FOURTH FIVE-YEAR REVIEW REPORT FOR
KERR-McGEE SUPERFUND SITE
CARIBOU COUNTY, IDAHO

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Date

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

List of Figures

Appendixes

LIST OF ABBREVIATIONS & ACRONYMS

µg/L	microgram per Liter
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
City	City of Soda Springs
COC	contaminant of concern
EPA	U.S. Environmental Protection Agency
FYR	Five-Year Review
GEMT	Greenfield Environmental Multistate Trust
IC	Institutional Control
ICP	Institutional Control Plan
KMCC	Kerr McGee Chemical Corporation
MCL	maximum contaminant level
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PSL	Project Screening Level
RAO	Remedial Action Objectives
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SRI	Supplemental Remedial Investigation Report
TBP	tributyl phosphate
TPH	total petroleum hydrocarbon
Trust	Greenfield Environmental Multistate Trust, LLC

I. INTRODUCTION

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

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 (42 U.S.C § 9621), consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the fourth FYR for the Kerr-McGee Chemical Corporation Superfund Site (Site). This statutory review was prompted by the completion date of the previous FYR. The FYR was prepared because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

The Kerr-McGee Chemical Corporation Superfund Site FYR was led by Allan Erickson/Hydrogeologist (CH2M HILL, Inc. [CH2M]) Other participants from CH2M included Jeff Schut/ Risk Assessor, Greg Warren/Geologist, and Dennis Smith/ Sr. Technical Consultant. The Greenfield Environmental Multistate Trust, LLC (Trust) was notified of the initiation of the FYR, which began in January, 2017.

Site Background

The Site is located within Idaho's Bear River Basin, characterized by broad, flat valleys with a few scattered topographic features that include cinder cones, rhyolitic domes, and uplifted fault blocks. The Site lies in a valley at approximately 6000 feet above mean sea level in elevation. The valley is bordered by northwest trending mountain ranges reaching approximately 8000 feet above mean sea level in elevation.

The northern boundary of the Bear River Basin drainage basin is formed by the Blackfoot Reservoir, located approximately 13 miles north of the Site. Surface drainage in the valley is predominantly to the south. The regional groundwater flow is north to southeast. Natural springs are important hydrologic features of the basin and emerge at several locations to the ground surface as result of discharge from the underlying groundwater aquifer. The Record of Decision (ROD) specified that no floodplain zones, endangered species, or historical or archeological sites are known to exist in the immediate vicinity of the Site. A review of current information from the Idaho Fish and Wildlife Office specified that the Canada Lynx is the only species on the threatened list for Caribou County. A small wetland (Finch Spring/Pond) is present approximately 1 mile south of the Site.

The industrial chemical manufacturing facility originally owned by Kerr McGee Chemical Corporation (KMCC) is approximately 50 acres in size and is located approximately 3 miles north of Soda Springs, Idaho, on State Route 34. The facility was in operation between 1963 and 2009. KMCC acquired approximately 547 acres of additional land to the south of the industrial facility where deed restrictions were placed because of elevated concentrations of Site-related contaminants. There are no current operations at the Site. The area surrounding the Site is agricultural (primarily grain crops). Directly across State Route 34 to the west is the large Monsanto Corporation phosphate processing plant. The entire area north of Soda Springs is rural in nature (see Figure 1 [all figures are located at the end of this report ahead of the appendixes]).

Groundwater is the main source of drinking water in the vicinity of the Site, with Formation Spring and Ledger Spring complex serving as the sources of drinking water for the City of Soda Springs (City). Formation Spring is located northeast of the industrial facility and is upgradient, and Upper and Lower Ledger Springs are located to the south of the industrial facility. Water quality sampling from 1990 through 2011 has shown Site-related contaminant concentrations to be extremely low at Upper and Lower Ledger Springs, well below risk-based performance standards established for the Site and maximum contaminant levels (MCL) (not detected in many cases). Additionally, a number of domestic water wells may be located in the vicinity of the Site, some of which are located downgradient of the industrial facility.

