

**FIFTH FIVE-YEAR REVIEW REPORT
FOR
PHOENIX-GOODYEAR AIRPORT (NORTH AND SOUTH AREAS) SUPERFUND SITE
MARICOPA COUNTY, ARIZONA**



PREPARED BY

EA Engineering, Science, and Technology, Inc.

FOR

**United States Environmental Protection Agency
Region 9**

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Executive Summary

This is the Fifth Five-Year Review of the Phoenix-Goodyear Airport (North and South Areas) Superfund Site (Site) located in Goodyear, Arizona. The purpose of this Five-Year Review is to review information to determine if the remedy is and will continue to be protective of human health and the environment.

The Site is approximately 17 miles west of downtown Phoenix, Arizona. The United States Environmental Protection Agency (EPA) divided the Site into two distinct geographic areas: Phoenix-Goodyear Airport (PGA) North and PGA South. The primary contaminants of concern are trichloroethene (TCE) and perchlorate at PGA North, and TCE and chromium at PGA South.

In the 1987 Record of Decision, the EPA chose a remediation system using air and carbon filters to remove contamination from shallow groundwater for PGA South. In the 1989 Record of Decision, the EPA selected a remedy for both PGA North and PGA South addressing contaminated soil vapors in the vadose zone, and contaminated shallow and deep groundwater. The remedy includes groundwater treatment, groundwater monitoring, beneficial reuse of treated water, reinjection of treated water, and soil vapor extraction. In the 2014 Record of Decision Amendment, the EPA called for enhanced treatments at PGA North, including targeting perchlorate, which was not addressed in the 1989 Record of Decision. All three Record of Decision documents contribute to the current remedy being implemented.

In addition to the Record of Decision documents, EPA has also issued two Removal Action Memoranda. In October 1991, a Removal Action Memorandum was issued to address chromium in soil at PGA South, and this removal action is complete. In 2008, a Removal Action Memorandum was issued to address the perchlorate in groundwater at PGA North that was being extracted by the remedial wells, and this removal action is ongoing.

The remedies at PGA North and PGA South are functioning as intended, with pump and treat systems effectively reducing the areas of groundwater contamination (also known as plume) and contaminant concentrations of TCE. Soil vapor and vapor intrusion risks are less than Excess Lifetime Cancer Risk of 1×10^{-5} and Hazard Index thresholds of 1. A new treatment system using technologies specified in the existing Record of Decision documents was constructed in PGA South to address a newly identified groundwater plume which is impacted by TCE.

The remedy at the Phoenix-Goodyear Airport Superfund Site (North and South Areas) is protective of human health and the environment and is effectively reducing plume size and contaminant levels in groundwater. However, in order for the remedy to be protective in the

long-term, the following actions need to be taken: a comprehensive groundwater investigation for PFAS, reassessment of plume capture, and an update to the COCs and their respective cleanup levels in a decision document.

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List of Acronyms and Abbreviations

ADEQ	Arizona Department of Environmental Quality
EA	EA Engineering, Science, and Technology, Inc., an environmental firm and consultant for the EPA
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
GTRC	Goodyear Tire and Rubber Company, potentially responsible party for PGA South
HFPO-DA	hexafluoropropylene oxide dimer acid
MCL	maximum contaminant level
mg/kg	milligram per kilogram
PFAS	per- and polyfluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFNA	perfluorononanoic acid
PFHxS	perfluorohexanesulfonic acid
PFBS	perfluorobutanesulfonic acid
PGA	Phoenix-Goodyear Airport
ROD	Record of Decision
RSL	Regional Screening Levels
Site	Phoenix-Goodyear Airport (North and South Areas) Superfund Site
TCE	trichloroethene

1. Introduction

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

The United States Environmental Protection Agency (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act Section 121, 40 Code of Federal Regulation Section 300.430(f)(4)(ii) of the National Contingency Plan and EPA policy.

This is the Fifth Five-Year Review for the Phoenix-Goodyear Airport (North and South Areas) Superfund Site (Site). The triggering action for this statutory review is the completion date of the previous Five-Year Review, signed by the EPA on September 18, 2020. This Five-Year Review has been prepared because hazardous substances, pollutants, or contaminants remain at the Site greater than levels that allow for unlimited use and unrestricted exposure. The summary form for this Five-Year Review can be found as Table 1.

The Site consists of two areas, Phoenix-Goodyear Airport (PGA) North and PGA South. Both areas will be addressed in this Five-Year Review. PGA North is an area including groundwater contaminated primarily with trichloroethene (TCE) and perchlorate. PGA South is an area where groundwater was contaminated primarily with TCE and chromium.

The Phoenix-Goodyear Airport (North and South Areas) Superfund Site Five-Year Review was led by Vicky Wiraatmadja, EPA Region 9 Remedial Project Manager and Cynthia Ruelas, EPA Region 9 Superfund Five-Year Review Coordinator. Participants from EA Engineering, Science, and Technology, Inc. (EA) include: Catherine LeCours, EA Five-Year Review Project Manager; Emily Rozok, EA Five-Year Review Deputy Project Manager and technical lead; Alan Pacheco Malagon, EA technical support; and Nicole Brooks, EA main author. The review began on December 12, 2024. A list of documents reviewed in the preparation of this Five-Year Review Report can be found in Appendix A.

The Arizona Department of Environmental Quality (ADEQ) oversees the PGA Site and works closely with the EPA as a regulatory peer.

Table 1. Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Phoenix-Goodyear Airport (North and South Areas) Superfund Site		
EPA ID: AZD980695902		
Region: 9	State: AZ	City/County: Goodyear/Maricopa
SITE STATUS		
National Priorities List Status: Final		
Multiple Operable Units? Yes	Has the site achieved construction completion? No	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Vicky Wiraatmadja		
Author affiliation: EPA		
Review period: 12/12/2024 - 8/28/2025		
Date of site inspection: 2/13/2025		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/18/2020		
Due date (five years after triggering action date): 9/18/2025		

1.1. Background

1.1.1. PGA North

The former Unidynamics Phoenix, Inc. facility, established in 1963, served as a manufacturing plant for ordnance components and related electromechanical devices. The products produced here were then shipped off-site for integration into larger defense systems. These items typically contained small amounts of explosive or reactive chemicals. Unidynamics Phoenix, Inc used, stored, and tested more than 180 different chemicals and chemical mixtures including acids, explosives, tear gas, various propellants, paints, solvents, reactive chemicals and products, and radioactive materials.

Between 1963 and 1980, personnel reportedly disposed of various chemicals, specifically TCE and perchlorate — including solvents used in manufacturing electromagnetic devices — in four dry wells located west of the main production building.

Historically, the former Unidynamics Phoenix, Inc.'s property included 24 fixed buildings, each dedicated to specific manufacturing processes or research operations, and eight bunkers. The Crane Company purchased Unidynamics Phoenix, Inc. and the property in 1985. The Crane Company sold the Unidynamics Phoenix, Inc. business to Pacific Scientific Energy Dynamics in 1993. Pacific Scientific Energy Dynamics continued operations until 1994 and then removed the manufacturing equipment. The buildings and bunkers remained vacant until the Crane Company completed demolition in 2009. Recently, there has been an increase in commercial development on the PGA North area and outside of the source area boundaries. Appendix B presents a summary of the Site chronology.

1.1.2. PGA South

The contamination at PGA South originated from operations at the Goodyear Aerospace site and Navy activities at Litchfield Park Naval Air Facility.

The Goodyear Aircraft Corporation built an aircraft modification facility on the west side of Litchfield Road south of Yuma Road at the start of World War II. Goodyear Aerospace Corporation operated the facility at 101 South Litchfield Road from 1949 to 1987, later occupied by Loral Corporation and Lockheed Martin until 2014. The plant developed and manufactured aerospace products generating hazardous waste from metal treatment processes.

The Navy developed the Litchfield Park Naval Air Facility west and southwest of the Goodyear property at the start of World War II, building a runway, hangars, barracks, and other infrastructure. The facility stored surplus Navy aircraft after World War II and closed in the late 1960s. The Navy transferred the property and structures to the City of Phoenix Aviation Department as the Phoenix-Goodyear Airport in 1968.

At the Goodyear facility, solvents and acids, metal sludges, waste solvents, and waste acids, were disposed of on-site in sludge drying beds, ditches, and storm sewers until 1980. Remediation of the beds occurred in 1980 and 1993. In 1988, a 25,000-gallon underground storage tank released aviation gasoline. Corrective actions included groundwater monitoring and installation of a soil vapor extraction system. The EPA's Underground Storage Tank section manages the aviation gasoline site, with ongoing groundwater monitoring. This petroleum spill

is separate from the chlorinated volatile organic compounds and chromium contamination addressed in PGA South remedial actions. Appendix B presents a summary of the Site chronology.

1.2. Physical Characteristics

1.2.1. PGA North

PGA North includes 55 acres of land with commercial and industrial properties surrounding the former Unidynamics Phoenix, Inc. facility and agricultural land to the west (Figure 1). The area of groundwater contamination (also known as a plume) extends approximately 3 miles north of the former facility, and commercial properties, agricultural fields, housing developments, golf courses, and the Roosevelt Irrigation District Canal overlie contaminated groundwater (Figure 2).

Irrigated plots with crops like rye grasses were developed on-Site and used treated water for dust control and revegetation from 2009 to 2017. Increased perchlorate concentrations in monitoring wells led to the cessation of vegetation plot operations. The deep groundwater supplies drinking and irrigation wells, and some wells within the TCE plume area were abandoned or deactivated due to contamination prior to 2010. There are active water production wells near the PGA North TCE plumes in the deep groundwater.

1.2.2. PGA South

At PGA South, commercial and industrial properties are to the east, north, and south of the airport, with agricultural land to the south and southwest, and residential and recreational land (including the Goodyear Ballpark) to the west. The nearest residences are about one mile west and less than a quarter mile northeast of the Site. Commercial, industrial, and aviation facilities overlie parts of the groundwater plume.

The airport covers approximately 793 acres, housing general aviation aircraft storage, two commercial flight schools, a dormitory, and temporary storage for large aircraft (Figure 1).

There are water production wells within or near the PGA South TCE plumes in the deep groundwater. The two major surface water drainages near the PGA South area are the Gila River, located 2 to 3 miles to the south, and the Agua Fria River, located 1 to 2 miles to the east.

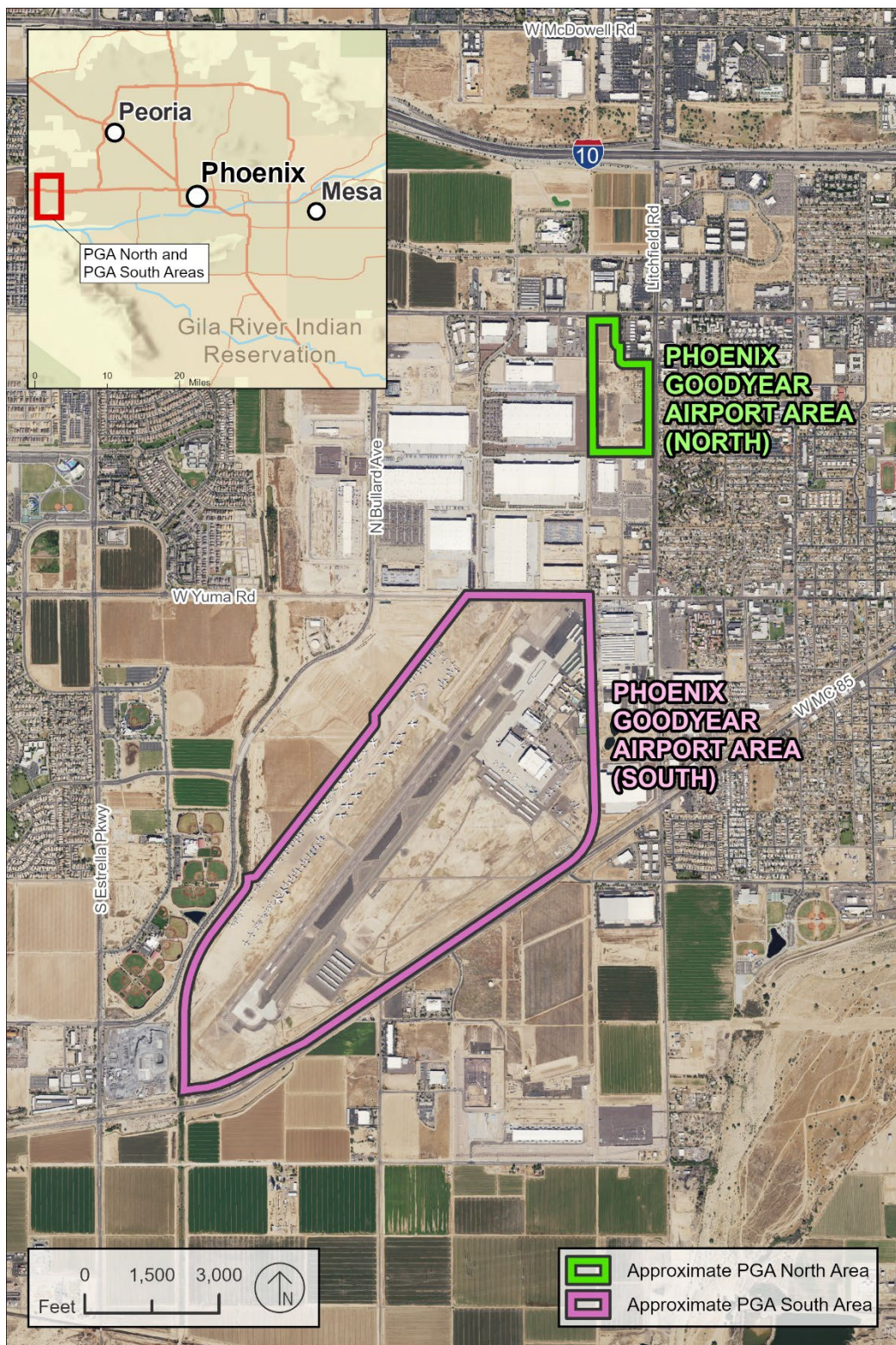
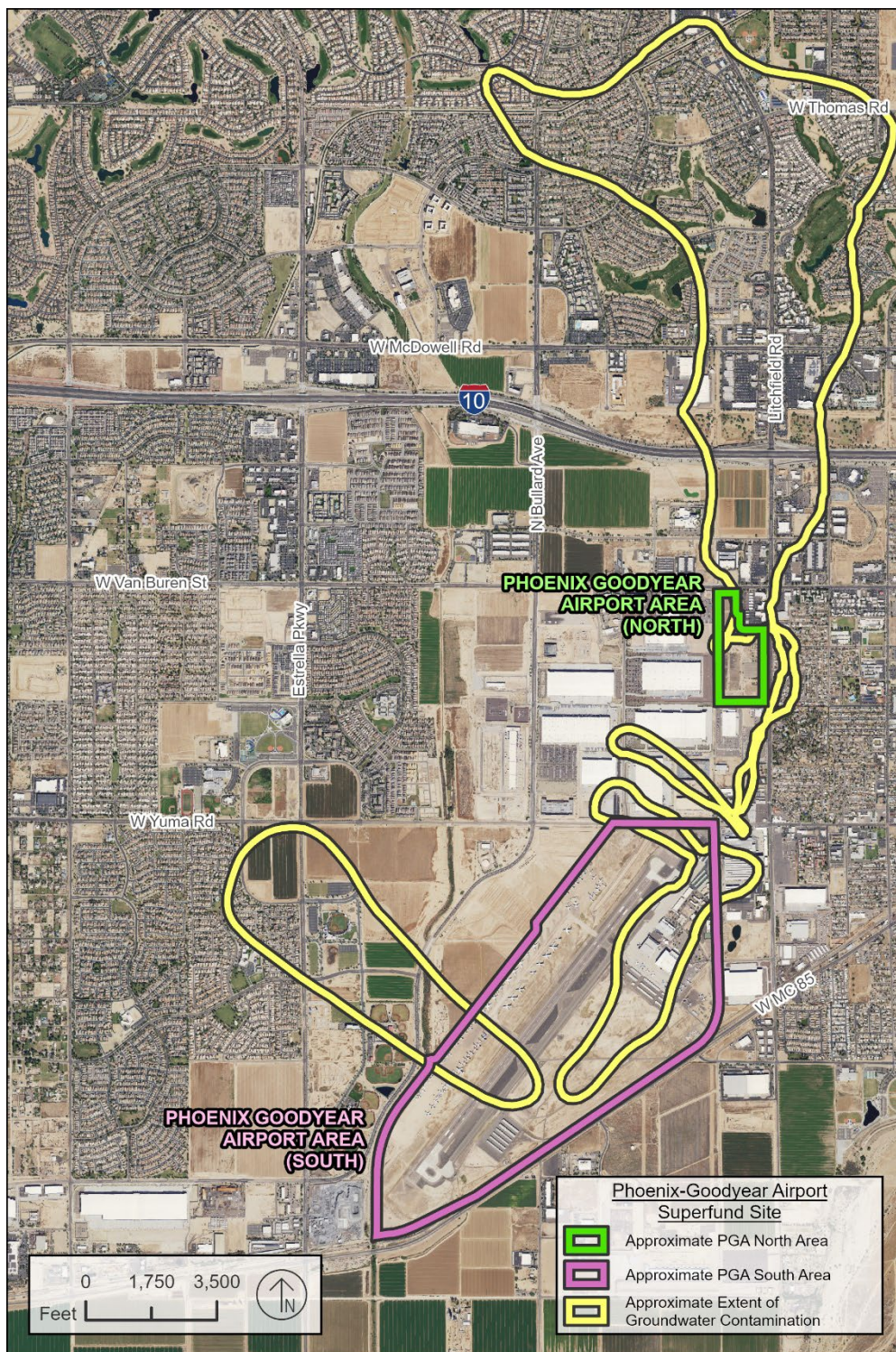


Figure 1. Location Map



Adapted from 2024 NPL Superfund Site Boundaries (EPA Public) GIS dataset. Site boundaries represent the footprint of a whole site, defined for purposes of this effort as the current understanding of the full extent of contamination. This includes both Subunit A and Subunit C, and concentrations of TCE, perchlorate, and chromium above their cleanup standards

Figure 2. Detailed Map

1.3. Hydrology

The PGA North and South Areas are located in the West Salt River Valley, a sub-basin of the Salt River Valley. The basin is mainly filled with alluvial sediment (soil, sand, and rock) deposited by rivers and streams. Basin-wide deposits are subdivided into three alluvial units: The Upper Alluvial Unit, the Middle Alluvial Unit, and the Lower Alluvial Unit. Groundwater is present within each alluvial unit. Upper Alluvial Unit aquifer is subdivided into three hydrological subunits (A, B, and C – shallow to deep) (Figure 3). Groundwater contaminated by Site activities is limited to the Upper Alluvial Unit. The Middle Alluvial Unit groundwater aquifer supplies many of the drinking water wells in the area. The Lower Alluvial Unit aquifer has minimal groundwater movement in most areas. The basin aquifer groundwater is recharged when snowmelt from the mountains infiltrates the ground at the base of the mountain. Additional recharge occurs through permitted recharge facilities, and agricultural and urban irrigation. Temporary and seasonal surface waters, such as the Agua Fria River and the Gila River, also recharge groundwater.

There is a groundwater divide near Yuma Road. At PGA North, the groundwater flows to the north-northwest. At PGA South, the groundwater flows to the southwest and west. The remediation systems for Site (e.g. injection wells and extraction wells) have modified local groundwater flow patterns. Additionally, the pumping of groundwater unrelated to the remedial actions near the Site has caused contaminated groundwater in Subunit A to travel in varying directions as shown by the northwest lobe of the PGA North plume (Figure 2).

Subunit A consists of loose sands and gravel and extends from the ground surface to approximately 160 to 200 feet below ground surface. The lower portion of Subunit A is saturated and considered an unconfined aquifer (there are no low permeability sediments between the groundwater and the surface). The water table (depth to Subunit A groundwater) ranges from approximately 90 to 140 feet below ground surface. Subunit A monitoring wells at PGA have generally seen a water level decline of more than 20 feet since the peak in 1993 attributable to a combination of long-term extraction from the PGA South site and regional drought conditions. Water levels have begun to rebound in the last few years. Additionally, some wells located along the south-southwestern portion of the PGA South site, such as GMW-24A, E-04, and NEW-01, display pronounced seasonal fluctuations, with ranges of up to 10 feet.

Subunit B is located from approximately 110 to 160 feet below ground surface near PGA South and 160 to 230 feet below ground surface at PGA North. Subunit B consists of fine sands and silts and is a confining layer, or aquitard, between Subunit A and Subunit C that restricts, yet does not prevent, the vertical movement of groundwater.

Subunit C is a confined aquifer located approximately 160 to 310 feet below ground surface at PGA South, and 200 to 350 feet below ground surface at PGA North. Subunit C consists of loose fine- to coarse-grained sands with some clay. The depth to groundwater in Subunit C monitoring wells ranges from approximately 220 and 280 feet below ground surface. Subunit C receives groundwater moving vertically from Subunit A to Subunit B and into Subunit C. Recent site characterization activities at wells GMW-67UC and GMW-68UC, located at the southern end of the PGA South Site, has shown that Subunit B is missing in this area. This absence creates a hydraulic connection between Subunit A and Subunit C, resulting in a hydraulic sink at the distal end of the Subunit A plume. Additionally, transect drilling along the airport property boundary (wells GMW-69UC through GMW-73UC), as well as offsite characterization (wells GMW-74UC through GMW-77UC), indicates that the thickness of Subunit B aquitard is highly variable throughout the southern portion of the PGA South area.

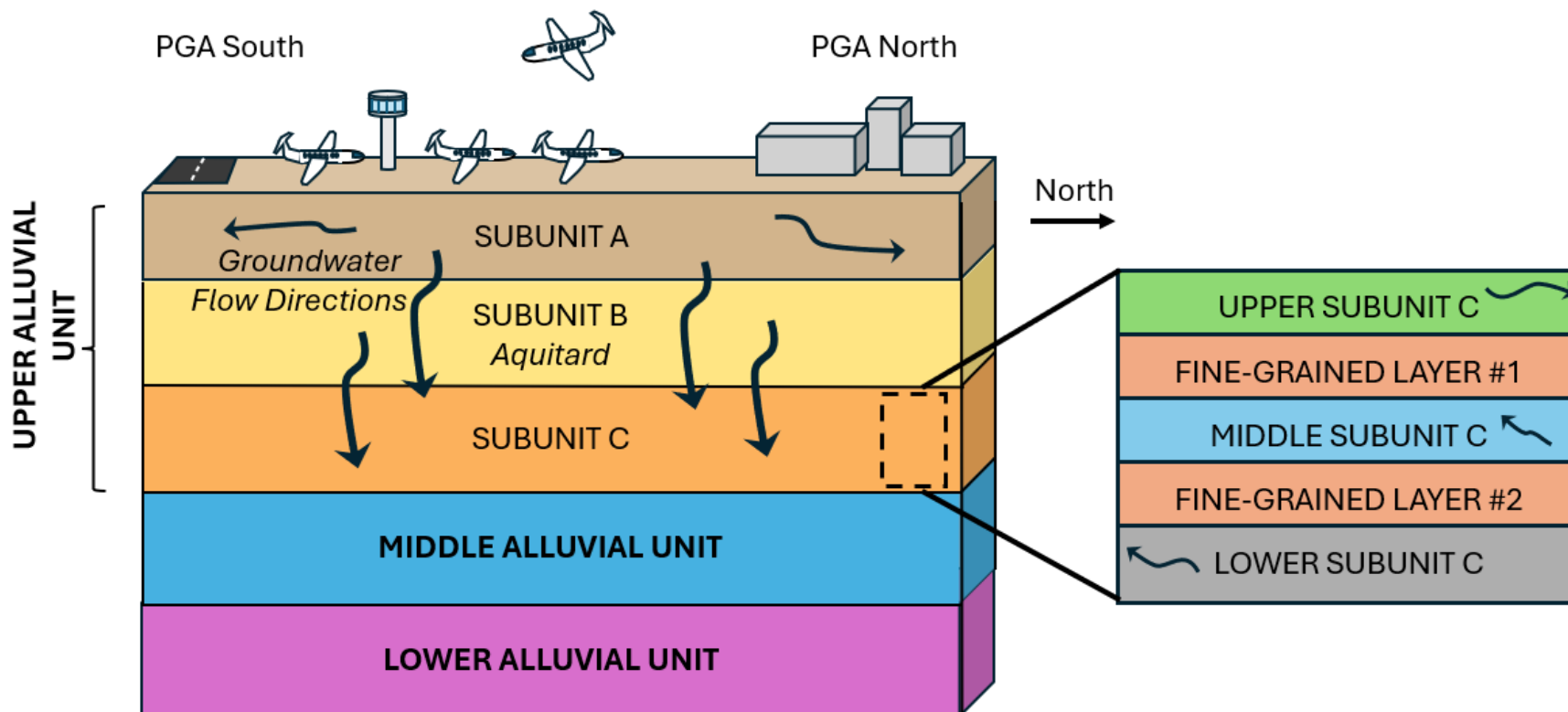
Since 1982, the potentially responsible parties, the Crane Company (PGA North) and Goodyear Tire and Rubber Company (GTRC, PGA South), have conducted various remedial investigations to identify and characterize the nature and extent of contaminants of concern particularly those whose concentrations in groundwater are greater than the EPA's Maximum Contaminant Levels (MCLs).

At PGA North, the TCE contaminated groundwater in Subunit A extends north approximately 2.5 miles, covering an area of approximately 4 square miles. The footprints of the TCE contaminated groundwater in Subunit B and Subunit C are smaller than Subunit A and are closer to the boundaries of the PGA North area. Perchlorate impacts to groundwater in Subunit A are located in the northeast corner of the PGA North area. Drinking water wells and irrigation wells near PGA North draw water from Subunit C. Drinking water wells located within the footprint of the PGA North TCE Subunit A and Subunit C plumes were abandoned prior to 2010. Well COG-3, the closest active drinking water well to the PGA North plume, is located east of the TCE footprint in Subunit C and has had no detections of TCE during the past five-year period.

At PGA South, the Subunit A TCE plume is orientated northeast to southwest along the historical groundwater flow direction, with higher TCE concentrations being observed in the northeast area of PGA South. The TCE plume extends 1.3 miles to the southwest covering an area of approximately 0.4 square miles. Groundwater contaminated with chromium in Subunit A is localized in the northeast corner. Contaminated groundwater in Subunit C is generally limited to the upper portion of Subunit C and the plume extends approximately 0.8 miles to the northwest covering approximately 0.12 square miles. There are currently three separate

Subunit C plumes at PGA South, defined as the Northern, Central, and Southwestern Subunit C plumes. Drinking water wells located within or near the footprint of the PGA South TCE plumes in Subunit C include active wells GAC-02 and COG-20. Well GAC-02 is a private well located between the Northern and Central Subunit C plumes. COG-20 is located near the downgradient end of the Southwestern Subunit C plume, and TCE concentrations at COG-20 have been below the MCL during the past five-year period.

Section 4.2.3 provides additional characterization of the contaminated groundwater at the Site, including figures illustrating the extent of impacted groundwater.



Source: Adapted from EPA 1987, Record of Decision Summary for Section 16 Operable Unit, Phoenix-Goodyear Airport Superfund Site, Goodyear Arizona, September 25 and EPA 1989, Record of Decision, Phoenix-Goodyear Airport, Superfund Site, Goodyear, Arizona. September.

Figure 3. General Cross Section

2. Remedial Actions Summary

2.1. *Basis for Taking Action*

In 1981, the Arizona Department of Health Services found elevated concentrations of solvents and chromium in groundwater. Additional sampling of wells in 1982 and 1983 found the groundwater had elevated concentrations of TCE. In response to Arizona's findings, the EPA added the PGA Site to the National Priorities List in 1983. In 1984, the EPA began a remedial investigation to inform remedial efforts to reduce the risk of human exposure to contaminants from ingestion of contaminated groundwater and contact with contaminated soil. Based on the results of remedial investigation, the EPA identified two major areas of contamination, a northern area (PGA North) and a southern area (PGA South).

2.2. *Remedy Selection*

2.2.1. Remedial Action Objectives

In the 1987 and 1989 ROD, EPA established Remedial Action Objectives for VOC-contaminated soil and groundwater. The Remedial Action Objectives for both PGA North and PGA South for soil are to:

- Protect public health and the environment from exposure to VOC-contaminated soil.
- Prevent migration of VOCs from soil to groundwater that would result in the groundwater contamination exceeding the requirements of the 1987 ROD and the requirements of the Sitewide 1989 ROD.

The Remedial Action Objectives for groundwater are:

- Protect public health and the environment from exposure to contaminated groundwater.
- Eliminate further migration of contaminated groundwater.
- Restore the quality of the Subunit B/C aquifer with respect to contaminant levels that can be attributed to industrial activities.

Additional Remedial Action Objectives established in the 2014 ROD Amendment for PGA North are:

- Achieve permanent contaminant mass reduction of at least 80 percent for TCE and perchlorate in Subunit A groundwater within the Source Area.
- Achieve permanent TCE and perchlorate concentration reduction of at least 80 percent for Subunit A groundwater within the Source Area.

2.2.2. PGA North

The 1989 ROD addressed TCE, methyl ethyl ketone, and acetone contamination in soil and groundwater in Subunits B and C of the upper alluvial unit and in the Subunit A groundwater. The selected remedy for treatment of groundwater at the Site included an extraction and treatment system using air stripping, vapor phase carbon, and granular activated carbon (GAC) polishing to remove acetone and methyl ethyl ketone. The treated water was to be either re-injected or incorporated into the potable water supply. Soil vapor extraction (SVE) with vapor phase carbon was the selected remedy for the treatment of soil at PGA North.

The EPA issued a Removal Action Memorandum in April 2008 to address the perchlorate in groundwater at PGA North that was being extracted by the remedial wells. The Action Memorandum requires wellhead treatment of extracted groundwater where perchlorate levels exceed the Arizona Health Based Guidance Level of 14 parts per billion (ppb). The Action Memorandum also set forth a process for ensuring ongoing provision of potable water where perchlorate impacts any domestic supply wells. An ion exchange system was added to the Main Treatment System process to treat perchlorate.

The EPA issued the 2014 ROD Amendment to provide for enhanced treatment in the PGA North main drywells source area for perchlorate, a PGA North contaminant that was not addressed in the 1989 ROD, and TCE. In addition to maintaining the existing remedy of groundwater extraction, treatment and reinjection or reuse, the selected remedy also includes an enhanced hydraulic barrier and in-situ remediation technologies consisting of chemical reduction, using nano-scale zero-valent iron and zero-valent iron, and anaerobic reductive dechlorination, using biostimulation and bioaugmentation.

2.2.3. PGA South

The 1987 ROD addressed only contaminated groundwater in Subunit A, which is the upper portion of the upper alluvial unit, at PGA South. Remedial determinations for Subunits B and C, and for contaminated soil at the Site, were not made at this time because investigations were still taking place.

The selected remedy was an extraction and treatment system to remove contaminated groundwater from the aquifer. Contaminants were to be removed from the extracted water by an air stripping tower with treatment of the off-gas by a vapor phase GAC system. Treated

groundwater was then to be re-injected into the aquifer through a network of Subunit A injection wells.

The 1989 ROD addressed groundwater at the PGA South site in Subunits B and C of the upper alluvial unit and VOC contamination of soil for PGA South and PGA North. An extraction and treatment system using air stripping was the selected remedy for treatment of groundwater at the Site. Treated water would then be provided to then current domestic water users. The 1989 ROD also selected use of an SVE system with vapor phase carbon treatment of soil. The 1989 remedy addressed VOCs in the soil, but it did not address chromium in the soil.

A Removal Action Memorandum was issued in October 1991 to address chromium in soil at PGA South. The Removal Action Memorandum set forth requirements for the excavation of the former sludge drying beds. Any soil containing total chromium concentrations greater than 2,000 mg/kg or cadmium concentrations greater than 100 mg/kg was to be excavated and stabilized, with confirmation samples taken to ensure that the toxicity characteristic leaching procedures leachate did not exceed regulatory limits. Stabilized soil was redeposited followed by capping with clean soil and gravel. Notably, in 2008, toxicity characteristic leaching procedures results from soil sampling at the sludge bed area exhibited no detections of contaminants of concern.

2.2.4. Explanation of Significant Differences

The remedy detailed in the Record of Decision documents were modified through a series of Explanation of Significant Differences, which document incremental changes in the remedial approach at the site but do not alter fundamentally the overall approach of the remedy.

The first ESD was issued in January 1991 (EPA, 1991a). There were five components to the ESD, four of which applied to PGA North. The four changes to the remedy were the following:

- Revised the cleanup level for methyl ethyl ketone in groundwater from 170 ppb to 350 ppb,
- Set a cleanup level for acetone in groundwater of 700 ppb,
- Clarified the target area and criteria for establishing cleanup goals for soil at PGA North, and
- Clarified that soil excavation is an approved option should the selected soil remedy of soil vapor extraction be ineffective.

The second ESD was issued in May 1993 (EPA, 1993). This ESD applied only to PGA North and changed the following components of the remedy:

- Changed the emission control technology for the SVE system from vapor-phase GAC to treatment by thermal oxidation with wet scrubbing,
- Changed the designated end use for treated Subunit C water to reinjection back into the Subunit C section of the aquifer with an option for future municipal use,
- Suspended the remedial design and construction of the GAC treatment requirement from the Subunit A groundwater remedy because ketones were no longer present in groundwater at levels above remediation levels,
- Added the requirement that wellhead treatment be implemented at any private or municipal drinking water well in the vicinity of the PGA site with an occurrence of Site contaminants at levels in excess of the groundwater cleanup standards, and
- Established four additional groundwater cleanup standards: benzene (5 ppb), ethylbenzene (700 ppb), 1,1,2,2-tetrachloroethane (0.18 ppb) and tetrachloroethylene (5 ppb).

The third ESD, issued in December 1995, allowed for air sparging to accelerate soil cleanup and modified the groundwater remedy for chromium-contaminated Subunit A groundwater to include the use of wellhead treatment systems at both PGA North and PGA South with implementation expected only at PGA South. The third ESD was optional for PGA North, and it has not been applied there.

The fourth ESD, issued in March 1998, updated the current groundwater cleanup standards for both Subunit A and Subunit B and C to be consistent with the Safe Drinking Water Act MCLs adopted in October 1996. Primary contaminants affected by this ESD were toluene and seven metals (barium, beryllium, cadmium, chromium, lead, nickel, and selenium).

The fifth ESD, issued in September 2002, applied only to SVE system at PGA North. The fifth ESD changed air emissions control technology for PGA North SVE to GAC from thermal oxidation with wet scrubbing due to community opposition to the use of thermal oxidation.

The sixth ESD, issued in August 2016, stated that the material in the sludge drying beds and surrounding soil does not contain chromium at the hazardous waste level, and it can be managed as a solid waste.

The seventh ESD, issued in March 2021, established that arsenic is no longer considered a contaminant of concern because arsenic concentrations were not known to be impacted by historical, site related activities and arsenic is naturally occurring at the Site.

2.2.5. Cleanup Levels

The 1989 ROD set forth cleanup levels for the soil and groundwater at PGA North and PGA South. The EPA set final cleanup levels for chromium and other metals in soil at PGA South through the 1991 Action Memorandum. The cleanup levels for soil are set such that remaining contamination will not contribute to groundwater contamination at levels above the groundwater cleanup levels.

The 1989 ROD groundwater requires restoration throughout the Site aquifer – including Subunits B/C – to Site-specific cleanup levels as listed in the 1989 ROD. The cleanup levels were based on MCLs and, for perchlorate, the Arizona Health Based Guidance Levels for. Subunit C and the middle alluvial unit are domestic water supply sources for the area and thus must meet MCLs. Although Subunit A is not a potential source of drinking water, pursuant to Arizona state law, cleanup must achieve the maximum protection of drinking water. Thus, MCLs apply to Subunit A. It should be noted that the 2014 ROD Amendment set goals for reduction of concentrations within the Subunit A source area. Some of the cleanup levels are established in the 1989 ROD were modified in the second, fourth, and seventh ESDs.

Table 2. Groundwater Cleanup Levels

Contaminant of Concern	Cleanup Level (µg/L)	Basis for Cleanup Level	Decision Document(s)
1,1,1-Trichloroethane	200	Federal MCL	1987 ROD
1,1,2,2-Tetrachloroethane	0.18	Unclear in 1993 ESD	1993 ESD
1,1-Dichloroethene	7	Federal MCL	1987 ROD and 1989 ROD ¹
1,2-Dichloropropane	1	ADEQ Action Level	1989 ROD
Acetone	700	EPA Site-Specific ²	1991 ESD
Antimony	1.46	AWQC	1989 ROD
Arsenic	No longer a COC ³	Federal MCL	2021 ESD
Barium	2,000	Federal MCL	1998 ESD
Benzene	5	Federal MCL	1993 ESD
Beryllium	0.004	Federal MCL	1998 ESD
Cadmium	5	Federal MCL	1998 ESD
Carbon tetrachloride	5	Federal MCL	1987 ROD and 1989 ROD ¹
Chloroform (Subunit A of PGA South) ⁴	0.5	AWQC	1987 ROD

Contaminant of Concern	Cleanup Level (µg/L)	Basis for Cleanup Level	Decision Document(s)
Chloroform (Subunit A of PGA North, Subunit B/C of PGA South and PGA North)	100	Federal MCL	1989 ROD
Chromium	100	Federal MCL	1998 ESD
Ethylbenzene	700	Federal MCL	1993 ESD
Lead	15	Federal MCL	1998 ESD
Mercury	2	Federal MCL	1989 ROD
Methyl ethyl ketone	350	EPA Site-Specific ⁵	1991 ESD
Methylene chloride	1	ADEQ Action Level	1989 ROD
Nickel	100	Federal MCL	1998 ESD
Perchlorate ⁶	14	ADHS	2014 ROD Amendment
Perchloroethene	3	ADHS Action Level	1987 ROD
Selenium	50	Federal MCL	1998 ESD
Silver	50	Federal MCL	1989 ROD
Tetrachloroethene	5	Federal MCL	1993 ESD
Toluene	1,000	Federal MCL	1998 ESD
<i>trans</i> -1,2-Dichloroethene	70	Federal Proposed MCL	1987 ROD
Trichloroethene (TCE)	5	Federal MCL	1987 ROD and 1989 ROD ¹
Trichlorofluoromethane	1	ADEQ Action Level	1989 ROD
Xylenes	440	ADEQ Action Level	1989 ROD
Zinc	5,000	AWQC	1989 ROD

Notes:

¹ Both the 1987 ROD and the 1989 ROD have been identified as the applicable decision documents. The 1987 ROD address groundwater contamination only in Subunit A of PGA South. The 1989 ROD addresses groundwater contamination in PGA North and Subunit B/C for PGA South. The 1989 ROD also addresses contamination in Subunit A for PGA North. The cleanup level identified in the 1987 ROD and the 1989 ROD is the same value.

² No applicable or relevant and appropriate requirements are in effect at the time of the 1991 ESD, meaning the EPA calculated the cleanup level for acetone using the available EPA-developed toxicity information.

³ See Section 2.2.10 for more information.

⁴ Source is not a byproduct of municipal water supply chlorination.

⁵ The EPA discovered that the cleanup level for methyl ethyl ketone used in the 1989 ROD was not applicable nor relevant and appropriate. Based on available EPA-developed toxicity information, the EPA determined the correct cleanup level for methyl ethyl ketone.

⁶ Cleanup level adopted in 2008 in the Removal Action Memorandum. Officially added in the 2014 ROD Amendment.

µg/L = microgram(s) per liter

ADEQ = Arizona Department of Environmental Quality

ADHS = Arizona Department of Health Services

AWQC = Ambient Water Quality Criteria; adjusted for consumption of drinking water only; fish ingestion component removed

COC = contaminant of concern

MCL = Maximum Contaminant Level

EPA published Maximum Contaminant Levels under the Safe Drinking Water Act. Maximum Contaminant Levels are the maximum permissible concentration of a chemical in water considered safe to drink and are generally used as action levels for contaminants in groundwater. A site-specific action level is the concentration that, when exceeded, initiates an investigation by EPA.

Table 3. Soil Cleanup Level

Contaminant of Concern	Cleanup Level (mg/kg)	Basis for Cleanup Level	Decision Document
Trichloroethene (TCE) ¹	65	State SRLs	2014 ROD Amendment

Notes:

¹ The cleanup level for TCE will only apply if TCE is found in soil during subsurface investigation activities associated with implementation of the chosen remediation alternative (Table 3, EPA 2014).

mg/kg = milligrams(s) per kilogram

SRL = Soil Remediation Level

2.3. *Remedy Implementation*

PGA North and PGA South both meet the substantive requirements of an Arizona Pollutant Discharge Elimination System permit to discharge treated groundwater into canals owned and operated by Roosevelt Irrigation District.

2.3.1. PGA North

The Crane Company began groundwater treatment at PGA North in 1994. Currently, five groundwater treatment systems are in operation at PGA North, including the Main Treatment System (began operation in 1994) and four satellite treatment systems (33A began operation in 1994, EA-05 began operation in 2008, EA-06 began operation in 2007, and EA-08 began

operation in 2011). Each of the five groundwater treatment systems includes a liquid phase granular activated carbon component to treat volatile organic compounds.

In November 2000, the EPA required testing for perchlorate in groundwater monitoring and found perchlorate was present at levels that warranted treatment. In October 2001, TCE-treated water began to be discharged to the City of Goodyear treatment plant for a perchlorate treatability study. In April 2005, the Crane Company added an ion exchange system to the PGA North Main Treatment System to treat perchlorate groundwater contamination and reinjection of treated water resumed.

The Crane Company completed installation of the new additive emplacement well in 2022 for the purposes of source area flushing and, if deemed necessary in the future, injecting amendments in accordance with the 2014 Record of Decision Amendment. The source area flushing initiative began in 2023 and is ongoing. Thus far, there has been no need for injecting amendments.

During this Five-Year Review period, with the EPA's approval, the Crane Company also constructed and abandoned several injection, extraction, and monitoring wells in downgradient areas of the Subunit A plume to optimize the remedy and accelerate cleanup.

The soil gas remedy at PGA North was a soil vapor extraction system addressing vadose zone soil gas near the former Unidynamics Phoenix, Inc. main drywells area where contaminant dumping occurred. In 1993, the EPA issued an ESD which altered the soil gas remedy selected in the 1987 ROD for PGA North from treatment of air emissions from the soil vapor extraction liquid phase granular activated carbon system to thermal oxidation treatment. The soil vapor extraction system using thermal oxidation functioned for four years removing approximately 10,000 pounds of TCE from the soil. The Crane Company shut off the thermal oxidation system for reevaluation in 1998 after the community raised concerns about potential dioxin emissions, residual soil gas contamination and increased groundwater contamination. The 2002 ESD re-established the soil gas remedy to soil vapor extraction using liquid phase granular activated carbon. Following completion of soil vapor monitoring activities conducted in the second quarter of 2018 and subsequent agency approval based on reduced soil vapor concentrations, operation of the soil vapor extraction system was discontinued and an approved reduction in the sampling program was implemented.

2.3.2. PGA South

In early 1990, the Goodyear Tire and Rubber Company (GTRC) began operation of a Subunit A groundwater treatment facility. At the beginning of operation, there were five extraction wells, one air stripper with vapor phase granular activated carbon (in use until 1995), and seven injection wells. By 1995, the facility had 12 extraction wells and 14 injection wells. The third ESD modified the groundwater remedy to include the removal of volatile organic compounds by air sparging and a metal adsorption well-head treatment for metal contaminants like chromium. During this Five-Year Review period, with the EPA's approval, GTRC also constructed several injection wells in downgradient areas of the Subunit A plume to optimize the remedy and accelerate cleanup.

In Subunit C, there were originally three areas of contamination: the Northern plume, the Central plume, and the Southern plume. Historically, the Northern and Southern plumes each had separate extraction and treatment systems, operating from 1994 to 2004 (Northern) and 1994 to 2009 (Southern). Groundwater cleanup goals were found to have been achieved throughout the Southern plume before its treatment system was shut down. The current Subunit C treatment system began operation in 2014, and treats groundwater extracted from the Central plume at E-102R and from the Northern plume at E-103 by two 20,000-pound liquid phase granular activated carbon vessels. An additional Subunit C treatment system treating groundwater extracted from the Central plume at E-104 began operation in June 2025.

In 2023, GTRC discovered a fourth Subunit C plume impacted by TCE in the southwestern portion of the Site (further detailed in Section 3.2.2). Remedy implementation to address the Southwest plume is underway and consists initially of two extraction wells and a stand-alone treatment system which began operation in May 2025.

At PGA South, soil vapor extraction remedy actions occurred between 1993 and 1998 to remove contaminant mass from the vadose zone. The GTRC implemented soil vapor extraction and air sparging to reduce volatile organic compound concentrations in the groundwater between May 1996 and April 1998. The GTRC conducted rebound monitoring and confirmation soil gas sampling to support closure modeling. Cessation of soil vapor extraction and air sparging was approved by the EPA in 1998 after reviewing the evaluation of the post-remediation soil gas concentrations. During the operation of the soil vapor extraction and air sparging systems, 1,768 pounds of volatile organic compounds were removed from the soil and groundwater.

To address chromium contamination, the GTRC began excavation and stabilization at two small (14,000 square feet) sludge drying beds between 1992 and 1993. Following excavation, the soil was disposed of off-site. The sixth ESD discussed the status of the stabilized fill in the drying beds and surrounding soil stating that the material met landfill disposal requirements. The stabilized fill does not contain a hazardous substance and therefore institutional controls are not needed to prevent material disturbance.

2.4. System Operations/Operation and Maintenance

2.4.1. Operations and Maintenance Requirements

PGA North

As part of the existing PGA North groundwater remedy, the Crane Company operates five groundwater treatment systems including one Main Treatment System and four Satellite Groundwater Treatment Systems. Each treatment system has a specific Operations and Maintenance Plan guiding such activities, and the plans are listed below.

- 2023 Final Main Treatment System Operation and Maintenance Plan.
- 2021 Final Well 33A Groundwater Treatment System Operations and Maintenance Plan.
- 2020 Final EA-05 Groundwater Treatment System Operations and Maintenance Plan.
- 2023 Final EA-06 Groundwater Treatment System Operations and Maintenance Plan.
- 2021 Final EA-08 Groundwater Treatment System Operations and Maintenance Plan.

At the time of this Five-Year Review, the PGA North groundwater well network consisted of 158 monitoring wells, 14 piezometers, 16 extraction wells, 16 injection wells, 7 irrigation wells, and 6 drinking water supply wells. Routine tasks include documenting routine operation and maintenance activities and collecting water quality samples. Weekly field notes include but are not limited to: details for each carbon and ion exchange resin change-out; offline wells; system alarms/notifications; general condition of the system; condition of extraction wells including equipment, piping, and pump/motor vibration; and condition of injection wells, where applicable. Weekly system data collection includes groundwater flow rates from the extraction wells, through the systems, and to the injection wells; depth to water, pressure, and totalizer readings in the extraction and injection wells; liquid phase granular activated carbon and ion exchange systems operational data; system pressures; and overall site conditions. To monitor the progress and effectiveness of the remedy, the Crane Company completes the groundwater monitoring activities in accordance with the Final 2017 Groundwater Monitoring Work Plan Addendum, dated November 6, 2017, and approved by the EPA on December 6, 2017, by taking

monthly and bi-monthly influent, mid-point, and effluent water quality samples, which are analyzed for volatile organic compounds and perchlorate.

PGA South

The GTRC operates four treatment plants at PGA South: one Subunit A Treatment System and three Subunit C Treatment System. At the time of this Five-Year Review, the PGA South groundwater network consists of 129 monitoring wells, 12 extraction wells, 15 injection wells, and 2 production wells. The Subunit A and Subunit C treatment systems include documentation of weekly operations and maintenance activities and performance sampling. The GTRC conducts EPA-approved groundwater monitoring activities monthly and quarterly, which includes laboratory analysis of groundwater samples for volatile organic compounds and chromium.

Operations of the Subunit A treatment system include injecting acid to reduce the pH of extracted groundwater and replacing the media in the packed air stripper tower. For the Subunit C system, the GTRC replaces the liquid phase granular activated carbon media in the vessels when analytical results indicate an increase of contaminant concentrations in treated groundwater indicating a breakthrough. A breakthrough occurs when the media in a treatment component, such as a packed air stripper or liquid phase granular activated carbon, has adsorbed the maximum amount of contaminants possible and needs to be replaced.

The GTRC routinely records groundwater extraction rates, total volume of treated groundwater, differential pressures across the multi-bag filter vessels and liquid phase granular activated carbon vessels, groundwater levels, and system pressures. Groundwater discharge quantities are recorded if applicable to the system. Water quality samples from the influent, mid-points between each vessel, and effluent ports of the treatment systems are collected on a monthly and bi-monthly basis and are analyzed for contaminants to determine media health.

2.4.2. Significant Operations and Maintenance During the Past Five Years

PGA North

The most recent operations data for PGA North is from the 2024 Annual Groundwater Operations and Remediation report and presented in Table 4 and on Figure 4 and Figure 5.

The data shown in Table 4 presents the cumulative pounds of contaminants removed and operational start times for the five treatment systems at PGA North. Figure 4 presents the cumulative mass of TCE removed each year by each treatment system. Figure 5 presents the

cumulative amount of mass of perchlorate removed each year and in previous years for the Main Treatment System. Around 2014, there was a notable increase in perchlorate removal at the Main Treatment System, following enhanced treatment initiatives set in place by the 2014 RODA.

