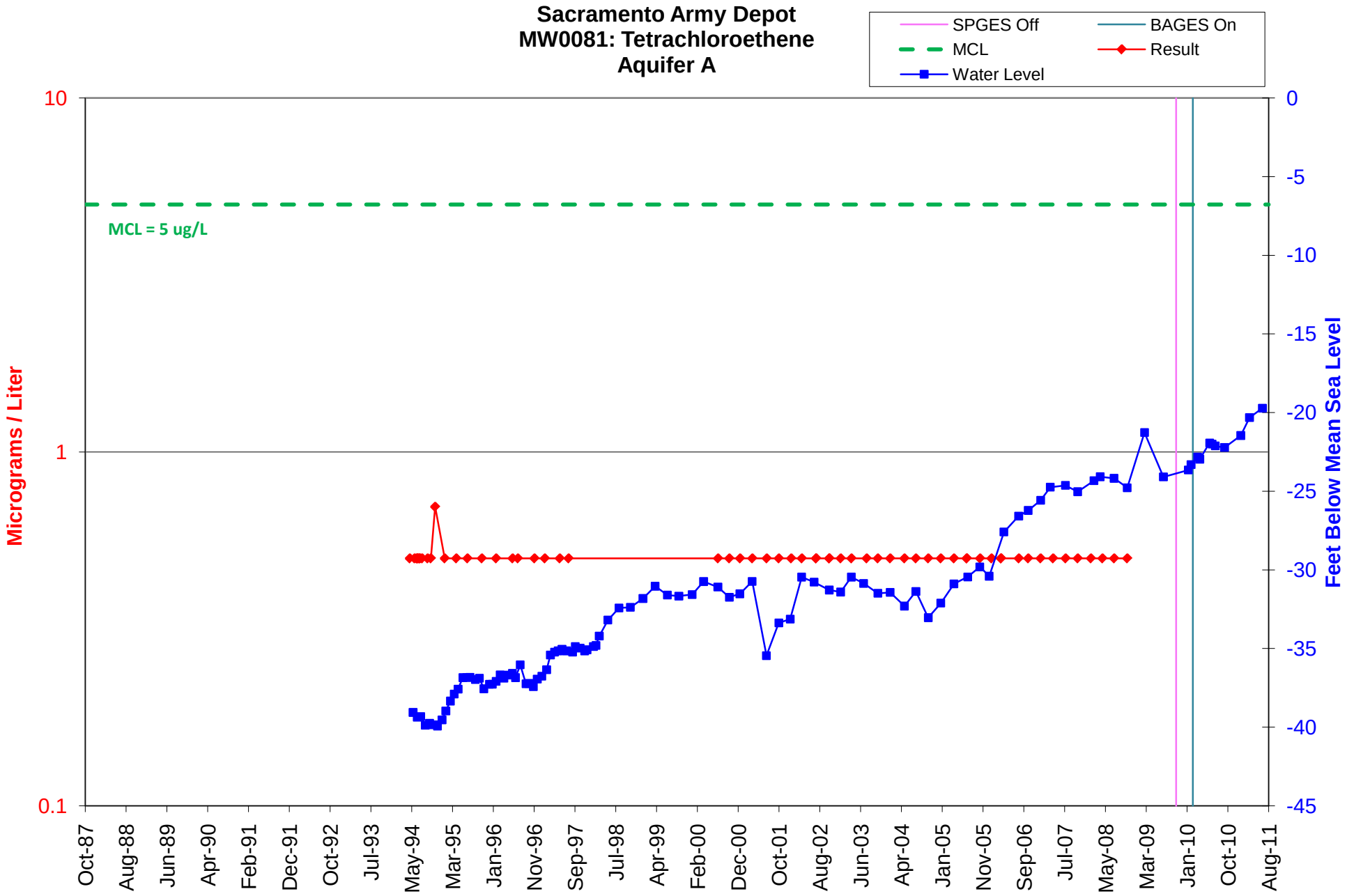
10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

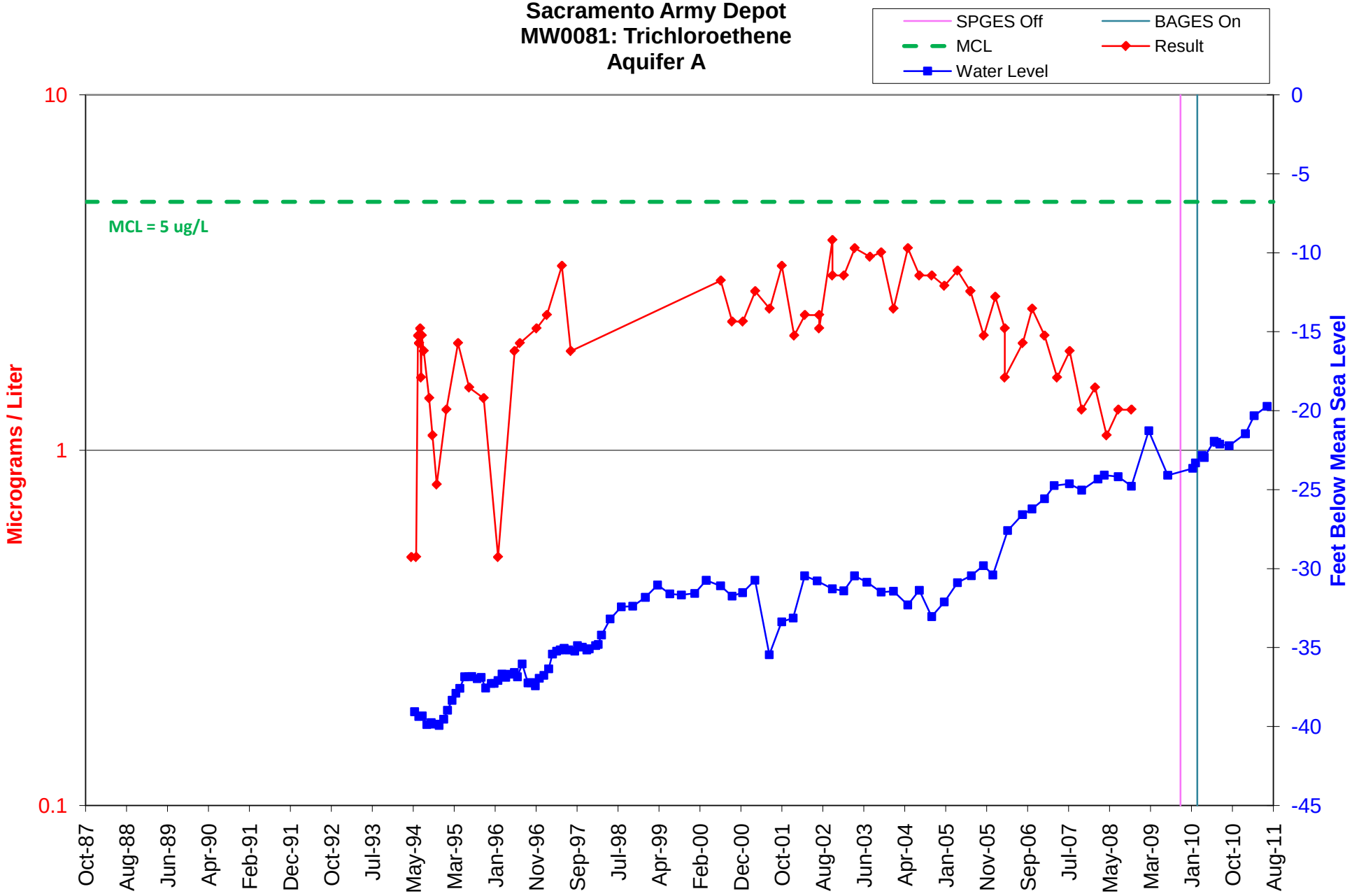


11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW0081: Trichloroethene
Aquifer A

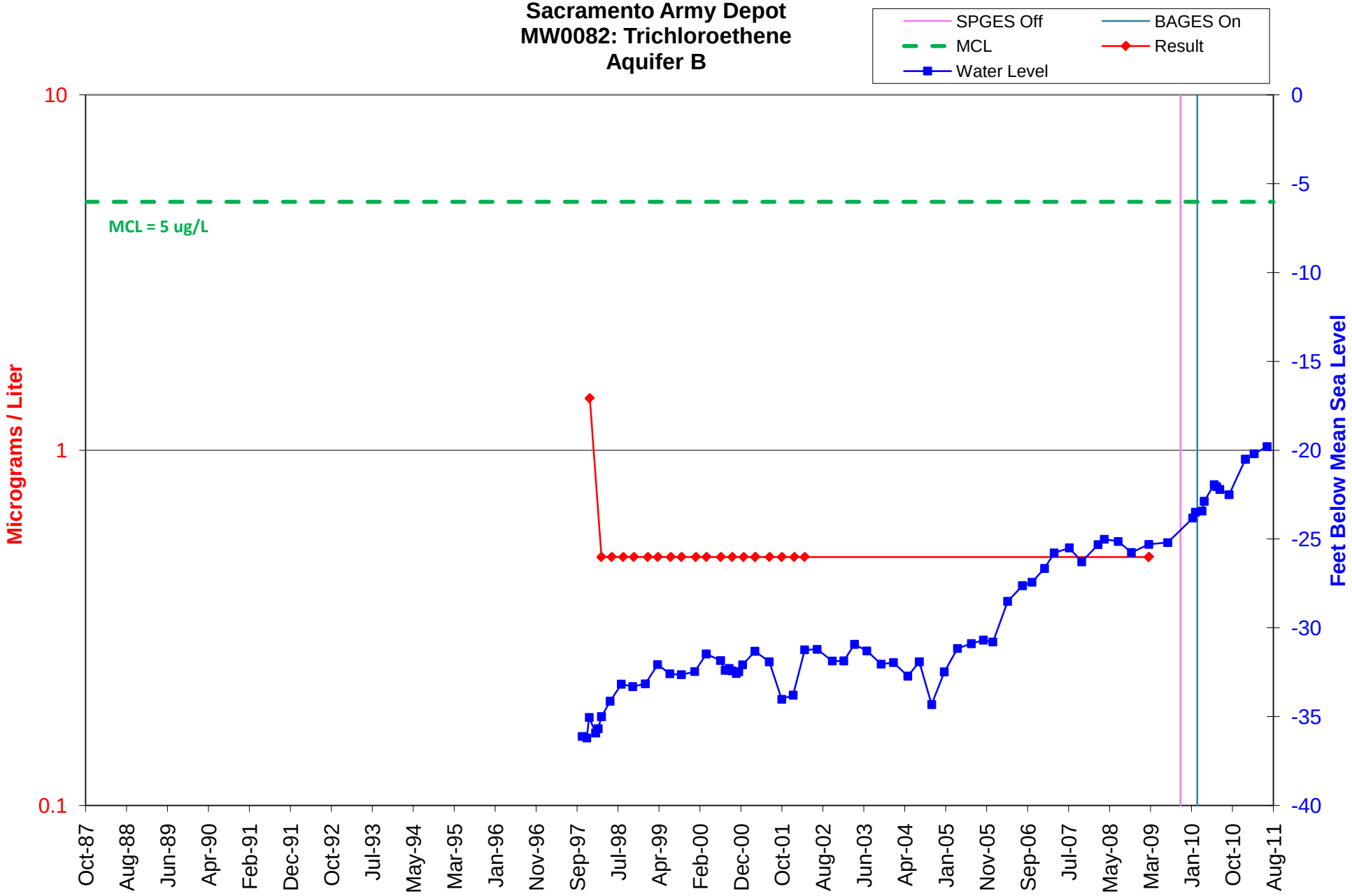


11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

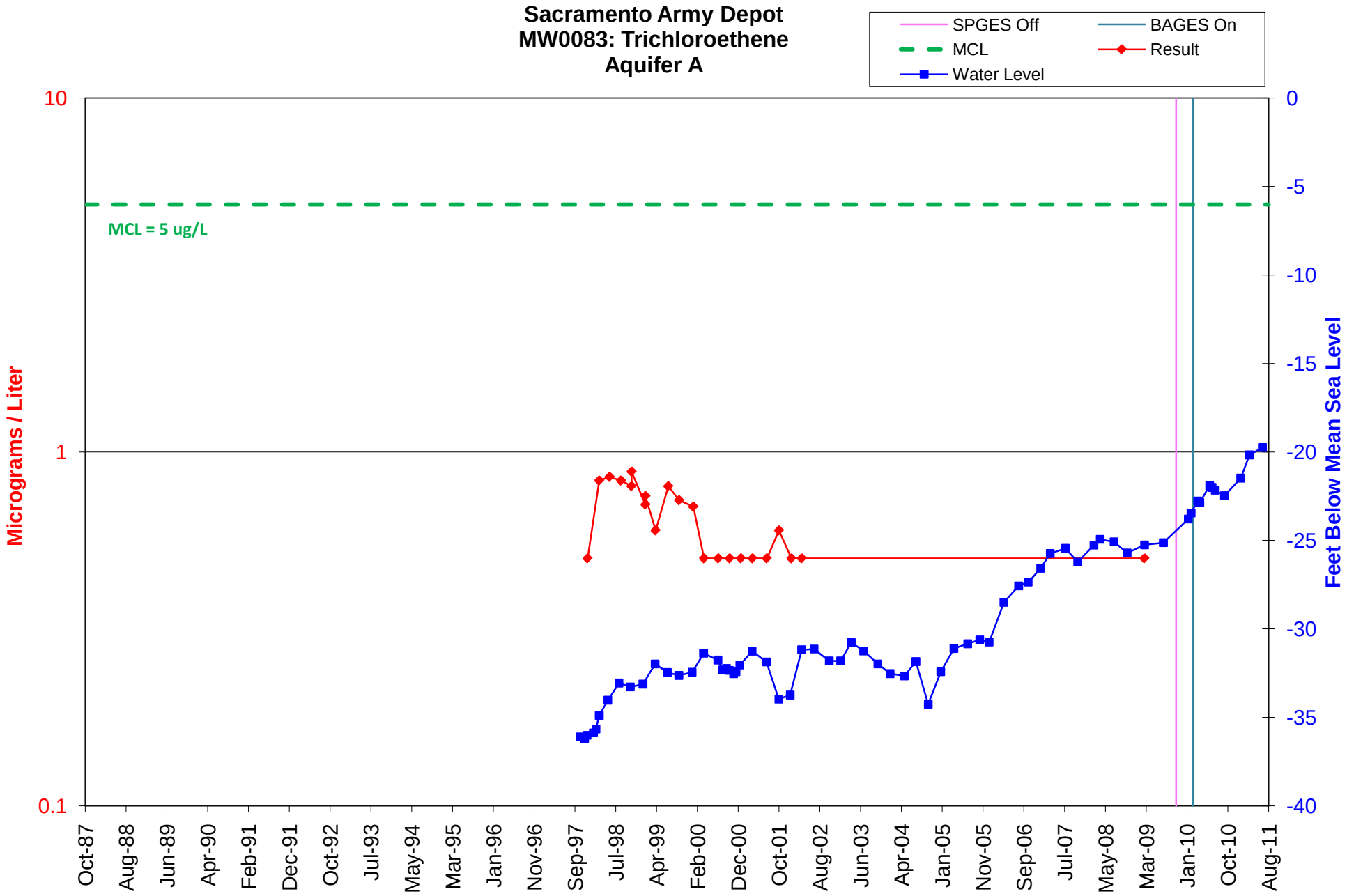
Sacramento Army Depot
MW0082: Trichloroethene
Aquifer B



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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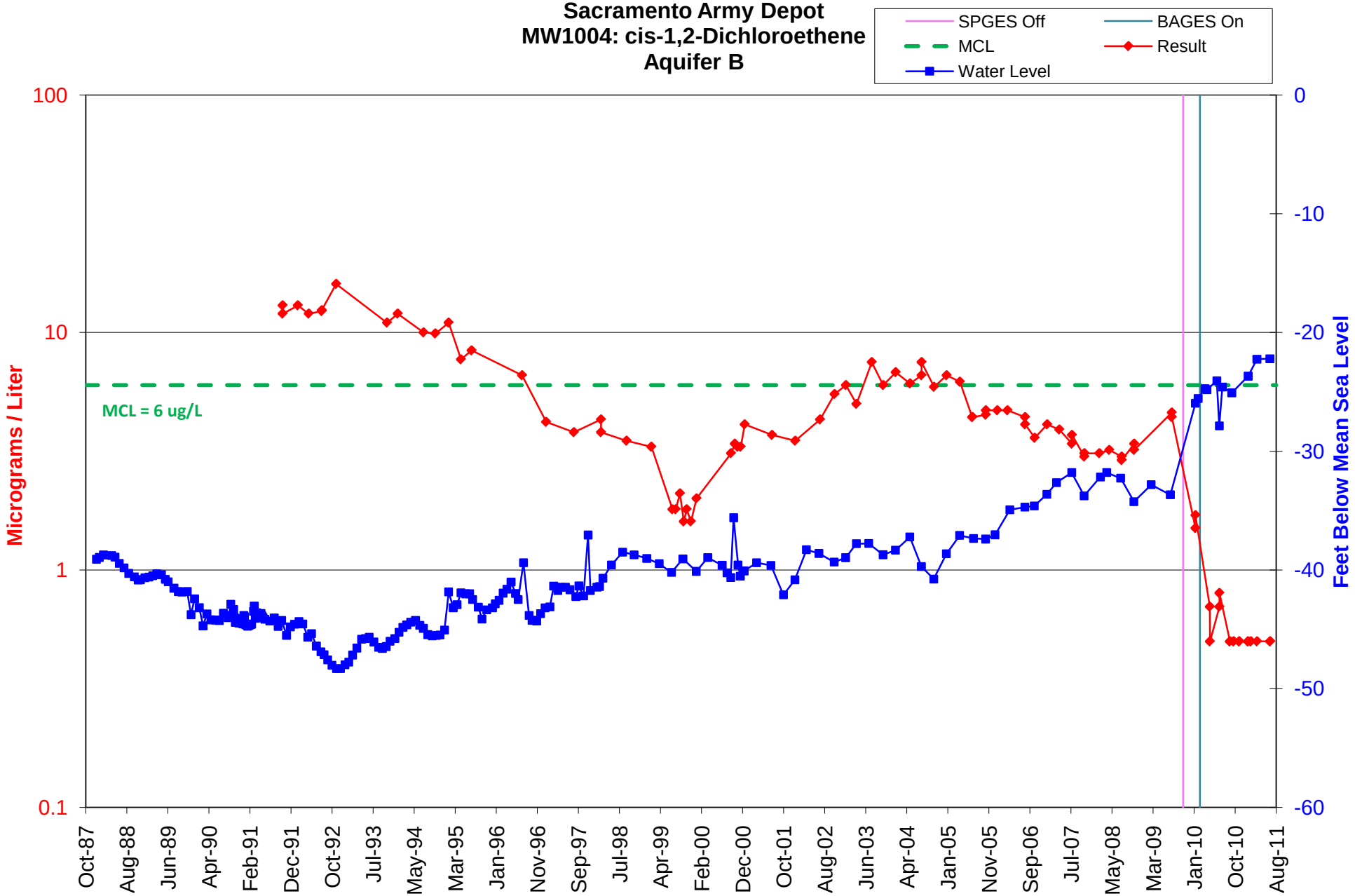
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

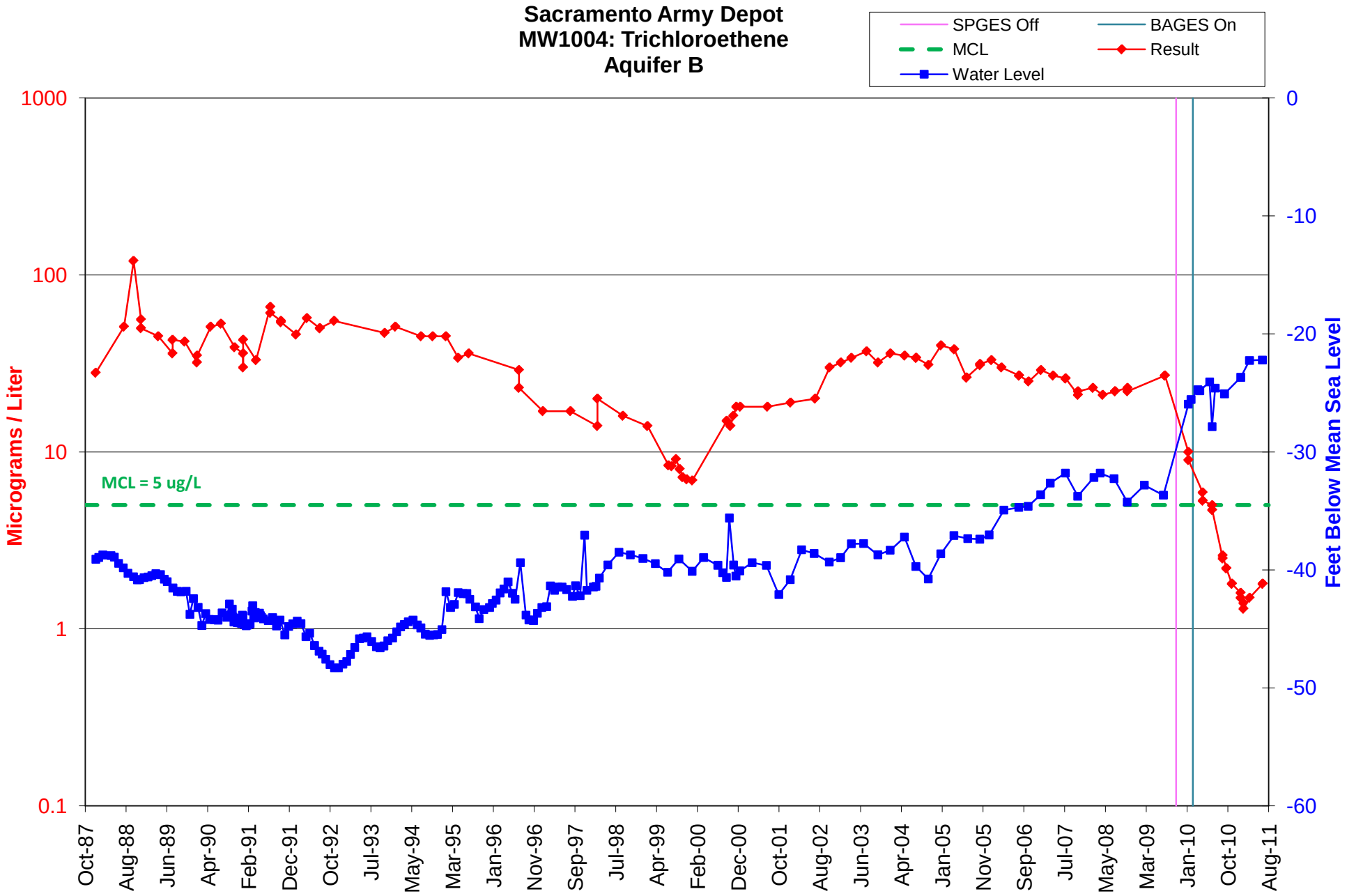
Sacramento Army Depot
MW1004: cis-1,2-Dichloroethene
Aquifer B



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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1/2003 - EW11 (C Zone) Turned Off

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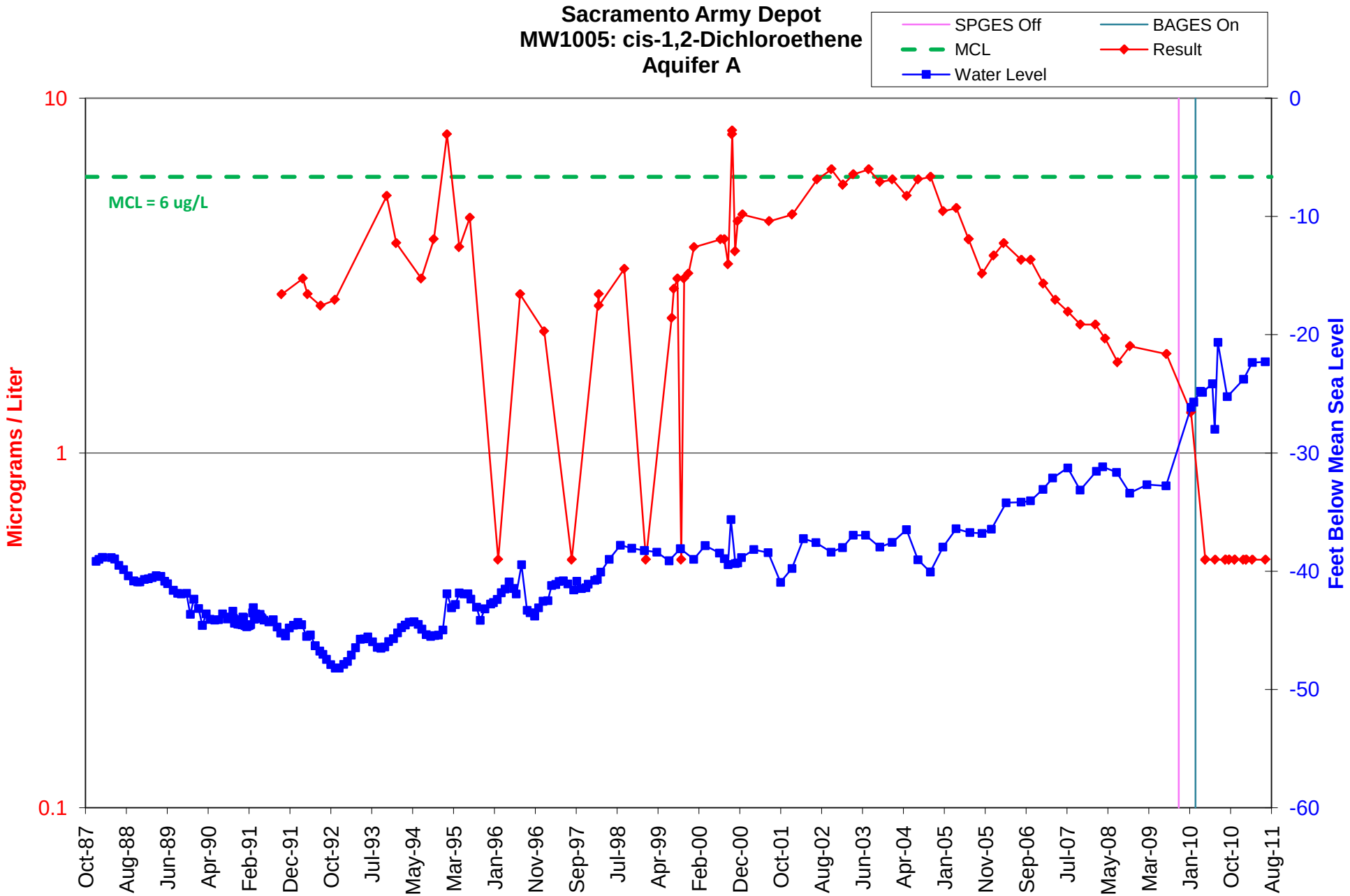
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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5/1996 - EW11 (C Zone) Turned On

