FIVE-YEAR REVIEW REPORT

THIRD FIVE YEAR REVIEW REPORT for

MGM BRAKES SUPERFUND SITE

CLOVERDALE, SONOMA COUNTY, CALIFORNIA

September 2013

Prepared by
U.S. Army Corps of Engineers, Seattle District
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Executive Summary

This is the third Five-Year Review of the MGM Brakes Superfund Site (Site) located in Cloverdale, California. The purpose of this Five-Year Review is to evaluate the implementation and performance of the remedy and determine if it continues to be protective of human health and the environment. The triggering action for this Five-Year Review (FYR) was the signing of the previous FYR on August 20, 2008.

The Site is located at the southern corner of the intersection of South Cloverdale Boulevard and Santana Drive in Cloverdale, Sonoma County, California. The MGM Brakes facility manufactured and cast aluminum brake components for large vehicles between 1965 and 1982. Wastewater containing polychlorinated biphenyls (PCBs) was discharged into the field south of the plant from 1965 to 1972. From 1972 until 1981, the use of ethylene glycol on the Site caused PCBs already in the soil to travel over a wide area both horizontally and vertically. Groundwater was subsequently found to be contaminated with dissolved volatile organic compounds (VOCs), especially trichloroethylene (TCE), although a source area was never located.

The 1988 Record of Decision selected removal of soil contaminated with PCBs in excess of 10 milligrams per kilogram (mg/kg) and characterization of VOCs in groundwater. An Explanation of Significant Differences (ESD) was published in 1995 that revised the soils remedy to allow PCB-contaminated soil deeper than 15 feet to be left in place, at concentrations less than 100 mg/kg. The ESD selected monitored natural attenuation as the remedy for groundwater, which was to include periodic groundwater sampling, analysis, and evaluation. The need for the ESD was based on the difficulty in removing soil when bedrock was encountered below 15 feet and the results of additional groundwater investigations.

There are no known site issues that, either currently or in the future, prevent the remedial action from being protective. Groundwater contamination is below maximum contaminant levels (MCLs) for all contaminants of concern. Residual PCB soil contamination in site soils up to 26 feet below ground surface (bgs) feet bgs are within the protective risk range for residential use and deeper than 26 feet are at levels that are protective for commercial/industrial scenarios. The residual PCB concentrations are at depths that would prevent exposures under reasonable re-use scenarios.

The remedy at the MGM Brakes Superfund Site is protective of human health and the environment because all exposure pathways have been eliminated.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: MGM Brakes Superfund Site		
EPA ID: CERCLIS ID #: CAD000074120		
Region: 9	**State:** CA	**City/County:** Cloverdale/Sonoma

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:**
Author name: Cynthia Wetmore
Author affiliation: Five Year Review Coordinator
Review period: November 2012 – May 2013
Date of site inspection: January 16, 2013
Type of review: Policy
Review number: 3
Triggering action date: August 20, 2008
Due date *(five years after triggering action date)* August 20, 2013

Five-Year Review Summary Form (continued)

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
Both soil and groundwater components of the OU				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): None	**Issue Category:** No Issue			
	Issue: None			
	Recommendation: None			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
N/A	N/A	N/A	N/A	N/A

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Addendum Due Date (if applicable):* N/A
Protectiveness Statement: The remedy at the MGM Brakes Superfund Site is protective of human health and the environment.	

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List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
Cis-1,2-DCE	cis-1,2-Dichloroethylene
COC	Contaminants of Concern
1,4-DCB	1,4-Dichlorobenzene
1,1-DCE	1,1-Dichloroethylene
DTSC	California Department of Toxic Substances Control
EKI	Erler & Kalinowski, Inc.
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
ft/ft	Feet per foot
FYR	Five-Year Review
HRA	Health Risk Assessment
ICs	Institutional Controls
IRIS	Integrated Risk Information System
MCLs	Maximum Contaminant Levels
mg/kg	Milligrams per Kilogram
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCB	Polychlorinated Biphenyl
RA	Remedial Actions
RAO	Remedial Action Objectives
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RSL	Regional Screening Level
RWQCB	State of California North Coast Regional Water Quality Control Board
SVOCs	Semivolatile Organic Compounds
TCA	1,1,1-trichloroethane
TCE	Trichloroethylene
TSCA	Toxic Substances Control Act
µg/L	Micrograms per Liter
USACE	United States Army Corps of Engineers
VOCs	Volatile Organic Compound

Third Five-Year Review Report
for
MGM Brakes Superfund Site

1. **Introduction**

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 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."*

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which 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 actions no less often than every five years after the initiation of the selected remedial action*."

EPA Region 9 and U.S. Army Corps of Engineers (USACE) conducted the FYR and prepared this report regarding the remedy implemented at the MGM Brakes Superfund Site (Site) in Cloverdale, Sonoma County, California. EPA is the lead agency for developing and implementing the remedy for the Site. The California North Coast Regional Water Quality Control Board as the support agency representing the State of California, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the third FYR for the MGM Brakes Superfund Site. The triggering action for this review is the previous FYR dated August 20, 2008.

The Site consists of one Operable Unit (OU) that includes soil and groundwater contamination. The remedy for soil consisted of soil removal and institutional controls (ICs). The remedy for groundwater consisted of monitored natural attenuation. All remedial actions(RAs) have been completed. This FYR addresses soil and groundwater at the MGM Brakes Site.

2. Site Chronology

Table 1 lists the dates of important events for the MGM Brakes Superfund Site.

Table 1. Chronology of Site Events

Event	Date
The MGM Brakes facility manufactured and cast aluminum brake components.	1965-1982
PCB contamination in on-site soils is confirmed by the IT Corporation.	Sept 1981
The Site is placed on National Priorities List (NPL).	Sept 1983
Multiple remedial contractors working for the Potentially Responsible Parties (PRPs) conduct several phases of soil, surface water, and groundwater investigation and characterization at the Site and the surrounding property.	Nov 1981 – Oct 1984
The Feasibility Study (FS) is issued.	Sept 1986
The revised FS (conducted to meet new Superfund Amendments Reauthorization Act) is issued.	April 1988
The Proposed Plan is completed.	May 1988
The Record of Decision (ROD) for the cleanup of soil and groundwater at the Site is completed.	Sept 1988
The casting plant building demolition begins.	April 1992
Soil excavation work begins at the Site.	Feb 1993
The Human Health Risk Assessment for PCBs in soil is issued.	April 1994
Preliminary Close-out Report	September 9, 1994
Quarterly groundwater monitoring of on- and off-site wells is conducted.	Sept 1994 – Mar 1998
The Final VOC Groundwater Monitoring Plan is completed.	April 1995
The Voluntary Covenant and Agreement to restrict use of MGM Brakes property is recorded.	July 1995
The Explanation of Significant Differences (ESD) modifying the 1988 ROD by leaving certain deep PCB-contaminated soils in place, imposing land-use restrictions, and identifying natural attenuation as the	August 1995

Event	Date
groundwater cleanup option is completed.	
EPA issues certificate of completion for demolition and excavation work.	March 1998
EPA agrees to amend the 1995 Final VOC Groundwater Monitoring Plan to terminate analysis of pesticides and semivolatile organic compounds (SVOCs) and to reduce sampling frequency from quarterly to semi-annually.	Mar 1998
EPA agrees to allow for termination of analysis for PCBs in groundwater.	August 1999
The First Five-Year Review is completed.	Sept 2003
Ready for Re-Use Determination is jointly issued by EPA and California Department of Toxic Substances Control (DTSC).	Feb 2005
Following EPA and State of California North Coast Regional Water Quality Control Board (RWQCB) agreement, nine wells (all but B-50 and B-73) are abandoned.	Oct 2007
The Second Five-Year Review is completed.	July 2008

3. Background

3.1. Physical Characteristics

The MGM Brakes Superfund Site is an approximately 5-acre tract of land located in Sonoma County, in the southern portion of the City of Cloverdale, California (Figure 1). Cloverdale is located in the Alexander Valley, 80 miles north of San Francisco and within the North Coast Ranges. The entrance to the Site is located at the southern corner of the intersection of Santana Drive (formerly Donovan Road) and South Cloverdale Boulevard (Figure 2).

The Site is located less than one mile west of the Russian River but is not within the river's 100-year flood zone. The Site is topographically flat and vegetated with grass except for the northeastern corner, which is covered by an asphalt pad that once served as a parking lot. Two concrete-lined drainage ditches exist just inside the eastern and southeastern perimeter fence line. Adjacent property consists mainly of multi-unit residential buildings, office buildings, a hotel, fueling stations, and convenience stores.

Figure 1. Site Location Map

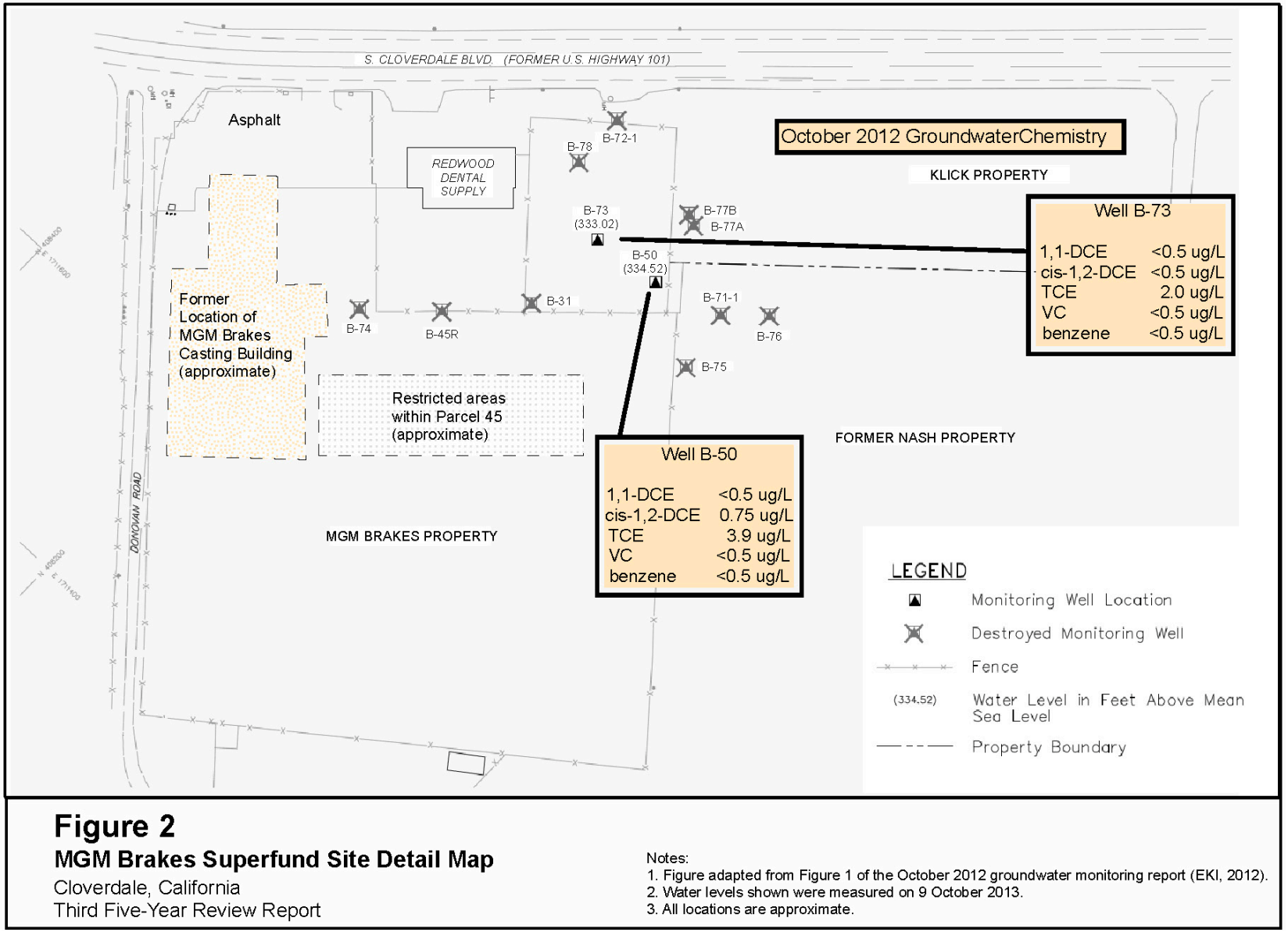

Figure 2
MGM Brakes Superfund Site Detail Map
Cloverdale, California
Third Five-Year Review Report

Notes:
1. Figure adapted from Figure 1 of the October 2012 groundwater monitoring report (EKI, 2012).
2. Water levels shown were measured on 9 October 2013.
3. All locations are approximate.

Figure 2. Site Detail Map

3.2. Hydrogeology

The Site is situated in the northwest-trending California Northern Coast Ranges. These mountains consist of a complex assemblage of igneous, metamorphic, and sedimentary rocks. The Franciscan Formation is the oldest and most extensive unit in the Northern Coast Ranges. The Franciscan Formation is characteristically fractured and deformed due to intense folding and faulting. The dark grey siltstone bedrock that underlies the unconsolidated sediments at the Site is believed to belong to the Franciscan Formation (EKI 1995).

The local geology in the vicinity of the Site has been investigated using both a seismic reflection survey and numerous soil borings (USEPA 1988). The data gathered from the investigations identified dark gray, siltstone bedrock underlying the Site. The sediments consist primarily of sandy, silty clay that contains lenses of clayey, gravely sand and sandy, clayey silt. The lenses are believed to be discontinuous. Sediment thickness varies from approximately 2 feet to 25 feet (EKI 1995).

Depths to the top of the water table at the Site fluctuate seasonally and are generally higher in the winter months. Since 2007, the depth to groundwater in the two existing wells on the Site ranged from 3 feet below ground surface (bgs) to 15 feet bgs, during the wet and dry seasons respectively. The dominant groundwater flow direction is to the southeast and the hydraulic gradient magnitude averages 0.012 ft/ft and is slightly greater during the spring months.

The site characterization data taken around the time of the record of decision (ROD) confirms that the dominant groundwater flow direction is to the southeast (EKI 1995). However, given that only two wells remain on the Site, a recent site-specific hydraulic gradient is unavailable.

Surface water is drained by two concrete-lined ditches following the eastern and southeastern perimeter fence lines, and by an unlined ditch paralleling South Cloverdale Boulevard. All three ditches channel surface water away from the Site to the southeast to the nearest surface water body (approximately 2,100 feet), Icaria Creek, which ultimately discharges to the Russian River.

3.3. Land and Resource Use

Prior to 1961, 22 acres of land, including the 5 acres which comprise the MGM Brakes Superfund Site, served as an American Indian reservation. From 1965 until operations ceased on site in 1982, the MGM Brakes facility manufactured and cast aluminum brake components for large motor vehicles. Prominent features of the facility included a casting plant building, seven above-ground storage tanks, a cooling tower, and a storage shed.

All buildings and related appurtenances were removed from the Site as part of the remedial action. A Voluntary Covenant and Agreement was recorded in Sonoma County on July 12, 1995 to restrict use of those portions of the Site where contaminated soil was left in place. The MGM Brakes property is completely enclosed by a chain link fence and is accessed by one of two gates. The Site boundary is defined as the extent to which groundwater contamination reached; the Site boundary thus extends beyond the fenced MGM Brakes property onto an adjacent vacant lot. The MGM Brakes property continues to be vacant. The shallow aquifer underlying the Site is not used as a public drinking water source. The South Cloverdale Water Company provides drinking water from two wells located one-

half to three-quarters of a mile upgradient and to the east of the Site. The municipal wells are reportedly screened in a deeper aquifer. The water from these wells is treated by chlorination and serves homes near the Site. No downgradient water supply wells have been identified.

3.4. History of Contamination

When the MGM Brakes facility was in operation, hydraulic fluids containing PCBs were reportedly used in the casting machines between 1965 and 1972. These hydraulic fluids leaked from the casting machines in the normal course of plant operations and then collected, together with water used to cool the dies between castings, in floor drains. Following gravity separation of oils and grease, the wastewater containing PCBs was discharged to the ground adjacent to the casting plant via a drain line. The use of hydraulic fluid containing PCBs was reportedly discontinued by 1973, but wastewater containing ethylene glycol (the hydraulic fluid later used in the casting machines) continued to be discharged in the same manner until 1981. The practice of discharging wastewater onto the vacant land surrounding (mostly to the south) the casting building is believed to be the main cause of contamination at the Site. The location of the former MGM Brakes casting building with respect to other site features is shown in Figure 2.

In response to a citizen complaint, the State of California North Coast Regional Water Quality Control Board (RWQCB) and the California Department of Fish and Game conducted a site inspection of the property on August 11, 1981. During the inspection, they noted the presence of oily soil. In response to these observations, MGM Brakes personnel dug up the soil and stockpiled it on site. Samples related to the disposal process indicated the soil was contaminated with PCBs. In response to these findings, contractors for MGM Brakes conducted additional studies from 1981 to 1983. PCB contamination was detected in surface water runoff, surface and subsurface soils, and inside the casting plant building. Although groundwater was tested at the same time, PCBs were not detected. In 1986, volatile organic compounds (VOCs) were detected in groundwater at the southeast property boundary and on portions of adjacent properties to the south and southeast of the Site. The source of the VOCs in groundwater was never identified.