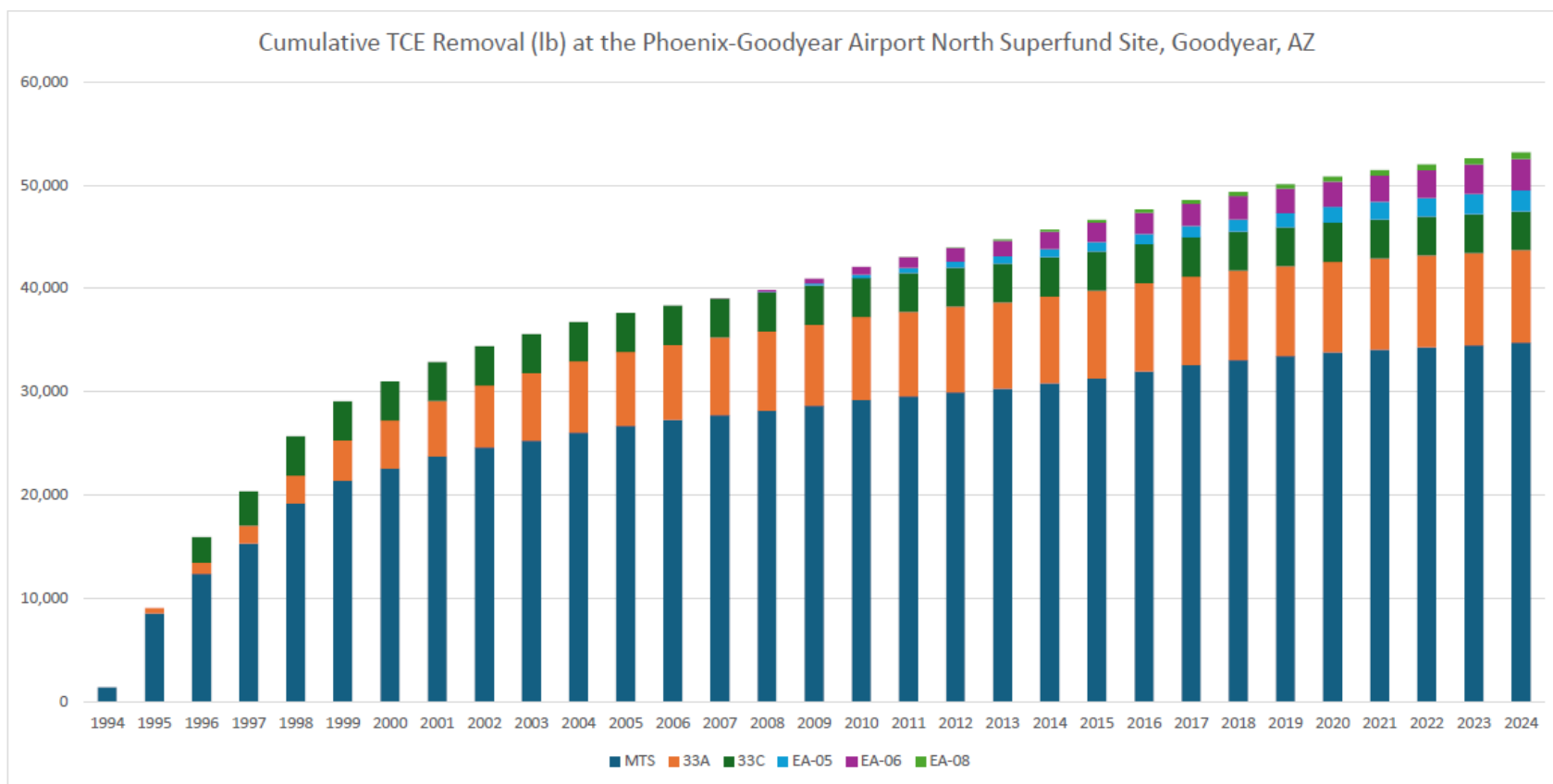
Table 4. PGA North Groundwater Treatment Plant Performance

System Name	Operational Start	Operational Start through 2024 Cumulative TCE Removal (pounds)	2003¹ through 2024 Cumulative Perchlorate Removal (pounds)
Main Treatment System	1994	34,756	816
Satellite – 33A	1994	8,949	Not Applicable
Satellite – EA-05	2008	2,018	Not Applicable
Satellite – EA-06	2007	3,054	Not Applicable
Satellite – EA-08	2011	622	Not Applicable

Notes:

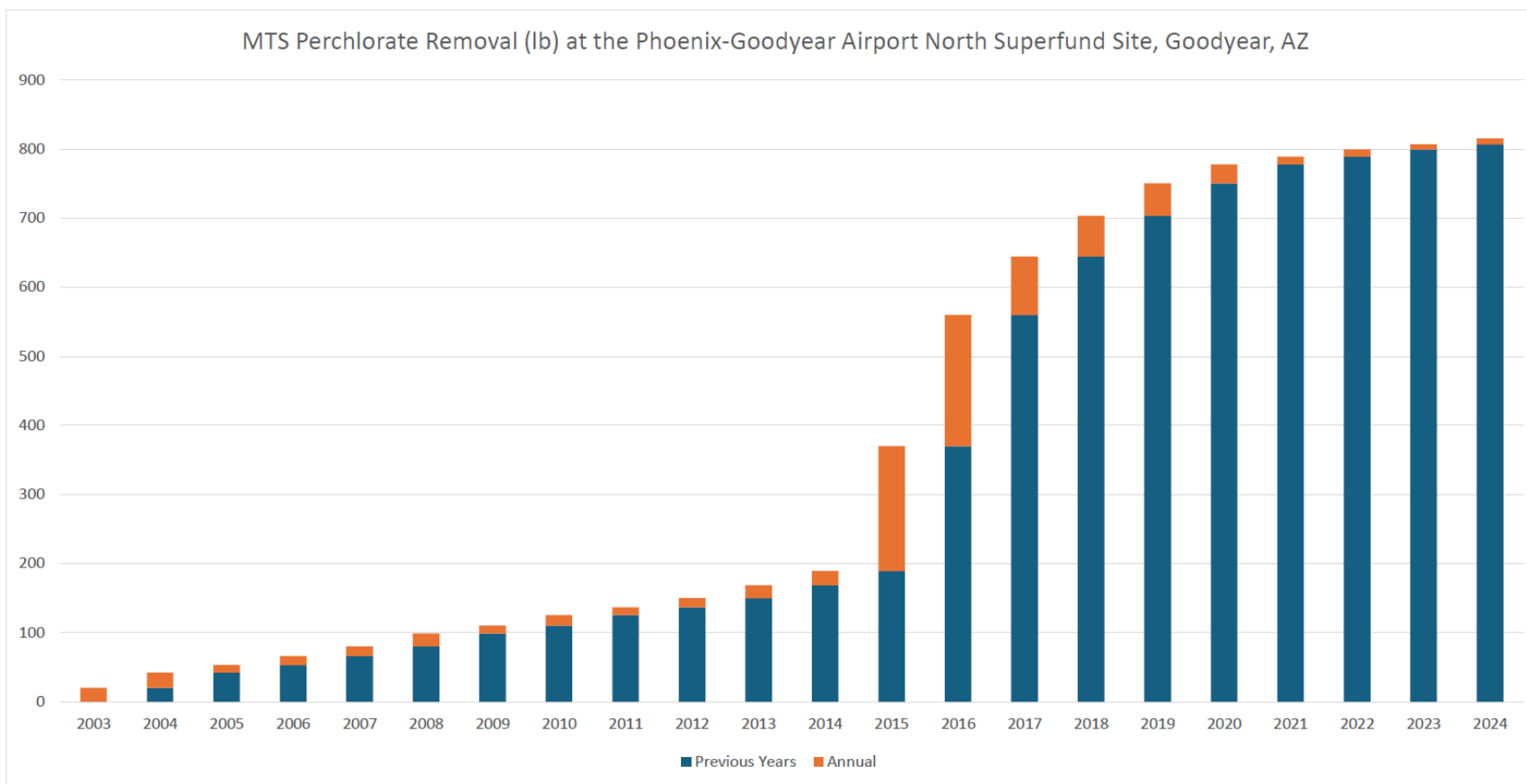
Data from the 2024 Annual Groundwater Operations and Remediation report.

¹Perchlorate removal data from 2003-2005 was from treatment at the City of Goodyear wastewater treatment plant.



Source: EHS Support. 2025. 2024 Annual Groundwater Operations And Remediation Report Phoenix-Goodyear Airport – North Superfund Site Goodyear, Maricopa County, Arizona.

Figure 4. PGA North Cumulative Groundwater Treatment System TCE Mass Removal



Source: EHS Support. 2025. 2024 Annual Groundwater Operations And Remediation Report Phoenix-Goodyear Airport – North Superfund Site Goodyear, Maricopa County, Arizona.

Figure 5. PGA North Main Treatment System Cumulative Perchlorate Mass Removal

PGA South

In March 2023, GTRC installed a new acid injection system to reduce the pH of the extracted groundwater prior to treatment.

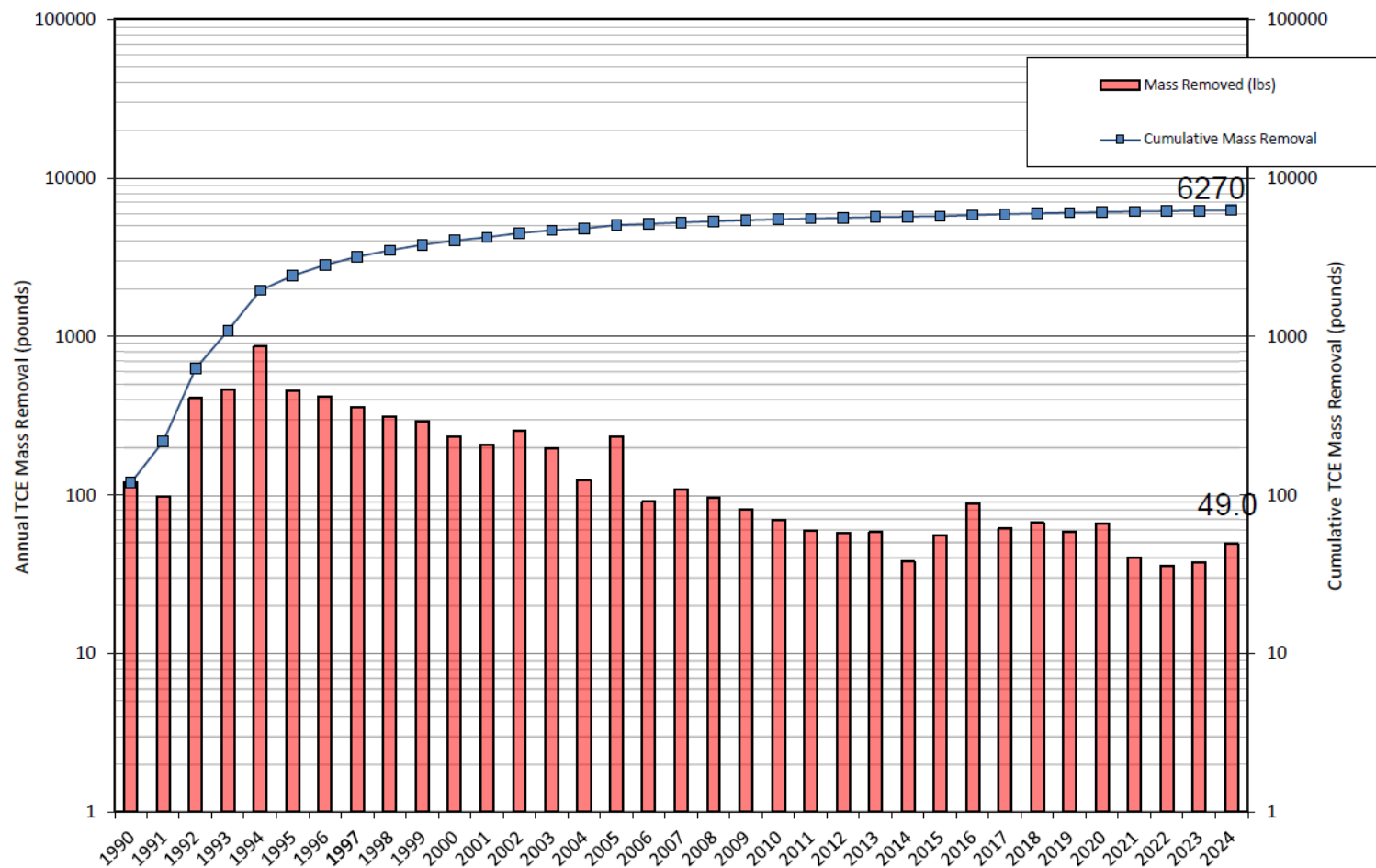
Treatment system performance was based on TCE data for PGA South from the Second Semiannual Groundwater Monitoring Report for PGA South 2024 (Table 5, Figure 6, Figure 7.).

Table 5. PGA South Groundwater Treatment System Performance

System Name	Operational Start Date	Operational Start through 2024 Cumulative TCE Removal (pounds)
Subunit A	1990	6,270
Subunit C	2014	88.6

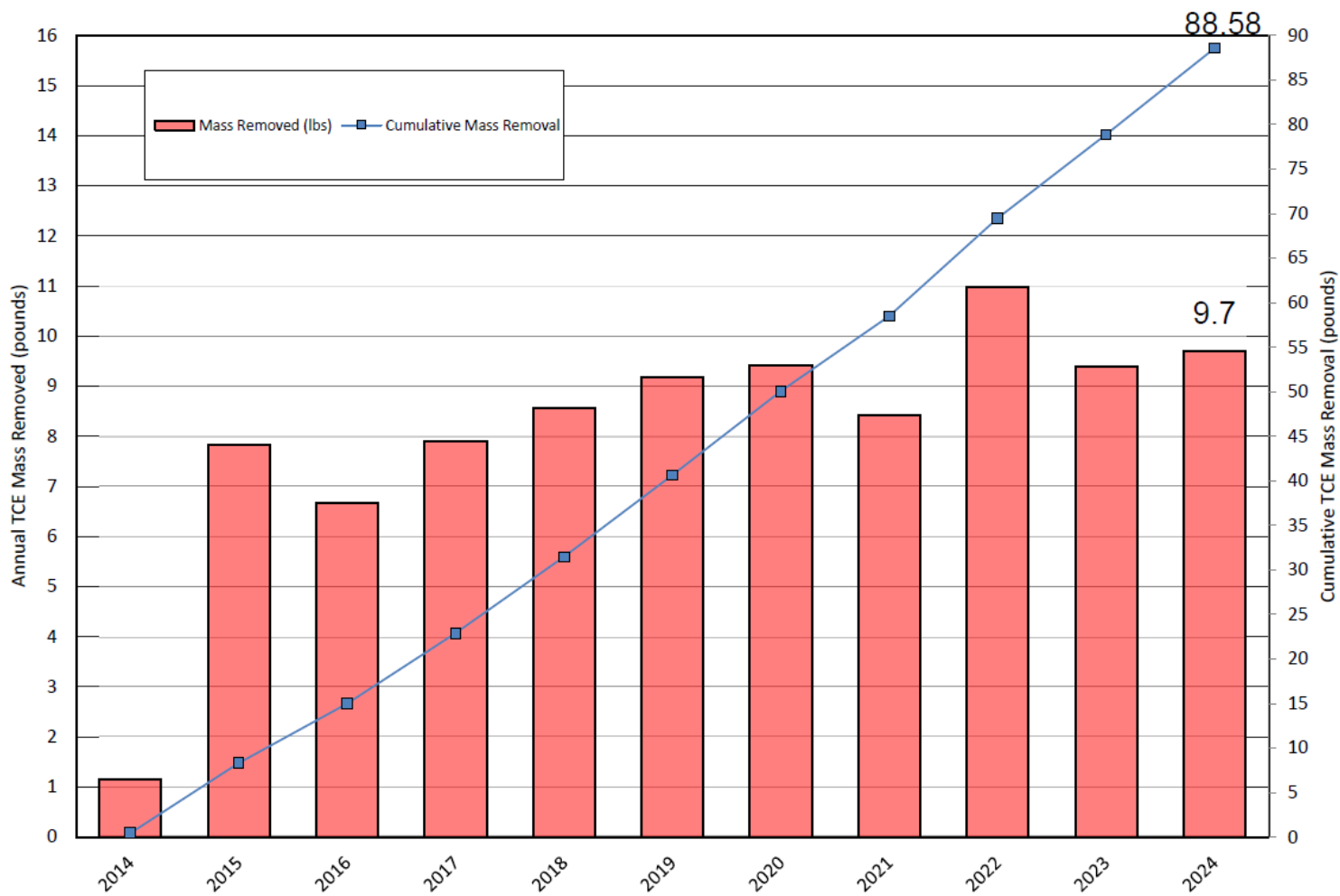
Notes:

Data from Haley & Aldrich, Inc. 2025. Second Semiannual Groundwater Monitoring Report – 2024, Phoenix-Goodyear Airport South Superfund Site, Goodyear, Arizona.



Source: Haley & Aldrich, Inc. 2025. Second Semiannual Groundwater Monitoring Report – 2024, Phoenix-Goodyear Airport South Superfund Site, Goodyear, Arizona.

Figure 6. PGA South Subunit A Annual and Cumulative TCE Mass Removal



Source: Haley & Aldrich, Inc. 2025b. Second Semiannual Groundwater Monitoring Report – 2024, Phoenix-Goodyear Airport South Superfund Site, Goodyear, Arizona.

Figure 7. PGA South Subunit C Annual and Cumulative TCE Mass Removal

3. Progress Since the Last Five-Year Review

3.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the 2020 Five-Year Review for PGA North stated:

“The remedy at Phoenix-Goodyear Airport North is protective of human health and the environment. Soil vapor extraction was completed, protecting the public from contaminated soil and preventing migration of contaminants from the soil to groundwater. The groundwater treatment systems eliminating further migration of contaminated groundwater and restoring the quality of the Subunit B/C aquifer. The monitoring of City of Goodyear production wells continues to ensure that the public is protected from exposure to contaminated groundwater.”

The protectiveness statement from the 2020 Five-Year Review for PGA South stated:

“The remedy at Phoenix-Goodyear Airport South is protective of human health and the environment. Soil vapor extraction was completed, protecting the public from contaminated soil and preventing migration of contaminants from the soil to groundwater. The groundwater treatment systems eliminating further migration of contaminated groundwater and restoring the quality of the Subunit B/C aquifer. The monitoring of City of Goodyear production wells continues to ensure that the public is protected from exposure to contaminated groundwater.”

The 2020 Five-Year Review did not identify any issues or recommendations.

3.2. Work Completed at the Site During this Five-Year Review Period

3.2.1. PGA North

The Crane Company conducted groundwater sampling monthly to monitor conditions near potential receptors, such as drinking water wells, to map the spread of TCE and perchlorate in Subunits A and C, and to evaluate the effectiveness of remediation efforts. These data help decide where to add new wells or remove old ones to reduce the spread of pollution and accelerate aquifer restoration. During this review period, the Crane Company abandoned two injection wells and converted one extraction well to injection to enhance remedy performance.

In 2020, the Crane Company conducted a source area characterization to collect additional data and evaluate remediation efforts for PGA North. Using the new data, the Crane Company refined the understanding of the PGA North source area’s hydrogeology and TCE distribution.

In 2021, the Crane Company refined the remedial design and remedial action plan for the source area to target Subunit A groundwater areas where TCE concentrations exceeded 1,000 micrograms per liter in 2019 and 2020 in accordance with the 2014 Record of Decision Amendment. Building on recent improvements in groundwater extraction, injection, and enhanced bioremediation testing, the design aims to maintain the existing groundwater barrier along West Van Buren Street, optimize source area flushing to accelerate contaminant removal, and, if required after source area flushing, inject certain materials into the ground that support microbiological breakdown of TCE and perchlorate without using oxygen. These additional activities at the source area are enhancing the overall pump and treat remedy.

The Crane Company conducted soil vapor sampling annually at PGA North to monitor concentrations after SVE system operations ceased in 2018. In May 2021, the laboratory reported TCE concentrations greater than the laboratory detection limit, and with the final monitoring event planned for 2023. Due to redevelopment of the property, soil vapor monitoring was delayed until 2024. The 2024 results indicated that soil vapor concentrations do not pose unacceptable risks to human health via the vapor intrusion pathway under current land use. Additional soil vapor monitoring is planned to monitor any changes in the soil vapor profile due to source area flushing.

During this review period, the Crane Company created annual reports summarizing groundwater treatment system operations and remediation. The reports focused on treatment system performance evaluations, system uptime, volumes of treated groundwater, contaminant mass removal, and water reuse. Details of these reports are further discussed in Section 2.4.2.

3.2.2. PGA South

The GTRC conducts groundwater monitoring events monthly, providing information to support decisions on where to install new injection and extraction wells. New injection wells are strategically located to move groundwater toward nearby extraction wells, helping reduce TCE levels in groundwater. During this review period, GTRC installed several new Subunit A injection wells.

The 2023 First Semiannual Groundwater Report described a new groundwater depression at the southwestern end of the Subunit A TCE plume. To investigate the groundwater depression, the GTRC installed five new on-site and seven new off-site Subunit C monitoring wells west-northwest of the southwestern area of the airport to further delineate the Southwestern plume. To mitigate the spread of contamination, the GTRC constructed a Subunit C Southwest

Plume On-Site Plume Interception System which consists of two extraction wells and a stand-alone treatment system which began operation in May 2025.

To intercept the Central Subunit C plume at the airport property boundary and accelerate plume cleanup, the GTRC also constructed an additional Subunit C E-104 System consisting of one extraction well and a standalone treatment system which began operation in June 2025.

The GTRC conducted the two vapor intrusion sampling events (February and August 2021), to characterize the potential for vapor intrusion into three PGA South buildings as a follow up to the 2018 Vapor Intrusion Program Summary Report and subsequent sampling in 2020. The results are discussed in Section 4.2.4.

At the request of the EPA, in December 2022 the GTRC sampled the locations of previously remediated soil to evaluate if the lowering of groundwater levels in Subunit A, expanding the vadose or unsaturated zone, had an impact on current soil vapor conditions. The GTRC compared current vapor contaminant concentrations, specifically TCE, to the 1998 post-remediation vapor concentrations. Results are discussed in Section 4.2.4. In response to estimated indoor concentrations from the sampling report, the GTRC conducted additional vapor intrusion investigation activities in February and March 2024 focusing on airport buildings owned by the City of Phoenix.

The GTRC uses a groundwater flow model as a tool to inform and optimize remedy implementation, such as, the location of the extraction and injection well network to ensure plume containment and enhance mass removal efficiency, reducing remediation time where possible. In 2024, the GTRC updated the groundwater flow model to account for both annual high water and low water levels to evaluate different groundwater conditions. In April 2024, the EPA agreed that the updated modeling approach was reasonable and the GTRC began using the updated model for groundwater simulations.

4. Five-Year Review Process

4.1. Community Notification and Site Interviews

4.1.1. Five-Year Review Community Notifications

The EPA issued a press release on February 20, 2025 (<https://www.epa.gov/newsreleases/sign-progress-superfund-cleanups-across-pacific-southwest-epa-perform-five-year>) notifying the public that the Site was undergoing a Five-Year Review. A copy of the press release is presented in Appendix F. The EPA also placed a notification on the Site's website (<https://www.epa.gov/>

[superfund/phoenix-goodyearairport](https://www.epa.gov/superfund/phoenix-goodyearairport)) stating that the Site was undergoing a Five-Year Review. The EPA did not receive public questions or comments regarding the Five-Year Review in response to the press release or Site website notice. Results of the review and the report will be made available electronically on the Site's website (<https://www.epa.gov/superfund/phoenix-goodyearairport>) and at the Site information repository located at:

EPA Superfund Records Center
75 Hawthorne Street, Third Floor
San Francisco, California 94105

Georgia T. Lord Library
1900 N Civic Square
Goodyear, AZ 85395

4.1.2. Site Interviews

During the Five-Year Review process, the EPA conducted interviews to document any perceived problems or successes with the remedy that has been implemented to date.

The EPA sent interview forms to those listed in Table 6, and Rob Wilhelm, Maria Scudder, Elizabeth Zima, Rebecca Godley, Jonathan Dziekan, Michael Felix, and Nicole Park did not respond. The interview records are provided in Appendix G and summarized here.

Those that have responded stated that the overall impression of the project is that the remedy is functioning as expected. They have been well informed of the Site's activities and progress as some of them have routine monthly meetings. Diane Krone from the Community Advisory Group suggested that the project continue to be innovative to see if faster progress can be made in the restoration and containment. GTRC reported unexpected and increased amount of water being discharged in the ditch upstream, which affects continuous operation of the Subunit C treatment systems. They recommend continuous upgrading and improving equipment and systems.

Table 6. Interview Form Recipients

Name	Affiliation	Position
Katelyn Kane DeVries	Arizona Department of Environmental Quality	Project Manager
Karin Harker	Arizona Department of Environmental Quality	Unit Manager

Name	Affiliation	Position
Rob Wilhelm	Arizona Department of Environmental Quality Contractor -Tetra Tech	Principal Hydrogeologist
Kirk Beaty	City of Avondale	Director of Public Works
Ray Diaz	City of Goodyear	Water Resources and Sustainability Manager
Larry Williams	City of Goodyear - GHD Group	Senior Project Manager
Russell Cote	City of Goodyear - GHD Group	Senior Project Manager and Geologist
Keith Drunasky	City of Litchfield	City Engineer and Community Development Director
Maria Scudder	City of Phoenix	Not Provided
Elizabeth Zima	City of Phoenix	Environmental Programs Manager
Rebecca Godley	City of Phoenix	Superintendent - Environmental Planning and Environmental Division
Diane Krone	Community Advisory Group	Member and Former Co-Chair
Peter Minarik	Community Advisory Group	Co-Chair
Tom Vanaskey	Crane Company Contractor - BLUF Contracting LLC	Lead Operator
Ernie Marks	Crane Company Contractor - EHS Support LLC	Project Coordinator/Senior Scientist
Kathleen Johnson	Crane Company Contractor - EHS Support LLC	Senior Engineer
Jonathan Dziekan	EPA Contractor - TechLaw	Director of Quality Assurance
Michael Felix	EPA Contractor - United States Army Corps of Engineers	Geologist
Emily Gloeckler	Goodyear Tire and Rubber Company	Senior Project Manager
Kendall Wilson	Goodyear Tire and Rubber Company	Senior Manager and Global Remediation
Nicole Park	Goodyear Tire and Rubber Company Contractor - Haley & Aldrich	Senior Project Manager and Geologist
Scott Zachary	Goodyear Tire and Rubber Company Contractor - Haley & Aldrich	Vice President

4.2. Data Review

4.2.1. PGA North Updates to the Conceptual Site Model

Using new data, the Crane Company updated the conceptual site model and improved the understanding of the area's groundwater movement and TCE distribution. The ground underlying PGA North is made of more diverse material than previously thought, affecting how contaminants move and are absorbed. Groundwater flows slowly through clay and silt, which is made of very small particles (fine-grained), and the clay and silt layers limit movement and trap TCE contamination, resulting in higher TCE concentrations in finer-grained soil. Contaminants trapped in fine-grained sediment can become a secondary source of contamination if clean groundwater adequately flows through it.

Additionally, the subsurface soil and groundwater support microbes that can break down contaminants without using oxygen. These microbes work best in certain areas with the right natural conditions, especially in softer, fine-grained soil like clay and silt. Based on the updated model, 90 percent of the TCE mass is in fine-grained soils, mostly off-site and despite higher concentrations in fine-grained material, most of the TCE movement occurs in sandy soils.

4.2.2. Contaminant Mass Removals

At the Site, while most of the pump and treat systems maintain initial and design extraction rates, there is a general decline in specific capacity likely due to a decline in the regional groundwater level (due to drought and other pumping activities).

The most recent (2024) cumulative contaminant mass removals are presented in Section 2.4.2. The shape of the cumulative mass removal curves on Figures 4 through 7 help assess the effectiveness of contaminant capture. A flattening, or asymptotic trend, suggests that most accessible contamination has been removed. Asymptotic mass removal happens when the amount of contamination being removed from the source decreases temporally (Figure 8). Early in the remediation process, the pollutants are easy to extract because they are in more open or accessible areas. As cleanup continues, the remaining contamination is trapped in tighter spaces, making it more difficult and slower to remove resulting in lower removal amounts.

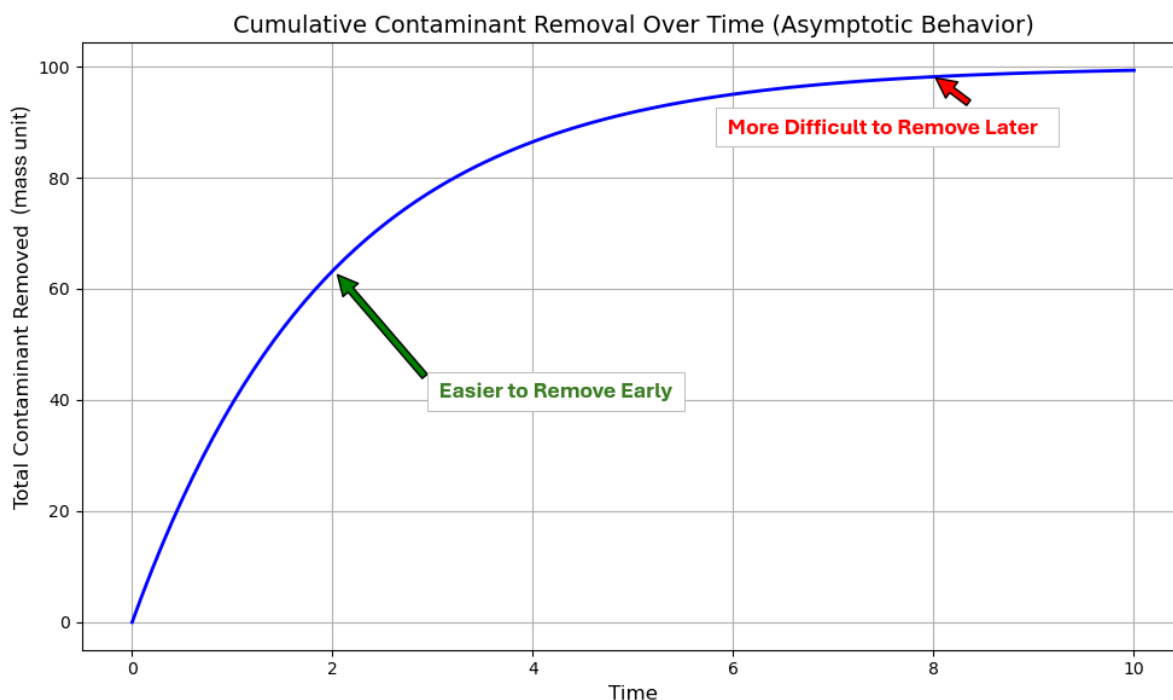


Figure 8. Example of Asymptotic Trend

PGA North

The TCE mass removal data for Subunit A (Figure 4) shows an asymptotic trend for the cumulative amount of TCE removed and decreasing mass of TCE removed each year for the older treatment systems, the Main Treatment System and 33A which both began operation in 1994. The extraction wells associated with the Main Treatment System are sited in areas with higher concentrations of TCE, and these concentrations have been declining over time. Extraction wells EA-15, EA-16, and EA-17 were installed in in 2021/2022 for the EA-06 system may be contributing to less mass treatment at the 33A system. The newer systems, EA-06 began operation in 2007, EA-05 began operation in 2008, and EA-08 began operation in 2011, have not been operating long enough to reach the asymptotic trend.

Perchlorate removal began as a pilot study in 2003 and the Crane Company added it to the Main Treatment System in 2005 and increases in mass removal are seen annually on the graph (Figure 5). Following the implementation of the 2014 ROD Amendment, the perchlorate mass removal percentage noticeably increased likely due to enhanced treatments selected by the remedy described in Section 2.2.8. Since 2014, the cumulative mass removal has been trending towards an asymptotic level. Given the conservative fate and transport properties of perchlorate, this trend indicates that extraction pumping is containing the target perchlorate source zone.

PGA South

The TCE mass removal data for Subunit A (Figure 6) show an asymptotic trend for the cumulative amount of TCE removed and decreasing trends for TCE removed each year. Both the data sets and graphs indicate continued removal of TCE from the groundwater. Subunit C TCE Mass Removal (Figure 7) has not yet reached asymptotic trends yet even though mass removal has decreased. Subunit C treatment systems are younger and began operation in 2014 or 2025, and have not yet reached asymptotic conditions.

4.2.3. Groundwater

The EPA established remedial action objectives for the groundwater remedy in the 1989 ROD to limit further migration of contaminated groundwater and restore the quality of the Subunit B and C aquifer. In the 2014 ROD Amendment, the EPA established additional remedial action objectives to achieve permanent contaminant mass and concentration reduction of at least 80 percent for TCE and perchlorate in Subunit A groundwater within the target treatment zone of PGA North. The general location of the target treatment zone can be found in Figure 9.

To assess the progress towards achieving these objectives, groundwater elevation and analytical data was evaluated from select Subunit A and Subunit C monitoring wells at PGA North and PGA South. A comprehensive data review can be found in Appendix C, including a plume stability analysis of the monitoring wells. Based on the evaluation of available data, the remedy is currently achieving the objective to limit further migration of the Subunit A TCE and perchlorate plumes at PGA North and the TCE and chromium plumes at PGA South. Increasing contaminant trends near the edges of the Subunit C monitoring well network at PGA North could suggest the plume may be migrating further downgradient. Contaminant concentrations greater than the cleanup levels in Subunit A and Subunit C indicate that the quality of the aquifer is not yet restored. At PGA North, recent perchlorate and TCE concentrations in groundwater from monitoring well MW-07 support the objective of 80 percent contaminant concentration reduction within the target treatment zone. The achievement of this objective cannot be confirmed in this review without the evaluation of additional target treatment zone monitoring wells. The PGA North semiannual groundwater monitoring reports provide this type of evaluation of the source area.

The general locations of the wells discussed in this section are presented in Figure 9.



Figure 9. Select Evaluated Well Locations at PGA North and PGA South

PGA North

In Subunit A, perchlorate concentration trends from groundwater in monitoring wells located downgradient of the perchlorate plume were stable or did not have an increasing or decreasing trend. This indicates that the perchlorate plume is not migrating past these monitoring wells and is being contained by extraction and injection wells.

Monitoring well MW-24 is located near the northwestern edge of the Subunit A TCE Plume. TCE concentrations were increasing at this location during the review period. The groundwater flow patterns at MW-24 are unclear, and it cannot be determined if the groundwater at MW-24 is being captured by nearby extraction wells or if the plume is migrating past MW-24.

Monitoring well MW-07 is located within the target treatment zone of the PGA North source area. Perchlorate concentration results from 2024 were less than the cleanup level at MW-07. TCE concentration results from 2024 were less than 200 micrograms per liter. These sample results support the achievement of 80 percent reduction of perchlorate and TCE contamination at MW-07.

Subunit C can further be divided into upper, middle, and lower layers. Various monitoring wells in the upper, middle, and lower layers had groundwater TCE concentrations that exceeded the cleanup level, indicating that the groundwater has not yet been restored in Subunit C. In the upper unit, TCE concentrations in groundwater were increasing at monitoring well MW-31C but generally remained below the cleanup level. In the middle layer, TCE concentrations in groundwater were increasing but have remained below the cleanup level at monitoring well MW-20C, located at the northwestern edge of the monitoring well network. In the lower layer, groundwater elevation data suggests that contaminated groundwater flows towards and is being captured by extraction wells.

PGA South

In Subunit A, increasing chromium and TCE concentrations can likely be attributed to proximity to nearby extraction well drawing in the plume. Groundwater elevation data and a lack of increasing concentration trends in groundwater from other wells evaluated suggest that the injection and extraction wells are capturing the chromium and TCE plumes and limiting the migration outside of the well network.

In Subunit C, various monitoring wells had chromium and TCE concentrations that exceeded the cleanup level during the review period, indicating that the groundwater has not yet been restored in Subunit C.

Monitoring wells GMW-49UC and GMW-11UC had groundwater with increasing total chromium concentrations during the review period. Groundwater elevation data suggests that groundwater from GMW-49UC and GMW-11UC is expected to flow towards downgradient extraction wells.

There are three distinct TCE plumes in Subunit C that are spatially referred to as the Northern, Central, and Southwestern plumes. The Southwestern plume does not have enough data at this time to perform trend analyses and therefore was excluded from data evaluation.

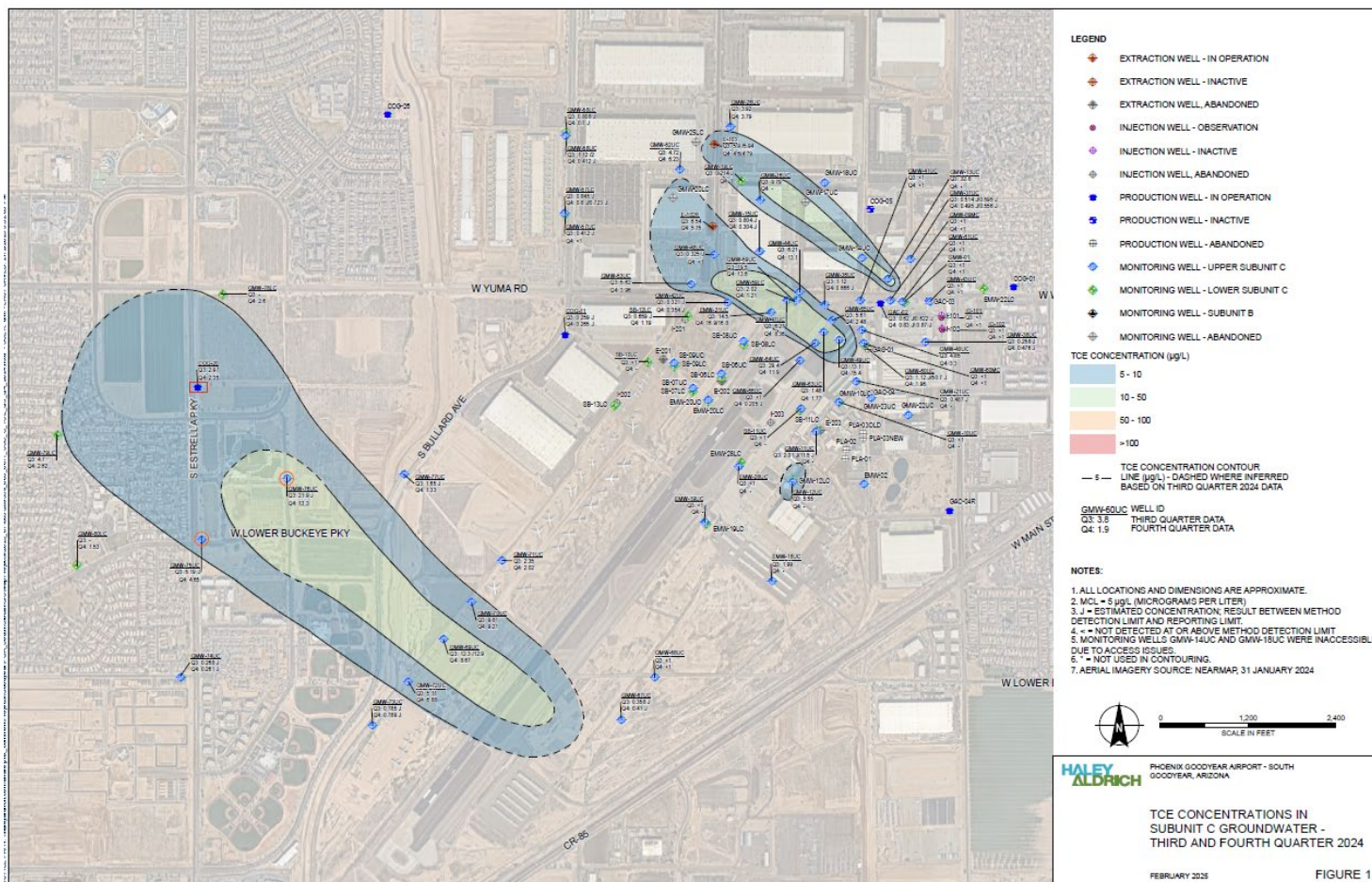
Monitoring well GMW-26UC is located at the northwestern edge of the Northern plume and though it had an increasing TCE trend during the review period, TCE concentrations remain below the cleanup level. Groundwater from GMW-26UC is flowing towards extraction well E-103.

Monitoring well GMW-52UC is located between the northwestern edges of the Northern and Central plumes. TCE concentration data from GMW-52UC did not exhibit either increasing or decreasing trends during the review period. Groundwater flow models suggest that contaminated groundwater from GMW-52UC is flowing towards extraction well E-103.

Monitoring well GMW-53UC is located at the southwestern edge of the Central plume and had a decreasing TCE concentration trend during the review period. Groundwater elevation data and flow modeling suggest that contaminated groundwater is flowing north to downgradient extraction wells. Decreasing TCE concentrations at GMW-53UC indicates that the plume is likely not migrating past this location.

Subunit C Off-Site Southwest Plume Investigations

The off-site investigation of Subunit C has confirmed that a TCE-impacted groundwater plume extends northwest from the PGA South area (Figure 10) toward the downgradient City of Goodyear production well COG-20 (red rectangle). Monitored on a monthly basis, concentrations at COG-20 remain below the cleanup level for TCE. Monitoring data from wells GMW-75UC and GMW-76UC (orange circles) indicates the presence of TCE above the cleanup level in middle Subunit C, with concentrations reaching up to approximately 21.2 micrograms per liter. The highest concentration was observed at GMW-76UC, with levels decreasing both to the southwest and northeast.



Source: Adapted from Haley and Aldrich, Inc. 2025. Second Semiannual Groundwater Monitoring Report – 2024, Phoenix-Goodyear Airport South Superfund Site, Goodyear, Arizona.

Figure 10. PGA South New Southwestern Subunit C Plume and Investigation Wells

4.2.4. Soil Gas and Vapor Intrusion

PGA North

In May 2021, the Crane Company conducted a soil vapor monitoring event. TCE exceeded the laboratory reportable limit in each of the six samples collected, prompting further investigation.

The Crane Company conducted an annual soil vapor monitoring sampling event in 2024. Soil vapor results from the 2024 sampling event were compared to soil vapor levels from 2004 and showed a 99 percent reduction in TCE levels since 2004. In January 2024, five soil gas samples had TCE levels greater than the safety limit for industrial areas, which is 100 micrograms per cubic meter. The levels found ranged from 130 to 7,410 micrograms per cubic meter. Even though these levels are high, the samples were taken from 30 to 74 feet below the ground surface, which reduces the risk to people because TCE vapors usually weaken as they move upward through the soil. Based on results from the Johnson and Ettinger (J&E) Model, January 2024 soil gas sampling results do not indicate unacceptable risks to human health via the vapor intrusion pathway. EPA had requested sampling of an additional soil monitoring well (SVM-12) during this event to determine if there was a plume shift. TCE concentrations in monitoring well SVM-12 were not detected, indicating a plume shift related to active source area treatment is not evident.

PGA South

The GTRC performed vapor intrusion sampling events in February and August 2021. The results indicated the levels of volatile organic compounds found in indoor air — possibly from vapor intrusion — were less than the EPA Industrial Air Regional Screening levels. The related long-term cancer risks and overall health risks were also within acceptable limits (less than the target acceptable thresholds of 1×10^{-5} for incremental lifetime cancer risk and 1 for total hazard index). Based on these results, further assessments for vapor intrusion were not recommended.

In 2023, the GTRC tested soil vapor for TCE during a vadose zone gas study. They found TCE in vapor monitoring point samples; TCE was not found in ambient air samples. They compared the results to samples collected in 1998. One soil vapor well had TCE levels greater than in 1998; otherwise, the current TCE levels are like those measured after soil vapor extraction cleanup in 1998. It was determined the drop in groundwater levels does not seem to be causing higher TCE vapor concentrations in the vadose zone at the sampled locations.

In the vadose zone gas sampling report, GTRC estimated how much TCE could enter indoor air by using soil vapor results. To do this, they multiplied the measured soil vapor concentrations by a generic EPA attenuation factor that predicts how much vapor can move from the soil into a building based on site geology (e.g., soil characteristics) and subsurface lithology.

Based on the estimated results, the GTRC conducted indoor air investigation of airport buildings in February and March 2024. Five chemicals of concern were found in one or more indoor air samples: Freon 113, carbon tetrachloride, chloroform, tetrachloroethene, and TCE. Analytical lab results indicated the detections were below the EPA Industrial Air Regional Screen Levels, and the EPA deemed there were no immediate vapor intrusion concerns.

4.2.5. Climate Resilience Screening

EA consulted a variety of climate change tools, including and not limited to extreme temperatures, landslides, hurricanes and sea level rise, to determine which climate hazards have the potential to impact the remedy. The tools that presented risks from climate change include:

- Wildfires: University of California Merced Climate Toolbox Climate Mapper.
- Extreme heat and drought: National Oceanic and Atmospheric Administration (NOAA) Climate Explorer.

The remedy implemented at the Site has a high risk of being impacted by climate change. Possible risks identified for the location of the Site include wildfires, extreme heat (days with maximum temperature greater than 95 degrees Fahrenheit), and drought.

Wildfire risk, based on the percentage of water present in vegetation, is projected to decrease below 10 percent in more than one season (spring, summer, fall). Based on the National Oceanic and Atmospheric Administration Climate Explorer tool, there is a greater than 10 percent change in the annual number of consecutive dry days and days with maximum temperature greater than 95 degrees Fahrenheit meaning the exposure to drought and extreme heat is high.

4.3. *Site Inspection*

The EPA coordinated and conducted the Site inspection in two parts — morning and afternoon — on February 13, 2025, to assess the condition of the remedy and confirm it is functioning as intended at PGA North and South.

The PGA South inspection participants met in the morning at the City of Phoenix Aviation Authority Airport lobby. Those in attendance were Vicky Wiraatmadja (EPA Region 9), Katelyn Kane-DeVries (Arizona Department of Environmental Quality), Emily Gloeckler and Kendall Wilson (GTRC), Scott Zackary, Nichole Park, and Andrew Prichard (Haley and Aldrich), and Alan Pacheco Malagon (EA). The Site inspection consisted of a brief discussion of the Site history and background, safety briefing, discussion of the status of the remedy, and a tour around the facility. During the facility tour, the inspection team visually checked the Subunit A and Subunit C groundwater treatment systems; select monitoring, extraction, and injection wells; an underground utility vault; the conveyance piping system; and related parts like flow meters, valves, and pressure gauges. At the time of the inspection, crews were constructing the new Subunit C Southwest Treatment System and extraction well E-104. Overall, the PGA South remedy components appeared to be in good working condition and operating as intended.

The PGA North inspection participants met at the Main Treatment System in the afternoon. Those in attendance were Vicky Wiraatmadja (EPA Region 9), Katelyn Kane-DeVries (Arizona Department of Environmental Quality), Kathleen Johnson and Tom Vanaskey (Environmental Health and Safety Support), and Alan Pacheco Malagon (EA). The Site inspection consisted of a brief discussion about the Site, safety briefing, and a tour around the Site. During the tour, the participants made visual observations of the Main Treatment System; the satellite treatment systems (33A, EA-05, EA-06, EA-08); monitoring, injection and extraction wells; and other associated remedy components. The main treatment system and satellite systems each have two to six liquid phase granulated activated carbon vessels, depending on the system. The EA-05 vessels had noticeable corrosion. Security systems and warning signs are present at each treatment plant enclosure. Some wells are now in newly developed light industrial and commercial areas, which may complicate future access from possible activities at the new developments. Overall, the systems and components are in good condition and function as intended.

The Site inspection trip report is included in Appendix H.

5. Technical Assessment

5.1. Question A: Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedies are functioning as intended and in accordance with the decision documents for PGA North and PGA South. The pump-and-treat systems are effectively reducing plume size

and contaminant concentrations, with minimal downtime. Soil vapor and vapor intrusion investigations have shown contaminant levels less than the EPA industrial Regional Screening Levels indicating no further action is needed to address risk from vapor intrusion. Contaminant mass removal trends support ongoing contaminant reduction.

The new Southwest Subunit C Treatment System is to address the new plume in the southwestern area of PGA South, and the new E-104 System further addresses the Central Plume.

An opportunity to optimize the remedy at PGA North is to reassess and confirm complete groundwater capture. Monitoring wells on the westerly edge of the plume (MW-20C and MW-31C) have increasing concentrations, which is a concern if the plume is not being captured by existing extraction wells and may be migrating west.

With the reduced VOC concentrations in soil vapor and subsequent termination of SVE for remediation of vadose zone soils in 2018, the objective of the ROD to prevent VOCs in the soil from migrating to the groundwater has reached completion.

5.2. Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Remedy Selection Still Valid?

No. There have been changes in toxicity values, risk assessment methodology, and screening levels since the decision documents were issued which are discussed further in this section. The changes described in this section are not expected to alter the protectiveness of the remedy because 1) Although the Maximum Contaminant Levels for certain chemicals are more stringent now than when the EPA established the cleanup levels, the concentrations in groundwater for those chemicals are less than the current Maximum Contaminant Levels as discussed in Appendix D; and 2) Appendix E assesses the toxicity values of cleanup levels that are not Maximum Contaminant Level, and concludes that the new toxicity values are still within the EPA's target range for limiting harmful exposures to contaminants. A summary of changes in water and soil toxicity values in the last five years is presented in Appendix E.

There have been some changes to relevant standards for contaminants of concern at the Site. See Appendix D for a full assessment of chemical-specific applicable or relevant and appropriate requirements (ARARs). As shown in Appendix D, changes to chemical-specific applicable or relevant and appropriate requirements are both more stringent and less stringent than what was set forth in decision documents for the Site. The EPA Maximum Contaminant Level for

chloroform is more stringent than the current groundwater cleanup levels for Subunit A of PGA North, Subunit B/C of PGA South and PGA North and more stringent for silver, zinc, and 1,1,2,2-tetrachloroethane. However, groundwater sampling results indicate that chloroform concentrations continue to be less than the Maximum Contamination Level throughout the groundwater for both PGA North and PGA South. Groundwater sampling results for silver and zinc indicate that concentrations continue to be less than the Maximum Contaminant Levels at PGA North. Concentrations of 1,1,2,2-tetrachloroethane in groundwater samples were less than the Arizona State Drinking Water Standard.

On April 10, 2024, the EPA issued drinking water Maximum Contaminant Levels for six per- and polyfluoroalkyl substances (PFAS) contaminants, including perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA) (Gen-X), perfluorohexanesulfonic acid (PFHxS), and perfluorobutanesulfonic acid (PFBS) (Table 7).

Table 7. Maximum Contaminant Levels for PFAS Contaminants

Compound	Final Maximum Contaminant Level
HFPO-DA (Gen X)	10 ng/L
PFHxS	10 ng/L
PFNA	10 ng/L
PFOA	4 ng/L
PFOS	4 ng/L
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1 (unitless) Hazard Index 1

Notes:

ng/L = nanograms per liter

On April 17, 2024, the EPA designated two PFAS — PFOA and PFOS, including their salts and structural isomers — as hazardous substances under Section 102(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Arizona has not promulgated drinking water or groundwater standards for PFAS.