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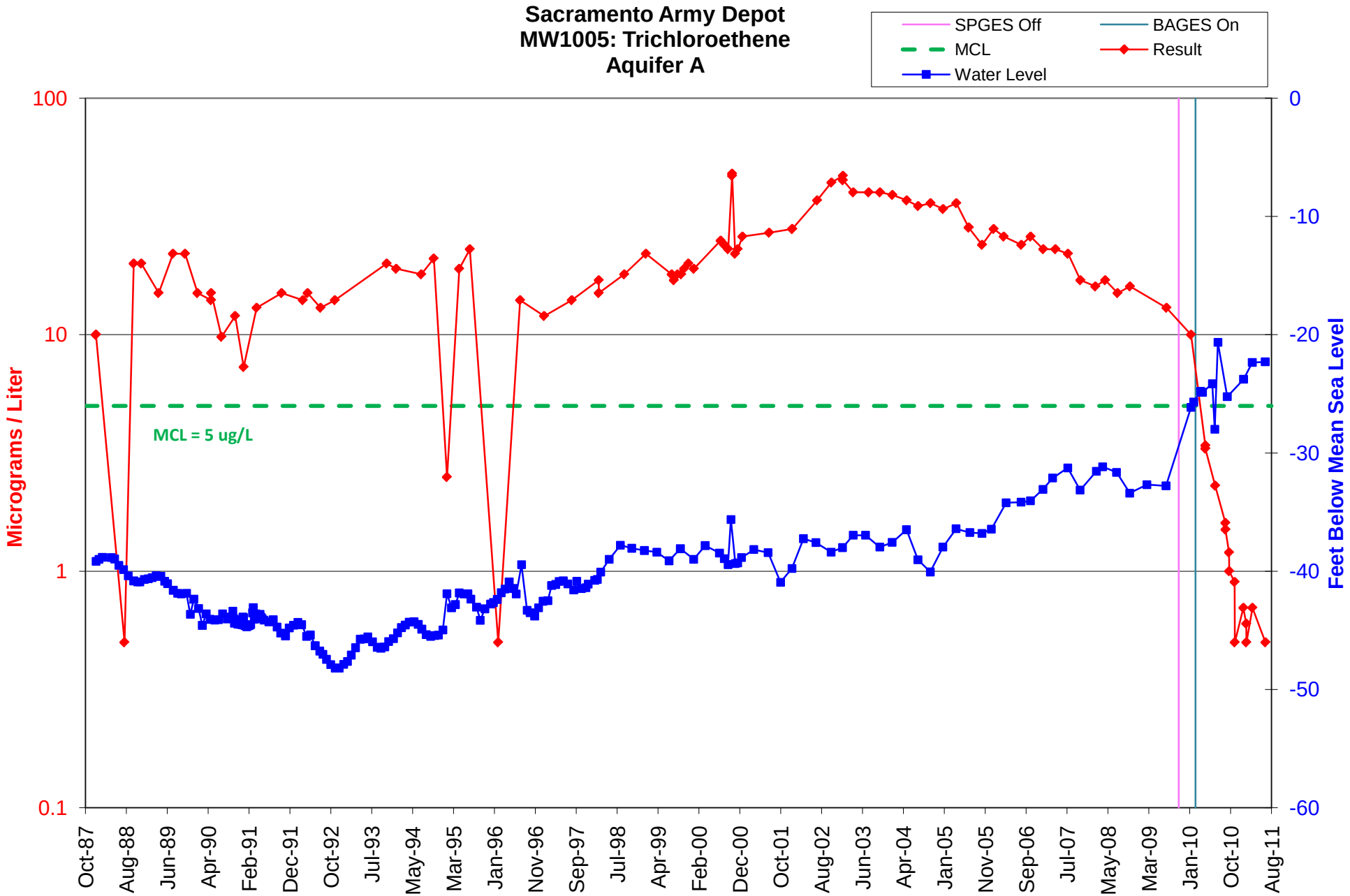
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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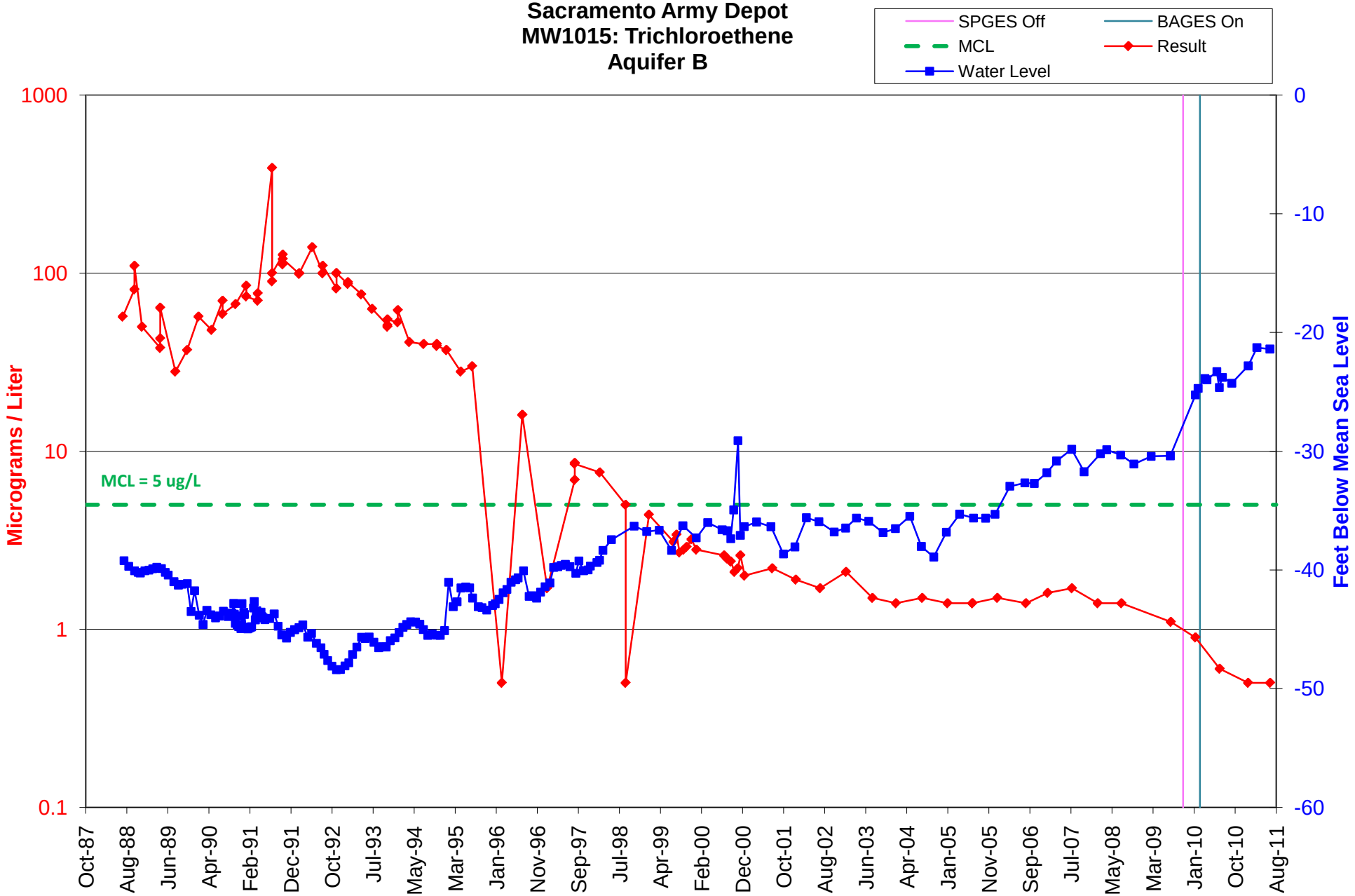
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW1015: Trichloroethene
Aquifer B



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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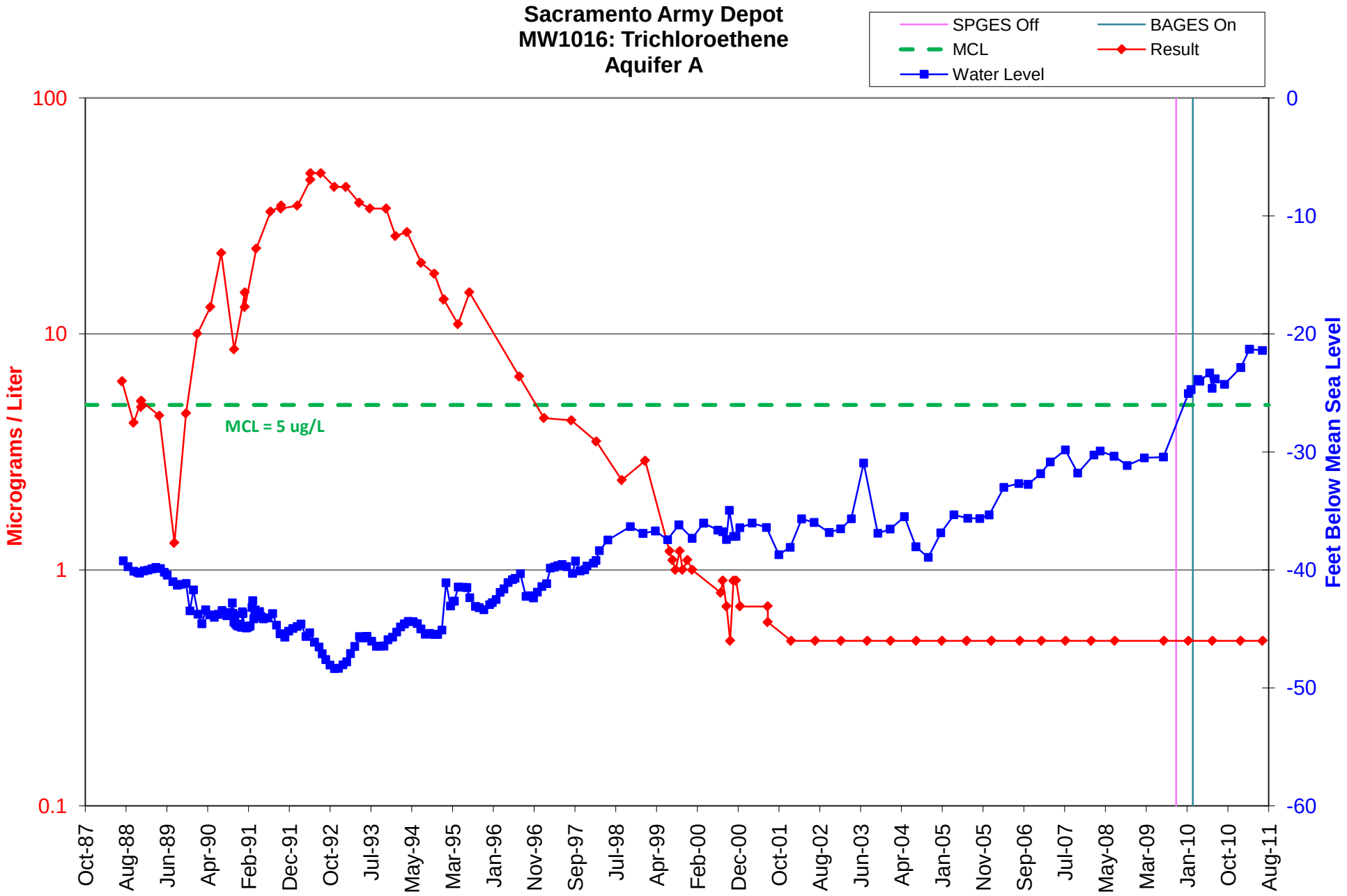
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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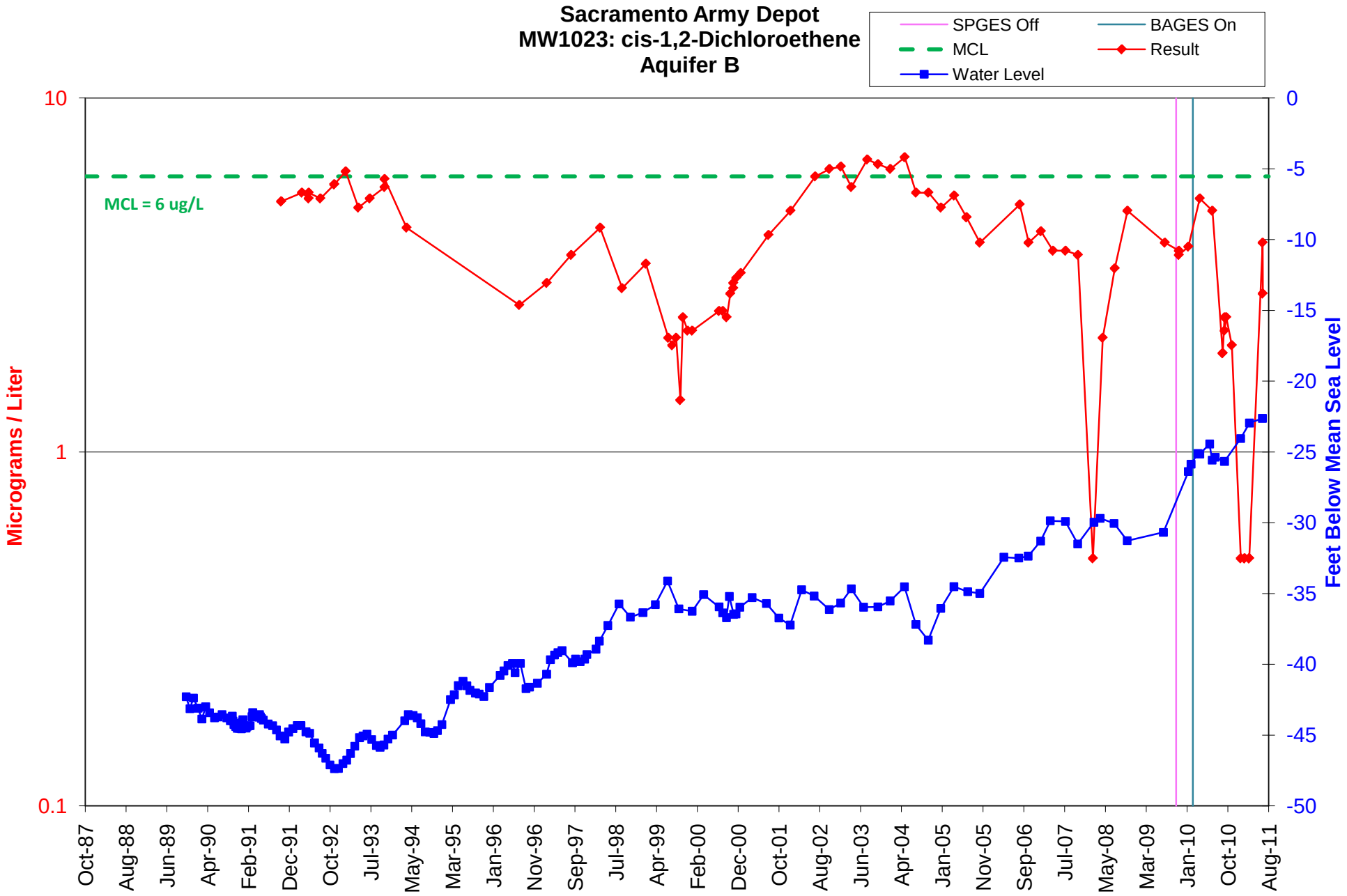
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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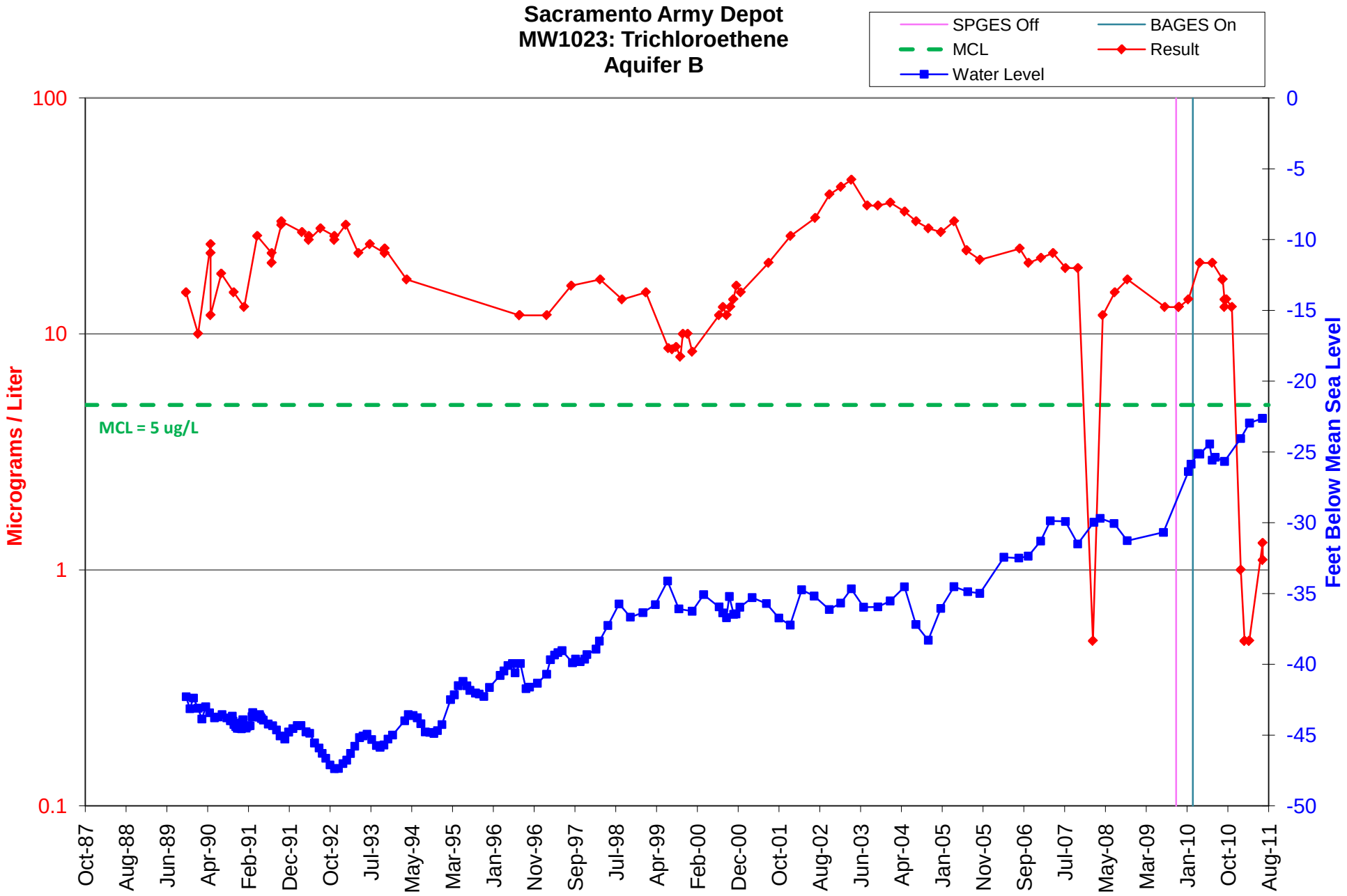
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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1/2003 - EW11 (C Zone) Turned Off

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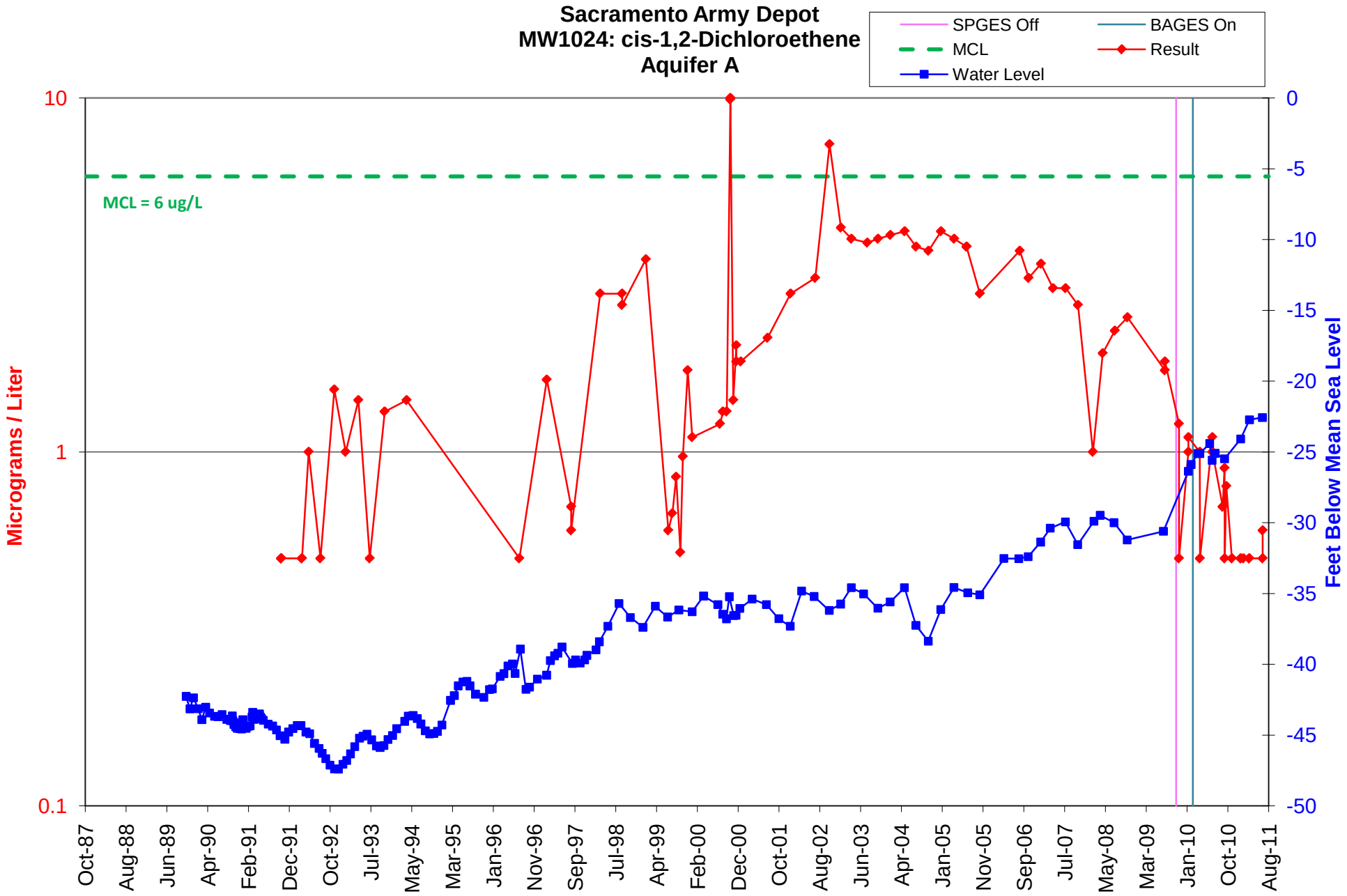
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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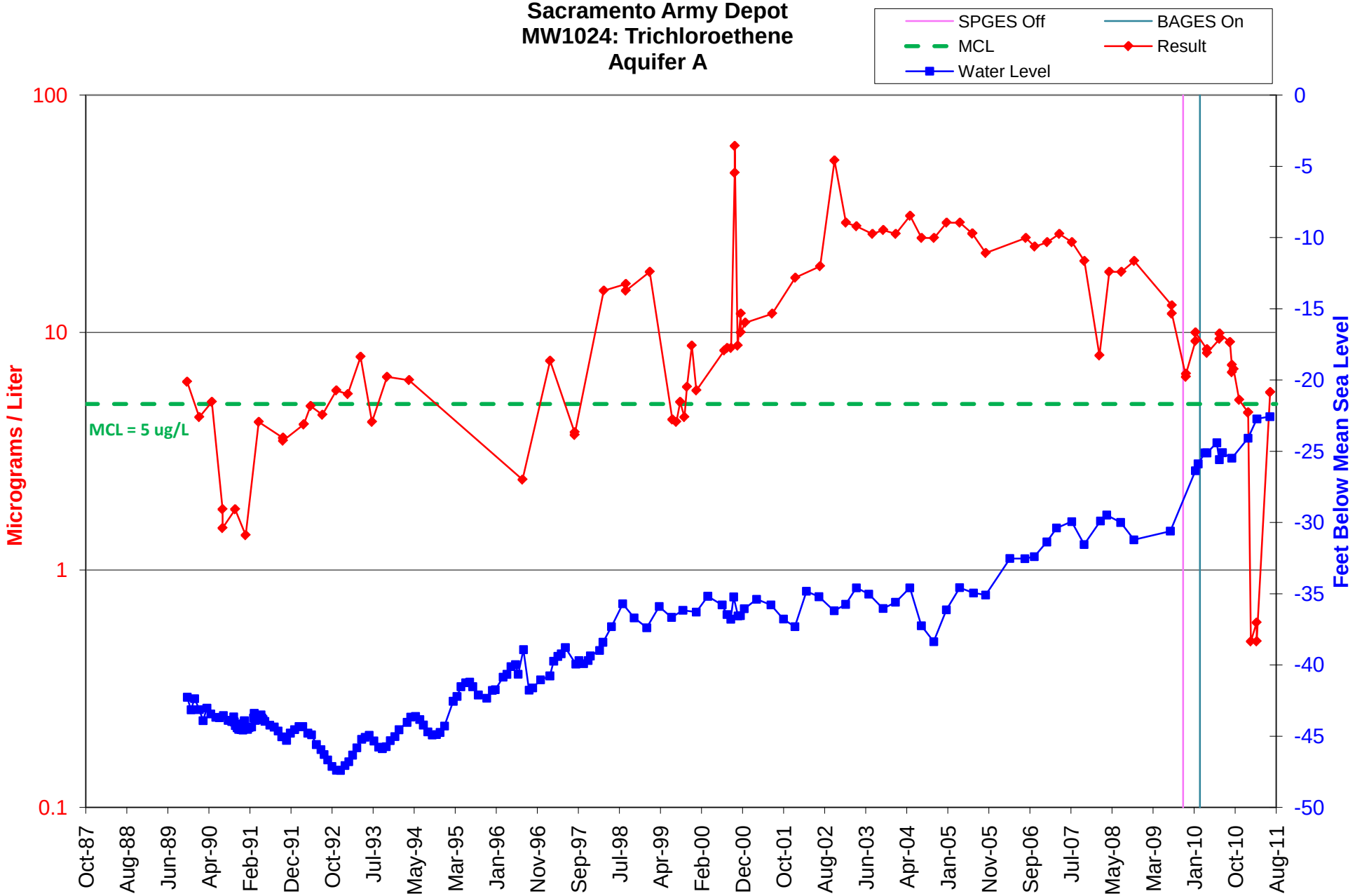
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW1024: Trichloroethene
Aquifer A

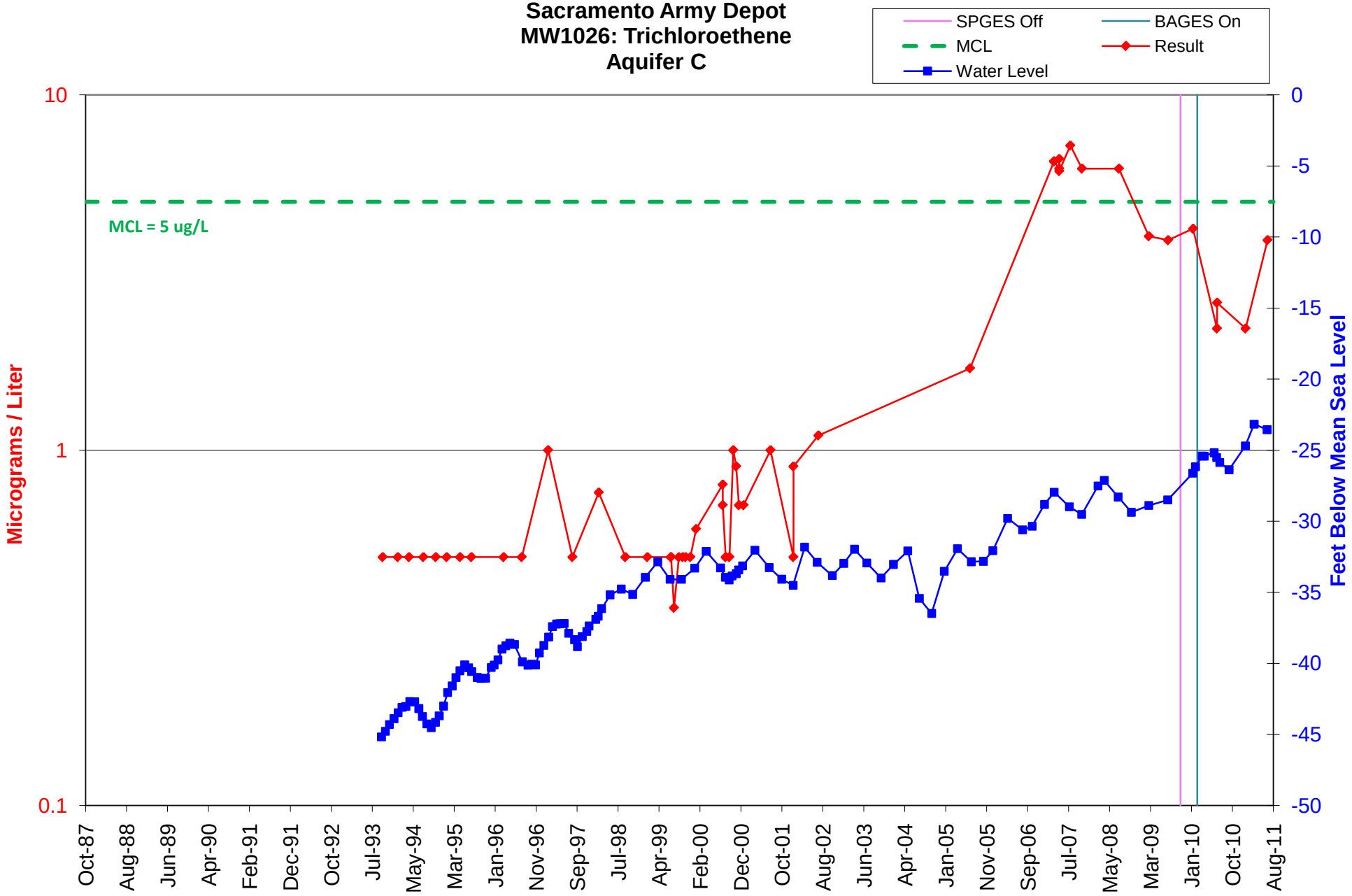


11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW1026: Trichloroethene
Aquifer C



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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1/2003 - EW11 (C Zone) Turned Off