In January 2009, Tronox, Inc. (owners and operators of the Site) filed for Chapter 11 bankruptcy. As part of the resolution of the bankruptcy, Tronox ceased operations at the Site and established, with the United States (U.S.), the State of Idaho and other states, an environmental response trust that that took ownership of, and is responsible for the cleanup of, the former Tronox properties, including the Soda Springs Site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Kerr-McGee Chemical Corporation (Soda Springs)		
EPA ID: IDD041310707		
Region: 10	**State:** ID	**City/County:** Soda Springs/Caribou
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA *[If "Other Federal Agency", enter Agency name]*:		
Author name (Federal or State Project Manager): Kathryn Cerise		
Author affiliation: EPA Region 10		
Review period: 5/1/2017 - 9/26/2017		
Date of site inspection: 5/18/2017		
Type of review: Statutory		
Review number: 4		
Triggering action date: 9/26/2012		
Due date *(five years after triggering action date)*: 9/26/2017		

II. RESPONSE ACTION SUMMARY

The following sections provide a summary of the response actions conducted at the Site.

Basis for Taking Action

The basis for taking action was the findings of the human health risks associated with the contaminated groundwater originating from the Site. Human health risk was also associated with ingestion, or direct contact, with roaster reject material, known to have high vanadium concentrations. The ROD designated arsenic, manganese, molybdenum, vanadium, TBP, and TPH as the Contaminants of Concern (COCs).

Response Actions

The ROD for the Site was signed on September 28, 1995, and amended on September 13, 2000. The selected remedy addresses the three media of concern: groundwater, roaster reject, and windblown calcine. The remedy selected for groundwater included elimination of uncontrolled liquid discharges from the Site (the main source of

groundwater impacts), recycling of solid sources (later amended), groundwater monitoring, and institutional controls.

Remedial Action Objectives

The remedial action objectives (RAO) for the Site are as follows:

- Prevent the transport of COCs from facility sources to the groundwater; transport may result in COC concentrations in groundwater exceeding risk-based groundwater performance standards or MCLs for drinking water.
- Prevent ingestion by humans of groundwater containing COCs that have concentrations exceeding risk-based groundwater performance standards or MCLs.
- Prevent transport of COCs from groundwater to surface water in concentrations that may result in exceedances of risk-based groundwater performance standards or MCLs in the receiving surface water body.
- Prevent the ingestion/direct contact with the roaster reject area material having vanadium concentrations in excess of 14,000 milligrams per kilogram.
- The ultimate goal of the remedial action is to restore groundwater impacted by site sources to meet all risk-based groundwater performance standards or MCLs for the COCs (Table 3).

Remedy Components

The Remedial Action for the Site selected in the ROD as modified in the ROD amendment included the following:

- Elimination of uncontrolled liquid discharges from the Site
- Placing solids from the ponds into an onsite landfill
- In-place capping of the windblown calcine, roaster reject, reject fertilizer, and active calcine tailings
- Semiannual COC groundwater monitoring, to determine the effectiveness of source control (changed to annual monitoring beginning in 2016)
- Establishment of institutional controls (deed restrictions; limit Site access; well restrictions and/or well-head protection) in affected areas downgradient of the industrial facility to prevent ingestion of groundwater for as long as the groundwater exceeds the risk-based concentrations.

The ROD contains a provision whereby the remedy and/or performance standards are to be re-evaluated should contaminant levels in groundwater cease to decline and/or remain constant at levels higher than the remediation goal over some portion of the plume.

As part of the overall Site strategy, although not part of the selected remedy, KMCC developed a waste minimization/treatment plan to eliminate liquid discharges to groundwater from the facility within 2 years. The plan included the following:

- Construction of new lined ponds to contain the main source of groundwater contamination (S-X raffinate that discharged to leaking unlined ponds)
- Construction and operation of a phosphoric acid plant to consume scrubber water and calcine tailings to produce phosphoric acid, ammoniated phosphate, and gypsum fertilizers as marketable products

A ROD Amendment was signed on September 13, 2000, that changed the remedy for the reuse/recycling of the calcine tailings and roaster reject materials for use as fertilizer to containment. The fertilizer process did not prove successful, and the capping alternative for this waste material (which was included in the Feasibility Study) was subsequently selected as part of the remedy for the Site. The final remedy selection included capping of the calcine, roaster reject, and rejected (off-specification) fertilizer. The amended remedy also called for establishing institutional controls to prohibit activities on the capped area that could lead to unacceptable exposures to COCs. Figure 2 shows the facility features at the Site.

Status of Implementation

A Consent Decree (CD) issued by EPA was entered into court on August 21, 1997. In the CD, KMCC agreed to implement the ROD and pay past and future EPA costs.