Arizona has not promulgated drinking water or groundwater standards for PFAS.

Currently, it is unclear whether historical operations or property usage at either PGA North or PGA South are significant sources for PFAS in groundwater. At the time of this review, PFAS sampling results from 2020 at PGA South were available. GTRC performed PFAS sampling Subunit A Treatment System influent and effluent, Subunit C Treatment System influent and effluent, and Subunit A monitoring well EMW-08R. PFAS were detected in the samples

collected. Only PFOS was detected greater than the EPA’s MCLs for drinking water. PGA North and PGA South began conducting PFAS sampling in 2025, but the finalized results were not available during this review. A comprehensive groundwater investigation would help clarify whether PFAS should be included as contaminants of concern and whether PFAS may affect long-term protectiveness of the remedy.

The Toxicity Assessment in Appendix E identifies changes to toxicity values for groundwater cleanup levels that are based upon health levels and the relevant PFAS toxicity values and state standards that are currently available. Changes to toxicity values do not affect the protectiveness of the remedy because the Regional Screening Levels are either the same or less stringent than the groundwater cleanup levels intended for the remedy.

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

No. No additional information has come to light which would affect the protectiveness of the remedy.

6. Issues and Recommendations

Table 8. Issues and Recommendations Identified in the Five-Year Review

Issues and Recommendations Identified in the Five-Year Review:				
Area: PGA North PGA South	Issue Category: Monitoring			
	Issue: PFAS Data Gaps There are data gaps regarding PFAS concentrations, possible plume delineation, and potential sources at the Phoenix-Goodyear Airport (North and South Areas) Superfund Site.			
	Recommendation: Conduct a comprehensive groundwater investigation for PFAS.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	EPA	12/31/2028

Area: PGA North PGA South	Issue Category: Monitoring			
	Issue: Plume Containment Several wells near the edges of contaminated groundwater plumes showed increasing TCE concentration trends in the North Area, and a new plume was identified in the South Area at the Phoenix-Goodyear Airport Superfund Site.			
	Recommendation: Reassess plume capture and evaluate the necessity of additional monitoring locations and/or operational changes to the groundwater treatment systems.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	EPA	12/31/2028

Area: PGA North PGA South	Issue Category: Monitoring			
	Issue: Revise Contaminants of Concern List Contaminants of concern identified in the decision documents may not adequately represent current conditions at the Phoenix-Goodyear Airport (North and South Areas) Superfund Site.			
	Recommendation: Conduct an evaluation of the contaminants of concern presented in the decision documents and if needed the EPA will prepare and issue a modification to the decision document to amend the list of contaminants of concern.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	EPA	10/31/2029

7. Protectiveness Statement

Table 9. Protectiveness Statement

Protectiveness Statement(s)	
<i>Operable Unit:</i> PGA North	<i>Protectiveness Determination:</i> Short-term Protective
Protectiveness Statement: The remedy at the North Area of the Phoenix-Goodyear Airport Superfund Site is protective of human health and the environment and is effectively reducing plume size and contaminant levels in groundwater. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: a comprehensive groundwater investigation for PFAS, reassessment of plume capture, and an update to the COCs and their respective cleanup levels in a decision document.	
Protectiveness Statement(s)	
<i>Operable Unit:</i> PGA South	<i>Protectiveness Determination:</i> Short-term Protective
Protectiveness Statement: The remedy at the South Area of the Phoenix-Goodyear Airport Superfund Site is protective of human health and the environment and is effectively reducing plume size and contaminant levels in groundwater. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: a comprehensive groundwater investigation for PFAS, confirmation of plume capture, and an update to the COCs and their respective cleanup levels in a decision document.	

8. Next Review

The next Five-Year Review report for the Phoenix-Goodyear Airport (North and South Areas) Superfund Site is required five years from the completion date of this review.

Appendix A: List of Documents Reviewed

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- EHS Support LLC. 2023. Final Second Semi-Annual Groundwater Monitoring Report – 2022, Phoenix-Goodyear Airport-North Superfund Site, Goodyear, Arizona. January.
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- Haley and Aldrich, Inc. 2023. Southwest Subunit C Plume On-Site Assessment Summary Report, Phoenix-Goodyear Airport South Superfund Site, 1658 South Litchfield Road, Goodyear, Arizona. November 30.
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Appendix B: Site Chronology

Table B-1. Chronology of Site Events for PGA North

Event	Date
Research, development and manufacturing plant for defense and aerospace equipment established at the PGA North (PGA North) property (Unidynamics Phoenix, Inc. [UPI]).	1963
Arizona Department of Health Services (ADHS) discovered that groundwater in the Goodyear area was contaminated with solvents and chromium.	1981
EPA added the PGA Superfund Site (originally listed as the "Litchfield Airport Area Superfund Site") to the National Priorities List.	September 1983
EPA issued first of several orders to UPI "to conduct a comprehensive sampling and analysis program to support subsequent remedial actions." Resource Conservation and Recovery Act Administrative Order (Docket No. 84-03).	April 1984
Phase I Remedial Investigations began on the Site.	October 1984
Phase II Remedial Investigations on the PGA North property.	1986
EPA published a Remedial Investigation/Feasibility Study (RI/FS) that identified two areas of noncontiguous contamination (PGA North and PGA South).	June 1989
EPA issued ROD that applied to both the PGA North and PGA South. [the 1987 ROD was for PGA South only]	September 1989
Groundwater extraction and treatment system for Subunit A groundwater was implemented at PGA South (trigger for five-year review for PGA South and PGA North).	1990
EPA issued an Amended Administrative Order (Docket No. 90-20) to UPI for Remedial Design and Remedial Action to implement the PGA North remedy specified in the 1989 ROD.	October 1990
EPA issued an ESD to the 1989 ROD (the first ESD)	January 1991
EPA issued a second ESD	May 1993
UPI facility manufacturing operations ceased.	1994
Full-scale soil vapor extraction (SVE) operations with thermal oxidation began at PGA North.	June 1994
Phase I groundwater treatment system for volatile organic compounds (VOCs), with on-site reinjection back into the Subunit A aquifer, began at PGA North.	September 1994
Phase II / III groundwater treatment system began operation at PGA North.	October 1996
Perchlorate was first detected in area monitoring wells.	August 1998

Event	Date
UPI shut down SVE system due to operational difficulties.	October 1998
Trichloroethylene (TCE and perchlorate were detected in several domestic supply wells southeast of the UPI facility.	2001
TCE was detected above the maximum contaminant level (MCL) for the first time in Subunit C monitoring well MW-20 (located north of the main manufacturing area).	May 2001
Reinjection stopped at the Main Treatment System (MTS) due to lack of perchlorate treatment. Treated groundwater was sent to the City of Goodyear (COG) Wastewater Treatment Plant for perchlorate treatability study.	2002
Effluent from the MTS continued to be sent to the COG Wastewater Treatment Plant for perchlorate treatment.	January 2002 – April 25, 2005
Well MW-20 was converted to a temporary extraction well connected to the Phase II / III groundwater treatment system for Subunit C groundwater treatment.	March 2002
EPA issued the fifth ESD [the third and fourth ESDs were for PGA South]	September 2002
EPA issued a Unilateral Administrative Order (Docket No. 9-2003-0001) to restart the SVE system with a granular activated carbon (GAC) treatment unit.	January 2003
TCE concentrations in COG production well COG-02 (located about ¼ mile east of the UPI facility) increased above MCL and forced closure of that well.	May 2003
EPA conducted the Phase II Source Area Groundwater Investigation that identified TCE and perchlorate levels in Subunits B and C in the source area.	2003
The SVE system was restarted using GAC treatment.	April 2004
A Scope of Work (SOW) was developed to comprehensively address the soil, and groundwater impacts attributed to PGA North.	2005
Perchlorate treatment using ion exchange unit was added to the MTS. Treated effluent reinjected into Subunit A groundwater.	April 2005
Implementation of the Year 1 Groundwater Investigation Work Plan was initiated.	March 2006
A partial consent decree (CD) between the United States and Crane/UPI was entered by United States District Court of the District of Arizona. The CD required Crane/UPI to implement the SOW.	June 2006
The first Five-Year Review Report was completed.	September 2006
Municipal drinking water supply well COG-02 was abandoned due to TCE levels.	December 2006
Treatment capacity of MTS was expanded by installing extraction well EC-01 and injection well IA-06.	2007

Event	Date
The Phase I Source Areas, Soils and Facility Structures Investigation was completed.	2007
Municipal drinking water supply well COG-10 was abandoned.	May 2007
Completion of Year 1 Groundwater Investigation Activities: Two middle alluvial unit (MAU) monitoring wells, five Subunit C wells, and eight Subunit A wells were installed to define the contaminant plumes.	October 2007
To address the Subunit A TCE impacts in groundwater located north-northeast of the Site, two new groundwater treatment systems were installed (EA-06 groundwater treatment system [GTS] and EA-05 GTS).	2008
Final Removal Action Memorandum submitted which established the perchlorate treatment goal of 14 micrograms per liter.	May 2008
Monitoring well PZ-01 was converted to an extraction well to increase treatment capacity of the MTS. A Removal Action Memorandum was issued for perchlorate at PGA North.	October 2008
Completion of Year 2 Groundwater Investigation: ten Subunit A monitoring wells, and four Subunit C monitoring wells were installed.	April 2009
The Final Year 3 Groundwater Investigation Work Plan was approved.	April 2009
Remaining UPI facility buildings and bunkers were demolished.	2009
The second Five-Year Review Report was completed.	September 2010
Groundwater extraction well EA-07 was installed.	2010
Maintenance to piping that conveys groundwater to the MTS was completed to increase pumping capacity.	May and June 2011
Crane Co. completed the Final Source Areas, Soil, and Facility Structure Investigation Report.	July 2011
Groundwater extraction well EA-08 was installed.	2011
Crane Co. completed Final Source Areas, Soil, and Facility Structures Baseline Human Health Risk Assessment.	2012
Crane Co. completed Final Source Areas, Soil, and Facility Structures Screening Level Ecological Risk Assessment.	2013
Groundwater extraction well EA-09 was installed.	2013
Crane Co. completed Source Area Remediation Focused Feasibility Study.	November 2013
The extraction-and-treatment system was expanded to reinject treated groundwater in wells IA-07 and IA-08.	2014
An amendment to the 1989 ROD was issued for PGA North.	September 2014
Injection well IA-09 was installed.	March 2015
Subunit A extraction well EA-10 was installed.	May 2015
The third Five-Year Review was completed	September 2015

Event	Date
Subunit C extraction well EC-02 was installed.	January 2016
Subunit A extraction well EA-11 was installed.	May 2017
Injection well IA-16 was installed.	June 2017
Subunit C extraction well EC-03 was installed.	February 2018
Injection well IA-17 was installed.	August 2018
SVE system ceased operation.	2018
Subunit A extraction well EA-12 and injection well IA-20 were installed.	February 2019
Subunit A extraction well EA-14 was installed.	August 2019
Injection well IA-19 was installed.	September 2019
Human Health Risk Assessment completed	October 2019
Subunit C extraction well EC-04 was installed.	November 2019
Additional Site characterization was completed.	2020
Subunit C extraction well EC-05 began operating.	2021
Soil Vapor sampling event	May 2021
New Subunit A extraction wells (EA-15, EA-16, EA-17) were constructed.	2022
New Subunit A extraction well EA-17 was installed	June 2022
Subunit A extraction well, EA-07, was converted to Subunit A injection well, EA-07-INJ.	February 2023
Vadose zone assessment sampling	May 2023
Soil vapor sampling event	January 2024

Table B-2. Chronology of Site Events for PGA South

Event	Date
Goodyear Aerospace Corporation (later Goodyear Aircraft Corporation and the Goodyear Tire and Rubber Company [GTRC]), Arizona Division, began operations.	1942
The United States Navy established the Litchfield Naval Air Facility in Goodyear, Arizona as an Auxiliary Acceptance Unit.	1943
Oily and chrome-colored contamination was detected in a drainage ditch on the airport.	1951
The wastewater treatment plant was upgraded to reduce the emissions observed in 1951.	1952
Ownership of the airport property was transferred to the City of Phoenix.	1968
Arizona Department of Health Services (ADHS) discovered that groundwater in the Goodyear area was contaminated with solvents and chromium.	1981
EPA added the PGA Superfund Site (originally listed as the "Litchfield Airport Area Superfund Site") to the NPL.	September 1983
Phase I Remedial Investigations began on the entire PGA area.	October 1984
Evaluations of Soils and Shallow Groundwater Contamination (1991 Consent Order).	1985
The 1987 ROD was issued for Subunit A groundwater (Section 16 Operable Unit [OU]) at PGA South.	September 1987
A Consent Decree CD with GTRC was entered to begin treating contaminated groundwater in Subunit A.	1988
An Underground Storage Tank was found to have leaked aviation gasoline at PGA South.	1988
EPA published a RI/FS that identified two areas of noncontiguous contamination (PGA North and PGA South).	June 1989
The 1989 ROD was issued for Subunit B/C groundwater and soil (except for the sludge drying beds).	September 1989
A groundwater extraction and treatment system for Subunit A Groundwater was implemented by GTRC.	1990
EPA issued the first ESD to revise cleanup levels for acetone and methyl ethyl ketone (MEK).	January 1991
EPA entered a Consent Decree with GTRC and Loral Defense Systems	1991
A Chromium Action Memorandum was issued for excavation, stabilization and monitoring of soil at former chromium sludge drying bed #2.	October 1991
A Consent Order with GTRC was entered, to excavate and stabilize soil at former sludge drying beds.	January 1992
A conduit well investigation was conducted.	1992

Event	Date
Removal of sludge drying beds and stabilization of contaminated soil were completed.	January 1994
EPA issued the second ESD.	May 1993
SVE was implemented in Polygon 79.	September 1993 – January 1994
Northern Subunit B/C groundwater extraction and treatment system began operation.	February 1994
Southern Subunit B/C groundwater extraction and treatment system began operation.	September 1994
SVE was implemented in Polygon 84.	September 1994 – January 1995
An air sparging pilot test was conducted for Subunit A groundwater.	1995
Installation of chromium treatment system at Well E-17.	1995
EPA issued the third ESD.	December 1995
SVE was implemented in Polygons 96, 27a, and 92.	March 1996 – April 1998
Air sparging was implemented in Polygons 96, 27a, 92, 81, and 100.	December 1996 – April 1998
EPA issued the fourth ESD.	March 1998
The chromium treatment system at E-17 was shut down due to operational problems.	2001
Air sparging in the airport infield was implemented for Subunit A groundwater.	November 2001 – January 2003
New North Subunit C extraction well E-102 was installed north of Yuma Road and connected to the treatment system.	2004
The First Five-Year Review Report was completed.	September 2005
Plans were approved for installation of new extraction well E-18.	2006
GTRC completed Phoenix-Goodyear Airport South Site Screening Level Ecological Risk Assessment.	2008
Data associated with TCE rebound at well GAC-04 were re-examined and were determined to indicate an isolated source within the wellbore resulting from operational activities near the wellhead.	October 2008
Three additional monitoring wells (GMW-18UC, GMW-19LC, and GMW-20LC) were installed to better delineate the boundary of the 5 micrograms per liter (µg/L) TCE plume in Subunit C.	December 2008 – March 2009
GTRC recommended pulsed pumping to overcome hydraulic stagnation and to address the residual contaminant mass in Southern Subunit C groundwater.	May 2009
A work plan was submitted to install two additional wells (GMW-21UC and GMW-2UC) to monitor TCE concentration in production well GAC-04.	August 2009
Monitoring wells GMW-21U and GMW-22UC were installed.	June 2010
The Second Five-Year Review Report was completed.	September 2010

Event	Date
Monitoring well GMW-23UC was installed.	January 2012
GTRC completed Groundwater Model Update Report.	January 2014
A pipeline to connect E-103 to the Subunit C treatment system and City of Goodyear water reuse pipeline was installed. E-102R was constructed to replace E-102.	April-May 2014
EPA completed a survey of burrowing owls.	August 2008
Monitoring wells GMW-27A and GMW-28A were installed. Subunit A extraction well E-18 was also installed.	September 2014
Subunit A extraction wells E-19 and E-20 were installed.	October 2014
EPA completed the Evaluation of Groundwater Chromium issues at the Phoenix-Goodyear Airport South Superfund Site, Goodyear, Arizona.	November 2014
The third Five-Year Review was completed.	September 2015
Subunit A extraction well E-21 was installed.	December 2015
EPA issued the sixth ESD [the fifth ESD was for PGA North].	August 2016
Subunit A extraction well E-22 was installed.	June 2018
Completed Final Vapor Intrusion Program Summary Report	December 2018
Subunit A extraction well E-23 was installed.	June 2019
Subunit A monitoring wells GMW-50A through GMW-56A installed	April – November 2020 2023
Subunit C monitoring wells GMW-52UC through GMW-71UC installed.	July 2020 – May
Subunit A extraction well E-12R installed	November 2020
Focused Study Area Vapor Intrusion sampling was completed.	February and August 2021
Subunit A injections wells INJ-01 through INJ-04 was installed	September 2021
Vapor intrusion sampling was completed.	December 2022
Vadose zone sampling was completed.	January – February 2023
Subunit A injection well INJ-05 was installed.	December 2023
Indoor Air Sample and Outdoor Air sampling event was completed.	February-March 2024
Confirmed presence of previously unknown Subunit C Plume	December 2024
Start-up of Subunit C extraction wells E-105 and E-106 and their associated Southwest Subunit C Intercept System	May 2025
Start-up of Subunit C extraction well E-104 and its associated treatment system	June 2025

Appendix C: Data Review

The network of extraction wells and injection wells at Phoenix-Goodyear Airport (PGA) North and PGA South were installed to address the remedial action objective to limit further migration of contaminated groundwater and restore the quality of the Subunit B and C aquifer. Monitoring wells installed within and outside of the groundwater contamination plumes track the progress of this objective. In the 2014 ROD Amendment, the EPA established additional remedial action objectives to achieve permanent contaminant mass and concentration reduction of at least 80 percent for TCE and perchlorate for Subunit A groundwater within the source area of PGA North. The Crane Company refined these contaminant reduction objectives in the 2021 Remedial Design and Remedial Action Work Plan to reduce TCE and perchlorate concentrations within the defined target treatment zone significantly and in a reasonable time frame. Furthermore, completion of the source remedy was refined to be when TCE concentrations in target treatment zone groundwater are permanently less than or equal to 200 micrograms per liter ($\mu\text{g/L}$) (80 percent reduction from 1,000 $\mu\text{g/L}$).

EPA evaluated the groundwater data results of monitoring well samples from PGA North and PGA South, separately. This data review focuses on two time periods: historical (after treatment system operations began through 2024) and the current review period (2019 through 2024). In 1994, the Crane Company began operation of the Main Treatment System as a part of the groundwater remedial action at PGA North. In 1990, the GTRC began the operation of a groundwater treatment facility as a part of the remedial action at PGA South.

This Five-Year Review evaluates monitoring wells screened in Subunit A and Subunit C of the Upper Alluvial Unit. Mann-Kendall trend analyses were performed on select monitoring wells at PGA North and PGA South targeting different contaminant plumes. For PGA North, perchlorate and TCE concentration trends were evaluated for wells screened in Subunit A and TCE concentration trends were evaluated for wells screened in Subunit C. For PGA South, chromium and TCE concentration trends were evaluated for wells screened in Subunit A and Subunit C.

For the Mann-Kendall analyses, non-detect results were re-coded so that non-detect results are treated as ties along with any detected result that is contained within the range of the non-detects. Re-coding the data in this manner is superior to disregarding the non-detects or substituting an arbitrary value such as one-half the laboratory detection limit that can result in the Mann-Kendall test identifying a false trend or failing to find a trend that exists. The null hypothesis of no monotonic trend was evaluated in accordance with the decision logic used in the GSI Mann-Kendall Toolkit (Table C-1). For data sets with 10 or fewer samples, the

confidence values were obtained from tabled one-sided probabilities for the null distribution. For data sets with greater than 10 samples, the confidence values were obtained using the normal approximation with adjustment for ties.

Table C-1. Mann-Kendall Trend Categories

Mann-Kendall Statistic S	Confidence in Trend	Concentration Trend
$S > 0$	> 95%	Increasing
$S > 0$	90-95%	Probably Increasing
$S > 0$	< 90%	No Trend
$S \leq 0$	< 90% and COV ≥ 1	No Trend
$S \leq 0$	< 90% and COV < 1	Stable
$S < 0$	90-95%	Probably Decreasing
$S < 0$	95%	Decreasing

Note:

% = percent

COV = coefficient of variation of detected sample results.

For datasets with significant monotonic trend identified by the Mann-Kendall test, the trendline was estimated using log-linear regression with maximum likelihood estimation to handle non-detect results. For datasets with at least 5 samples and at least 3 detected results, maximum likelihood estimation regression analysis was used to fit the rate and intercept of the first-order degradation model:

$$C(t) = C_0 e^{-k_d \times t}$$

Where:

$C(t)$ = concentration at time t ($\mu\text{g/L}$),

t = monitoring date (expressed as a decimal year),

k_d = first-order rate of degradation (y^{-1}), and

C_0 = model intercept ($\mu\text{g/L}$).

Results of Mann-Kendall trend analyses for PGA North are in Table C-2 (current review period) and Table C-3 (historical). Results for PGA South are in Table C-4 (current review period) and Table C-5 (historical). The plotted data results and trends for perchlorate, TCE, and chromium

evaluated at select monitoring wells evaluated by EPA are presented at the end of this appendix.

PGA North

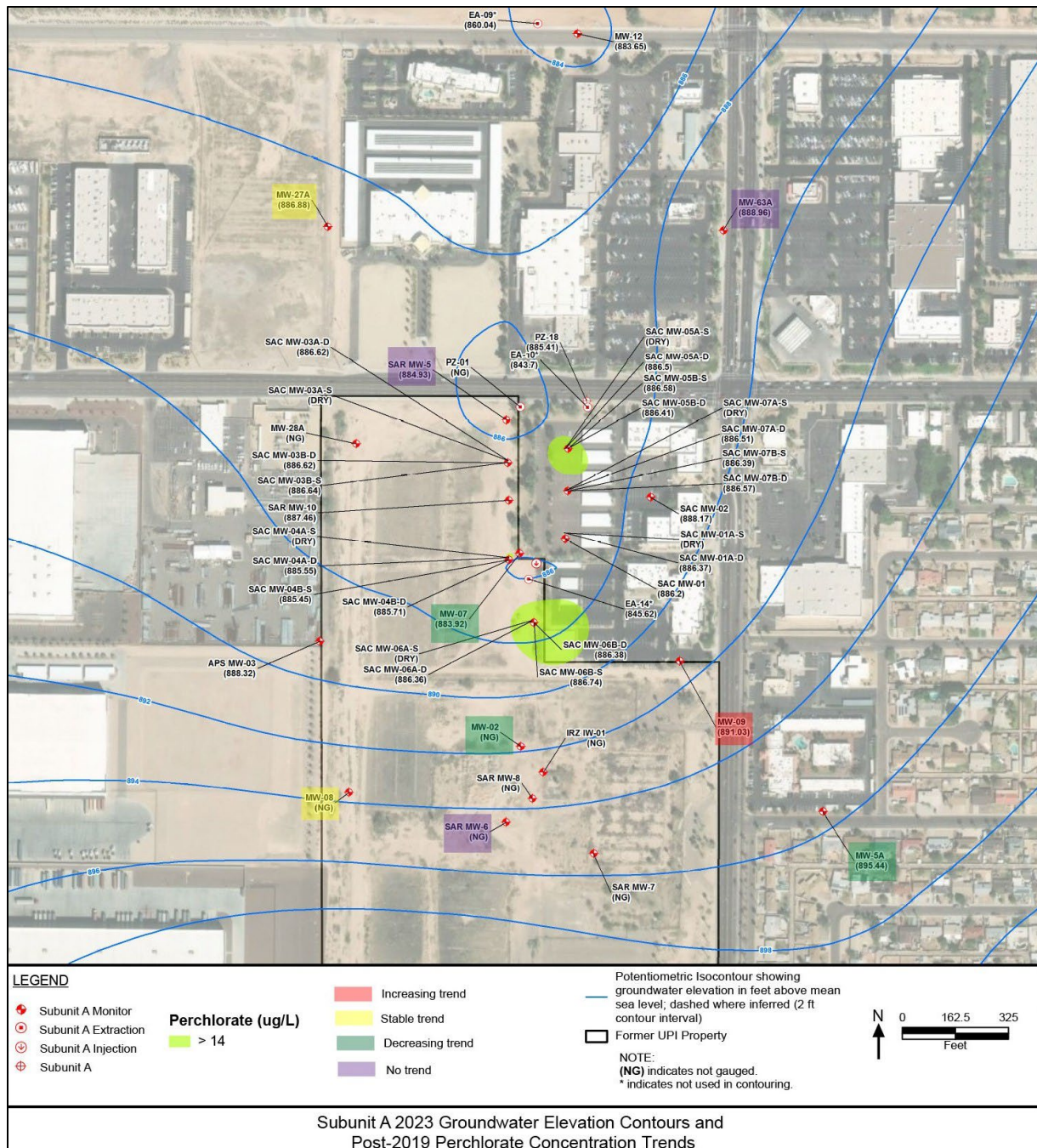
Subunit A Perchlorate Trend Summary

In general, groundwater flow in Subunit A is to the north and the northwest and is manipulated by injection and extraction wells, as seen on Figure C-1. Injection wells at the southwest corner of the former Unidynamics Phoenix, Inc. property reintroduce treated groundwater upgradient of main drywell source area and the plume into Subunit A. Of the nine monitoring wells evaluated for the Subunit A perchlorate plume, six monitoring wells (MW-02, MW-07, MW-08, MW-09, SAR MW-5, and SAR MW-6) had concentrations of perchlorate that were greater than the cleanup level.

Of the wells that had perchlorate exceedances during the review period, four monitoring wells (MW-08, MW-09, SAR MW-5, and SAR MW-6) had either stable, increasing, or non-monotonic (neither increasing nor decreasing) perchlorate trends. Therefore, perchlorate concentrations are not currently decreasing to less than the cleanup level.

Monitoring wells evaluated with perchlorate concentrations that exceeded cleanup levels are expected to flow downgradient to extraction wells EA-14, PZ-01, or EA-10 based on groundwater elevation contours. Monitoring wells MW-27A and MW-63A are located downgradient from extraction wells near the source area and perchlorate plume and had stable and non-monotonic trend, respectively, during the review period. This indicates that the perchlorate plume is not migrating past these monitoring wells and is adequately being captured by extraction wells EA-14, PZ-01, and EA-10.

Monitoring well MW-07 is located within the target treatment zone defined in the 2021 Remedial Design and Remedial Action Work Plan and was evaluated during this Five-Year Review. The most recent perchlorate cleanup level exceedance at MW-07 was during the December 2022 sampling event (16.6 µg/L). Perchlorate concentrations were decreasing during the review period and have consistently been less than the cleanup level since December 2022. This indicates that the perchlorate contamination in the target treatment zone is being reduced, supporting the achievement of this remedial action objective at MW-07.



Adapted from Matrix New World Engineering, Land Surveying and Landscape Architecture. 2024. Final 2023 Annual Groundwater Operations and Remediation Report.

Figure C-1: PGA North Subunit A aquifer groundwater elevations from 2023 and current review period perchlorate concentration trends.

Subunit A TCE Trend Summary

The TCE groundwater plume in Subunit A extends further to the north and the northwest than the perchlorate groundwater plume and is also being manipulated by injection and extraction wells (Figure C-2). Of the 17 monitoring wells evaluated for the Subunit A TCE plume, 16 monitoring wells had at least one TCE cleanup level exceedance during the review period. Monitoring well MW-72A is located to the south of the former Unidynamics Phoenix, Inc. property and had a stable trend less than the cleanup level during the review period. The stable TCE concentrations indicate the plume is not migrating past this area to the south.

Of the 17 wells evaluated for TCE in Subunit A, 11 wells had decreasing or probably decreasing TCE trends during the review period. This is most likely attributed to plume dilution and contaminant removal by injection and extraction wells. Monitoring wells MW-15, MW-24, and MW-26A demonstrated increasing TCE trends during the review period while MW-15 and MW-26A exhibited decreasing trends and MW-24 did not exhibit a monotonic trend when evaluated using historical data. Increasing TCE trends in MW-15 and MW-26A could be attributed to these wells being located outside of the capture zone of nearby extraction wells in addition to being downgradient from the source area. Monitoring well MW-24 is located near the northwestern edge of the monitoring well network, and an increasing trend in MW-24 suggests plume migration from the east. The groundwater flow patterns at MW-24 are unclear based on groundwater elevation data; therefore, it cannot be determined if the groundwater at MW-24 is being captured by extraction well 33A or if the plume is migrating downgradient.

Mann-Kendall trend analysis was not performed on monitoring well MW-07 for TCE due to its proximity to the source area. The most recent TCE cleanup level exceedance at MW-07 occurred during December 2023 and concentrations have been less than 200 µg/L since October 2020. This indicates that the TCE contamination in the target treatment zone is being reduced, supporting the achievement of this remedial action objective at MW-07.

Subunit C TCE Summary

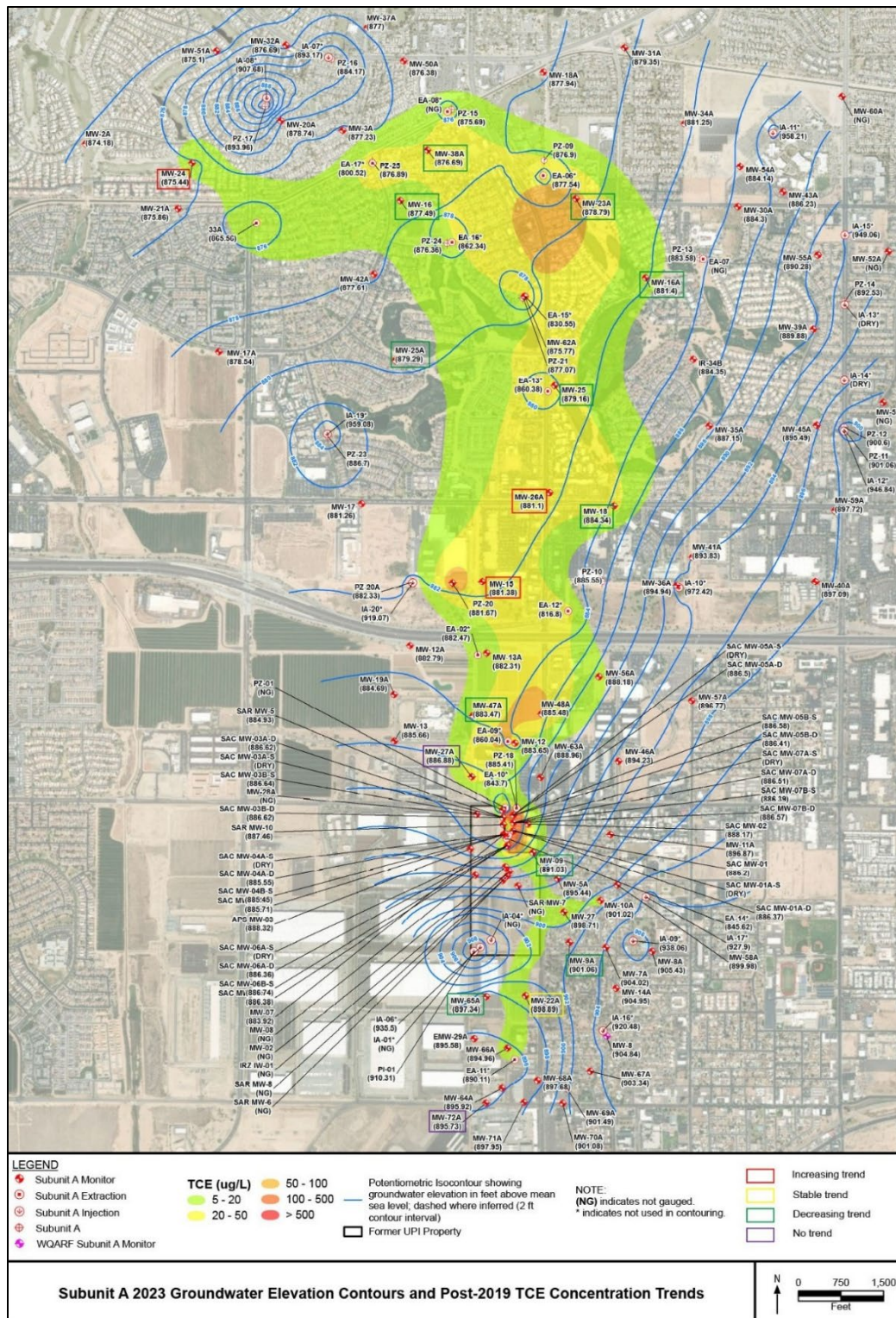
Subunit C can further be divided into upper, middle, and lower layers, each with different groundwater flow patterns, as seen on Figure C-3.

Groundwater flow in the upper layer is generally to the northwest. Of the seven monitoring wells evaluated for TCE in the upper layer, five monitoring wells (MW-3C, MW-4B, MW-9C, MW-21, and MW-47C) had TCE concentrations that were greater than the cleanup level during the review period. Monitoring wells MW-3C and MW-4B had decreasing TCE concentration

trends when evaluated with data from the review period, likely due to the proximity of extraction wells. Monitoring wells MW-9C, MW-21, and MW-47C exhibited stable trends, and groundwater elevations suggest that groundwater from these wells should flow towards the extraction wells. Monitoring well MW-13C is located at the northern edge of the upper layer monitoring network. Groundwater at MW-13C did not exhibit a monotonic trend and did not have any TCE concentrations that exceeded the cleanup level during the review period. The lack of a clear increasing trend could indicate that the plume is not migrating downgradient to this monitoring well and is currently being contained near MW-13C. Monitoring well MW-31C is located at the western edge of the upper layer monitoring network, and increasing TCE trends could indicate that the plume may be migrating to the west and may not be adequately captured by the extraction wells EC-01, EC-02, and EC-04. Furthermore, the extent of the northern edge of the plume between MW-13C and MW-63C presented in Figure C-3 cannot be delineated due to a lack of groundwater elevation contours. Based on the groundwater elevation data evaluated, the plume appears to be within the capture zone of EC-02 in this vicinity.

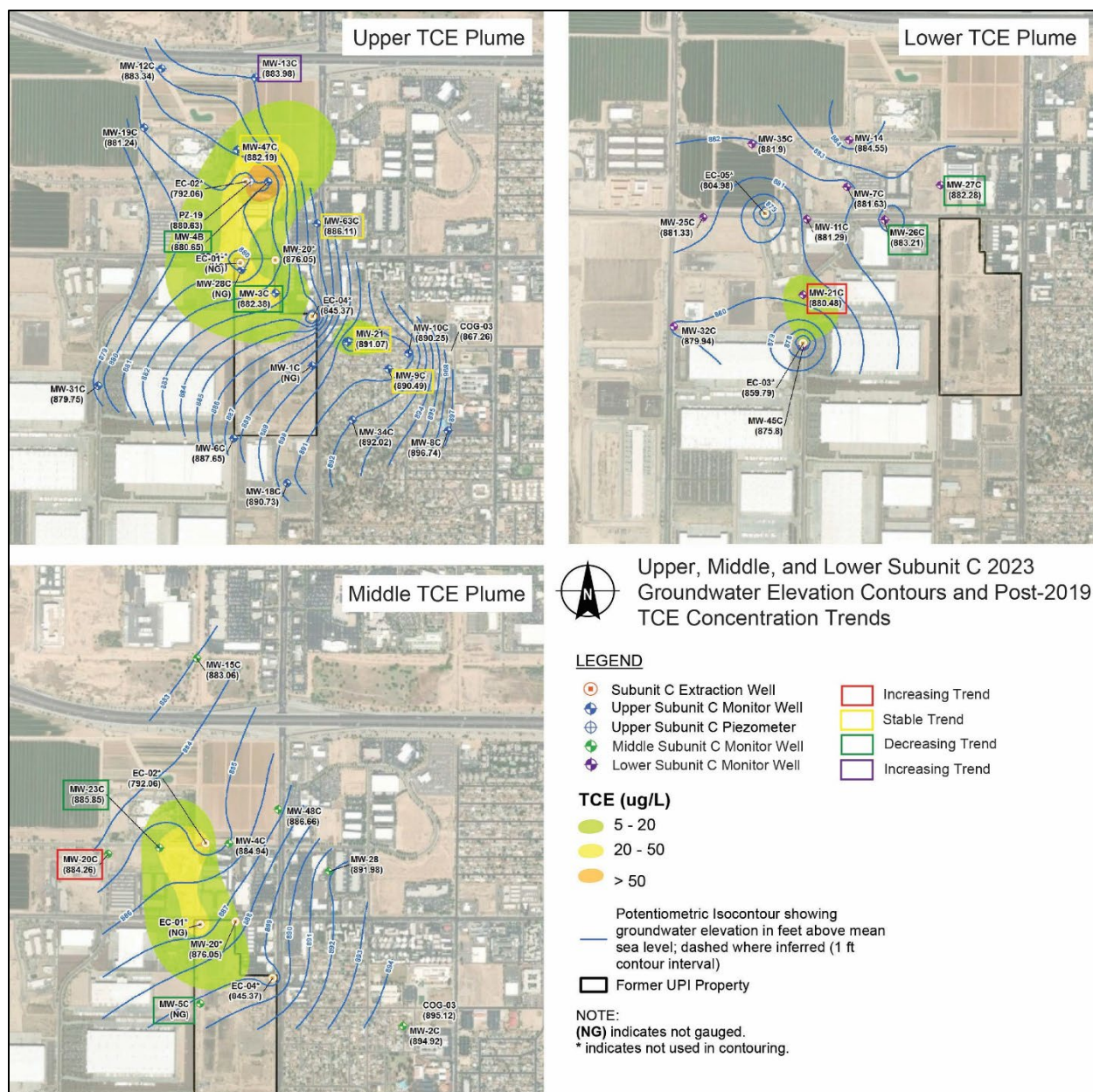
Groundwater flow in the middle layer is generally to the west and northwest. Monitoring wells MW-5C and MW-23C had TCE concentrations greater than the cleanup level during the review period with probably decreasing and decreasing trends, respectively. This may suggest that the plume is being captured in these areas by extraction wells or that contaminated groundwater from MW-5C is instead flowing northwest towards MW-20C. Monitoring well MW-20C did not have TCE concentrations that were greater than the cleanup level and had a probably increasing trend during the review period. MW-20C is located at the western edge of the middle layer monitoring network, and increasing TCE trends could indicate that the plume may be migrating to the northwest and may not be adequately captured by the extraction wells EC-01 and EC-02.

Groundwater flow in the lower layer is generally to the south and southwest. Of the three monitoring wells evaluated, monitoring wells MW-21C and MW-26C had TCE concentrations that exceeded the cleanup level during the review period. TCE trends in MW-26C are currently decreasing while trends in MW-21C are increasing, likely due to the southwestern groundwater flow from MW-26C to MW-21C. Based on current sample data and groundwater flow patterns, the plume is likely being contained by extraction wells EC-03 and EC-05 in this area.



Adapted from Matrix New World Engineering, Land Surveying and Landscape Architecture. 2024. Final 2023 Annual Groundwater Operations and Remediation Report.

Figure C-2. PGA North Subunit A aquifer groundwater elevations from 2023 and current review period TCE concentration trends.



Adapted from Matrix New World Engineering, Land Surveying and Landscape Architecture. 2024. Final 2023 Annual Groundwater Operations and Remediation Report.

Figure C-3. PGA North upper, middle, and lower Subunit C aquifer groundwater elevations from 2023 and current review period TCE concentration trends.

PGA South

Subunit A Chromium Summary

In general, groundwater flow in Subunit A is to the southwest and is influenced by injection and extraction wells, as seen on Figure C-4. Of the eight monitoring wells evaluated, monitoring

EMW-08R, EMW-10R, and NEW-03 had chromium concentrations greater than the cleanup level during the review period. Monitoring wells EMW-10R did not exhibit a monotonic chromium trend and NEW-03 had a stable trend. Groundwater from these wells should be flowing downgradient towards nearby extraction wells based on recent (2023) groundwater elevations. Monitoring wells EMW-08R and GMW-50A have a currently increasing trend, which is likely attributed to nearby extraction wells drawing in contaminated groundwater. Based on observed chromium trends and groundwater elevations during the review period, the extraction and injection wells appear to contain the chromium plume.

Subunit A TCE Summary

The 10 monitoring wells evaluated for TCE in Subunit A had TCE concentrations that exceeded the cleanup level during the review period (Figure C-4). Monitoring wells GMW-45A, GMW-51A, and NEW-03 are located at the southern end of the plume and had TCE concentrations that decreased to less than the cleanup level during the review period. This suggests that plume migration to the southwest is being contained by the injection wells and extraction wells. Monitoring well GMW-34A currently has an increasing trend that is likely attributed to nearby extraction well E-21 drawing in contaminated groundwater. Recent groundwater elevation contours indicate that groundwater from other monitoring wells with cleanup level exceedances should be flowing towards extraction wells.

Subunit C Chromium Summary

Groundwater in Subunit C is generally flowing northwest and is manipulated by extraction wells E-102R and E-103 located at the northwest end of the plume (Figure C-5). Of the six monitoring wells evaluated, four wells (GMW-09MC, GMW-11UC, GMW-13UC, and GMW-14UC) had chromium concentrations that were greater than the cleanup level during the review period. Monitoring wells GMW-09MC, GMW-13UC, and GMW-14UC had stable chromium concentrations during the review period. Contaminated groundwater from these three wells is expected to flow towards extraction well E-103. Monitoring well GMW-49UC did not have chromium cleanup level exceedances during the review period and had an increasing trend. Groundwater from GMW-49UC is expected to flow downgradient to extraction well E-102R. Monitoring well GMW-11UC has a probably increasing chromium trend during the review period. Contamination from GMW-11UC is likely flowing towards extraction well E-102R based on groundwater modeling in the 2023 First Semiannual Groundwater Monitoring Report. Monitoring wells GMW-57 and GMW-58 further downgradient from extraction wells E-102R and E-103 were not evaluated using Mann-Kendall analyses during this Five-Year Review, and TCE concentrations at those locations remain below the cleanup level.

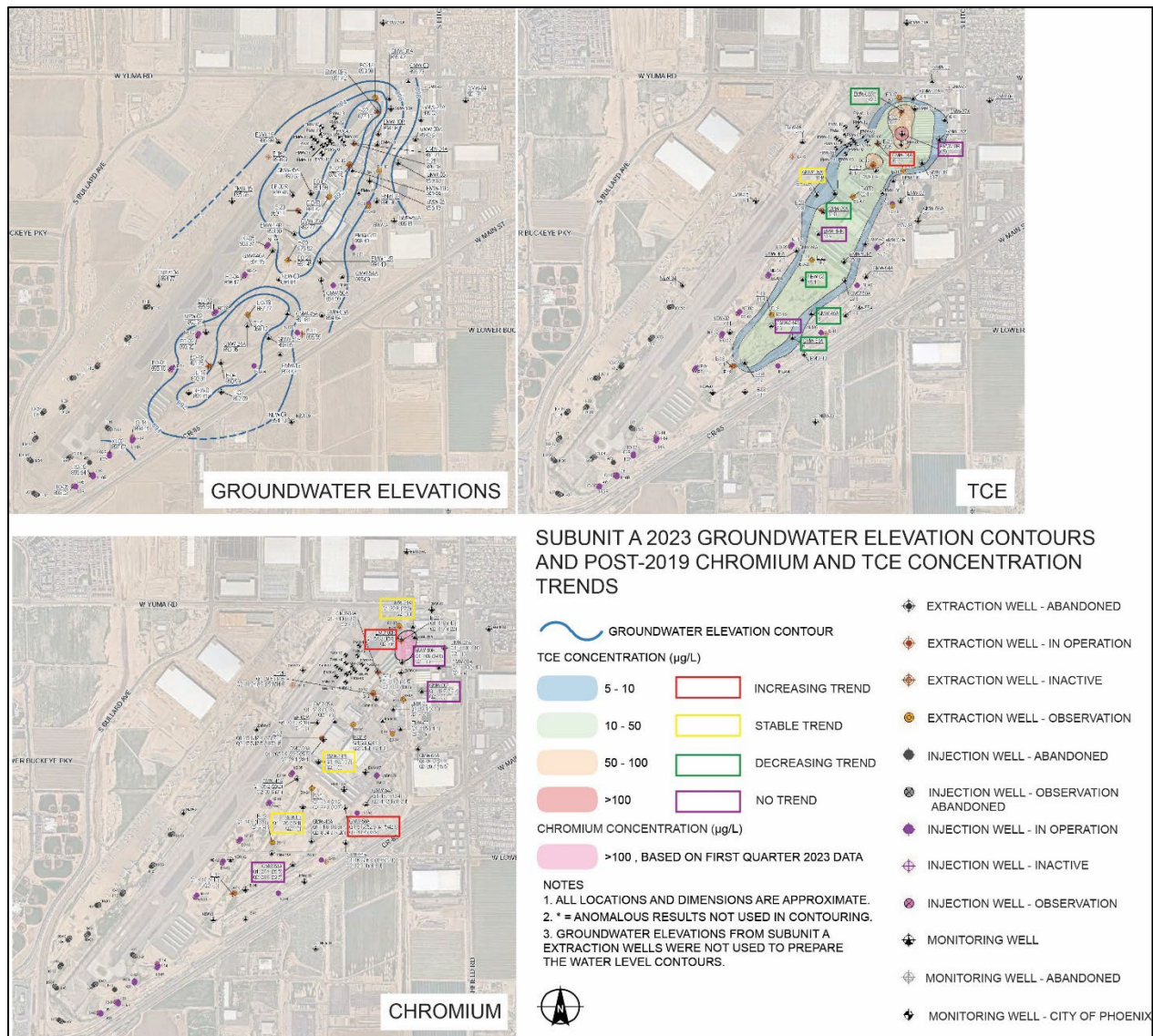
Subunit C TCE Summary

There are three distinct TCE plumes in Subunit C that are spatially referred to as the Northern, Central, and Southwestern plumes. The Southwestern plume did not have enough data at this time to perform Mann-Kendall analyses and therefore was excluded from data evaluation and Figure C-5.

In the Northern plume, three (GMW-13UC, GMW-17UC, and GMW-52UC) out of the four monitoring wells evaluated had TCE concentrations that were greater than the cleanup level during the review period. Monitoring well GMW-13UC is located at the southeastern edge of the northern plume and did not exhibit a monotonic trend during the review period (Figure C-5). GMW-13UC had a decreasing trend when evaluated using historical (post-2012) data, suggesting that contaminated groundwater is likely flowing from this location to extraction well E-103. Monitoring well GMW-26UC is located at the northwestern edge of the plume, had an increasing TCE trend during the review period, and TCE concentrations remained below the cleanup level. Groundwater from GMW-26UC is likely flowing towards extraction well E-103.

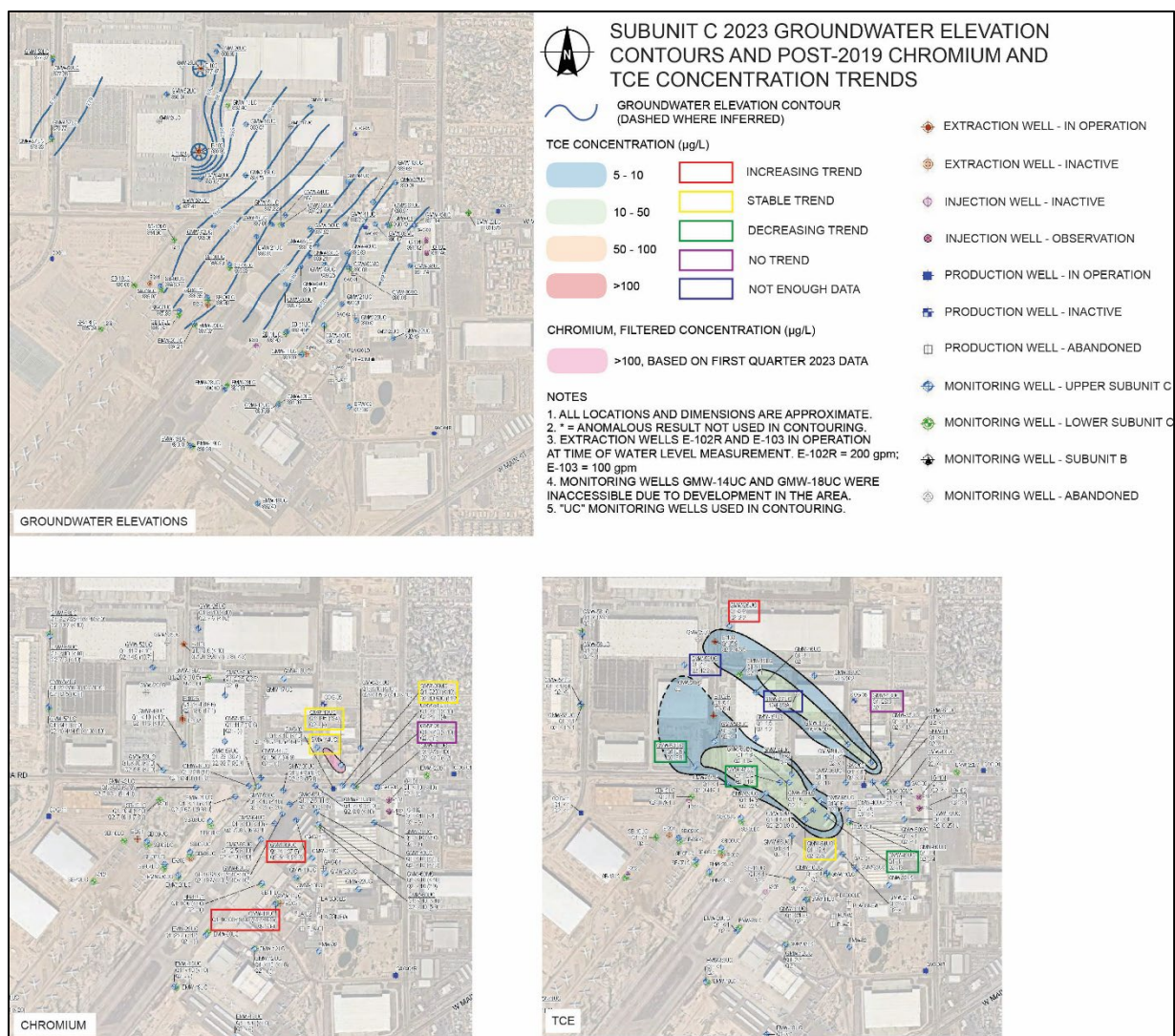
Monitoring well GMW-52UC is located between the northwestern edges of the northern plume and the central plume, and did not exhibit a monotonic trend during either the current or historical time periods. The groundwater flow model presented in the 2023 First Semiannual Groundwater Monitoring Report depicts groundwater from GMW-52UC to flow towards extraction well E-103. Plume capture by E-103 cannot be confirmed due to a lack of a clear decreasing TCE concentration trend.