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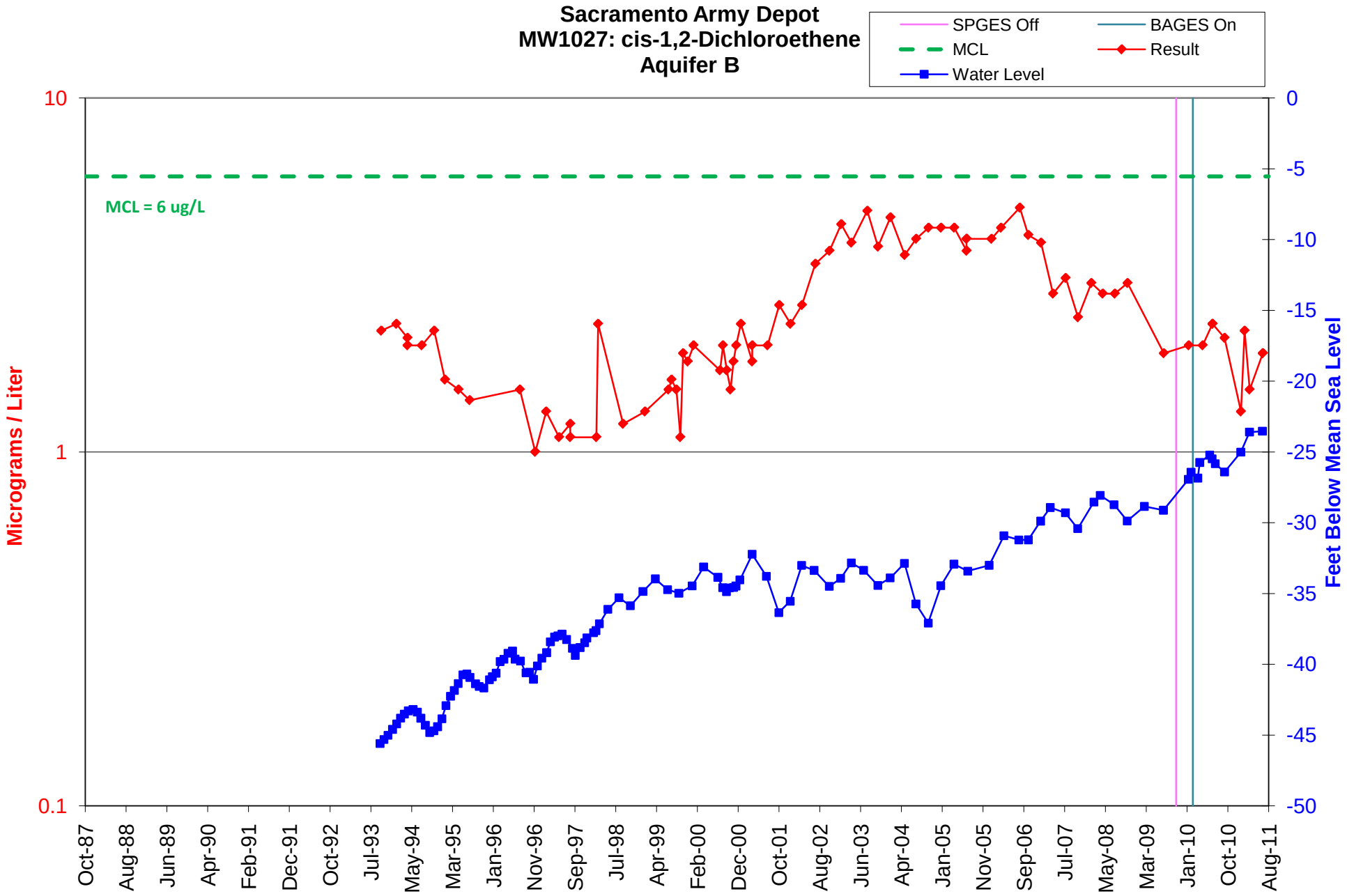
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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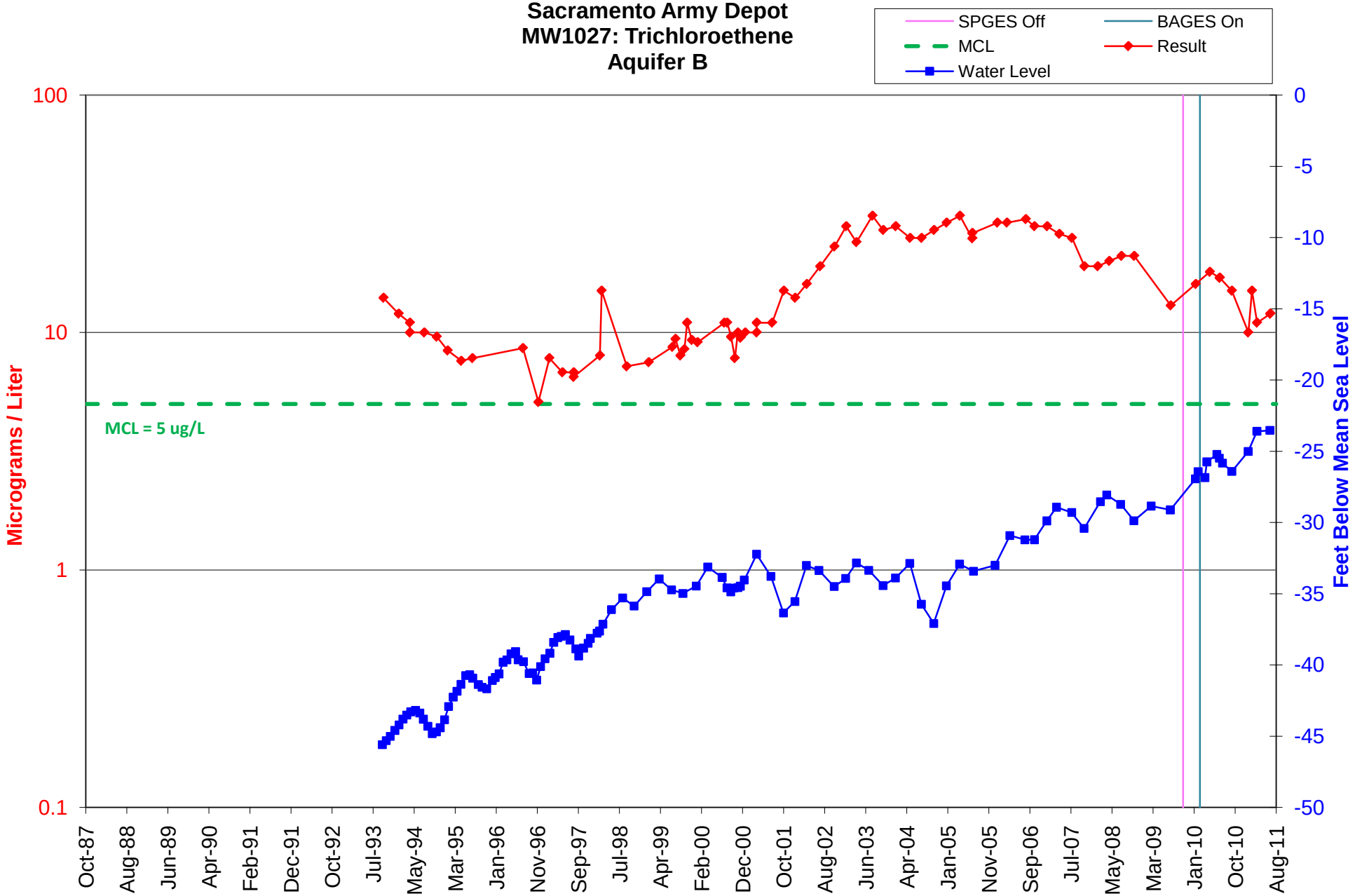
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

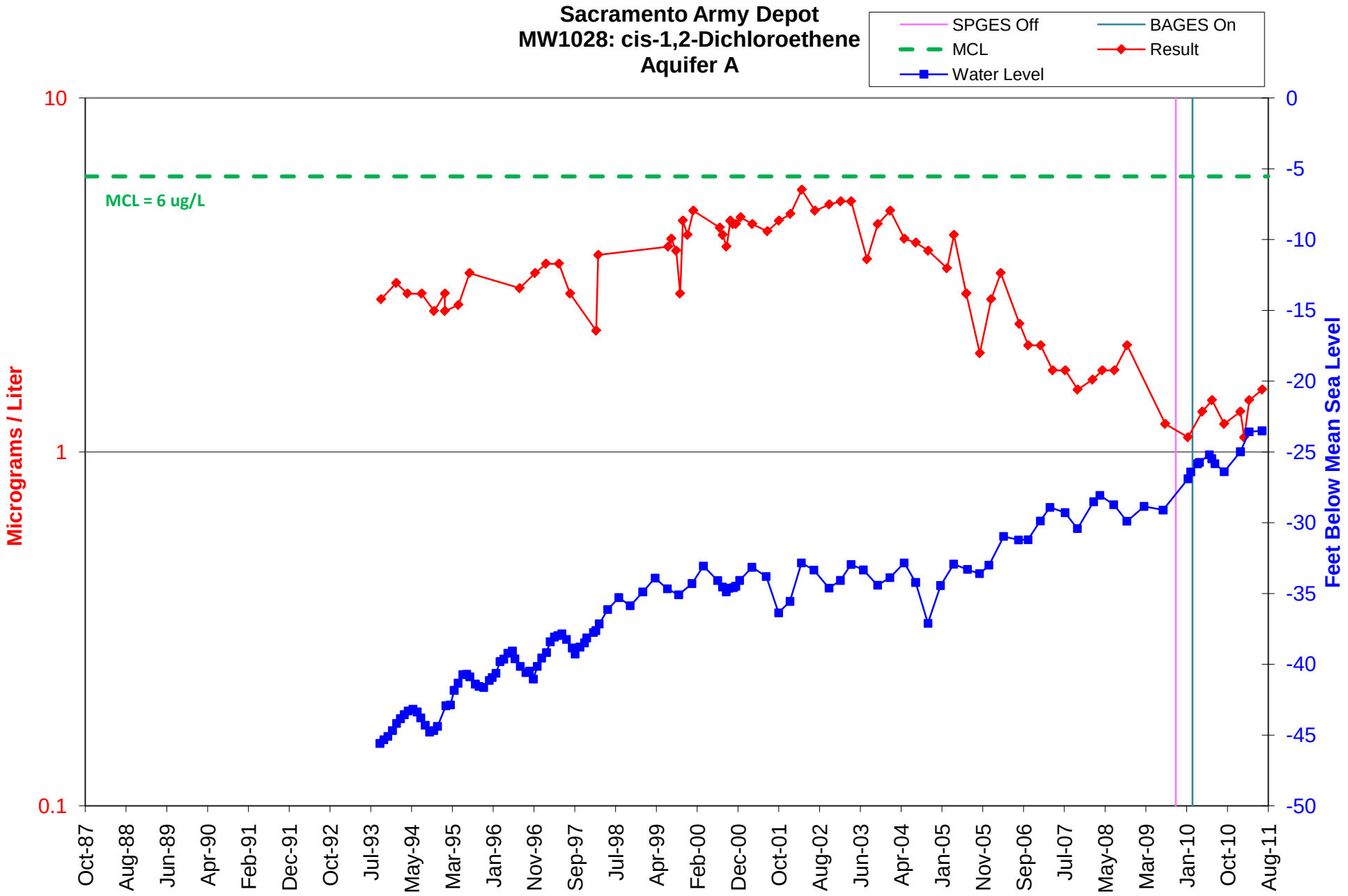
Sacramento Army Depot
MW1027: Trichloroethene
Aquifer B



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

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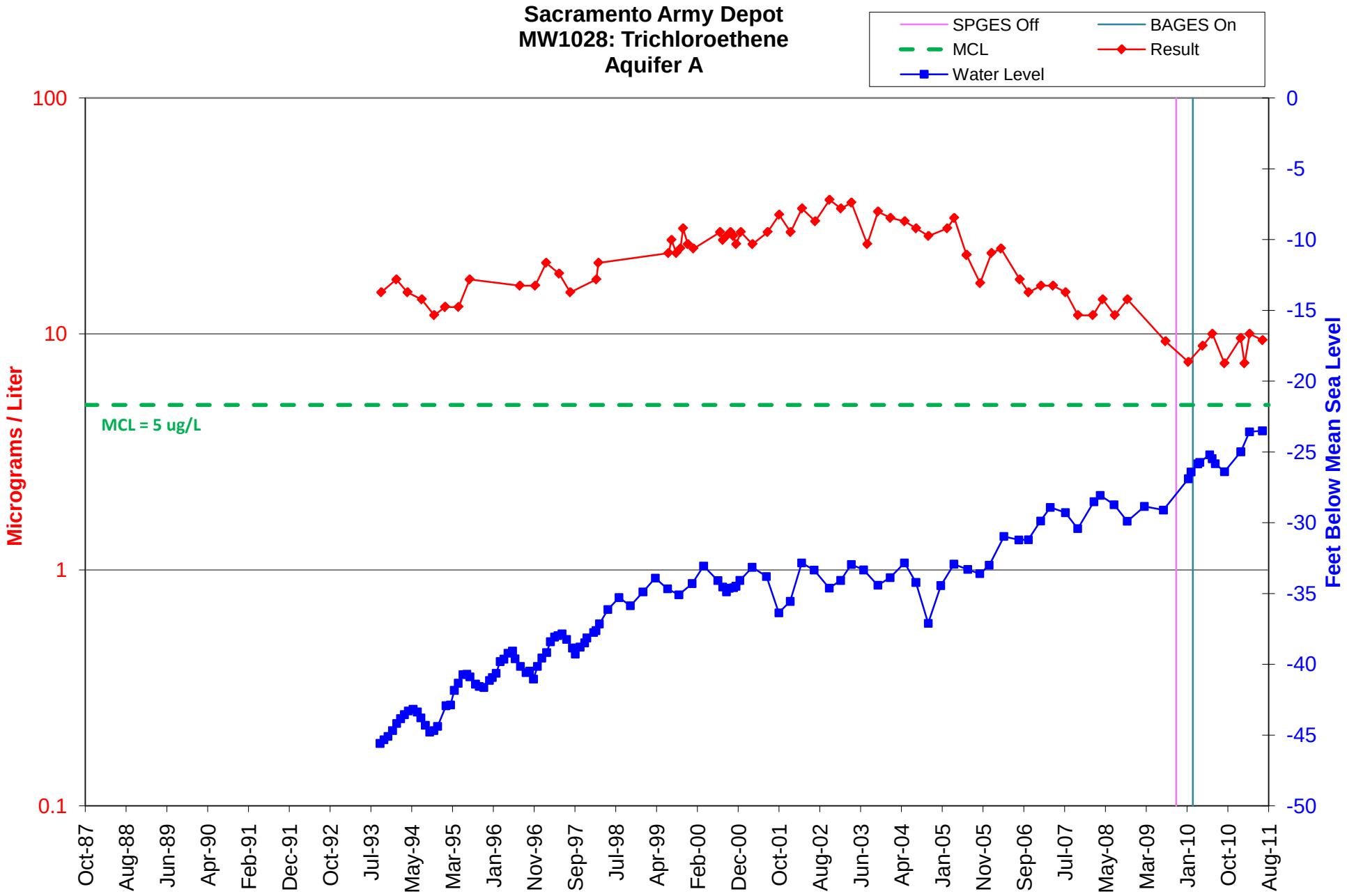
10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
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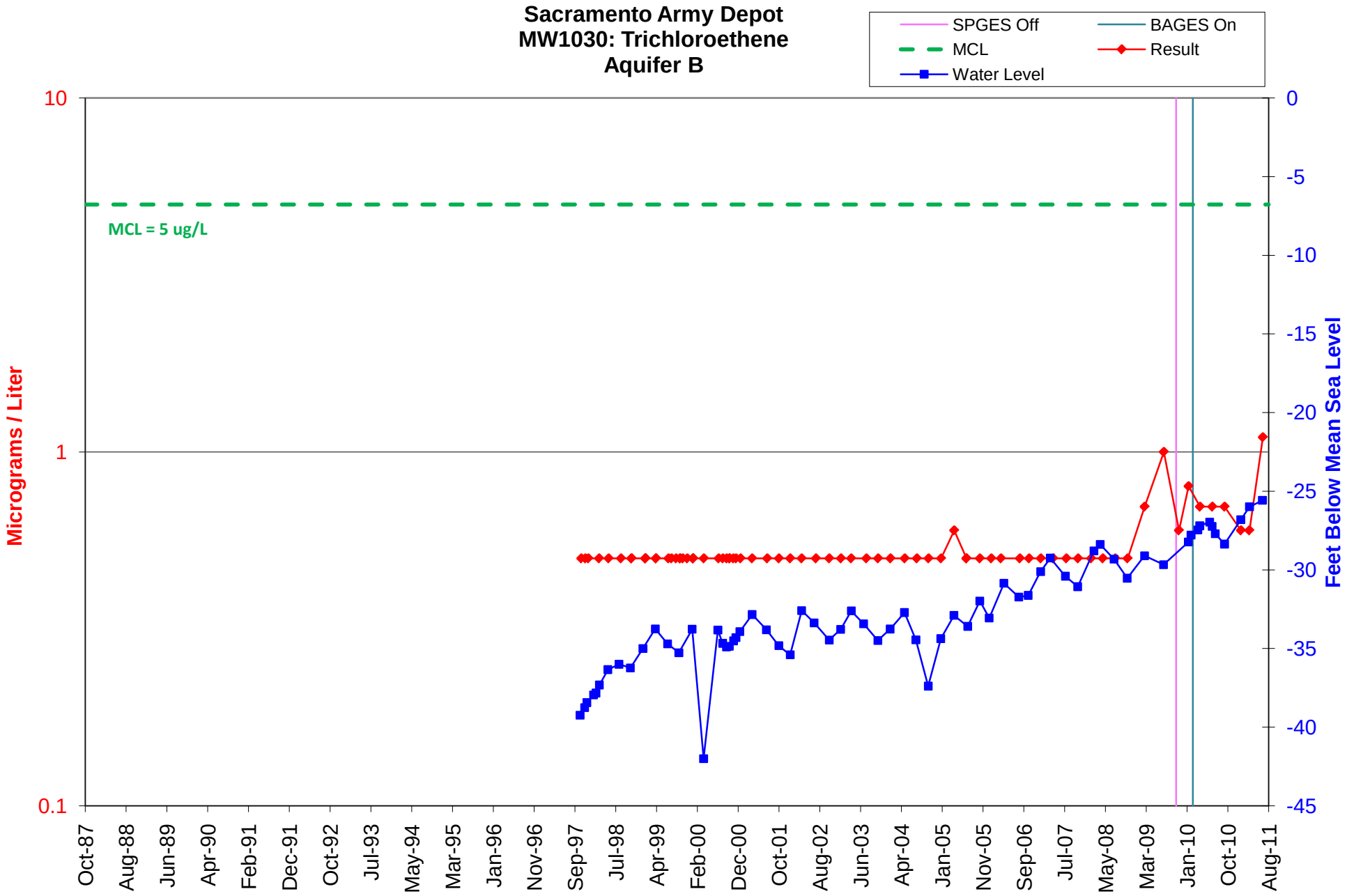
3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

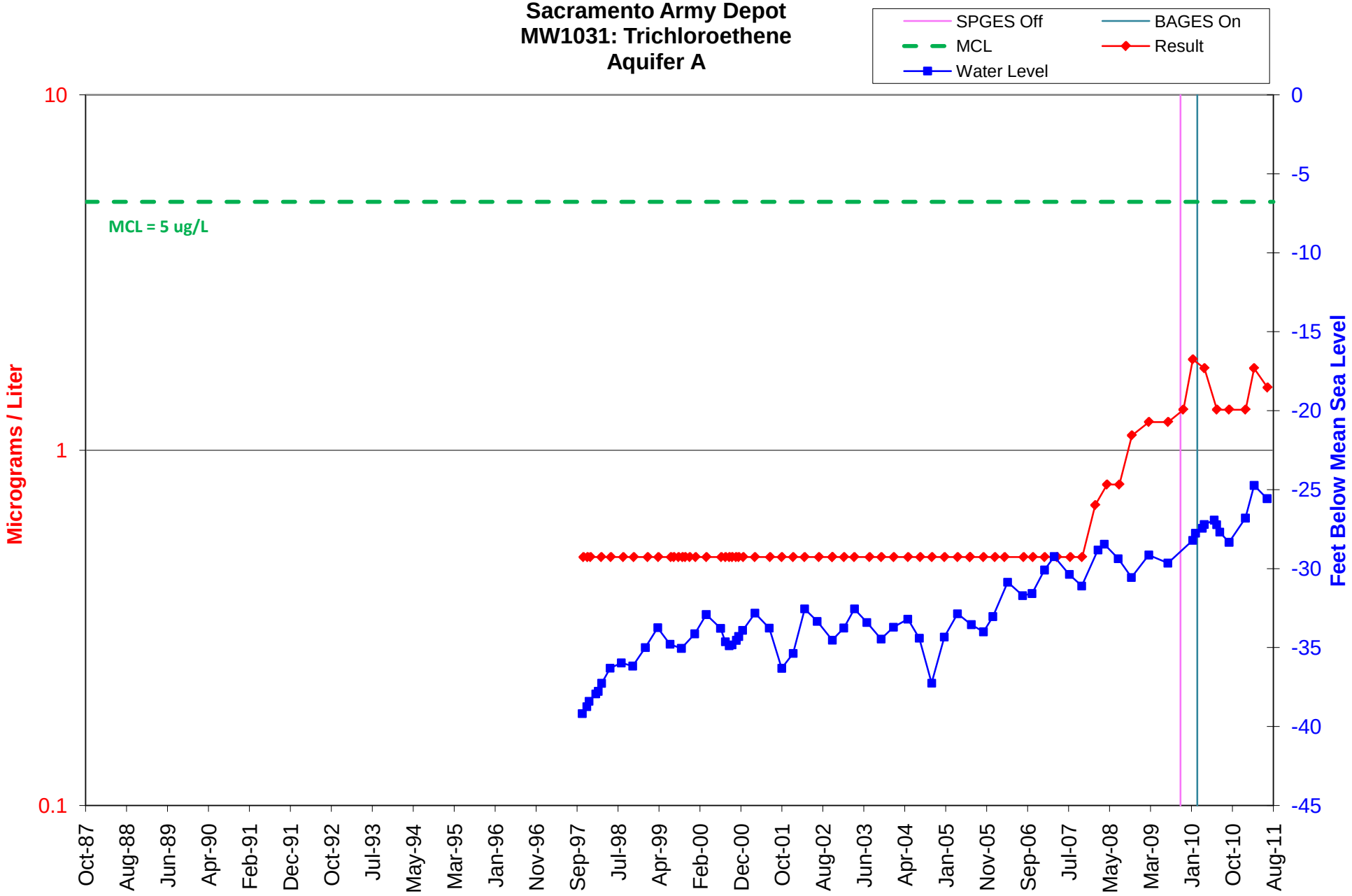


11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW1031: Trichloroethene
Aquifer A



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
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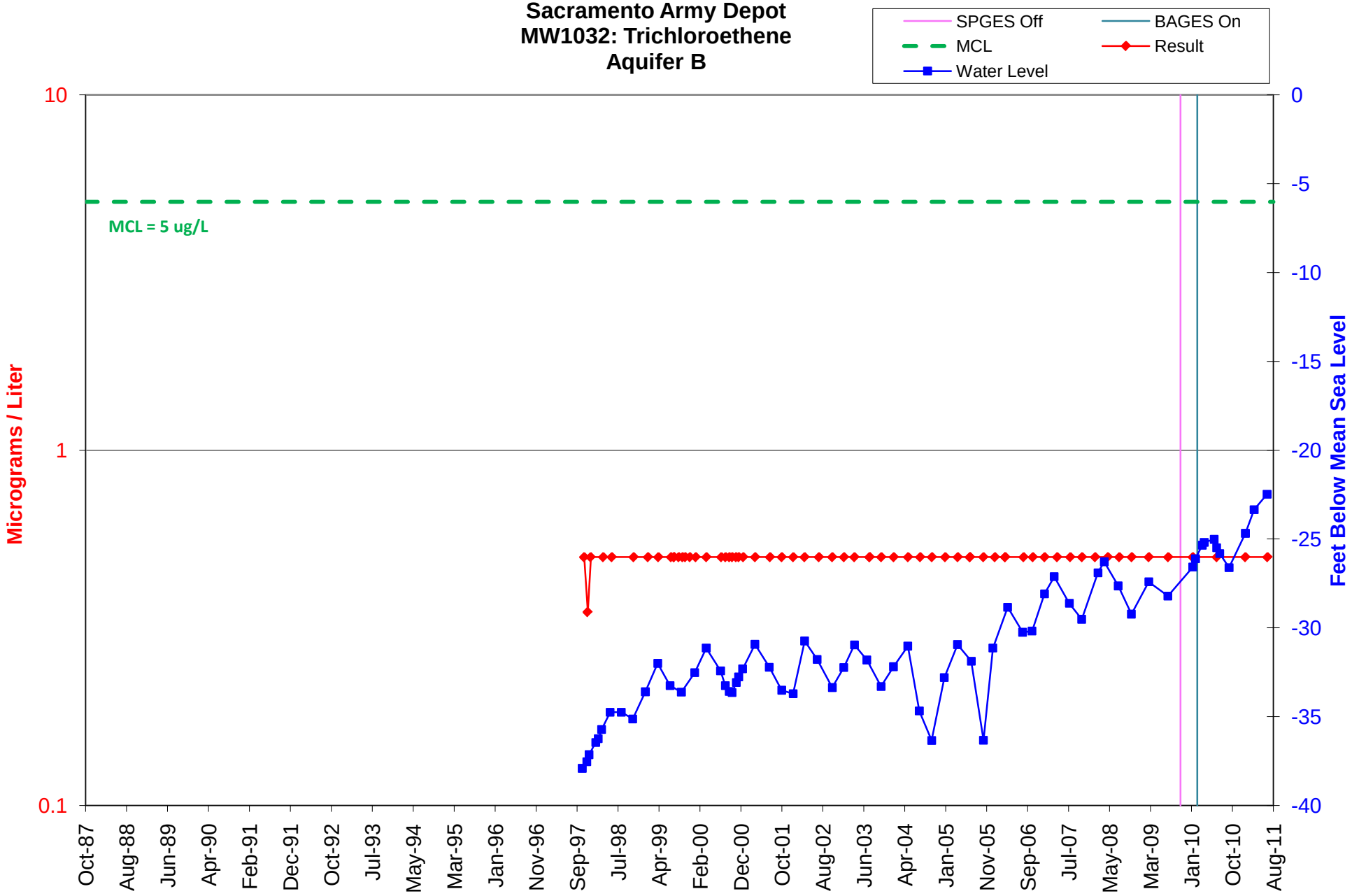
10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW1032: Trichloroethene
Aquifer B



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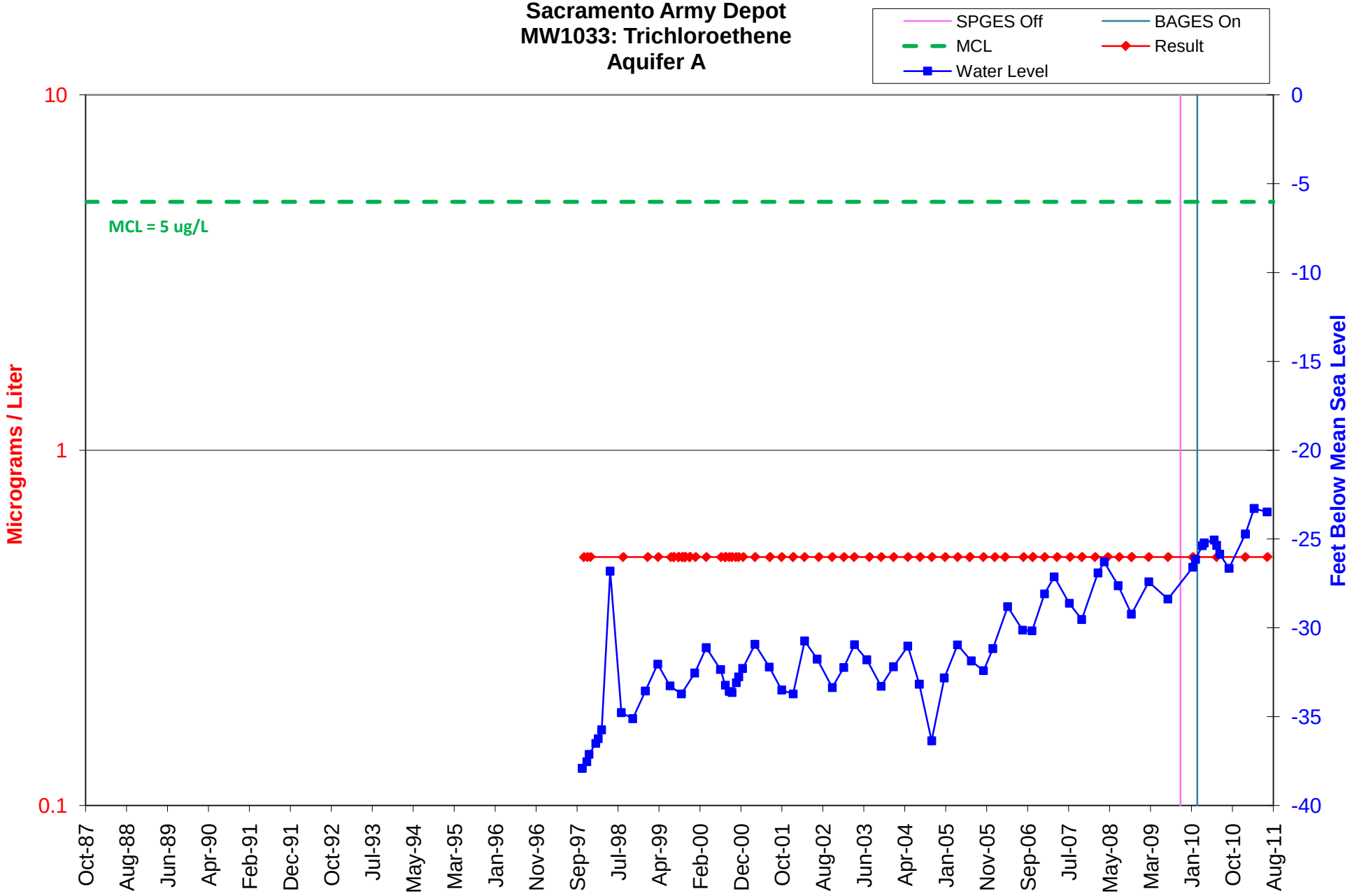
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW1033: Trichloroethene
Aquifer A