The remedial action implementation took place in two parts because of the ROD Amendment. The initial remedial action consisted of construction of an onsite landfill for the S-X and Scrubber Pond solids. Remedial design began on December 16, 1996, was completed on July 17, 1997, and incorporated all remedy requirements described in the ROD except the institutional controls. The construction process began on July 17, 1997, and was functionally completed on October 10, 1997. In accordance with the selected remedy, which required "elimination of the uncontrolled liquid discharges as soon as practicable," the following actions were taken between 1995 and 1997:

- An onsite lined landfill was constructed to contain pond solids, and the three large unlined ponds were closed. The landfill was constructed with primary and secondary liners, leachate collection, and an engineered cover. Some of the waste in the ponds was saturated, so the leachate is collected from a sump in the bottom liner to contain within the landfill.
- To support continuing operations, KMCC constructed three lined ponds totaling 20 acres to replace the S-X Pond, which was one of three identified sources of groundwater contamination. Two high-density polyethylene- (HDPE) lined 5-acre ponds located north of the facility were constructed in 1996. An additional 10-acre HDPE-lined pond was constructed during August 1997. The S-X Pond was also located originally on the west side of the facility. The pond was taken out of service in 1995 and the location filled and planted. Sediments that were excavated from the pond were transported and contained in the onsite landfill with Scrubber Pond sediments.
- The Scrubber Pond, an identified second source of groundwater contamination, was replaced by adding two baghouse systems to the plant. The Scrubber Pond was located on the southeast corner of the facility, directly south of the recently capped calcine waste. The Scrubber Pond was operational for 22 years before the scrubbers were replaced by the baghouse. The sediments from the Scrubber Pond were removed and combined with the S-X waste sediment and contained onsite in the lined engineered landfill.
- The third source, calcine tailings placed in unlined ponds, was to be addressed by excavation and reuse/ recycling. Reuse/recycling was found to be impractical and cost prohibitive, and EPA issued an Amended ROD to change the remedy to another alternative evaluated in the Feasibility Study—consolidation and capping.

The ROD Amendment required some additional design work to consolidate the calcine waste stream and rejected fertilizer into a containment area and then cap. This waste stream ceased with the end of vanadium production in 1999, and the design and construction of the cap was initiated. The design of the Calcine Cap was received by EPA on February 18, 2001, and the design was finalized on May 4, 2001. The CERCLA-engineered, low-permeability, multi-layered cap over the calcine tailings was constructed in 2001.

The construction of the cap over the calcine landfill began with the regrading of the calcine pile beginning on May 8, 2001. The rejected fertilizer had been returned to the calcine pile in October 2000 in preparation of the capping action. The calcine waste containment area was covered with a medium-weight, plastic, and flexible membrane liner; geocomposite; subsoil; and topsoil. Fencing and seeding were the last actions and were completed in August 2001. An EPA Preliminary Close Out Report was completed on September 26, 2001, documenting that all the landfill caps were operational and functional and construction of the remedy was complete.

Institutional controls required in the ROD included deed restrictions, limiting access, and well restrictions and/or well-head protection to prevent human ingestion of contaminated groundwater and wells from being developed as sources of drinking water within the area of contamination. Additionally, institutional controls were required in the ROD Amendment to prohibit activities on the capped area that could result in an unacceptable exposure to the COCs.

KMCC was responsible for implementation, monitoring, and enforcement of the institutional controls. Implementation of institutional controls included the purchase of the Hopkins property south of the Site to gain control over the potential use of impacted groundwater. The contamination now extends beyond the former Hopkins property and onto City property. Other impacted properties include the railroad right-of-way and the State Route 34 right-of-way, both of which have tight controls over any potential subsurface explorations that could expose impacted groundwater. To restrict access, portions of the facility are fenced. However, proprietary controls related to groundwater use on the former industrial site were never developed or implemented. Similarly, no institutional controls have been established for areas downgradient of the facility overlying

contaminated groundwater.

In 2002, an infiltration basin was constructed on the north side of the calcine containment area to capture precipitation runoff from the cap. In 2004, another infiltration basin was completed on the south side of the cap. After observing snow drifts piling on the cap and increasing the amount of percolation through the cap, a snow fence was erected along the south side of the facility in line with the cap.

Groundwater

Groundwater modeling performed for the RI/FS predicted that levels of all COCs would achieve the health-based performance standards following completion of the source control actions. Current groundwater monitoring trends suggest that the performance standards for all COCs will not be achieved in the near future.