3.5. Initial Response

In November 1981, the State of California (State) issued a Cleanup and Abatement Order (No. 81-216) which required MGM Brakes to cease discharge of contaminated wastewater and remove oily soil from the property. In the fall of 1981, the stockpiled soil was transported to the Casmalia hazardous waste disposal facility in Santa Barbara County. In addition, the order required submittal and implementation of a RA plan and groundwater monitoring for the presence of PCBs. Soil, surface water, and groundwater samples were collected and a seismic refraction study was completed in 1982. A Remedial Action plan was submitted to the State in April 1982. In response to the State's comments, subsequent actions to support the development of the Remedial Action plan included: additional groundwater monitoring, collection of soil samples, installation of surface water runoff collection systems, initiation of a study to determine whether the spread of PCB contamination was caused by the presence of solvents in soil, and cleanup of the interior of the MGM Brakes casting plant.

The Site was proposed for the National Priorities List (NPL) on December 30, 1982 and was officially included on the NPL in September 1983. At that time, EPA assumed lead responsibility for oversight of the site investigation, characterization, and cleanup activities.

The EPA conducted limited field investigations during the course of evaluating remedial alternatives. The original Feasibility Study (FS) was initiated in 1985 and released in 1986. The original FS identified incineration as the EPA's preferred alternative for removing contaminants of concern (COC). Due to strong opposition to incineration, as well as other comments submitted during the public comment period, EPA decided to prepare a revised FS. In May 1988, EPA released the revised FS which evaluated a list of alternatives including capping, excavation and on-site fixation, in-situ fixation, on-site incineration, and excavation and off-site disposal. The preferred remedy as stated in the May 1988 Proposed Plan was excavation and off-site disposal of COCs. No adverse comments were received during the public comment period regarding this remedy.

3.6. Basis for Taking Action

The primary COCs for the Site are PCBs in soil and VOCs in groundwater. Although the ROD does not specifically list VOC COCs, the following VOCs were identified in the groundwater at concentrations exceeding Maximum Contamination Levels (MCLs) at the time of the ROD:

- Benzene
- Trichloroethene (TCE)
- Vinyl chloride

Other VOCs detected at the site at concentrations below their respective MCLs at the time of the ROD included cis-1,2-dichloroethene (cis-1,2-DCE), chlorobenzene, 1,4-dichlorobenzene (1,4-DCB), 1,1-dichloroethene (1,1-DCE), 1,1,1-trichloroethane (TCA).

The presence of these contaminants in surface and subsurface soils as well as in the groundwater provided the basis for taking action under CERCLA. The release of hazardous substances into the environment at the Site posed, or potentially posed, a threat to human health and the environment via inhalation, ingestion, and direct contact.

Surface and subsurface soils contained PCBs at concentrations up to 4,800 milligrams per kilogram (mg/kg). The concrete slab of the casting plant was contaminated with concentrations of PCBs up to 5,400 mg/kg. These values far exceeded the 10 mg/kg level that EPA established in 1988 as the national cleanup level for PCBs in non-restricted residential soils.

In 1986, VOCs were first detected in groundwater with concentrations ranging up to 190 micrograms per liter (µg/l). The detected VOCs were benzene, chlorobenzene, cis-1,2-DCE, 1,4-DCB, 1,1-DCE, TCA, TCE, and vinyl chloride. While 1,1-DCE is a probable human carcinogen, TCE, vinyl chloride and benzene are known human carcinogens. The benzene, TCE, and vinyl chloride concentrations exceeded their respective MCLs at the time of the 1988 ROD. The MCLs for benzene, TCE, and vinyl chloride are 5, 5, and 2 µg/l, respectively. When the 1995 ESD was published, TCE was the only contaminant which remained above its MCL.

4. Remedial Actions

4.1. Remedy Selection

The ROD for the Site was signed September 29, 1988 and addressed soil and groundwater as one site-wide operable unit (OU). The groundwater portion of the remedy addressed contamination to the Site boundary which included a vacant lot adjacent to the MGM Brakes property. The lot is located to the southeast of the Redwood Dental Supply building as shown in Figure 2.
The soil remedy was addressed by two separate parcels as follows:

- Parcel 1: PCB-contaminated soil exclusive of that beneath the MGM Brakes casting plant and corresponding concrete slab of the building.
- Parcel 2: Contaminated soil and concrete beneath the casting plant building.

The ROD stated that the original selected remedy for soil was removal and offsite disposal of all soil exceeding a PCB concentration of 10 mg/kg. This selected remedy was intended to reduce the present and future on site risk to human health and the environment to 1 $x10^{-5}$ (1 in 100,000) cancer risk and provide unrestricted future use of the property. Soon after soil excavation began in 1993, it became evident that not all PCB-contaminated soil could be excavated due to the shallow presence and nature of bedrock below portions of the Site. The 1995 ESD altered the soil remedy to allow for some PCB contaminated soils less than 100 mg/kg, and at least 15 feet bgs, to remain on-site and imposed land-use restrictions for those contaminated soil areas (Figure 2). A Voluntary Covenant and Agreement to restrict land use was recorded in Sonoma County on July 12, 1995 prior to the issuance of the ESD in July 1995.

The ROD directed further investigation of the VOC contaminated groundwater in order to adequately characterize and then restore groundwater located within the Site boundary to appropriate MCLs (EPA 1988, CH_2MHILL 2003). Further evaluation of VOC groundwater contamination (up to 1995) demonstrated that VOC concentrations, which were relatively low initially, were declining naturally over time and that the extent of the contaminated plume was small (approximately 600 feet by 100 feet). The cost of natural attenuation was estimated at half the cost of the other treatment options evaluated. The ESD therefore selected natural attenuation as the groundwater remedy and defined the leading edge of the groundwater VOC plume as the point of compliance. The point of compliance is to be used to ensure that contaminants do not move beyond this point at concentrations greater than MCLs (EPA 1995, CH_2MHill 2003). The ESD requires that quarterly monitoring will continue until levels are at or below the MCLs for six consecutive quarters, followed by annual monitoring showing levels at or below MCLs for five consecutive years to confirm that MCLs have been achieved inside the point of compliance. Monitoring requirements were later reduced from quarterly to semi-annually as discussed in Section 4.2.

4.2. Remedy Implementation

The following section describes the RAs implemented in compliance with the ROD, Consent Decree, and ESD pertaining to contaminated soils and groundwater. The soil remedy was divided into two parts: demolition work and excavation work.

Demolition of the casting plant building and associated structures was necessary to completely access the contaminated concrete slab and soil beneath the slab. Building demolition, excluding the concrete slabs, was completed by May 1992. Building debris was found to be contaminated with hazardous levels of PCBs and was transported off site to Kettleman Hills Class I Landfill for disposal. In September 1992, the concrete building floor slab was covered with a temporary cap.

The excavation work began in June 1993 with the demolition and removal of the concrete floor slab. The excavation work was performed to remove and dispose PCB-contaminated soil from both Parcel 1 and Parcel 2. The surface soil excavation area was defined by site investigation and characterization data collected previously. The excavation was implemented by removing onsite surface soil (defined as the uppermost 10 inches) that exceeded 1 mg/kg PCB. The surface soils beyond the bounds of the excavation were then sampled. Any surface soil that exceeded the 1 mg/kg PCB goal but was less than 10 mg/kg PCBs was excavated and stockpiled. The exposed subsurface soil (greater than 10 inches below ground surface) was sampled and if the 10 mg/kg PCB goal was exceeded, an additional 2 feet of soil was removed and the area was resampled. This procedure was repeated until the subsurface soil concentration was less than 10 mg/kg. All excavated soil that exceeded 10 mg/kg was transported to an off-site disposal area. The maximum excavation depth was 40 feet. The stockpiled surface soil (<10 mg/kg) was placed in the deepest portion of the excavation prior to backfilling the area with clean imported fill material.

Prior to subsurface soil excavation, it was necessary to dewater the Site in the area proposed for deeper excavations. Twenty-seven well points were installed and connected to an extraction system to transfer groundwater to an on-site treatment plant which utilized granular activated carbon as the treatment method. Dewatering occurred between April and October 1993; lowering the water table approximately 30 feet below the ground surface.

While conducting the excavation, bedrock was encountered at some locations. Due to difficulties in excavating bedrock and soil at the bedrock interface, it was proposed to leave this material in place if it met the following conditions: 1) contained less than 100 mg/kg PCBs, and 2) was at least 15 feet bgs. As a result, the remedial goal of 10 mg/kg for PCBs in soil was not met in 12 of the 900 grid squares (12.5 ft by 12.5 ft). Eleven of the 12 confirmation samples exceeding 10 mg/kg were deeper than 26 feet below the surface. The highest concentration remaining was 87.8 mg/kg at a depth of 36 feet below surface. These grid squares are noted in the Voluntary Covenant and Agreement that documents the restricted use of the property. The approximate location of the restricted area is shown on Figure 2 of this report.

Excavated soil containing greater than 10 mg/kg PCBs and debris were removed daily from the Site and disposed of at facilities appropriate for the material. The well points used for dewatering were abandoned in accordance with applicable regulatory requirements. All excavation field work was completed by June 1994.

In March 1998, the EPA provided a Certificate of Completion for the demolition and excavation work, which documents EPA's concurrence that all portions of the RA for soil were completed in accordance with the ROD and the Consent Decree.

According to the ROD, the groundwater RA included activities to locate the source of VOCs, installation of additional wells to evaluate the extent of VOC contamination and groundwater monitoring. Despite attempts to locate the source of VOC contamination in the groundwater, no source was identified. The ESD selected natural attenuation as the groundwater remedy and defined a point of compliance to ensure contaminants did not move beyond this area at concentrations above MCLs.

The initial groundwater RA was quarterly monitoring for VOCs and annual monitoring for semivolatile organic compounds (SVOCs) and PCBs in 12 monitoring wells (EKI 1995). Based on approvals given by EPA in 1998 and 1999 to the remedial contractor, requirements for groundwater monitoring were significantly reduced as follows:

- Discontinued analysis of SVOCs and PCBs due to sustained measurements less than the respective detection limits,
- Termination of sampling at upgradient well B-74,
- Reduction of sampling frequency from quarterly to semi-annually (April and October),
- Termination of sampling for VOCs in all wells experiencing non-detectable concentrations of VOCs, and
- Abandonment of all wells experiencing non-detectable concentrations of VOCs.

In 2005, EPA and DTSC jointly issued a Ready for Reuse determination for the Site. The determination found that three parcels of land that comprise the Site were ready for commercial use and that the Site's remedy will remain protective of human health and the environment, subject to the operation and maintenance of the remedy and limitations outlined in the ROD, ESD, and Covenant.

In 2007, EPA and the RWQCB jointly approved the abandonment of nine additional wells at the Site (RWQCB 2007). Currently, the groundwater monitoring program includes just the two remaining wells, B-50 and B-73, to be analyzed for VOCs on a semi-annual basis.

4.3. Operation and Maintenance (O&M)

Groundwater samples are collected semi-annually at the Site from wells B-50 and B-73 A peristaltic pump is used and the purge rate is approximately 100 to 200 mL/min. The low-flow sampling method is standard practice.

Current annual O&M costs are unavailable. Costs include groundwater monitoring well sampling, analysis, data validation, and reporting. The ESD originally estimated O&M costs to be $385,000 over seven years ($55,000 per year in 1994 dollars without adjustment for inflation or then-present worth discounting). That estimate assumed quarterly monitoring of 11 wells for VOCs, SVOCs, pesticides, and PCBs. The scope for monitoring has been significantly reduced as a result of decreasing concentrations .

O&M Costs for mowing, groundwater sample collection and analysis, groundwater purge water disposal, and reporting is about $15,000 per year.

5. Progress since the Last Five-Year Review

5.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the 2008 FYR for the MGM Brakes Site stated the following:

> *The remedy at the MGM Brakes Site is considered protective of human health and the environment because all exposure pathways have been eliminated or controlled.*

The 2008 FYR did not identify any issues or recommendations for the Site.

5.2. Work Completed at the Site during this Five Year Review Period

Since the 2008 FYR, semi-annual monitoring at the two remaining wells (B-50 and B-73) have continued. Groundwater monitoring has been the only work activity completed at the Site.

6. Five-Year Review Process

6.1. Administrative Components

EPA Region 9 initiated the FYR in September 2012 and scheduled its completion for September 2013. The EPA review team was led by Cynthia Wetmore, EPA, and consisted of personnel from USACE, Seattle District, including Deborah Johnston (biologist), Heather Whitney (chemist), Diane Jordan (real estate specialist), and Richard Garrison (geologist). In October 2012, EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. A review schedule was established that consisted of the following:

- Community notification;
- Document review;
- Data collection and review;
- Site inspection;

- Local interviews; and
- Five-Year Review Report development and review.

6.2. Community Involvement

On January 16, 2013, a public notice was published in the *Cloverdale Reveille* announcing the commencement of the FYR process for the MGM Brakes Superfund Site, identifying Vicki Rosen as the EPA point of contact, and inviting community participation. The press notice is available in Appendix B. An information repository that contains the Site's Administrative Record, project reports, documents, fact sheets and other reference material is located in the Sonoma County Public Library, 3rd and E Streets, Santa Rosa, California.

The FYR report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated public repository. Upon completion of the FYR, a public notice will be placed in the *Cloverdale Reveille* to announce the availability of the final FYR report in the Site document repository.

6.3. Document Review

This FYR included a review of relevant, site-related documents including the ROD, RA reports, and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

6.3.1. ARARs Review

Section 121 (d)(2)(A) of CERCLA specifies that Superfund Remedial Actions must meet any federal standards, requirements, criteria, or limitations that are determined to be applicable or relevant and appropriate requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, RA, location, or other circumstance at a CERCLA site.

Since the ROD, the majority of the ARARs have remained unchanged except as noted in Table 2 and Table 3.

Chemical-specific ARARs identified in the selected remedy within the ROD and subsequent ESD for the groundwater at this Site and considered for this FYR for continued groundwater treatment and monitoring are listed in Table 2. At the time of the 1988 ROD, concentrations of benzene, TCE, and vinyl chloride all exceeded existing federal MCLs. Numerical MCLs were provided in the ROD for benzene, TCE, and vinyl chloride.

According to the ROD, the following additional VOCs were detected in groundwater beneath the site in 1986, but the concentrations did not exceed existing MCLs: 1,1-dichloroethene (1,1-DCE), 1,4-dichlorobenzene (1,4-DCB), chlorobenzene, 1,1,1-trichloroethane (TCA), and cis-1,2-dichloroethene (cis-1,2-DCE). The ROD selected federal MCLs as the cleanup levels for the groundwater COCs although numerical MCLs were not provided in the ROD. At the time of the ROD, there were no state MCLs; therefore, the federal standard was selected as the ARAR at the ROD signature date. Changes to State MCLs are provided for information only.

The State of California primary drinking water standards are the same as federal primary drinking standards except as noted in Table 2 below. Of the contaminants identified as exceeding the MCL at the time of the ROD, the State MCL for benzene was established and later revised to 1 micrograms per liter (µg/L) and is now more stringent than the federal MCL selected as the ROD clean up level. The State has also adopted a more stringent MCL for vinyl chloride since the ROD.

In September 2011, EPA released the final TCE health assessment with new toxicity values for TCE. Changes in toxicity values can sometimes lead to subsequent changes in MCL values; however, the federal MCL for TCE currently remains unchanged. The State MCL for TCE is now 5 µg/L, which matches both the federal MCL and the ROD cleanup level. The impact of these changes on the protectiveness question is addressed in Section 6.3.2.

For those contaminants detected that did not exceed MCLs at the time of the ROD, the following changes are noted: Federal and/or State MCLS have been adopted for cis-1,2-DCE, 1,4-DCB, 1,1-DCE, and TCA. While changes to State MCLs are included in the analysis for this FYR, only Federal MCLs were identified as ARARs in the ROD. In the most recent round of groundwater monitoring, only cis-1,2-DCE and TCE were detected and both occurred at concentrations below federal MCLs. Further groundwater analysis is provided in Section 6.4.2.

Table 2. Summary of Groundwater ARAR Changes

Contaminants of Concern	1988 ROD ARARs[1]	MCLs at Time of ROD		Current MCL Regulations		Notes
	Groundwater (µg/L)	Federal (µg/L)	State (µg/L)	Federal (µg/L)	State (µg/L)	
Benzene	5	5	N/A	5	1	State has adopted more stringent MCL.
Trichloroethene (TCE)	5	5	N/A	5	5	State revision now matches federal MCL.
Vinyl chloride	2	2	N/A	2	0.5	State adopted more stringent MCL
Additional Chemicals detected, but not exceeding MCLs at time of ROD						
cis-1,2-dichloroethene (cis-1,2-DCE)	N/A	N/A	N/A	70	6	Federal and State MCLs were established in 1991 and 1994, respectively
Chlorobenzene	N/A	100	N/A	100	N/A	
1,4-Dichlorobenzene (1,4-DCB)	N/A	75	N/A	75	5	More stringent State MCL was established in 1989
1,1-Dichloroethene (1,1-DCE)	N/A	7	N/A	7	6	State adopted more stringent MCL
1,1,1-Trichloroethane (TCA)	N/A	200	N/A	200	200	State adopted MCL to match federal MCL

1 – Only the MCLs for benzene, TCE, and vinyl chloride were provided in the 1988 ROD since they occurred in concentrations exceeding the existing MCL.