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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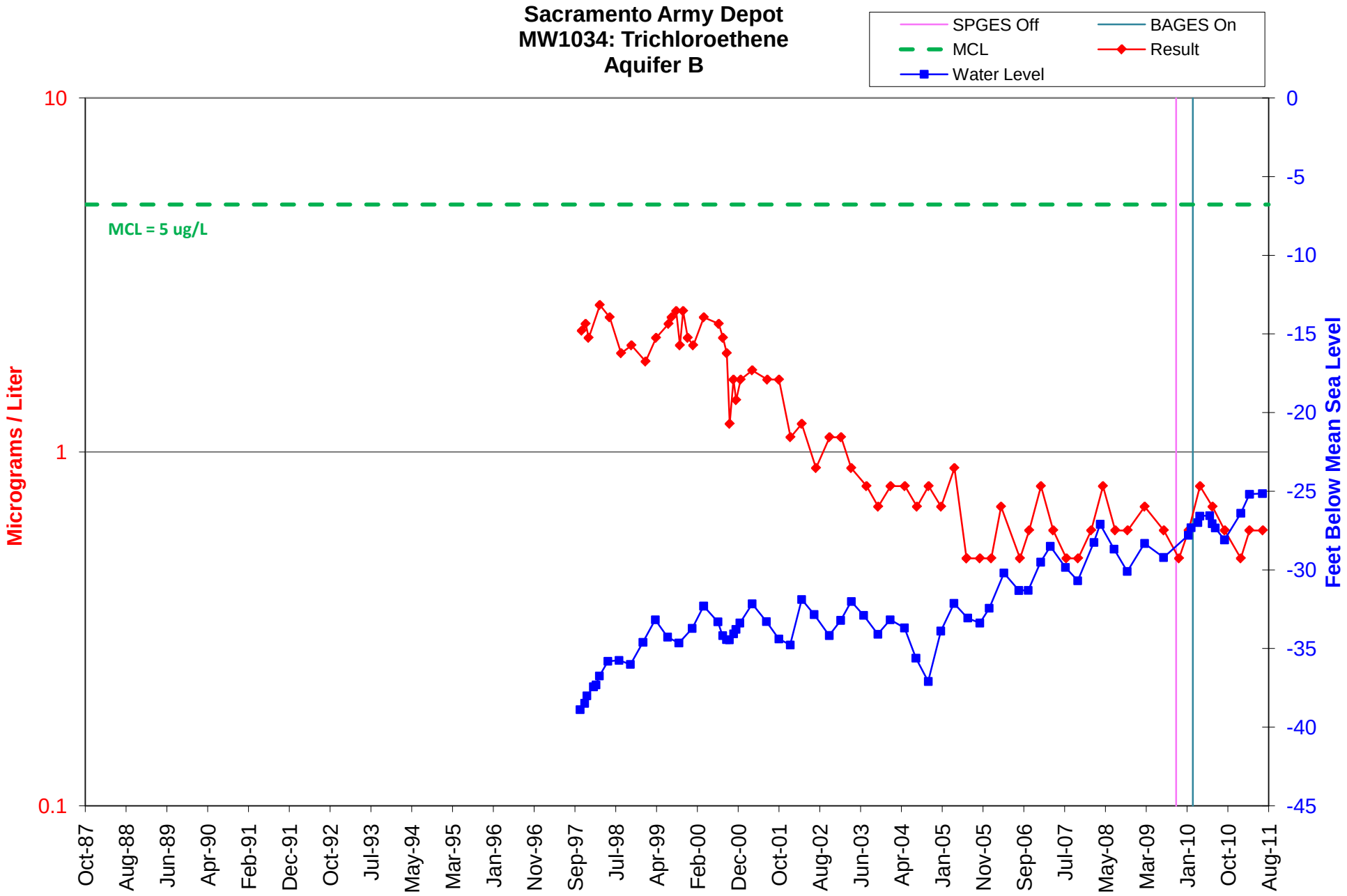
10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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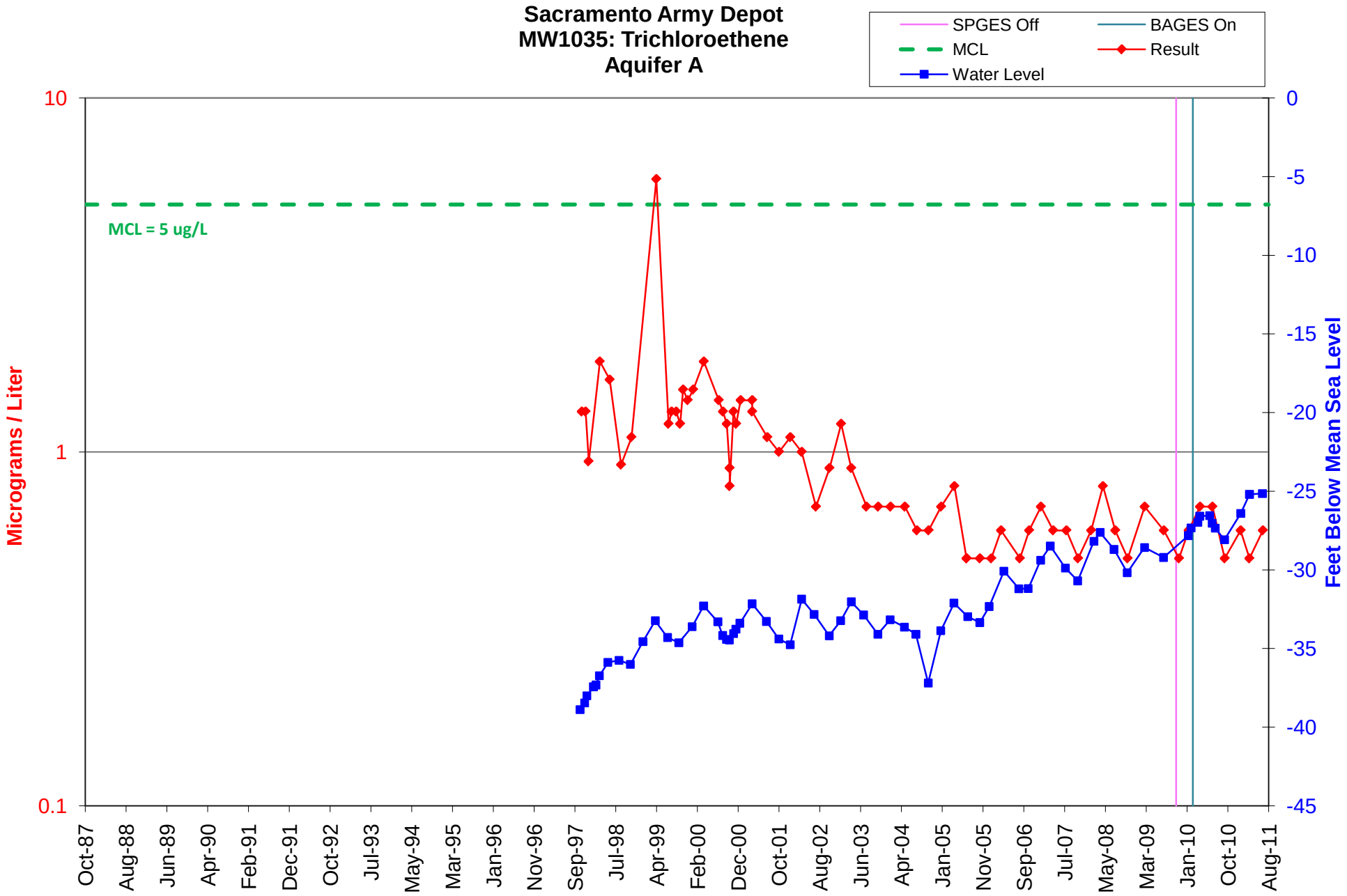
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
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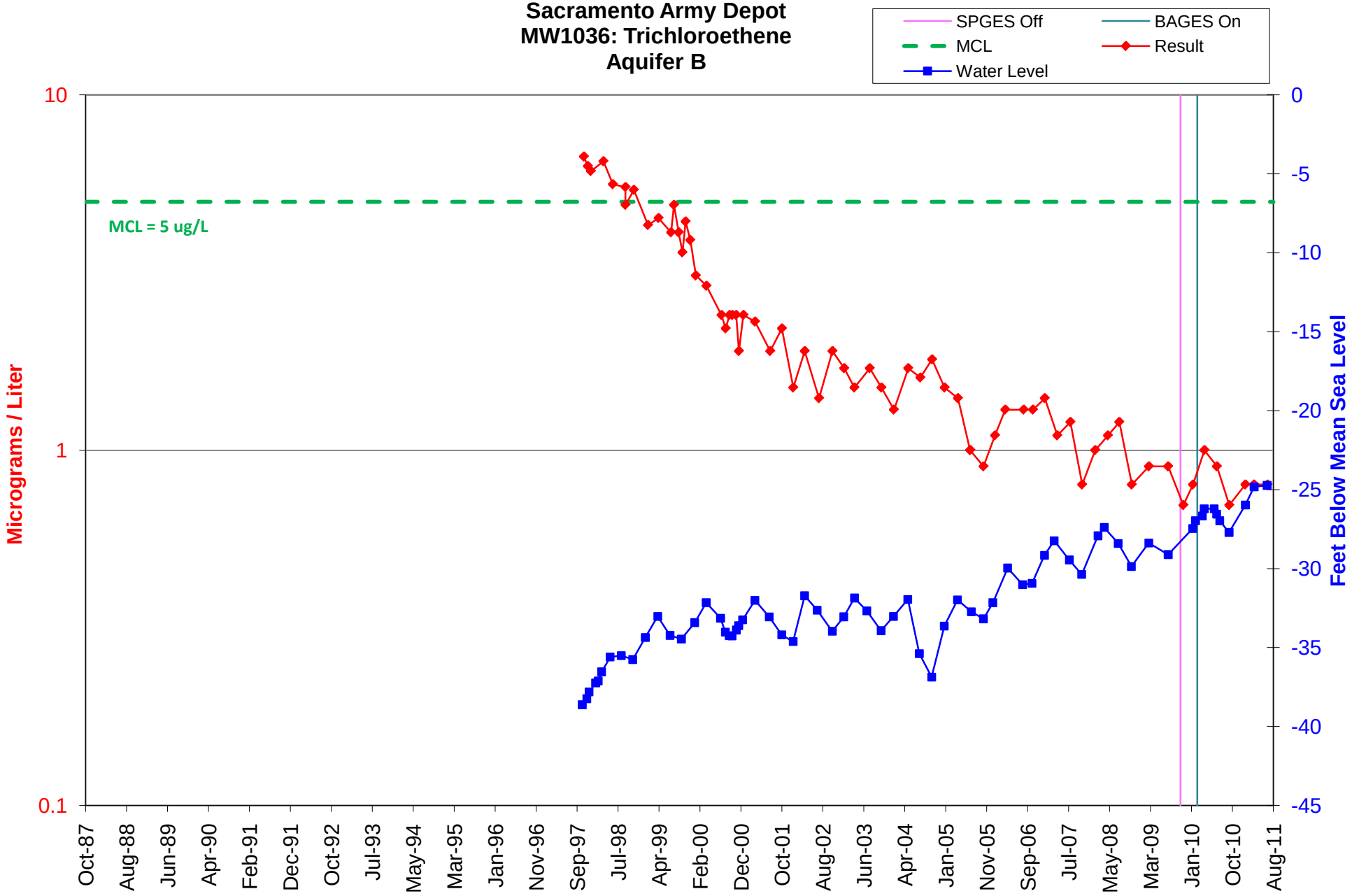
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Sacramento Army Depot
MW1036: Trichloroethene
Aquifer B



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
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1/2003 - EW11 (C Zone) Turned Off

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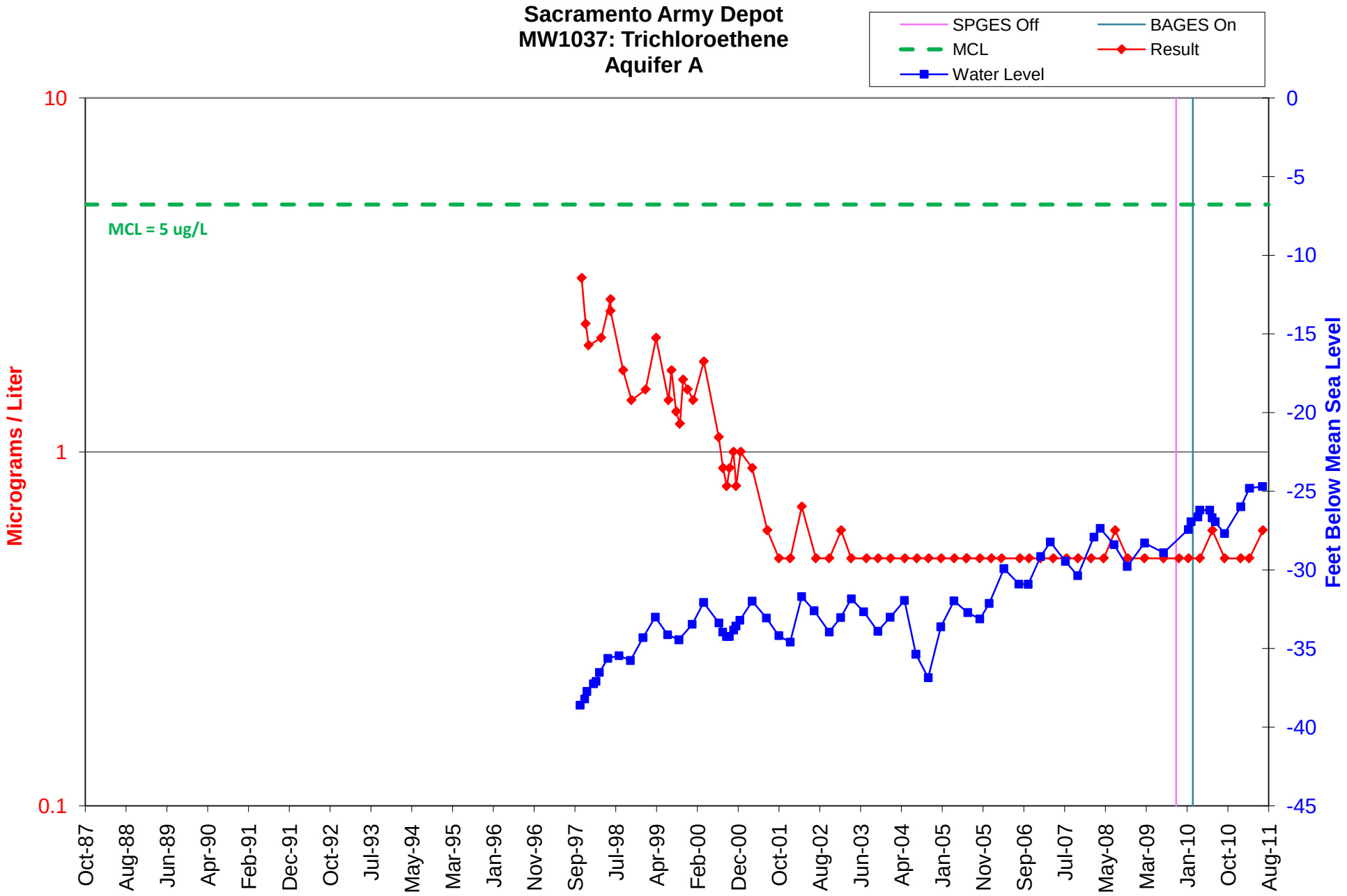
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



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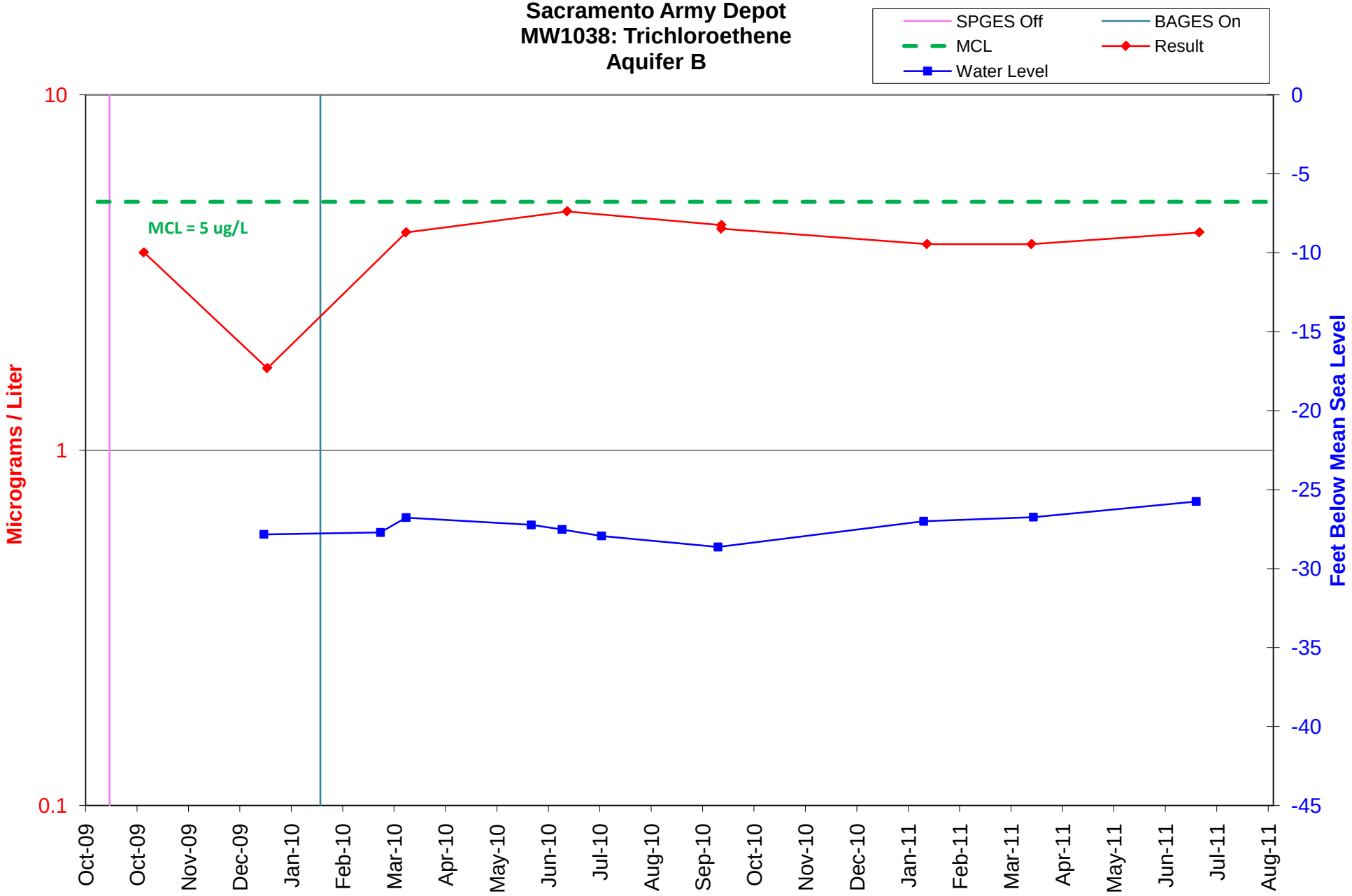
3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

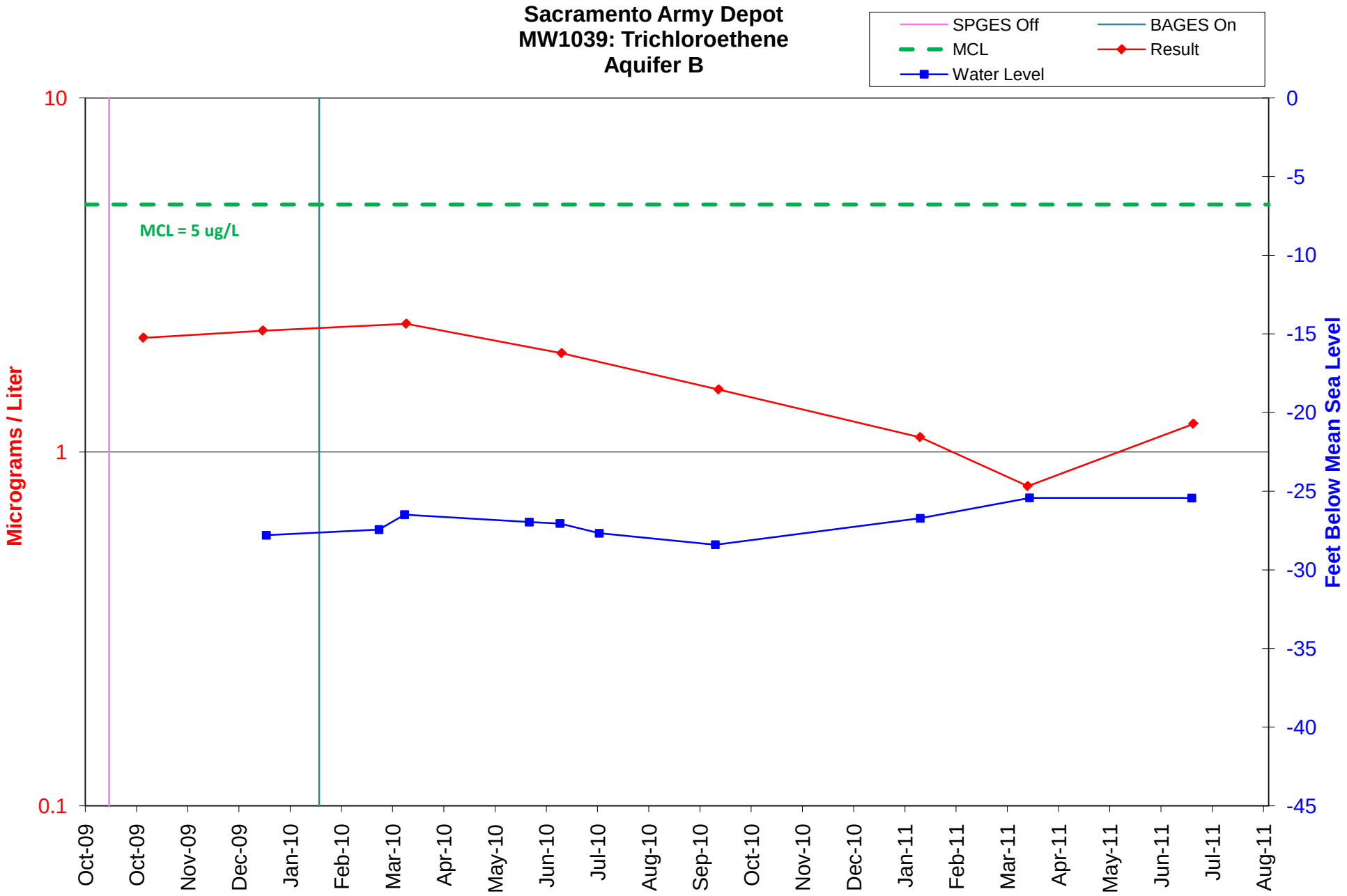
Sacramento Army Depot
MW1038: Trichloroethene
Aquifer B



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On



11/1989 - SPTP Turned On; Operating at Approx. 350 gpm
3/1996 - EW8 and EW9 (PL#3) Turned On
5/1996 - EW11 (C Zone) Turned On

3/1999 - SPTP Pumping Rate Increased to Approx. 450 gpm
6/2002 - EW8 and EW9 (PL#3) Turned Off
1/2003 - EW11 (C Zone) Turned Off

10/2009 - SPTP and PL#3 Turned Off
10/2009 - SPGES Turned Off
2/2010 - BAGES Turned On

Attachment 4
Site Inspection

Site Inspection Checklist

I. SITE INFORMATION	
Site name: former Sacramento Army Depot	**Date of inspection:** 10/24/2011
Location and Region: CA, Region 9	**EPA ID:** CA0210020780
Agency, office, or company leading the five-year review: ACSIM BRAC	**Weather/temperature:** Sunny, 60's

Remedy Includes: (Check all that apply)

- ✓ Landfill cover/containment
- ✓ Access controls
- ✓ Institutional controls
- ✓ Groundwater pump and treatment
- G Surface water collection and treatment
- G Other_____

- G Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Robert Johnson (Name) Env. Technician (Title) 10/24/2011 (Date)
   Interviewed ✓ at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached __Access issues at gate between the Navy property and SAAD and between the 2B parcel and Depot Park. Gates are being installed to control security. They Navy was asked to clear the gates between the property and did after the interview. No issues on the CAMU and all institutional controls are in place. A new bypass was installed on the treatment system so the influent water can be discharged without having to go through the treatment plant with decreased energy costs and pressure.

2. **O&M staff** _____N/A_____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

Site Inspection Checklist

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency see individual interviews
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

Site Inspection Checklist

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ✓ O&M manual — ✓ Readily available — G Up to date — G N/A
   - ✓ As-built drawings — G Readily available — ✓ Up to date — G N/A
   - ✓ Maintenance logs — G Readily available — ✓ Up to date — G N/A

   Remarks O&M documents available with updates on the PC.

2. **Site-Specific Health and Safety Plan** — ✓ Readily available — G Up to date — G N/A
   - ✓ Contingency plan/emergency response plan — ✓ Readily available — G Up to date — G N/A

   Remarks _____

3. **O&M and OSHA Training Records** — ✓ Readily available — G Up to date — G N/A

   Remarks _____

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — ✓ N/A
   - ✓ Effluent discharge — ✓ Readily available — G Up to date — G N/A
   - ✓ Waste disposal, POTW — ✓ Readily available — G Up to date — G N/A
   - G Other permits _____ — G Readily available — G Up to date — G N/A

   Remarks Documents available with updates on the PC

5. **Gas Generation Records** — G Readily available — G Up to date — ✓ N/A

   Remarks _____

6. **Settlement Monument Records** — G Readily available — G Up to date — ✓ N/A

   Remarks _____

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — ✓ N/A

   Remarks _____

8. **Leachate Extraction Records** — ✓ Readily available — G Up to date — G N/A

   Remarks Lysimeters were upgraded to better hold a vacuum and records are available.

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — ✓ N/A
   - ✓ Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks _____

10. **Daily Access/Security Logs** — G Readily available — G Up to date — ✓ N/A

    Remarks _____

Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**

G State in-house G Contractor for State
G PRP in-house ✓ Contractor for PRP
G Federal Facility in-house G Contractor for Federal Facility
G Other_____
_____

2. **O&M Cost Records**

G Readily available ✓ Up to date
✓ Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: N/A
_____
_____
_____
_____
_____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map ✓ Gates secured G N/A

Remarks_____
_____

B. Other Access Restrictions

1. **Signs and other security measures** ✓ Location shown on site map G N/A

Remarks All Institutional controls are in place and working.

Site Inspection Checklist

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes ✓ No G N/A

Site conditions imply ICs not being fully enforced G Yes ✓ No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Inspections.

Frequency Yearly

Responsible party/agency Department of the Army, BRAC Division

Contact Scott Armstrong (Name) BRAC Env. Coordinator (Title) 10/24/2011 (Date) 9169614577 (Phone no.)

Reporting is up-to-date ✓ Yes G No G N/A

Reports are verified by the lead agency ✓ Yes G No G N/A

Specific requirements in deed or decision documents have been met ✓ Yes G No G N/A

Violations have been reported G Yes G No ✓ N/A

Other problems or suggestions: G Report attached

The Depot Park Management team installed a new solar farm over open space and razed the old officer's quarters which contained lead paint and asbestos and had IC's in place. The material was appropriately sampled segregated and disposed of after demolition. One well was damaged during construction activities and will be replaced at our discretion at a later date. The damaged well was properly abandoned and the procedure was documented. New extraction wells were installed on Berry Avenue along the southern border of the FedEx property.

2. **Adequacy** ✓ ICs are adequate G ICs are inadequate G N/A

Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map ✓ No vandalism evident

Remarks However, labors inadvertently shutoff a valve on the treatment plant causing some damage to piping. The valves in question have been secured and the piping repaired.

2. **Land use changes on site** G N/A

Remarks Previous open space has been approved for use as a solar farm by the City of Sacramento and the solar panels installed.

3. **Land use changes off site** ✓ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map ✓ Roads adequate G N/A

Remarks

Site Inspection Checklist

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map ✓ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** G Location shown on site map ✓ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** G Location shown on site map ✓ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** G Location shown on site map ✓ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** ✓ Grass ✓ Cover properly established ✓ No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** ✓ N/A
   Remarks_____
   _____

7. **Bulges** G Location shown on site map ✓ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** ✓ Wet areas/water damage not evident
   G Wet areas G Location shown on site map Areal extent_____
   G Ponding G Location shown on site map Areal extent_____
   G Seeps G Location shown on site map Areal extent_____
   G Soft subgrade G Location shown on site map Areal extent_____
   Remarks_____
   _____

Site Inspection Checklist

9. **Slope Instability** G Slides G Location shown on site map ✓ No evidence of slope instability
Areal extent_____
Remarks_____
_____

B. Benches G Applicable ✓ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map ✓ N/A or okay
Remarks_____
_____

2. **Bench Breached** G Location shown on site map ✓ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** G Location shown on site map ✓ N/A or okay
Remarks_____
_____

C. Letdown Channels G Applicable ✓ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map ✓ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** G Location shown on site map ✓ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** G Location shown on site map ✓ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

Site Inspection Checklist

4. **Undercutting** G Location shown on site map ✓ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ✓ No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
✓ No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations G Applicable ✓ N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
✓ N/A
Remarks_____
_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance ✓ N/A
Remarks_____
_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance ✓ N/A
Remarks_____
_____

4. **Leachate Extraction Wells**
✓ Properly secured/locked G Functioning ✓ Routinely sampled ✓ Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____
_____

5. **Settlement Monuments** G Located G Routinely surveyed ✓ N/A
Remarks_____
_____

Site Inspection Checklist

E. Gas Collection and Treatment G Applicable ✓ N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____
   _____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____
   _____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance ✓ N/A
   Remarks_____
   _____

F. Cover Drainage Layer G Applicable ✓ N/A

1. **Outlet Pipes Inspected** G Functioning ✓ N/A
   Remarks_____
   _____

2. **Outlet Rock Inspected** G Functioning ✓ N/A
   Remarks_____
   _____

G. Detention/Sedimentation Ponds G Applicable ✓ N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____
   _____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____
   _____

3. **Outlet Works** G Functioning G N/A
   Remarks_____
   _____

4. **Dam** G Functioning G N/A
   Remarks_____
   _____

Site Inspection Checklist

H. Retaining Walls G Applicable ✓ N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____
   _____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____
   _____

I. Perimeter Ditches/Off-Site Discharge G Applicable ✓ N/A

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____
   _____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____
   _____

VIII. VERTICAL BARRIER WALLS G Applicable ✓ N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____
   _____

Site Inspection Checklist

C. Treatment System ✓ Applicable G N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   ✓ Good condition G Needs Maintenance
   ✓ Sampling ports properly marked and functional
   ✓ Sampling/maintenance log displayed and up to date
   ✓ Equipment properly identified
   ✓ Quantity of groundwater treated annually 60 GPM, ~30M Gallons annually
   G Quantity of surface water treated annually_____
   Remarks_____
   _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A ✓ Good condition G Needs Maintenance
   Remarks_____
   _____

3. **Tanks, Vaults, Storage Vessels**
   G N/A ✓ Good condition G Proper secondary containment G Needs Maintenance
   Remarks Main system is not presently in use._____
   _____

4. **Discharge Structure and Appurtenances**
   G N/A ✓ Good condition G Needs Maintenance
   Remarks_____
   _____

5. **Treatment Building(s)**
   G N/A ✓ Good condition (esp. roof and doorways) G Needs repair
   ✓ Chemicals and equipment properly stored
   Remarks_____
   _____

6. **Monitoring Wells** (pump and treatment remedy)
   ✓ Properly secured/locked G Functioning ✓ Routinely sampled ✓ Good condition
   ✓ All required wells located G Needs Maintenance G N/A
   Remarks One well destroyed by Depot Park laborers will be replaced at our discretion.