Institutional Control Summary Table

Table 1. Summary of Planned and/or Implemented Institutional Controls

Media, Engineered Controls, and Areas that Do Not Support Unlimited Use and Unrestricted Exposure Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or Planned)
Groundwater	Yes	Yes	City and privately-owned lands located downgradient of the current Site boundary impacted by COCs plume migration	Establish Drilling Area of Concern designation and obtain restriction agreements on current well use from private well owners.	Planned

Note:
IC = institutional control

Systems Operations/Operations and Maintenance

The Trust is currently conducting long-term operations and maintenance (O&M) at this Site. Currently, annual groundwater monitoring is occurring, with annual data reports sent to EPA for technical review. The cap and ponds are subject to detailed inspection for cracking, animal burrows, settlement, drainage, and fence and gate condition. O&M of the capped waste areas is limited to cap protection, cover crop, fencing, and erosion control. After the first year of installation, the scrubber/S-X landfill has not required any significant O&M to maintain the cap. Remedy components are inspected on a monthly basis, as described in the updated. A draft O&M Plan was submitted in late May 2017 to EPA for review.

III. PROGRESS SINCE THE LAST REVIEW

The remedy for the KMCC Site was identified as **not protective** during the third FYR conducted in 2012. That protectiveness statement is as follows:

> The remedy for the Kerr-McGee Chemical Corporation (KMCC) Site is currently not protective because of the following issues:
>
> 1. Concentrations of COCs in groundwater and surface water remain above MCLs and risk-based groundwater performance standards. Groundwater and surface water monitoring trends indicate that performance standards will not be met in the foreseeable future.
> 2. Institutional Controls have not been fully developed or implemented on Trust-owned property.
> 3. Institutional Controls have not been established or implemented for locations downgradient of the industrial facility where COCs exceed MCLs or risk-based groundwater performance standards.

4. Potential for domestic well usage downgradient of the former Kerr-McGee site has been identified.
5. Nature and extent of groundwater plumes of site-related COCs are not well defined, and the monitoring well network is not adequate to provide necessary information.
6. Fencing surrounding the landfill and calcine cap needs repair.
7. Current O&M Plan does not require routine monitoring in all capped areas.
8. Vanadium levels at Finch Spring have increased 150 percent since the ROD was signed, raising questions about current ecological risks.

The following actions need to be taken to ensure protectiveness:

1. Investigate and characterize possible additional sources of site-related COCs within the former Kerr-McGee facility.
2. Establish proprietary controls for Trust-owned property.
3. Develop an Institutional Control Plan and implement institutional controls governing groundwater use at locations downgradient of the industrial facility where COCs are known to exceed MCLs or risk-based groundwater performance standards.
4. Investigate current (and potential future) usage of domestic wells downgradient of the industrial facility and their relationship to the groundwater plume(s).
5. Augment/expand existing groundwater monitoring network and/or perform additional characterization work to better define plumes.
6. Repair identified fence sections located at the landfill and calcine caps.
7. Develop and implement a facility-wide O&M Plan.
8. Evaluate potential risks to ecological receptors in areas downgradient from the industrial facility.

The following table includes the protectiveness determinations, statements, recommendations, and status of recommendations from the last FYR.

Table 2. Status of Recommendations from the 2012 FYR

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Concentrations of COCs in groundwater and surface water remain above MCLs and risk-based groundwater performance standards. Groundwater and surface water monitoring trends indicate that performance standards will not be met in the foreseeable future.	Investigate and characterize possible additional sources of site-related COCs within the former Kerr-McGee facility.	Ongoing	A multi-phased supplemental remedial investigation was conducted at the Site. This investigation included the installation and sampling of additional monitoring wells and springs, as well as source area characterization sampling. The additional sampling included areas downgradient of the Site into the town of Soda Springs. The draft report was submitted in June 2017 and is currently under technical review including the identification of additional data gaps.	