In the central plume, the four monitoring wells evaluated had TCE concentrations that exceeded the cleanup level during the review period. Monitoring wells GMW-49UC, GMW-47UC, and GMW-53UC had decreasing TCE trends during the review period, which could indicate that the plume is being captured by the downgradient extraction wells. Groundwater elevation data suggests that contaminated groundwater in GMW-53UC is expected to flow towards extraction well E-102R. The groundwater flow model presented in the 2023 First Semiannual Groundwater Monitoring Report states that groundwater from GMW-53UC that is outside of the capture zone of extraction well E-102R flows north towards extraction well E-103. Cleanup level exceedances have not been found in groundwater samples collected downgradient at GMW-57UC and GMW-58UC, further supporting groundwater flow from GMW-53UC to E 102R and E-103. Monitoring well GMW-64UC had a stable concentration greater than the cleanup level during the review period, and groundwater from GMW-64UC is likely flowing downgradient to extraction well E-102R.



Adapted from Haley and Aldrich, Inc. 2024. First Semiannual Groundwater Monitoring Report – 2023.

Figure C-4. PGA South Subunit A aquifer groundwater elevations from 2023 and current review period chromium and TCE concentration trends.



Adapted from Haley and Aldrich, Inc. 2024. First Semiannual Groundwater Monitoring Report – 2023.

Figure C-5. PGA South Subunit C aquifer groundwater elevations from 2023 and current review period chromium and TCE concentration trends.

Table C-2. PGA North Mann-Kendall Trends for Post-2019 Data

Well	Greater Than MCL in the Last Five Years? ¹	Analyte	No. Samples	No. Detected	M-K S-Stat	Confidence Factor	COV of Detects	Trend	1st Order Regression Slope
MW-02	Yes	Perchlorate	10	10	-33	100%	0.54	Decreasing	-0.31
MW-07	Yes	Perchlorate	39	37	-234	100%	0.50	Decreasing	-0.20
MW-08	Yes	Perchlorate	11	11	-13	82%	0.45	Stable	---
MW-09	Yes	Perchlorate	35	30	333	100%	0.36	Increasing	0.23
MW-09	Yes	TCE	30	30	-213	100%	0.64	Decreasing	-0.26
MW-15	Yes	TCE	16	16	52	99%	1.28	Increasing	0.84
MW-16	Yes	TCE	15	14	-53	99%	0.37	Decreasing	-0.31
MW-16A	Yes	TCE	20	20	-166	100%	0.88	Decreasing	-0.75
MW-18	Yes	TCE	20	20	-135	100%	0.70	Decreasing	-0.45
MW-22A	Yes	TCE	12	12	-14	81%	0.34	Stable	---
MW-23A	Yes	TCE	17	17	-120	100%	0.44	Decreasing	-0.32
MW-24	Yes	TCE	53	53	255	97%	0.42	Increasing	0.03
MW-25	Yes	TCE	14	14	-25	91%	0.72	Probably Decreasing	-0.30
MW-25A	Yes	TCE	10	10	-31	100%	0.91	Decreasing	-0.44
MW-26A	Yes	TCE	20	20	76	99%	0.41	Increasing	0.22
MW-27A	No	Perchlorate	6	4	-6	81%	0.17	Stable	---
MW-27A	Yes	TCE	21	21	8	58%	0.38	No Trend	---
MW-38A	Yes	TCE	17	17	-88	100%	0.51	Decreasing	-0.27
MW-47A	Yes	TCE	16	16	-39	96%	0.23	Decreasing	-0.07
MW-5A	No	Perchlorate	15	13	32	94%	0.19	Probably Increasing	-0.03
MW-63A	No	Perchlorate	6	5	1	50%	0.28	No Trend	---
MW-65A	Yes	TCE	17	15	-43	96%	0.51	Decreasing	-0.30
MW-72A	No	TCE	14	14	-5	59%	0.59	Stable	---

Well	Greater Than MCL in the Last Five Years? ¹	Analyte	No. Samples	No. Detected	M-K S-Stat	Confidence Factor	COV of Detects	Trend	1st Order Regression Slope
MW-9A	Yes	TCE	20	19	-112	100%	0.75	Decreasing	-0.56
SAR MW-5	Yes	Perchlorate	34	32	-49	76%	1.19	No Trend	---
SAR MW-6	Yes	Perchlorate	11	11	7	68%	0.49	No Trend	---
MW-13C	No	TCE	17	17	10	64%	0.33	No Trend	---
MW-21	Yes	TCE	15	15	-15	76%	0.42	Stable	---
MW-3C	Yes	TCE	29	29	-220	100%	0.40	Decreasing	-0.22
MW-47C	Yes	TCE	22	22	-5	54%	0.70	Stable	---
MW-4B	Yes	TCE	17	17	-63	99%	0.17	Decreasing	-0.07
MW-63C	No	TCE	15	9	-3	56%	0.47	Stable	---
MW-9C	Yes	TCE	69	68	-132	75%	0.23	Stable	---
MW-20C	No	TCE	6	3	9	93%	1.41	Probably Increasing	1.51
MW-23C	Yes	TCE	18	18	-52	97%	0.40	Decreasing	-0.20
MW-5C	Yes	TCE	8	8	-14	95%	0.57	Probably Decreasing	-0.33
MW-21C	Yes	TCE	21	21	68	98%	0.64	Increasing	0.27
MW-26C	Yes	TCE	20	20	-82	100%	0.31	Decreasing	-0.10
MW-27C	No	TCE	14	14	-75	100%	0.56	Decreasing	-0.46

Note:

¹ The MCLs for perchlorate and TCE are 14 µg/L and 5 µg/L, respectively.

--- = not applicable

COV = coefficient of variation

MCL = Maximum Contaminant Level

M-K S-Stat = Mann-Kendall S-Statistic

No. = number of

% = percent

Table C-3. PGA North Mann-Kendall Trends for Post-2012 Data

Well	Greater Than MCL in the Last Five Years? ¹	Analyte	No. Samples	No. Detected	M-K S-Stat	Confidence Factor	COV of Detects	Trend	1st Order Regression Slope
MW-02	Yes	Perchlorate	79	76	531	99%	0.82	Increasing	0.06
MW-07	Yes	Perchlorate	107	102	-2967	100%	0.96	Decreasing	-0.09
MW-08	Yes	Perchlorate	82	71	400	95%	1.12	Probably Increasing	0.06
MW-09	Yes	Perchlorate	105	100	-1742	100%	0.55	Decreasing	-0.06
MW-09	Yes	TCE	123	123	-1054	99%	1.08	Decreasing	-0.03
MW-15	Yes	TCE	161	161	-6308	100%	3.67	Decreasing	-0.14
MW-16	Yes	TCE	166	144	-541	78%	0.83	Stable	---
MW-16A	Yes	TCE	121	121	-4612	100%	0.47	Decreasing	-0.13
MW-18	Yes	TCE	180	152	-20	51%	0.72	Stable	---
MW-22A	Yes	TCE	57	57	-862	100%	0.56	Decreasing	-0.20
MW-23A	Yes	TCE	80	80	-2113	100%	0.30	Decreasing	-0.08
MW-24	Yes	TCE	141	117	88	56%	0.71	No Trend	---
MW-25	Yes	TCE	155	144	-6463	100%	1.33	Decreasing	-0.05
MW-25A	Yes	TCE	77	77	-2269	100%	0.66	Decreasing	-0.16
MW-26A	Yes	TCE	76	76	-853	100%	0.36	Decreasing	-0.02
MW-27A	No	Perchlorate	53	50	-319	99%	0.69	Decreasing	-0.17
MW-27A	Yes	TCE	73	73	-1308	100%	0.84	Decreasing	-0.16
MW-38A	Yes	TCE	99	99	-2988	100%	0.44	Decreasing	-0.13
MW-47A	Yes	TCE	89	89	-3349	100%	1.10	Decreasing	-0.40
MW-5A	No	Perchlorate	57	52	176	89%	0.25	No Trend	---
MW-63A	No	Perchlorate	66	65	-807	100%	0.70	Decreasing	-0.24
MW-65A	Yes	TCE	58	55	-814	100%	0.81	Decreasing	-0.26
MW-72A	No	TCE	48	46	-272	99%	0.65	Decreasing	-0.14
MW-9A	Yes	TCE	65	64	620	100%	1.34	Increasing	0.21

Well	Greater Than MCL in the Last Five Years? ¹	Analyte	No. Samples	No. Detected	M-K S-Stat	Confidence Factor	COV of Detects	Trend	1st Order Regression Slope
SAR MW-5	Yes	Perchlorate	60	58	-617	100%	0.91	Decreasing	-0.18
SAR MW-6	Yes	Perchlorate	37	37	-389	100%	1.59	Decreasing	-0.51
MW-13C	No	TCE	85	78	1720	100%	0.50	Increasing	0.16
MW-21	Yes	TCE	170	160	7184	100%	0.86	Increasing	0.09
MW-3C	Yes	TCE	115	115	-5604	100%	0.81	Decreasing	-0.28
MW-47C	Yes	TCE	110	110	-4772	100%	0.96	Decreasing	-0.41
MW-4B	Yes	TCE	79	79	-639	100%	0.55	Decreasing	-0.09
MW-63C	No	TCE	80	65	-1421	100%	2.50	Decreasing	-0.35
MW-9C	Yes	TCE	309	305	10940	100%	0.48	Increasing	0.05
MW-20C	No	TCE	44	3	43	95%	1.41	Increasing	1.18
MW-23C	Yes	TCE	58	58	-806	100%	0.69	Decreasing	-0.18
MW-5C	Yes	TCE	90	90	-371	90%	0.45	Probably Decreasing	0.00
MW-21C	Yes	TCE	63	62	-76	76%	0.78	Stable	---
MW-26C	Yes	TCE	110	110	-1544	100%	0.61	Decreasing	-0.07
MW-27C	No	TCE	81	80	-42	57%	3.09	No Trend	---

Note:

¹ The MCLs for perchlorate and TCE are 14 µg/L and 5 µg/L, respectively.

--- = not applicable

COV = coefficient of variation

MCL = Maximum Contaminant Level

M-K S-Stat = Mann-Kendall S-Statistic

No. = number of

% = percent

Table C-4. PGA South Mann-Kendall Trends for Post-2019 Data

Well	Greater Than MCL in the Last Five Years? ¹	Analyte	No. Samples	No. Detected	M-K S-Stat	Confidence Factor	COV of Detects	Trend	1st Order Regression Slope
EMW-08R	Yes	Chromium	8	8	18	98%	0.58	Increasing	0.37
EMW-08R	Yes	TCE	8	8	-14	95%	0.43	Probably Decreasing	-0.26
EMW-10R	Yes	Chromium	5	5	2	59%	1.11	No Trend	---
EMW-10R	Yes	TCE	10	10	13	85%	0.42	No Trend	---
EMW-14R	No	Chromium	5	5	0	41%	0.29	Stable	---
EMW-14R	Yes	TCE	10	10	4	60%	0.44	No Trend	---
GMW-06	No	Chromium	6	5	1	50%	0.83	No Trend	---
GMW-24A	Yes	TCE	10	10	1	50%	0.40	No Trend	---
GMW-31A	No	Chromium	6	6	-3	64%	0.43	Stable	---
GMW-34A	Yes	TCE	10	10	27	99%	1.46	Increasing	0.90
GMW-35A	Yes	TCE	10	10	-11	81%	0.52	Stable	---
GMW-39A	Yes	TCE	21	21	-160	100%	1.56	Decreasing	-0.38
GMW-45A	Yes	TCE	20	20	-58	97%	0.49	Decreasing	-0.12
GMW-50A	No	Chromium	22	22	76	98%	0.36	Increasing	0.12
GMW-51A	No	Chromium	22	21	33	82%	0.33	No Trend	---
GMW-51A	Yes	TCE	22	22	-116	100%	1.04	Decreasing	-0.28
NEW-03	Yes	Chromium	5	5	-2	59%	0.62	Stable	---
NEW-03	Yes	TCE	11	11	-21	94%	0.67	Probably Decreasing	-0.97
GMW-01	No	Chromium	11	9	0	50%	1.20	No Trend	---
GMW-09MC	Yes	Chromium	19	19	-37	90%	0.88	Stable	---
GMW-11UC	Yes	Chromium	12	12	22	93%	1.35	Probably Increasing	0.40
GMW-13UC	Yes	Chromium	10	10	-3	57%	0.22	Stable	---
GMW-13UC	Yes	TCE	10	10	5	64%	0.32	No Trend	---
GMW-14UC	Yes	Chromium	4	4	-4	83%	0.95	Stable	---

Well	Greater Than MCL in the Last Five Years? ¹	Analyte	No. Samples	No. Detected	M-K S-Stat	Confidence Factor	COV of Detects	Trend	1st Order Regression Slope
GMW-17UC	Yes	TCE	3	3	---	---	0.36	---	---
GMW-26UC	No	TCE	17	17	60	99%	0.31	Increasing	0.14
GMW-47UC	Yes	TCE	21	21	-173	100%	0.47	Decreasing	-0.33
GMW-49UC	No	Chromium	21	21	94	100%	0.45	Increasing	0.23
GMW-49UC	Yes	TCE	21	21	-69	98%	0.38	Decreasing	-0.14
GMW-52UC	Yes	TCE	18	16	19	75%	0.72	No Trend	---
GMW-53UC	Yes	TCE	17	17	-71	100%	0.25	Decreasing	-0.16
GMW-64UC	Yes	TCE	11	11	-10	76%	0.54	Stable	---

Note:

¹ The MCLs for TCE and chromium are 5 µg/L and 100 µg/L, respectively.

--- = not applicable

COV = coefficient of variation

MCL = Maximum Contaminant Level

M-K S-Stat = Mann-Kendall S-Statistic

No. = number of

% = percent

Table C-5. PGA South Mann-Kendall Trends for Post-2012 Data

Well	Greater Than MCL in the Last Five Years? ¹	Analyte	No. Samples	No. Detected	M-K S-Stat	Confidence Factor	COV of Detects	Trend	1st Order Regression Slope
EMW-08R	Yes	Chromium	24	24	-110	100%	0.91	Decreasing	-0.09
EMW-08R	Yes	TCE	29	29	-52	83%	0.72	Stable	---
EMW-10R	Yes	Chromium	22	22	-33	82%	0.70	Stable	---
EMW-10R	Yes	TCE	37	37	-102	91%	0.93	Probably Decreasing	-0.05
EMW-14R	No	Chromium	24	24	-197	100%	0.42	Decreasing	-0.12
EMW-14R	Yes	TCE	37	37	-252	100%	0.44	Decreasing	-0.09
GMW-06	No	Chromium	30	27	-1	50%	1.65	No Trend	---
GMW-24A	Yes	TCE	38	38	-472	100%	0.36	Decreasing	-0.11
GMW-31A	No	Chromium	24	23	22	70%	1.56	No Trend	---
GMW-34A	Yes	TCE	33	33	-164	99%	1.93	Decreasing	-0.18
GMW-35A	Yes	TCE	35	35	-247	100%	1.13	Decreasing	-0.18
GMW-39A	Yes	TCE	27	26	-49	99%	1.79	Decreasing	-0.45
GMW-45A	Yes	TCE	21	21	-78	99%	0.74	Decreasing	-0.19
GMW-50A	No	Chromium	22	22	76	98%	0.36	Increasing	0.12
GMW-51A	No	Chromium	22	21	33	82%	0.33	No Trend	---
GMW-51A	Yes	TCE	22	22	-116	100%	1.04	Decreasing	-0.28
NEW-03	Yes	Chromium	28	28	-123	99%	1.37	Decreasing	-0.16
NEW-03	Yes	TCE	85	85	-2528	100%	1.11	Decreasing	-0.09
GMW-01	No	Chromium	40	38	44	75%	5.62	No Trend	---
GMW-09MC	Yes	Chromium	101	101	2522	100%	1.46	Increasing	0.11
GMW-11UC	Yes	Chromium	21	21	110	100%	1.77	Increasing	0.36
GMW-13UC	Yes	Chromium	88	88	162	72%	0.43	No Trend	---
GMW-13UC	Yes	TCE	146	146	-3049	100%	0.41	Decreasing	-0.03
GMW-14UC	Yes	Chromium	66	66	-397	99%	1.15	Decreasing	-0.02

Well	Greater Than MCL in the Last Five Years? ¹	Analyte	No. Samples	No. Detected	M-K S-Stat	Confidence Factor	COV of Detects	Trend	1st Order Regression Slope
GMW-17UC	Yes	TCE	86	86	-90	63%	0.70	Stable	---
GMW-26UC	No	TCE	25	25	-69	94%	0.35	Probably Decreasing	-0.06
GMW-47UC	Yes	TCE	23	23	-199	100%	0.45	Decreasing	-0.30
GMW-49UC	No	Chromium	21	21	94	100%	0.45	Increasing	0.23
GMW-49UC	Yes	TCE	21	21	-69	98%	0.38	Decreasing	-0.14
GMW-52UC	Yes	TCE	18	16	19	75%	0.72	No Trend	---
GMW-53UC	Yes	TCE	17	17	-71	100%	0.25	Decreasing	-0.16
GMW-64UC	Yes	TCE	11	11	-10	76%	0.54	Stable	---

Note:

¹ The MCLs for TCE and chromium are 5 µg/L and 100 µg/L, respectively.

--- = not applicable

COV = coefficient of variation

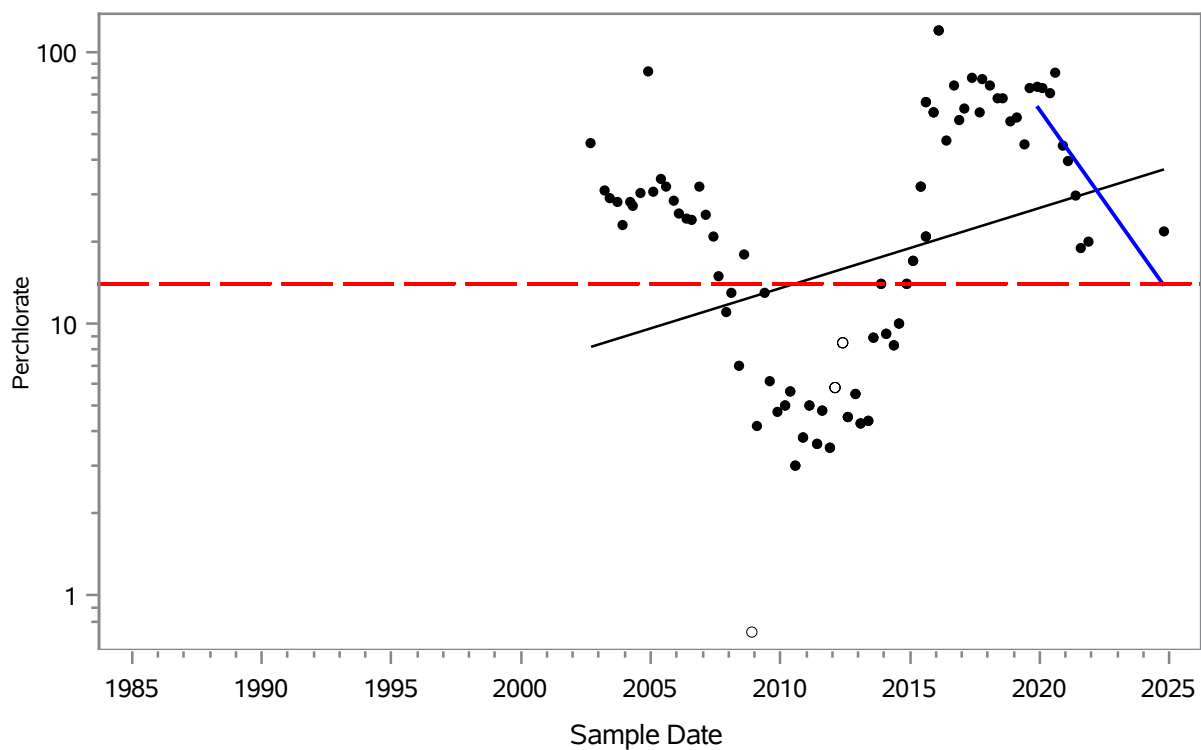
MCL = Maximum Contaminant Level

M-K S-Stat = Mann-Kendall S-Statistic

No. = number of

% = percent

Concentration Trend Plots: Subunit A MW-02

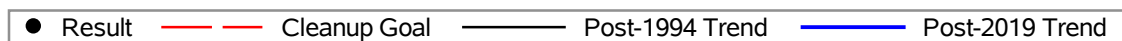
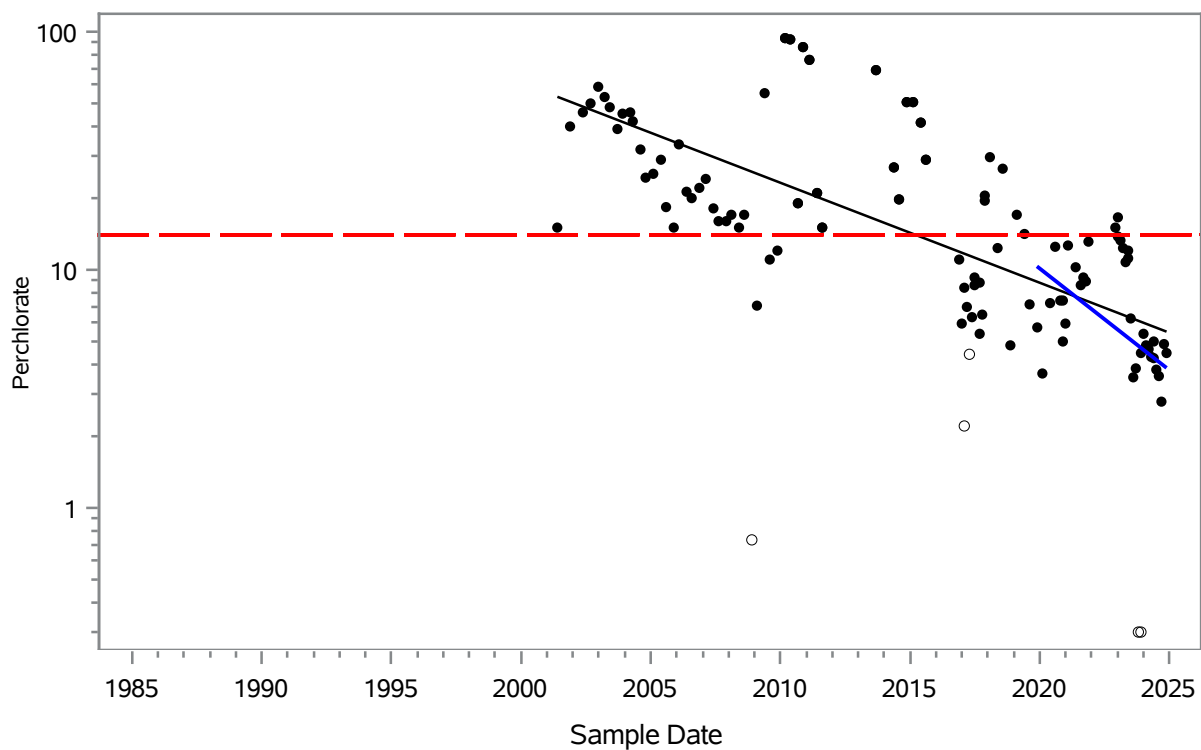


● Result - - - Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

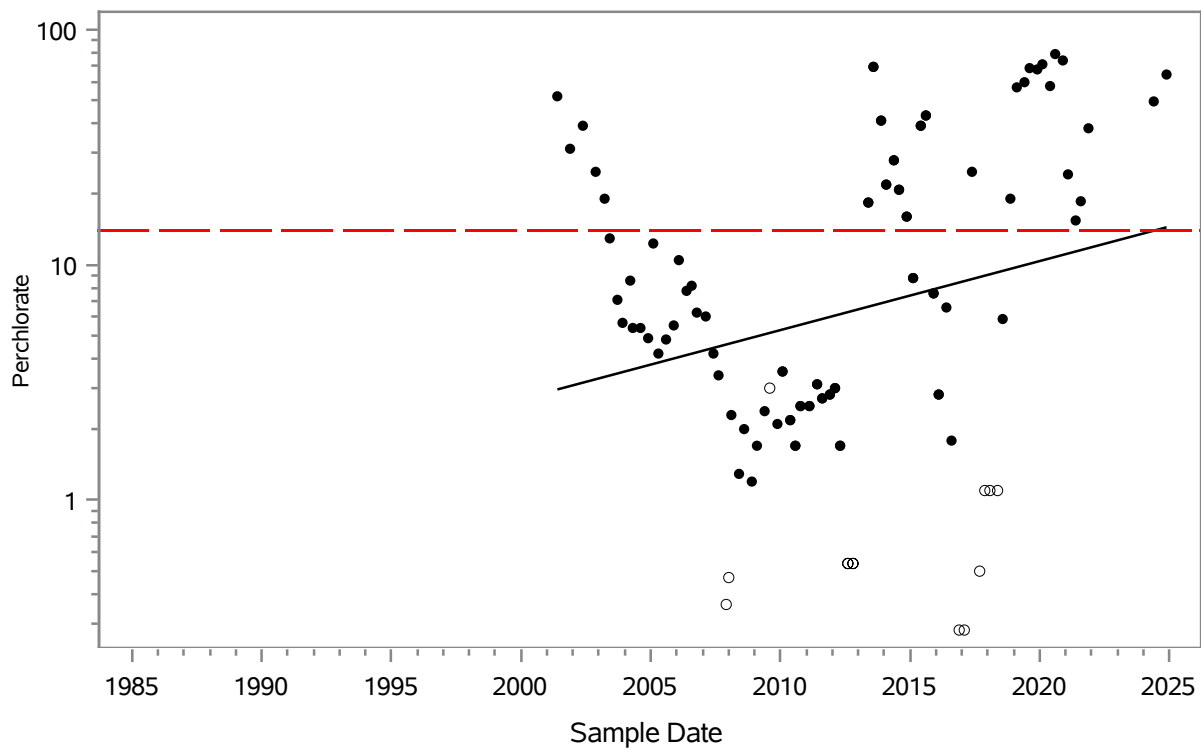
Concentration Trend Plots: Subunit A MW-07



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-08

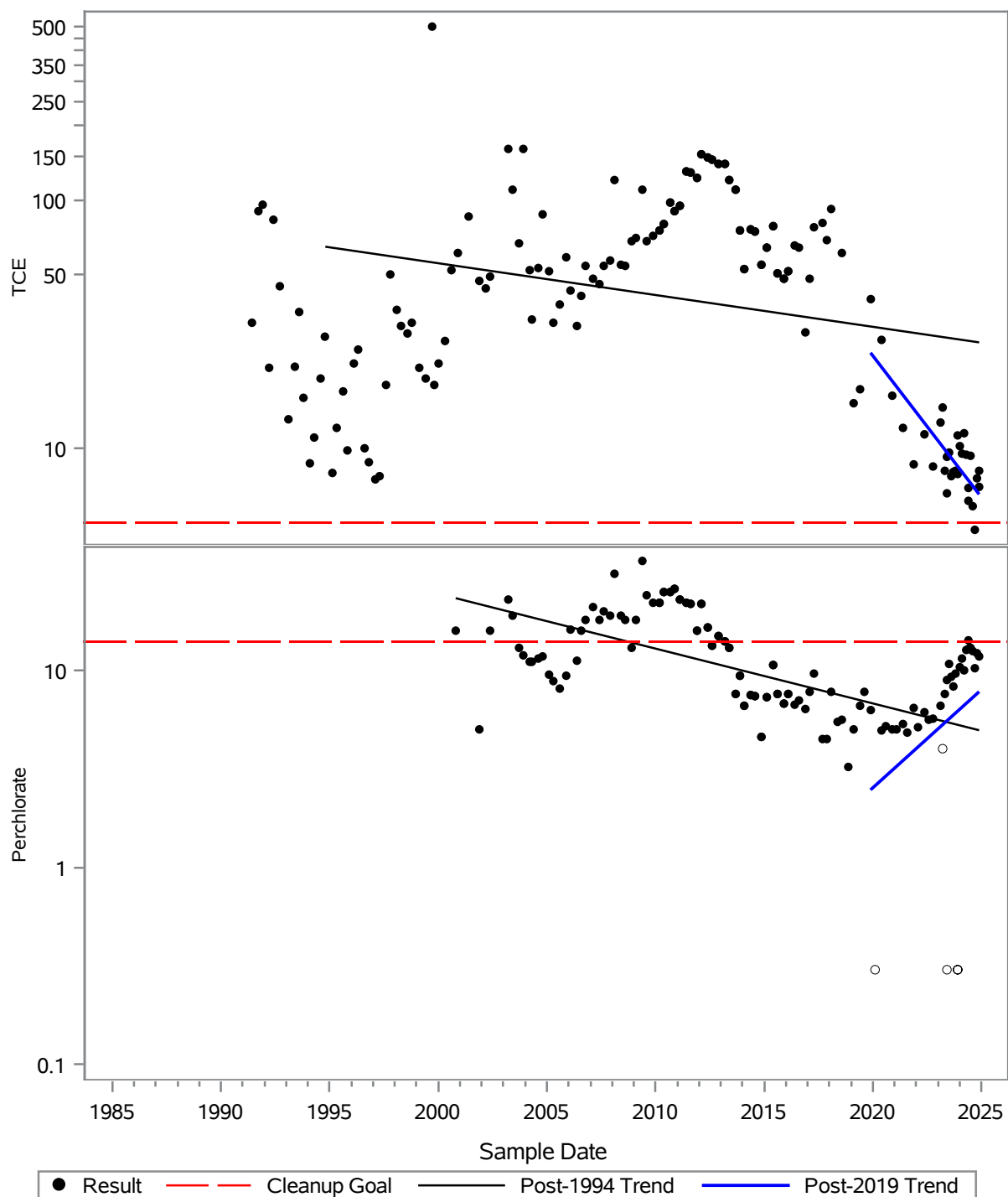


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

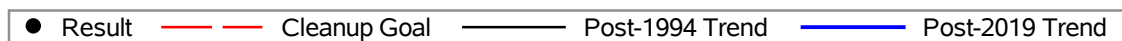
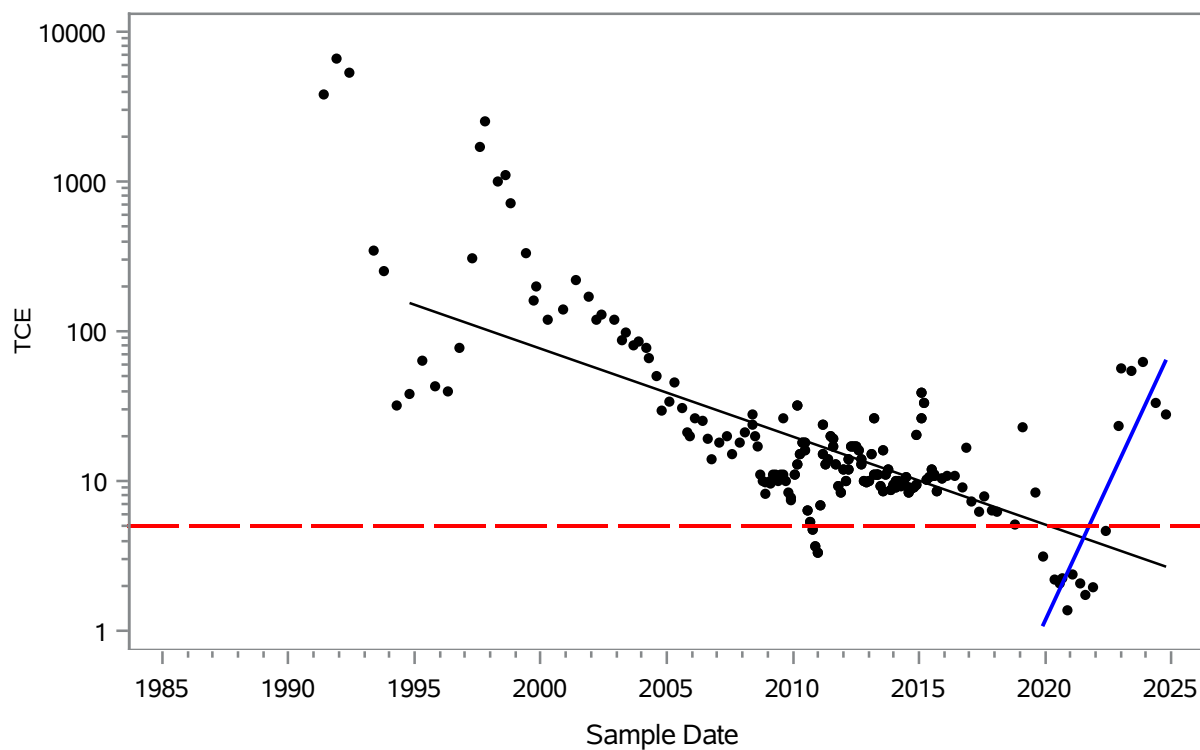
Concentration Trend Plots: Subunit A MW-09



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

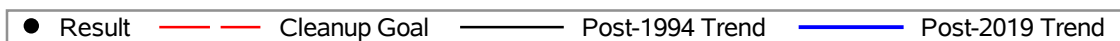
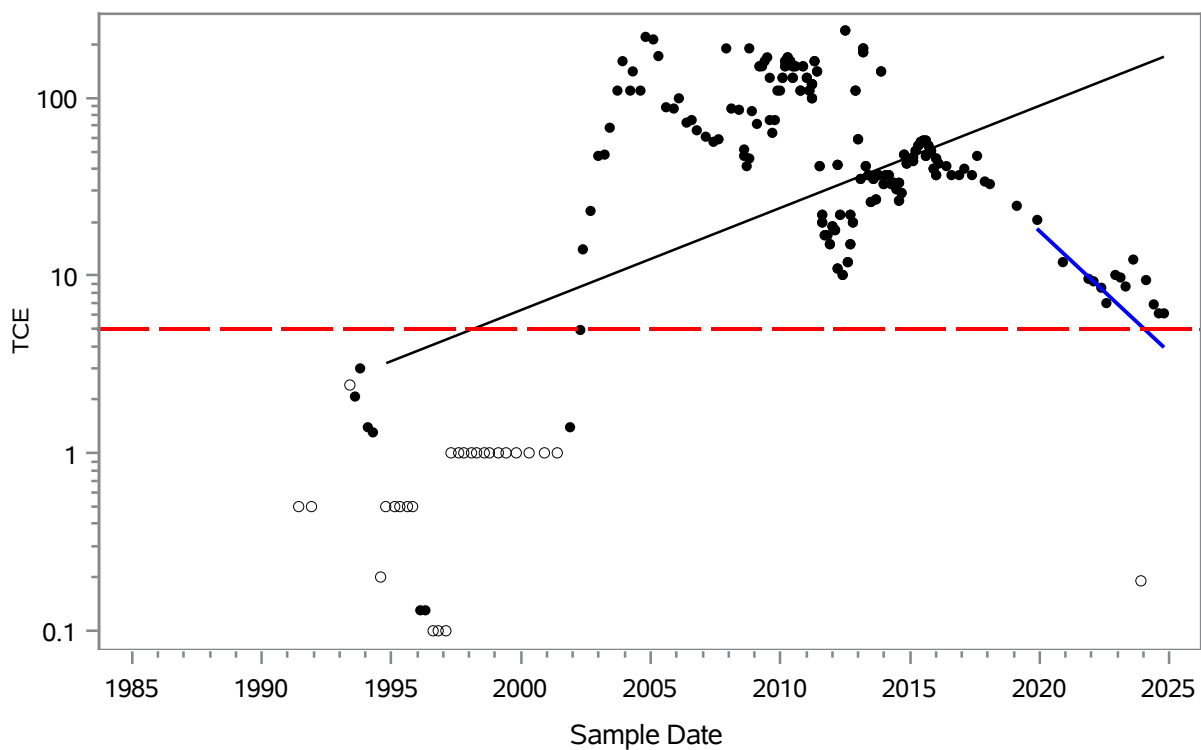
Concentration Trend Plots: Subunit A MW-15



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

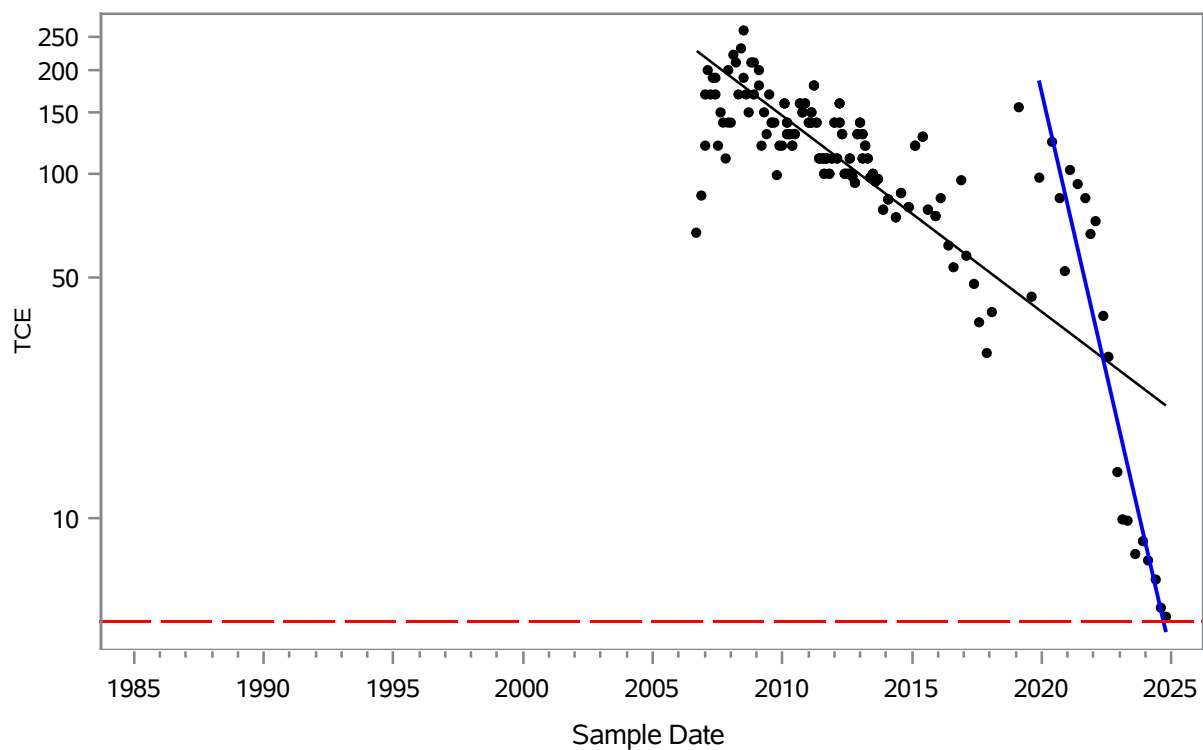
Concentration Trend Plots: Subunit A MW-16



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-16A

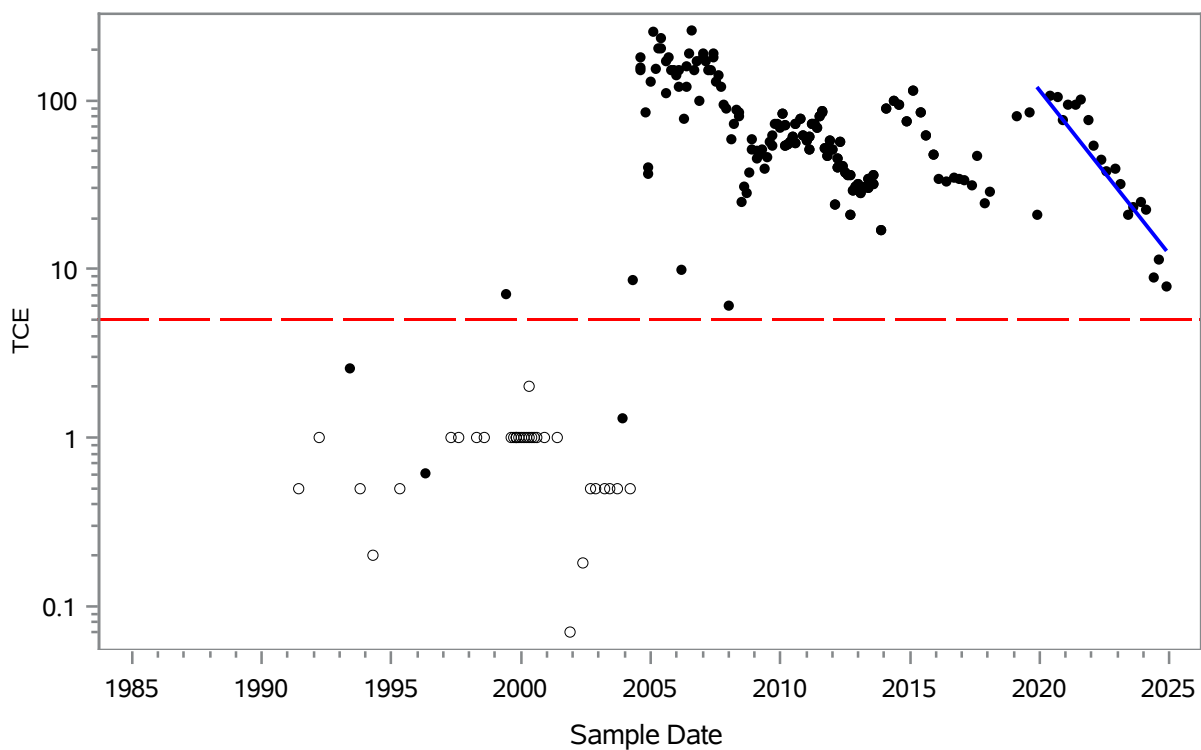


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-18

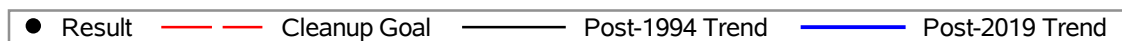
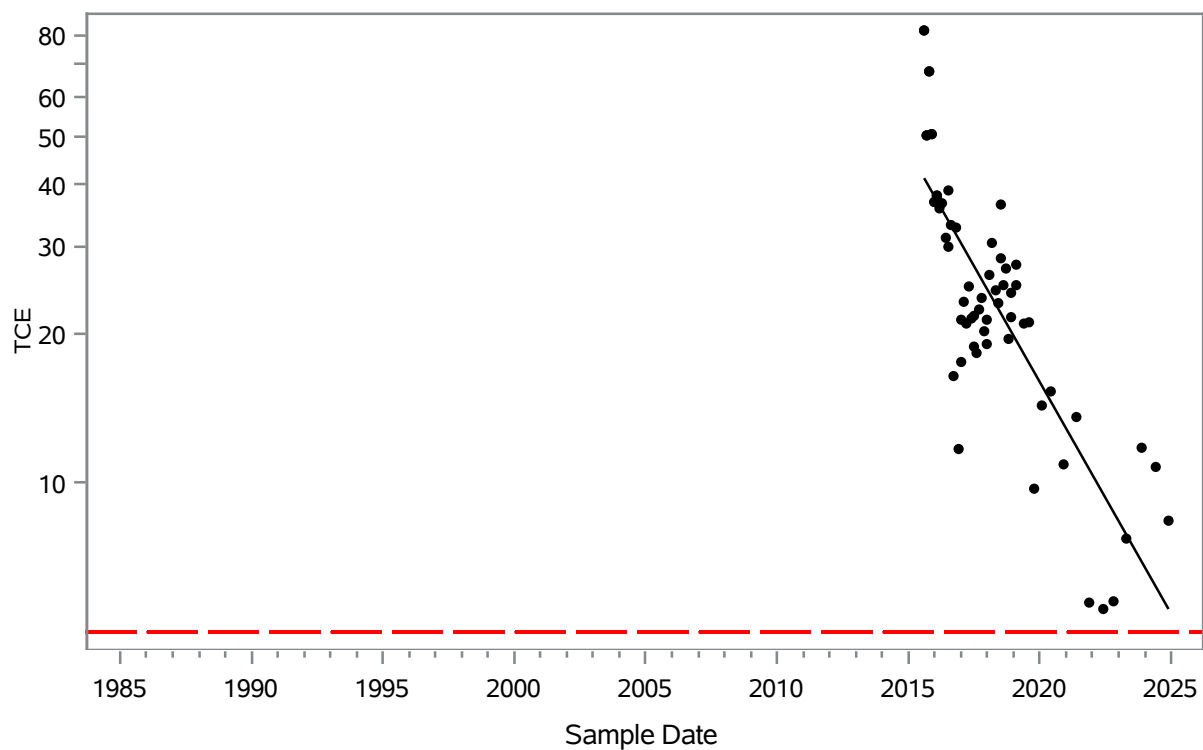


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

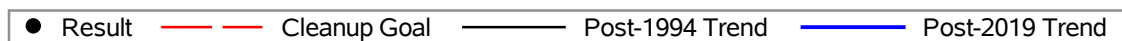
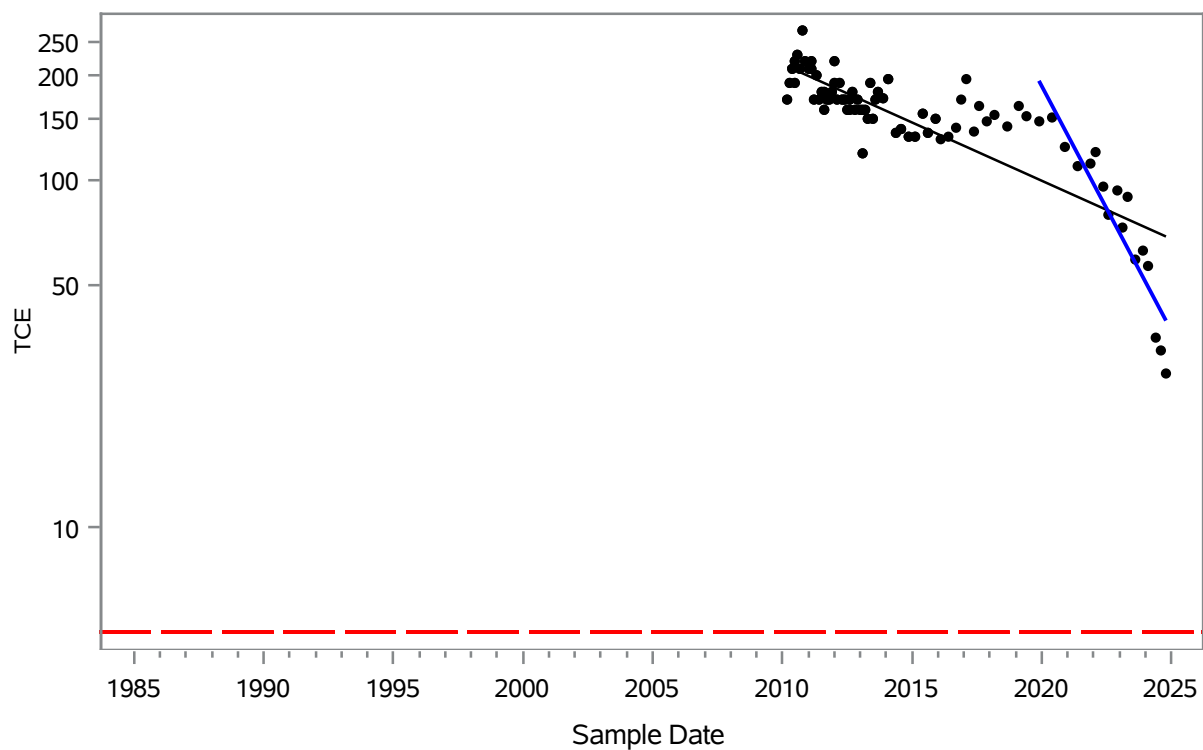
Concentration Trend Plots: Subunit A MW-22A



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

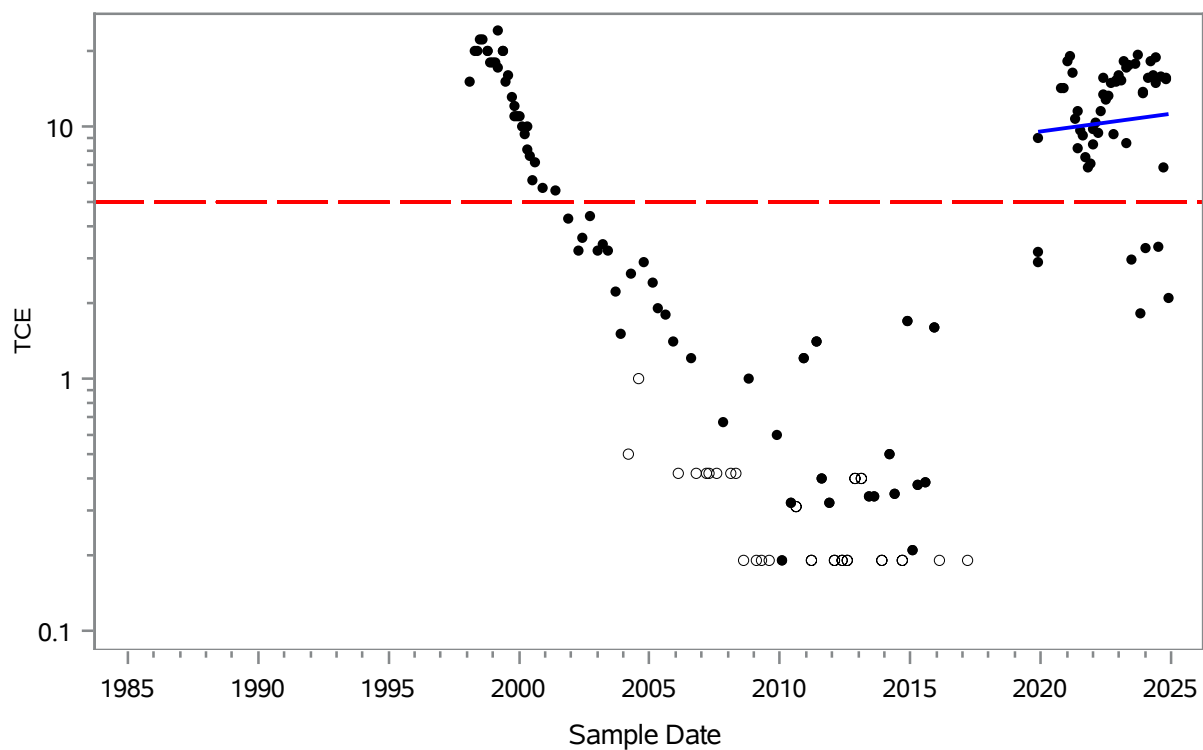
Concentration Trend Plots: Subunit A MW-23A