D. Monitoring Data

1. Monitoring Data
   ✓ Is routinely submitted on time ✓ Is of acceptable quality

2. Monitoring data suggests:
   ✓ Groundwater plume is effectively contained ✓ Contaminant concentrations are declining

Site Inspection Checklist

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance ✓ N/A
Remarks_____
_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy required by the ROD is for groundwater extraction, treatment, and containment of the plume. Since the last five year review a new extraction system was put in place at the southern extent of the plume along Berry Avenue and containment was re-established. Since installation of the new system all levels in the plume have continued to drop and have moved significantly toward the MCL requirements in the ROD.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The new system is up and running and the levels of TCE in the plume have significantly dropped and are presently approaching the MCL requirements in the ROD. The new system is currently protective and providing long-term protectiveness in concurrence with the ROD.

Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. TCE levels within the South Post Groundwater OU are approaching the MCL. Should TCE levels remain above the MCL then a Focused Feasibility Study will be conducted to evaluate optimization of remedial alternatives in the next year. This evaluation will include the potential for monitored natural attenuation. If monitored natural attenuation is selected, the change in remedy will be addressed in a ROD Amendment.

Attachment 5
Site Photographs

Site Photographs

Photograph 1: Berry Avenue Groundwater Extraction System (October 24, 2011)

Photograph 2: South Post Groundwater Extraction System (October 24, 2011)

Site Photographs

Photograph 3: Corrective Action Management Unit (October 24, 2011)

Attachment 6
Interview Responses

Former Sacramento Army Depot
Sacramento, California
Fourth Five-Year Review
Interview Responses
February 7-21, 2012

May 14, 2012

Plexus Scientific Corporation

4501 Ford Avenue, Suite 1200

Alexandria, VA 22302

Tel: 703-820-3339

Person Interviewed: Mr. Martin Hausladen

Title: Remedial PM

Organization/Community: EPA Region IX

1. What is your overall impression of the remedial actions as well as the on-going and long-term monitoring activities at this site?

   I've only been on the site for three and a half years, but overall they've done a very good job. They've done a lot of work and overall the groundwater remediation seems to be successful. On-going work we're doing hopefully will shorten the amount of time the remediation program takes to complete.

2. Do you feel that the progress of the project has been adequately conveyed to the public and that an effort has been made to seek their input?

   Again, most of public outreach and public involvement was done prior to me coming on-site but I do believe they've had a fairly successful outreach program. If anything, it seems people are now discussing the cost instead of arguing over the type of remediation.

3. Are you aware of any community concerns regarding this site? Please provide details.

   No—other than the overall cost and length of the project.

4. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?

   I believe the state has some concern about the efficacy of the South Berry Avenue well. Overall, I'm pleased with it.

5. Do you feel that the land use controls at this site are in place and adequately enforced?

   Yes.

6. Do you feel well-informed about the on-going and long-term monitoring activities?

   Yes.

7. Do you have any comments, suggestions, or recommendations regarding the management of this site?

   No, I believe the management team in place is good. I know the state is concerned about capture of the plume south of the former Sacramento Army Depot as it's being configured by the Berry Avenue well. There are still some lingering questions about whether the eastern side of the plume is being captured.

Closing comment: Mr. Hausladen asked if a city manager or mayor was among those being interviewed for this five-year review. Interviewer acknowledged that is the plan. "That makes me even happier then," he said, knowing his suggestion to talk to a public figure was being taken.

Interviewer (Name/Organization): Adriane Miller/Plexus Scientific Corp.

Date/Time of Interview: Feb. 8, 2012, 11:00 a.m. EST

Method of Interview (Telephone/Visit/Other): Telephone

Person Interviewed: Ms. Theresa McGarry

Title: Remedial Project Manager

Organization/Community: Department of Toxic Substances Control

1. What is your overall impression of the remedial actions as well as the on-going and long-term monitoring activities at this site?

   Good progress—remedial actions protective / soil vapor extraction, ground water remedial systems generally well-designed and implemented.

2. Do you feel that the progress of the project has been adequately conveyed to the public and that an effort has been made to seek their input?

   Historically, most likely—since being PM, very few public meetings. Army expects to have a public meeting for five-year [review] so we will see how interested public is.

3. Are you aware of any community concerns regarding this site? Please provide details.

   Dick Walker [is] concerned about remediation efforts related to pumping are too costly.

4. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?

   If pumping ceases or is reduced at the BAGES [Berry Avenue Groundwater Extraction System], Army will need to verify COCs [contaminants of concern] are not migrating off-site to southeast into A or B zone.

5. Do you feel that the land use controls at this site are in place and adequately enforced?

   Yes.

6. Do you feel well-informed about the on-going and long-term monitoring activities?

   Yes.

7. Do you have any comments, suggestions, or recommendations regarding the management of this site?

   Cost/benefit of pumping at BAGES is not clear. Army-related COCs in off-site and on-site groundwater are at a low enough concentration and appropriate distribution to qualify for change of remedy to a passive approach, potentially MNA [monitored natural attenuation] with contingency pumping. Army may want to evaluate this option or others at this time.

Interviewer (Name/Organization): Adriane Miller/Plexus Scientific Corp.

Date/Time of Interview: Feb. 15, 2012, 5:00 p.m. EST

Method of Interview (Telephone/Visit/Other): Email response

Person Interviewed: Ms. Conny Mitterhofer

Title: Senior Water Resource Control Engineer

Organization/Community: State Water Resources Control Board

(Ms. Mitterhofer was the Remedial Project Manager for Sacramento Army Depot in the Site Clean-up Program at the Central Valley Regional Water Quality Control Board 03/2008-01/2012)

1. What is your overall impression of the remedial actions as well as the on-going and long-term monitoring activities at this site?

   Definitely making progress. Groundwater extraction system may not be the best method to address remaining low-level VOC concentrations. Due to the facility's operations and practices, the Army may need to evaluate hexavalent chromium in groundwater once an MCL has been established. A PHG of 0.02 ug/L was issued by OEHHA last year (July 2011).

2 Do you feel that the progress of the project has been adequately conveyed to the public and that an effort has been made to seek their input?

   No—public meetings in last 4 years were not advertised as required. Additionally, there has been no RAB/Annual Meeting since the spring of 2010.

3. Are you aware of any community concerns regarding this site? Please provide details.

   Yes—Dick Walker, the RAB co-chair, raised concerns in the spring 2010. A fact sheet was drafted to respond to his concerns but has not been sent (to my knowledge).

4. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?

   Some issues with lysimeter monitoring—obtaining adequate moisture. Also need to address outstanding lateral capture issues/questions.

5. Do you feel that the land use controls at this site are in place and adequately enforced?

   Yes.

6. Do you feel well-informed about the on-going and long-term monitoring activities?

   Yes.

7. Do you have any comments, suggestions, or recommendations regarding the management of this site?

   Evaluate alternative remediation or work with agencies to evaluate low threat closure/monitoring only, with SLUC in place until clean-up levels are reached.

Interviewer (Name/Organization): Adriane Miller/Plexus Scientific Corp.

Date/Time of Interview: Feb. 13, 2012, 4:30 p.m. EST

Method of Interview (Telephone/Visit/Other): Email response

Person Interviewed: Ms. Melissa Anguiano

Title: Economic Development Manager

Organization/Community: City of Sacramento

1. What is your overall impression of the remedial actions as well as the on-going and long-term monitoring activities at this site?

   I wasn't involved in the initial phase of the project—I took over this position in 2006—but since then it seems it's been pretty a streamlined and efficient course of remedial action. The City was conveyed property through the process on time as anticipated.

2. Do you feel that the progress of the project has been adequately conveyed to the public and that an effort has been made to seek their input?

   Yes.

3. Are you aware of any community concerns regarding this site? Please provide details.

   I am not aware of any, nor have any concerns been reported to our department or the City.

4. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?

   I'm not aware of any problems or concerns.

5. Do you feel that the land use controls at this site are in place and adequately enforced?

   Yes.

6. Do you feel well-informed about the on-going and long-term monitoring activities?

   Yes. We've discussed an approach with Scott Armstrong, the BRAC coordinator, of establishing a better communication system for on-going and long-term monitoring activities.

7. Do you have any comments, suggestions, or recommendations regarding the management of this site?

   Aside from that (comment in #6), no. I think there are only some portions of the site that are deed-restricted because of contamination. But in the last year and a half we have looked at an alternate use of the site, besides putting a cap on and leaving it, that has met everyone's needs in a sustainable way. Through more dialog and consistent communication we'll be able to address the long-term and on-going activities.

Interviewer (Name/Organization): Adriane Miller/Plexus Scientific Corp.

Date/Time of Interview: Feb. 21, 2012, 1:00 p.m. EST

Method of Interview (Telephone/Visit/Other): Telephone

Person Interviewed: Mr. Scott Armstrong

Title: BRAC Environmental Coordinator (BEC)

Organization/Community: Calibre

1. What is your overall impression of the remedial actions as well as the on-going and long-term monitoring activities at this site?

   We are meeting all of our goals and we've made significant progress in the last year, almost achieving the regulated mandate for drinking water standards.

2. Do you feel that the progress of the project has been adequately conveyed to the public and that an effort has been made to seek their input?

   Yes, it's been going on for 20 some years and there really is no public interest. We're meeting all our mandates, and considering the project is almost completely done, we are getting no response from the RAB. We've done multiple rounds of meeting with the public and never get any response.

3. Are you aware of any community concerns regarding this site? Please provide details.

   There are none.

4. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?

   No we've actually made a lot of progress since our last five-year review. The project was supposed to be done a long time ago, but it's not unusual for these programs to go on a long time.

5. Do you feel that the land use controls at this site are in place and adequately enforced?

   Yes, all required enforcement techniques are being administered and implemented.

6. Do you feel well-informed about the on-going and long-term monitoring activities?

   Yes.

7. Do you have any comments, suggestions, or recommendations regarding the management of this site?

   My only comment would be there's been a lot of turnover on the regulator side in the last five years and it's caused an information lag trying to get everybody on the same page at the same time. But that's common. The only disadvantage we're seeing is every time a new person comes on we end up [going over] old situations that have already been decided and we've already moved beyond. Unfortunately, that will cause a little problem in the next few years. We're hoping we'll meet our timelines in next couple of years. It might be a more difficult process because some people won't know the history of the site. Since the last five-year review we've been moving forward but every time someone new comes in we have to address new questions we've already addressed previously. We are moving to a definite end-game where closure will involve understanding of historical work and it could be an issue.

   We've made some good progress over the last two years especially towards meeting requirements put forth in the ROD. I don't think anyone thought they'd come down this fast. I think everyone should be excited about seeing that. I would like [others] to see the realization of where we are. I think everyone is on the same page, we're trying to keep everyone up to speed, and all parties are working together well. We hope that everyone

agrees the site is moving close to closure, but we worry about the site being closed in an efficient manner.

Closing comment: Mr. Armstrong expressed some concern about reaching the RAB co-chair, Dick Walker, who has not responded to multiple voice mail messages left recently to his home phone. His comments would be instructive for this five-year review. “Last time we spoke, last spring or summer, he was supportive of adjourning the RAB,” Mr. Armstrong said. “Because of the good relationship we have, we discussed doing the RAB adjournment coincidental with the five-year review.” Mr. Armstrong said he would continue to try to reach Mr. Walker, and in the meanwhile, consider others to include in interviews for a public perspective on the SAAD project.

Interviewer (Name/Organization): Adriane Miller/Plexus Scientific Corp.

Date/Time of Interview: Feb. 10, 2012, 12:00 p.m. EST

Method of Interview (Telephone/Visit/Other): Telephone

Person Interviewed: Mr. Paul Giller

Title: Project Manager

Organization/Community: Plexus Scientific Corp.

1. What is your overall impression of the remedial actions as well as the on-going and long-term monitoring activities at this site?

   The remedial actions are working as designed. They have been optimized and are working well. I think the on-going and long-term monitoring are sufficient.

2. Do you feel that the progress of the project has been adequately conveyed to the public and that an effort has been made to seek their input?

   Yes I do. We hold yearly RAB/restoration advisory board meetings. We generated a fact sheet in 2011 and will disseminate it in 2012.

3. Are you aware of any community concerns regarding this site? Please provide details.

   No.

4. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?

   No.

5. Do you feel that the land use controls at this site are in place and adequately enforced?

   Yes, the land use controls are in place and have been registered in appropriate government locations and are definitely enforced.

6. Do you feel well-informed about the on-going and long-term monitoring activities?

   Certainly, as the PM (project manager) I have a detailed knowledge of the current monitoring activities.

7. Do you have any comments, suggestions, or recommendations regarding the management of this site?

   I think the site is well managed. I think all the stakeholders work well as a team. And I would like to see that continued as we go to eventual closure.

Interviewer (Name/Organization): Adriane Miller/Plexus Scientific Corp.

Date/Time of Interview: Feb. 7, 2012, 11:00 a.m. EST

Method of Interview (Telephone/Visit/Other): Telephone

Person Interviewed: Mr. Robert Chambers

Title: Site Technician (overseer/operations and maintenance)

Organization/Community: Johnson Controls

1. What is your overall impression of the remedial actions as well as the on-going and long-term monitoring activities at this site?

   I've been involved since the late '80s and they've have used a lot of technologies like air sparging and vapor extraction, a groundwater treatment system, and I'm very impressed with some of them. At the time they were state of the art. Of course the Army wants to do things right the first time.

2. Do you feel that the progress of the project has been adequately conveyed to the public and that an effort has been made to seek their input?

   Absolutely.

3. Are you aware of any community concerns regarding this site? Please provide details.

   No. I think the community is hoping finalization happens quickly.

4. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?

   No.

5. Do you feel that the land use controls at this site are in place and adequately enforced?

   Yes.

6. Do you feel well-informed about the on-going and long-term monitoring activities?

   Yes. Absolutely.

7. Do you have any comments, suggestions, or recommendations regarding the management of this site?

   No, I'm pretty happy with Plexus and the Army. Of course Calibre is more of the Army's eyes and ears, but I'm cognizant of and happy with everything.

Interviewer (Name/Organization):_Adriane Miller/Plexus Scientific Corp.

Date/Time of Interview: Feb. 8, 2012, 11:20 a.m. EST

Method of Interview (Telephone/Visit/Other): Telephone

Person Interviewed: Richard A. "Dick" Walker (Ret. Lt. USN)

Title: RAB Co-Chair

Organization/Community: RAB

1. What is your overall impression of the remedial actions as well as the on-going and long-term monitoring activities at this site?

   Too long for the long-term monitoring. Could have done it sooner. Don't think problem was that severe.

2. Do you feel that the progress of the project has been adequately conveyed to the public and that an effort has been made to seek their input?

   The public has no idea what is going on. Restoration Advisory Board knows but the public knows nothing about it.

3. Are you aware of any community concerns regarding this site? Please provide details.

   The community has no idea or awareness of it.

4. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?

   Waste of time and money as no one knows what's going on. I couldn't say.

5. Do you feel that the land-use controls at this site are in place and adequately enforced?

   I have no idea what the land use controls are so I can't comment.

6. Do you feel well informed about the on-going and long-term monitoring activities?

   Land use—don't know. Monitoring activities—very busy about that. I am kept informed as a RAB member, but community is not aware.

7. Do you have any comments, suggestions, or recommendations regarding the management of this site?

   Management efforts are appreciated but restrictions were too sever [*sic*]. Didn't need that parts per billion. Too strict (determined by different agency.) Unrealistic restrictions but restoration did a good job.

Interviewer (Name/Organization): Georgette Mariano (Mr. Walker's niece)

Date/Time of Interview: March 20, 2012

Method of Interview (Telephone/Visit/Other): Telephone; provided by email to Plexus Scientific Corp. March 23, 2012

Attachment 7
Applicable or Relevant and Appropriate Requirements Evaluation

ATTACHMENT 7 – ARAR EVALUATION

ARAR	DESCRIPTION	COMPLIANCE	EVALUATION
South Post Groundwater - General			
40 CFR 403 (Applicable)	General pre-treatment regulations for existing and new sources of water pollution.	Groundwater pre-treatment at the South Post Groundwater Treatment Plant has been discontinued.	This is not applicable at the current time because the pre-treatment step has been eliminated.
South Post Groundwater – Resource Conservation and Recovery Act (RCRA) Tanks			
22 CCR 66264.195 (Applicable)	Tank inspection schedule and procedures are outlined.	The former South Post Groundwater Treatment Plant used hydrogen peroxide (H_2O_2), a hazardous material because it is a strong oxidant. The groundwater treatment plant is no longer in operation.	Extracted groundwater is currently discharged directly to the sanitary sewer and the groundwater treatment plant is not in operation. Therefore, this ARAR is not currently applicable.
22 CCR 66264.196 (Applicable)	Emergency Response	This regulation is applicable to the H_2O_2 tank at the South Post Groundwater Treatment Plant.	Extracted groundwater is currently discharged directly to the sanitary sewer and the groundwater treatment plant is not in operation. H_2O_2 is not currently stored on site. Therefore, this ARAR is not currently applicable.
22 CCR 66264.197 (Applicable)	Closure and post-closure care requirements for tanks.	This regulation is applicable to the H_2O_2 tank at the South Post Groundwater Treatment Plant.	This ARAR is still applicable. No decision has been reached to remove the groundwater treatment plant from the site.
South Post Groundwater - National Primary Drinking Water Regulations			
40 CFR Part 141.61 (Relevant and Appropriate)	Maximum levels for constituents in drinking water supplied to the public (Federal). Establishes a Maximum Contaminant Level (MCL) of 0.005 mg/L for tetrachloroethene (PCE) and trichloroethene (TCE) in water served to people.	The MCLs for constituents in drinking water are relevant and appropriate for evaluating final remediation goals for remediation of groundwater. This sub-alternative will comply with this ARAR by restoring the aquifer over time to the Final Remediation Goals (FRGs), which are set not to exceed the MCLs. Federal MCLs are relevant and appropriate for PCE and TCE.	This ARAR is still relevant and appropriate.

ATTACHMENT 7 – ARAR EVALUATION

ARAR	DESCRIPTION	COMPLIANCE	EVALUATION
South Post Groundwater - State Primary Drinking Water Regulations			
22 CCR 64444.5 (Relevant and Appropriate)	Maximum levels for constituents in drinking water supplied to the public.	The MCLs for constituents in drinking water are relevant and appropriate for evaluating FRGs for remediation of groundwater. This sub-alternative will comply with this ARAR by restoring the aquifer over time to the FRGs, which are set not to exceed the MCLs. State MCLs are relevant and appropriate for 1,2-dichloroethane (1,2-DCA), carbon tetrachloride (CCl_4), and trans-1,2-dichloroethene (tDCE).	This ARAR is still applicable.
South Post Groundwater - Groundwater Monitoring Requirements			
22 CCR 66264.97 (b) and (e) (Applicable)	RCRA groundwater monitoring requirements.	The Army installed sufficient monitoring points to fully evaluate the effectiveness of the remedial action and complied with the general monitoring requirements in this section.	This ARAR is still applicable.
Water Quality Control Plan (Basin Plan) for the RWQC, CVR Chapter 2 Beneficial Uses: Municipal and Domestic, Agricultural, and Industrial Supply Chapter 3 Water Quality Objectives: Chemical Constituents (Applicable)	Specific applicable portions of the Basin Plan include beneficial uses of affected water bodies and water quality objectives to protect those uses. Any activity (e.g., a new discharge of contaminated soil, in-situ treatment of contaminated soil) that may affect water quality must not result in water quality exceeding water quality objectives.	The groundwater clean-up standards are set at the most stringent water quality objectives, which protect groundwater for beneficial use as drinking water.	This ARAR is still applicable.

ATTACHMENT 7 – ARAR EVALUATION

ARAR	DESCRIPTION	COMPLIANCE	EVALUATION
State Water Resources Control Board Resolution No. 88-63 ("Sources of Drinking Water Policy" as contained in the RWQCB's Water Quality Control Plan) (Applicable)	Determines beneficial uses for waters that may be affected by discharges of waste.	Specifies that, with certain exceptions, all ground water and surface waters have the beneficial use as a municipal or domestic water supply.	This ARAR is still applicable.
State Water Resources Control Board Resolution No. 92-49 Section IIG (as amended April 21, 1994) (Applicable)	Applies to all clean-ups for discharges that may affect water quality. Establishes requirements for investigation, clean-up and abatement of discharges. Among other requirements, discharger must clean-up and abate the effects of discharges in a manner that promotes the attainment of either background water quality, or the best water quality that is reasonable if background water quality cannot be restored.	The Army demonstrated in the Feasibility Study (FS) that it would be economically infeasible to achieve background levels (i.e., non-detect for volatile organic compounds [VOCs]) in groundwater. It appears that the groundwater clean-up standards listed in the Basewide ROD for investigation and clean-up are the lowest levels that are technologically and economically achievable. These standards are set at the Federal or more stringent State MCLs, and will protect the groundwater for its beneficial use as drinking water.	This ARAR is still applicable.

ATTACHMENT 7 – ARAR EVALUATION

ARAR	DESCRIPTION	COMPLIANCE	EVALUATION
Title 23, CCR Section 2550.4 (Applicable)	Clean-up levels must be set as background concentration levels, or if background levels are not technologically and economically feasible, then at the lowest levels that are economically and technologically achievable. Specific factors must be considered in setting clean-up levels above background levels.	The Army demonstrated in the FS that it would be infeasible to achieve background levels. It appears that the groundwater clean-up standards listed in Basewide ROD are the lowest levels that are technologically and economically feasible. These standards are set at the Federal or more stringent State MCLs, and will protect the groundwater for its beneficial use as drinking water.	This ARAR is still applicable.
Parking Lot 3 Groundwater - General Pre-treatment Regulations			
40 CFR 403 (Applicable)	General pre-treatment regulations for existing and new sources of water pollution.	This chemical-specific regulation is applicable to the discharge of groundwater to the Sacramento Regional County Sanitation District (SRCSD). Contaminant concentrations in the groundwater at Parking Lot 3 are at levels that meet pre-treatment requirements. Extracted groundwater will be discharged in compliance with the requirements described in the current SRCSD discharge permit.	No groundwater extraction or treatment is currently occurring at this site.
Parking Lot 3 Groundwater - National Primary Drinking Water			
40 CFR Part 141.61 (Relevant and Appropriate)	Establishes an MCL of 0.005 mg/L for TCE and PCE in water served to people.	The MCLs for constituents in drinking water are relevant and appropriate for evaluating FRGs. This sub-alternative will comply with this ARAR by restoring the aquifer over time to the FRGs, which are set not to exceed the MCLs. Federal MCLs are relevant and appropriate for PCE and TCE.	This ARAR is still relevant and appropriate.

ATTACHMENT 7 – ARAR EVALUATION

ARAR	DESCRIPTION	COMPLIANCE	EVALUATION
Parking Lot 3 Groundwater - State Primary Drinking Water Regulations			
22 CCR 64444.5 (Relevant and Appropriate)	Sets maximum levels for constituents in drinking water supplied to the public.	The MCLs for constituents in drinking water are relevant and appropriate for evaluating FRGs for remediation of groundwater. This sub-alternative will comply with this ARAR by restoring the aquifer over time to the FRGs, which are set not to exceed the MCLs. State MCLs are relevant and appropriate for 1,2-DCA, CCl_4, and tDCE.	This ARAR is still applicable.
Water Quality Control Plan (Basin Plan) for the RWQCB, CVR Chapter 2 Beneficial Uses: Municipal and Domestic, Agricultural, and Industrial Supply; Chapter 3 Water Quality Objectives; Chemical Constituents (Applicable)	Specific applicable portions of the Basin Plan include beneficial uses of affected water bodies and water quality objectives to protect those uses. Any activity (e.g., a new discharge of contaminated soil, or in-situ treatment or containment of contaminated soil) that may affect water quality must not result in water quality exceeding water quality objectives.	The groundwater clean-up standards are set at the most stringent water quality objectives, which protect the groundwater for beneficial use as drinking water.	This ARAR is still applicable.
State Water Resources Control Board Resolution No. 88-63 ("Sources of Drinking Water Policy" as contained in the RWQCB's Water Quality Control Plan (Applicable)	Determines beneficial uses for waters that may be affected by discharges of waste.	Specifies that, with certain exceptions, all ground and surface waters have the beneficial use as a municipal or domestic water supply.	This ARAR is still applicable.

ATTACHMENT 7 – ARAR EVALUATION

ARAR	DESCRIPTION	COMPLIANCE	EVALUATION
State Water Resources Control Board Resolution No. 92-49 Section IIIG (as amended April 21, 1994) (Applicable)	Applies to all clean-ups of discharges that may affect water quality. Establishes requirements for investigation, clean-up, and abatement of discharges. Among other requirements, discharger must clean-up and abate the effects of discharges in a manner that promotes the attainment of either background water quality, or the best water quality that is reasonable if background water quality cannot be restored.	The Army demonstrated in the FS that it would be economically infeasible to achieve background levels (i.e., non-detect for VOCs) in groundwater. It appears that the groundwater clean-up standards listed in the Basewide ROD are the lowest levels that are technologically and economically achievable. These standards are set at the Federal or more stringent State MCLs, and will protect the groundwater for its beneficial use as drinking water.	This ARAR is still applicable.
Title 23, CCR Section 2550.4 (Applicable)	Clean-up levels must be set at background concentration levels, or if background levels are not technologically and economically feasible, then at the lowest levels that are economically and technologically achievable. Specific factors must be considered in setting clean-up levels above background levels.	The Army demonstrated in the FS that it would be economically infeasible to achieve background levels (i.e., non-detect for VOCs) in groundwater. It appears that the groundwater clean-up standards listed in the Basewide ROD are the lowest levels that are technologically and economically achievable. These standards are set at the Federal or more stringent State MCLs, and will protect the groundwater for its beneficial use as drinking water.	This ARAR is still applicable.
22 CCR 66264.97 (b) and (e) (Applicable)	RCRA groundwater monitoring requirements.	The Army installed sufficient monitoring points to fully evaluate the effectiveness of the remedial action complies with the general monitoring requirements in this section.	This ARAR is still applicable.

ATTACHMENT 7 – ARAR EVALUATION

ARAR	DESCRIPTION	COMPLIANCE	EVALUATION
Building 300 Burn Pit Soil, Battery Disposal Well IDW, and Oxidation Lagoons			
Rule 402 (Applicable)	General guideline; if the operation causes release of contaminants to the atmosphere, then a case-by-case determination of public nuisance potential should be performed to verify compliance. This rule states that discharges to air causing injury, detriment, nuisance, annoyance; or endangering comfort, repose, health, safety, or causing damage to business or property is prohibited.	During excavation at the Building 300 Burn Pit, the Battery Disposal Well IDW, and the Oxidation Lagoons, the contractor shall minimize the potential for emissions using Best Available Control Technology (BACT). A health risk assessment has been conducted to evaluate the effect of fugitive emissions on the receptors in the vicinity of the stabilization unit. Workers could come into contact with the contaminated soil during excavation and soil stabilization. Workers shall follow all safety guidelines for work on a hazardous waste site, wearing personal protective equipment as required and continuously monitoring ambient air quality. The surrounding community of SADA will not be exposed to hazardous materials during remedial activities associated with soil stabilization, with the possible exception of a slight, temporary increase of dust during excavation and soil treatment, which shall be controlled through the use of dust control technologies, and covering of excavated material. The contractor shall use perimeter air monitoring to verify the success of dust control measures. If the following values are exceeded, the contractor shall stop dust generating work and undertake all actions necessary to eliminate dust from traveling off-site: arsenic - 0.042 $\mu g/m^3$, cadmium - 0.034 $\mu g/m^3$, copper - 35 $\mu g/m^3$, nickel - 0.06 $\mu g/m^3$, zinc - 35 $\mu g/m^3$, and lead - 1.5 $\mu g/m^3$.	Remedial construction activities at this site are complete and this ARAR is no longer applicable.
Rule 403 (Applicable)	Fugitive dust.	During excavation at the Building 300 Burn Pit, the Battery Disposal Well IDW, and the Oxidation Lagoons, every reasonable effort shall be taken to prevent fugitive dust from extending beyond the property line. Dust control measures shall include watering with addition of dust control chemicals or foams available, if needed.	Remedial construction activities at this site are complete and this ARAR is no longer applicable.
Rule 405 (Applicable)	Dust and condensed fume requirements.	No discharges into the atmosphere shall be made from any source whatsoever of dust or condensed fumes in total quantities exceeding the allowable quantities.	Remedial construction activities at this site are complete and this ARAR is no longer applicable.