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
ICs have not been fully developed or implemented on Trust-owned property.	Establish proprietary controls for Trust-owned property.	Ongoing	The Trust has increased the Site inspections to confirm security and control of the Site. Trust is in proprietary control of the site. However, no Institutional Control Plan (ICP) has been submitted to agencies.	
Institutional Controls have not been established or implemented for locations downgradient of the industrial facility where COCs exceed MCLs or risk-based groundwater performance standards.	Develop an ICP and implement institutional controls governing groundwater use at locations downgradient of the industrial facility where COCs are known to exceed MCLs or risk-based groundwater performance standards.	Ongoing	No ICP has been developed for downstream locations and submitted to agencies. No current ICs in place for downstream locations.	
Potential for domestic well usage downgradient of the former Kerr-McGee site has been identified.	Investigate current usage of registered domestic wells downgradient of the former Kerr-McGee facility and relationship to the groundwater plume(s).	Completed	A domestic well survey and sampling event was conducted to investigate current usage of all wells potentially impacted by the Site. Currently, no drinking water wells were discovered to exceed the risk-based criteria.	April 2015
Nature and extent of groundwater plumes of site-related COCs are not well defined, and the monitoring well network is not adequate to provide necessary information.	Augment/expand existing groundwater monitoring network and/or perform additional characterization work to better define plumes.	Ongoing	A multi-phased supplemental remedial investigation was completed at the Site. This investigation included the installation and sampling of additional monitoring wells within and downgradient of the Site including the town of Soda Springs. The draft report was submitted in June 2017 and is currently under technical review including the identification of additional data gaps.	
Fencing surrounding the landfill and Calcine Cap needs repair.	Repair identified fence sections located at the landfill and Calcine Caps.	Completed	Repairs to fence sections were completed. Future repairs, as needed, will be covered under the O&M Plan.	June 2013
Current O&M Plan does not require routine monitoring in all capped areas.	Develop and implement a facility-wide O&M Plan.	Completed	A draft O&M Plan was submitted May 31, 2017 and contains the appropriate monitoring frequency for capped areas.	May 31, 2017
Vanadium levels at Finch Spring have increased 150 percent since the ROD was signed, raising questions about current ecological risks.	Evaluate potential risks to ecological receptors in areas downgradient from the industrial facility.	Ongoing	A *Draft Screening Level Human Health and Ecological Risk Assessment* Technical Memorandum was submitted in February 2017. Technical comments submitted in June 2017, identified multiple issues with the study including a missing Screening Level Problem Formulation.	

Note:
ICP = Institutional Control Plan

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available by publishing an announcement of the FYR for the Site in the *Caribou County Sun* on 6/16/2017, inviting the public to submit any comments to EPA. To date, no comments from the community have been provided.

On May 18, 2017, EPA met with the Mayor of Soda Springs and other City representatives. The meeting was to inform City officials of the current FYR and discuss any pertinent information related to the Site. No specific action items were developed, nor was updated information directly related to the FYR identified at that meeting.

Data Review

The semiannual water quality monitoring program has continued at the Site since 1991. Seventeen Site groundwater monitoring wells, four Evergreen Facility wells (added in 2013 located downgradient of current well network and outside property boundary), and four surface water/springs are included in the monitoring program (Figure 3). Groundwater flow in the area is in a west to southwest direction. The contamination plumes are found in both the shallow (up to 70 feet below grade surface) and deep (up to 250 feet below grade surface) basalt water bearing units.

Twenty-eight additional monitoring wells were installed in 2015 to 2017 including downgradient locations beyond the facility boundary into the town of Soda Springs. These locations assisted in characterizing and defining the extent of the COC plume. Results from sampling the new wells indicate that molybdenum plume has migrated significantly off the IC controlled boundary into Soda Springs (Figure 3). However, these have only been sampled once and therefore these data cannot be used to evaluate trends of COC concentrations at these downgradient locations. Therefore, the overall data trend discussion will focus on the FYR period of 2012 to 2017. At the time of this review, monitoring data for the Site were available through 2015. Groundwater concentrations of site-related COCs decreased significantly at most monitoring locations during the period following the implementation of the remedial actions. However, in many cases, trends have flattened above the Project Screening Levels (PSLs).

Table 3 presents a summary of groundwater concentrations and MCLs or risk-based performance standards; also called PSLs established in the ROD. The groundwater data presented in the table were collected from well KM-8, located southwest of the S-X Pond within the industrial site boundary, where the highest Site-related contaminant levels have been measured from the early 1990s through 2015.

Table 3. Concentrations of COCs and Risk-based Performance Standards
Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho

COC	Risk-based Performance Standard (PSL) (µg/L)	Highest Concentration RI/FS to Present (µg/L)	Current (September 2015) Highest Concentration (µg/L)	Location of Current Highest Concentration
Arsenic	50[a]	150 (2002)	72	KM-8
Manganese	180	8,770 (2010)	5,200	KM-8
Molybdenum	180	140,000 (1996)	45,000	KM-8
Vanadium	260	28,600 (2004)	18,000	KM-8
TBP	180	4,442 (1997)	850	KM-8
TPH	730	9,500 (1999)	730	KM-8

Note:
[a] The arsenic maximum concentration level was 50 µg/l at the time the ROD was issued. It was subsequently revised in 2001 to 10 µg/L.