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-24

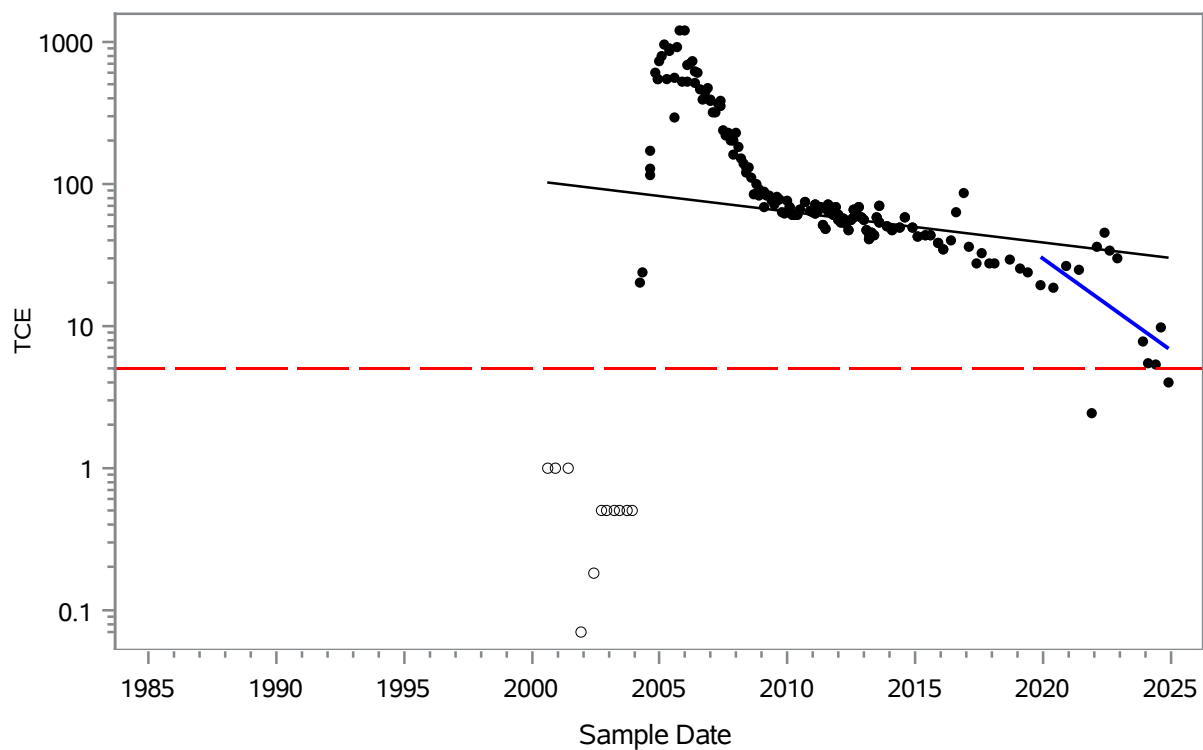


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-25

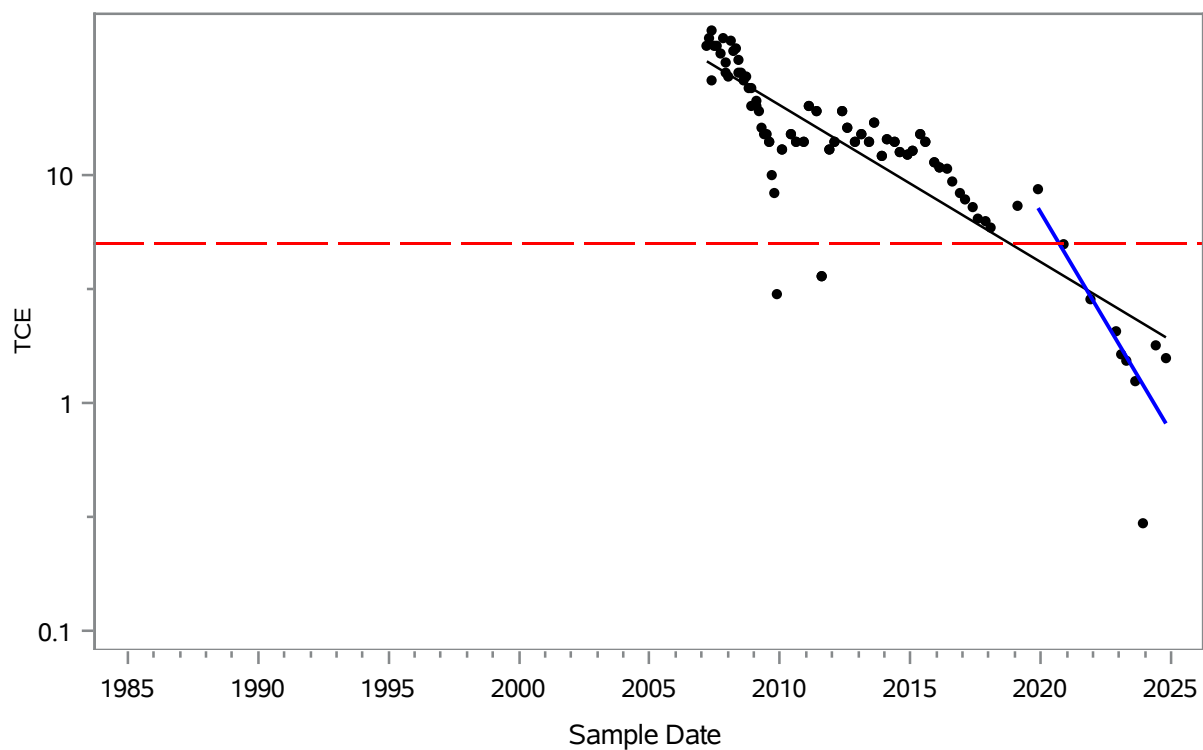


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-25A

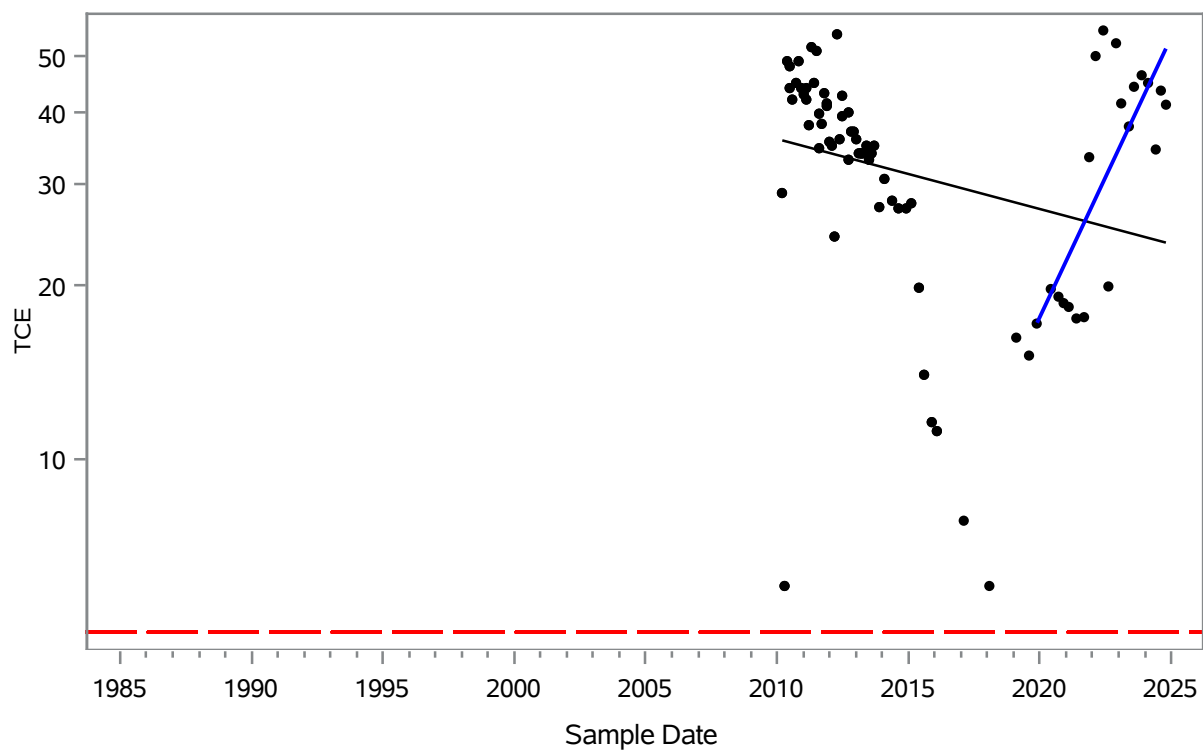


● Result - - - Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-26A

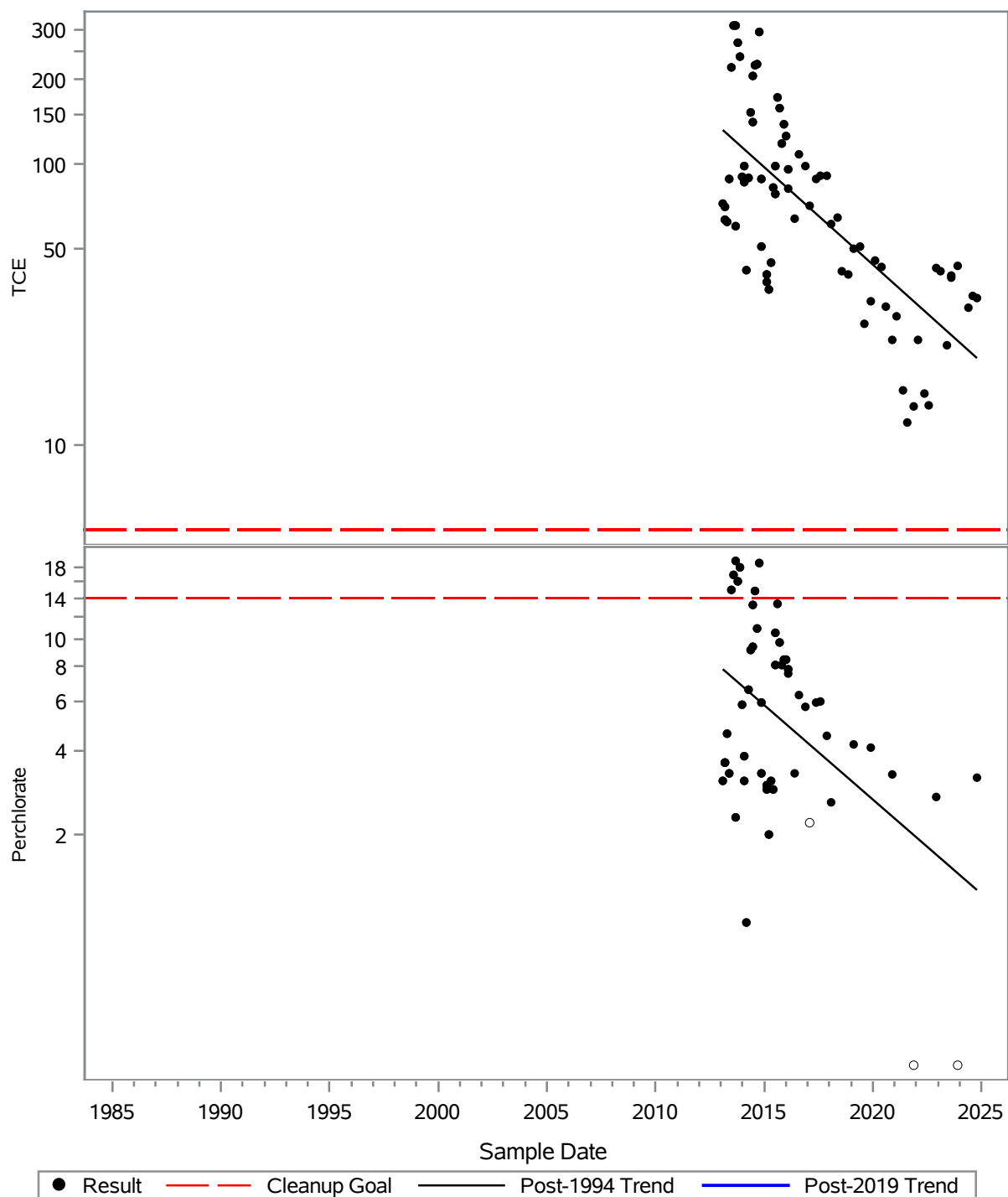


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

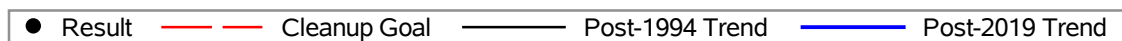
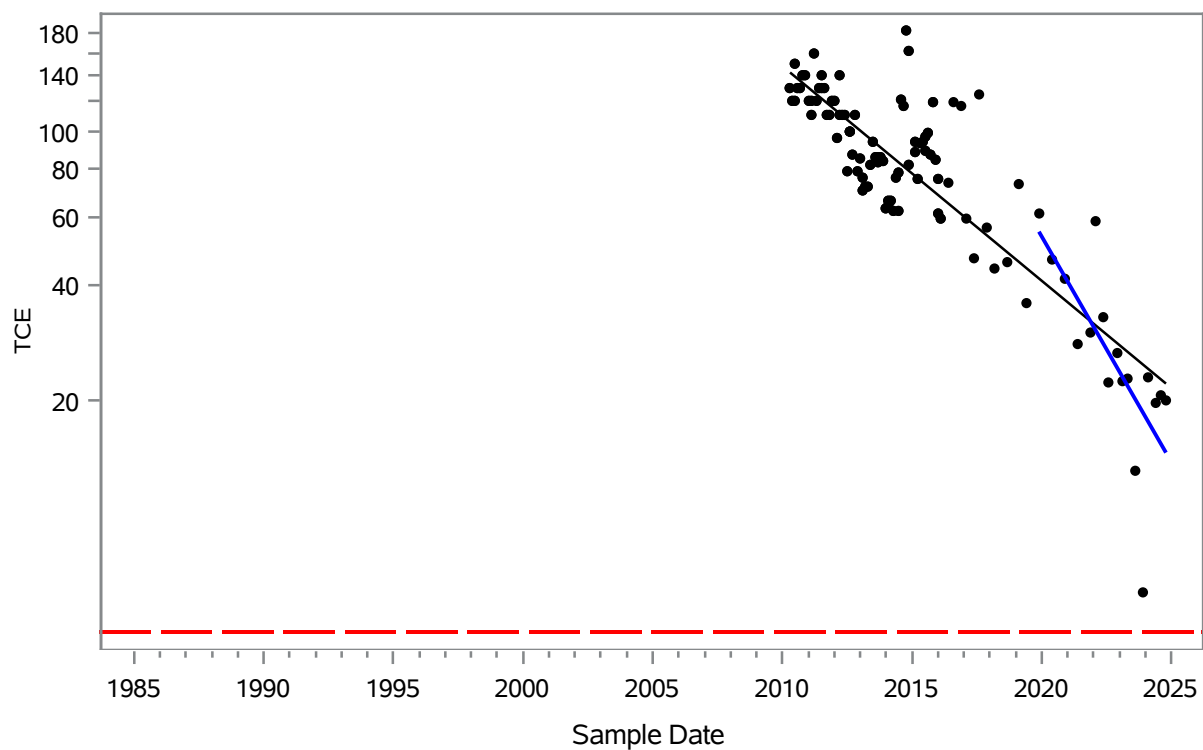
Concentration Trend Plots: Subunit A MW-27A



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

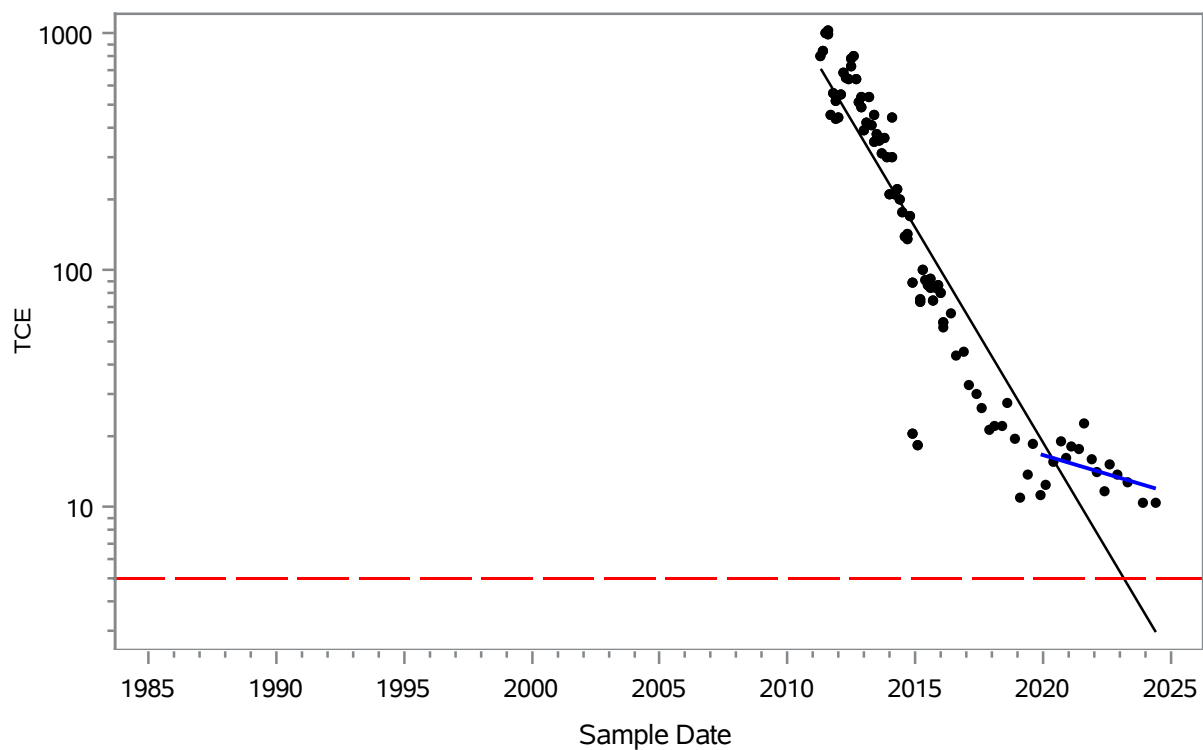
Concentration Trend Plots: Subunit A MW-38A



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-47A



● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-5A

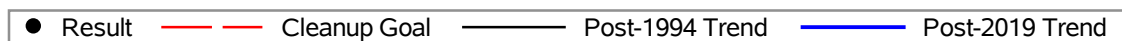
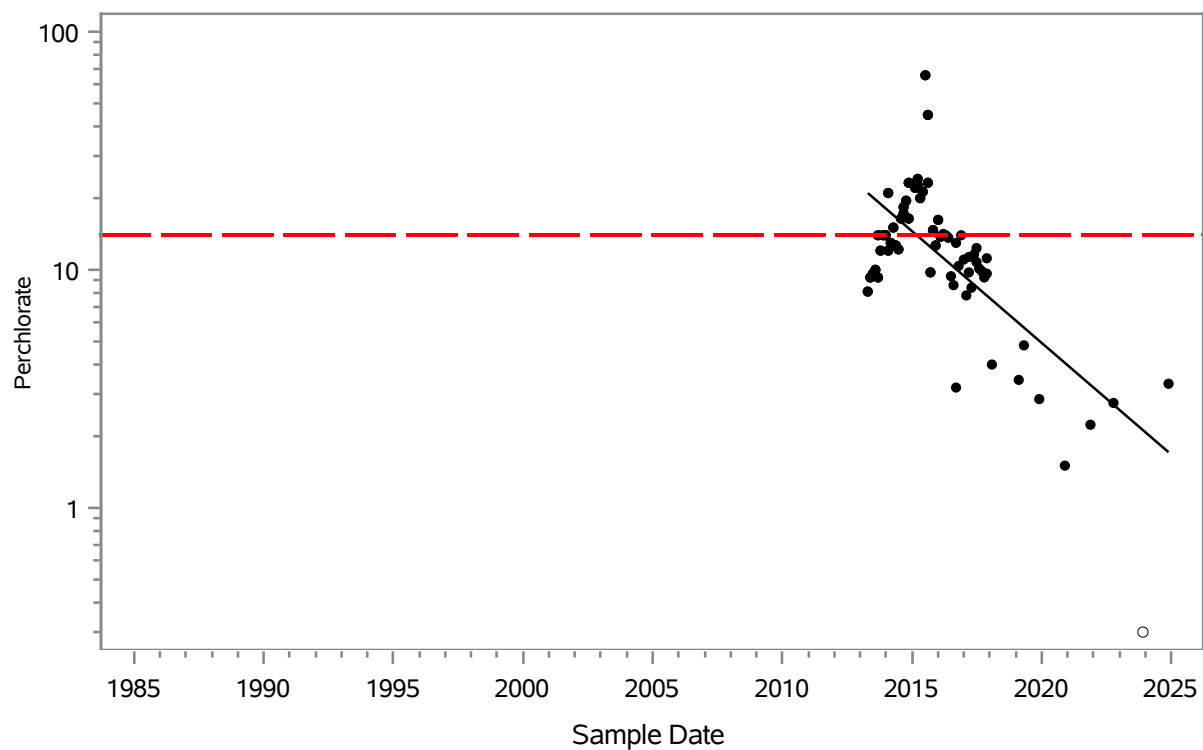


● Result
— Cleanup Goal
— Post-1994 Trend
— Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

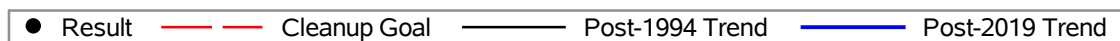
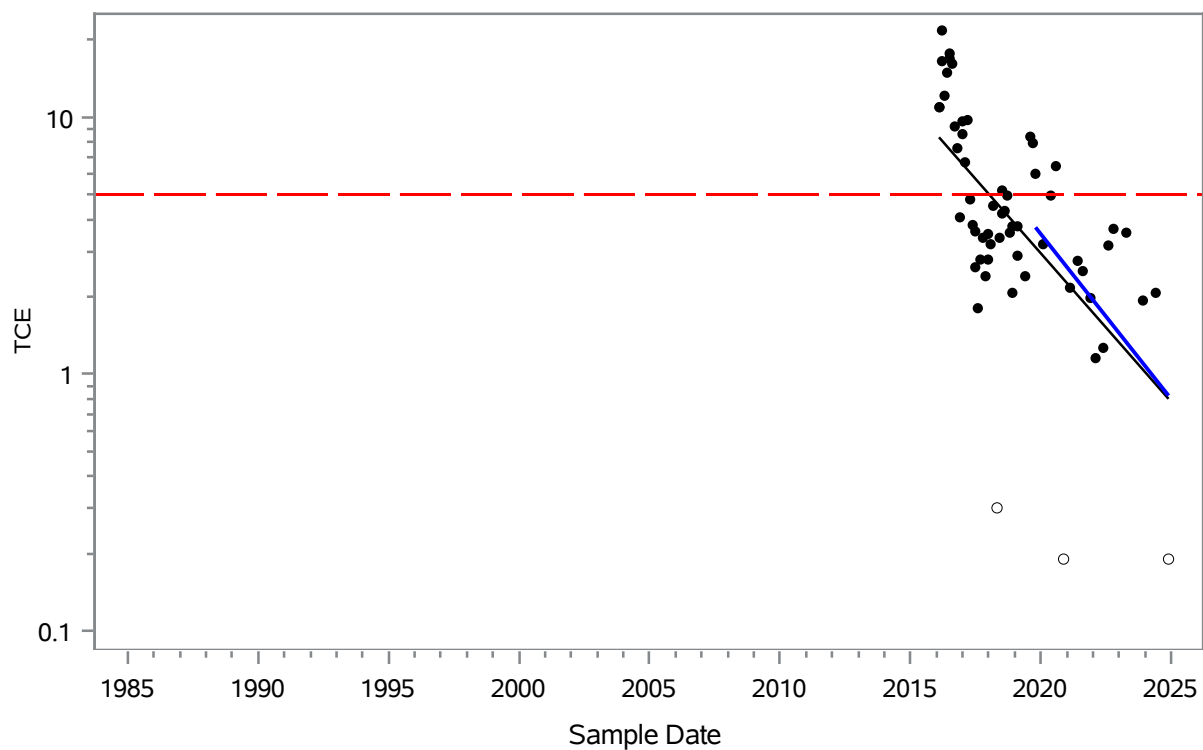
Concentration Trend Plots: Subunit A MW-63A



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

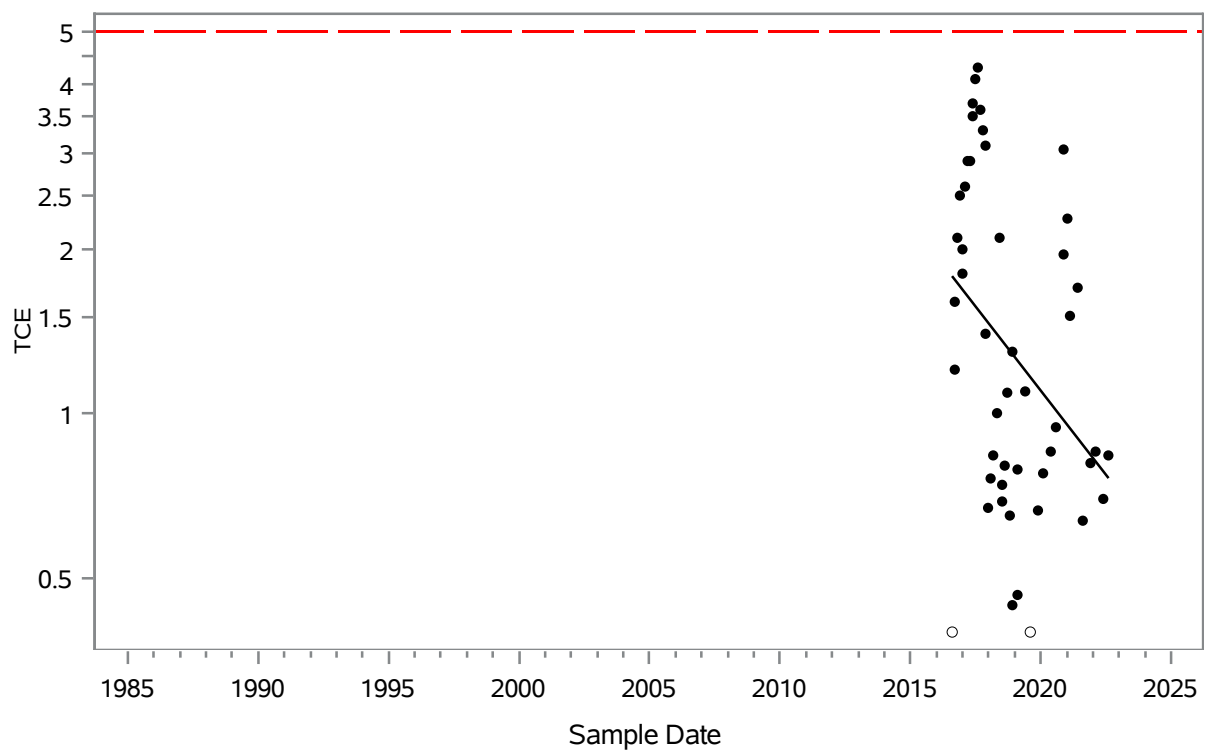
Concentration Trend Plots: Subunit A MW-65A



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-72A

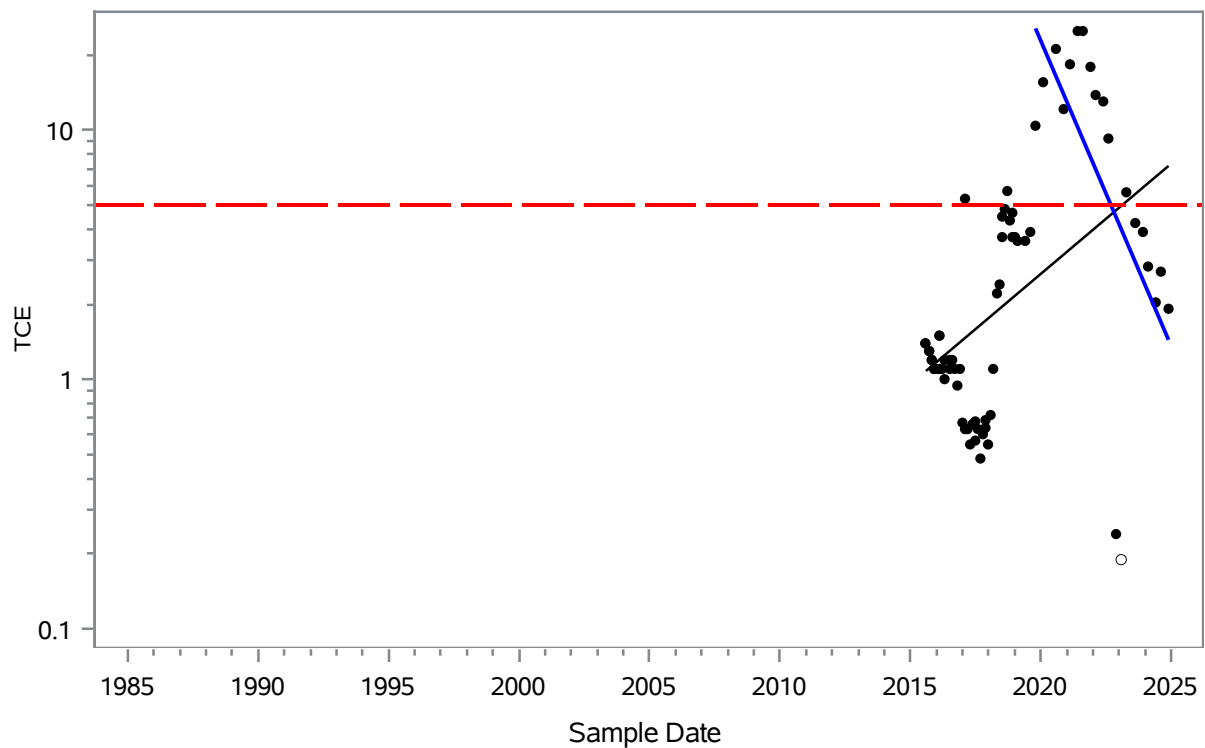


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A MW-9A

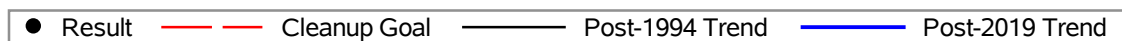
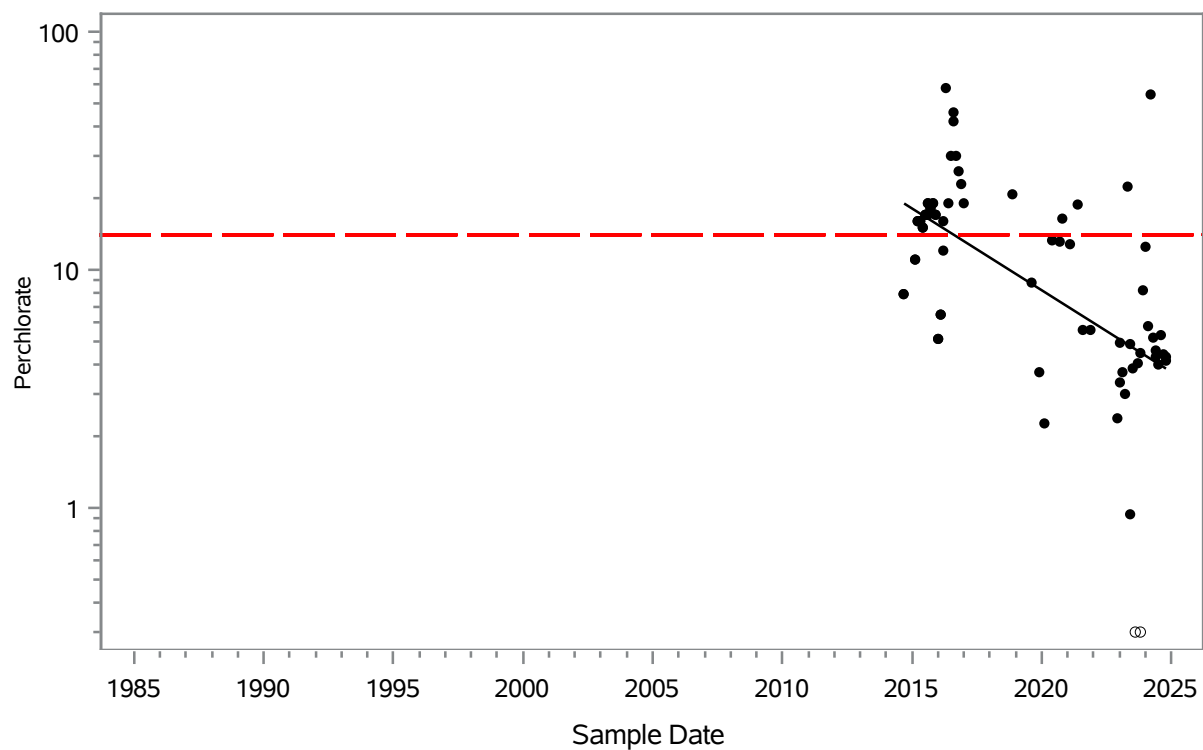


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

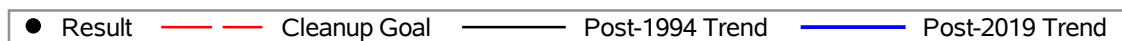
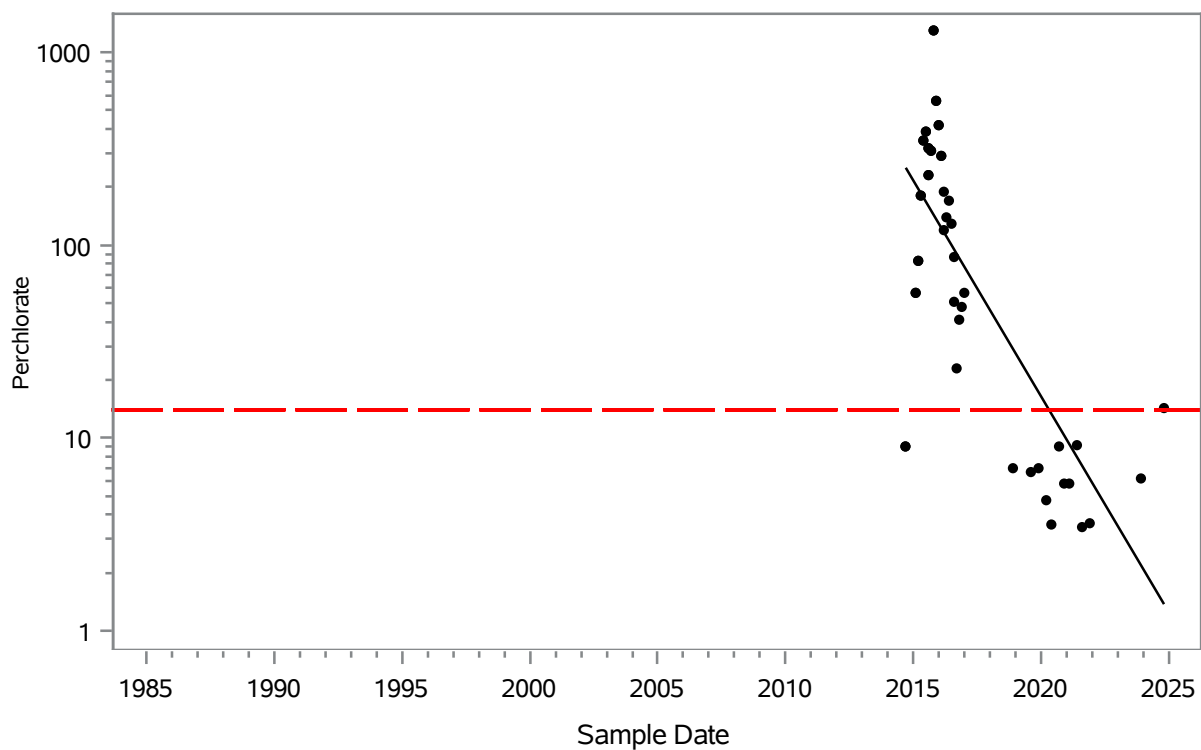
Concentration Trend Plots: Subunit A SAR MW-5



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

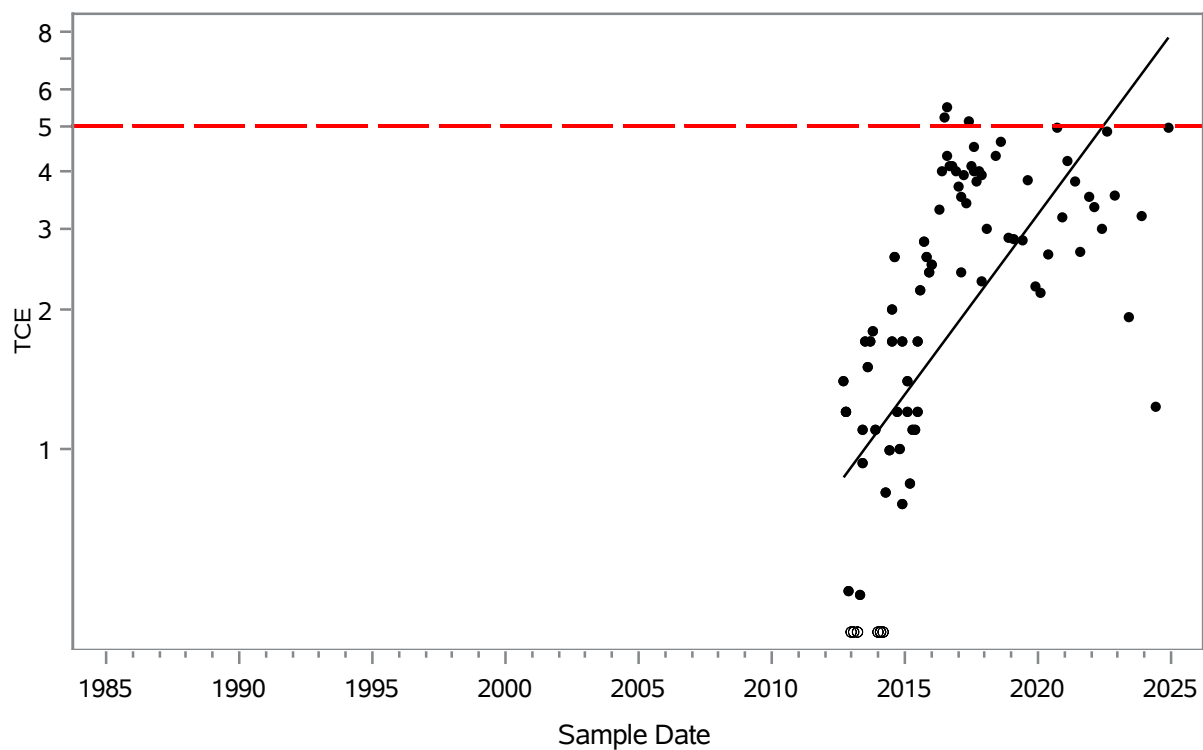
Concentration Trend Plots: Subunit A SAR MW-6



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C Upper MW-13C

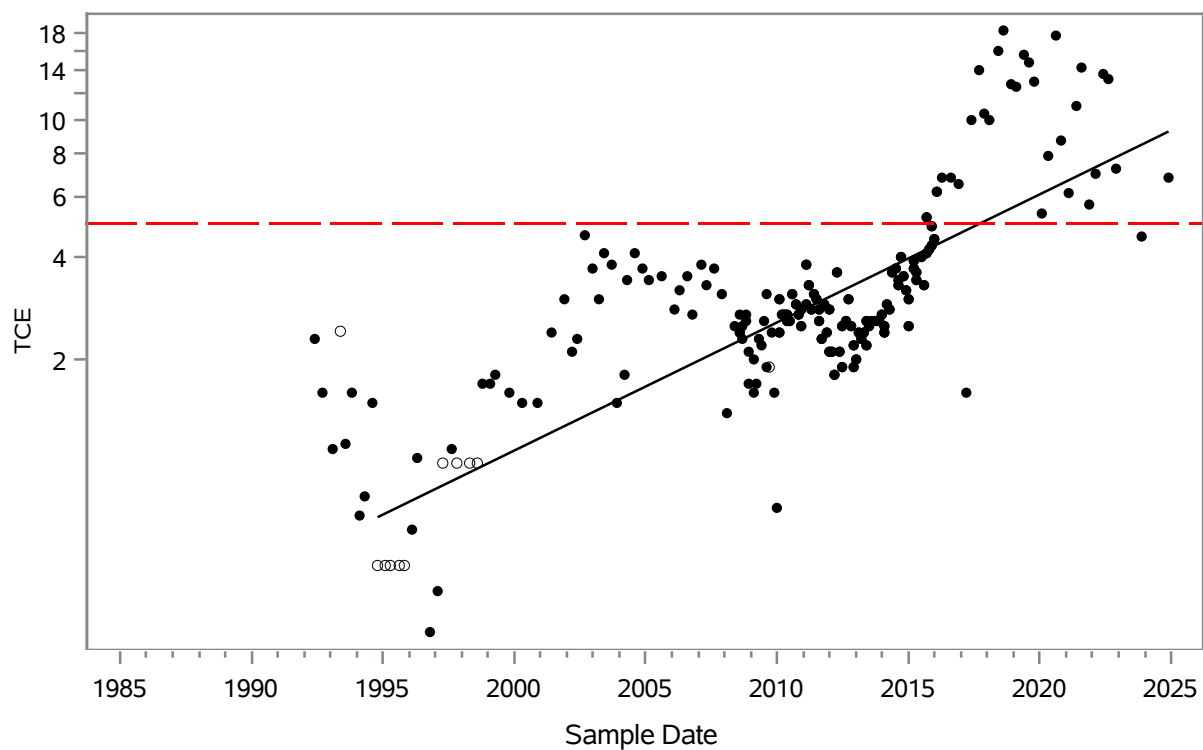


● Result - - - Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C Upper MW-21

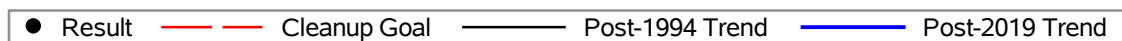
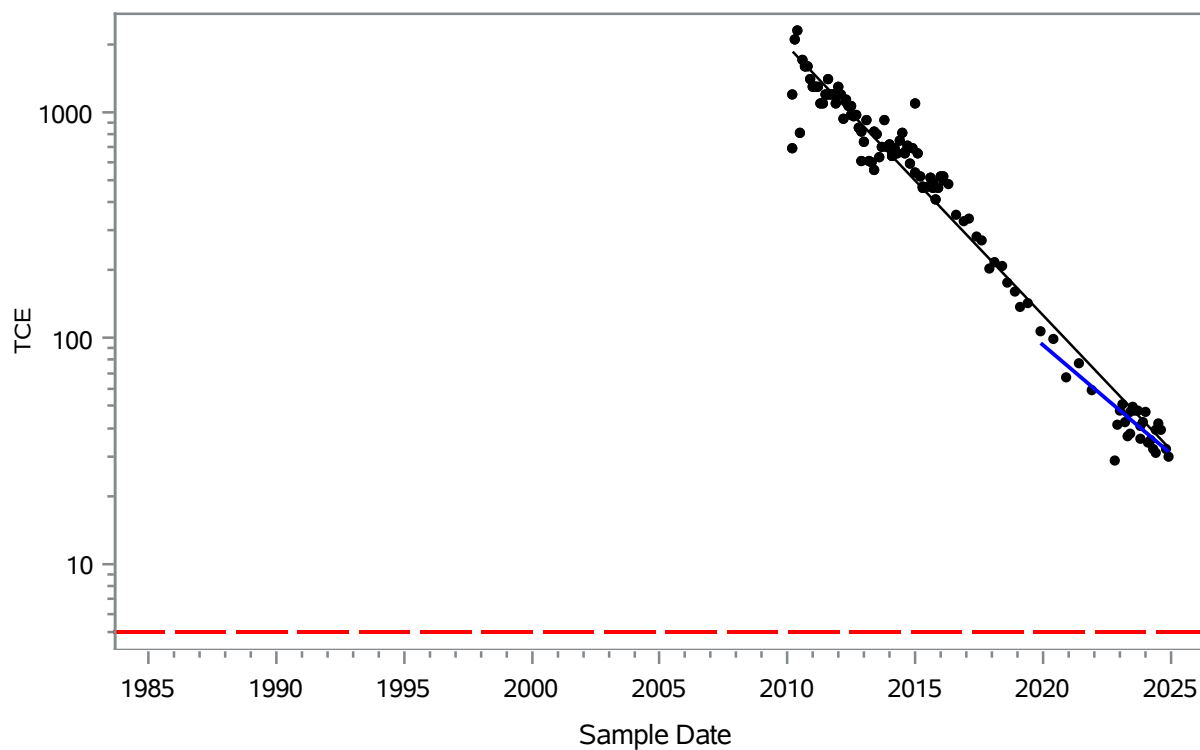


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

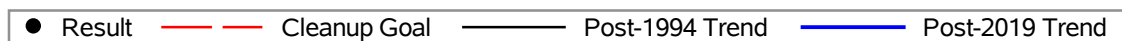
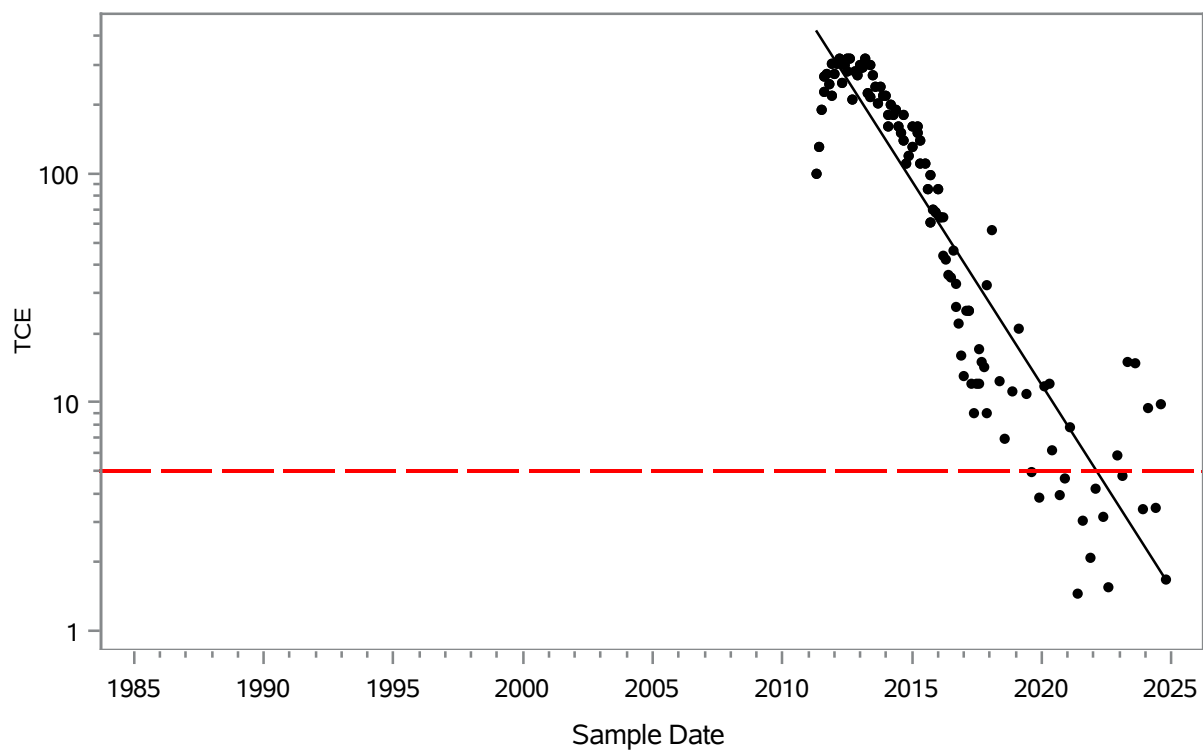
Concentration Trend Plots: Subunit C Upper MW-3C