ATTACHMENT 7 – ARAR EVALUATION

ARAR	DESCRIPTION	COMPLIANCE	EVALUATION
South Post Burn Pits - RCRA Closure			
22 CCR 66264.97 (b) and (e) (Applicable)	RCRA unsaturated zone monitoring.	The Army will install sufficient monitoring points to fully evaluate the effectiveness of the remedial action and will comply with the general monitoring requirements in this section.	This ARAR is still applicable.
22 CCR 66264.111 (Applicable)	Closure performance standards.	The Army developed and implemented a remedial design complying with the substantive requirements set forth in this section.	This ARAR is no longer applicable as construction is complete.
22 CCR 66264.112 (Applicable)	Closure plan.	The Army will develop a remedial design that complies with the substantive requirements set forth in this section.	This ARAR is still applicable.
South Post Burn Pits – Corrective Action Management Units			
22 CCR 66264.552 (e) (1) (Applicable)	CAMU requirements.	The remedial design shall address the following requirements for the South Post Burn Pits CAMU: 1) The areal configuration of the CAMU; 2) Requirements for remediation waste management for those areas of the CAMU used for treatment or storage of remediation wastes; 3) Monitoring requirements; and 4) Closure and post-closure requirements.	This ARAR is still applicable.
22 CCR 66264.250 – 253 (Applicable)	Waste pile requirements.	The remedial design shall address the following requirements for South Post Burn Pits CAMU: 1) Waste pile design and operating requirements; 2) Action leakage rate; 3) Response actions; and 4) Monitoring and inspection.	This ARAR is still applicable.

ATTACHMENT 7 – ARAR EVALUATION

ARAR	DESCRIPTION	COMPLIANCE	EVALUATION
Rule 402 (Applicable)	General guideline; if the operation causes release of contaminants to the atmosphere, then a case-by-case determination of public nuisance potential should be performed to verify compliance. This rule states that discharges to air causing injury, detriment, nuisance, annoyance; or endangering comfort, repose, health, safety, or causing damage to business or property is prohibited.	For the stabilization at the CAMU the Army minimized the potential for emissions using BACT. A health risk assessment has been conducted to evaluate the effect of fugitive emissions on the receptors in the vicinity of the CAMU. The contractor used perimeter air monitoring to verify the success of dust control measures.	Remedial construction activities at this site are complete and this ARAR is no longer applicable.
Rule 403 (Applicable)	Fugitive dust.	At the CAMU, every reasonable effort was taken to prevent fugitive dust from being airborne beyond the property line from which the emissions originated. The Army complied with this rule during construction.	Remedial construction activities at this site are complete and this ARAR is no longer applicable.
Rule 405 (Applicable)	Dust and condensed fume requirements.	No discharges into the atmosphere were made from any source whatsoever of dust or condensed fumes in total quantities exceeding the allowable quantities.	Remedial construction activities at this site are complete and this ARAR is no longer applicable.

Source: FINAL Third Five-Year Review Report for Sacramento Army Depot, Sacramento, Sacramento County, California (April, 2008).

Attachment 8
Risk Assessment and Toxicology Evaluation

Attachment 8 – Risk Assessment and Toxicology Evaluation

Table 1: Changes in Chemical-Specific Soil Standards

Contaminant	Clean-up Levels	CHHSLs[1]		RSLs[2]	
		Residential	Commercial/ Industrial	Residential	Industrial
Arsenic	7.3 mg/kg[A]	0.07 mg/kg	0.24 mg/kg	0.39 mg/kg	1.6 mg/kg
Cadmium	Bldg. 300 Burn Pit and South Post Burn Pits 88 mg/kg[A] Oxidation Lagoons 40 mg/kg[A]	1.7 mg/kg	7.5 mg/kg	70 mg/kg	800 mg/kg
Chromium (VI)	16 mg/kg[A]	17 mg/kg	37 mg/kg	0.29 mg/kg	5.6 mg/kg
Total Chromium	112 mg/kg[A]	Total chromium values are no longer addressed in USEPA RBCs.			
Lead	174 mg/kg[A]	80 mg/kg	320 mg/kg	400 mg/kg	800 mg/kg

1) California Human Health Screening Levels dated January 2005; lead values revised in September 2009
2) Regional Screening Levels dated April 2012
A) 1995 ROD, Table 4
CHHSL = California Human Health Screening Level
mg/kg = milligrams per kilogram
RBC = Risk-Based Concentration
ROD = Record of Decision
RSL = Regional Screening Level
USEPA = United States Environmental Protection Agency

Attachment 8 – Risk Assessment and Toxicology Evaluation

Table 1a: Changes in Chemical-Specific Groundwater Standards

Contaminant	Clean-up Levels	Indoor Air CHHSL[1]		Tap-Water RSL[2]	Maximum Contaminant Level
		Residential	Commercial/ Industrial		
Carbon Tetrachloride	0.5 µg/L[A]	0.0579 µg/m^3	0.0973 µg/m^3	0.39 µg/L	5 µg/L
Cis-1,2-Dichloroethene	6 µg/L[A]	36.5 µg/m^3	51.1 µg/m^3	28 µg/L	70 µg/L
1,2-Dichloroethane	0.5 µg/L[A]	0.116 µg/m^3	0.195 µg/m^3	0.15 µg/L	5 µg/L
Trans-1,2-Dichloroethene	10 µg/L[A]	73 µg/m^3	102 µg/m^3	86 µg/L	100 µg/L
Tetrachloroethene	5 µg/L	0.412 µg/m3	0.693 µg/m3	9.7 µg/L	5 µg/L
Trichloroethene	5 µg/L	1.22 µg/m3	2.04 µg/m3	0.44 µg/L	5 µg/L

1) California Human Health Screening Levels dated January 2005
2) Regional Screening Levels dated April 2012
A) California Maximum Contaminant Level
CHHSL = California Human Health Screening Level
MCL = Maximum Contaminant Level
mg/kg = milligrams per kilogram
ROD = Record of Decision
µg/L = micrograms per Liter
µg/m^3 = micrograms per cubic meter
USEPA = United States Environmental Protection Agency

Attachment 8 – Risk Assessment and Toxicology Evaluation

Table 2: Direct Comparison Between 1993 Toxicity Values and June 2011 RSLs

The non-carcinogens' reference dose values for oral (RfDo) and inhalation (RfDi) pathways of exposure and the oral and inhalation cancer potency factors (SFo and SFi, respectively) are listed. The potentially significant changes are shaded.

Chemical	Ingestion Exposure				Inhalation Exposure				Comment
	RfDo mg/kg/day		SFo $(mg/kg\text{-}day)^{-1}$		RfCi mg/m^3		UIR $(\mu g/m^3)^{-1}$		
	1993[A]	2011[B]	1993[A]	2011[B]	1993[A]	2011[B]	1993[A]	2011[B]	
Arsenic	0.0003	0.0003	1.75	1.5*	-	1.5E-5**	15	0.0043*	
Cadmium	0.001	0.0005*	-	-	-	0.00002**	15	0.0018*	
Carbon Tetrachloride	0.0007	0.004**	0.15	0.07*	0.00057	0.1*	0.15	6E-6*	No change to the MCL
Chromium (total)	1	-	-	-	-	-	-	-	The remedy assume all chromium was in the VI valence state
Chromium VI	0.005	0.003*	0.42	0.5**		0.0001	510	0.0084*	
Cis-1,2-Dichloroethene	0.01	0.002*	-	-	0.01	-	-		No change to the MCL
1,2-Dichloroethane	-	0.006**	0.09	0.091**	-	0.007**	0.09	2.6E-5*	No change to the MCL
Lead	-	-	-	-	-	-	-	-	Lead is evaluated separately
Tetrachloroethene	0.01	0.01	0.05	0.54**	0.01	0.27**	0.05	5.9E-6*	No change to the MCL
Trans-1,2-Dichloroethene	0.01	0.02**	-	-	0.01	0.06**	-	-	No change to the MCL
Trichloroethene	0.006	-	0.015	0.0059*	0.006	0.01**	0.01	2E-6*	No change to the MCL

A – From Table 4-2 of "Basewide Human Health Risk Assessment, Sacramento Army Depot," Kleinfelder, 1997.
B – Toxicity values as they appear on the US EPA RSL Table June 2011.
*Changes in toxicity values indicate an increase in estimated risks or hazards.
**Changes in toxicity values indicate a decrease in estimated risks or hazards.
MCL – Maximum Contaminant Level
mg/kg – milligrams per Kilogram
mg/m^3 – milligrams per cubic meter
$\mu g/m^3$ – micrograms per cubic meter
UIR – Unit Inhalation Risk

Attachment 9
Vapor Intrusion Screening for the South Post Plume

ATTACHMENT 9

VAPOR INTRUSION SCREENING FOR THE SOUTH POST PLUME

This attachment was originally prepared at the request of the U.S. Environmental Protection Agency (EPA) for the Third Five-Year Review to address the vapor intrusion (VI) screening process for the South Post Groundwater Operable Unit, Question B, Sec. 7.3.2.2, of the statement of service, "Are the exposure assumptions, toxicity data, clean-up levels and remedial action objectives used at the time of the remedy selection still valid?**"**

Since the last five-year review, potential vapor intrusion issues have continued to have visibility across the nation, and when conducting a risk assessment, should be considered as a possible exposure pathway posed by releases of hazardous chemicals into the environment. Vapor intrusion is not recognized as an Applicable or Relevant and Appropriate Requirement (ARAR) in the 1995 Basewide Record of Decision (ROD) for the former Sacramento Army Depot (SAAD); however, in an effort to address this continually evolving issue, the Army conducted a screening level investigation to determine if vapor intrusion was a viable exposure pathway groundwater contamination associated with the South Post Groundwater OU.

The Army thoroughly reviewed EPA guidance, the California Department of Toxic Substances Control (DTSC) guidance, Army guidance, and the Johnson & Ettinger (J&E) model, and utilized the DTSC automated screening tool (automated excel spreadsheet; last revised in 2009) to evaluate vapor intrusion risk associated with contaminated groundwater in the South Post Plume at SAAD. In addition, this screening evaluation was conducted in a manner consistent with the recently released toxicological data for trichloroethene (TCE), which is available at www.epa.gov/ncea/iris/subst/0199.html.

The following sections address general site conditions, process, data, tools used, and results of this vapor intrusion investigation.

Site Background/Hydrogeology

SAAD is located in the Central Valley of California, and overlies a thick sequence of alluvial sediments consisting of silt, sand, gravel, and hardpans. These sediments are laterally and vertically discontinuous. In general, the shallow site soil has moderate to very low permeability. The water-bearing zones beneath SAAD are composed of a series of sand, silty sand, and sandy silt units. These units have been grouped into three general water-bearing zones, informally designated as the "A/B," "C," and "D" hydrogeologic zones. The A/B zone consists of the upper A and the lower B zones which are commonly interconnected. The vadose zone above the shallowest water-bearing zone and the aquitard between the water-bearing zones consist primarily of silt, silty clay, and clay. The approximate depths of the primary water-bearing zones from ground surface are as follows:

Zone	Depth (feet)
A/B	78 to 148
C	156 to 188
D	195 to 230

The three aquifer zones can be subdivided into two depositional regimes. The upper regime comprising the A/B zone is heterogeneous, and laterally and vertically discontinuous. This regime is composed of silt with interbedded fine-grained arkosic sand lenses. The lower regime is composed of laterally continuous units comprising two distinct water-bearing zones: zone C

and zone D. These two zones are typically highly productive, consisting of fine- to coarse-grained, moderately graded sand interbedded with silt and clay.

For the assessment, the area of concern deals specifically with the geology in the vadose zone. A fence diagram and real-time data from a previous Cone Penetrometer Test (CPT) were provided in the Third Five-Year Review as further reference to the geological conditions in the area specific to the South Post Plume. The CPT data was collected from a sample location approximately 75 feet to the south of MW1025. In general, there was evidence that clay, silt, and sand layers were continuous (when depths are corrected for elevation) at elevations that were comparable to layers and elevations found in boring logs for the following monitoring well clusters: MW1025 through MW1028, MW1021 through MW1024, and MW1036/MW1037.

Vapor Intrusion Screening

During the original assessment the Army utilized the DTSC screening guidelines, "*Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*" (Revised February 2005), to analyze the risk associated with possible vapor intrusion via contaminated groundwater under the Federal Express (FedEx) property. Since the time of this original assessment, the DTSC has published a new final guidance document (October 2011).

Both documents recommend the following step-wise approach for the evaluation of vapor intrusion. For sites with existing buildings, Steps 1 through 11 apply. For sites with proposed buildings, Steps 1, 2, 3, 5, 6, 7, and 11 apply.

Step 1 – Identify the spill(s) or release(s).

Step 2 – Characterize the site.

Step 3 – Identify the site as one where vapor intrusion into indoor air may represent a complete exposure pathway (volatile organic compounds [VOCs] are detected in the subsurface).

Step 4 – For an existing building, identify whether an imminent hazard exists from vapors migrating into indoor air. If none exists,

Step 5 – Perform a screening evaluation using the provided default vapor attenuation factors. If a potential risk exists,

Step 6 – Collect additional site data.

Step 7 – Perform a modeling evaluation using site-specific physical parameters and building parameters as appropriate. If the calculated risk is still significant,

Step 8 – For an existing building, prepare an indoor air sampling work plan, which includes an assessment of the utility corridors and the development of a contingency plan for appropriate response actions. Also, conduct appropriate public outreach with the affected community.

Step 9 – For an existing building, conduct indoor air sampling.

Step 10 – For an existing building, evaluate the data to determine if the indoor air concentrations are acceptable. If they are not,

Step 11a – For an existing building, mitigate indoor air exposure, implement engineering controls, and remediate the VOC contamination as appropriate.

Step 11b – If no building exists on the site, and the calculated risk is significant, remediate subsurface VOC contamination or implement institutional measures to assure that engineering controls are installed in any future buildings.

Step 11c – For both circumstances, institute long-term monitoring at the site.

The DTSC has also published a decision tree for use when screening a site for vapor intrusion concerns. The decision tree mirrors the steps outlined above, but only steps 1 through 5 are necessary to complete the screening process at SAAD. To completely assess the possibility of VI in Step 5, the Army utilized the 2009 DTSC EXCEL™ screening tool based on calculations from the J&E model. DTSC guidance provides the following summary of this screening method:

"Fate and transport models can assist in evaluating the degradation of indoor air quality due to the intrusion of subsurface volatile contaminants. When used in combination with site-specific information, the results of modeling will add to the overall weight of evidence used to evaluate the exposure pathway. The Johnson and Ettinger (1991) model (J/E) is one of the most commonly used models for evaluating the indoor air exposure pathway. DTSC has selected the J/E model as the recommended approach to evaluate the vapor intrusion pathway in California. USEPA programmed the J/E model into Microsoft EXCEL™ and added a health risk component that calculates the risk from inhaling the specific chemical at the concentration estimated in indoor air."

DTSC guidance also describes usage of the J&E model:

"The J/E model is a simple, deterministic model, having single-point inputs and outputs. The J/E model is based on the basic principles of contaminant fate and transport, contaminant partitioning between media, and the physical and chemical properties of the contaminants themselves. The model incorporates both diffusion and advection as mechanisms of transport of subsurface vapor into the indoor air environment."

The Army utilized the automated DTSC 2009 EXCEL™ spreadsheet model to screen for VI risk related to buildings on the FedEx property directly above the South Post Plume. Using site-specific inputs,

"the J/E model can allow users to quickly screen sites for VI risk. The output of the J/E model is the dimensionless attenuation factor "alpha" State of California DTSC / Cal – EPA Vapor Intrusion Guidance Document – Final, October 2011 (α) that represents the ratio of the indoor air concentration to the vapor concentration at a subsurface source. Using the attenuation factor and the appropriate target indoor air concentrations, contaminant concentrations in soil gas and groundwater that are protective of human health can be calculated, and these calculated values can be used as site cleanup goals."

Finally, the guidance notes the following when screening for VI risk:

"DTSC recommends the use of a two-phased approach in evaluating the vapor intrusion at a facility. A phase approach ensures that simple cases can be evaluated relatively quickly with minimal resources. The first phase of the evaluation utilizes default attenuation factors to quickly quantify the risk for vapor intrusion (Step 5)… If the preliminary screening demonstrates that the risk associated with vapor intrusion is acceptable, no further evaluation for the exposure pathway is warranted."

Attachment 9

Vapor Intrusion Screening for the South Post Plume

Using the DTSC 2009 EXCEL™ spreadsheet, the DTSC decision tree, and site-specific data, the Army concluded:

Step 1 – Identify the spill(s) or release(s): The releases are well documented and covered in this document and previous documents. TCE contamination in groundwater is the main contaminant of concern (COC) at SAAD.

Step 2 – Characterize the site: The site is fully characterized and five COCs have been identified: TCE, tetrachloroethene, carbon tetrachloride, cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethene, and 1,2-dichloroethane.

Step 3 – Identify the site as one where vapor intrusion into indoor air may represent a complete exposure pathway (VOCs are detected in the subsurface): The site may represent a complete exposure pathway.

Step 4 – For an existing building, identify whether an imminent hazard exists from vapors migrating into indoor air. If none exists: No imminent hazard exists at this site.

Step 5 – Perform a screening evaluation using the provided default vapor attenuation factors. If a potential risk exists: Potential risk may exist and the Army utilized the J&E model to evaluate risk. The Army also used the following site-specific input parameters to increase the accuracy of the J&E model:

1. COC concentrations (TCE and cDCE) and water levels used in the model were detected during the summer 2011 annual groundwater monitoring event at MW1028. MW1028 is the A zone well closest to buildings on FedEx property.
2. Silt is the predominant soil strata in the vadose zone above the A aquifer and was used in the model.
3. The program default groundwater temperature of 24 degrees Celsius (^{o}C) was used during calculations. This value is conservative and highly protective.

The following table represents the modeling output using the inputs provided in Step 5.

Contaminant of Concern	Actual Concentration* (ug/L)	Water Level* (cm)	GW Concentration** (ug/L)	Cancer Risk***	Hazard Quotient****
Trichloroethylene	9.4	1718	106	8.9 x 10-8	1.7 x 10-4
Tetrachloroethylene	ND	1718	22.3	NA	NA
Carbon Tetrachloride	ND	1718	1.74	NA	NA
cis-1,2-dichloroethylene	1.5	1718	8280	NA	
trans-1,2-dichloroethylene	ND	1718	6570	NA	NA
1,2-dichloroethane	ND	1718	72.7	NA	NA

* Concentrations and depth to ground water were taken from the Summer 2011GW Sampling Activities at MW1028. This is the A-Zone well closest to buildings on the Fedex Property

** Concentration derived from the J&E Model that would be needed in groundwater to cause an indoor air exposure given depth to contaminant and soil characteristics. (Silt is the predominant soil strata above the aquifer in this area

*** Cancer Risk values derived from the J&E Model are all below 1x10-6 and are not considered a cancer hazard

****Hazard Quotient Values derived from the J&E Model are all below 1

Conclusions

Contaminant concentration and water level inputs used during this evaluation are similar to the site-specific input parameters used during the 2007 evaluation. Using these data, the Army re-

evaluated vapor intrusion risk potentially associated with groundwater contamination located off-site of SAAD and presently in the vicinity of buildings located on the FedEx property on Berry Avenue (South Post Plume). To complete the assessment, the Army used site-specific data collected during the summer of 2011 and input the data into the 2009 DTSC J&E model for risk screening. After extensive review of modeling results, given the depth to contaminants, concentration, and geology, the Army does not believe that there is a vapor intrusion concern associated with groundwater contamination in the South Post Plume. Furthermore, when the J&E model was run using the most restrictive screening level with sand as the predominant strata in the vadose zone, the values remain below the values needed to indicate a potential vapor intrusion exposure risk associated with the groundwater contamination in this area.

Attachment 10
Vapor Intrusion Screening for Parking Lot 3

ATTACHMENT 10

VAPOR INTRUSION SCREENING FOR PARKING LOT 3

Potential vapor intrusion issues have continued to have visibility across the nation, and when conducting a risk assessment, vapor intrusion should be considered as a possible exposure pathway posed by releases of hazardous chemicals into the environment. Vapor intrusion is not recognized as an Applicable or Relevant and Appropriate Requirement (ARAR) in the 1995 Record of Decision (ROD) for the Sacramento Army Depot (SAAD). At the present time, there are no structures within the boundary of Parking Lot 3. To assess the risk associated with two hypothetical building types, the Army conducted a supplemental screening level investigation to determine if vapor intrusion was a potential viable exposure pathway for Parking Lot 3 at SAAD.

The Army thoroughly reviewed EPA guidance, the California Department of Toxic Substances Control (DTSC) guidance, Army guidance, and the Johnson & Ettinger (J&E) model, and utilized the DTSC automated screening tool (automated excel spreadsheet; revised in 2011) to evaluate vapor intrusion risk associated with contaminated groundwater at Parking Lot 3. This screening evaluation was conducted in a manner consistent with the recently released toxicological data for trichloroethene, which is available at www.epa.gov/iris/subst/0199.htm.

The following sections address the general site conditions, site characterization, and the data and tools used during this vapor intrusion screening investigation.

Site Background

Parking Lot 3 is located on the western edge of SAAD adjacent to a railroad bed. The area is fenced and capped with asphalt. The parking lot is approximately 350 feet in length and approximately 275 feet in width.

This site has been characterized in detail; however, sampling of groundwater wells within the parking lot is still conducted. Monitoring well MW0073 is sampled on a semi-annual basis and is located within the boundary of the parking lot. Historical characterization activities conducted at Parking Lot 3 include the analysis of soil, soil gas, air sparging effluent, and dual-phase extraction effluent for contaminant of concern concentration. The remaining contaminant of concern is trichloroethene. Other contaminants identified in testing from this area included: chloroform, tetrachloroethene, and 1,2 dichloroethene.

Site Hydrogeology

SAAD is located in the Central Valley of California, and overlies a thick sequence of alluvial sediments consisting of silt, sand, gravel, and hardpans. These sediments are laterally and vertically discontinuous. In general, the shallow site soil has moderate to very low permeability. The water-bearing zones beneath SAAD are composed of a series of sand, silty sand, and sandy silt units. These units have been grouped into three general water-bearing zones, informally designated as the "A/B," "C," and "D" hydrogeologic zones. The A/B zone consists of the upper A and the lower B zones, which are commonly interconnected. The vadose zone above the shallowest water-bearing zone and the aquitard between the water-bearing zones consist primarily of silt, silty clay, and clay. The approximate depths of the primary water-bearing zones from ground surface are as follows:

Zone	Depth (feet)
A/B	78 to 148
C	156 to 188
D	195 to 230

The three aquifer zones can be subdivided into two depositional regimes. The upper regime comprising the A/B zone is heterogeneous, and laterally and vertically discontinuous. This regime is composed of silt with interbedded fine grained arkosic sand lenses. The lower regime is composed of laterally continuous units comprising two distinct water-bearing zones: zone C and zone D. These two zones are typically highly productive, consisting of fine- to coarse-grained, moderately graded sand interbedded with silt and clay.

A depth to groundwater of 56.37 feet (1,718 centimeters) was used to evaluate vapor intrusion risk associated with contaminated groundwater at Parking Lot 3.

Site Geology

SAAD is located in the Great Valley of California, a broad asymmetrical trough filled with a thick assemblage of flat-lying marine and non-marine sediments. The most recent formations deposited in the Great Valley are non-marine sediments derived from the Sierra Nevada foothills and mountains on the east side of the valley, and from the Coast Ranges on the west side of the valley. The sediments under SAAD were carried out of the mountains and deposited by the American River as it meandered westward across the valley floor.

The upper 250 feet of sediments under SAAD are comprised of interbedded sands, silts, and clays, with some coarse gravel underlying the north side of the facility at an approximate depth of 40 feet. Older buried stream channels exist at various locations and depths in the area. These streams have deposited materials ranging in size from gravel to clay as they meandered across the area. Multiple discontinuous hardpans (cemented clays) representing ancient soil horizons exist throughout the site.

Soil boring data collected from Parking Lot 3 indicate that the first 80 feet below ground surface is comprised primarily of silt, silty sand, and sandy silt. In several borings, clayey silt or silty clay were also identified at depths greater than 80 feet. These soil types were used to evaluate vapor intrusion risk associated with contaminated groundwater at Parking Lot 3.

Vapor Intrusion Screening

During this assessment the Army utilized the DTSC screening guidelines, *Final Guidance for the Evaluation & Mitigation of Subsurface Vapor Intrusion to Indoor Air* (October 2011), to analyze the hypothetical risk associated with possible vapor intrusion via contaminated groundwater at Parking Lot 3.

This document recommends the following step-wise approach for the evaluation of vapor intrusion. For sites with existing buildings, Steps 1 through 11 apply. For sites with proposed buildings, Steps 1, 2, 3, 5, 6, 7, and 11 apply.

Step 1 – Identify the spill(s) or release(s).

Step 2 – Characterize the site.

Step 3 – Identify the site as one where vapor intrusion into indoor air may represent a complete exposure pathway (volatile organic compounds [VOCs] have been detected in the subsurface).

Step 4 – For an existing building, identify whether an imminent hazard exists from vapors migrating into indoor air. If none exists,

Step 5 – Perform a screening evaluation using the provided default vapor attenuation factors. If a potential risk exists,

Step 6 – Collect additional site data.

Step 7 – Perform a modeling evaluation using site-specific physical parameters and building parameters as appropriate. If the calculated risk is still significant,

Step 8 – For an existing building, prepare an indoor air sampling work plan, which includes an assessment of the utility corridors and the development of a contingency plan for appropriate response actions. Also, conduct appropriate public outreach with the affected community.

Step 9 – For an existing building, conduct indoor air sampling.

Step 10 – For an existing building, evaluate the data to determine if the indoor air concentrations are acceptable. If they are not,

Step 11a – For an existing building, mitigate indoor air exposure, implement engineering controls, and remediate the VOC contamination as appropriate.

Step 11b – If no building exists on the site, and the calculated risk is significant, remediate subsurface VOC contamination or implement institutional measures to assure that engineering controls are installed in any future buildings.

Step 11c – For both circumstances, institute long-term monitoring at the site.

The DTSC has also published a decision tree for use when screening a site for vapor intrusion concerns. The decision tree mirrors the steps above, but only steps 1 through 5 are necessary to complete this screening process.

Step 1 – Identify the spill(s) or release(s): The groundwater at Parking Lot 3 is currently contaminated with trichloroethene.

Step 2 – Characterize the site: Parking Lot 3 has been extensively characterized and the following contaminants have been identified: trichloroethene, tetrachloroethene, chloroform, and 1,2-dichloroethene.

Step 3 – Identify the site as one where vapor intrusion into indoor air may represent a complete exposure pathway (VOCs are detected in the subsurface): Since no buildings exist on this site and current land use covenants prevent building construction, a complete pathway does not exist. This assessment was completed to investigate a hypothetical complete exposure pathway in the event a building is constructed within the boundary of Parking Lot 3.

Step 4 – For an existing building, identify whether an imminent hazard exists from vapors migrating into indoor air. If none exists: No imminent hazard exists at this site. There are no buildings on this site.

Step 5 – Perform a screening evaluation using the provided default vapor attenuation factors. If a potential risk exists: Hypothetical screening evaluations were performed. The Army used the following site-specific input parameters to conduct the evaluations:

1. Both maximum and average trichloroethene concentrations from 2007 through 2011 were used along with a depth to groundwater of 56.37 feet for MW0073. MW0073 is located within aquifer zone A at Parking Lot 3.

2. Silt is the predominant soil strata in the vadose zone above aquifer zone A, and it was used in the model. In addition, modeling was conducted using other soil types present at the site, including loamy sand, sandy loam, sandy clay loam, and loam.
3. A groundwater temperature of 20.2 ^{o}C was used in the model.

To conduct this hypothetical assessment of the possibility of vapor intrusion in Step 5, the Army utilized the DTSC EXCEL™ screening tool based on calculations from the J&E model. The October 2011 DTSC Final Vapor Intrusion Guidance provides the following summary of this screening method:

> *The J&E model (Johnson and Ettinger, 1991) is a fate and transport model that simulates the transport of soil vapors in the subsurface by both diffusion and advection into indoor air. The model calculates an attenuation factor, alpha (α), which represents the ratio of predicted indoor air concentrations to subsurface soil gas concentrations. Hence, by inputting subsurface data, the model estimates an indoor air concentration. In September 1998, USEPA programmed the J&E model into Microsoft EXCEL™ and added a health risk component that calculates the risk from inhaling a specific chemical at the concentration estimated in indoor air (USEPA, 2004a).*
>
> *Individual spreadsheets were generated for different contaminated environmental media: soil gas, soil matrix, and groundwater. Model results are provided as a risk-based soil, soil gas, or groundwater concentration protective of human health or as an estimate of the incremental risk associated with user-defined initial contaminant concentrations. DTSC has modified two USEPA Vapor Intrusion Model spreadsheets, the models for soil gas and for groundwater, by including Cal/EPA OEHHA toxicity factors and California-specific building properties. The spreadsheets can be downloaded from DTSC's website and are recommended for site-specific evaluations.*

Modeling outputs are presented in the following table:

Attachment 10

Vapor Intrusion Screening for Parking Lot 3

Modeling Equations Input Data and Source		
Ground Water Temperature	20.2 °C	February 2012 Groundwater Dataset
Ground Water Concentration	6.7 / 12.0 ug/L	Average and maximum values from MW-73 Well values from 2007 through 2011
Groundwater Depth	1759 cm (57.72 ft)	2011 Monitoring Well Groundwater Level Data
Soil Gas Advection Rate	5 liters/minute	Required by CA 2011 Final VI Guidance
Crack to Total Area Ratio	0.005 (unitless)	Required by CA 2011 Final VI Guidance
Slab on Grade Depth	15 cm	DTSC On-line Model Specified
Basement Depth	200 cm	DTSC On-line Model Specified

Modeling Equation Results						
Contaminant of Concern	Actual Groundwater Concentration (ug/L)	Water Level Below(cm)	Soil Type	Construction Type	Predicted Groundwater Concentration Required for VI Hazard* (ug/L)	Cancer Risk **
Trichloroethene	6.7 (Average)	1759	Loamy Sand	Slab on Grade	17.1	3.9×10^{-7}
			Sandy Loam		34.8	1.9×10^{-7}
			Sandy Clay Loam		73.3	9.1×10^{-8}
			Loam		54.6	1.2×10^{-7}
			Silt		61.6	1.1×10^{-7}
	12 (Maximum)		Loamy Sand		17.1	7.0×10^{-7}
			Sandy Loam		34.8	3.4×10^{-7}
			Sandy Clay Loam		73.3	1.6×10^{-7}
			Loam		54.6	2.2×10^{-7}
			Silt		61.6	1.8×10^{-7}
	6.7 (Average)	1759	Loamy Sand	Basement	13.9	4.8×10^{-7}
			Sandy Loam		28.3	2.4×10^{-7}
			Sandy Clay Loam		59.5	1.1×10^{-7}
			Loam		44.2	1.5×10^{-7}
			Silt		50.6	1.3×10^{-7}
	12 (Maximum)		Loamy Sand		13.9	8.6×10^{-7}
			Sandy Loam		28.3	4.2×10^{-7}
			Sandy Clay Loam		59.5	2.0×10^{-7}
			Loam		44.2	2.7×10^{-7}
			Silt		50.6	2.4×10^{-7}

* Concentrations derived from the J&E Model that would be needed to cause an indoor air exposure given the depth to contaminant, soil characteristics and type of construction

** Cancer Risk Values derived from the J&E DTSC Tool are below the 1×10^{-6} cancer risk benchmark including either the average or maximum TCE water concentration and loamy sand, sandy loam, sandy clay loam and silt as the predominant soil above ground water.