Table 3. Concentrations of COCs and Risk-based Performance Standards
Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho

COC	Risk-based Performance Standard (PSL) (µg/L)	Highest Concentration RI/FS to Present (µg/L)	Current (September 2015) Highest Concentration (µg/L)	Location of Current Highest Concentration

µg/L = microgram per Liter
COC = contaminant of concern
RI/FS = remedial investigation/feasibility study
TBP = tributyl phosphate
TPH = total petroleum hydrocarbon

Water Quality Trends

Groundwater concentrations of site-related COCs had decreased significantly at most monitoring locations during the period immediately following the implementation of the remedial actions in 1997. However, in many cases, trends have flattened and not all groundwater cleanup goals have been met. In some locations, contaminant concentrations have increased.

During the third FYR period, groundwater trends for the COC concentrations revealed vanadium, molybdenum, and manganese in many wells had remained above the risk-based groundwater performance standards and have exhibited flattened (i.e. not decreasing) trends since the late 1990s. In some cases, concentrations of COCs at specific monitoring wells have been increasing over recent years. The highest concentrations for these contaminants were located generally downgradient of the former S-X pond, vanadium plant, and the former Scrubber Pond/Calcine cap (Figure 2). Concentrations in groundwater monitoring wells remained above the risk-based groundwater performance standards and current arsenic MCL at locations downgradient of the industrial facility. The downgradient springs have all diminished to below the risk-based standards.

Spring water and groundwater quality trends for each COC identified in the ROD and pertinent to this FYR period are discussed in the following text. Table 3 lists the ROD risk-based groundwater performance standards for surface water and groundwater. Figure 3 shows the location of groundwater monitoring wells. Specific trends for the Evergreen Facility and the new downgradient monitoring wells will not be discussed as a result of the small data set available.

Arsenic

The ROD identified a risk-based groundwater performance standard of 50 µg/L for arsenic, which was the established MCL at the time. For purposes of measuring progress toward restoring groundwater to its beneficial use as a drinking water source, groundwater concentrations of COCs are being compared in this review to the current arsenic MCL of 10 µg/L. Concentration trends of monitoring wells near the west side of the facility and near the former S-X Pond have decreased since 1995. Arsenic concentrations in those wells have remained consistent since 2007, with concentrations that are well below the MCL of 10 µg/L.

Three wells currently exhibit concentrations that are at or above the MCL for arsenic of 10 µg/L; KM-2, KM-3, and KM-8 (Figure 3). These same wells were also observed above the MCL during the 2012 FYR. Wells KM-2 (Figure 4) and KM-3 (Figure 5), monitoring wells located near the former Scrubber Pond/Calcine Cap, have trended relatively stable since 2012 with concentrations near 10 µg/L. Similar to KM-2 and KM-3, arsenic concentrations at Well KM-8, located southwest of S-X Pond, (currently 72 µg/L) remains above the MCL of 10 µg/L and has been stable between 2012 and 2015 (Figure 6).

Of the additional Evergreen Facility wells that are outside the property boundary, EV-2 was above 10 µg/L in 2013 (18 µg/L), but has been below the MCL in in 2014 and 2015. EV-1 exhibits an upward trend with concentrations of the latest sample just below the MCL (9.6 µg/L).

Manganese

Manganese concentrations in KM-3 and KM-8 currently remain above PSLs (Project Screening Level). Monitoring wells located near the former Scrubber Pond/Calcine Cap show variable manganese concentrations through the late 1990s, followed by decreasing concentrations (below PSL) to the present, with the exception of Well KM-3. Manganese concentrations in Well KM-3 have demonstrated an increasing trend from 2000 to 2012,

but has been relatively stable from 2013 to 2015 (Figure 5). KM-3 continues to exceed the PSL of 180 µg/L with a maximum concentration of 470 µg/L in 2015.

Manganese concentration trends at monitoring wells near the west side of facility, near and downgradient of the former S-X Pond, are generally variable with multiple spikes in concentrations at Well KM-6 in 2006, 2009, and 2011 (Figure 7). Concentrations at Well KM-6 from 2012 to 2015 have remained relatively stable and just below the risk-based groundwater performance standard of 180 µg/L with concentrations ranging from around 135 to 160 µg/L.