A cleanup standard of 10 mg/kg was selected in the ROD for PCB contaminated soils. This soil cleanup standard was based on Toxic Substances Control Act (TSCA) soil cleanup levels for PCB contaminated soils. TSCA was not identified as an ARAR in the ROD or ESD as a basis for the cleanup level. Thus, there are no ARARs that warrant a change in the selected soil cleanup level. There are no readily-available standard soil cleanup values against which the original standard can be compared. Instead, existing soil data can be compared to EPA Regional Screening Levels (RSLs) for residential soil exposure. A comparison of cleanup standards and existing soil data against the RSLs is addressed in the evaluation of risk assessment and toxicology issues.

Federal and state laws and regulations, other than the chemical-specific ARARs that have been promulgated or changed over the past five years, are described in Table 3. ARARs identified in the 1988 ROD that are no longer pertinent, due to the phase the remedy is in, are not included in the table. There have been no revisions to laws and regulations that affect the protectiveness of the remedy.

Table 3. Applicable or Relevant and Appropriate Requirements Evaluation

Requirement	Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
Federal Drinking Water Standards	Section 1412 of the Safe Drinking Water Act (SDWA), 42 United States Code (USC) § 300f-1, "National Drinking Water Regulations"; National Primary Drinking Water Regulations, 40 CFR Part 141	1988 ROD	40 CFR Part 141 establishes federal MCLs that were used to establish groundwater cleanup levels.	Revisions do not affect Protectiveness.	Since the 1988 ROD, there has been one revision to 40 CFR Part 141.61 MCLs for organic contaminant (59 FR 34324, July 1, 1994). This revision did not affect any of the contaminants selected for clean up levels in the ROD.	40 CFR Part 141.61 – July 1, 1994
State Drinking Water Standards	California Safe Drinking Water Act, Health & Safety Code, Div. 5, Part 1, Chapter 7, § 4010 et seq., California Domestic Water Quality Monitoring Regulations, CAC Title 22, Division 4, Chapter 15, §64401 et seq	1988 ROD	Establishes state MCLs that were used to establish groundwater and surface water cleanup levels	Revisions do not affect protectiveness.	No changes that would significantly impact the current RAs or cleanup standards. Surface water runoff samples were collected for several years after construction was complete. The samples were analyzed for PCBs and none of the samples had detectable PCB concentrations.	Numerous amendments between 1981 and 2012.
Federal PCB Disposal and Treatment Requirements	40 CFR 761.60(A)(4)	1988 ROD	Regulations promulgated under the TSCA state that any non-liquid PCBs at concentrations of 50 ppm or greater (but less than 500 ppm) in the form of contaminated soil shall be treated in an incinerator or disposed in a chemical waste landfill which complies with 40 CFR 761.75.	Revisions do not affect protectiveness.	Soil excavation and disposal associated with the selected remedy are complete. EPA modified the remedy in the 1995 ESD to allow residual PCB material with concentrations greater than 10 ppm to remain if greater than 15 feet deep. Land use restrictions were enacted to ensure protectiveness.	None.
Occupational Safety and Health Administration (OSHA) Regulations	NIOSH 1985; 29 CFR 1926, Subpart C.	1988 ROD	Hazardous waste operations during the selected RA must comply with OSHA regulations.	The soil excavation portion of the remedy is complete. Any revisions would not affect protectiveness.	NIOSH manual has undergone regular updates since ROD.	N/A

Requirement	Citation	Document	Description	Effect on Protectiveness	Comments	Amendment Date
Porter-Cologne Water Quality Control Act	California Water Code Section 13260, 13370, and 13370.5	1988 ROD	Applies to discharges to waters of the state or to a publicly owned treatment work (POTW).	Any revisions would likely not affect protectiveness. Residual PCB contamination above the soil cleanup level (10ppm) only exists at depth (>15 ft).	Drainage ditches channel surface water away from the Site to Icaria Creek, which discharges to the Russian River. No surface water monitoring has been conducted at the site during precipitation events.	N/A

6.3.2. Human Health Risk Assessment Review

A human health risk assessment was not completed for the Site in preparation for the 1988 ROD. Table 4 summarizes the site risks and exposure pathways qualitatively identified in the 1988 ROD.

Table 4. Summary of Site Risks Identified in ROD

Source	Exposure Scenario & Pathway	Risk Driver(s)	Risk Estimate
PCB-contaminated soil	Inhalation of Vapors	Not defined.	Quantitative evaluation not performed.
	Particulate Inhalation		
	Soil Ingestion		
	Soil Direct Contact		
VOCs in Groundwater	Groundwater Ingestion		

In 1994, two human Health Risk Assessments (HRA) were conducted for PCB contamination left in place following the RA in shallow (<15 feet bgs) and deep (>15 feet bgs) soil on the Site (EKI 1993; EKI 1994a). Table 5 presents the exposure pathways and best-estimate associated risks identified in the 1994 shallow soil HRA (EKI 1994a).

Table 5. Summary of 1994 Human Health Risk Assessments

Reference	Exposure Scenario & Pathway	Risk Driver(s)	Cancer Risk Estimate[1]	
			PCB 1242	PCB 1248
Shallow (<15 feet bgs) soil HRA (EKI 1994a)	Inhalation of Vapors	Adult Resident	1.1×10^{-5}	$1.9X\ 10^{-5}$
	Soil Ingestion	Adult Resident	3.1×10^{-6}	2.1×10^{-6}
		Child Resident	8.8 x 10-6	7.5×10^{-6}
	Soil Dermal Contact	Adult Resident	6.3×10^{-6}	4.3×10^{-6}
		Child Resident	5.5×10^{-5}	4.1×10^{-5}
	Total Estimated Excess Lifetime Incremental Cancer Risk[2]		8.4×10^{-5}	7.4×10^{-5}
Deep (>15 feet bgs) soil HRA (EKI 1993)	Soil Gas Inhalation[3]	Adult/Child Resident	$<2.6 \times 10^{-9}$	$<2.0 \times 10^{-9}$

1 - Shallow soil risk estimates presented are only for PCB Aroclors 1242 and 1248, which are the two predominant Aroclors present at the site. Aroclor 1254 was considered in the shallow soil HRA, although it had the lowest total risk of the three Aroclors considered. No non-carcinogenic risk estimates were calculated.

2 - Represents sum of Adult vapor inhalation, adult soil ingestion, child soil ingestion, adult dermal contact, and child dermal contact.

3 – Risk estimates were calculated for varying depths of cover for residual contamination. The soil gas inhalation risk estimate presented here is for the most conservative scenario which assumes 10 mg/kg residual PCB soil concentration (the cleanup level) is covered by 10 inches of clean soil cover.

The shallow soil HRA estimated an excess cancer risk associated with leaving residual PCBs in uncovered soil was within EPA's acceptable range of excess cancer risk (1×10^{-4} to 1×10^{-6}). This

conclusion was considered conservative because 10 inches of clean fill was placed over all soils with potential residual PCB soil contamination.

The deep soil (>15 feet bgs) HRA evaluated soil left in place with PCB concentrations greater than the RA cleanup goal of 10 mg/kg and deeper than 15 feet bgs. Exposure risks due to soil gas inhalation were calculated for PCBs 1242 and 1248 in soils at depths of 15, 20, and 30 feet bgs. The greatest cancer risk calculated is shown in Table 5 and represents the scenario in which a residual PCB soil contamination of 10 mg/kg (the soil cleanup level) is covered by 10 inches of clean fill.

The risk assessments were reviewed to identify any changes in exposure pathways or toxicity that would impact protectiveness.

Groundwater. The groundwater exposure pathway identified in the ROD is still a valid assumption. The 1988 ROD described the shallow aquifer below the Site as "unproductive." Although the Site remedy specified in the ROD did not prohibit the use of groundwater for drinking purposes, EPA advised the Sonoma County Department of Health not to approve permits for domestic wells in the areas where the groundwater contamination plume is still present at levels above MCLs (USEPA 1995). Current groundwater data show that TCE concentrations at the two remaining monitoring wells on the Site are below the cleanup standard of 5 µg/L (EKI 2012). The presence of TCE in the groundwater in relation to its cleanup standard is discussed in more detail in Section 6.4.2.

Soil. The exposure pathways considered in the ROD and subsequent HRAs included ingestion, dermal contact, particulate inhalation, and vapor inhalation for future child and adult residents. The ingestion, particulate inhalation, and dermal contact pathway assumptions remain valid. (The soil gas inhalation pathway is discussed under "Vapor Intrusion.") If future construction were to occur on the Site, the occupational (construction worker) receptor should be considered. In general, however, the residential scenario is more protective than the occupational scenario. Currently, the Site is vegetated and fenced, so the soil exposure pathways are incomplete.

Residual concentrations of PCBs in soil measured during the excavation are all below the selected cleanup standard except within 12 sampling grid cells (out of more than 900 grid cells) with detected concentrations that exceed the residential soil cleanup level of 10 mg/kg (EKI 1994b). Of these, 11 sampling grid cells were identified at depths of 26 ft bgs or more with concentrations exceeding EPA's acceptable excess cancer risk of 1×10^{-4} for residential exposure. Given that concentrations within the upper 26 feet of soil are within the protective excess lifetime cancer risk range, the overall risk attributed to the residual soil PCB contamination is extremely low. Section 6.4.1 contains a more detailed analysis of the existing soil data.

Vapor Intrusion. EPA's understanding of contaminant migration from soil gas and/or groundwater into buildings has evolved over the past few years leading to the conclusion that vapor intrusion may have a greater potential for posing risk to human health than assumed when the ROD was prepared. In September 2002, EPA released an external review draft version of its vapor intrusion guidance titled "Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils" (USEPA 2002).

Presently, site access is restricted with fencing and there are no occupied buildings; thus, the vapor intrusion pathway is currently incomplete.

The potential for vapor intrusion is evaluated following a "multiple lines of evidence" approach. The primary COCs at the Site are PCBs and TCE. PCBs are not considered sufficiently volatile to be of concern for vapor intrusion risk; therefore, the vapor intrusion exposure pathway (evaluated in the 1993 HRA that considered vapor intrusion due to PCBs) is no longer useful and the associated conclusions are no longer relevant.

TCE is considered both sufficiently volatile and toxic to be of potential concern for the vapor intrusion pathway. Groundwater concentrations of TCE in the two monitoring wells on Site were both less than the MCL (5 µg/L) in the latest (October 2012) monitoring event. Using EPA's Vapor Intrusion Screening Level calculator, the cancer and non-cancer risks were computed for TCE's MCL (USEPA 2012a). At the MCL, the excess cancer risk is 4.8×10^{-6}, which is within EPA's acceptable cancer risk range. The total hazard quotient is less than 1. Given that TCE groundwater concentrations are now less than the MCL, there is no unacceptable risk associated with vapor intrusion potential.

Toxicity values: EPA's Integrated Risk Information System (IRIS) has a program to update toxicity values used by the Agency in risk assessment when newer scientific information becomes available. In the past five years, there have been a number of changes to the toxicity values for certain contaminants of concern at the Site. Table 6 presents the COCs identified in the ROD. Only PCBs were evaluated subsequently in full risk assessments (EKI 1994a, EKI 1994b). Since neither benzene nor vinyl chloride has been detected in groundwater on the Site in over five years, neither compound is evaluated for toxicity changes in this section. In summary, revisions to the toxicity values for TCE and PCBs indicate a higher and lower risk, respectively, from exposure to these chemicals than previously considered. None of the COCs are currently under review through IRIS.

Table 6. Revisions to toxicity values since the last FYR.

Contaminant of Concern (COC)	Toxicity Values				Change
	Cancer		Non-Cancer		
	Inhalation Unit Risk (IUR)	SFo (1/(mg/kg-day)	RfCi (mg/m^3)	RfDo (mg/kg-d)	
TCE	OLD: 1.3×10^{-2} $(mg\text{-}kg\text{-}day)^{-1}$ [3.6E-6$(\mu g/m^3)^{-1}$] NEW: 4.1E-6$(\mu g/m^3)^{-1}$	OLD: 1.1×10^{-2} NEW: 4.6E-2	NEW: 0.002	NEW: 0.0005	Cancer: More stringent Non-Cancer: New

PCBs[1]	OLD: 7.7 (mg/kg-day)$^{-1}$ [2.2E-3(µg/m^3)$^{-1}$] NEW: 5.7 x 10^{-4} X (µg/m^3)$^{-1}$	OLD: 7.7 NEW: 2.0	No change (no value).	No change (no value).	Cancer: Less stringent

Notes: Only Aroclors 1242 and 1248 are considered for PCBs since these were the predominant Aroclors detected on the site. Although Benzene, TCE, and vinyl chloride have never been the subject of a risk assessment for the site, they are included here because all were detected above their MCLs at the time of the 1988 ROD and were thus considered COCs in the ROD. In addition, EPA no longer recommends using inhalation toxicity values that are derived from oral data (i.e., no longer using inhalation slope factors [SFi] or inhalation reference doses [RfDi]). For comparison with newer IURs (in units of (µg/m^3)$^{-1}$) , older inhalation toxicity values are converted to IURs for cancer risks using the following formula: IUR (ug/m^3)$^{-1}$ = [SF$_i$ (mg/kg-day)$^{-1}$ x 20 m^3/day x 0.001 mg/ug]/70 kg. Non cancer inhalation reference doses are converted to noncancer hazards Converted IUR values are shown in brackets "[ ]" following the original inhalation toxicity value.

In September 2011, EPA completed a review of the TCE toxicity literature and posted on IRIS both the cancer and non-cancer toxicity values that resulted in lower RSLs for TCE. The screening level for chronic exposure for cancer excess risk level of 1 x 10^{-4}is 0.44 µg/L. EPA uses an excess cancer risk range between 1 x 10^{-4}and 1 x 10^{-6} for assessing potential exposures, which translates to a TCE concentration between 0.44 and 44 µg/L. The current MCL for TCE of 5 µg/L is within the revised protective carcinogenic risk range. EPA's 2011 Toxicological Review for TCE developed safer levels that include at least a 10-fold margin of safety for health effects other than cancer. Any concentration below the non-cancer RSL indicates that no adverse health effect from exposure is expected. Concentrations significantly above the RSL may indicate an increased potential of non-cancer effects. The non-cancer screening level for TCE is 2.6 µg/L. EPA considers the TCE MCL of 5 µg/L to be protective for both cancer and non-cancer effects.

For PCBs, the cancer oral slope factor became less stringent in 2000, resulting in a lower cancer risk than was previously assumed.

6.3.3. Ecological Review

A formal ecological risk assessment was not conducted at the time of the ROD. The ROD stated that PCBs, which are resistant to degradation, bioaccummulate in the environment, and bioconcentrate in the fatty tissues of organisms, have been detected in the drainage ditch leading from the Site. At the time of the ROD, the unlined ditch adjacent to the Site was known to support aquatic life during the winter rainy season (USEPA 1988).

During the first FYR, a screening-level ecological risk assessment was conducted to evaluate the potential for ecological risk. It found that there were no PCBs detected in surface water in 49 sampling events from February 1994 through March 1997. The risk assessment concluded that there was little to no potential risk to ecological receptors that are currently using the Site or may use the Site in the future (CH_2MHill 2003). There are no changes to the terrestrial ecosystem or site usage since that time; therefore, the initial conclusions remain valid.

The Site is located approximately one mile west of the Russian River which provides habitat for listed salmonids. The Site is flat and vegetated with ruderal grasses except for the northeastern corner which is

covered by the asphalt parking lot. The lined drainage ditches, inside the eastern and southeastern perimeter fence line, carry surface water from the site into an unlined ditch paralleling South Cloverdale Boulevard. A review of aerial photographs (Google Earth reviewed April 2013) does not show any connection to a drainage system which enters the Russian River. Concrete-lined ditches were constructed after the soil was removed (July 1994) to direct rainfall away from the Site preventing soil erosion runoff. These ditches are only wet during storm events and do not support aquatic receptors. Since all PCB soil was removed to 15 feet bgs and backfilled with clean soil, there is no pathway for terrestrial receptors to contact PCB-containing soil remaining in the deep soils. There is no pathway for aquatic organisms to be exposed to the contaminated materials as any runoff from the Site (should it even reach the Russian River) would only be rainwater in contact with clean soils that were brought in after removal of the contaminated surface soils.

6.4. Data Review

The media of concern addressed in the ROD were soil and groundwater. They are discussed in detail below.

6.4.1. Soil

Soil was an original medium of concern for the Site. Site soil contamination originated from the discharge of wastewater containing PCBs and ethylene glycol to the ground adjacent to the casting plant via a drain line. The soil component of the Site remedy, as stated in the ROD, was the excavation and offsite disposal of PCB-contaminated soils with concentrations above 10 mg/kg. During the excavation of PCB-contaminated soils, planned excavation activities could not be completed due to the presence of bedrock encountered at depths greater than 15 feet bgs in certain areas. Thus, in 1995, the ESD modified the excavation component of the remedy to leave soil in place that contained less than 100 mg/kg PCB and was at least 15 feet bgs. Based on these criteria, 12 square grid areas (out of more than 900) with PCB contamination above 10 mg/kg were identified in the excavation report (EKI 1994b). The entire Site was divided into square grid cells 12.5 feet on each horizontal side by 2 feet vertically. In the area outside the main excavation, the 12.5-foot square grid cells were put into groups of four to form 25-foot square grid cells for sampling. Eleven grid cells identified in the Excavation Report as having exceedances ranged in depth from 26 to 40 ft bgs and were all generally located in the central portion of the Site where the main excavation occurred. One additional grid cell in the main excavation area (# 26293, Table 8) had a measured soil concentration of 11.1 mg/kg at a depth of 14 feet, but was considered to have met the remedial goal of 10 mg/kg for PCBs because the measurement was within the calculated allowable limit of 11.8 mg/kg (EKI 1994b). In 1995, a land use restriction was imposed on the Site to further protect against exposure to soils located 15 feet bgs or deeper in the 11 grid areas where PCBs still remained at concentrations above the cleanup level (TBG Inc. 1995).