Attachment 10

Vapor Intrusion Screening for Parking Lot 3

Conclusions

There are no buildings present at this site and land use covenants currently prevent any building construction. The Army evaluated vapor intrusion risk for two hypothetical building types using average and maximum groundwater concentrations measured in monitoring well MW0073 during the last five years. This data, soil classifications, and recent groundwater temperature and elevation were entered in the current DTSC J&E Excel vapor intrusion screening tool to assess vapor intrusion risk.

The evaluation also included a review of the extensive historical monitoring and site remediation activities. Site-specific remediation has resulted in a significant reduction of trichloroethene contamination at this site.

After careful review of modeling results for the hypothetical building types, the depth to contaminants, groundwater concentration, and the site geology, the Army does not believe that there is a vapor intrusion concern associated with groundwater contamination at Parking Lot 3. Furthermore, when the J&E model was run using the most restrictive soil types, the values remain below values needed to indicate a potential vapor intrusion exposure risk associated with the groundwater.

Recommendations

Currently, there are no complete exposure pathways as Land Use Covenants prevent building construction on this site. However, even if a future building were to be constructed within the boundary of the parking lot the results from this screening assessment must be considered along with the actual proposed location, most recent sampling results, and building foundation engineering plans to determine the potential risk for adverse vapor intrusion as defined by the DTSC at that date.

Attachment 11
Regulatory Agency Comments with Army Response to Comments

PLEXUS scientific

July 9, 2012

Mr. Martin Hausladen
U.S. EPA Region IX (SFD-8)
75 Hawthorne Street
San Francisco, CA 94105

Subject: Submittal of the Response to Comments on the Draft Fourth Five-Year Review Report, Sacramento Army Depot, Sacramento, California. Contract: W91ZLK-05-D-0011-0003 SAAD

Dear Mr. Hausladen:

Plexus Scientific Corporation, in conjunction with the Army, is pleased to submit for your review the Response to Comments on the Draft Fourth Five-Year Review Report for the former Sacramento Army Depot located in Sacramento, California.

Enclosed please find one hard copy of the Response to Comments table and associated attachments. Please feel free to contact the SAAD BEC (Scott Armstrong) at 916.261.4577, or through e-mail at scott.armstrong@calibresys.com, if you have any questions or comments.

Sincerely,

Paul B. Giller
Project Manager

cc: file
Theresa McGarry, DTSC
James Brownell, Water Board
Scott Armstrong, BEC
Andrew Van Dyke, ACSIM ODB PM
Kellie Reali, USACE Librarian
Jeff Sgambato, Plexus
Donald Kidd, Westwater

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Review Comments

Project:	Sacramento Army Depot, Sacramento, California		
Document:	*Draft Fourth Five-Year Review Report*		
Contract:	W91ZLK-05-D-0011, Task Order 0003		
Reviewer:	**Karla Brasaemle (TechLaw)**	Review Date: 3 May 2012	Date: 6 July 2012

GENERAL COMMENTS

Item	Reference	Comment	Action
1	General	"The Draft Fourth Five-Year Review Report for Sacramento Army Depot (the Report), dated March 2012, should include maps that indicate which locations were sampled in 2011, provide analytical results, and highlight the locations where screening criteria were exceeded. Please revise the Report to include a figure showing recent data."	**A** The Fourth Five-Year Review Report will be revised to include a figure (**Figure 8**), which depicts site-wide (South Post Groundwater Operable Unit [OU] and Parking Lot 3 Groundwater) groundwater sampling results from July 2011. The figure will highlight the locations where the Maximum Contaminant Level (MCL) was exceeded. The last paragraph of Section 6.2.1 will be modified as follows, *"The only contaminant of concern remaining above the MCL is TCE. TCE was detected at 6.5 µg/L in MW0073 during the July 2011 sampling event. The results of the July 2011 groundwater sampling event are presented in **Figure 8**. Monitoring of residual groundwater contamination will continue at Parking Lot 3 pursuant to the amended Groundwater Monitoring Plan."* The second to last paragraph of Section 6.2.2 will be modified as follows, *"The summer 2011 annual groundwater monitoring event detected TCE greater than the MCL in only three monitoring wells in the South Post Plume at concentrations equal to or less than 12 µg/L: MW1024 (5.6 µg/L), MW1027 (12 µg/L), and MW1028 (9.4 µg/L). The results of the July 2011 groundwater sampling event are presented in **Figure 8**."* The Table of Contents will be updated to included **Figure 8** (Trichloroethene Concentration Map July 2011 Annual Sampling Event).

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

2	General	"The Five-Year Review should provide further detail in discussing the maintenance, effectiveness, monitoring, and enforcement of institutional controls (ICs), following guidelines in the United States Environmental Protection Agency (EPA) Recommended Evaluation of Institutional Controls: Supplement to the Comprehensive Five-Year Review Guidance (the Guidance Supplement), dated September 13, 2011. For example, the specific concerns raised in Sections 2.2 and 3.1 of the Guidance Supplement should be addressed. The Five-Year Review should explain how ICs are being monitored and enforced, including routine monitoring and reporting to regulatory agencies. Please revise the Five-Year Review to provide further details regarding ICs at the site."	**A** Per Section 2.2 of the Guidance Supplement dated September 13, 2011, the Army interviewed stakeholders, local officials, and project members regarding the adequacy and enforcement of Institutional Controls (ICs) at the Depot. Their responses are included in **Attachment 6**. Per Section 3.1 of the Guidance Supplement dated September 13, 2011, the Army evaluated protectiveness of the remedy with respect to ICs in Section 7.0. The Army conducts routine monitoring to confirm enforcement of the established ICs at the Depot and prepares a report which is provided to the DTSC on an annual basis. The following text will be added after **Table 3-2** of Section 3.2, *"The Army conducts routine inspections to confirm that LUCs are enforced and that there are no activities or issues that may result in human exposure to contaminants associated with the Depot. An annual report is submitted to the DTSC which summarizes results of the Army's routine LUC monitoring."*
3	General	"The Land Use Covenants (LUCs) delineated in the 2-1 & 2-B Finding of Suitability to Transfer (FOSTs) Reports (referenced in Section 3.2) should also be included in a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Decision Document. Please discuss the possibility of including these LUCs in a future Record of Decision (ROD) amendment or Explanation of Significant Difference (ESD)."	**A** The following text will be added to the end of Section 3.2, **"***Applicable Land Use Covenants included in **Table 3-2** will be evaluated for potential inclusion into any future ROD amendments or ESDs prepared for the Depot."*
SPECIFIC COMMENTS			
Item	Reference	Comment	Action
1	Five-Year Review Summary Form, Page XI	"The review period refers to the entire time period since the last review; the start of the review period should be the same as the triggering action date (see Section 1.3 of the Comprehensive Five-Year Review Guidance [the Guidance], dated June 2001). The Five-Year Review Summary Form lists the review period as September 1, 2011 – February 6, 2012, but the triggering action date is listed as September 24, 2007. Please revise the review period to reflect the full time period for which information was reviewed."	**A** The review period in the Five-Year Review Summary Form will be modified as follows, "*September 24, 2007 – February 6, 2012.*"

2	Executive Summary, Page IX; Section 1.0, Introduction, Page 1; and Table 2-1, Chronology of Site Events, Page 4	"Table 2-1 lists the date of the Third Five-Year Review Report as April 2008, but the Executive Summary and Section 1.0 indicate that EPA's concurrence on this report is dated September 24, 2007. Please clarify the date of the Third Five-Year Review Report."	**A** The date of the Third Five-Year Review Report in **Table 2-1** will be revised to September 2007.
3	Table 2-1, Chronology of Site Events, Page 5	"The chronology indicates the Berry Avenue Groundwater Extraction System (BAGES) was online and operating in February 2010, but the Work Plan for the BAGES installation and operation was not finalized until March 2010. Please provide further explanation to clarify the chronology of these events."	**A** Operation and design of the BAGES was approved by the regulators following submission of the Draft Final Work Plan in August 2009.
4	Table 2-1, Chronology of Site Events, Page 5	"The chronology indicates that the regulatory agencies requested a Receptor Survey to evaluate downgradient drinking water sources that may be impacted by the South Post Plume, but it is not stated whether this survey was completed. Please clarify whether a Receptor Survey was performed. If a survey was performed, please summarize the results and reference the document in which further information can be found."	**A** The Receptor Survey is in progress and has not been finalized.
5	Section 4.0, Remedial Actions, Page 11	"The text states "the Second Five-Year Review recommended that the final soil cleanup levels and the basis for their selection should be included in the next decision document update for the SAAD [Sacramento Army Depot]" but does not state whether these items were included in the next decision document update. Please clarify the current status of this issue."	**A** Final Soil Remediation levels as detailed in the 1995 Basewide Record of Decision (ROD) were met for the South Post Burn Pits OU, Oxidation Lagoons OU, and the Building 300 Burn Pit; therefore language regarding establishment of final soil remediation levels in a ROD Amendment or Explanation of Significant Difference (ESD) is unnecessary and will be removed..
6	Table 4-2 Site-Wide Operational Costs, Page 14	"The table should provide a breakdown of operational costs, as specified in the Guidance. Please revise the table to include more detailed cost information."	**N** The Army will provide further detail regarding costs associated with the operation and maintenance of the South Post Groundwater OU and the Parking Lot 3 Groundwater within the body of the report to describe the reduction in operational costs from FY2008 to FY2011 presented in **Table 4-2**. The following text will be added after **Table 4-2** in Section 4.1, "*Operational costs were significantly reduced from FY2008 to FY2011 following implementation of a new Performance Based Contract and system optimization. The reduction resulted from the adoption of a new groundwater monitoring plan which significantly reduced sampling frequency and analyte analysis and the modification of the groundwater treatment system which significantly reduced utility costs."*

7	Section 5.2, South Post Groundwater Operable Unit Remedy Optimization, Page 21	"The last two paragraphs of the section discuss the soil vapor extraction that took place southwest of the site in 2010, but extraction locations and analytical data from this effort are not provided. The text also states that the Army plans to install additional soil vapor extraction wells, but details of this investigation, such as well locations and specific study goals, are not discussed. Please provide further discussion of off-site soil vapor extraction or reference the document(s) in which this information can be found."	**A** The second to last paragraph of Section 5.2 will be modified as follows, "*As part of the remedy optimization, the Army is also evaluating additional technologies to facilitate achievement of the RAOs at the South Post Groundwater OU. In August 2010, soil vapor extraction was initiated along the northern extent of impacted groundwater southwest and off-site of the Depot. The soil vapor extraction was conducted to evaluate the potential for a secondary source of soil VOCs (TCE) that may be contributing to the persistence of impacted groundwater at the South Post Groundwater OU. The soil vapor extraction was conducted over a period of three months ending in November 2010. Additional details regarding the soil vapor extraction test that was conducted during the fall of 2010 can be found in the Draft Final Soil Vapor Testing and Soil Vapor Extraction System Installation Report, Former Sacramento Army Depot, Sacramento, California dated August 2011."*
8	Table 5-1, Status of Recommendations, Pages 22-23	"Several of the recommendations from the Third Five-Year Review have not been addressed in the current Report: **a.** The Report does not include an evaluation of risk posed by remaining contamination (second row on Page 22). **b.** The groundwater flow and contaminant transport model has not been updated (third row on Page 22). Also, it is not clear why an update to this model was recommended at the time of the Third Five-Year Review but is now considered unnecessary. **c.** The Report does not include an evaluation of the likelihood that the remedy will meet remedial action objectives (RAOs) if continued (first row on Page 23). Please revise the Report to address these issues, including supporting information."	**N a.** The application and enforcement of ICs at Parking Lot 3 prevents the completion of an exposure pathway to the remaining groundwater contamination and a risk evaluation is not required at this time. Vapor intrusion risk associated with the groundwater at Parking Lot 3 was evaluated for the Fourth Five-Year Review Report. The evaluation indicated that vapor intrusion at Parking Lot 3 posed no unacceptable risk. The vapor intrusion risk evaluation for Parking Lot 3 is presented in **Attachment 10**. **N b.** The groundwater flow and transport model that was under development in the Groundwater Cleanup Optimization Report is no longer applicable as groundwater flow and groundwater treatment system configuration has changed. A revised groundwater flow and contaminant transport model may be developed, If necessary. **A c.** The following text will be added to **Table 5-1**, "*The BAGES Work Plan evaluated the South Post Groundwater OU remedy and concluded that it would meet RAOs and that remedy optimization would accelerate attainment through installation of the BAGES."*

9	Section 7.1.2.1, Changes in Standards, Newly Promulgated Standards, and Items to be Considered, Page 30	"It is not clear from the information presented that the risk from lead in soil falls within the target risk range. The text indicates that the action level for lead falls above the residential California Human Health Screening Level (CHHSL), but also states that "the remaining concentrations are low and it is expected that the remaining risk would still fall within the EPA [Environmental Protection Agency] target risk range for the soil related sites." Please evaluate the risk associated with lead in soil or include this in the list of recommendations for the next Five-Year Review."	**N** The Corrective Action Management Unit (CAMU) was constructed at the location of the South Post Burn Pits OU; therefore, exposure to soil associated with the former South Post Burn Pits is regulated by the Land Use Covenants (LUCs) established for the CAMU. The LUCs prevent completion of an exposure pathway and risk evaluation is not necessary.
10	Section 7.2.2, Question B, Page 33; Section 7.3.2, Question B, Page 35; and Appendix 8, Table 2, Direct Comparison Between 1993 Toxicity Values and Current RSLs, Page 3	"It is not clear from the information presented that the risk from contaminants of concern (COCs) in groundwater is below the target risk range. The text states that "because MCLs [maximum contaminant levels] have remained unchanged, it is expected that the remaining risk would still fall within the EPA risk range for the groundwater related chemicals and no further evaluation is required." However, the MCLs are not risk-based. As indicated in Appendix 8, toxicity values for several COCs changed between 1993 and 2011, including revised toxicity values for trichloroethene (TCE) in 2011. Please revise the text to clarify how changes in toxicity affect the risks associated with COCs at the site."	**N** The Army does not agree with the statement that MCLs are not risk-based. Per the Safe Drinking Water Act, the United States Environmental Protection Agency (EPA) promulgates MCLs utilizing human health risk data while considering best available technologies and cost of enforcement to determine allowable contaminant concentration limits in drinking water. Revised contaminant of concern toxicity factors indicate somewhat greater estimated hazards and risks; however no complete exposure pathway exists through the application and enforcement of ICs. The third paragraph of Section 7.2.2.1 and Section 7.3.2.1 will be modified as follows, *"The groundwater related chemicals of concern are 1,2-DCA, CCl_4, cDCE, TCE, and PCE. As shown in Table 2 of* ***Attachment 8****, toxicity values for each of the groundwater-related chemicals have been changed and indicate somewhat greater estimated hazards and risks. At this time, concentrations corresponding to risks greater than 1 x 10^{-6} do remain on site. However, institutional controls are in place and there is no complete exposure pathway for groundwater."* Vapor intrusion risk was evaluated for the South Post Groundwater OU and the Parking Lot 3 Groundwater during this five-year review. The evaluations used the revised trichloroethene (TCE) toxicity data and indicated that vapor intrusion posed no unacceptable risk. The vapor intrusion evaluation for the South Post Groundwater OU is presented in **Attachment 9**. The vapor intrusion evaluation for the Parking Lot 3 Groundwater is presented in **Attachment 10**.

11	Figure 6, Berry Avenue Groundwater Extraction System Capture Zone	"Capture zone analysis should be conducted in accordance with the EPA guidance document, A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems, dated January 2008. Please ensure that the capture zone analysis is consistent with this guidance document."	**A** The capture zone induced by the Berry Avenue Groundwater Extraction System (BAGES) was evaluated per the referenced EPA guidance and was documented in the Technical Memorandum that was finalized in April 2012.
MINOR COMMENTS			
Item	Reference	Comment	Action
1	Section 5.2, South Post Groundwater Operable Unit Remedy Optimization, Page 21	"A reference is not provided for the statement that "in June 2011, the Army was granted permission by the EPA to continue operation of the BAGES independent of the SPGES [South Post Groundwater Extraction System] as long as the groundwater TCE concentration does not exceed 50 ug/L [micrograms per liter]." Please reference the specific document, meeting, or other means by which this communication took place."	**A** The not to exceed groundwater TCE concentration of 50 µg/L was agreed upon during a stakeholder meeting held on June 2, 2011. The proceedings of the June 2011 stakeholder meeting were documented in meeting minutes. The last sentence of the fifth paragraph of Section 5.2 will be modified as follows, *"During the June 2011 stakeholder meeting, the Army was granted permission by the EPA to continue operation of the BAGES independent of the SPGES as long as the groundwater TCE concentration does not exceed 50 µg/L."*
2	Table 6-3, Interview Summary, Page 28	"The interview summary should include interview dates and locations. Please revise the table to include this information."	**A** **Table 6-3** will be revised to include date and method of interview.
3	Appendix 8, Table 2, Direct Comparison Between 1993 Toxicity Values and Current RSLs, Page 3	"The table heading indicates that Regional Screening Levels (RSLs) are being compared to toxicity values from 1993, but the table actually compares toxicity values from 1993 to those from 2011. Please revise the heading of the table to reflect its contents."	**A** The title of Table 2 in **Attachment 8** will be revised as follows, *"Table 2: Direct Comparison Between 1993 Toxicity Values and June 2011 RSLs."*

Review Comments

Project:	Sacramento Army Depot, Sacramento, California		
Document:	*Draft Fourth Five-Year Review Report*		
Contract:	W91ZLK-05-D-0011, Task Order 0003		
Reviewer:	**Thelma K. Estrada (EPA Region IX)**	Review Date: 25 April 2012	Date: 6 July 2012

Item	Reference	Comment	Action
1	General	"In several sections of the document, it is stated that there is a need to set out in decision document the final soil remediation levels for the South Post Burn Pits OU, the Oxidation Lagoons OU and Bldg 300 Burn Pit. If the soil remediation for these OUs are completed, why is there such a need? A related question to that would be if we did not have these soil remediation levels (or clean up levels for the soil) how did we determine that the Army was done with the soil remedies for these OUs?"	**A** Final Soil Remediation levels as detailed in the 1995 Basewide ROD were met for the South Post Burn Pits OU, Oxidation Lagoons OU, and the Building 300 Burn Pit; therefore language regarding establishment of final soil remediation levels in a ROD Amendment or ESD is unnecessary and will be removed.
2	Page 8, Table 3-2: Land Use Restrictions	"Which ones apply to the South Post Burn Pits OU? Is it the Stabilized Mass Covenant? Please make it clear. Further, what are the lead based paint covenants? To what OUs do these apply?"	**A** The LUCs included in **Table 3-2** for the "Stabilized Mass" apply to the South Post Burn Pits OU. The first column in the second row of **Table 3-2** will be modified as follows, *"Stabilized Mass Covenant (South Post Burn Pits OU / CAMU)."* The Lead-based Paint (LBP) Covenant does not apply to any of the OUs defined by the Decision Documents of the Depot. The LBP Covenant applied only to the Commander's Residence located southeast of the CAMU. The Commander's Residence was demolished in October 2010 and the debris was appropriately disposed off-site by a contractor for the City of Sacramento and the LBP Covenants no longer apply. Therefore, the third row of **Table 3-2** will be removed.
3	Page 14, Section 4.2.1	"There is a footnote that states that the RAO to prevent further migration of the VOC plume off site was not included in the 1995 Basewide ROD. Where did this RAO come from?	**A** The referenced Remedial Action Objective (RAO) was not formally included in the 1995 Basewide ROD. It was first mentioned as an RAO in the Second Five-Year Review Report that was finalized in December 2001. The footnote will be modified as follows, *"This RAO was not included in the 1995 Basewide ROD and was first mentioned in the Second Five-Year Review Report dated December 2001."*

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

4	Page 11 through 19, Remedial Action Discussion	"I suggest that at the end of the discussion for each of the OU, there should be a statement as to whether the RAOs have been met."	**A** A statement regarding whether or not RAOs have been met for the South Post Burn Pits OU is provided at the end of Section 4.1.3. The following text will be added to the end of Section 4.2.3, *"Remedial action operations continue at the South Post Groundwater OU as groundwater concentrations of TCE remain above the MCL of 5 µg/L."* The last paragraph of Section 4.3.3 will be modified as follows, *"Groundwater sampling results from the summer 2011 annual monitoring event indicate that only one monitoring well contains TCE above the MCL at Parking Lot 3. Monitoring well MW0073 reported a TCE concentration of 6.5 µg/L. Monitoring of residual contamination will continue at Parking Lot 3 pursuant to the amended Groundwater Monitoring Plan as the groundwater concentration of TCE remains above the MCL of 5 µg/L and RAOs have not been met."*
5	Page 18, paragraph beginning with "The Army…"	"There is a statement that "state regulatory agencies" agreed that resumption of groundwater extraction would not be an effective method. What about EPA?"	**A** The regulatory stakeholders, including the EPA, California Department of Toxic Substances Control, and California Central Valley Regional Water Quality Control Board, agreed that resumption of groundwater extraction at Parking Lot 3 would not be an effective method of obtaining the RAOs defined in the Basewide ROD. The second to last paragraph in Section 4.3.3 will be modified as follows, "*The Army verbally notified the project team that reactivating the groundwater system would not attain the RAOs in a cost effective manner. The project team agreed with this decision. In 2005, the regulatory stakeholders sent a letter to the Army requesting resumption of groundwater extraction, and indicated that a failure to do so constituted a violation of the ROD. The regulatory stakeholders moved away from this position during subsequent project team meetings, and agreed with the Army that resumption of groundwater extraction would not be an effective method for treating the residual groundwater contamination at Parking Lot 3."*
6	Page 39, Table 9-1, Issue 2	"To what OU does this apply? Please clarify."	**A** Issue 2 in **Table 9-1** applies to the South Post Groundwater OU. The 1st sentence in the 2nd column of the 2nd row in **Table 9-1** will be modified as follows, *"Continue groundwater treatment and monitoring at the South Post Groundwater OU."*

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

Review Comments

Project:	Sacramento Army Depot, Sacramento, California		
Document:	*Draft Fourth Five-Year Review Report*		
Contract:	W91ZLK-05-D-0011, Task Order 0003		
Reviewer:	**Monica L. McEaddy (EPA, Federal Facilities Restoration and Reuse Office)**	Review Date: 21 May 2012	Date: 6 July 2012

Item	Reference	Comment	Action
1	Summary Page	"On the summary page, it states that the remedy is protective but mentions actions needed to be taken so that the remedy remains protective in the long term. I am confused with the protectiveness statement and wonder if it should be a short term protectiveness statement."	**A** The protectiveness statements for the South Post Burn Pits OU, South Post Groundwater OU, and Parking Lot 3 Groundwater are modeled after the, "protective in the short-term" protectiveness statements in Exhibit 4-6 for sites where, "the remedial action … is operating or completed …" in the EPA's *Comprehensive Five-Year Review Guidance* dated June 2001. The protectiveness statement for the South Post Burn Pits OU on the Five-Year Review Summary Form on Page xiii and in Section 10 on Page 40 will be modified as follows, *"The remedy currently protects human health and the environment in the short-term because contaminated soil exceeding clean-up levels has been excavated, stabilized, and placed in a CAMU at SAAD. However, in order for the remedy to be protective in the long-term, the institutional controls must continue to be enforced and the physical integrity of the soil cover over the CAMU must be maintained."* The protectiveness statement for the South Post Groundwater OU on the Five-Year Review Summary Form on Page xiii and in Section 10 on Page 40 will be modified as follows, *"The remedy currently protects human health and the environment in the short-term because institutional controls prevent exposure to contamination remaining above the clean-up goals. In addition, the South Post Plume is currently under the influence of a groundwater extraction system, which is actively reducing contaminant concentrations and preventing further migration. However, in order for the remedy to be protective in the long-term, the institutional controls restricting groundwater use must continue to be enforced until clean-up goals are achieved."* The protectiveness statement for the Parking Lot 3 Groundwater on the Five-Year Review Summary Form on Page xiii and in Section 10 on Page 40 will be modified as follows, *"The remedy currently protects human health and the environment in the short-term because institutional controls prevent exposure to contamination remaining above the clean-up goals. However, in order for the remedy to be protective in the long-term, the institutional controls restricting groundwater use must continue to be enforced until clean-up goals are achieved."*

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

<table>
<tr><td>2</td><td>Summary Table</td><td>“I suggest adding a table the crosswalks between the OUs in CERCLIS and the Areas listed on the Summary table.”</td><td>A Table 1-1 on Page 2 of Section 1 will be modified, as follows:
<table><tr><th>Location</th><th>Remedial Status</th><th>CERCLIS OU ID</th></tr><tr><td>South Post Groundwater OU</td><td>Operation and Maintenance</td><td>1, 2[A]</td></tr><tr><td>South Post Burn Pits OU / CAMU</td><td>Operation and Maintenance</td><td>1, 5[A]</td></tr><tr><td>Parking Lot 3 Groundwater</td><td>Operation and Maintenance</td><td>1</td></tr><tr><td>Tank 2 OU</td><td>Remedial Action Complete / No Further Action</td><td>3[A]</td></tr><tr><td>Oxidation Lagoons OU</td><td>Remedial Action Complete / No Further Action</td><td>1, 4[A]</td></tr><tr><td>Building 300 Burn Pit</td><td>Remedial Action Complete / No Further Action</td><td>1</td></tr><tr><td>Battery Disposal Well IDW</td><td>Remedial Action Complete / No Further Action</td><td>1</td></tr></table>CERCLIS – Comprehensive Environmental Response, Compensation, and Liability Information System
A – Interim RODs were prepared and executed for these OUs prior to the completion of a Basewide ROD in 1995. The Basewide ROD incorporated all OUs and Areas of Concern where contamination remained such that unrestricted use was prohibited into OU 1. The Remedial Action Objectives (RAOs) of the Interim ROD prepared for OU 3 (Tank 2) were achieved and OU 3 was not incorporated into OU 1 in the Basewide ROD.</td></tr>
<tr><td>3</td><td>Issues and Recommendations Table</td><td>“For the issues and recommendations table, the implementing party should read the Army and for the milestone date, please specify the month, day and year that the recommendation will be implement.”</td><td>A The “Implementing Party” of the Issues/Recommendations section of the Five-Year Review Summary Form will be updated as requested.</td></tr>
<tr><td>4</td><td>Summary Table</td><td>“On the summary table, the author is the Army contact not the contractor.”</td><td>A The Author Name and Author Affiliation of the Five-Year Review Summary Form will be modified as follows, “Author Name: Andrew VanDyke” and “Author Affiliation: ACSIM ODB PM.”</td></tr>
<tr><td>5</td><td>Page 17, Section 4.3.2</td><td>“On page 17 under 4.3.2, the sentence is repeated again.”</td><td>A The duplicate sentence on Page 17 of Section 4.3.2, “Groundwater restrictions end upon determination by the Army and regulatory agencies that cleanup standards have been met,” will be deleted from the Report.</td></tr>
</table>

6	Attachment 6, Interview Responses	"Also, one comment is that the interviews did not include community member. It was stated that the RAB member was notified but I wonder if there could have been more of an effort to contact a community person. The Federal Workgroup is working on deliverables that will enhance community folks involvement in the five-year review process. We will be looking for Regional comments on several deliverables."	**A** Interview responses from the Restoration Advisory Board (RAB) Co-Chair (Dick Walker) were received and will be included in **Attachment 6** (Interview Responses). In addition, Ms. Melissa Anguiano, Economic Development Manager for the City of Sacramento, was interviewed and her responses were included in **Attachment 6**.

Review Comments				
Project:	Sacramento Army Depot, Sacramento, California			
Document:	*Draft Fourth Five-Year Review Report*			
Contract:	W91ZLK-05-D-0011, Task Order 0003			
Reviewer:	**Dianna Young (EPA, Federal Facilities Restoration and Reuse Office)**		Review Date: 21 May 2012	Date: 6 July 2012
Item	Reference	Comment	Action	
1	Page xi	"On page xi, the Triggering action date was September 24, 2007. On page 4 in the chronology table, it lists the last FYR as being done in April 2008. I don't understand the discrepancy."	**A** The date of the Third Five-Year Review Report in **Table 2-1** will be revised to September 2007.	
2	Attachment 6, Interview Responses	"To expand on Monica's comment about the interviews (and wearing my old CI hat): Most of the people interviewed were either DoD folks or regulators. Thus, it came across as having interviewed yourselves and finding that all was going well. I saw that the RAB co-chair could not be reached. Too bad there were no other community people interviewed."	**A** Interview responses from the RAB Co-Chair (Dick Walker) were received and will be included in **Attachment 6** (Interview Responses). In addition, Ms. Melissa Anguiano, Economic Development Manager for the City of Sacramento, was interviewed and her responses were included in **Attachment 6**.	