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

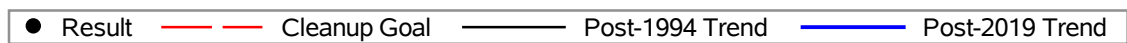
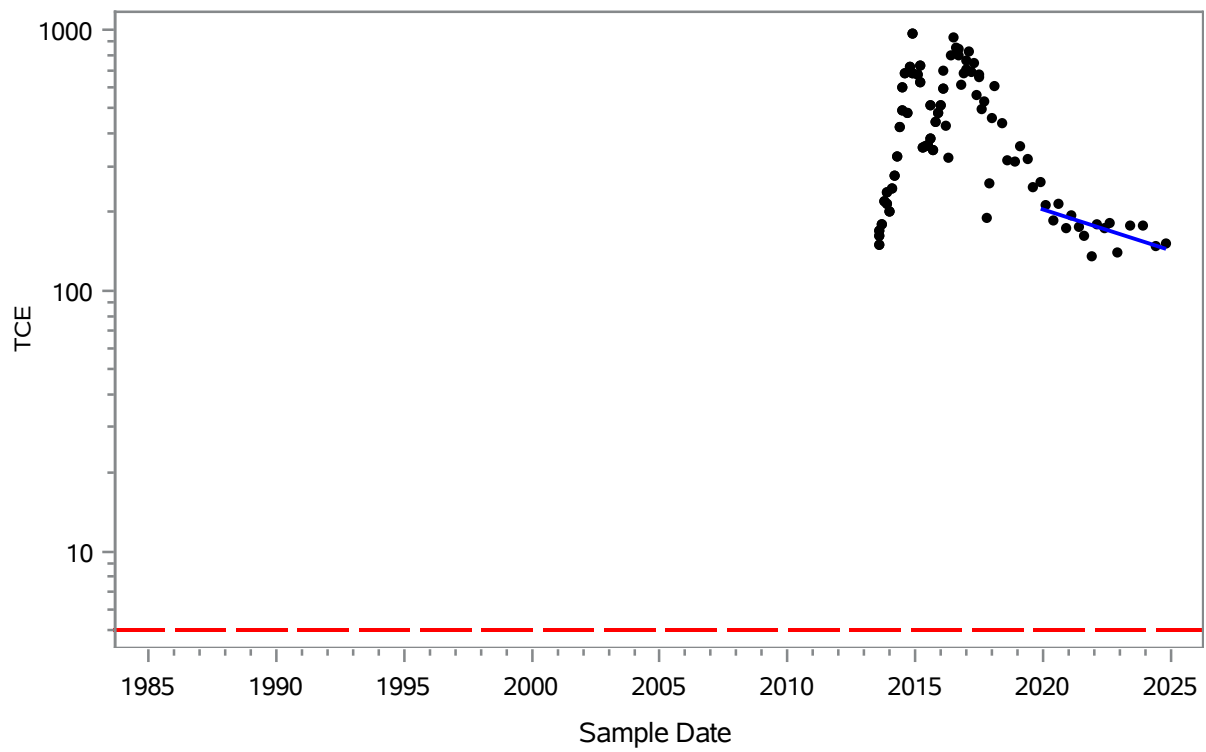
Concentration Trend Plots: Subunit C Upper MW-47C



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

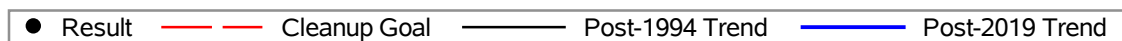
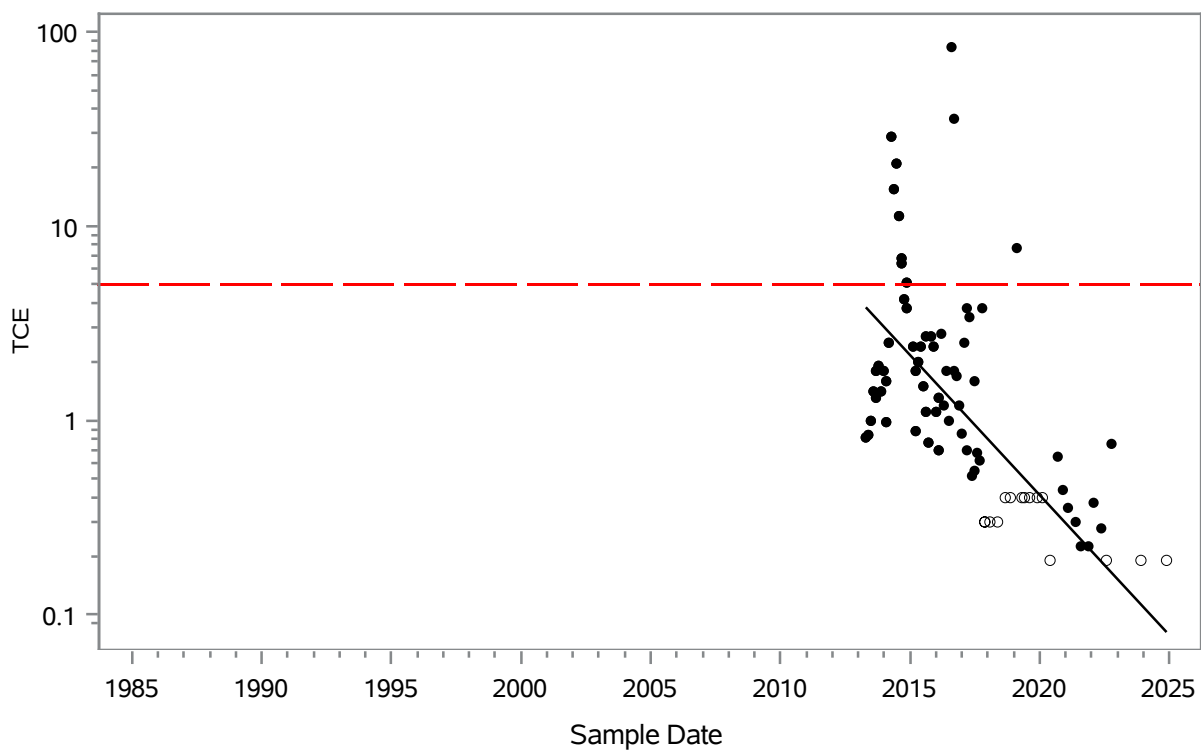
Concentration Trend Plots: Subunit C Upper MW-4B



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

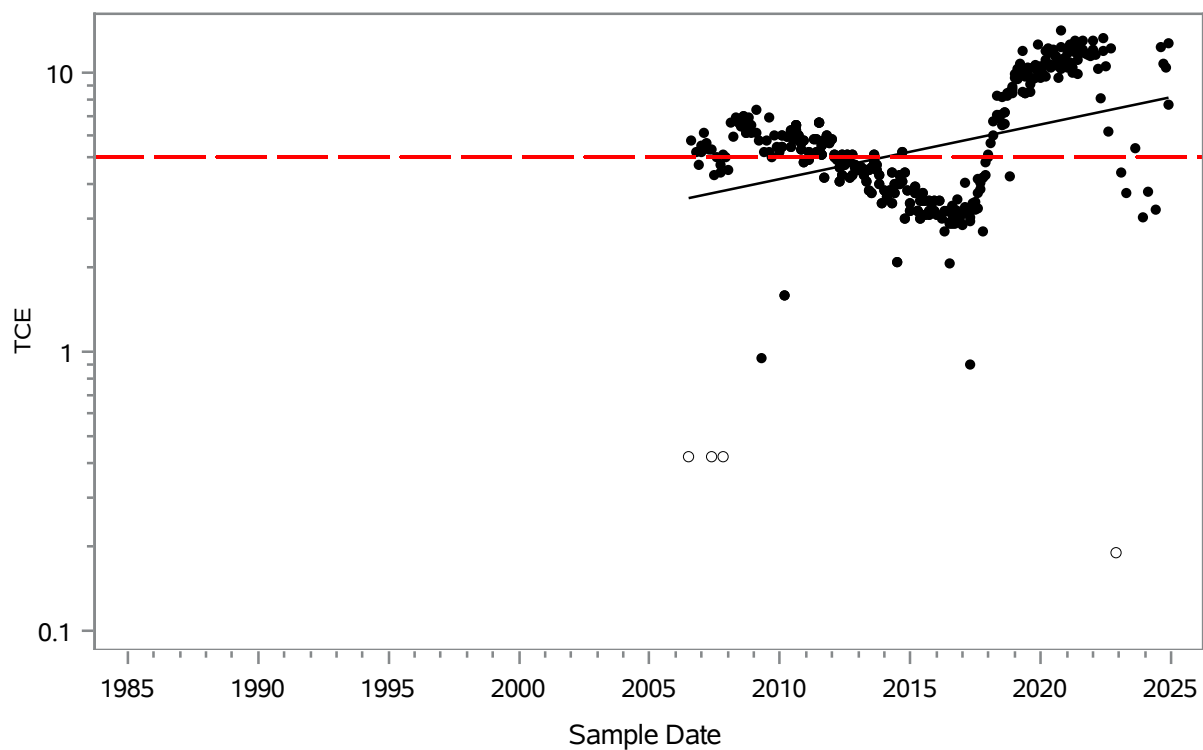
Concentration Trend Plots: Subunit C Upper MW-63C



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C Upper MW-9C

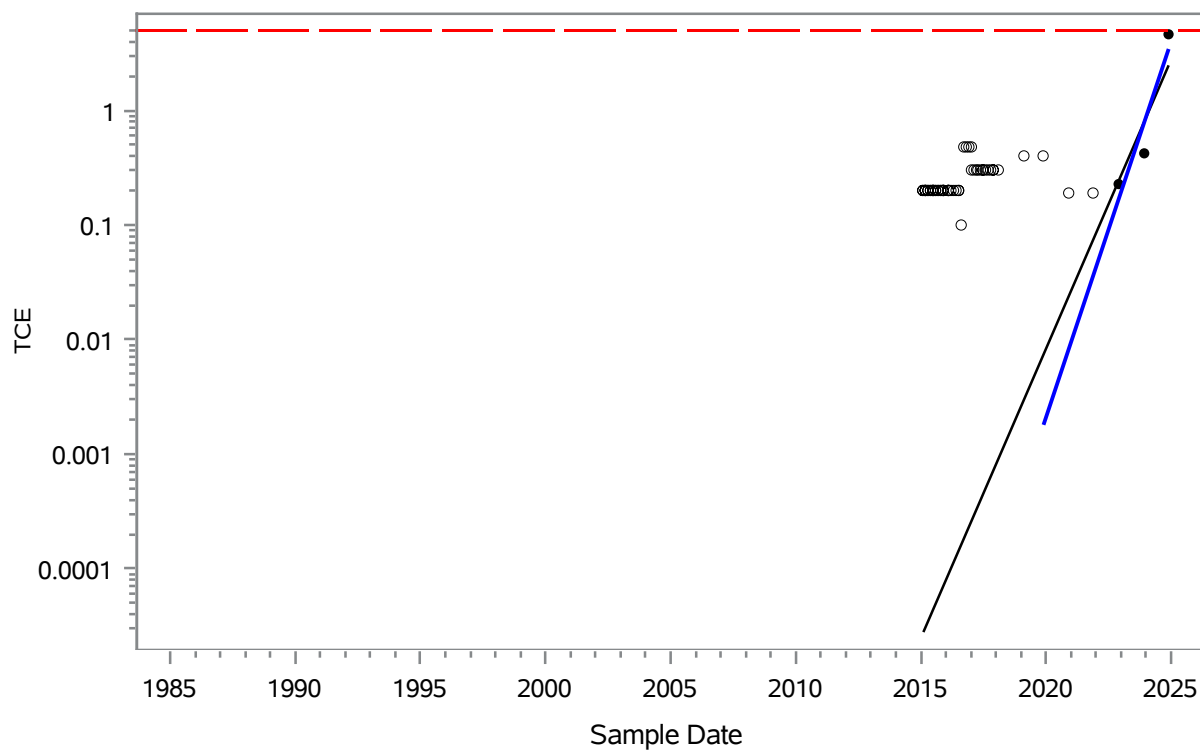


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C Middle MW-20C

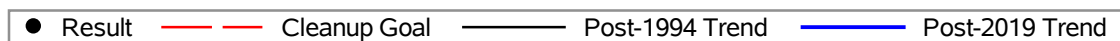
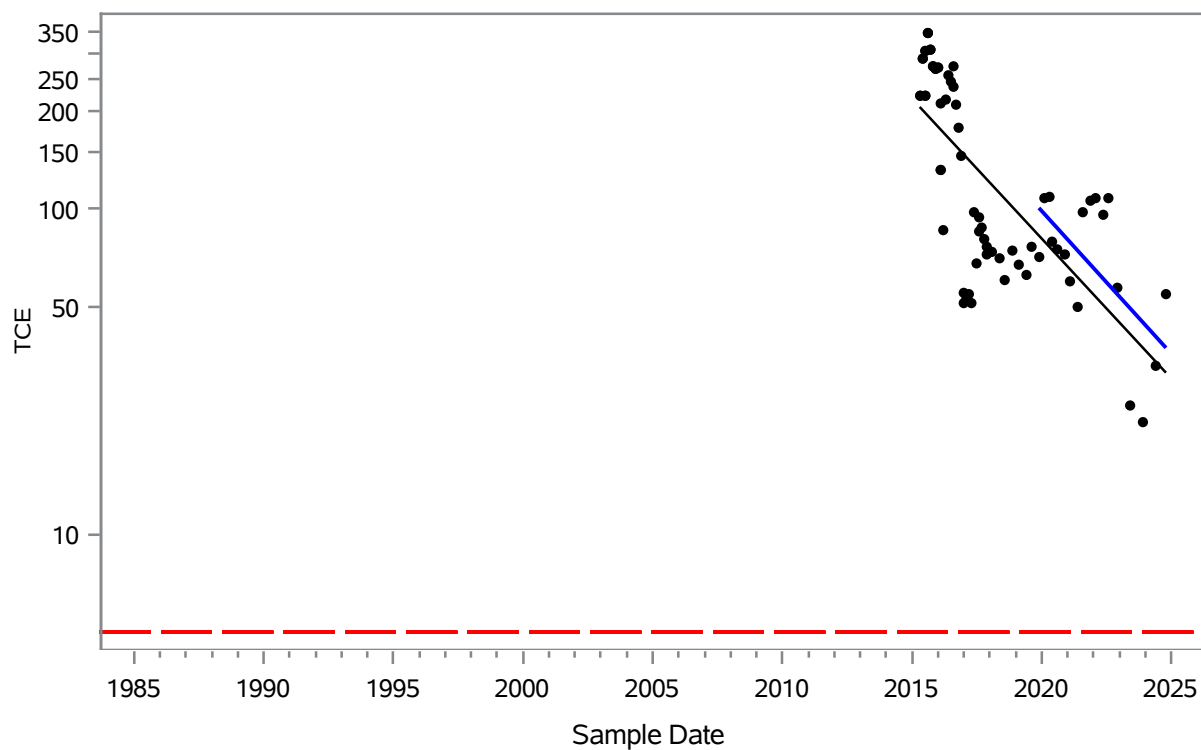


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

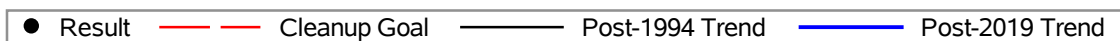
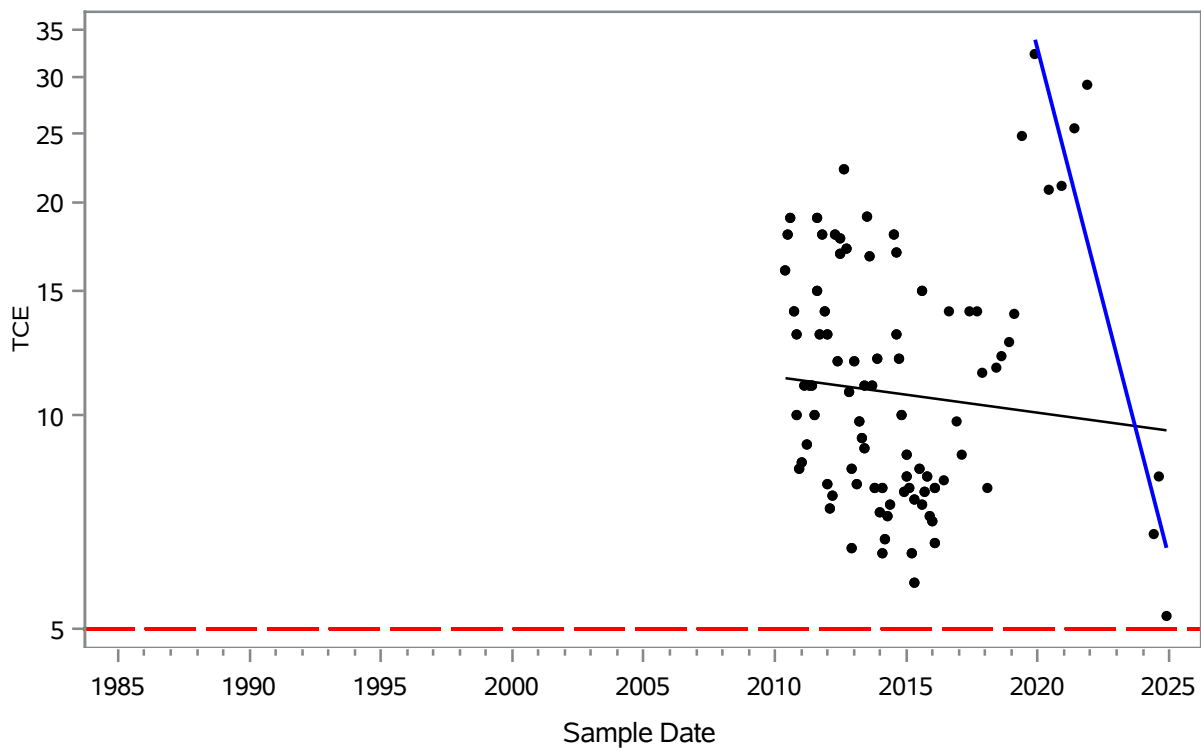
Concentration Trend Plots: Subunit C Middle MW-23C



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

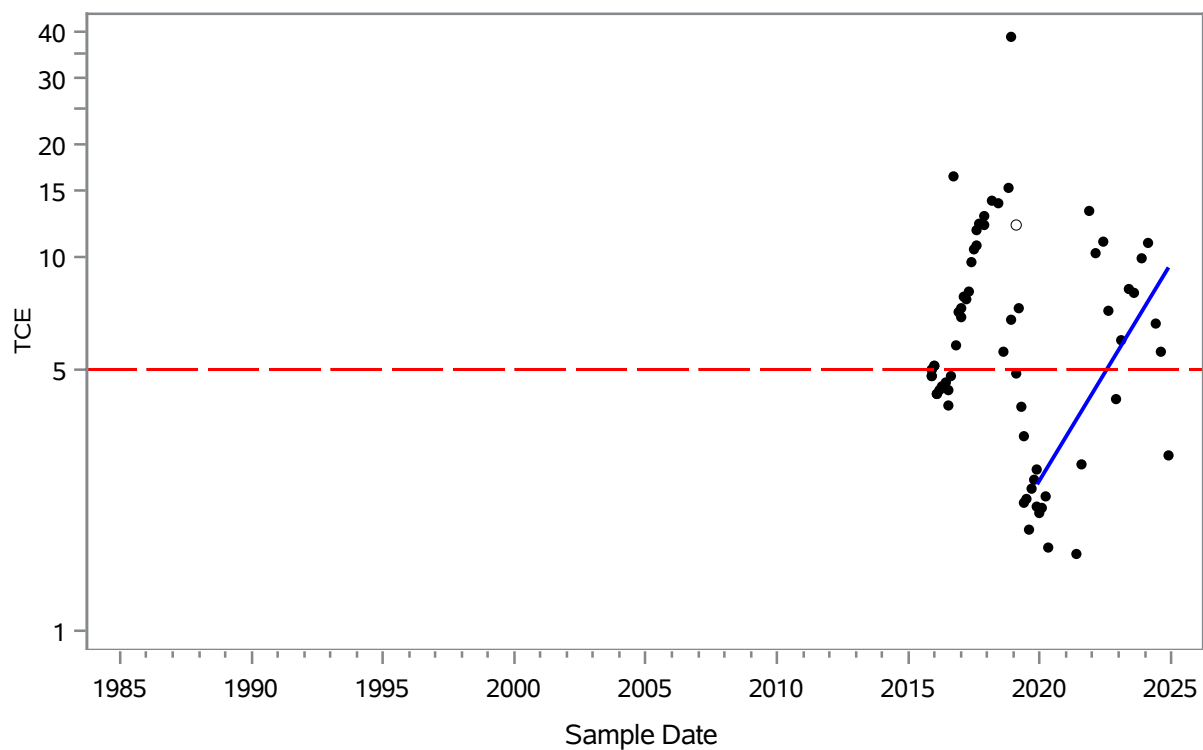
Concentration Trend Plots: Subunit C Middle MW-5C



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C Lower MW-21C

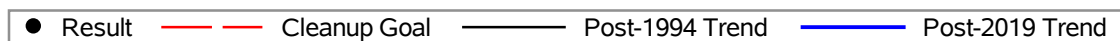
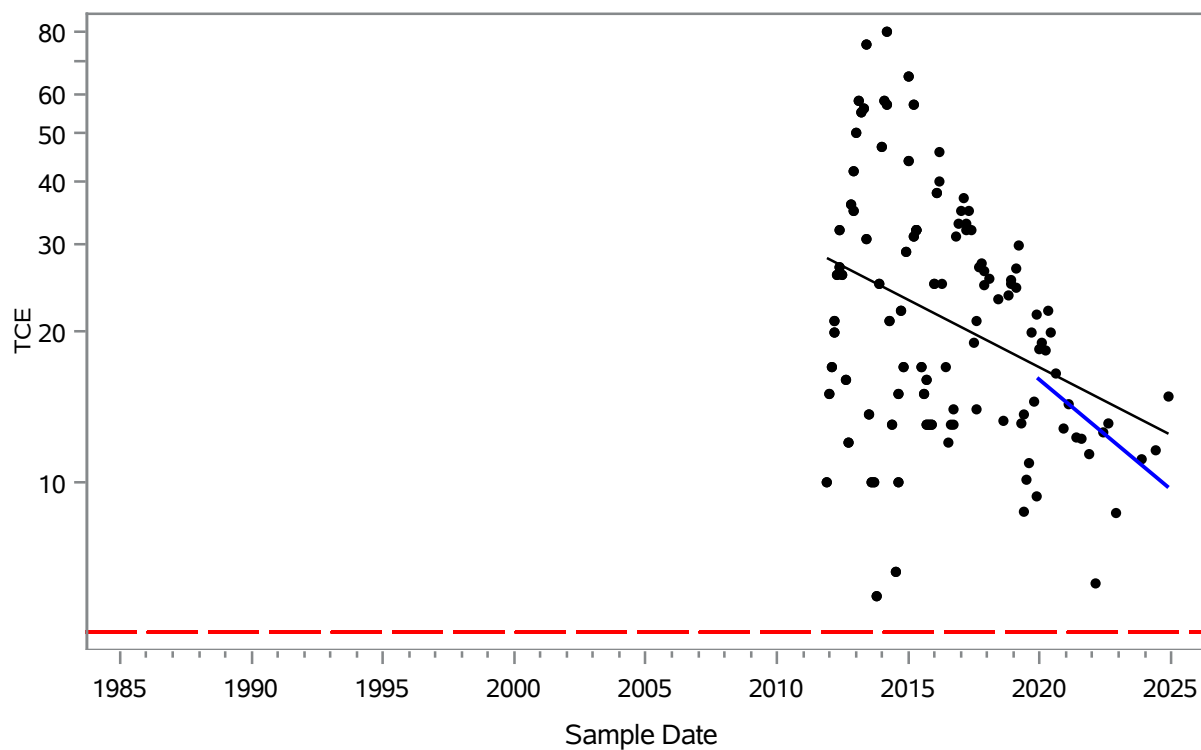


● Result — Cleanup Goal — Post-1994 Trend — Post-2019 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

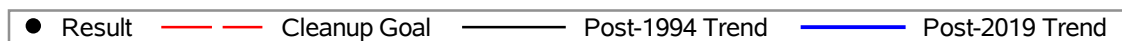
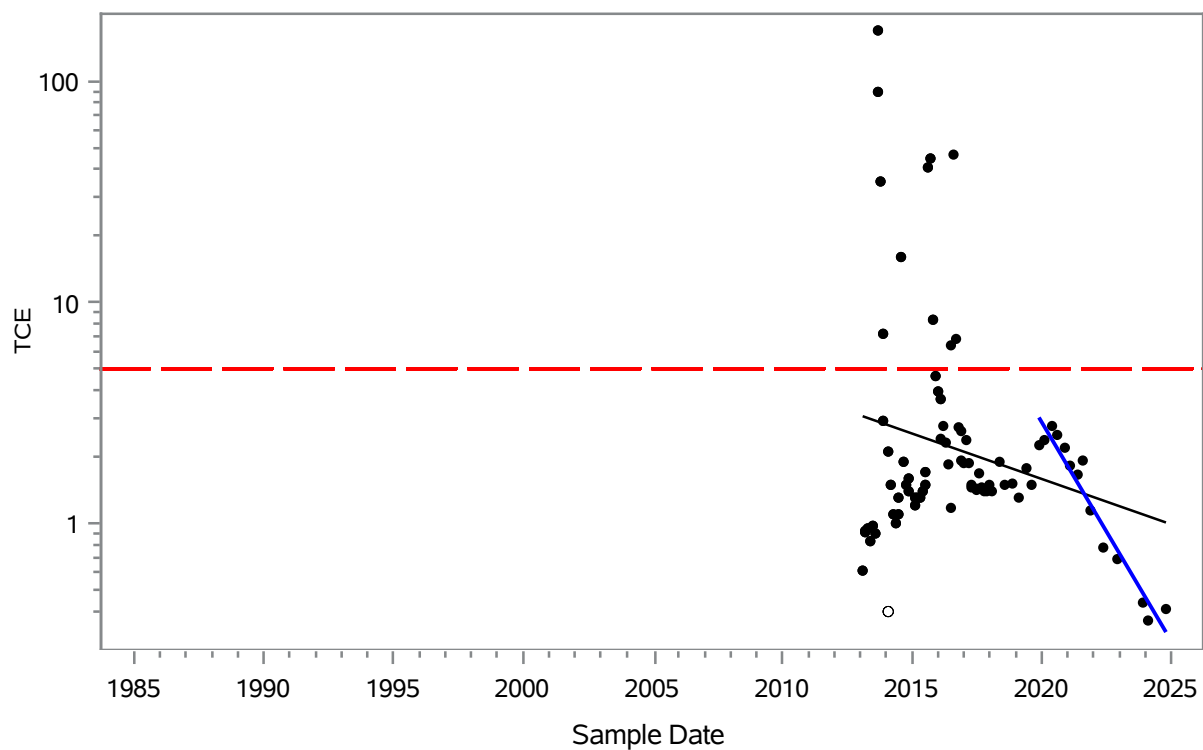
Concentration Trend Plots: Subunit C Lower MW-26C



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

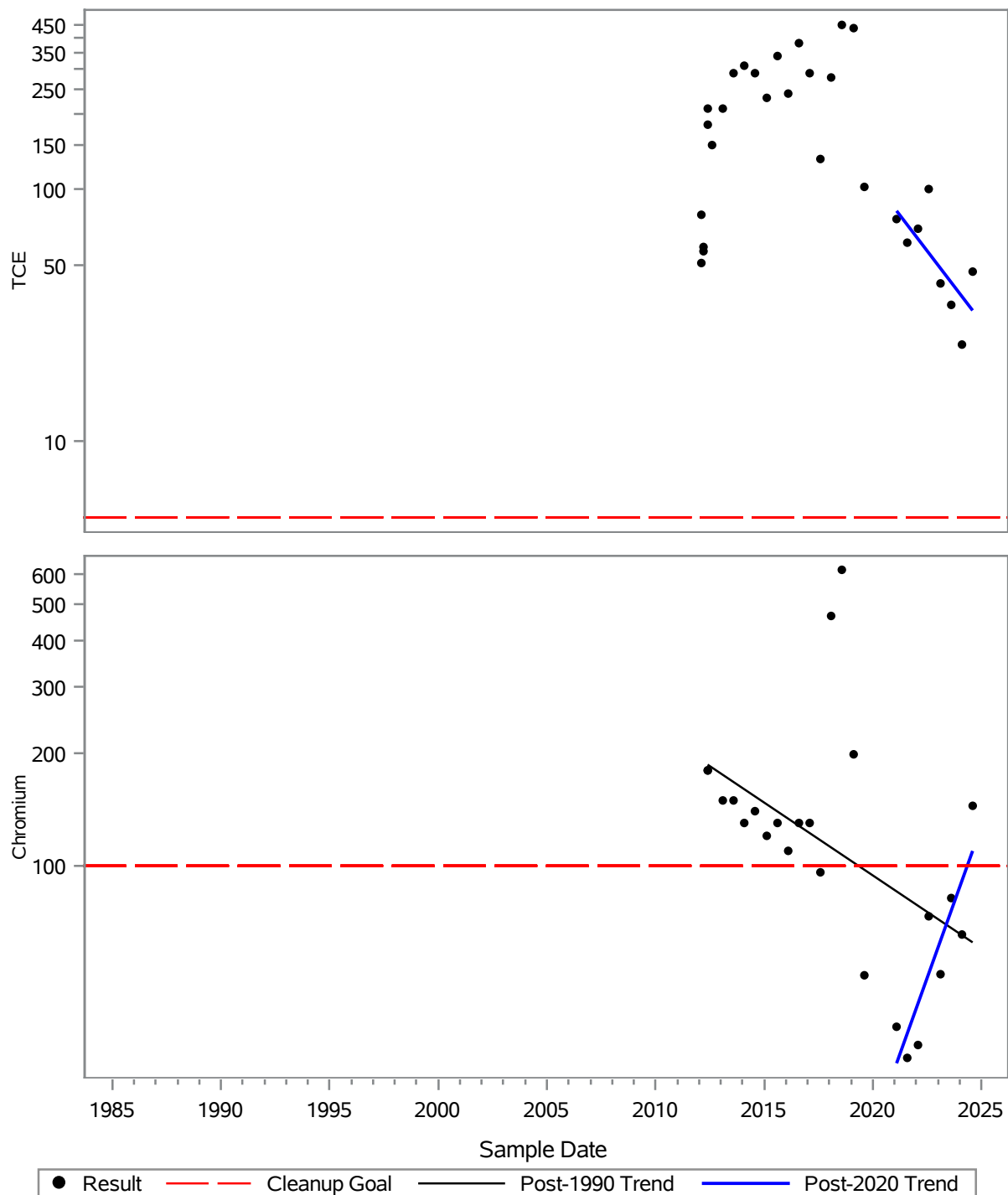
Concentration Trend Plots: Subunit C Lower MW-27C



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

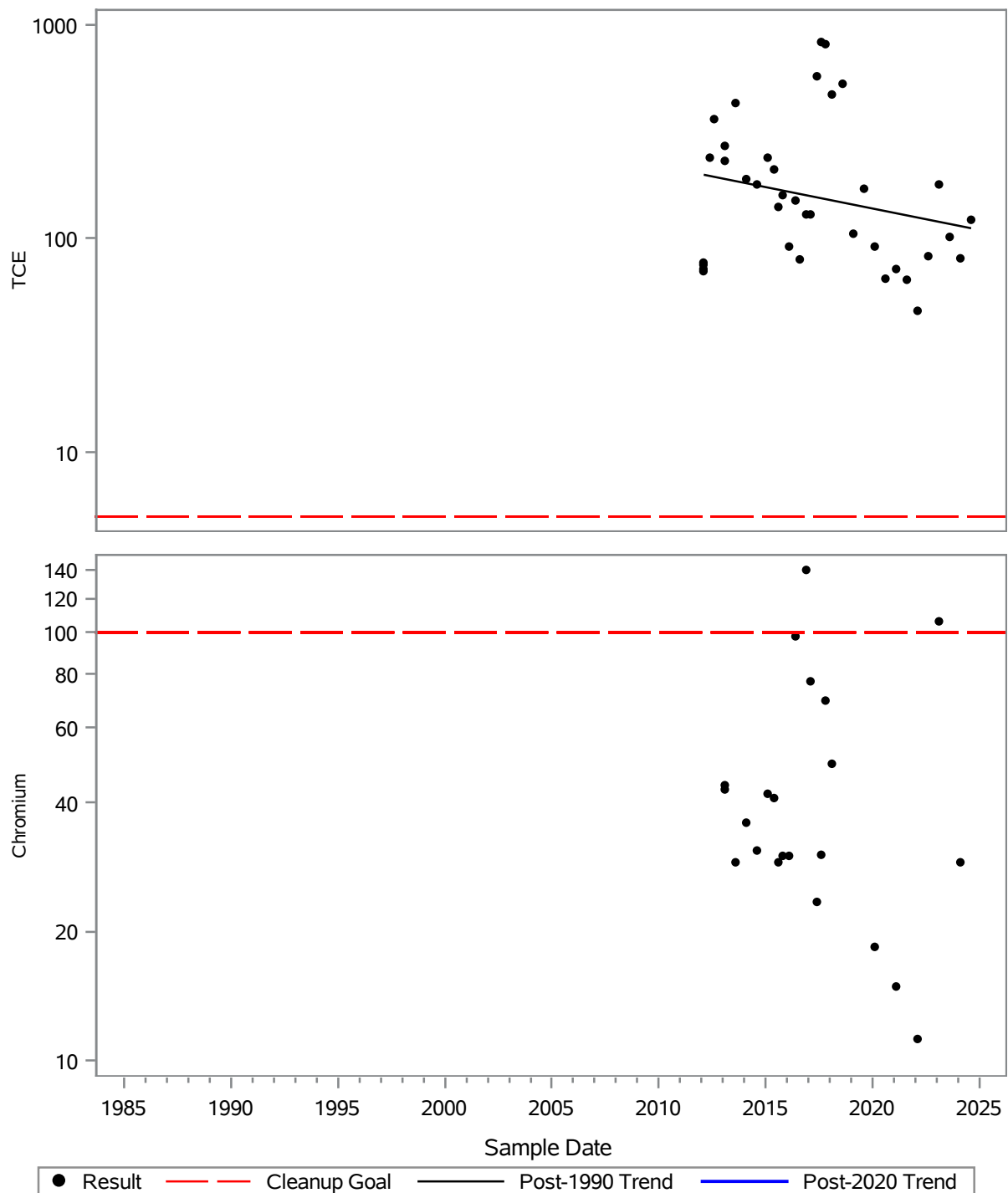
Concentration Trend Plots: Subunit A EMW-08R



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

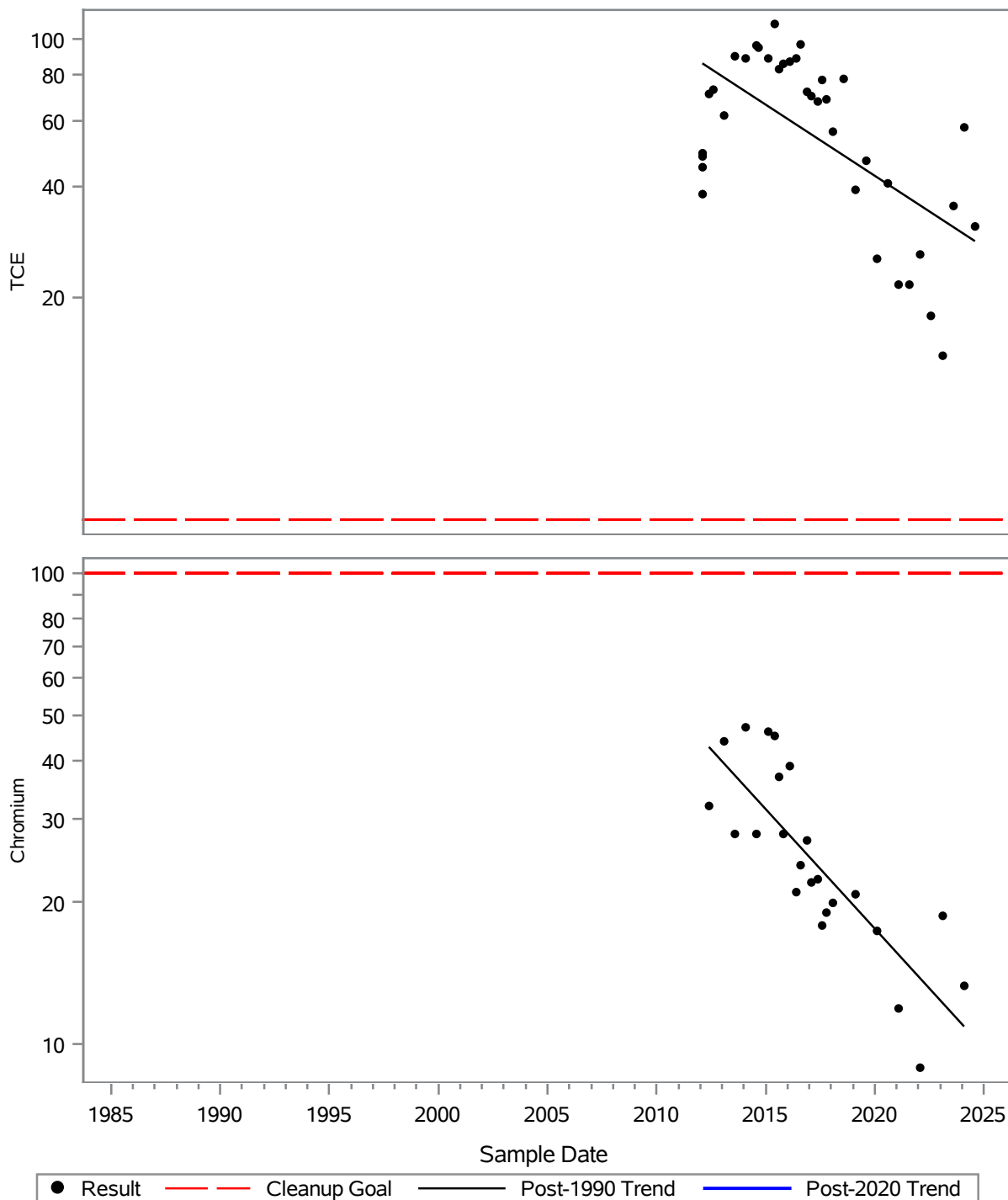
Concentration Trend Plots: Subunit A EMW-10R



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

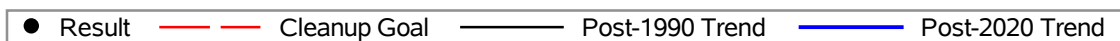
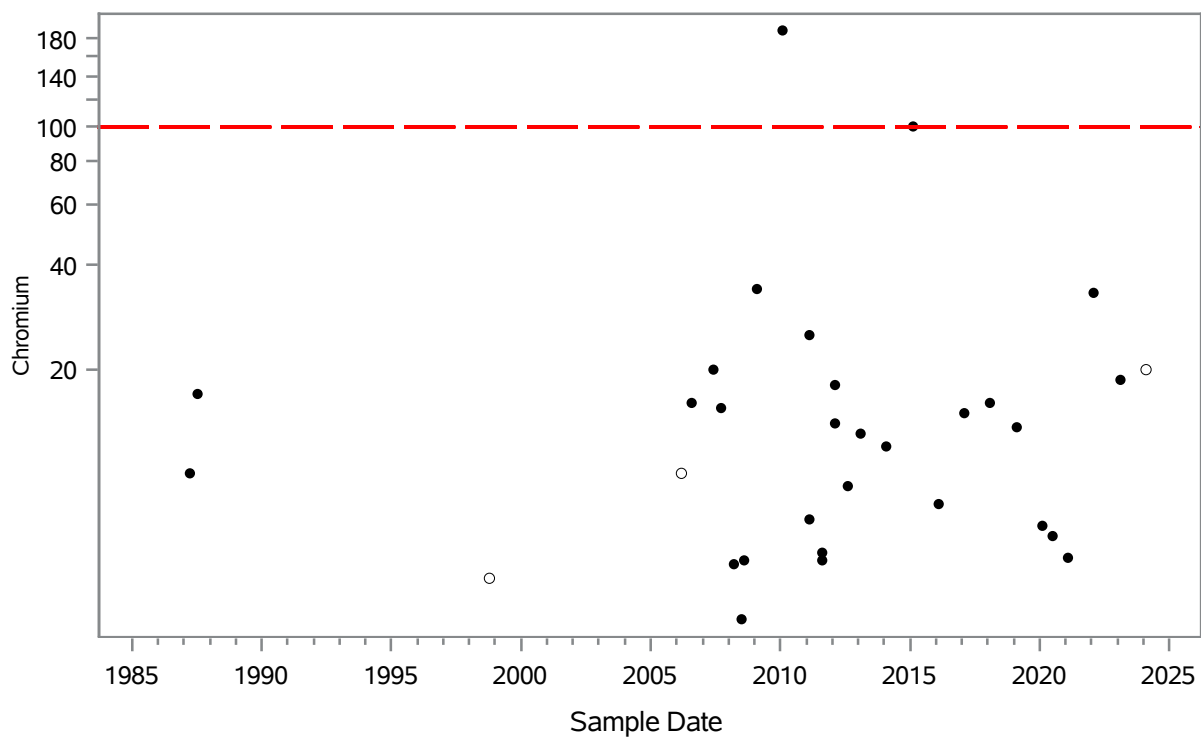
Concentration Trend Plots: Subunit A EMW-14R



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

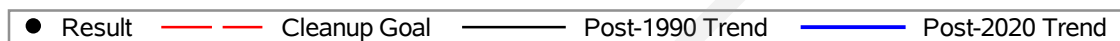
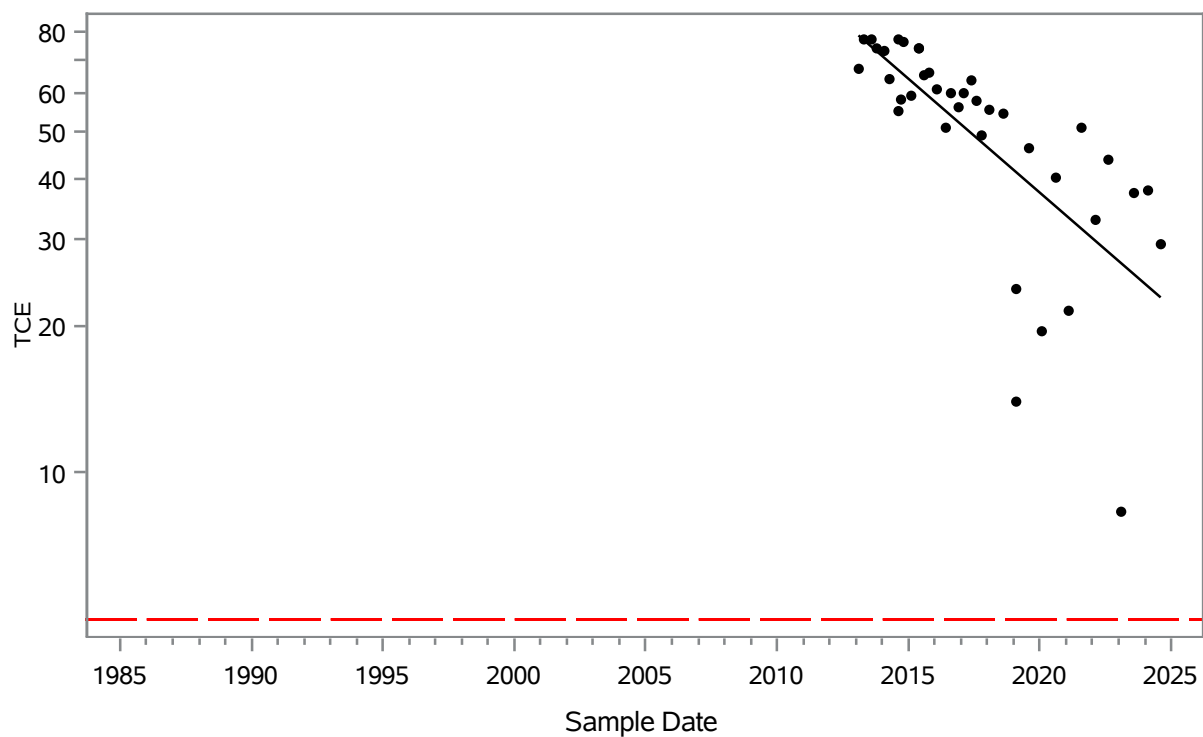
Concentration Trend Plots: Subunit A GMW-06



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

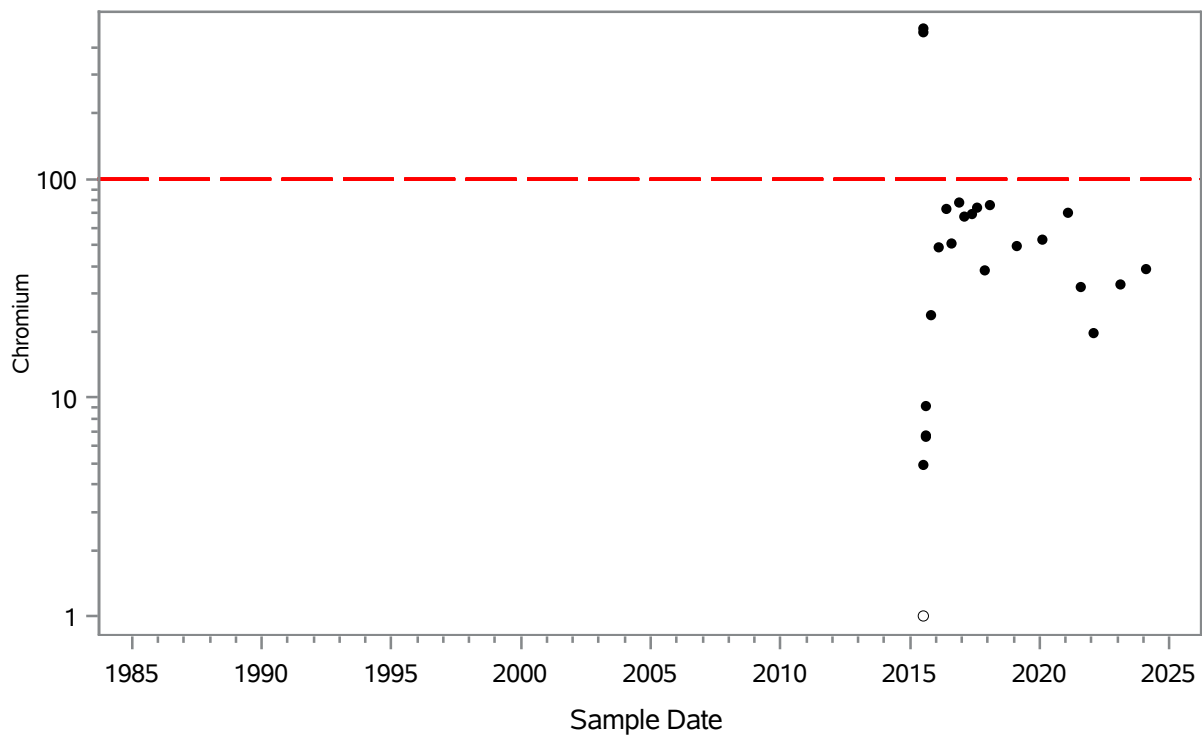
Concentration Trend Plots: Subunit A GMW-24A