Following excavation, the Site was backfilled with stockpiled soil that met soil cleanup standards followed by clean fill imported from off-site. In addition, the top 10 inches of surface soil anywhere on the Site that contained PCB concentrations greater than 1 mg/kg was removed and replaced with clean fill (EKI 1994b).

PCB Risk Screening: As part of this FYR, the existing soil data and ROD soil cleanup levels were re-evaluated by screening against current (November 2012) EPA residential and commercial/industrial soil multi-pathway (ingestion, inhalation, and dermal contact) RSLs to confirm whether the remaining soil concentrations, following the RA, are still protective of human health.

All soil data analyzed as part of this FYR was obtained from the following document:

- 1994 Proposed Final Prefinal Inspection Report (EKI 1994b).
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The 1994 Proposed Final Prefinal Inspection Report documents the excavation and disposal of PCB-contaminated soil, below-grade tanks and sumps, and concrete from the casting plant building pad; backfilling of the excavation with stockpiled soil with PCB levels less than 10 mg/kg; and placement of clean surface soil. Analytical data is included in tables and appendices attached to the report.
The latest available (November 2012) EPA RSLs were used in this comparison. The RSLs and ROD soil cleanup standards are shown in Table 7.

Table 7. Cleanup Standards for Target Constituents in Soil

Target Constituent	ROD Soil Cleanup Standard (mg/kg)	November 2012 EPA RSLs, Residential Soil, all pathways (mg/kg)		November 2012 EPA RSLs, Commercial/Industrial Soil, all pathways (mg/kg)	
		Cancer	Protective Risk Range	Cancer	Protective Risk Range
PCBs	10				
Aroclor 1242		0.22	0.22 - 22	0.74	0.74 – 74
Aroclor 1248		0.22	0.22 - 22	0.74	0.74 - 74

The toxicity of any particular PCB mixture depends on the composition and concentration of individual Aroclors or PCB congeners, each of which has a specific toxicity. Thus, while there is no single RSL for PCBs, EPA provides RSLs for selected individual Aroclors and PCBs congeners. At the MGM Brakes Site, the most prevalent PCBs detected were Aroclors 1242 and 1248 (EKI 1994a). Table 7 indicates that the ROD-specified soil cleanup standard for PCBs exceeds the November 2012 residential soil RSLs for both Aroclors 1242 and 1248. However, the ROD cleanup level is within the protective excess cancer risk range of 0.22 to 22 mg/kg.

Surface soils and soils less than 15 feet below ground surface (bgs) – As noted above, the top 10 inches of PCB-containing surface soils (with concentration > 1 mg/kg) were removed and replaced by clean soil. Thus the soil most relevant for direct contact by a future resident contains PCBs at a concentration equal to or less than 1 mg/kg. As shown in Table 7, the protective risk range for a residential exposure under Reasonable Maximum Exposure (RME) conditions spans 0.22 to 22 mg/kg. Soils containing PCBs at or below 1 mg/kg are within the lower portion of this protective risk range and are thus protective for future residential exposures.

According to the ESD, excavation of all soils that exceeded the cleanup standard of 10 mg/kg occurred at depths up to 15 ft bgs. A review of the 1994 Inspection Report corroborates this statement with the exception of one sample grid cell at a depth of 14 ft bgs that had a measured soil PCB concentration of

11.1 mg/kg. This concentration was considered acceptable because the result was within the allowable limit (11.8 mg/kg) calculated for the Site that was still considered to meet the remedial goal for PCBs for the site (EKI 1994b). Regardless, the measured concentration (11.1 mg/kg) is still within the protective excess lifetime cancer risk range for residential exposures.

The residential protective risk range is used for this comparison in order to be conservative; in reality it is extremely unlikely that a future resident will come into contact with these sub-surface soils in a manner assumed by the RME residential exposure assessment (350 days per year over a 30 year period). Any human contact with soils between 10 inches and 15 ft bgs is more likely (although still unlikely) to match the exposure assumptions for a commercial/industrial worker (250 days per year for a 25 year working lifetime). Thus, comparison of the remaining PCB concentrations (less than or equal to 10 mg/kg following remediation) to commercial/industrial RSLs provides a more relevant screening evaluation. Again, as shown in Table 7, the protective risk range for a commercial/industrial exposure under RME conditions spans 0.74 to 74 mg/kg. Soils containing PCBs at or below 10 mg/kg are within the lower portion of this protective risk range and are thus protective under the commercial/industrial exposure scenario.

Soils greater than 15 feet bgs – PCBs were detected at concentrations above 15 mg/kg in 11 sampling grid cells below 15 ft bgs (EKI 1994b; TBG 1995). The sample grid cells, concentrations, and approximate depths are listed in Table 8. Sample grid cell depth below original surface was calculated per Table 3 in the Inspection Report (EKI 1994b)

Table 8. Excavation Sample Grid Cells with Soil Left in Place with PCBs Exceeding 10 mg/kg

Grid Number	Depth below original surface (ft)	Soil PCBs (mg/kg)	Exceeds 1X 10-4 residential cancer risk threshold (22 mg/kg)
26293[a]	14	11.1	No
52358	26	37.0	Yes
59770	30	10.2	No
59835	30	45.8	Yes
59900	30	52.3	Yes
72379	36	48.5	Yes
73028	36	87.8	Yes
77317	38	24.6	Yes
81674	38	56.1	Yes
84987	40	43.4	Yes
85053	40	46.3	Yes
85054	40	20.8	No

Notes: a – This sample grid was considered to have met the remedial goal because the measurement was within the calculated allowable limit (11.8 mg/kg) for verification sampling (EKI, 1994).

As shown in Table 8, PCB concentrations in all but two of the sample grids below 15 ft bgs exceed the 22 mg/kg threshold for 1 x 10^{-4} excess cancer risk for residential exposure. The shallowest exceedance of this

upper bound cancer risk threshold occurs at 26 feet bgs; the rest occur at depths of 30 feet bgs or greater. All sample grids except for one (grid cell# 73028 at 36 feet bgs) have concentrations that are within the 1 x 10^{-4} excess cancer risk threshold for industrial soil (74 mg/kg).

PCBs are not easily biodegradable. Combined with their low water solubility, PCBs in soil can be expected to persist for decades at the Site. As such, PCB concentrations are not likely to have decreased significantly since the excavation occurred.

Residential construction in the surrounding area is predominantly slab-on-grade. Basements are uncommon in this area. In a residential scenario, the most likely encounter with soil contamination would be during the construction of residential swimming pools and utility installations and repairs. Given the depth (30 ft bgs) at which the PCB contamination occurs at levels that exceed the 1 x 10^{-4} residential risk threshold, the likelihood of exposure to soil contamination at levels harmful to human health is extremely low in a residential scenario. The clean surface fill would further prevent children or other sensitive populations from contacting soil with PCB contamination at less than 10 mg/kg that is present at depths less than 15 ft bgs.

Summary – Based on a review of the existing data, Site soils are unlikely to pose an unacceptable risk to future residential use. Evaluation of existing Site soil data against the November 2012 EPA residential soil RSLs reveals that Site soils up to 26 ft bgs are within the protective risk range for residential scenario. Site soils at depths up to 36 ft are within the protective risk range for a commercial/industrial scenario. Given the unlikelihood of residential and industrial contact with soil at these depths as assumed by the RSL calculations, the overall human health risk due to residual soil contamination on the Site is extremely low.

6.4.2. Groundwater

Groundwater is the primary media of concern. Since October 2003, the only chemical detected at levels above its federally promulgated MCL has been TCE. All groundwater monitoring data associated with the Site, with an emphasis on data since October 2008, were reviewed and evaluated. The following list is a compilation of all project-related documents reviewed in support of the data assessment:

- Second Five-Year Review Report for MGM Brakes (USACE/USEPA July 2008),
- Semi-Annual (Groundwater) Monitoring Reports (Oct 2007, Apr 2008, Oct 2008, Apr 2009, Apr 2011, Oct 2011, Apr 2012, Oct 2012)
- MGM Brakes Superfund Site Record of Decision (USEPA Sep 1988)
- MGM Brakes Superfund Site Explanation of Significant Differences (USEPA July 1995)

Groundwater data, as presented in Figure 3, shows consistent seasonal variations. The data suggest annual variations that appear to reflect rainfall volumes (Figure 4) such as the high groundwater elevations in 1996 to 1997, when annual rainfall totals were much above normal, and when groundwater elevations were low in 2008, when rainfalls were well below normal. The Cloverdale, California vicinity experiences a pronounced Mediterranean-type climate, with dry summers and wet winters. Yearly precipitation averages 44.36 inches; 89 percent of which falls in the six months of October to March. Precipitation since 2006 has been below average, with four of the six years significantly below average.

Analytical data were reviewed for the two monitoring wells on Site for which data was collected. Those wells are B-50 and B-73. All analytical data were reviewed for this report and only TCE was found to exceed the current cleanup standard for Site groundwater at any point since the last FYR in 2008, and only in well B-50. For other COCs, detections of 1 ,2-DCE, continue to be observed in B-50, though at levels below MCL. No detections (above MCLs) of 1,1- DCE, vinyl chloride, and benzene have been observed in any wells since 1991.

At well B-73, October 2005 was the last time any COC was detected at levels above regulatory limits, when TCE was 7 µg/L. Well B-73 has demonstrated an overall decline in TCE since 1991 when TCE at 61 µg/L was detected in this well.

TCE concentrations in well B-50 declined significantly from 1986 to 1998, and then declined very slowly since the late 1990s to present (Figure 3). Since April 2010, the analytical results have very little seasonal variation with only a range of 3.8 to 5.1 µg/L. The 5.1 µg/L results occurred in October 2011 with results of 3.8 and 3.9 µg/L in 2012. In April 2013, the TCE concentration results for B-50 was 4.1 µg/L (3.7 µg/L duplicate value).

The loss of seasonal variations in TCE concentrations since 2010 has no obvious explanation. Human activity and construction appears to show very little change in the area. The region has had 65 percent of normal annual rainfall totals for four of the most recent six years (2007 to 2012), and thus precedes the loss of seasonal variation. Groundwater elevations fell much below normal in 2008, but appear to have returned to normal elevations since then.

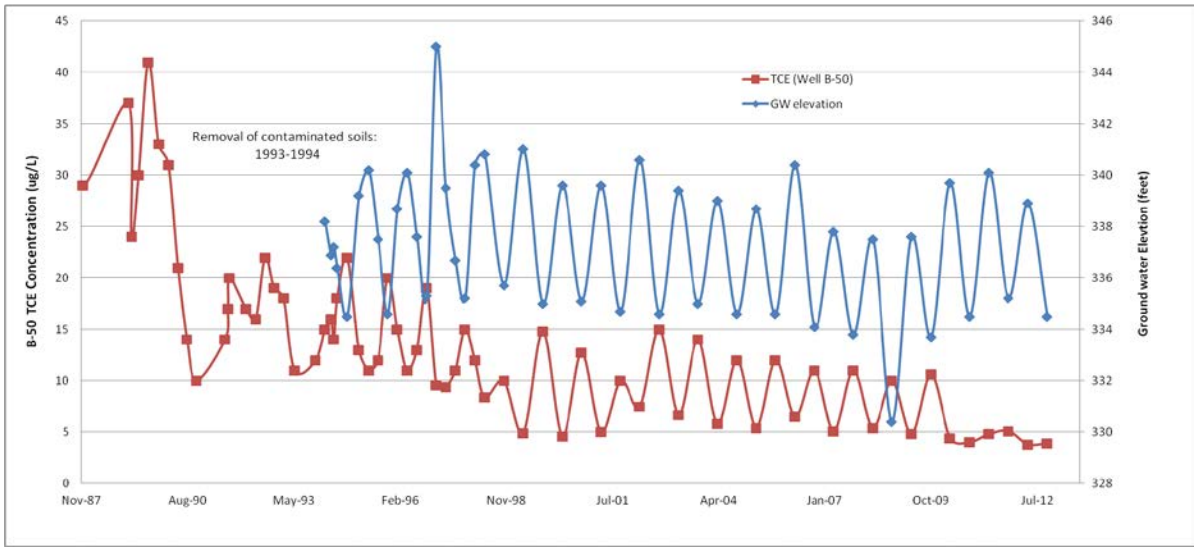

Figure 3. Well B-50 TCE concentrations and groundwater elevations (1990 to present).

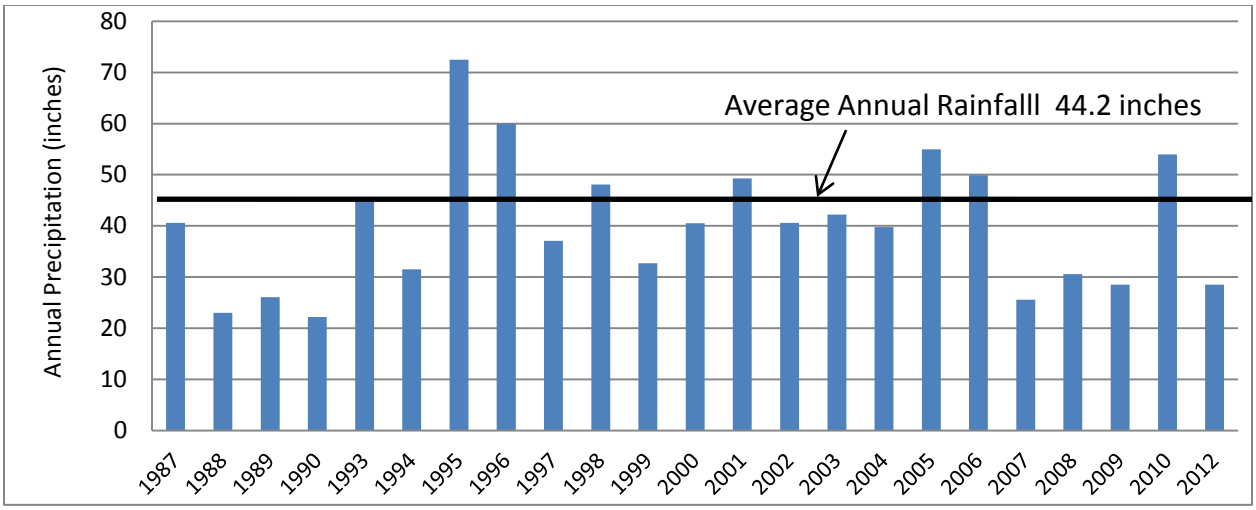

Figure 4. Annual precipitation for the Cloverdale Cooperative Weather Station compared to yearly average with depths to groundwater in well B-50. Years not shown had incomplete totals for that year.

A Mann-Kendall trend analysis of the TCE contaminant concentrations in wells B-50 and B-73 indicate that concentrations in both wells are decreasing. The analysis was conducted using the Monitoring and Remediation Optimization System software and data collected from 1998 to 2012. Table 9 summarizes the trend analysis for wells B-50 and B-73. A full statistical report is presented in Appendix E.

The Mann-Kendall non-parametric statistical method is used for analyzing time series groundwater monitoring data to quantitatively determine if the measured concentrations of a chemical are increasing, decreasing, or stable over time. The Mann-Kendall protocol is one of the most commonly used and widely applicable tools to formally evaluate plume stability.

Table 9. Mann-Kendall Trend Analysis Results.

Sampling Point ID:	B-73	B-50
Coefficient of Variation:	0.66	0.47
Mann-Kendall Statistic (S):	-217	-144
Confidence Factor:	>99.9%	99.80%
Concentration Trend:	Decreasing	Decreasing

Notes:

1. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.

2. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

EPA's *Performance Monitoring of MNA Remedies for VOCs in Ground Water* guidance discusses how to assess the attainment of cleanup objectives which should include:

- Sufficient verification monitoring (e.g., three to five years) once the standards are met to evaluate the effects of natural variations in site conditions; and

- Objective statistical analyses of the data showing a stable or decreasing trend.

Concentrations of TCE have met or equaled the remediation goal for TCE in B-73 since 2005 and in well B-50 since April 2010. The latest concentration of TCE in Well B-73 is 0.92 µg/L, and is in well B050 is 4.1 µg/L (3.7 µg/L duplicate value) in Well B-50. The Mann-Kendall non-parametric statistical analysis shows a decreasing trend for both wells with a high level of confidence.

6.5. Site Inspection

A site inspection for the MGM Brakes Site was conducted on January 16, 2013. Participants included Cynthia Wetmore from EPA; Karen Gruebel, a project manager from EKI (a consultant); and Jim Udstuen, a representative for the property owner. The Site Inspection Checklist is presented in Appendix C. Photos from the site inspection are embedded within the checklist.

The participants walked the site, noting that the fencing was undamaged and grass was kept well-mowed. The monitoring wells appeared to be properly secured and there was no evidence of vandalism on the site. In summary, the site inspection determined the Site to be in great condition.