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

Review Comments

Project:	Sacramento Army Depot, Sacramento, California		
Document:	*Draft Fourth Five-Year Review Report*		
Contract:	W91ZLK-05-D-0011, Task Order 0003		
Reviewer:	**Theresa McGarry (CA DTSC)**	Review Date: 7 June 2012	Date: 6 July 2012

GENERAL COMMENTS

Item	Reference	Comment	Action
a.	General	"Plume Extent Figures: There are currently no plume figures included in the report. To demonstrate progress, as well as the current status, the Army needs to present plume extent figures for the A and B zone groundwater. We recommend these figures depict plume size reduction observed over the last five years in a side-by-side format. In support of this, the Army should calculate the plume size reduction in each zone in the last five years (and potentially since the remedy began) and present this information in the text. This will result in a more effective demonstration of progress and will better support protectiveness statements made by the Army."	**N** The Army does not believe that sufficient data is available to accurately calculate plume size in each aquifer zone for the purpose of determining plume size reduction over time. Instead, the Army will prepare figures which include TCE concentration data plotted over the last five-years (July 2007 through July 2011) for selected monitoring wells in both the South Post Groundwater OU and Parking Lot 3. These figures are designed to support the Army's protectiveness statements through the demonstration of declining site-wide TCE concentrations observed at the Depot. The last paragraph of Section 5.6 on Page 23 will be modified as follows, *"Declining site-wide TCE concentrations from July 2007 through July 2011 are graphically presented in **Figure 7**, **7A**, and **7B**. Monitoring wells representing Parking Lot 3 are presented in **Figure 7A** and monitoring wells representing the South Post Plume are presented in **Figure 7B**. In addition, recommendations from the last five-year review have been addressed where possible and appropriate as detailed in **Table 5-1**."* The Table of Contents will be updated to include **Figure 7** (Declining Site-Wide Trichloroethene Concentration July 2007 through July 2011), **Figure 7A** (Declining Site-Wide Trichloroethene Concentration July 2007 through July 2011 – Parking Lot 3), and **Figure 7B** (Declining Site-Wide Trichloroethene Concentration July 2007 through July 2011 – South Post Plume).

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

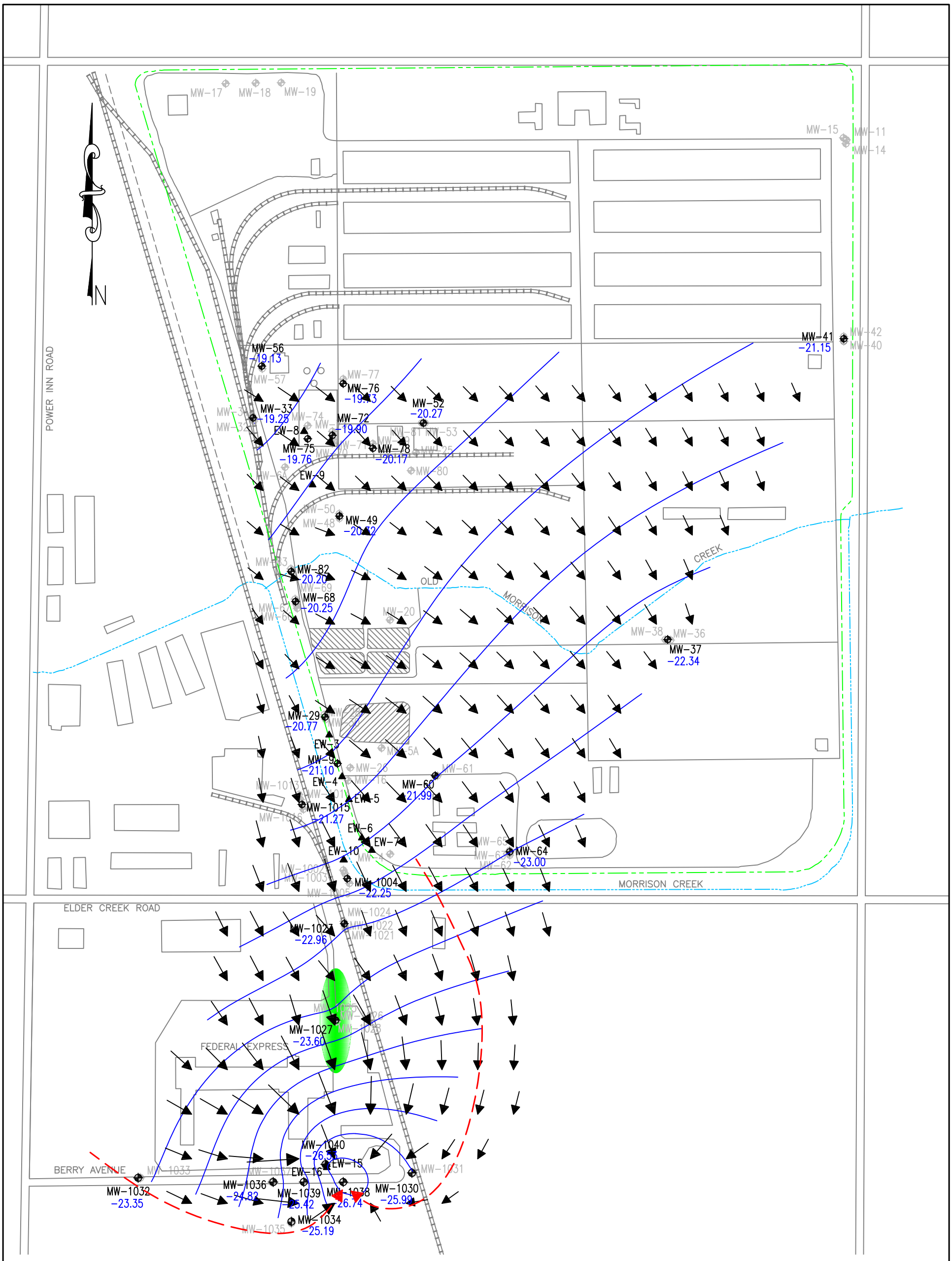
b.	General	"Please explain how the institutional controls for each area of concern (i.e. Parking Lot 3 and South Post Groundwater, stabilized mass and lead-based paint buildings) are being routinely monitored and reported to the regulatory agencies."	**A** The Army conducts periodic monitoring to confirm enforcement of the established ICs at the Depot and prepares a report which is provided to the DTSC on an annual basis. The lead-based paint LUCs associated with the Commander's Residence are no longer valid. The Commander's Residence was demolished in October 2010 and the debris was appropriately disposed off-site by a contractor for the City of Sacramento. Therefore, the lead-based paint LUCs will be removed from **Table 3-2**. The following text will be added following **Table 3-2** on Page 9 of Section 3.2, *"The Army routinely inspects the Depot to confirm that LUCs are enforced and that there are no activities or issues that may result in human exposure to contaminants associated with on-site groundwater and the CAMU. An annual report is submitted to the DTSC which summarizes results of the Army's routine LUC monitoring."*
SPECIFIC COMMENTS			
c.	Executive Summary, Page ix	"Executive summary, page ix: References to the number of wells above the MCL needs to be corrected in executive summary and main body of the report. There is more than one well with concentrations above the MCL for TCE and other constituents of concern."	**A** The review period for the preparation of the Fourth Five-Year Review Report extended from September 24, 2007 to February 6, 2012. The July 2011 annual sampling event data was therefore evaluated and presented in this Report. The data from that sampling event indicated that only four monitoring wells contained TCE in excess of the MCL; one monitoring well at Parking Lot 3 and three monitoring wells in the South Post Groundwater OU. The second to last paragraph on Page ix of the Executive Summary will be modified as follows, *"The soil remedies are complete with all stabilized soils consolidated within the CAMU. Groundwater extraction and treatment has ceased at Parking Lot 3. Groundwater monitoring at Parking Lot 3 continues with only one monitoring well slightly exceeding the Maximum Contaminant Level (MCL) for TCE at that location."*
d.	Executive Summary, Page x	"Executive summary, page x: Please delete the phrase "(soil vapor extraction)" because this is superfluous information in the section."	**A** The referenced text will be deleted from the Report.

e.	Figure 6	"Figure 6: If the above referenced figures are not generated, recipients of the five year review may erroneously view the ellipse shaped capture zone on Figure 6 to represent the plume. To rectify this, the Army should delete the ellipse and replace this with the current plume. To demonstrate capture of the B zone plume, a bounding flow line should be delineated along the west of the plume in addition to the eastern line currently shown. When complete, the revised figure will show a capture zone (as supported by data), versus a "target" capture zone which is neither a plume nor an empirically supported shape."	**A** The suggested revisions will be made to **Figure 6**.
f.	Attachment 6, Interview with DTSC, Page 3	"Attachment 6, Interview with DTSC, page 3: The word "quality" should change to "qualify" in the response provided by DTSC to question #7."	**A** The referenced text replacement will be made in **Attachment 6**.

Review Comments				
Project:	Sacramento Army Depot, Sacramento, California			
Document:	*Draft Fourth Five-Year Review Report*			
Contract:	W91ZLK-05-D-0011, Task Order 0003			
Reviewer:	**James Brownell (Central Valley Water Board)**		Review Date: 30 May 2012	Date: 6 July 2012
Item	Reference	Comment	Action	
1	General	"In October 2011, the USEPA published a revised assessment on the effects that TCE has on human health. Based upon acute exposure concerns, 2.6 micrograms per liter (µg/L) is now the appropriate health protective concentration for TCE in drinking water. The current groundwater remedy for the Depot requires the Army to cleanup TCE in groundwater to less than 5 µg/L, and once achieved, allows unrestricted groundwater use. However, unrestricted use of groundwater with TCE concentrations greater than 2.6 µg/L is no longer believed to be protective of human health. Therefore, the Report should include an explanation of the new toxicological data for TCE and address its effect on protectiveness of the remedy.	**A** The EPA's currently promulgated MCL for TCE is 5.0 µg/L. In the future, the EPA may decide to revise the current MCL in light of the new TCE toxicity data. If the MCL is revised by the EPA, then remedy protectiveness will be re-evaluated with respect to the agreed upon cleanup standards in the ROD. The last paragraph of Section 7.2.2 and Section 7.3.2 will be modified as follows, "*Reassessment of TCE toxicity was recently completed and new toxicity factors have been developed by the EPA. As a result, the MCL for TCE may be revised by the EPA in the future. If the MCL is revised by the EPA, remedy protectiveness will be re-evaluated with respect to the agreed upon cleanup standards in the ROD.*"	

Action Codes: A – Accepted/Concur N – Non-Concur D – Action Deferred W – Withdrawn

2	Section 4.2.2, 3rd Paragraph	"The third paragraph of the Report titled Section 4.2.2 Remedy Selection states the following: *"All required institutional controls agreed to by the Army, the State, and Federal regulators are monitored for compliance. In addition, there are also well permit requirements (governmental controls) that are overseen by the Sacramento County Environmental Management Department. Contaminant plume information is provided to the county by the state regulatory agencies and is used to regulate any off-site drilling or water production in this area. Groundwater restrictions end upon determination by the Army and regulatory agencies that clean-up standards have been met."* The Army must describe the required institutional controls discussed in Section 4.2.2 of the Report in more detail. It must be clear that the Army and the regulatory agencies have formalized these controls in such a way that well drillers cannot install water supply wells without review by governmental personnel with knowledge of the Depot's groundwater contaminant plumes. In addition, the institutional controls must be updated to address the USEPA revised human health assessment for TCE described in Comment 1, above."	**N and A** The Sacramento County Environmental Management Department (SCEMD) is responsible for the installation and permitting of all groundwater wells within Sacramento County where the Depot is located. The SCEMD is provided with groundwater contaminant plume maps associated with the Depot by the Central Valley Regional Water Quality Control Board on an annual basis. The SCEMD utilizes the provided plume maps to prevent installation of water supply wells within the contaminant plumes during the well installation and permitting process. These details were confirmed with the SCEMD by the Army in June 2012. The following information will be added to the text to clarify what ICs are required and in place at the Depot. Section 4.2., Paragraph 3 will be amended as follows: *"All required institutional controls agreed to by the Army, the State, and Federal regulators are monitored for compliance as outlined in Section 3.2 and **Table 3.2**."*



LEGEND

MW-1035	GROUNDWATER MONITORING WELL LOCATION - AQUIFER ZONE A
MW-1034	GROUNDWATER MONITORING WELL LOCATION IN THE B, C, or D AQUIFER
EW-7	GROUNDWATER EXTRACTION WELL LOCATION
-23'	GROUNDWATER ELEVATION CONTOUR (Mean Sea Level ~ feet)
-26.40	GROUNDWATER ELEVATION (Mean Sea Level ~ feet)
	BOUNDING GROUNDWATER FLOW LINE
	SOUTH POST PLUME (TRICHLOROETHENE IN EXCESS OF THE MAXIMUM CONTAMINANT LEVEL)

600' 0' 300' 600'

SCALE: 1 inch = 600 ft.

Note: Water level data used to generate this contour map were collected on April 7, 2011.

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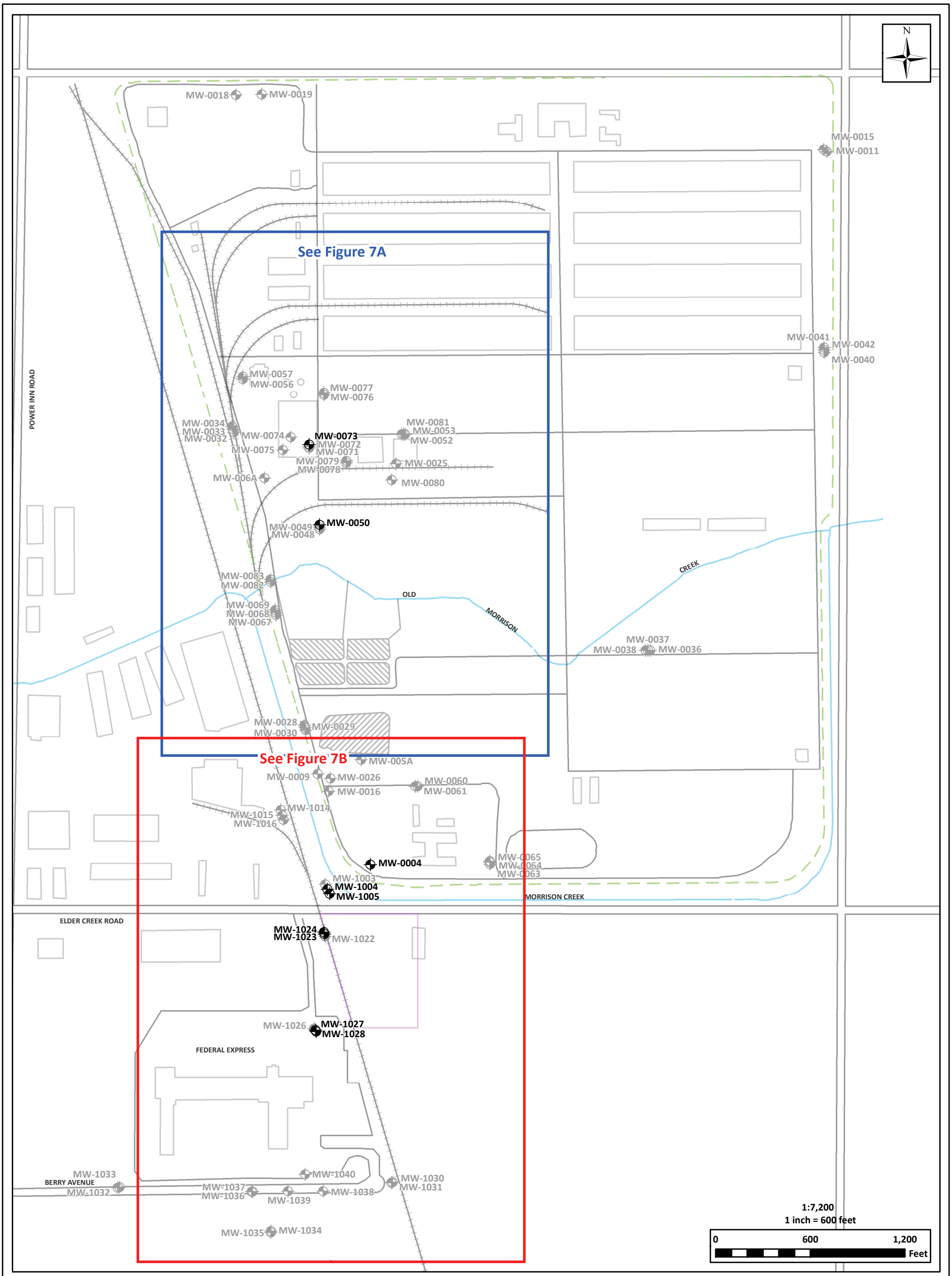
Project No.:	8119-3CD
Date:	05-17-12
Filename:	Figure6*.dwg

BERRY AVENUE GROUNDWATER EXTRACTION SYSTEM CAPTURE ZONE

FORMER SACRAMENTO ARMY DEPOT
SACRAMENTO, CALIFORNIA

FIGURE

6



Map Key:

- Groundwater Monitoring Wells
- Depot Boundary
- Railroad
- Creek

Abbreviation Key:
µg/L: micrograms per liter

Declining Site-Wide Trichloroethene Concentration July 2007 through July 2011

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Figure 7

Former Sacramento Army Depot Sacramento, California

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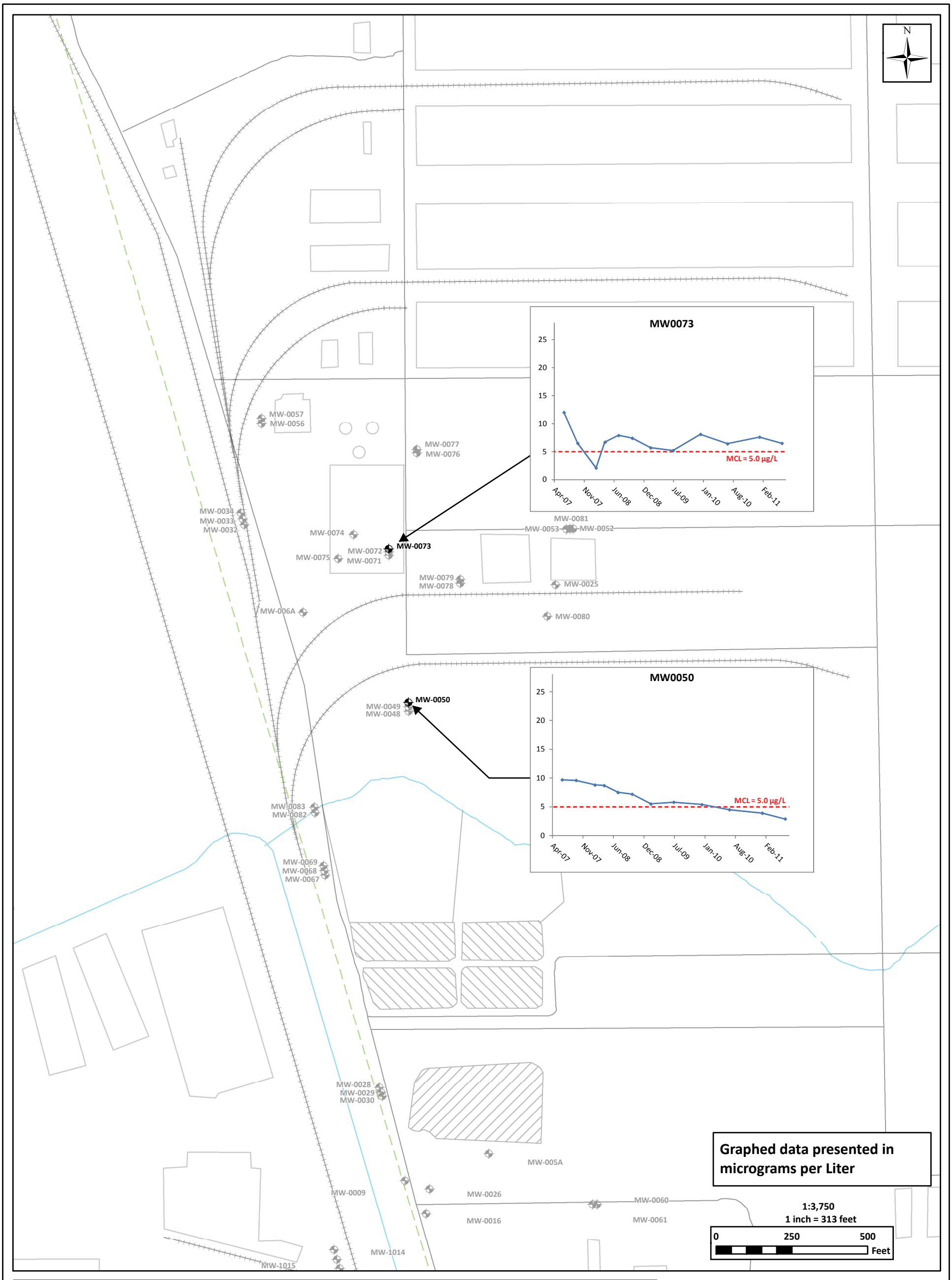

Map Key:

- Groundwater Monitoring Wells
- Depot Boundary
- Railroad
- Creek

Declining Site-Wide Trichloroethene Concentration July 2007 through July 2011 Parking Lot 3

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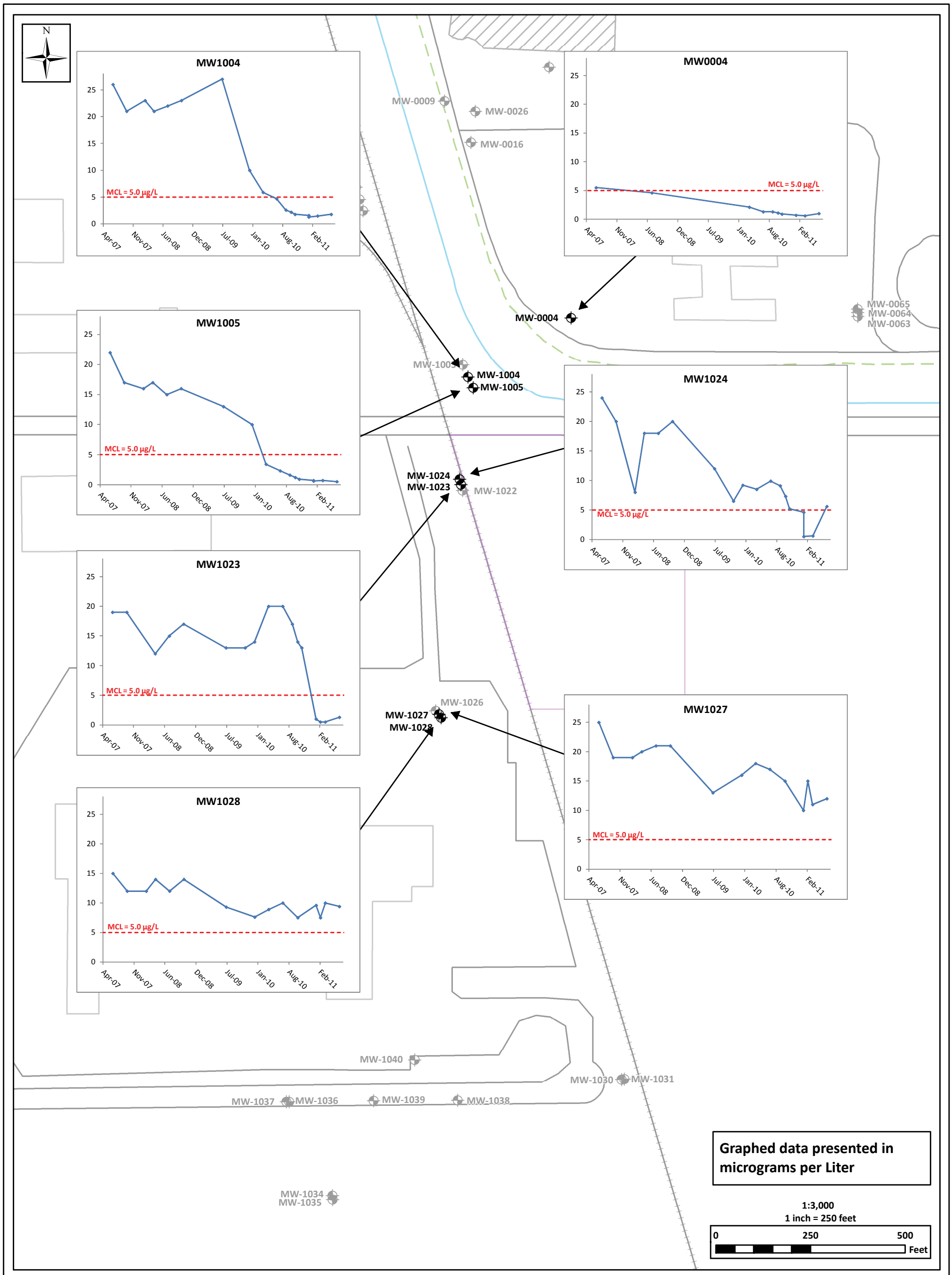
Figure 7A

Former Sacramento Army Depot Sacramento, California



Map Key:

- Groundwater Monitoring Wells
- Depot Boundary
- Railroad
- Creek

Declining Site-Wide Trichloroethene Concentration July 2007 through July 2011 South Post Plume

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Figure 7B

Former Sacramento Army Depot Sacramento, California

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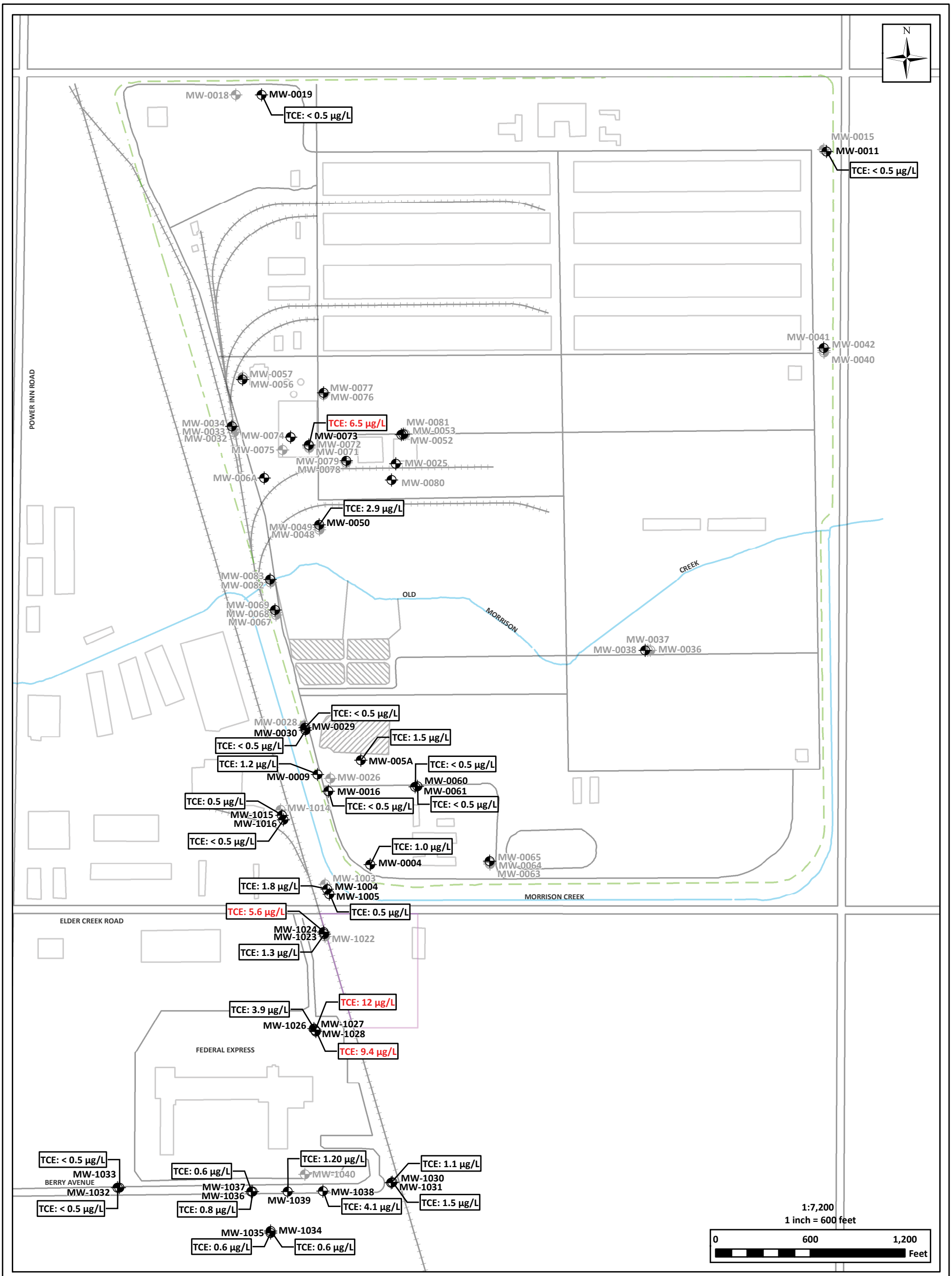

Map Key:

- Groundwater Monitoring Wells Sampled During the July 2011 Event
- Depot Boundary
- Railroad
- Creek

Abbreviation Key:
TCE: Trichloroethene
µg/L: micrograms per liter

Trichloroethene Concentration Map July 2011 Annual Sampling Event

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Figure 8

Former Sacramento Army Depot Sacramento, California

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