As shown in Figure 6, concentrations of manganese in Well KM-8 (currently 5,200 µg/L) remain significantly above the risk-based groundwater performance standard and exhibit the highest concentrations at the Site. Manganese concentrations in Well KM-8 have been somewhat stable since 2013.

Three of the offsite Evergreen Facility wells exceeded the PSL for manganese. Concentrations ranged from 500 µg/L at EV-3 to 940 µg/L at EV-1. EV-2 and EV-3 have exceeded the PSL for all three sampling events, while EV-1 did not exceed the initial sampling event in 2013.

Molybdenum

All monitoring wells located near and downgradient the Calcine Cap and former Scrubber Pond Area exhibit molybdenum concentrations above the risk-based groundwater performance standard of 180 µg/L, except for KM-11. KM-2 and KM-3 exhibit stable concentrations since 2012 as shown on Figure 8 and Figure 9, respectively. Since 2012 KM-4 (Figure 10), KM-11 (Figure 11), and KM-17 (Figure 12) exhibit slight decreases in molybdenum concentrations.

Except for wells KM-5, KM-9, KM-13, and KM-19; all monitoring wells have current concentrations that exceed the risk-based groundwater performance standard on the west side of the facility near the S-X Pond and plant production areas. KM-5 has exceeded the PSL in 2013 and 2014, but has shown a decreasing trend since 2014 to below the PSL (Figure 13). Concentrations at KM-6 have shown a decreasing trend from 2012 to 2014, but a slight increase was found during the most recent sampling events (Figure 14). Molybdenum concentrations at KM-7 have been variable, with an overall increasing trend above the PSL (Figure 15).

Well KM-8 continues to contain the highest level of molybdenum at the Site (currently 45,000 µg/L). Concentrations at KM-8 display an increasing trend from 2012 to present (Figure 16). KM-12, located near KM-8, also continues to exceed the PSL. Concentrations at KM-12 have shown a decreasing trend from 2012 to 2014, but recent sampling in 2015 indicates an increase (Figure 17) and concentrations are above the PSL. Concentrations at KM-13 have been stable from 2012 to 2015 and have remained just below the PSL (Figure 18).

Molybdenum concentrations in wells downgradient of the wells located near the S-X Pond Area (KM-15, KM-16, and KM-18) remain above the PSL. Data trends for molybdenum at Wells KM-15 (Figure 19) and KM-18 (Figure 21) have been stable during the FYR period. Concentrations at KM-16 have a decreasing trend from 2012 to present (Figure 20). Of the Evergreen Facility wells located downgradient of the property boundary, only EV-2 had concentrations below the PSL during all three sampling rounds.

Vanadium

Vanadium concentrations in all monitoring wells near and downgradient from the former Scrubber Pond and Calcine Cap, with the exception of wells KM-11 and KM-17, remain above the risk-based groundwater performance standards of 260 µg/L. Since 2012, KM-2 has displayed a slight decreasing trend (Figure 8) and KM-3 has exhibited slightly variable concentrations (Figure 9); in the same time period, KM-4 (Figure 10) has had a decreasing trend; but concentrations are above the PSL.

KM-19 is the only monitoring well that does not currently exceed the risk-based groundwater performance standard for vanadium on the west side of the facility near and downgradient of the S-X Pond and plant production areas. KM-5 has always exceeded the PSL and has shown a decreasing trend since 2012 (Figure 13). Like KM-5, concentrations at KM-6 have shown a decreasing trend from 2012 to 2015 (Figure 14). Vanadium concentrations have been variable at KM-7 with no discernible trend (Figure 15).

Well KM-8 continues to contain the highest level of vanadium at the Site (18,000 µg/L). Concentrations at KM-8 display an increasing trend during the period of the study (Figure 16). Concentrations at KM-12 have shown a stable trend from 2012 to 2015 (Figure 17). Concentrations at KM-13 have been stable from 2012 to 2015 and

have remained above the PSL (Figure 18).

Vanadium concentrations at the Evergreen Facility wells have all exceeded the PSL during most of the three sampling events. In 2015, concentrations in EV-2 and EV-3 decreased to just below the PSL to 250 µg/L.

Total Petroleum Hydrocarbons
Well KM-8 is the only well that is routinely sampled for TPH. Concentrations remained relatively stable above the PSL of 730 µg/L from 2012 to 2014 and then a decrease in 2015, but still above the PSL (Figure 22).