6.6. Interviews

During the FYR process, interviews were conducted with parties impacted by the Site, including the current landowners, and regulatory agencies involved in Site activities or aware of the Site. The purpose of the interviews was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy that have been implemented to date. A Site owner representative was interviewed by EPA during the Site inspection on January 16, 2013. The interviewee's main interest was to de-listing the site from the NPL. Available interview records are included in Appendix C.

6.7. Institutional Controls

The remedy, as originally selected in the ROD, did not require institutional controls (ICs) or access restrictions, as it intended to remove all waste from the Site. However, as described in Sections 4.2 and 6.4.1, during the excavation of PCB-contaminated soils, the parties conducting the work were unable to complete excavation activities in certain areas due to the presence of bedrock encountered at depths greater than 15 feet. Thus, 11 out of more than 900 square grid areas with soils contaminated with less than 87.8 mg/kg of PCBs at depths of 26 feet or greater were identified for land use restrictions. On July 12, 1995, a Voluntary Covenant and Agreement to Restrict Use of Certain Property was recorded (Instrument No. 0055957) outlining precautions that property owners are to follow if they conduct excavation in the specified areas, including regulatory notification, sampling, dust control procedures, proper disposal of excavated soils, and backfilling with clean soil (). In the Voluntary Covenant and Agreement restrictions are to run with the land and shall apply to, and bind any future respective landowners. The Covenant requires that the California Department of Toxic Substances Control (DTSC) have access to the property during any excavation activities for inspection, surveillance, and monitoring and that the current owner or occupant notify DTSC of the name and address of new owners or occupants in the event of a sale or lease. The 1995 ESD selected institutional controls of the Voluntary Covenant as part of the soils remedy.

There are no formal ICs for the contaminated groundwater, because the information available to EPA indicates that no use is made of the water in this aquifer. Nevertheless, as a precautionary measure, in the event that there is a proposed use of this groundwater, EPA had advised the Sonoma County Department of Health to deny any permit application seeking to drill a well into a contaminated portion of the aquifer. However, as of May 2013, the Permit & Resource Management Department for the County of Sonoma is not aware of the EPA advisory. As of May 2013, the county, after some research, knows of no water supply well constructed the past several years, in any area down gradient of the MGM Brakes Superfund site.

In December 2012, EPA issued new guidance on institutional controls at Superfund Sites - *Institutional Controls: A Guide to Planning, Implementing, Maintaining and Enforcing Institutional Controls at Contaminated Sites.* The guidance recommends considering the impacts of the IC on current and reasonably anticipated future land uses. At the MGM Brakes Site, the current land is zoned Service/Commercial. Adjacent property consists mainly of multi-unit residential buildings, office buildings, a hotel, fueling stations, and convenience stores. A reasonable reuse scenario would be light industrial with the possibility of excavation for utility lines, foundations and tanks. Another possible reuse scenario would be multi-unit residential buildings with possible excavation for underground parking, pool, as well as utilities and foundations. Under both these re-use scenarios, the maximum excavation would be about 10 feet. In addition, depth to water fluctuates between 3 feet below ground surface (bgs) to 15 feet bgs, making excavation greater than 15 feet highly unlikely. All soil shallower than 26 feet is safe for all and reasonably anticipated future land uses.

7. Technical Assessment

7.1. Question A: Is the remedy functioning as intended by the decision documents?

Yes. The review of Site data, documents, ARARs, risk assumptions and the results of the site inspection indicates that the remedy is functioning as intended by the ROD, as modified by the ESD.

Groundwater monitoring has indicated a gradual but notable decline in dissolved TCE (a chlorinated VOC) concentrations since the previous FYR. Contaminants of concern in Well B-73, including TCE, have been below regulatory limits since 2005. TCE concentrations in Well B-50 have been below or equal to regulatory limits since April 2010. A Mann-Kendall trend analysis indicate that concentrations in both wells are decreasing. The low rainfalls have not significantly affected groundwater elevations, except in 2008, and the loss of seasonal variation of the TCE concentrations didn't appear until two to three years from the beginning of the regional drought.

Since soil contaminants associated with the Site's operations are below cleanup standards in the upper 15 feet and within the protective risk range for depths up to 26 feet for residents and up to 36 ft for industrial uses, potential exposure to harmful contaminants is extremely unlikely. Institutional controls are currently

in place to restrict excavation of buried residual PCB contamination. However, given the unlikelihood of contact with this residual soil, ICs may no longer be necessary.

7.2. Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

No. The Site is currently a grassy field enclosed by a chain-linked fence. The land use was formerly industrial, although there is a potential for future land use to change to residential or occupational use if the Site is redeveloped.

Toxicity values for benzene, TCE, and vinyl chloride have changed since the last FYR. These changes do not affect the protectiveness of the remedy. While the MCL for TCE is greater than the current residential tapwater RSL, the MCL for TCE is still within the protective excess lifetime cancer risk range. As of the most current (October 2012) data, TCE concentrations in groundwater were below the MCL. Future changes to the MCLs, which are the Site groundwater cleanup levels, may occur in the future due to these toxicity factor changes.

Applicable or relevant and appropriate requirements (ARARs) identified in the ROD and ESD have been revised. However, these revisions do not affect the protectiveness of the remedy. The State has promulgated some new MCL standards; however, federal MCLs were established as the cleanup levels in the ROD. No new promulgated standards affect the protectiveness of the remedy.

No additional human health routes of exposure were observed. The exposure pathways identified in the ROD for soil & groundwater ingestion, soil particulate inhalation, and soil dermal contact are still valid assumptions. The vapor intrusion pathway identified in the shallow soil HRA is considered incomplete due to the absence of a contaminant that is both sufficiently toxic and volatile and present in high enough concentrations to create a vapor intrusion concern.

No new contaminants have been identified.

Vapor intrusion risk assessment methodology has undergone significant revisions since the vapor intrusion assessment in the 1994 HRA. This does not affect protectiveness because the contaminant (PCBs) evaluated in the 1994 HRA is not considered sufficiently toxic or volatile enough to be a vapor intrusion concern. There have been no other changes in the standard risk assessment methods used to support the ROD.

The goals of the selected remedial actions are to prevent exposure of the public to contaminated soil and prevent possible exposure of the public to contaminated groundwater. Since the completion of the remedial actions, soil concentration of PCBs have been reduced via excavation to the cleanup levels specified in the ROD and ESD and groundwater concentrations of contaminants have achieved MCLs. The RAOs have been achieved.

7.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No other information has come to light that would call into question protectiveness of the remedy.

7.4. Technical Assessment Summary

The review of Site data, documents, ARARs, risk assumptions and the results of the site inspection indicates that the remedy is functioning as intended by the ROD, as modified by the ESD. The soil excavation was successful in removing PCB-contaminated soil, thus reducing the risk to human health and the environment. At the time of the last FYR, TCE was the only COC in the groundwater to remain above its MCL. However, since 2010, TCE concentrations have remained statistically at or below the MCL, suggesting that the plume has attenuated below regulatory levels on the site.

No additional human health routes of exposure were observed. The exposure pathways identified in the ROD are still valid assumptions and the vapor intrusion pathway identified in the shallow soil HRA is considered incomplete. No new contaminants have been identified. Toxicity values for benzene, TCE, and vinyl chloride changed since the last FYR. These changes do not affect the protectiveness of the remedy. While the MCL for TCE is greater than the current residential tapwater RSL, the MCL for TCE is still within the protective excess lifetime cancer risk range.

8. Issues

There are no known site issues that, either currently or in the future, prevent the RA from being protective.

9. Recommendations and Follow-up Actions

There are no issues that affect protectiveness. The site is ready for site completion as all response actions have been completed and all Remedial Action Objectives have been met. No further Superfund response is necessary to protect human health and the environment.

10. Protectiveness Statement

The remedy at the MGM Brakes Superfund Site is protective of human health and the environment.

11. Next Review

CERCLA requires ongoing FYRs as long as contaminants remain on site at levels that do not allow for unlimited use and unrestricted exposure. EPA has determined that this site now qualifies for unlimited use and unrestricted exposure. EPA intends to draft a document (ESD or memo to the file) in the near future clarifying that ICs are no longer required at the site to achieve protectiveness. Therefore, this is the last five year review for this Site and EPA recommends that the Site be considered for delisting from the NPL.

Appendix A: List of Documents Reviewed

CH2MHill, 2003. First Five-Year Review Report for MGM Brakes Superfund Site, Cloverdale, California. September 2003.

EKI, 1993. Health Risk Assessment for Soils with PCB Concentrations Greater than Remedial Action Goals and Deeper than 15 Feet, MGM Brakes Superfund Site. November 1993.

EKI, 1994a. Health Risk Assessment for PCB Residual in Shallow Soils Remaining after Remedial Action, MGM Superfund Site. April.

EKI, 1994b. Proposed Final Excavation Prefinal Inspection Report, MGM Brakes Superfund Site, Cloverdale, CA. 01 July 1994 .

EKI, 1995. Final VOC Groundwater Monitoring Plan, MGM Brakes Superfund Site, Cloverdale, California. April 1995.

EKI, 2007. Semi-Annual Monitoring Report – October 2007, MGM Brakes Superfund Site, Cloverdale, California. 14 November 2007.

EKI, 2008. Semi-Annual Monitoring Report – April 2008, MGM Brakes Superfund Site, Cloverdale, California. 12 May 2008.

EKI, 2008. Semi-Annual Monitoring Report – October 2008, MGM Brakes Superfund Site, Cloverdale, California. 25 November 2008.

EKI, 2009. Semi-Annual Monitoring Report – April 2009, MGM Brakes Superfund Site, Cloverdale, California. 15 June 2009.

EKI, 2011. Semi-Annual Monitoring Report – April 2011, MGM Brakes Superfund Site, Cloverdale, California. 4 May 2011.

EKI, 2011. Semi-Annual Monitoring Report – October 2011, MGM Brakes Superfund Site, Cloverdale, California. 11 November 2011.

EKI, 2012. Semi-Annual Monitoring Report – October 2012, MGM Brakes Superfund Site, Cloverdale, California. 24 October 2012.

HLA. 1983. Revised Remedial Action Plan, MGM Brakes, Cloverdale, California. July 15.

RWQCB, 2007. Concurrence with Abandonment of Select Groundwater Monitoring Wells, MGM Brakes Superfund Site, Cloverdale, California. May 14, 2007.

TBG, Inc., 1995. Covenant and Agreement to Restrict Use of Certain Property. June 1995

USEPA, 1988. MGM Brakes Superfund Site Record of Decision. EPA/ROD/R09-88/018. September 1988.

USEPA, 1995. MGM Brakes Superfund Site Explanation of Significant Differences. August 1995.

USEPA, 1988. MGM Brakes Superfund Site record of Decision.

USEPA, 1998. Certificate of Completion for the Demolition and Excavation Work, MGM Brakes Superfund Site, Cloverdale, California. March 1998.

USEPA, 2002. OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). EPA530-D-02-004. November 2002.

USEPA, 2005. Ready for Re-Use Determination, MGM Brakes Superfund Site. Effective February 2, 2005.

USEPA. July 2008. Second Five-Year Review Report for MGM Brakes Superfund Site. Cloverdale, Sonoma County, California.

USEPA, May 2011. Close Out Procedures for National Priorities List Sites. Available at http://www.epa.gov/superfund/programs/npl_hrs/closeout/pdf/2011guidance.pdf

USEPA, 2012a. Vapor Intrusion Screening Level (VISL) Calculator, Version 1.0, November 2011 RSLs. Available at http://www.epa.gov/oswer/vaporintrusion/guidance.html.

USEPA, 2012b. Regional Screening Levels (RSLs), April 2012. Available at http://www.epa.gov/region9/superfund/prg/

USEPA, 2012c. Assessing Protectiveness at Sites for Vapor Intrusion. Supplement to the "Comprehensive Five Year Review Guidance," OSWER Directive 9200.2-84. November 2012

Appendix B: Press Notices

CLOVERDALE REVEILLE
CNS#2430468
U.S. EPA BEGINS THIRD REVIEW OF CLEANUP
AT MGM BRAKES SUPERFUND SITE

The United States Environmental Protection Agency (EPA) is conducting the third Five-Year Review of the cleanup of MGM Brakes Superfund Site in Cloverdale, California. The review will cover the soils and groundwater contamination at the Site. According to the Superfund law, if a cleanup takes more than five years to complete or hazardous wastes remain on the Site, the cleanup will be reviewed every five years. The last Five-Year Review, conducted in 2008, determined that the soils and groundwater cleanup was protective because the contamination is controlled and there is no exposure risk.

During this upcoming review process, EPA will study information about the site gathered during the period between 2008 and 2013 and conduct a facility inspection. The purpose of this third Five-Year Review is to determine whether the cleanup continues to be protective. The methods, findings and conclusions from the review will be documented in the Five-Year Review Report to be issued by fall 2013. Upon completion, a copy of the final report will be posted on EPA's web site and placed in the information repositories listed below. In addition, a notice summarizing the findings and conclusions will be published in a local newspaper.

EPA invites the community to learn more about this process and welcomes your involvement. An information repository that contains the Site's Administrative Record, project reports, documents, fact sheets and other reference material is located in the Sonoma County Public Library, 3rd and E Streets, Santa Rosa, California, and also in EPA's Superfund Records Center at 95 Hawthorne Street, 4th floor, San Francisco, California 94105. You may also contact Vicki Rosen, Community Involvement Coordinator, at (415) 972-3244 or rosen.vicki@epa.gov or Cynthia Wetmore, Five-Year Review Coordinator, at (415) 972-3059 or wetmore.cynthia@epa.gov to provide or obtain additional information.

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Appendix C: Site Inspection Checklist

Site Inspection Checklist

I. SITE INFORMATION	
Site name: MGM Brakes	**Date of inspection: January 16, 2013**
Location and Region: Cloverdale CA	**EPA ID: CAD000074120**
Agency, office, or company leading the five-year review: Cynthia Wetmore, US EPA	**Weather/temperature: Sunny, 60°**

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- X Access controls
- X Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other_____
- X Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

II. ATTENDEES

1. **Project Manager:**

Cynthia Wetmore, EPA Remedial Project Manager.

Karen Gruebel, Project Manager with EKI, Consultants

Problems, suggestions: None

2. **Owner's Representative:** Jim Udstuen,

Problems, suggestions: Mr Udstuen is interested in delisting the Site

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

1. **O&M Documents**

G O&M manual G Readily available G Up to date **XN/A** G As-built drawings G Readily available G Up to date **XN/A** G Maintenance logs G Readily available G Up to date **XN/A**

Remarks: Because the only site activity is groundwater monitoring, and no active remedy is in place, there is no site documents kept on-site.

2. **Site-Specific Health and Safety Plan** G Readily available G Up to date **XN/A** G

Contingency plan/emergency response plan G Readily available G Up to date **XN/A**

Remarks_____

3. **Groundwater Monitoring Records** **X Readily available** G Up to date N/A

Remarks: Kept by Contractor EKI, Consultants and by Region 9 EPA

4. **Daily Access/Security Logs** G Readily available G Up to date **XN/A**

Remarks Keys to the gate are kept across the street at the current MGM Brakes Assembly Plant (not owners of the Superfund property)

IV. O&M COSTS	
1. **O&M Organization**	
G State in-house	G Contractor for State
G PRP in-house	**X Contractor for PRP**
G Federal Facility in-house	G Contractor for Federal Facility
G Other_ _____	
2. **O&M Cost Records -** Records are kept at EKI, Consultant Offices.	
X Readily available G Up to date	
G Funding mechanism/agreement in place	
3. **Unanticipated or Unusually High O&M Costs During Review Period**	
Describe costs and reasons: Records not available at site inspection. O&M involves biannual mowing, and groundwater sampling. EKI, Consultants will provide.	
V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A	
A. Fencing	
1. **Fencing damaged** G Location shown on site map **X Gates secured** G N/A	
Remarks: Fence in great shape and has quite a lot of vegetative growth around it indicating that it hadn't been disturbed in a long time, if at all.	
B. Other Access Restrictions	
1. Signs and other security measures G Location shown on site map G N/A	
Remarks. There is a small sign noting that it is a Superfund Site on South Cloverdale Road (See Photo 1).	

Photo 1. MGM Brakes Superfund Site Sign

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes **X No** G N/A Site conditions imply ICs not being fully enforced G Yes **X No** G N/A

Reporting is up-to-date **X Yes** G No G N/A Reports are verified by the lead agency **X Yes** G No G N/A

Specific requirements in deed or decision documents have been met **X Yes** G No G N/A Violations have been reported G Yes G No **XN/A** Other problems or suggestions: G Report attached

D. General

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

Remarks: There is no evidence of vandalism or trespassing; the fence has no holes and there is no littering or any evidence of trespassing

2. **Land use changes on site** - None

Remarks: The site is currently an empty, grassy field

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

Remarks: The Site is located on a major commercial street, South Cloverdale Road. There is a brewery to the south of the site, and a gas station to the north. There is a kennel located northeast of the property. Across the street is a Starbucks coffee store. Residential property is located behind the property off South Cloverdale Road

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable X N/A

B. Other Site Conditions

Remarks: The Site is in great condition

C. Perimeter Ditches/Off-Site Discharge G Applicable **X N/A**

The ditches along the perimeter are not part of the remedy.

D. Monitoring Wells

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

Remarks: Well B-50 (**Error! Reference source not found.**) lock was verified, but Well B-73 (**Error! Reference source not found.**) could not be verified because cover could not be lifted. No evidence of vandalism or tapering.