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A GMW-31A

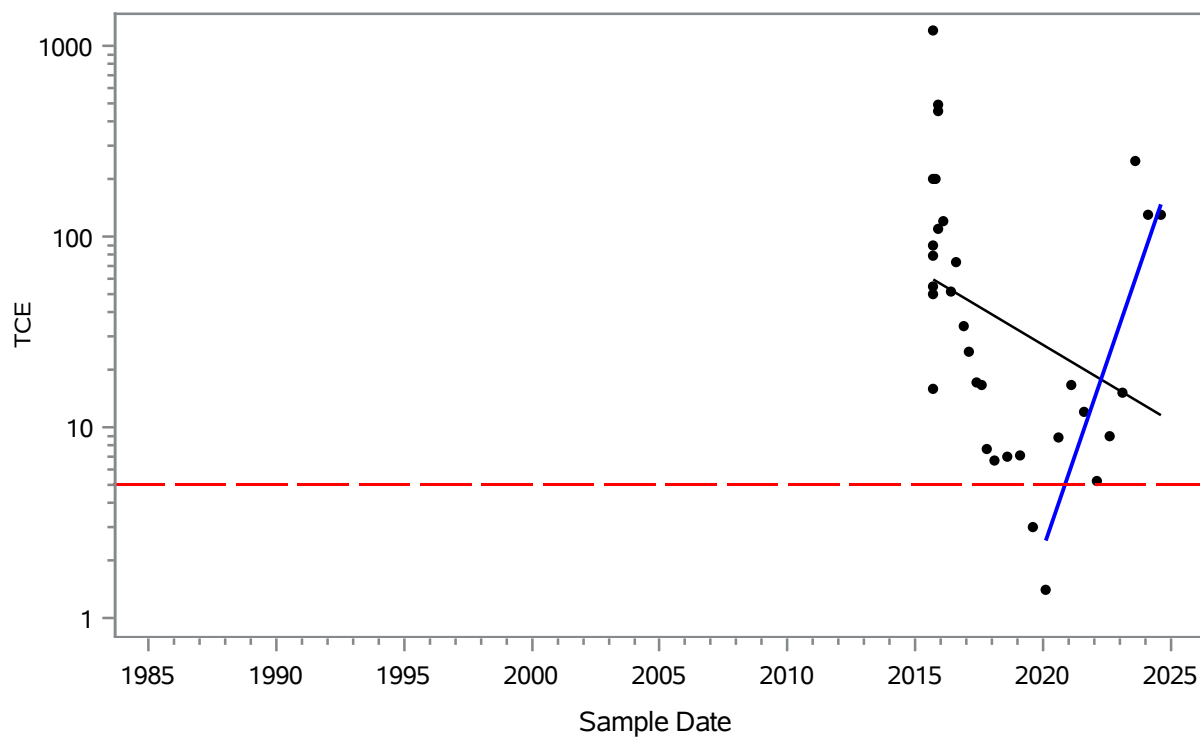


● Result - - - Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A GMW-34A

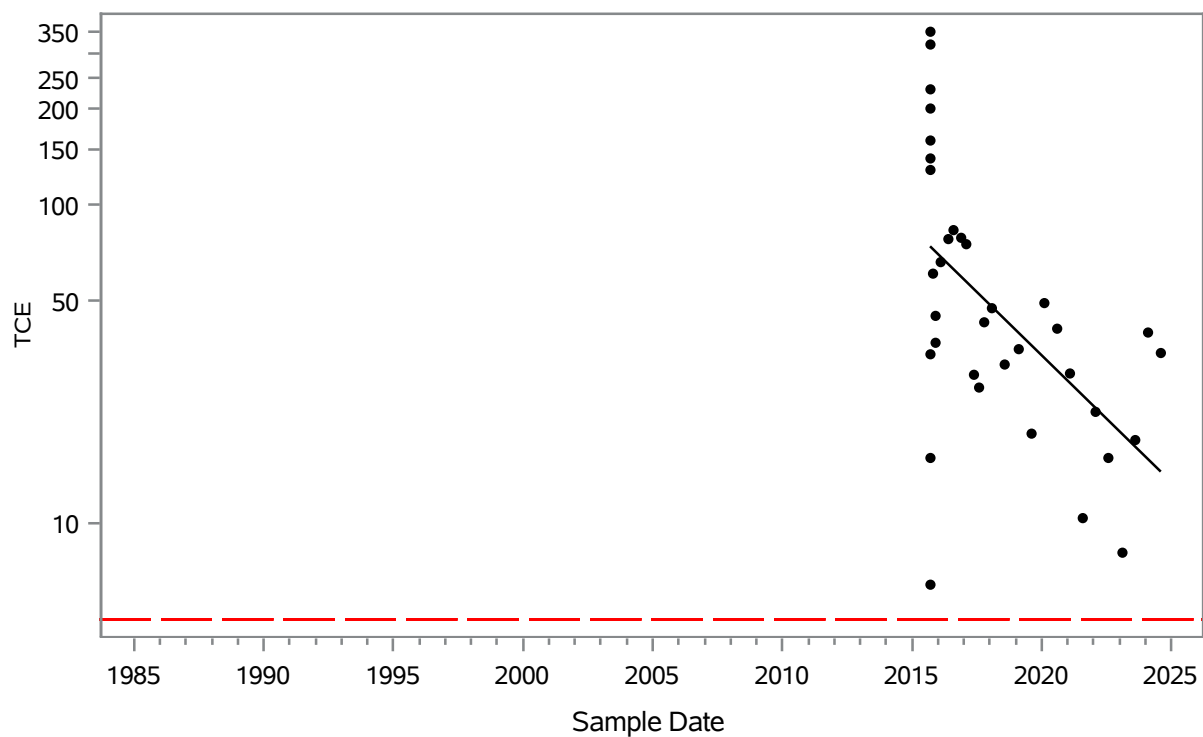


● Result — Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A GMW-35A

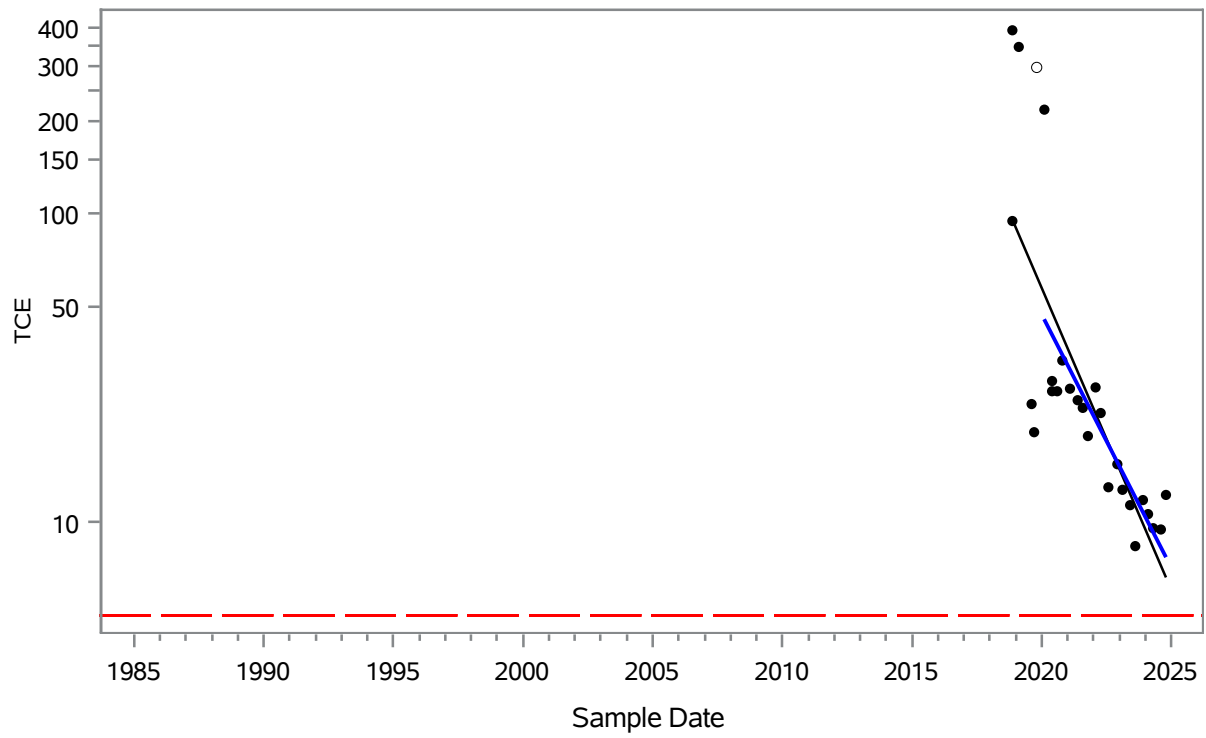


● Result — Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A GMW-39A



Concentration Trend Plots: Subunit A GMW-45A

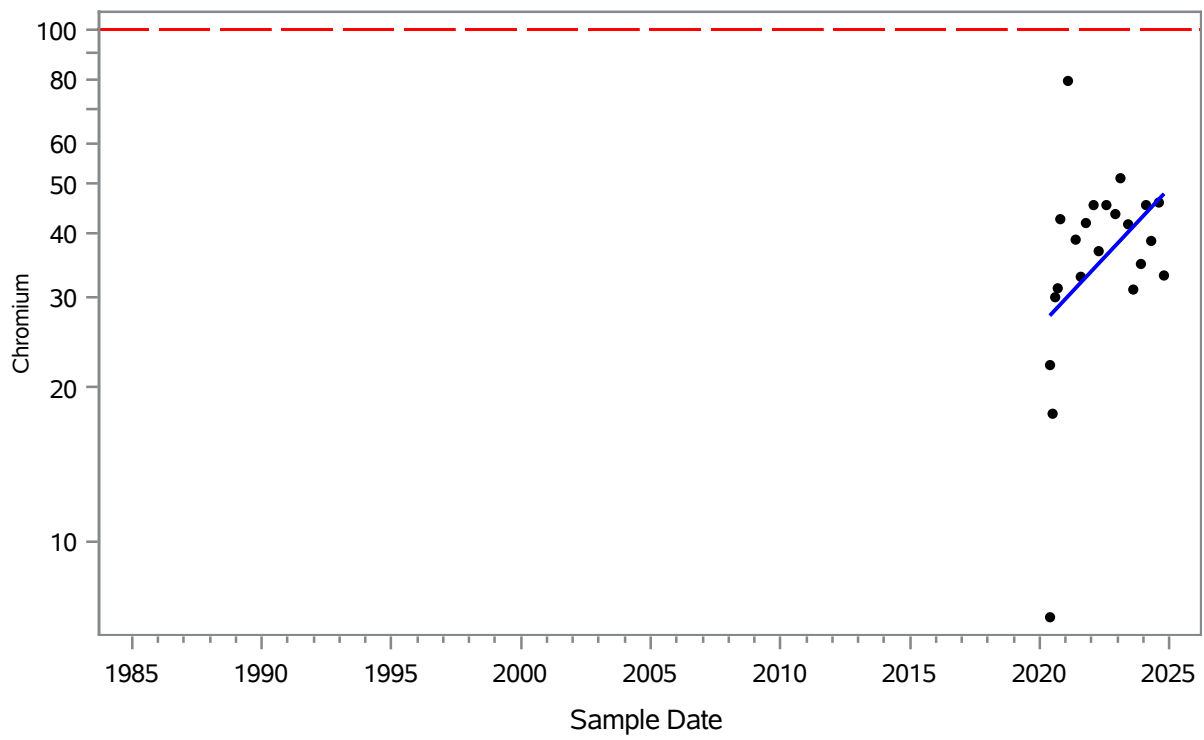


● Result — Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit A GMW-50A

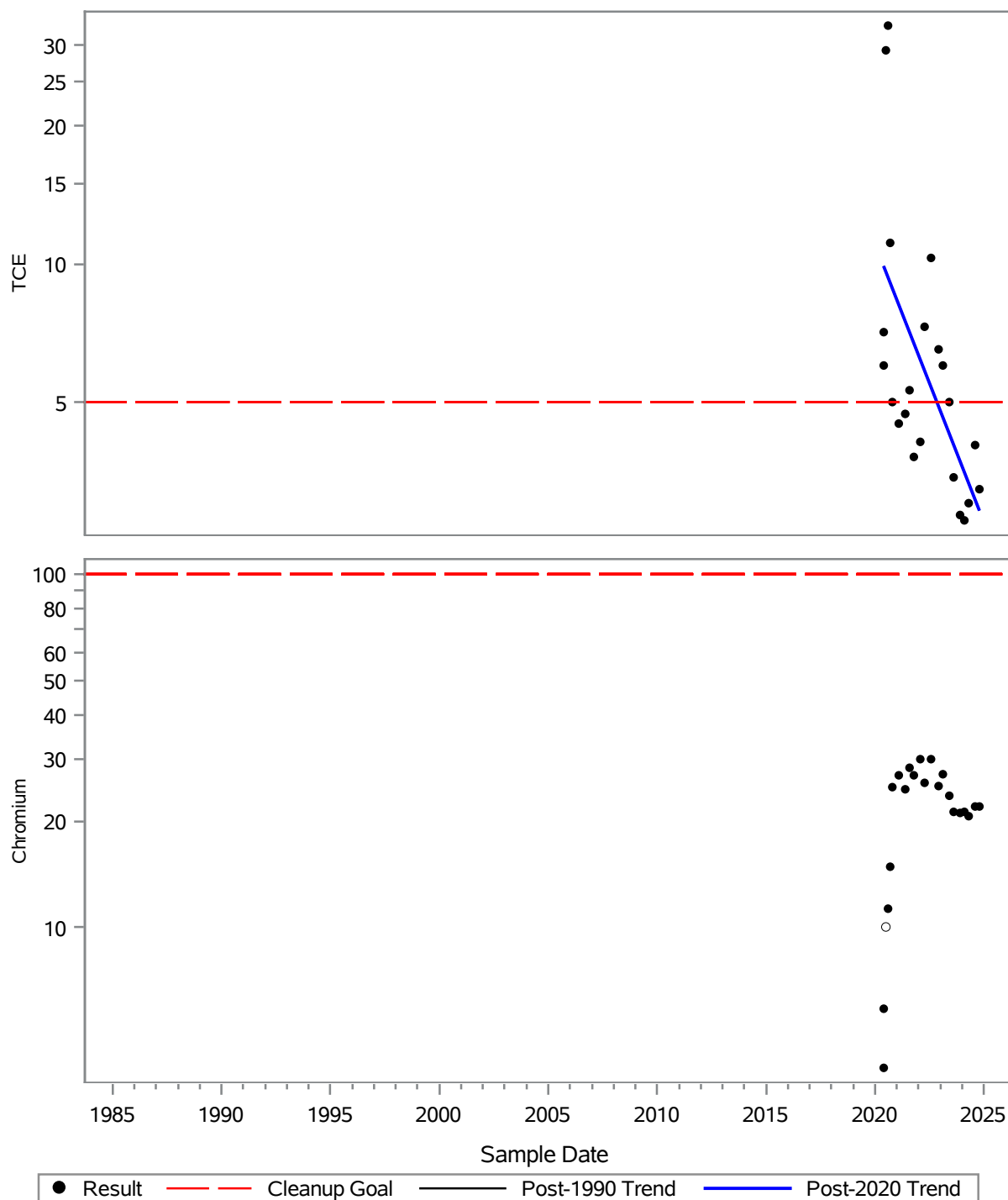


● Result — Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

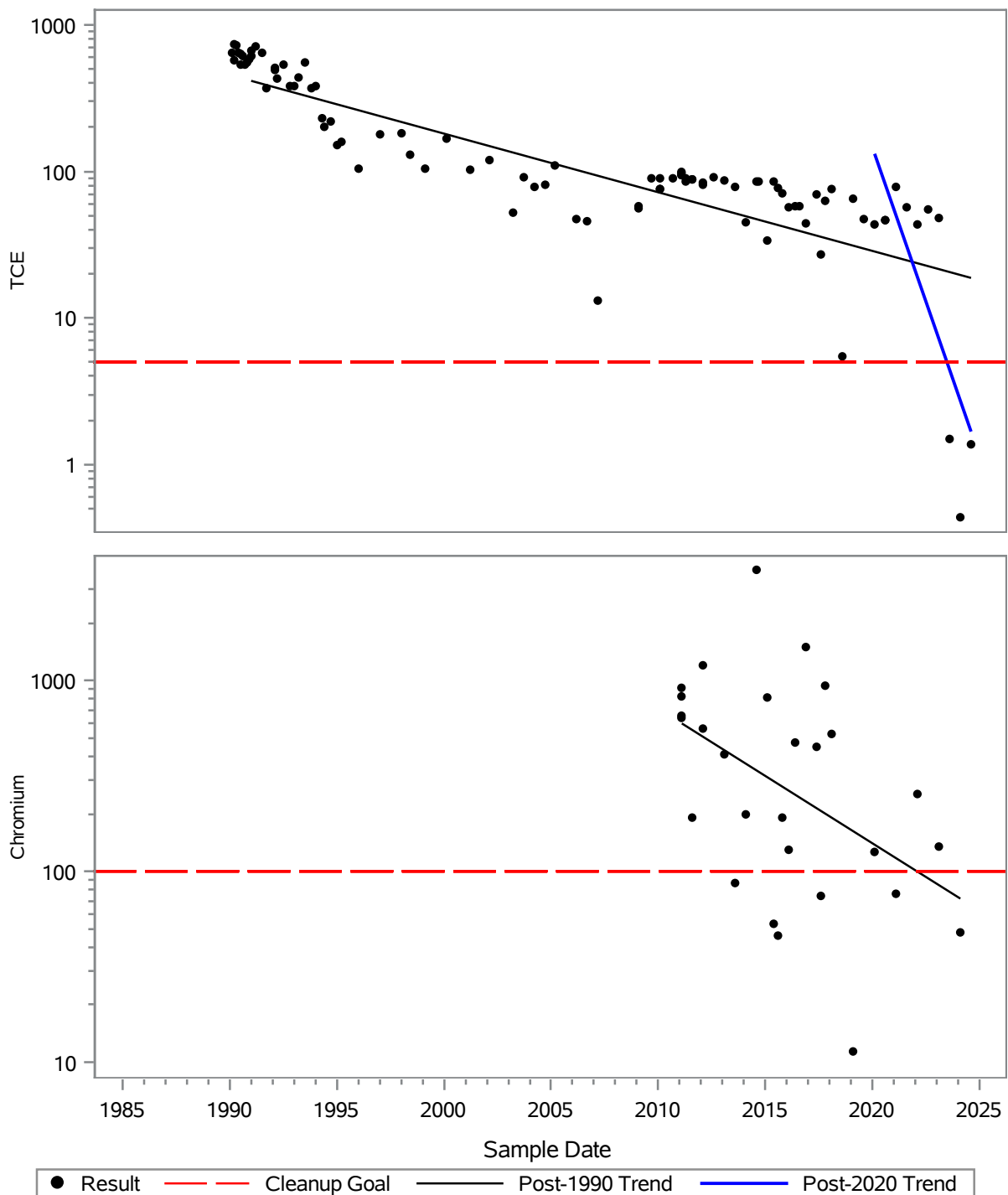
Concentration Trend Plots: Subunit A GMW-51A



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

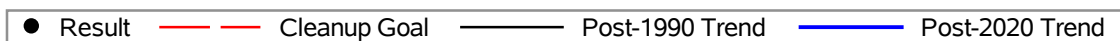
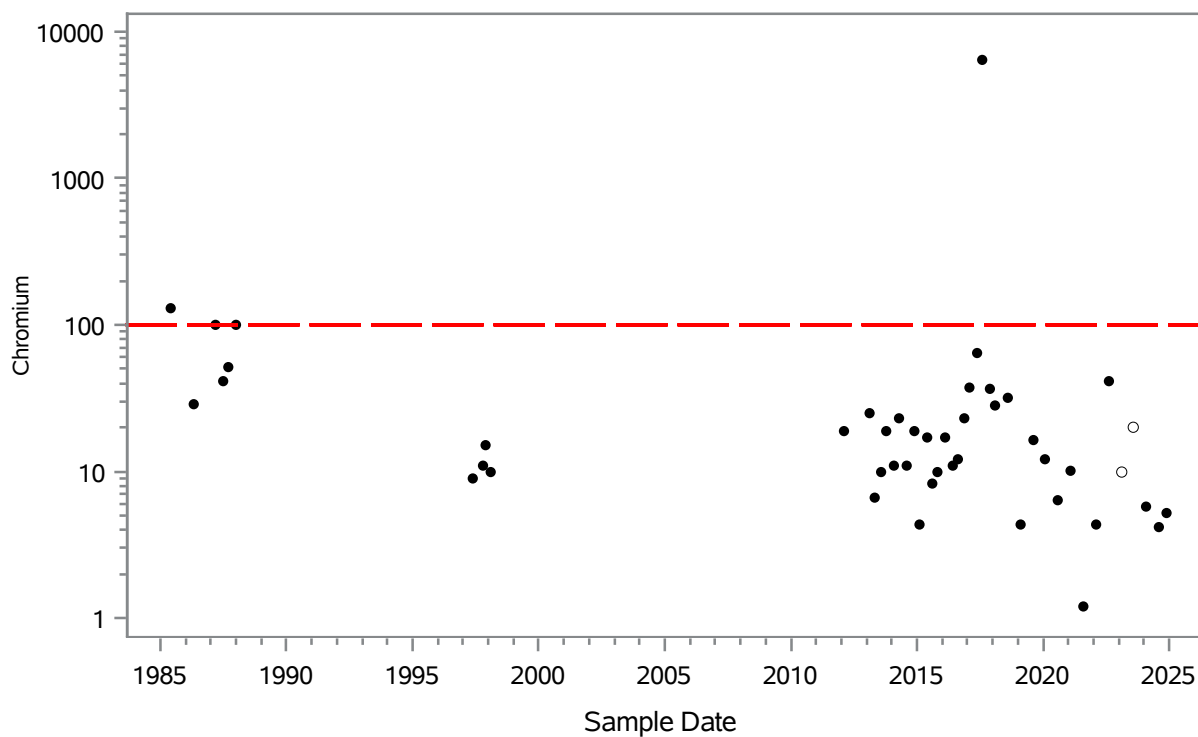
Concentration Trend Plots: Subunit A NEW-03



Notes:

1. All concentrations in $\mu\text{g/L}$.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

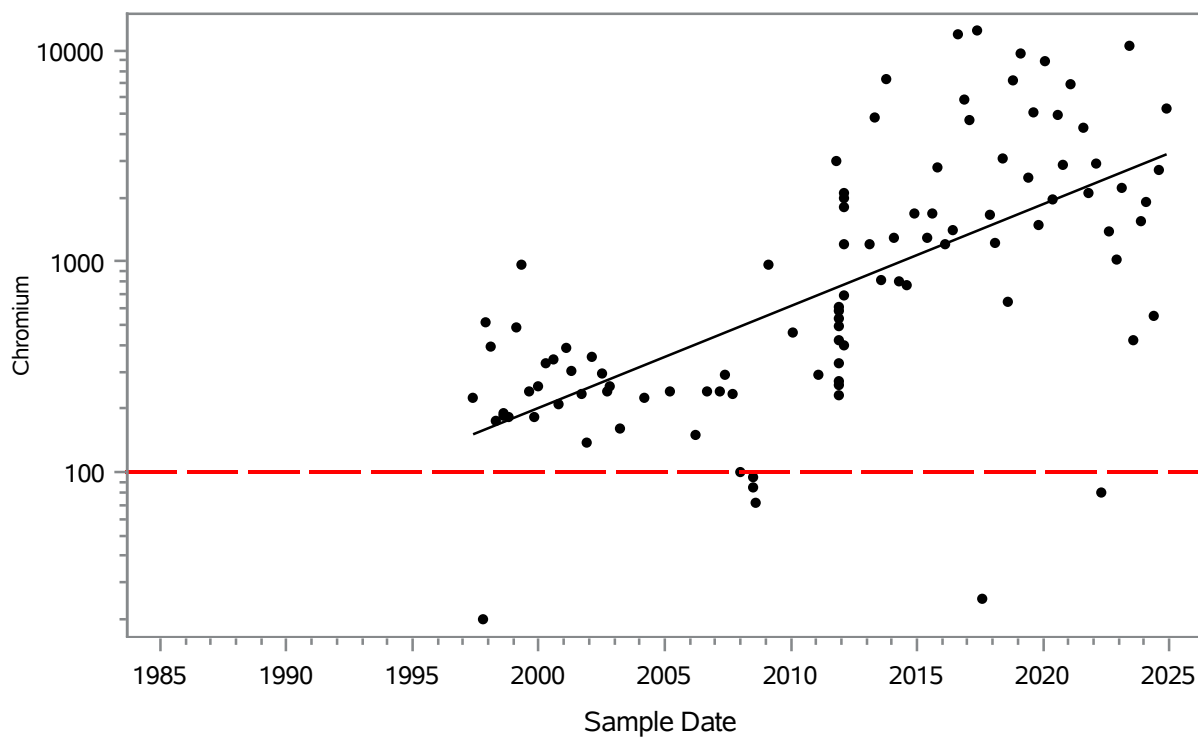
Concentration Trend Plots: Subunit C GMW-01



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C GMW-09MC

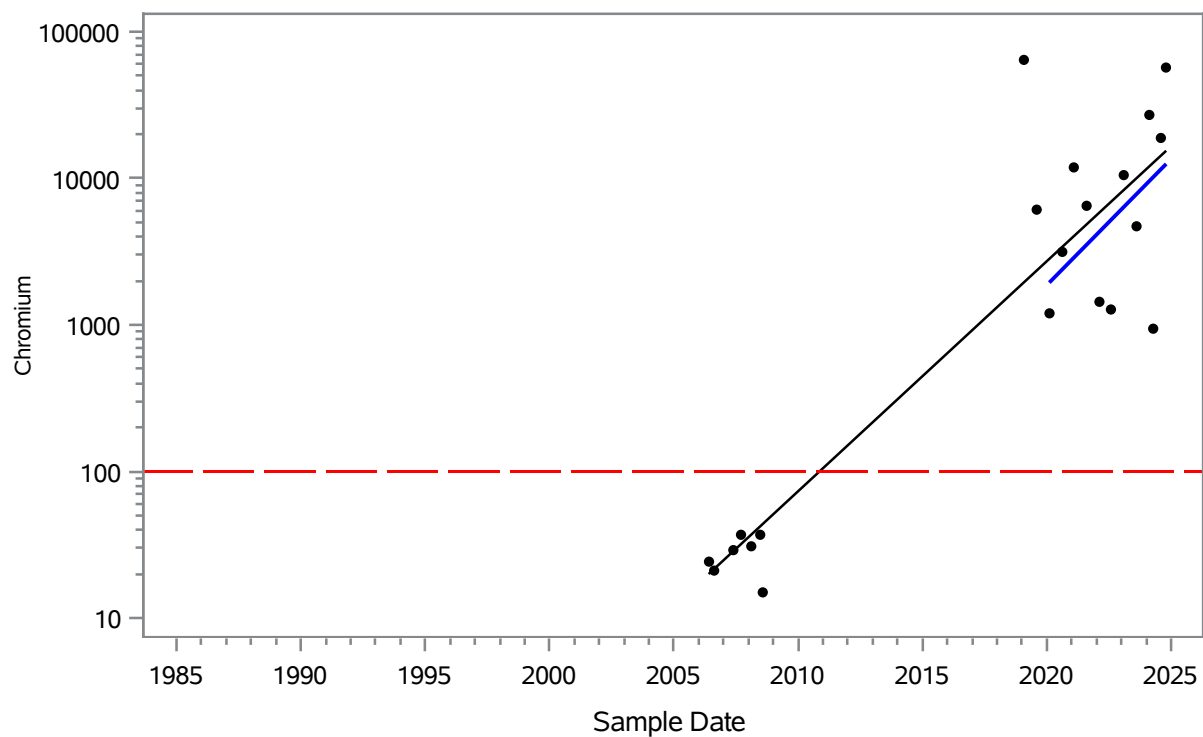


● Result — Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C GMW-11UC

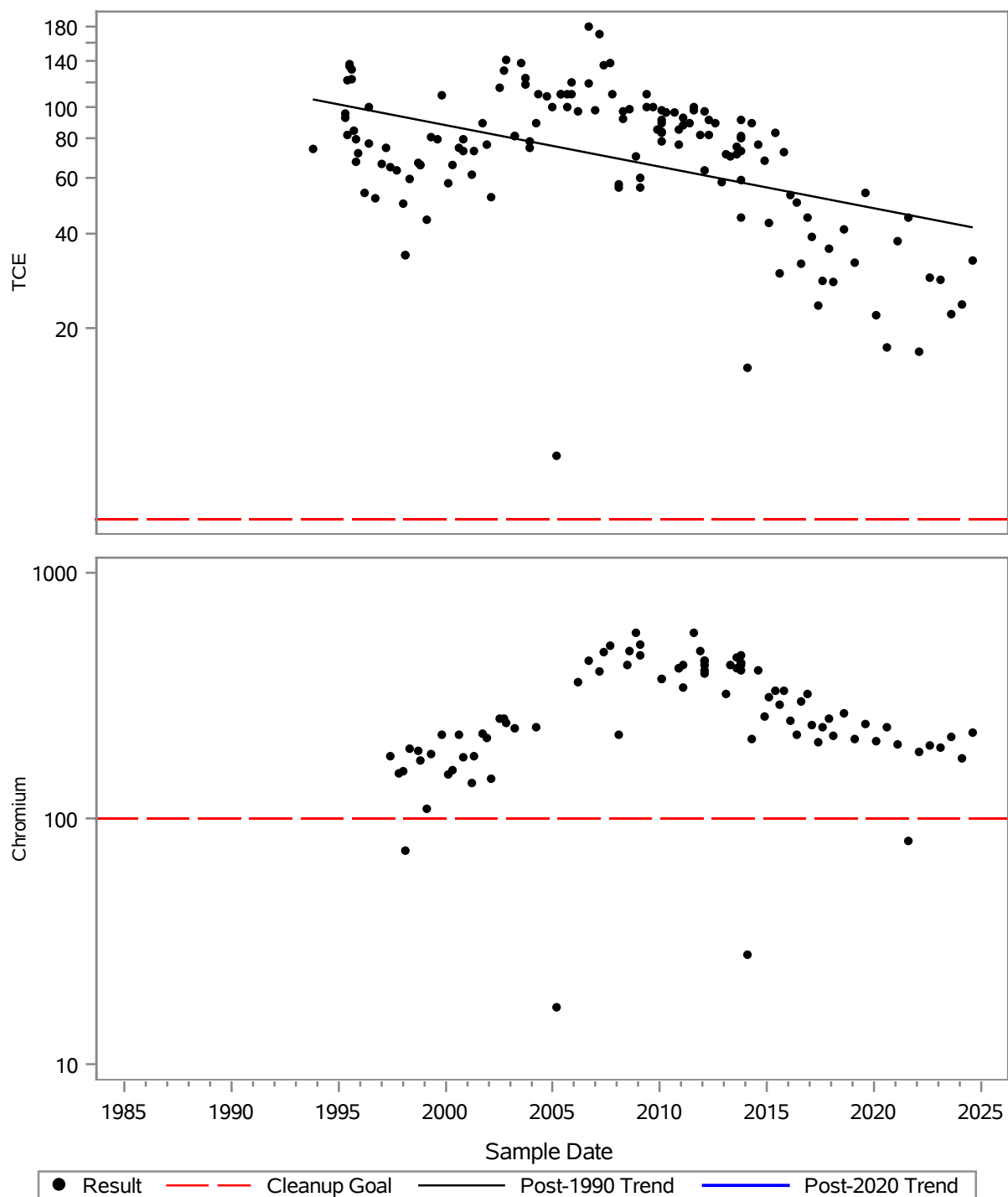


● Result — Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

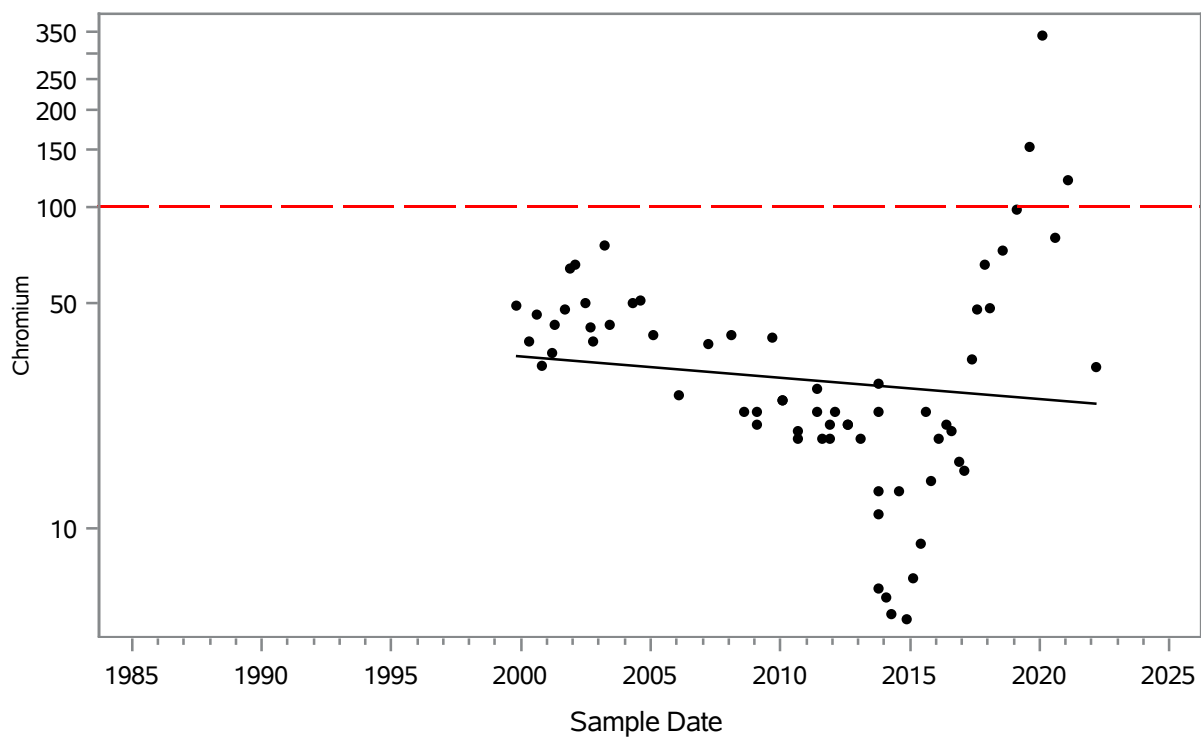
Concentration Trend Plots: Subunit C GMW-13UC



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C GMW-14UC

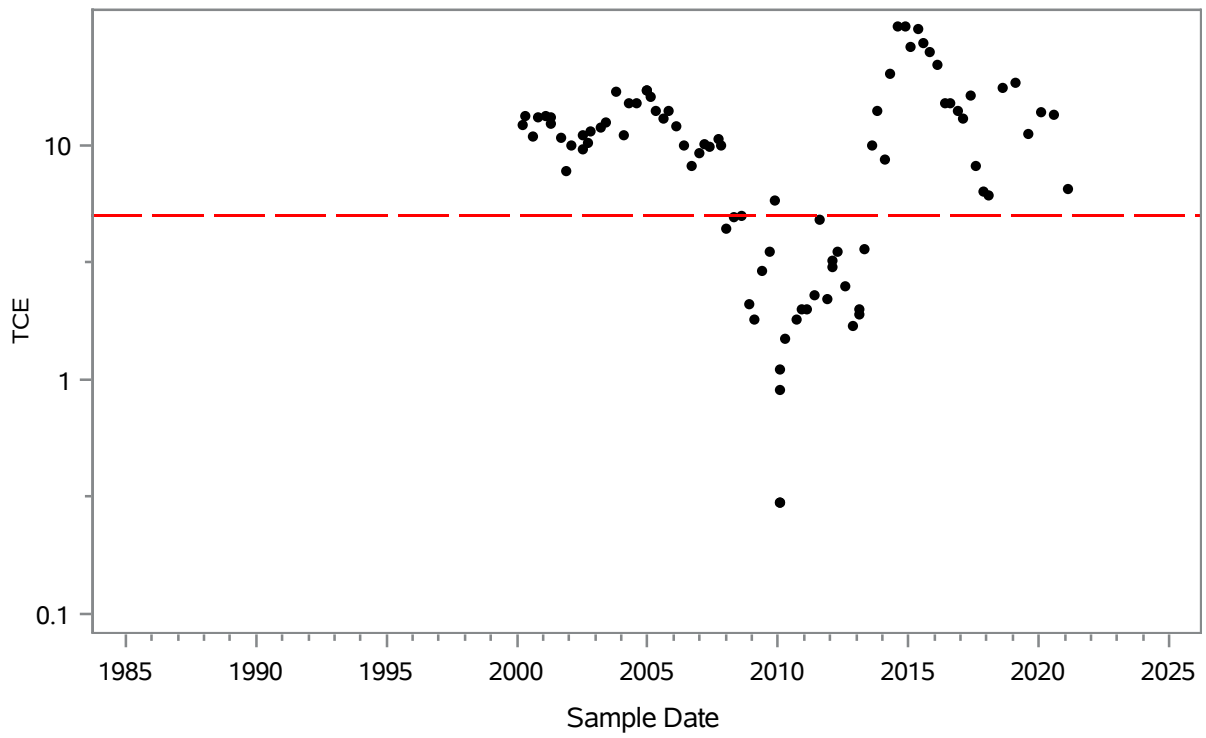


● Result — Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C - Northern Plume GMW-17UC

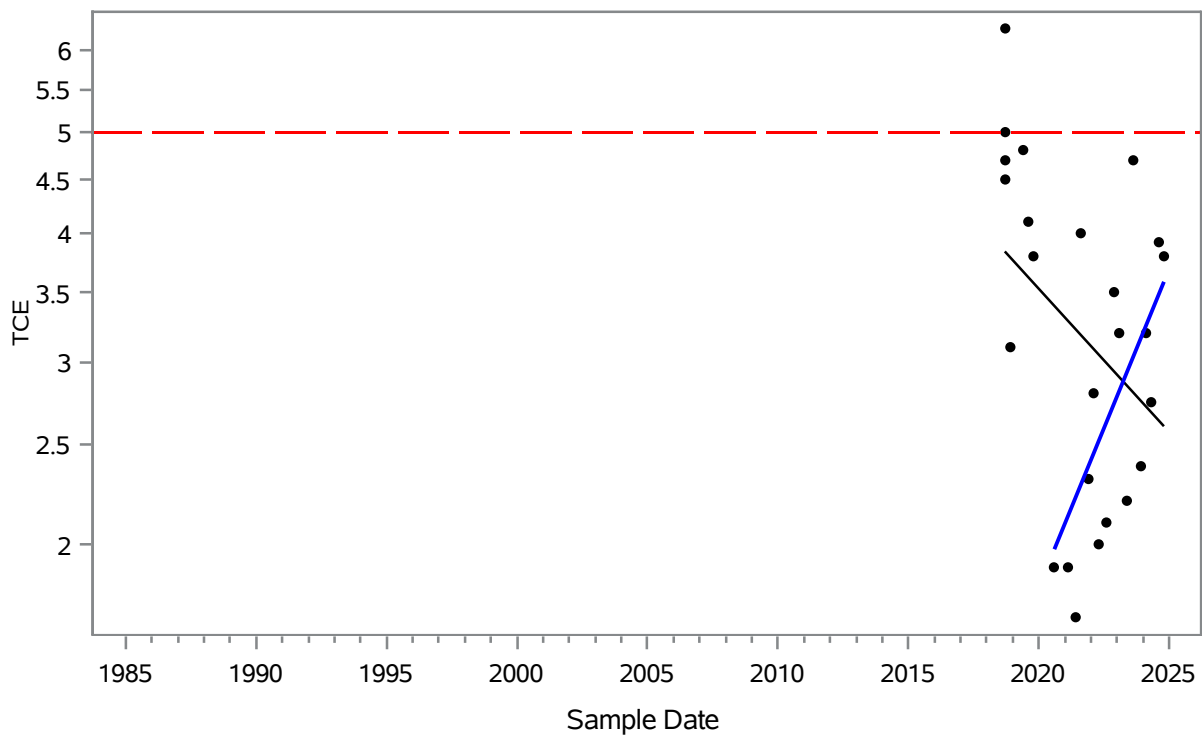


● Result - - - Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C - Northern Plume GMW-26UC

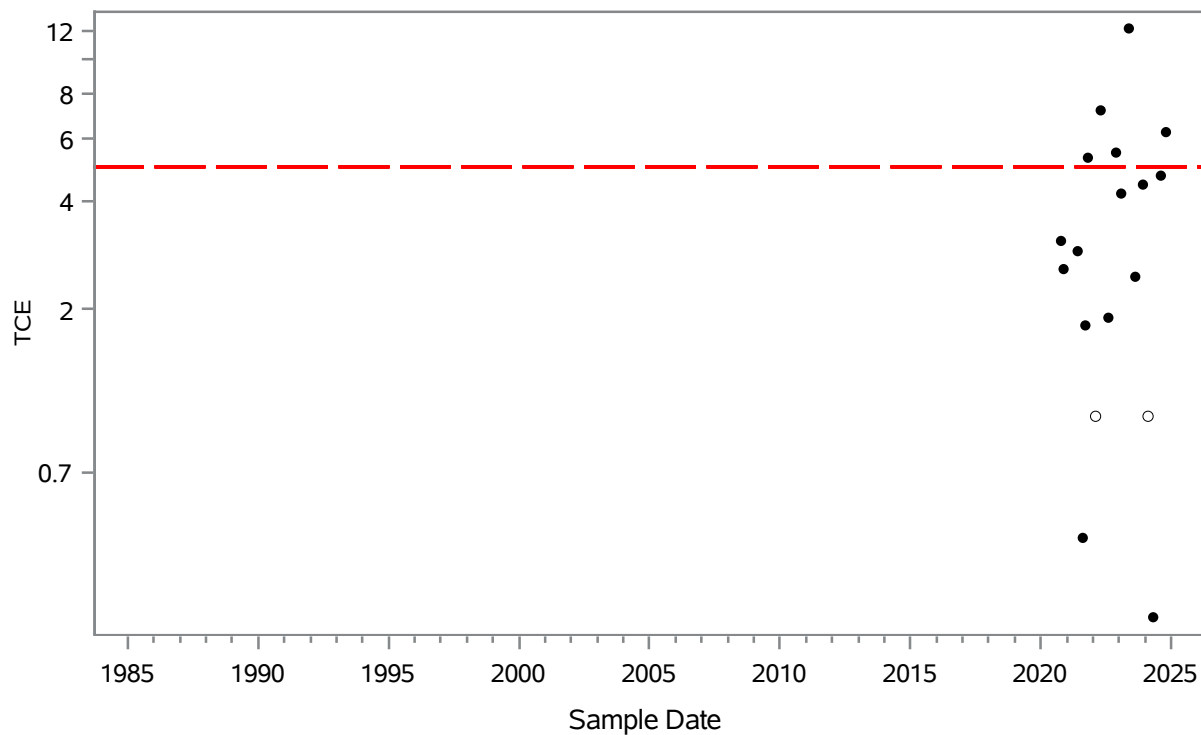


● Result — Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C - Northern Plume GMW-52UC

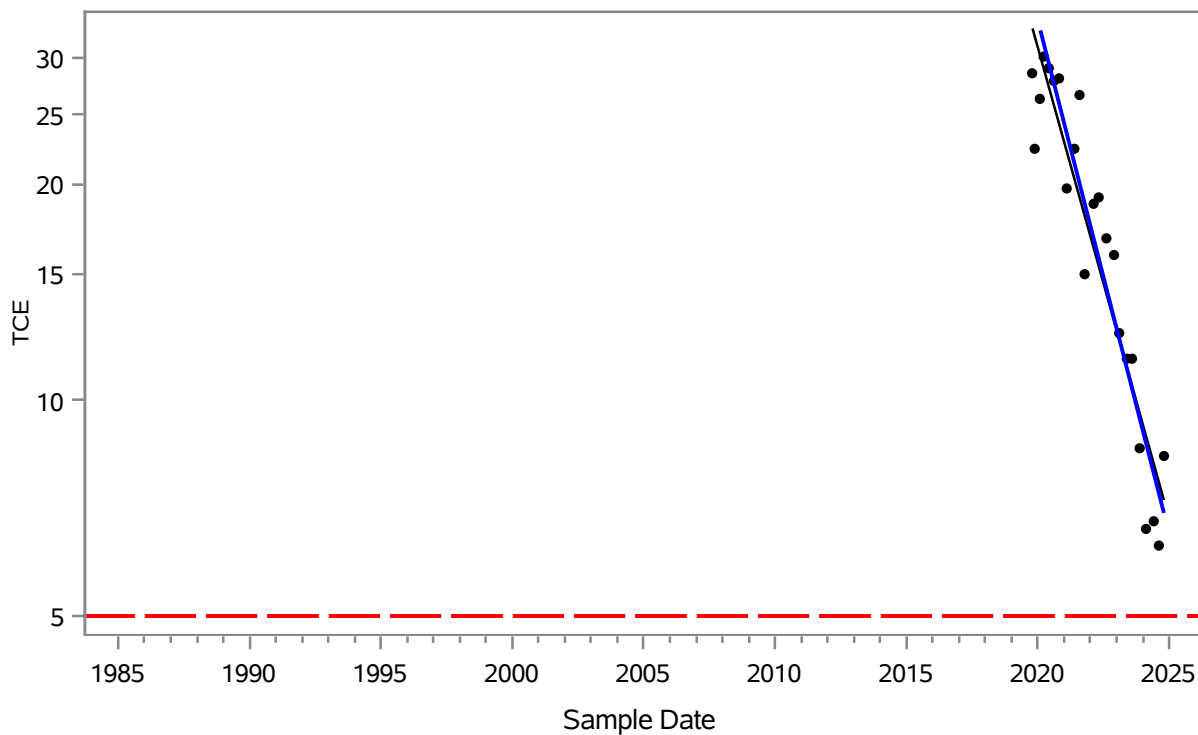


● Result
— Cleanup Goal
— Post-1990 Trend
— Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C - Northern Plume GMW-47UC

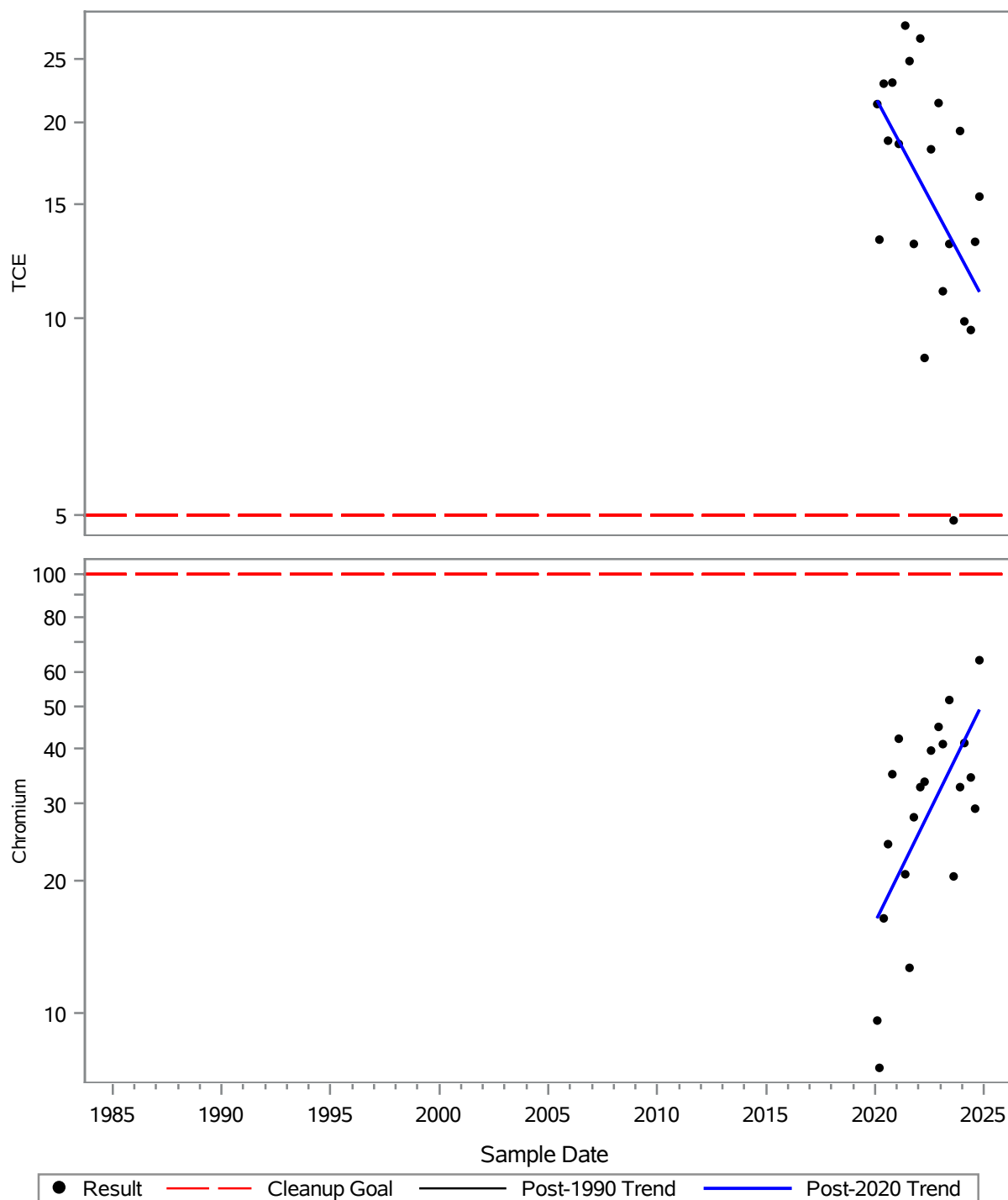


● Result - - - Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

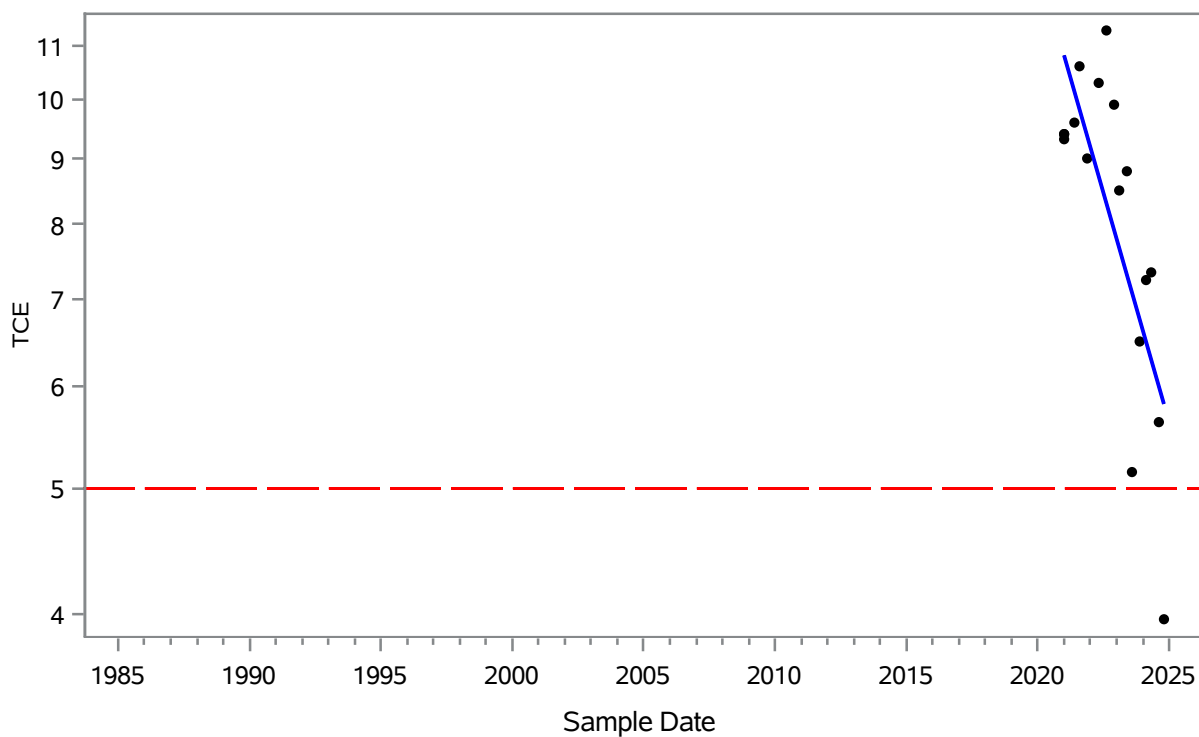
Concentration Trend Plots: Subunit C GMW-49UC



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C - Northern Plume GMW-53UC

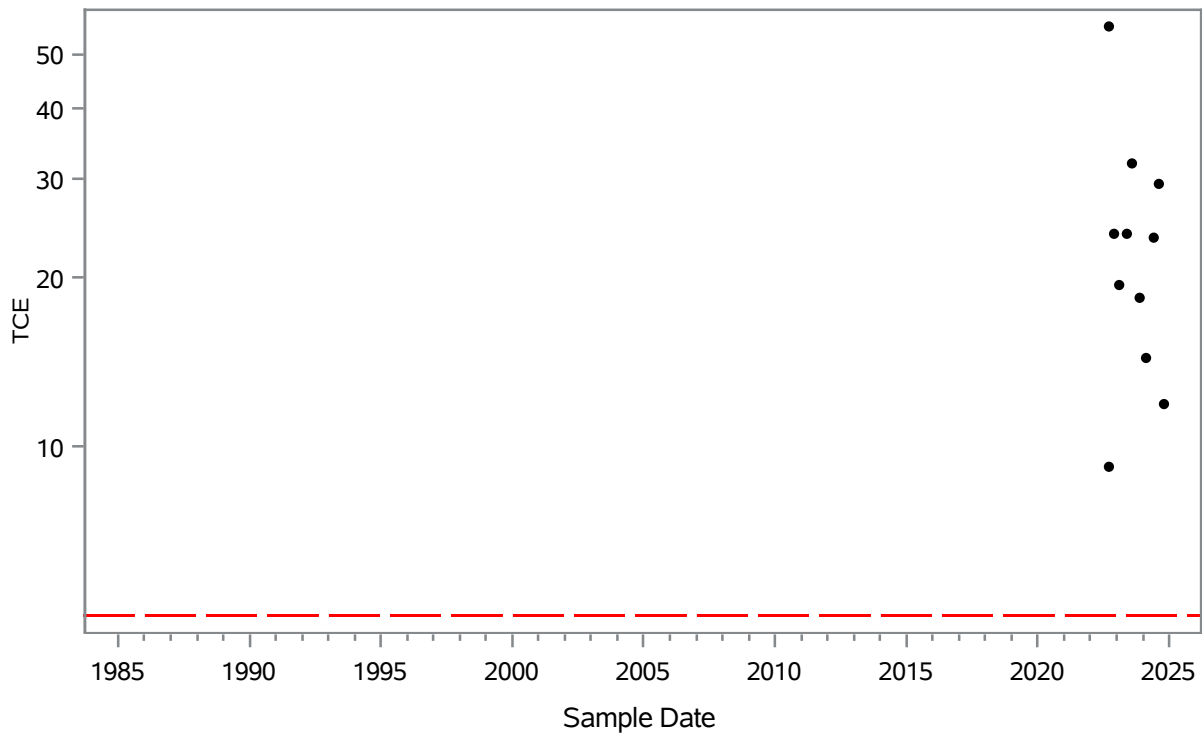


● Result - - - Cleanup Goal — Post-1990 Trend — Post-2020 Trend

Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Concentration Trend Plots: Subunit C - Northern Plume GMW-64UC



Notes:

1. All concentrations in µg/L.
2. Open symbols indicate a non-detect result plotted at the reporting limit.
3. Trendlines estimated using MLE regression for significant trend (Mann-Kendall $p < 0.1$).