Photo 2. Monitoring Well B-73

Photo 3. Monitoring Well B-50

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 includes two wells to verify MNA and a fenced property. The Site is in great shape; there is no evidence of any problems.

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. None

Photo 4. View from the entrance gate at So. Cloverdale Rd. and Santana Rd.

Photo 5. View of the entrance towards So. Cloverdale Road (north)

Photo 6. Standing at southwest corner facing northeast towards entrance. The fence and ditch are to the left.

Photo 7. Same location as Photo 6, but facing west over the property.

Appendix D Groundwater Data Summary

Statistical support provided by Thomas Georgian, USACE.

Statistical Evaluations of TCE Concentrations in Groundwater for Two Wells for the Five-Year Review for the MGM Brakes Superfund Site

9 April 2013

There are significant decreasing trends (with over 95% confidence) for wells B-50 and B-73 (as qualitatively shown in Figure 1 and quantitatively shown in Tables 1 and 2 by the p-values of the correlation coefficients that are less than 0.05). These wells exhibit seasonal (periodic) trends in addition to decreasing trends. As the changes in the TCE concentrations for well B-73 owing to seasonal variability are relatively small, they were initially ignored. The (base ten) logarithm of the results for well B-73 fit a linear regression line reasonably well when the seasonal trend is ignored; $r^2 \approx 0.8$ and the residuals for the regression fit are normally distributed, as shown in Figures 4 and 5. The equation for linear regression fit is:

$$\text{Log(TCE)} = 8.60 - 0.000204 \text{ Date}$$

The date in the above equation is expressed as a numerical value (e.g., 19 April 1999 corresponds to a value of 36269).

Figure 2 shows the regression fit in terms of the original (untransformed) concentrations. The 95% confidence interval for the regression fit for well B-73 is well below the TCE MCL of 5 µg/L (Figures 2 and 3), suggesting this well currently complies with the MCL.

An additional evaluation that takes the seasonal trend into account was subsequently done for well B-73. As shown in Figure 10, when the seasonal trend is taken into account there is better agreement between the predicted and observed TCE concentrations. The logarithm-transformed de-seasoned (i.e., seasonally adjusted) concentrations give a value of $r^2 \approx 0.9$ for the regression line. As shown below, the equation of the regression line is similar to the regression line initially calculated when seasonality was ignored.

$$\text{Log(TCE)} = 8.760 - 0.000208 \text{ Date}$$

The 95% confidence interval for the linear regression fit is less than the MCL (i.e., the Log(MCL) ≈ 0.7) for the most recent sampling events, which also supports the hypothesis that contamination is currently below the MCL at well B-73.

Neither the concentrations nor the logarithms of the concentrations for well B-50 were directly fitted to a linear regression line owing to the large variability from what appears to be

a seasonal trend from April 1999 to April 2010 (Figure 6). However, the portion of the time series plot after the April 2010 sampling event (from Oct 2010 to the most recent sampling event on Oct 2012) seems to be qualitatively different from the portion of the time series plot after April 2010, which does not seem to exhibit a seasonal trend. For example, the model for temporal trend shown in Figure 8 agrees fairly well with the observed concentrations until after April 2010.

The TCE results for the last five sampling events (after April 2010 sampling event) for well B-50 were subsequently evaluated. The results are consistent with a normal distribution and produce a Student's t 95% upper confidence limit (UCL) of the mean equal to 4.9 µg/L, which implies TCE is present at concentrations less than the MCL. However, as the sample size is small, additional monitoring is recommended to verify contamination is below the MCL at B-50. A sample size of least eight to ten is desirable (e.g., for detected concentrations that are normally distributed). Furthermore, if the lack of a seasonal trend beginning in 2010 corresponds to "below-to-much-below average annual rainfall since 2006" it seems advisable to continue monitoring to characterize TCE concentrations in this well when there more precipitation (e.g., as larger TCE concentrations may be observed).

Figures and Tables

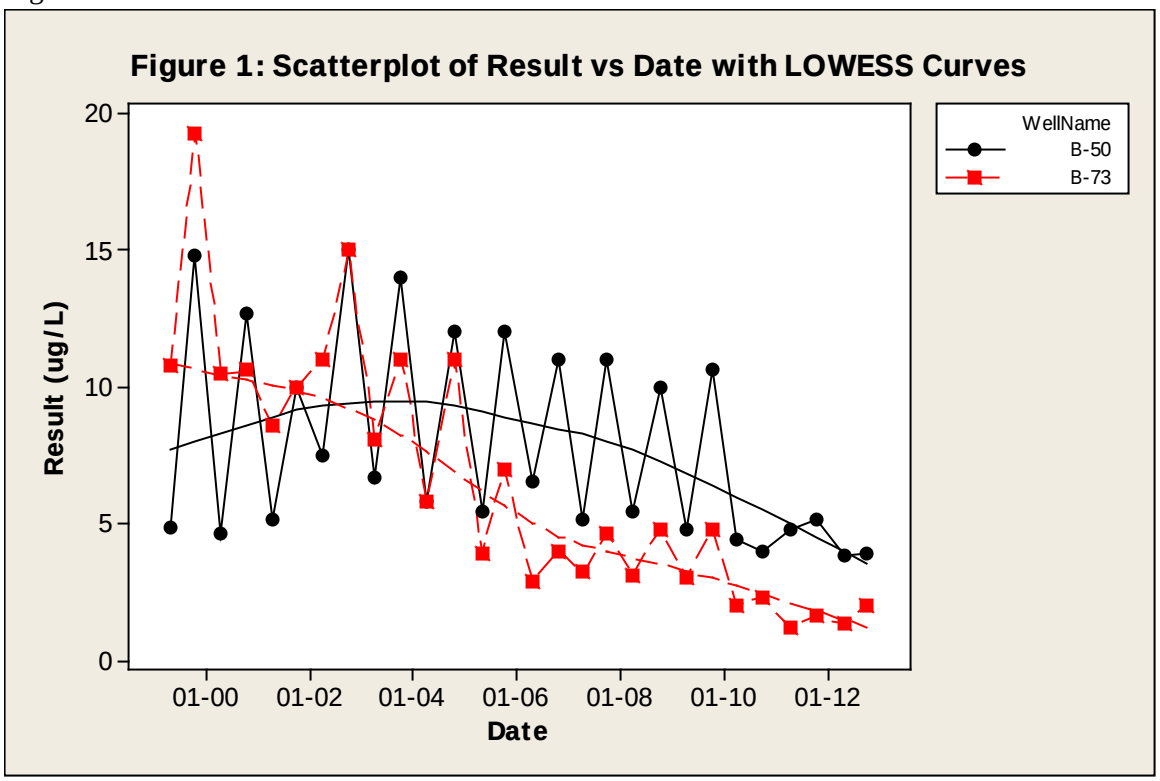


Table 1: Trend Evaluations for Well B-73

CORRTYPE	CORR_VAL	P_VALUE
PEARSON'S R	-0.855255	0.0000000
SPEARMAN'S RHO	-0.878269	0.0000000
KENDALL'S TAU_A	-0.687831	0.0000003
KENDALL'S TAU_B	-0.691499	0.0000003

Table 2: Trend Evaluations for Well B-50

CORRTYPE	CORR_VAL	P_VALUE
PEARSON'S R	-0.416631	0.0274209
SPEARMAN'S RHO	-0.490479	0.0080526
KENDALL'S TAU_A	-0.380952	0.0046552
KENDALL'S TAU_B	-0.385049	0.0046552

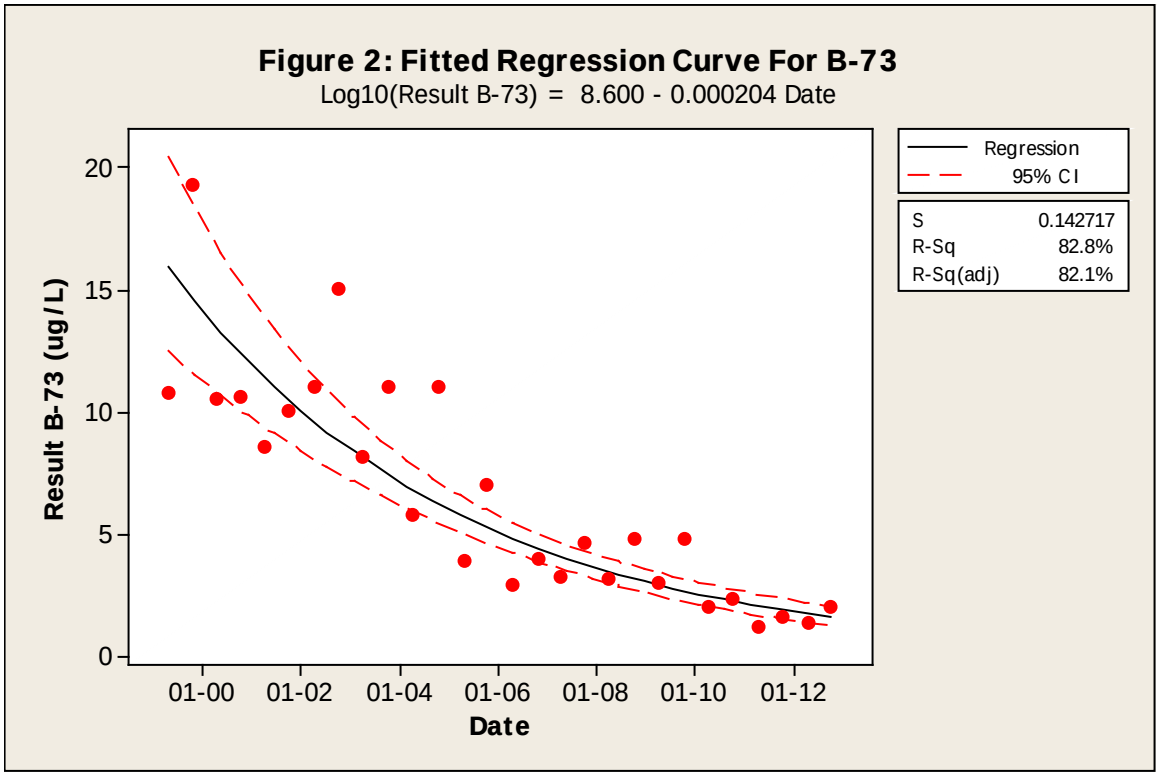


Figure 2: Fitted Regression Curve For B-73
Log10(Result B-73) = 8.600 - 0.000204 Date
Result B-73 (ug/L)
Date
01-00
01-02
01-04
01-06
01-08
01-10
01-12
Regression
95% CI
S 0.142717
R-Sq 82.8%
R-Sq(adj) 82.1%

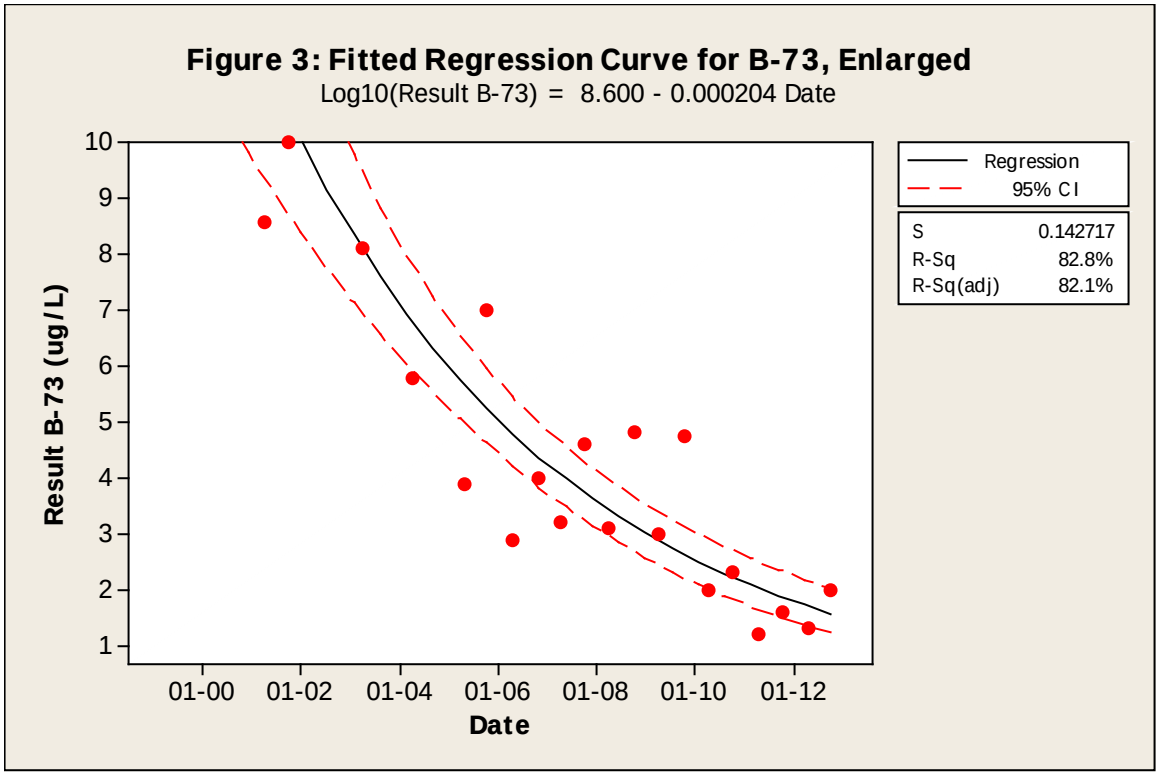


Figure 3: Fitted Regression Curve for B-73, Enlarged
Log10(Result B-73) = 8.600 - 0.000204 Date
Result B-73 (ug/L)
Date
01-00
01-02
01-04
01-06
01-08
01-10
01-12
Regression
95% CI
S 0.142717
R-Sq 82.8%
R-Sq(adj) 82.1%

Table 3: Regression Fit for B-73

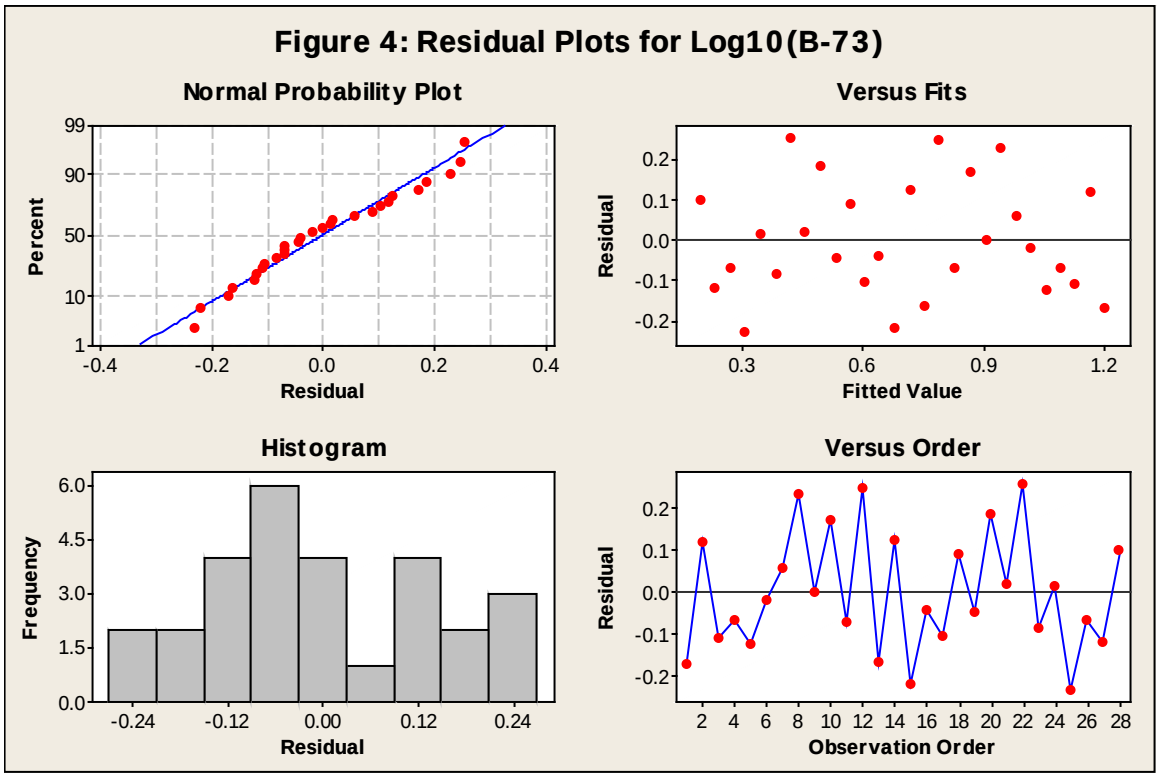
The regression equation is
Log(B-73) = 8.60 - 0.000204 Date

Predictor Coef SE Coef T P
Constant 8.6001 0.7076 12.15 0.000
Date -0.00020397 0.00001826 -11.17 0.000

S = 0.142717 R-Sq = 82.8% R-Sq(adj) = 82.1%

Analysis of Variance

Source DF SS MS F P
Regression 1 2.5417 2.5417 124.79 0.000
Residual Error 26 0.5296 0.0204
Total 27 3.0713