Appendix D: Applicable or Relevant and Appropriate Requirements Assessment

Section 121 (d)(2)(A) of Comprehensive Environmental Response, Compensation, and Liability Act specifies that Superfund remedial actions must meet any federal standards, requirements, criteria, or limitations that are determined to be legally 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, remedial action, location, or other circumstance at a Comprehensive Environmental Response, Compensation, and Liability Act site.

Changes (if any) in ARARs are evaluated to determine if the changes affect the protectiveness of the remedy. Each ARAR and any change to the applicable standard or criterion are discussed in this appendix.

Chemical-specific ARARs identified in the Phoenix-Goodyear Airport (PGA) North and PGA South Records of Decision (RODs), the subsequent ROD Amendment for PGA North for groundwater, and the several Explanation of Significant Differences (ESDs) were evaluated (Table D-1).

Cleanup levels based on a set of chemical-specific ARARs were established in seven decision documents; for a complete list of the decision documents that establish cleanup levels for each chemical, see Section 2.2. Several chemical-specific ARARs have changed since their cleanup levels were established; these chemicals are presented in Table D-1 and discussed later in this section.

Cleanup levels for acetone, perchlorate, and methyl ethyl ketone in groundwater and trichloroethene in soil are toxicity-based, not ARAR-based, and are evaluated in the Toxicity Assessment (Appendix E). The remaining contaminants of concern that are not ARAR-based, and whose cleanup level is more stringent than the basis for the cleanup level, are retained in this table for simplicity.

Table D-1. Summary of Groundwater Chemical-Specific ARAR Changes

Chemical	Decision Document(s) Cleanup Level (µg/L)	Basis for Cleanup Level	Current Arizona State DWS Standard (µg/L)	Current Federal MCL (µg/L)	ARARs More or Less Stringent than Cleanup Level?
1,1,1-Trichloroethane	200	Federal MCL	200	200	Equal To
1,1,2,2-Tetrachloroethane	0.18	Unclear in 1993 ESD	0.17	None	More Stringent
1,1-Dichloroethene	7	Federal MCL	7	7	Equal To
1,2-Dichloropropane	1	ADEQ Action Level	5	5	Less Stringent
Antimony	1.46	AWQC	6	6	Less Stringent
Barium	2,000	Federal MCL	2,000	2,000	Equal To
Benzene	5	Federal MCL	5	5	Equal To
Beryllium	0.004	Federal MCL	4	4	Less Stringent
Cadmium	5	Federal MCL	5	5	Equal To
Carbon tetrachloride	5	Federal MCL	5	5	Equal To
Chloroform (Subunit A of PGA North, Subunit B/C of PGA South and PGA North)	100	Federal MCL	80 ¹	80 ¹	More Stringent
Chloroform (Subunit A of PGA South)	0.5	AWQC	80 ¹	80 ¹	Less Stringent
Chromium	100	Federal MCL	100	100	Equal To
Ethylbenzene	700	Federal MCL	700	700	Equal To
Lead	15	EPA Action Level	15	15	Equal To
Mercury	2	Federal MCL	2	2	Equal To
Methylene chloride	1	ADEQ Action Level	None	5	Less Stringent
Nickel	100	Federal MCL	140	None	Less Stringent

Chemical	Decision Document(s) Cleanup Level (µg/L)	Basis for Cleanup Level	Current Arizona State DWS Standard (µg/L)	Current Federal MCL (µg/L)	ARARs More or Less Stringent than Cleanup Level?
Selenium	50	Federal MCL	50	50	Equal To
Silver	50	Federal MCL	35	100 ²	More Stringent or Less Stringent
Tetrachloroethene	5	Federal MCL	5	5	Equal To
Toluene	1,000	Federal MCL	1,000	1,000	Equal To
<i>trans</i> -1,2-Dichloroethene	70	Federal Proposed MCL	100	100	Less Stringent
Trichloroethene	5	Federal MCL	5	5	Equal To
Trichlorofluoromethane	1	ADEQ Action Level	None	None	Not Applicable
Xylenes	440	ADEQ Action Level	10,000	10,000	Less Stringent
Zinc	5,000	AWQC	2,100	5,000 ² -	More Stringent or Equal To

Notes:

¹ Source is not a byproduct of municipal water supply chlorination. There is no federal MCL for chloroform. The listed MCL is for Total Trihalomethanes, a class of chemicals that includes chloroform.

² This value is a Secondary MCL.

µg/L = microgram(s) per liter

ADEQ = Arizona Department of Environmental Quality

AWQC = Ambient Water Quality Criteria; adjusted for consumption of drinking water only; fish ingestion component removed

DWS = Domestic Water Source

MCL = Maximum Contaminant Level

Several compounds have had chemical-specific ARARs change since cleanup levels were established. ARARs for antimony, beryllium, methylene chloride, *trans*-1,2-dichloroethene, 1,2-dichloropropane, nickel, and xylenes are now less stringent than the cleanup levels. Chloroform has ARARs that are less stringent than cleanup levels established for PGA South, and more stringent than those established for PGA North. ARARs for silver, zinc, and 1,1,2,2-tetrachloroethane are more stringent than the cleanup levels established for those chemicals.

Federal and state laws and regulations other than the chemical-specific ARARs discussed in Table D-1 that have been promulgated or changed since the PGA North and PGA South RODs, and the subsequent ROD Amendment for PGA North are described in Table D-2. There have been no revisions to laws or regulations that affect the protectiveness of the remedy.

Action- or location-specific ARARs that have not changed since the PGA North and PGA South RODs, and the subsequent ROD Amendment for PGA North or for which the changes do not affect protectiveness are:

- RCRA Solid Waste Disposal General Provisions (42 § USC 6901 et seq. A.R.S. § 49- 921 et seq. 40 CFR § 141.5b).
- Arizona Aquifer Water Quality Standards (A.R.S § 49-223).
- Arizona Aquifer Identification, Classification and Reclassification (A.R.S § 49-224).
- Arizona Historic Preservation and Archaeological Discovery (A.R.S. § 41-841-847, 865).
- National Historic Preservation Act (16 U.S.C. 470).
- Minimum Design Criteria (A.A.C. §§R18-5-501 and 502).
- Hazardous Waste Determination (40 CFR § 262.11 and A.A.C. § R18- 8-262).
- Arizona Groundwater Management Act (A.R.S. § 45- 454.01, §§ 45-594, 595, 596, 600 and 605).
- Safe Drinking Water Act (42 USC § 300f et seq. 40 CFR § 144.12 through § 144.16).
- Well Permitting, Construction and Drilling Standards (A.R.S. § 45- 591 through § 45-604; A.A.C. § R12- 15-801,822).
- Protection of the Environment, Solid Wastes (40 CFR Part 261; A.A.C. § R18- 8-261).
- Hazardous Waste Regulations Accumulation Time (40 CFR § 262.34).
- Standards Applicable to Generators of Hazardous Waste (40 CFR § 262.11).
- RCRA Hazardous Waste and Arizona Hazardous Waste Management Requirements (40 CFR § 264.18(a) and (b) A.A.C. § R18- 8-264 A.R.S. § 49- 901 - § 49-973).

- RCRA Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities (40 CFR § 264.1(j) (2-6, 10-12) A.A.C. § R18- 8-264(j) (2-6, 10-12) A.R.S. § 49-921 et seq.).
- RCRA Hazardous Waste Management (40 CFR § 264.600 – 603).
- RCRA Hazardous Waste Management (40 CFR § 264.73 A.R.S. § 49-921 et seq.).
- RCRA Tank Systems (40 CFR Subpart J, except §264.192(a) A.A.C. § R18-8-264.190 et seq, except §§ R18-264.192(a) A.R.S. § 49-921 et seq.).
- Hazardous Waste Transportation 49 CFR Subchapter C; 10 CFR § 71; 10 CFR § 20.2006.
- Well Location (A.A.C. § R12-15-818).
- Aquifer Water Quality Standards (A.A.C. § R18 11-405(a) and (c)).
- Aquifer Protection Permit (A.R.S. § 49-241 et. seq.).
- Anti-degradation (A.R.S. § 49-243).

Table D-2. Summary of ARAR Changes for Site Since the Decision Document(s)

Requirement and Citation	Document	Description	Effect on Protectiveness	Comments	Recent Amendment Date
Safe Drinking Water Act Regulations, 40 CFR §§ 141.24 and 141.61	1987 ROD	Federal MCLs are ARARs for the Site and were used to establish groundwater cleanup levels.	Changes may affect protectiveness.	Addition of Per- and Polyfluoroalkyl Substances (PFAS) to list of regulated chemicals, minor text changes	June 25, 2024
Safe Drinking Water Act Regulations, 40 CFR §§ 141.24 and 141.61	1987 ROD	Federal MCLs are ARARs for the Site and were used to establish groundwater cleanup levels.	Changes do not affect protectiveness.	Changes to alternate testing procedures for analysis of some contaminants.	October 12, 2018

Appendix E: Toxicity Assessment

Chemical-specific applicable or relevant and appropriate requirements (ARARs) identified in the ten governing documents issued for the Site for groundwater (Table E-1) and soil (Table E-2) were evaluated. The EPA adopted Arizona Action Levels and Site-specific values for groundwater cleanup levels and Arizona Soil Remediation Levels for soil cleanup levels. The EPA's Regional Screening Levels (RSLs) updates toxicity values used by the EPA in risk assessment when newer scientific information becomes available based upon the toxicity hierarchy set forth by the EPA, and the most recent update available used for this analysis was the November 2024 update.

Groundwater Toxicity Values

Groundwater cleanup levels were mostly based upon the Federal Maximum Contaminant Level (MCL) or the Arizona Action Level. Only three chemicals had groundwater cleanup levels determined based upon human health toxicity values. Changes have occurred to some toxicity values since the 1991 Explanation of Significant Differences (ESD) and 2014 Record of Decision (ROD) Amendment (Table E-1). The RSLs are either the same or less stringent than the groundwater cleanup levels. Therefore, these groundwater cleanup levels remain protective.

Table E-1. Summary of Water Toxicity Changes

Chemical	Groundwater Cleanup Level (µg/L)	Basis for Cleanup Level	Current Tap Water RSL (µg/L) c = cancer n = noncancer	RSLs More or Less Stringent than Cleanup Levels?
Acetone	700	EPA Site-Specific ¹	18,000 (n)	Less stringent
Methyl Ethyl Ketone	350	Based on noncancer hazard index of 1	5,600 (n)	Less stringent
Perchlorate	14	ADHS HBGL	11 (n)	More stringent

Notes:

ADHS = Arizona Department of Health Services, c = cancer, HBGL = health-based guidance level, n = noncancer, RSL = Regional Screening Level

¹ No applicable or relevant and appropriate requirements are in effect at the time of the 1991 ESD, meaning the EPA calculated the cleanup level for acetone using the available EPA-developed toxicity information (EPA 1991b).

Soil Toxicity Values

The soil cleanup level for TCE selected in the 2014 ROD Amendment was the Arizona Soil Remediation Level. Toxicity values for trichloroethene have not changed since the 2014 ROD Amendment. Table E-2 compares the soil cleanup level to the current EPA industrial soil RSL.

Table E-2. Summary of Soil Toxicity Changes

Chemical	Soil Cleanup Level (mg/kg)	Basis for Cleanup Level	Current EPA Industrial RSL (mg/kg) c = cancer n = noncancer	RSLs More or Less Stringent than Cleanup Levels?
Trichloroethene	65	Arizona SRLs	6 (c)	More stringent

Notes:

c = cancer, mg/kg = milligram(s) per kilogram, n = noncancer, RSL = Regional Screening Level, Target Hazard Quotient = 0.1; November 2024; SRL = Soil Remediation Level

The EPA industrial soil RSL is based upon a carcinogenic target risk of 1×10^{-6} . The Arizona SRL is set to a cancer risk level between 1×10^{-4} to 1×10^{-6} . Therefore, the soil cleanup level is within the EPA's risk management range of 1×10^{-4} to 1×10^{-6} (approximately 1×10^{-5}) as discussed in the National Contingency Plan; therefore, the soil cleanup level is still protective.

PFAS Toxicity Values

This section presents the toxicity values that the EPA currently has available for PFAS compounds.

In July 2024, the EPA released a non-cancer organ specific reference dose (RfD) value for PFDA of 2×10^{-9} milligram per kilogram (mg/kg)-day based on a new Integrated Risk Information System (IRIS) value. Previously there was no toxicity value available for PFDA.

On April 10, 2024, the EPA Office of Water released new toxicity values for PFOA and PFOS for cancer and non-cancer effects. The new oral cancer slope factors are 2.93×10^4 [mg/kg/day]⁻¹ for PFOA and 3.95×10^1 [mg/kg/day]⁻¹ for PFOS. For noncancer, the new oral reference dose values are 3×10^{-8} (mg/kg/d) for PFOA and 1×10^{-7} (mg/kg/d) for PFOS. It is noted that toxicity values for PFHxS, PFNA, HFPO-DA (Gen-X), and PFBS are not changed with the new Maximum Contamination Levels.

In November 2023, the EPA adopted new non-cancer oral reference dose (RfD) values for multiple PFAS compounds based on toxicity values developed by the State of Wisconsin

Department of Health Services which include Perfluorooctadecanoic acid (PFODA) 4×10^{-2} mg/kg-day, Perfluorotetradecanoic acid (PFTetA) 1×10^{-3} mg/kg-day, Perfluorododecanoic acid (PFDoDA) 5×10^{-5} mg/kg-day, and Perfluoroundecanoic acid (PFUDA) 3×10^{-4} mg/kg-day.

Additionally, new oral RfD values were released for two PFAS compounds based on toxicity values published by the EPA Office of Research and Development (ORD) which include Perfluoropropanoic acid (PFPrA) 5×10^{-4} mg/kg-day and Lithium bis[(trifluoromethyl)sulfonyl]azanide (HQ-115) 3×10^{-4} mg/kg-day, also known as 1,1,1-Trifluoro-N-(trifluoromethanesulfonyl)methanesulfonamide (TFSI).

These values were determined to be based on similar methods and procedures as those used for other Tier 3 toxicity values. It is noted that currently there are no analytical methods available for PFODA and the two ORD compounds PFPrA and HQ-115/TFSI.

In April 2023, the EPA released a new non-cancer oral reference dose (RfD) of 5×10^{-4} mg/kg-day for Perfluorohexanoic acid (PFHxA) based on an IRIS value.

In December 2022, the EPA released a new non-cancer oral reference dose (RfD) of 1×10^{-3} mg/kg-day for Perfluorobutanoic acid (PFBA) based on a new IRIS value.

Appendix F: Press Release



Media Contact: Mikayla Rumph, 213-244-1806, rumph.mikayla@epa.gov

In sign of progress in Superfund cleanups across Pacific Southwest, EPA to perform Five-Year Reviews at 27 Superfund sites in 2025

SAN FRANCISCO (Feb. 20, 2025) – In an important marker of progress achieved on long-term Superfund cleanups across the Pacific Southwest region, in 2025 the U.S. Environmental Protection Agency (EPA) will perform comprehensive Five-Year Reviews of cleanups at 27 Superfund sites across Arizona, California, Hawaii and Nevada. EPA will undertake these legally required reviews to ensure that cleanup efforts, some of which were completed years ago, continue to be protective of public health and the environment.

“Reviewing the long-term, complex cleanup work at these Superfund sites is critical to ensuring that public health and the environment will continue to be protected,” said **EPA Pacific Southwest Superfund and Emergency Management Director Michael Montgomery**. “Cleanups at these sites also promote redevelopment, providing communities with the opportunity for a variety of reuse options.”

Once the Five-Year Reviews are complete, the findings will be posted to each Superfund site’s webpage. The reviews to be completed in 2025 are:

Arizona:

- Mountain View Mobile Homes, Globe, Ariz.
- Nineteenth Avenue Landfill, Phoenix, Ariz.
- Phoenix-Goodyear Airport Area, Goodyear, Ariz.
- Yuma Marine Corps Air Station, Yuma, Ariz.

California:

- Applied Materials, Santa Clara, Calif.
- Casmalia Resources, Casmalia, Calif.
- CTS Printex, Inc., Mountain View, Calif.
- Del Amo, Los Angeles, Calif.
- Fresno Municipal Sanitary Landfill, Fresno, Calif.
- Hewlett-Packard (620-640 Page Mill Road), Palo Alto, Calif.
- Intersil Inc./Siemens Components, Cupertino, Calif.
- J.H. Baxter & Co., Weed, Calif.

- Liquid Gold Oil Corp., Richmond, Calif.
- Lorentz Barrel & Drum Co., San Jose, Calif.
- Mather Air Force Base (AC&W Disposal Site), Mather, Calif.
- Moffett Field Naval Air Station, Moffett Field, Calif.
- Montrose Chemical Corp., Torrance, Calif.
- Norton Air Force Base (Landfill 2), San Bernardino, Calif.
- Operating Industries, Inc., Landfill, Monterey Park, Calif.
- Pemaco Maywood, Maywood, Calif.
- Rockets, Fireworks, and Flares Site, Rialto, Calif.
- Southern California Edison Co. (Visalia Pole Yard), Visalia, Calif.
- South Bay Asbestos Area, Alviso, Calif.
- Tracy Defense Depot (USARMY), Tracy, Calif.

Hawaii:

- Del Monte Corp. (Oahu Plantation), Kunia, Hawaii
- Naval Computer and Telecommunications Area Master Station Eastern Pacific, Wahiawa, Hawaii

Nevada:

- Anaconda Copper Mine, Yerington, Nev.

Background

Throughout the process of designing and constructing a Superfund cleanup (also called a remedy) at a hazardous waste site, EPA's primary goal is to make sure the remedy will be protective of public health and the environment. After the remedy has begun to move forward, EPA continues to ensure it remains protective by requiring reviews of cleanups every five years. It is important for EPA to regularly check on these sites to ensure the remedy is working properly. These reviews identify issues (if any) that may affect the protectiveness of the constructed remedy and, if necessary, recommend action(s) necessary to address them.

There are many phases of the Superfund cleanup process, including considering future use and redevelopment of sites as well as conducting post cleanup monitoring of sites. EPA must ensure that any redevelopment will uphold the protectiveness of the remedy into the future.

More information:

The Superfund program, a federal program established by Congress in 1980, investigates and cleans up the most complex, uncontrolled or abandoned hazardous waste sites in the country and endeavors to facilitate activities to return them to productive use. In total, there are 140 Superfund sites (this includes sites currently on the National Priorities List, deleted sites, and sites under the Superfund Alternative Approach program) across EPA's Pacific Southwest Region.

Learn more about Superfund and other cleanup sites in the Pacific Southwest.

Learn more about EPA's Superfund program.

Learn more about EPA's Pacific Southwest Region. Connect with us on Instagram, Facebook and on X.

EPA.GOV



Appendix G: Interview Forms

Five-Year Review Interview Record Interview Questionnaire

Site: Phoenix-Goodyear Airport

EPA Identification Number: AZD980695902

Date: 04/04/2025

Interviewee Name	Organization	Title	Telephone	Email
Katelyn Kane-DeVries	Arizona Department of Environmental Quality	Project Manager	602-771-0167	kane-devries.katelyn@azdeq.gov
Karin Harker	Arizona Department of Environmental Quality	Unit Manager	602-771-0361	harker.karin@azdeq.gov

Questions

1. What is your overall impression of the project?

Katelyn's Response: I have been the Arizona Department of Environmental Quality (ADEQ) project manager for the site since May 2022, the activities conducted at the Phoenix Goodyear Airport (PGA) Sites have been in accordance with the record of decision. The PGA Site's project teams work continuously to contain the plumes, optimize the remedial efforts, continuously updating the conceptual site model and keep the agencies informed. In regard to the PGA South, the Subunit C Southwest plume discovery, characterization and construction of a treatment system has been accomplished to keep the public drinking water protected.

Karin's Response: I have been ADEQ's unit manager during this 5-year review period for which Federal Projects Unit regulatory site activities were conducted in accordance with at the Superfund Site. The PGA Superfund Site project work over the course of this review

period functioned as intended and optimization was performed where practicable. The project team kept ADEQ well informed of the all the work that was performed.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

Katelyn's Response: Communications and activities regarding the PGA Sites are routine on a monthly basis via virtual meetings, two technical meetings are held each year in May and November which also have included site visits should activities warrant, additionally in May and November the project teams host a meeting for the community action group. I have also attended a site inspection during field work on the PGA North Site during the source area flushing initiative in June 2023. Should a treatment system shutdown or other site related issue arise both the PGA project managers relay via email those issues in a timely manner to ADEQ. ADEQ believes the communication stream with the PGA Sites project teams are effective. ADEQ is involved in reviews of semi-annual groundwater monitoring reporting, operations and maintenance update documents, work plans, construction completion reports, and other reporting related to the sites.

Karin's Response: Similar to Katelyn's response, the project team routinely provides communications with ADEQ on activities with the PGA Superfund Sites through meetings, site visits, Community Advisory Group meetings, and reporting activities. Communications provided to ADEQ is very effective.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

Katelyn's Response: In 2023 and 2024 ADEQ received requests from a property owner on the PGA South site to provide reports, data, and hold meetings with ADEQ personnel. ADEQ has held two meetings regarding the property owner's concerns and provided the requested documents. No responses or complaints have been relayed to ADEQ in regard to PGA North.

Karin's Response: No additional information to provide.

4. Do you feel well informed about the site's activities and progress?

Katelyn's Response: Yes, the PGA project teams are responsive and keep ADEQ well informed.

Karin's Response: Yes, the PGA project teams are responsive and keep ADEQ well informed.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Katelyn's Response: ADEQ is open to suggestions and recommendations to optimize both PGA Sites remedial efforts and discuss modifications to groundwater monitoring which are technically reasonable.

Karin's Response: Nothing further to add.

6. Do you have any comments, suggestions, or recommendations regarding the project?

Katelyn's Response: ADEQ encourages the continued open communication between the PGA Site Project teams, agencies, cities, stakeholders and community action group. Continued discussion on optimization of the remedial actions and monitoring is important as the plumes continue to reduce in size and concentration.

Karin's Response: Nothing further to add.

Five-Year Review Interview Record
Interview Questionnaire

Site: Phoenix-Goodyear Airport

EPA Identification Number: AZD980695902

Date: 04/04/2025

Interviewee Name	Organization	Title	Telephone	Email
Kirk Beaty	City of Avondale	Director of Public Works	Not Provided	kbeaty@avondaleaz.gov

Questions

1. What is your overall impression of the project?

It appears that the project is moving along as anticipated. I've had no concerns about how the project is impacting the City of Avondale.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

Nothing routine. We listen in on meetings occasionally and will communicate with the EPA Project Manager on an as needed basis.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

None.

4. Do you feel well informed about the site's activities and progress?

Yes.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

None.

6. Do you have any comments, suggestions, or recommendations regarding the project?

None.

Five-Year Review Interview Record
Interview Questionnaire

Site: Phoenix-Goodyear Airport

EPA Identification Number: AZD980695902

Date: 04/01/2025

Interviewee Name	Organization	Title	Telephone	Email
Ray Diaz	City of Goodyear	Water Resources and Sustainability Manager	623-882-7593	ray.diaz@goodyearaz.gov
Larry Williams	City of Goodyear – GHD Group	Senior Project Manager	602-216-7238	larry.williams@ghd.com
Russell Cote	City of Goodyear – GHD Group	Senior Project Manager/ Geologist	602-216-7218	Russell.Cote@ghd.com

Questions

1. What is your overall impression of the project?

Overall, the project is progressing well. The project is well managed with no concerns regarding the project.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

The only routine communications our office has are the monthly project management meetings and the technical meetings.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

There have been no complaints or incidents which have required any serious action. The city did raise a concern regarding one of their wells and the EPA responded quickly, and addressed their concerns regarding the well.

4. Do you feel well informed about the site's activities and progress?

The monthly project management meetings and the technical meetings keep us and the city well informed of the progress of the project as well as any changes.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

The overall management of the project has been good. The EPA, Haley & Aldrich, and EHS project managers have managed the project well and are always accessible and quick to answer any of our or the city's questions.

6. Do you have any comments, suggestions, or recommendations regarding the project?

We are currently satisfied with how the project is managed and progressing and we and the city have no other suggestions or recommendations.

Five-Year Review Interview Record
Interview Questionnaire

Site: Phoenix-Goodyear Airport

EPA Identification Number: AZD980695902

Date: 03/31/2025

Interviewee Name	Organization	Title	Telephone	Email
Keith Drunasky	City of Litchfield Park	City Engineer & Community Development Director	623-889-6208	Kdrunasky@litchfieldpark.gov

Questions

1. What is your overall impression of the project?

Overall, City staff has been happy with how the project has moved forward, the data presented, the format of some of the data, project team knowledge, responsiveness, and attention to detail.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

Litchfield Park has not completed routine inspections or site visits, only occasional, as-needed. Staff does regularly attend the PGA North and South update/progress and Community Advisory Group meetings. The purpose is to continue to stay updated on status of PGA project activities, status of the contaminations plumes, the limits, test results, etc. and to provide updates to City Council and City Staff.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

Not that I am aware of.

4. Do you feel well informed about the site's activities and progress?

Yes.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

The only concern I have is that the back up for the various reports that are commented on or reviewed is never attached to those review letters, and the final versions are not sent out. Individuals have to know what they are looking for on the various data share sites and download. It would be more helpful that each review document has the original completed document and/or the final completed document with all attachments, whether is attached to the email or as a link for a direct download.

6. Do you have any comments, suggestions, or recommendations regarding the project?

Other than what was previously mentioned, no.

Five-Year Review Interview Record
Interview Questionnaire

Site: Phoenix-Goodyear Airport

EPA Identification Number: AZD980695902

Date: 04/08/2025

Interviewee Name	Organization	Title	Telephone	Email
Peter Minarik	Community Advisory Group	Co-Chair	202.309.2398	pminarik09@yahoo.com

Questions

1) What is your overall impression of the project?

I consider the project very valuable to ensure water quality in a heavily populated part of the country.

2) What effects have site operations had on the surrounding community?

The surrounding community has not been inconvenienced in any manner by site operations.

Regarding public sentiment, there is general confidence that continued operations will ensure water used for household consumption purposes is safe and non-toxic.

3) Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

No.

4) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

No.

5) Do you feel well informed about the site's activities and progress?

Yes. To that, two public meetings are held each year during which progress on the cleanup is reported to attending persons.

6) Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

No.

7) Do you have any comments, suggestions, or recommendations regarding the project?

Yes.

Projects such as Phoenix-Goodyear Airport are essential to the current and future health and wellbeing of the citizenry.

For decades throughout the 20th Century, the nation's air and water were dangerously polluted to the detriment of public health.

The Phoenix-Goodyear Airport project is addressing the harm done to the water supply in past decades. It is essential to the current and future health and wellbeing of the citizenry that these endeavors continue with both public and private support.

Five-Year Review Interview Record
Interview Questionnaire

Site: Phoenix-Goodyear Airport

EPA Identification Number: AZD980695902

Date: 04/11/2025

Interviewee Name	Organization	Title	Telephone	Email
Diane Krone	Community Advisory Group	Member and Former Co-Chair	602-697-5918	madreekrone@yahoo.com

Questions

1. What is your overall impression of the project?

It is a worthwhile project. Any effort to restore an aquifer is valuable especially in the desert. It does take cooperation from all parties to get the job done.

2. What effects have site operations had on the surrounding community?

It makes it more difficult to drill drinking water wells and in the early days several municipal wells had to be shut down because of contamination that went un-checked. The quality of drinking water in a community is highly important.

3. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

I am not aware of any because the area is growing so fast I think this issue is the last thing on people's minds.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

No.

5. Do you feel well informed about the site's activities and progress?

I feel certainly more informed than the average person since I am a member of the citizen committee.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

I suggest you make more of a serious effort to form an alliance with the City Officials so that there is more of a desire within the City to work with these efforts and more of a desire to move approvals.

7. Do you have any comments, suggestions, or recommendations regarding the project?

Yes, please continue to be innovative to see if faster progress can be made in the restoration and containment.

Five-Year Review Interview Record
Interview Questionnaire

Site: Phoenix-Goodyear Airport

EPA Identification Number: AZD980695902

Date: 03/31/2025

Interviewee Name	Organization	Title	Telephone	Email
Ernie Marks	Crane Company Contractor – EHS Support LLC	Project Coordinator/ Senior Scientist	850-284-5629	ernie.marks@ehssupport.com
Kathleen Johnson	Crane Company Contractor – EHS Support LLC	Senior Engineer	412-598-3206	Kathleen.Johnson@ehs-support.com
Tom Vanaskey	Crane Company Contractor – BLUF Contracting LLC	Lead Operator	623-670-3236	trv@blufcontracting.com

Questions

- 1. What is your role in the project (e.g. property owner, groundwater user, drinking water provider, impacted adjacent property, consultant)?**

Project Coordinator representing Crane Company.

- 2. How do you interact with the Superfund Project Manager regarding concerns with the cleanup?**

Semiannual, Monthly and Weekly reporting. Semiannual and monthly meetings on project status. Correspondence as needed or required by the Consent Decree.

- 3. Has a private well or a non-public water system ever served the property? Can you provide details?**

There are no potable wells on the property. All wells on site are for monitoring, extraction or injection.

- 4. Do you have evidence or prior knowledge that a public or private well, water system, or aquifer has been designated contaminated by any government or health agency? Please describe.**

We are operating a Comprehensive Environmental Response, Compensation, and Liability Act Superfund Site where groundwater impacts have been documented.

- 5. Do you review any of the published data/reports and what is your overall impression of the project? (If the answer is no continue on to question 12).**

Yes, we review and/or generate reports. The project has made significant progress over the last few 5-year reports. Significant mass, concentration and areal extent reductions have been documented showing the success of the remedy at this site.

- 6. When you are reviewing the monitoring data, are there any trends that show contaminant levels decreasing?**

Yes, this has been the prevailing theme since 2017. These are documented in each of our reports.

- 7. Is the cleanup functioning as expected and how well is it performing?**

Yes. The project has made significant progress over the last few 5-year reports. Significant mass, concentration and areal extent reductions have been documented showing the success of the remedy at this site.

- 8. Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities?**

Yes. Operational staff are on-site during typical business hours and are on call and monitor the site remotely. Activities include operation, repair, maintenance and construction needs.

- 9. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? Please describe changes and impacts.**

Yes. Successful remediation efforts have resulted in the elimination and/or reduction in frequency of monitoring across the site. The only additional monitoring that has occurred is those requested by ADEQ to be consistent with its program authority under the EPA for site 33A and occasional synoptic sampling where requested to fill data gaps.

10. Have there been unexpected O&M difficulties at the site in the last five years (e.g. fence damage, vandalism, storm damage)? If so, please give details.

We routinely deal with vandalism, maintenance activities outside of our purview that encroach on our site from others or impacts from other parties that we have no control over and that are not adequately communicated to us.

11. Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and desired results or improved efficiency (e.g. better warning system for groundwater wells, repair/replace outdated equipment).

The PGA North site has been recognized several times by the agencies and the public for our modernization efforts, advanced reporting techniques, equipment standardization (allowing us to stock common components and pumps that can be used at various locations, limiting down times and supply chain issues observed at other sites), optimization of monitoring and operations (to reduce remedial times where such areas may be impacted by stagnation zones, etc.). Recent upgrades to telemetry and communication systems have further enhanced our ability to monitor, adjust, remotely activate/deactivate, troubleshoot and extend the life of components.

12. Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the recovery of the existing contamination or how the cleanup will be conducted?

Not at this time.

13. Do you have any comments, suggestions, or recommendations regarding the project?

The current modernization and optimization efforts continue to serve to expedite remedial timeframes, protect public health and reduce the potential for any further impacts from past activities. Further coordination on optimization efforts in areas with low concentrations (<30 parts per billion) should be considered, under adaptive management, to test operational modifications that can further speed up remedial efforts and focus resources in areas where the most benefit may be had.

14. Do you wish to be included in the contact roster for receiving additional data reports or Five Year Reports?

Yes.

Five-Year Review Interview Record
Interview Questionnaire

Site: Phoenix-Goodyear Airport

EPA Identification Number: AZD980695902

Date: 05/06/2025

Interviewee Name	Organization	Title	Telephone	Email
Kendall Wilson	Goodyear Tire & Rubber Company	Senior Manager, Global Remediation	330-907-4123	kendall_wilson@goodyear.com
Emily Gloeckler	Goodyear Tire & Rubber Company	Senior Project Manager	440-865-7486	emily_gloeckler@goodyear.com
Scott Zachary	Goodyear Tire & Rubber Company Contractor – Haley & Aldrich	Vice President	619-993-1791	SZachary@haleyaldrich.com

Questions

- 1. What is your role in the project (e.g. property owner, groundwater user, drinking water provider, impacted adjacent property, consultant)?**

Potentially responsible party representative/project manager

- 2. How do you interact with the Superfund Project Manager regarding concerns with the cleanup?**

Via emails, phone calls, on-line meetings, in-person meetings

- 3. Has a private well or a non-public water system ever served the property? Can you provide details?**

The former Goodyear Aerospace property had 4 water supply wells. There are 3 existing operating water supply wells on that property.

- 4. Do you have evidence or prior knowledge that a public or private well, water system, or aquifer has been designated contaminated by any government or health agency? Please describe.**

Two aquifers are contaminated. The Subunit A aquifer and the Subunit C aquifer.

- 5. Do you review any of the published data/reports and what is your overall impression of the project? (If the answer is no continue on to question 12).**

Project is well run and potentially responsible party is proactive in cleanup operations.

- 6. When you are reviewing the monitoring data, are there any trends that show contaminant levels decreasing?**

yes

- 7. Is the cleanup functioning as expected and how well is it performing?**

The cleanup is functioning as expected and performs well.

- 8. Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities?**

On-site full-time operator with other support as necessary.

- 9. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? Please describe changes and impacts.**

The biggest change is the identification of 2 new Subunit C plumes not previously known. Both plumes are being actively remediated.

- 10. Have there been unexpected O&M difficulties at the site in the last five years (e.g. fence damage, vandalism, storm damage)? If so, please give details.**

The major unexpected difficulty has been the change in “operation” of the Bullard Wash irrigation ditch. There has been an unexpected and increased amount of water being discharged in the ditch upstream which affects continuous operation of the Subunit C treatment systems.

11. Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and desired results or improved efficiency (e.g. better warning system for groundwater wells, repair/replace outdated equipment).

Yes. Continuous upgrading and improving equipment and systems. Upgrades to the communication system by installation of fiber optic cables. Installation of a new extraction well and treatment system to improve mass removal and plume reduction (E-104). Installation of additional injection wells to improve flush kinetics in Subunit A. Installation of a cross-connect line to add operational flexibility to the injection system.

12. Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the recovery of the existing contamination or how the cleanup will be conducted?

The PFAS Maximum Contaminant Levels may affect operation and treatment. PFAS assessment is pending EPA approval of the sampling work plan.

13. Do you have any comments, suggestions, or recommendations regarding the project?

[No response]

14. Do you wish to be included in the contact roster for receiving additional data reports or Five Year Reports?

no

Appendix H: Site Inspection Report and Photos

Trip Report

Phoenix-Goodyear Airport (North and South Areas) Superfund Site (Site), Goodyear, Arizona

1. INTRODUCTION

- a. Date of Visit: February 13, 2025; Time of Visit: 08:00-03:28 PM MST
- b. Location: Goodyear, Arizona
- c. Purpose: A Site visit was conducted to visually inspect and document the conditions of the remedy, the Site, and the surrounding area for inclusion in the Five-Year Review Report.
- d. Participants:

Alan Pacheco Malagon	EA Engineering, Science and Technology, Inc., (EA)	916-604-4375
Vicky Wiraatmadja	U.S. Environmental Protection Agency (EPA) Region 9	415-972-3175
Katelyn Kane- DeVries	Arizona Department of Environmental Quality	602-771-0167
Emily Gloeckler	Goodyear Tire & Rubber Company	440-865-7486
Kendall Wilson	Goodyear Tire & Rubber Company	330-907-4123
Scott Zachary	Haley and Aldrich	619-993-1791
Nicole Park	Haley and Aldrich	Not Provided
Andrew Prichard	Haley and Aldrich	Not Provided
Kathleen Johnson	EHS Support	412-598-3206
Tom Vanaskey	EHS Support	855-244-8125

2. SUMMARY

The EPA conducted the Site inspection on February 13, 2025, as part of the Fifth Five-Year Review. The Site is divided into two areas, Phoenix Goodyear Airport (PGA) South and PGA North. The PGA South inspection was conducted in the morning and the PGA North inspection was conducted in the afternoon. Each inspection consisted of a safety meeting, followed by a brief discussion of the Site history and background, discussion of the status of the remedies,

and a tour around the individual areas. The inspection included visual observation of overall Site conditions and inspection of remedy components of the Site. The groundwater treatment plants are operated daily by their respective managers.

3. DISCUSSION

On February 13, 2025, Alan Pacheco Malagon (EA) and Vicky Wiraatmadja (EPA) arrived at the Phoenix-Goodyear Airport at 8:00 am to meet for the Five-Year Review Inspection. The weather was sunny, calm, and in the low 50 degrees Fahrenheit. The PGA South Site visit participants met at the City of Phoenix Aviation Authority Airport lobby where a safety and introduction meeting was held. Scott Zachary (Haley and Aldrich) gave an overview and history of the project and Site.

The PGA South Site visit participants proceeded to tour the Site and the remedy components. Access to the PGA South area is restricted to badged personnel through security gates. The PGA South Site visit participants inspected Subunit A injection wells INJ-02 and INJ-05, extraction well E-20, and observation well EA-20. The wells and associated components such as flow meters, valves, and pressure gauges observed as working and operating properly. Goodyear Tire and Rubber Company recently installed fiber optic lines to improve communication to the entire treatment system. The conveyance system is below ground surface and is well marked by purple indicators.

At PGA South, there is a “cross connect” vault where the original main line systems and new main line systems are integrated. The vault was tidy and in working order.

The main control system for PGA South is housed in the Subunit A Groundwater Treatment System control room along with project documents (e.g. Spill Response Plan, Health and Safety Plan and Safety Data Sheets). The main controls include emergency shut-off buttons connected to the PGA South groundwater treatment systems. Airport personnel and PGA South personnel are regularly trained on emergency shut-off and associated procedures.

Scott Zachary (Haley and Aldrich) described the treatment system operations. The Subunit A groundwater treatment system uses sulfuric acid to lower pH before treating water with an air stripper. Treated water is either reinjected, used for irrigation, or sent to nearby baseball fields. Operations are automated with data loggers, and records are stored electronically. The system operator is labeling components with QR codes linking to manuals. Discharge to the irrigation canal stops when water reaches a set level.

Following the discovery of a new TCE plume in Subunit C in the southwest portion of PGA South, Goodyear Tire and Rubber Company began construction of the Subunit C Southwest Treatment System in late 2024 and was under construction during the Site inspection. The Subunit C Southwest Treatment System is estimated to be completed by May 2025 and have a capacity of approximately 750 gpm. It will consist of two 2,000-lbs liquid phase granular activated carbon (LGAC) vessels and an equalization tank.

To prevent the possibility of algae growth in normally white equalizing tanks, the PGA South system operators replaced white equalization tanks with black equalization tanks inhibiting the sunlight that promotes algal growth.

The operator noted that one of the main challenges during the past five years was sourcing parts and equipment due to COVID-19-related supply chain disruptions. To address this, spare parts are kept in stock, and a quarterly inventory is conducted.

The PGA South Site visit participants examined extraction well E-103 while it was under construction. The well was properly covered, and the pit perimeter was secured with orange delineators. The final item inspected was the utility vault and the PGA South Site visit participants observed the vault to be in good condition. The PGA South inspection concluded at 11:30 am.

At 12:00 pm, Alan Pacheco Malagon (EA) and Vicky Wiraatmadja (EPA) arrived at the PGA North Main Treatment System. The weather was sunny, calm, and approximately 50 degrees Fahrenheit. The EHS personnel (Kathleen Johnson and Tom Vanaskey) conducted an overview and history of the project and Site at the Main Treatment System office trailer. Major improvements highlighted by Environmental, Health and Safety were the rewiring of the programmable logic controller, mitigation (relocation) of the instability of LGAC vessels due to wood-eating organisms, and the construction of new warehouses near existing monitoring wells.

The Site inspection started at the Main Treatment System. The primary components of the Main Treatment System are equalization, ion-exchange, LGAC, and discharge tanks.

In 2023, operators carried out a flushing initiative that included continuous injection of treated groundwater from the Main Treatment System into injection well, AEW-01, from June through November, followed by a rebound test in November. The rebound test determines how effective the groundwater remediation system is. The operators then performed a two-week pulse injection between February and October 2024. The pulse injection is a pulsing on and off

shutdown of the system to determine effectiveness of the system. The treated groundwater was discharged to injection wells.

The PGA North Site visit participants inspected the Satellite Groundwater Treatment Systems, EA-05, EA-06, EA-08, and 33A.

The top and sides of the LGAC vessels for groundwater treatment system EA-05 had noticeable corrosion which could be the result of reoccurring leaks or improper sealing. On the EA-05 eastern vessel, there was a noticeable amount of corrosion on one of the pipes and valves.

The PGA North Site visit participants observed pooling within the secondary containment concrete pad. Operators had recently changed the bag filters and hung them to dry, the pooling could be from the changing of the filters or a possible leak. Groundwater treatment systems EA-06, EA-08, and 33A appeared to be in good working condition and operating as intended.

Extraction well EA-12 was under construction at the time of the Site visit. It was mentioned during the inspection that EA-10 did not have a flow meter, installation is anticipated pending approval of work plan. Currently, mass balance calculations are used to estimate water flows.

The main treatment system and the satellite treatment system lines are well marked with color coding and arrows to show the direction of the liquid processes. The groundwater treatment areas have restrictive signage (e.g. no trespassing signs) posted at their respective main entrances with emergency contact information. Additionally, each treatment area has a security system and is surrounded by a concrete block wall. The access gate is locked when unattended.

Some monitoring wells are located within the loading and unloading area of the new warehouses. Agreements will likely be necessary to access the monitoring wells in the future.

Alan Pacheco Malagon
Environmental Engineer
EA Engineering, Science, and Technology, Inc.

Site Visit Photos



Photograph 1. February 13, 2025, 08:25 AM
PGA South injection well INJ-05 cross connect vault. Facing west.



Photograph 2. February 13, 2025, 08:51 AM
PGA South injection well INJ-02 vault. Facing northwest.



Photograph 3. February 13, 2025, 09:23 AM
PGA South Subunit A acid storage tank within secondary containment. Facing south.



Photograph 4. February 13, 2025, 09:23 AM
PGA South Subunit A air stripper. Facing southwest.



Photograph 5. February 13, 2025, 10:22 AM

PGA South Subunit C Southwest treatment system under construction. Facing northwest.



Photograph 6. February 13, 2025, 10:33 AM

PGA South Subunit C LGAC vessels. Facing northeast.



Photograph 7. February 13, 2025, 10:42 AM
PGA South Subunit C LGAC vessels. Facing north.



Photograph 8. February 13, 2025, 10:57 AM
PGA South extraction well E-104 under construction. Facing south.



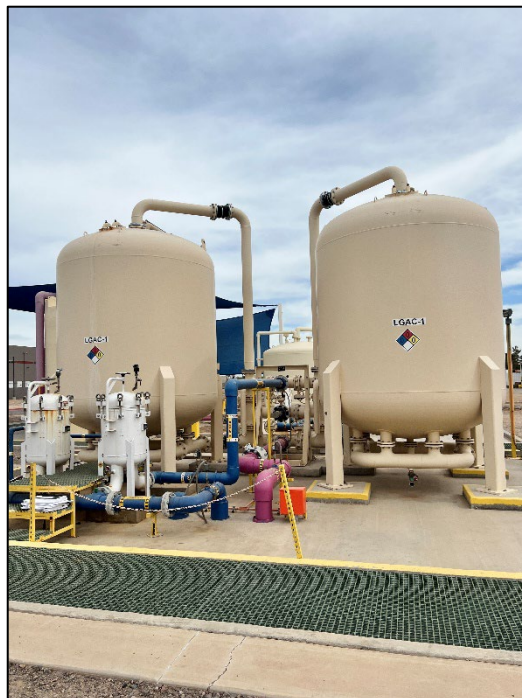
Photograph 9. February 13, 2025, 12:34 PM
PGA North main treatment system process lines. Facing southwest.



Photograph 10. February 13, 2025, 12:42 PM
PGA North main treatment system ion exchange vessels. Facing east.



Photograph 11. February 13, 2025, 12:48 PM
PGA North main treatment system LGAC vessels (LGAC 2/3). Facing north.



Photograph 12. February 13, 2025, 01:00 PM
PGA North main treatment system LGAC vessels (LGAC 1). Facing west.



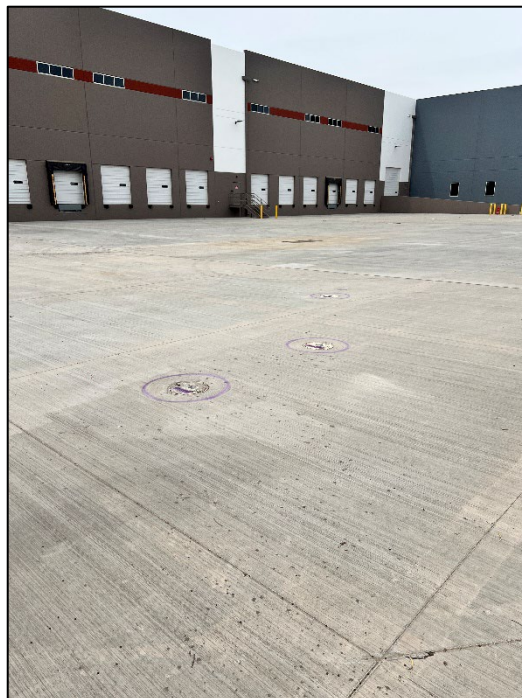
Photograph 13. February 13, 2025, 01:22 PM
PGA North main treatment system LGAC vessels (LGAC 4). Facing east.



Photograph 14. February 13, 2025, 01:29 PM
PGA North extraction well EA-14 control panels. Facing east.



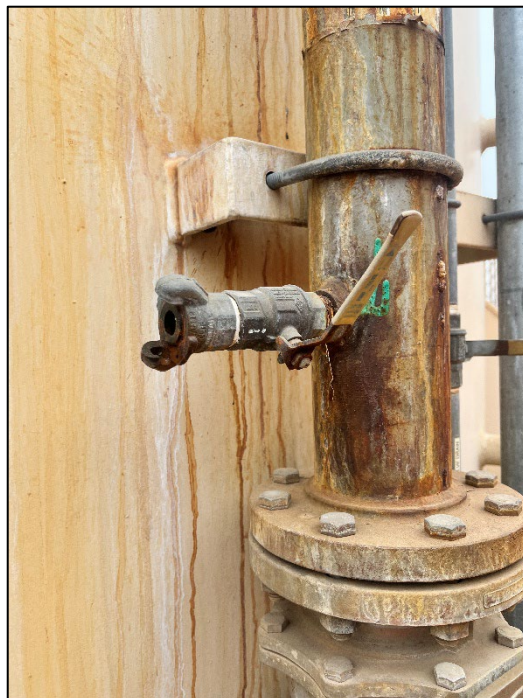
Photograph 15. February 13, 2025, 01:31 PM
PGA North injection well AEW-01 (potential use for additive emplacement). Top view.



Photograph 16. February 13, 2025, 01:34 PM
PGA North groundwaters monitoring wells MW-5B, SAC MW-04A. Facing northwest.



Photograph 17. February 13, 2025, 01:48 PM
PGA North groundwater treatment system EA-05 LGAC vessels. Facing north.



Photograph 18. February 13, 2025, 01:51 PM
PGA North groundwater treatment system EA-05 corroded pipe. Facing south.



Photograph 19. February 13, 2025, 02:11 PM
PGA North groundwater treatment system EA-06 LGAC vessels. Facing north.



Photograph 20. February 13, 2025, 02:27
PGA North groundwater treatment system EA-08 LGAC vessels. Facing northeast.



Photograph 21. February 13, 2025, 02:43
PGA North groundwater treatment system 33A LGAC vessels. Facing west.



Photograph 22. February 13, 2025, 02:53
PGA North Treated groundwater discharge into the Roosevelt Canal. Facing east.



Photograph 23. February 13, 2025, 03:28

PGA North sign at entrance to the main treatment system. Facing south.