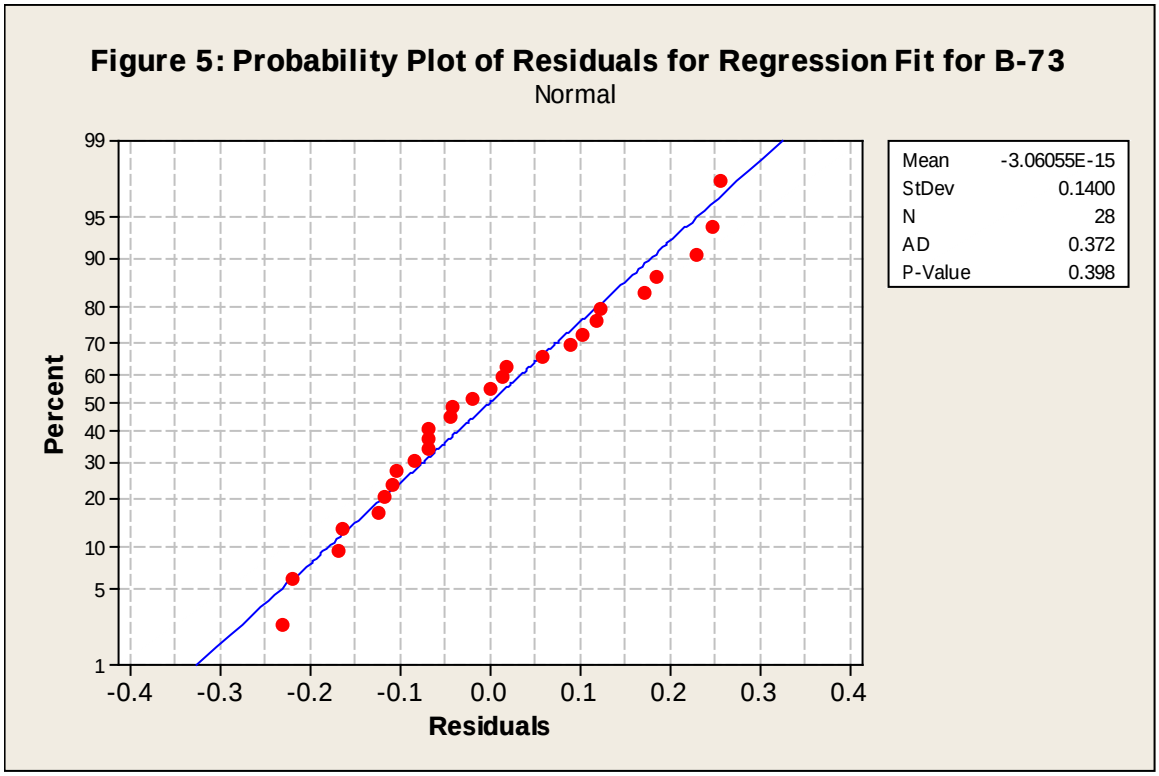


Figure 5: Probability Plot of Residuals for Regression Fit for B-73
Normal
Mean -3.06055E-15
StDev 0.1400
N 28
AD 0.372
P-Value 0.398
Percent
99
95
90
80
70
60
50
40
30
20
10
5
1
-0.4
-0.3
-0.2
-0.1
0.0
0.1
0.2
0.3
0.4
Residuals

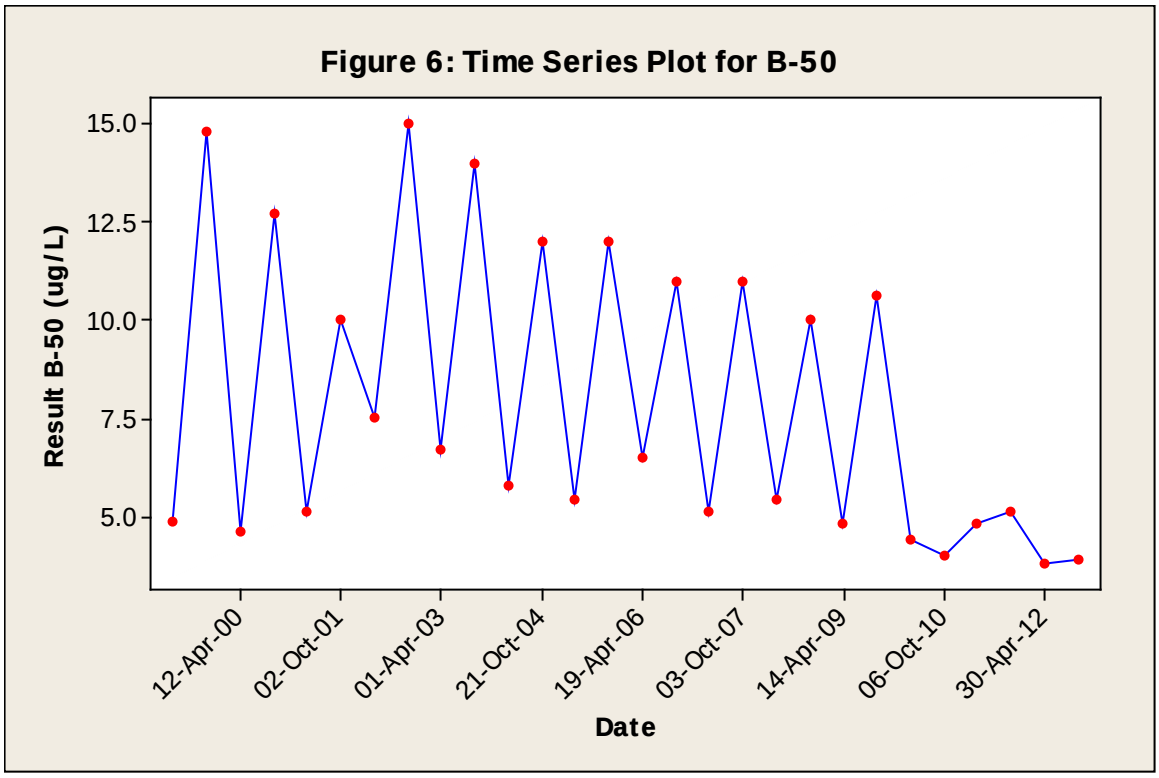
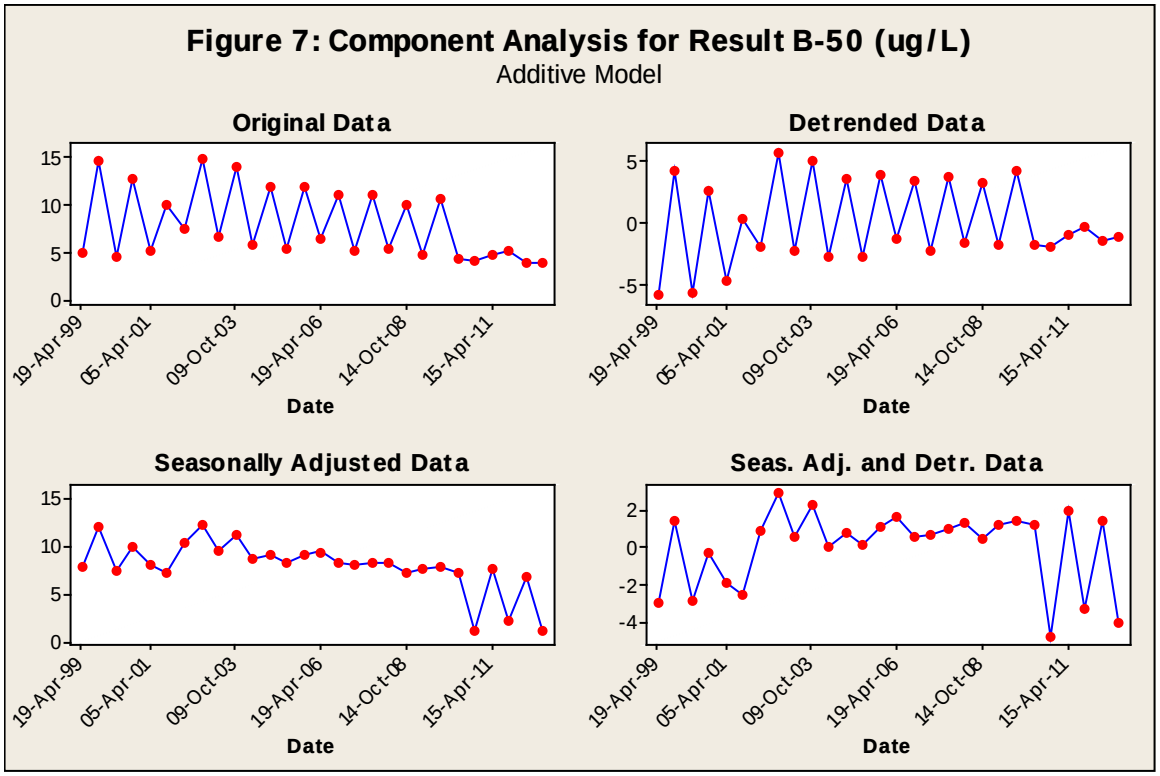


Figure 6: Time Series Plot for B-50
Result B-50 (ug/L)
15.0
12.5
10.0
7.5
5.0
12-Apr-00
02-Oct-01
01-Apr-03
21-Oct-04
19-Apr-06
03-Oct-07
14-Apr-09
06-Oct-10
30-Apr-12
Date



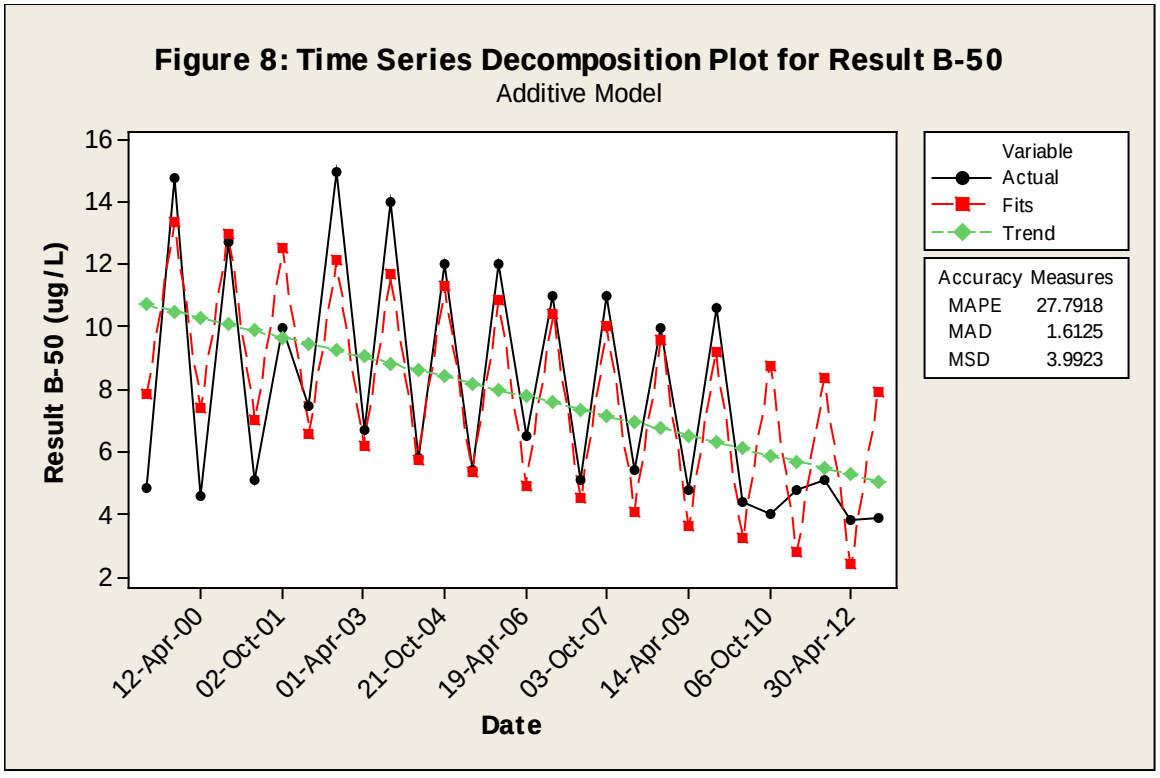


Table 5: Time Series Decomposition for Well B-50 (µg/L)

Additive Model

```
Data Result B-50 (µg/L)
Length 28
NMissing 0
```

Fitted Trend Equation

Yt = 10.927 - 0.209622*t

Seasonal Indices

```
Period Index
 1 -2.875
 2 2.875
```

Accuracy Measures

MAPE 27.7918

```
MAD 1.6125
MSD 3.9923
```

Result

```
 B-50
Time (µg/L) Trend Seasonal Detrend Deseason Predict Error
19-Apr-99 4.87 10.7178 -2.875 -5.84776 7.745 7.8428 -2.97276
12-Oct-99 14.80 10.5081 2.875 4.29186 11.925 13.3831 1.41686
12-Apr-00 4.59 10.2985 -2.875 -5.70851 7.465 7.4235 -2.83351
11-Oct-00 12.70 10.0889 2.875 2.61111 9.825 12.9639 -0.26389
05-Apr-01 5.10 9.8793 -2.875 -4.77927 7.975 7.0043 -1.90427
02-Oct-01 10.00 9.6696 2.875 0.33035 7.125 12.5446 -2.54465
03-Apr-02 7.50 9.4600 -2.875 -1.96002 10.375 6.5850 0.91498
03-Oct-02 15.00 9.2504 2.875 5.74960 12.125 12.1254 2.87460
01-Apr-03 6.70 9.0408 -2.875 -2.34078 9.575 6.1658 0.53422
09-Oct-03 14.00 8.8312 2.875 5.16884 11.125 11.7062 2.29384
07-Apr-04 5.80 8.6215 -2.875 -2.82154 8.675 5.7465 0.05346
21-Oct-04 12.00 8.4119 2.875 3.58809 9.125 11.2869 0.71309
27-Apr-05 5.40 8.2023 -2.875 -2.80229 8.275 5.3273 0.07271
06-Oct-05 12.00 7.9927 2.875 4.00733 9.125 10.8677 1.13233
19-Apr-06 6.50 7.7830 -2.875 -1.28305 9.375 4.9080 1.59195
24-Oct-06 11.00 7.5734 2.875 3.42658 8.125 10.4484 0.55158
11-Apr-07 5.10 7.3638 -2.875 -2.26380 7.975 4.4888 0.61120
03-Oct-07 11.00 7.1542 2.875 3.84582 8.125 10.0292 0.97082
02-Apr-08 5.40 6.9446 -2.875 -1.54456 8.275 4.0696 1.33044
14-Oct-08 10.00 6.7349 2.875 3.26507 7.125 9.6099 0.39007
14-Apr-09 4.80 6.5253 -2.875 -1.72531 7.675 3.6503 1.14969
14-Oct-09 10.60 6.3157 2.875 4.28431 7.725 9.1907 1.40931
08-Apr-10 4.40 6.1061 -2.875 -1.70607 7.275 3.2311 1.16893
06-Oct-10 4.00 5.8964 2.875 -1.89644 1.125 8.7714 -4.77144
15-Apr-11 4.80 5.6868 -2.875 -0.88682 7.675 2.8118 1.98818
19-Oct-11 5.10 5.4772 2.875 -0.37720 2.225 8.3522 -3.25220
```

```
30-Apr-12 3.80 5.2676 -2.875 -1.46758 6.675 2.3926 1.40742
09-Oct-12 3.90 5.0580 2.875 -1.15796 1.025 7.9330 -4.03296
```

Note: See Figure 8

Result: Black circles (Actual)
Trend: Green diamonds
Predict: Red squares (Fits)
Error = Result – Predict

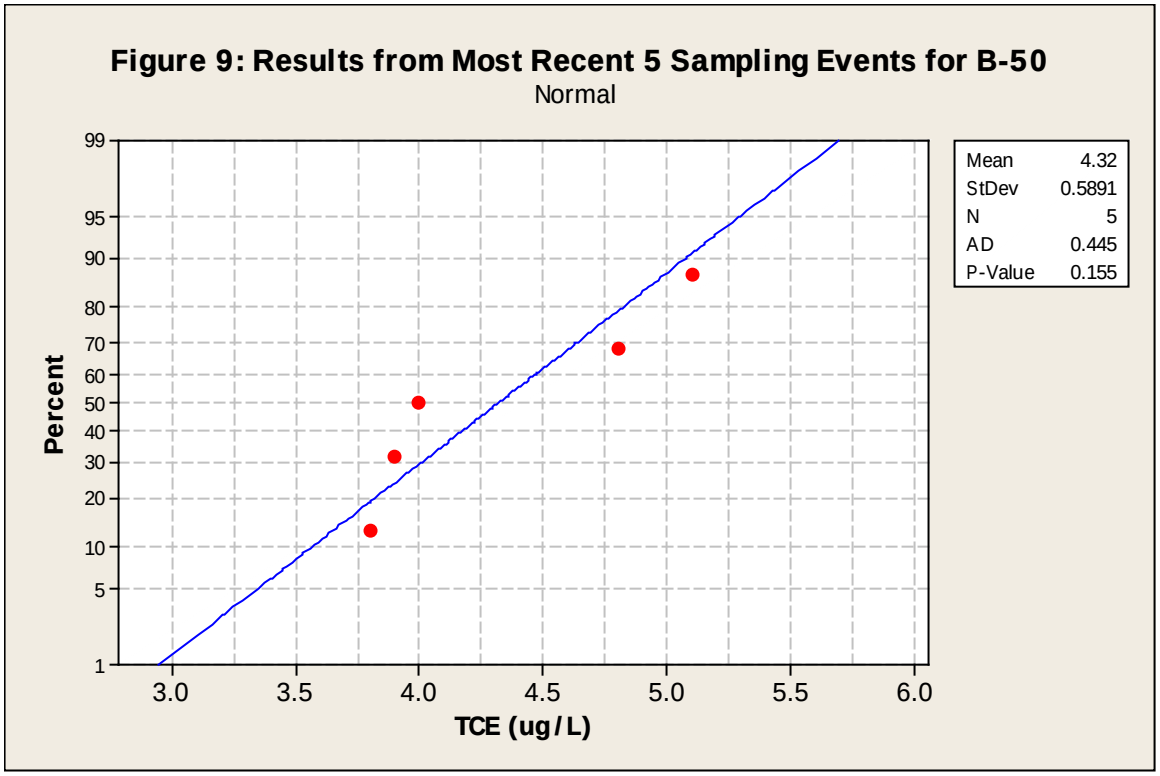


Table 6: One-Sample t-Test for B-50 Using Five Most Recent Results

Test of mu = 5 vs < 5

```
 95% Upper
Variable N Mean StDev SE Mean Bound T P
TCE 5 4.320 0.589 0.263 4.882 -2.58 0.031
```

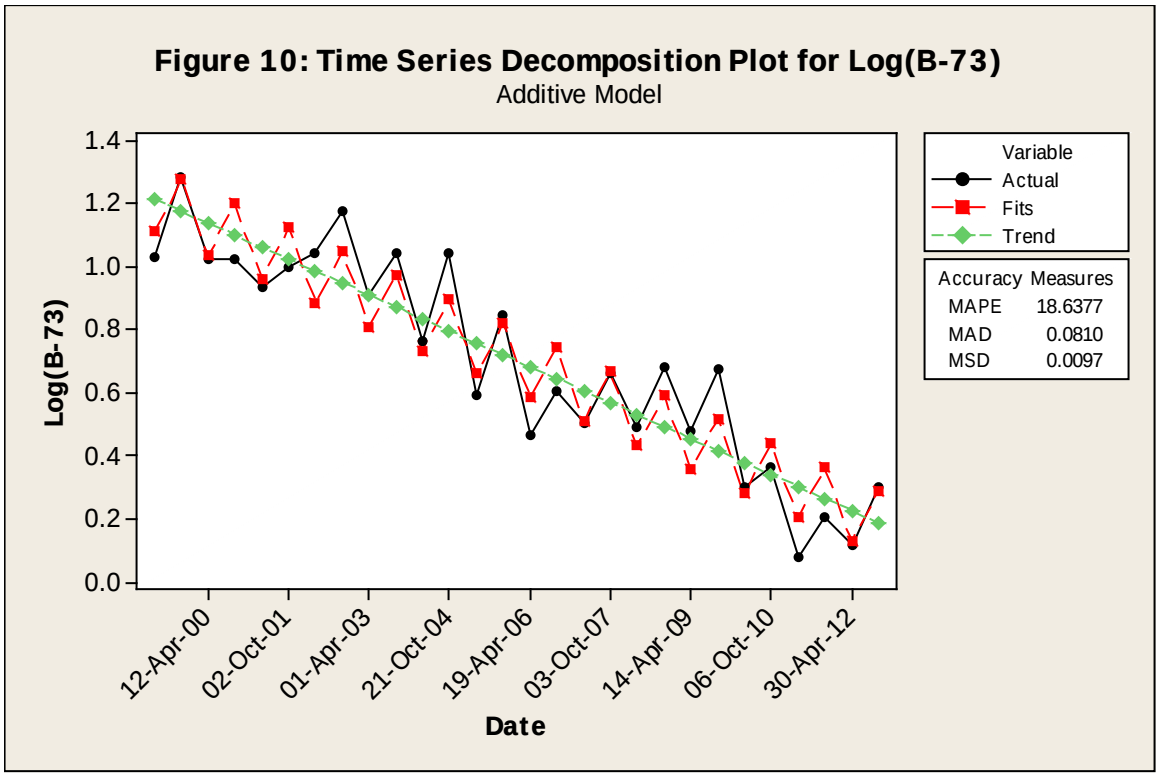


Table 7: Time Series Decomposition for Log(B-73)

Additive Model

```
Data Log(B-73)
Length 28
NMissing 0
```

Fitted Trend Equation

Yt = 1.2525 - 0.038036*t

Seasonal Indices

```
Period Index
 1 -0.0993142
 2 0.0993142
```

Accuracy Measures

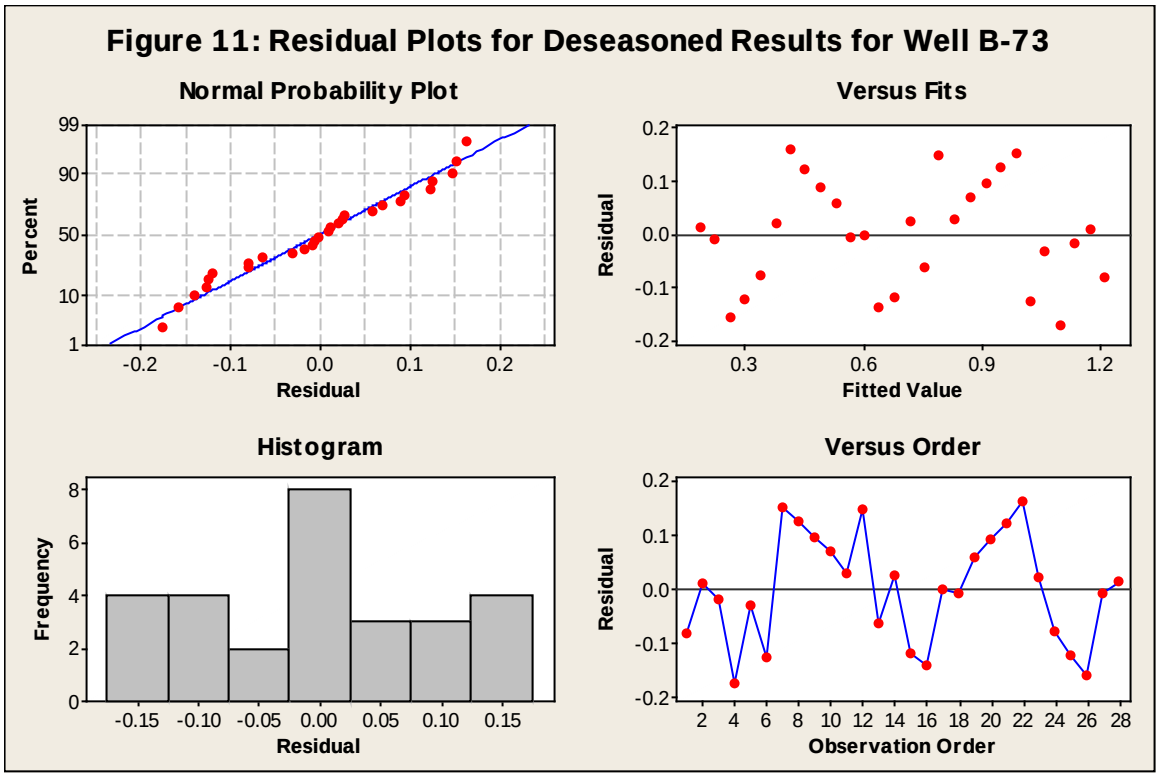
MAPE 18.6377

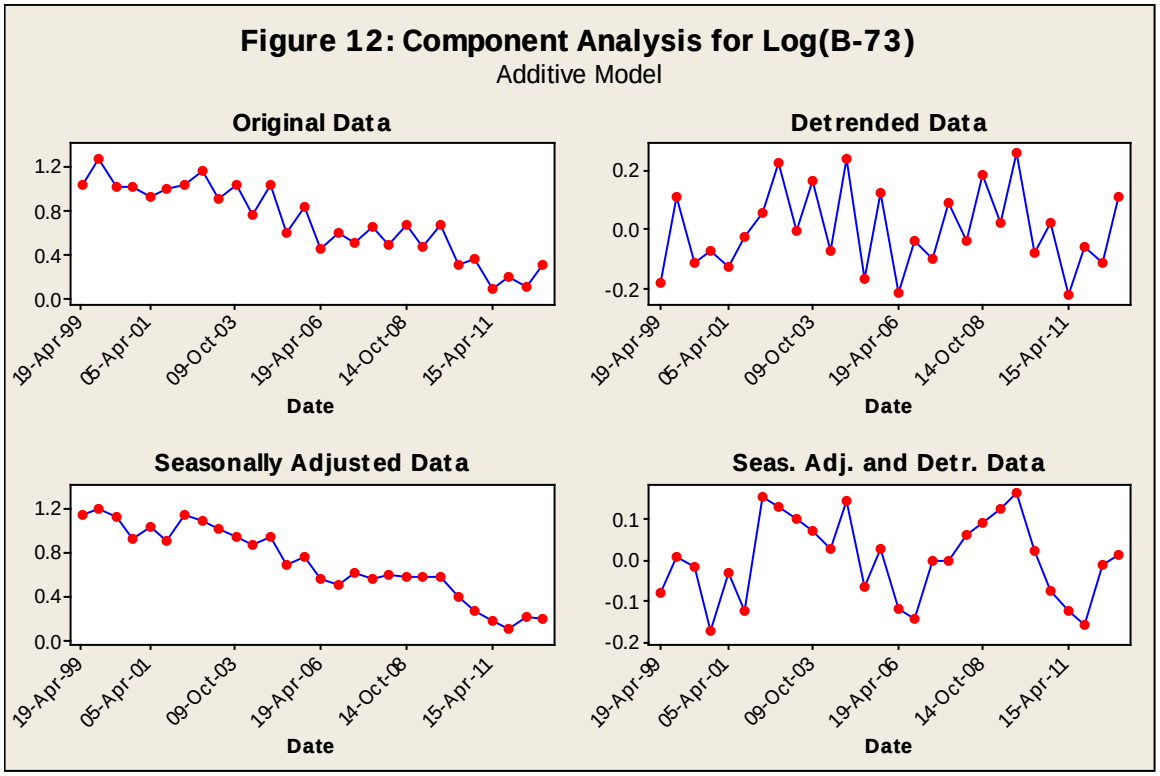
MAD 0.0810
MSD 0.0097

Time	Log(B-73)	Trend	Seasonal	Detrend	Deseason	Predict
19-Apr-99	1.03342	1.21448	-0.0993142	-0.181057	1.13274	1.11517
12-Oct-99	1.28556	1.17645	0.0993142	0.109112	1.18624	1.27576
12-Apr-00	1.02119	1.13841	-0.0993142	-0.117221	1.12050	1.03910
11-Oct-00	1.02531	1.10037	0.0993142	-0.075069	0.92599	1.19969
05-Apr-01	0.93349	1.06234	-0.0993142	-0.128852	1.03280	0.96302
02-Oct-01	1.00000	1.02430	0.0993142	-0.024303	0.90069	1.12362
03-Apr-02	1.04139	0.98627	-0.0993142	0.055125	1.14071	0.88695
03-Oct-02	1.17609	0.94823	0.0993142	0.227859	1.07678	1.04755
01-Apr-03	0.90849	0.91020	-0.0993142	-0.001712	1.00780	0.81088
09-Oct-03	1.04139	0.87216	0.0993142	0.169231	0.94208	0.97148
07-Apr-04	0.76343	0.83413	-0.0993142	-0.070698	0.86274	0.73481
21-Oct-04	1.04139	0.79609	0.0993142	0.245302	0.94208	0.89540
27-Apr-05	0.59106	0.75805	-0.0993142	-0.166990	0.69038	0.65874
06-Oct-05	0.84510	0.72002	0.0993142	0.125079	0.74578	0.81933
19-Apr-06	0.46240	0.68198	-0.0993142	-0.219586	0.56171	0.58267
24-Oct-06	0.60206	0.64395	0.0993142	-0.041888	0.50275	0.74326
11-Apr-07	0.50515	0.60591	-0.0993142	-0.100763	0.60446	0.50660
03-Oct-07	0.66276	0.56788	0.0993142	0.094881	0.56344	0.66719
02-Apr-08	0.49136	0.52984	-0.0993142	-0.038480	0.59068	0.43053
14-Oct-08	0.68124	0.49181	0.0993142	0.189435	0.58193	0.59112
14-Apr-09	0.47712	0.45377	-0.0993142	0.023351	0.57644	0.35446
14-Oct-09	0.67761	0.41573	0.0993142	0.261872	0.57829	0.51505
08-Apr-10	0.30103	0.37770	-0.0993142	-0.076669	0.40034	0.27839
06-Oct-10	0.36173	0.33966	0.0993142	0.022064	0.26241	0.43898
15-Apr-11	0.07918	0.30163	-0.0993142	-0.222447	0.17850	0.20231
19-Oct-11	0.20412	0.26359	0.0993142	-0.059473	0.10481	0.36291
30-Apr-12	0.11394	0.22556	-0.0993142	-0.111614	0.21326	0.12624
09-Oct-12	0.30103	0.18752	0.0993142	0.113509	0.20172	0.28684

Time	Error
19-Apr-99	-0.081743
12-Oct-99	0.009797
12-Apr-00	-0.017907
11-Oct-00	-0.174383
05-Apr-01	-0.029538
02-Oct-01	-0.123618
03-Apr-02	0.154439
03-Oct-02	0.128545
01-Apr-03	0.097602
09-Oct-03	0.069917
07-Apr-04	0.028616
21-Oct-04	0.145988
27-Apr-05	-0.067676
06-Oct-05	0.025765
19-Apr-06	-0.120271
24-Oct-06	-0.141202
11-Apr-07	-0.001448
03-Oct-07	-0.004433
02-Apr-08	0.060834
14-Oct-08	0.090121
14-Apr-09	0.122665
14-Oct-09	0.162558
08-Apr-10	0.022645
06-Oct-10	-0.077250

15-Apr-11 -0.123133
19-Oct-11 -0.158787
30-Apr-12 -0.012300
09-Oct-12 0.014194





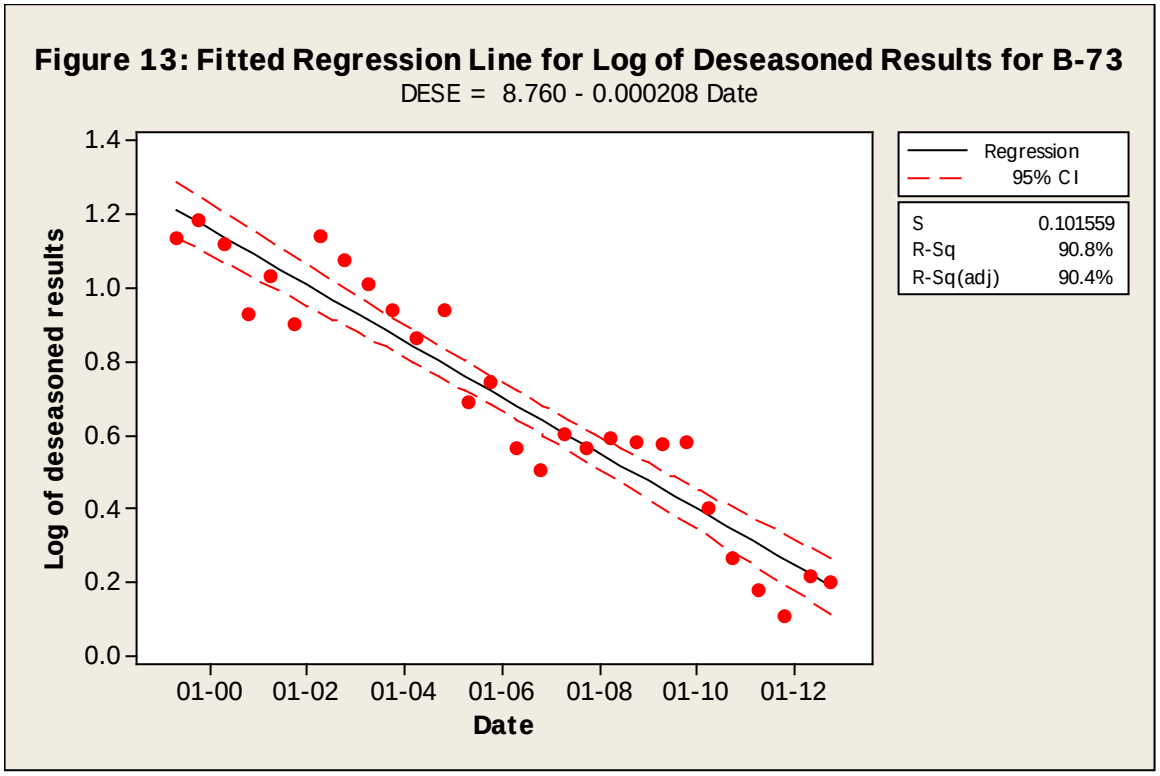


Table 8: Regression Analysis for Log Transformed De-seasoned Results for B-73 vs. Date

The regression equation is

DESE = 8.760 - 0.000208 Date

S = 0.101559 R-Sq = 90.8% R-Sq(adj) = 90.4%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	2.64571	2.64571	256.51	0.000
Error	26	0.26817	0.01031		
Total	27	2.91388			