Tributyl Phosphate
Similar to TPH, Well KM-8 is the only well that is routinely sampled for tributyl phosphate. Concentrations of tributyl phosphate in Well KM-8 increased from 2012 to 2014, remaining above the PSL of 180 µg/L. In 2015 the concentrations decreased to below the PSL with a nondetection result (Figure 22).

Offsite Springs
Of the four offsite springs (Big Spring, Finch Springs, Upper Ledger, and Lower Ledger) sampled, Big Spring and Finch Spring have only shown historical exceedances of the risk-based groundwater performance standard for molybdenum. Concentrations of molybdenum in both Big Spring (located in the southern part of Soda Springs) and Finch Spring (north of Soda Springs) have shown a steady decline since 1998 (Figures 23 and 24). Over the FYR period, concentrations of molybdenum in these two springs continued to decline and remain below the PSL of 180 µg/L, while vanadium remained flat significantly below the PSL. All other COCs measured at Upper and Lower Ledger springs have consistently been well below risk-based groundwater performance standards.

Site Inspection

Site inspection was conducted on May 18, 2017. Steve MacNeil from Tetra Tech (representative of Trust) and Allan Erickson of CH2M (representative of EPA) were in attendance. The purpose of the inspection was to assess the protectiveness of the remedy and ongoing Site O&M (including the integrity of the caps, the condition of the monitoring wells, and restrictive fencing).

No significant findings were observed during the inspection. The fences were in place, no apparent issues were noted on the caps, and the monitoring wells were all in acceptable condition. The checklist is included in Appendix B and provides additional details regarding the condition and performance of the remedy.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

No. The remedy is currently not performing as intended based on a review of current groundwater data, a groundwater monitoring network that indicates a significant migration of COCs downgradient, and the failure to fully implement ICs. While the various components of the remedy have been constructed as designed, groundwater monitoring data continue to reveal, after initially decreasing, COC trends that are relatively flat since the late 1990s through early 2000s and persist above the risk-based cleanup goals identified in the ROD. In some cases, trends for certain COCs at specific monitoring wells have been increasing over the last several years.

While capping and other remedial actions intended to minimize the migration of contaminants to groundwater have been implemented (RAO), the persistence of COCs from Site sources above risk-based groundwater performance standards raises the uncertainty of the ability of the implemented remedy to achieve the goal of groundwater restoration. Groundwater cleanup performance standards have not been achieved through 2015, and data suggest that those standards will not be achieved in the foreseeable future. Current COC trends in groundwater suggest that active sources of COCs still exist at the Site.

In addition, a preliminary review of the recently submitted Supplemental Remedial Investigation Report (SRI) indicates that the COCs (molybdenum) have migrated above risk-based groundwater performance standards, south significantly beyond the property boundary into the town of Soda Springs (Figure 3).

The ROD included a requirement for KMCC to establish ICs as part of the remedy for the facility and for properties downgradient with underlying groundwater contamination. Of these controls (deed restrictions, limited

access, well restrictions, and/or well-head protection), only deed restrictions governing groundwater use for the property immediately south of the industrial facility (purchased by KMCC) have been established or implemented. Therefore, there are no safeguards in place to restrict certain types of use of groundwater in locations where site-related COCs in groundwater exceed established risk-based cleanup standards, now located within the town of Soda Springs.

A 2015 domestic well survey and sampling event was conducted to investigate current usage. The area of the study included all areas where wells that could have been potentially impacted by the plume from the Site. Currently, no drinking water wells were discovered to exceed the risk-based criteria.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question B Summary:

No. Although most of the exposure assumptions, toxicity factors, cleanup levels (risk-based performance standard levels or PSLs), and RAOs used at the time of the remedy are still valid, there are uncertainties in the offsite exposures to ecological resources and humans that require additional evaluation. In addition, several toxicity factors and Applicable or Relevant and Appropriate Requirements (ARAR) have changed since the ROD. Changes to the human health toxicity factors and related ARARs are not expected to affect the remedy. Recommended toxicity factors for ecological receptors were unavailable at the time of the original risk assessment and ROD. The toxicity factors currently recommended by EPA for ecological receptors are lower than were used in the risk assessment for several COCs and would result in higher risk estimates. It is uncertain to what extent these changes may affect the remedy (if any). The narrative below describes changes that have occurred since the remedy was selected, and whether those changes affect the validity of the remedy.

Changes in Standards and To-Be-Considered Criteria

Arsenic is the only COC with changes to the MCL since the ROD was published. EPA lowered the arsenic MCL from 50 to 10 µg/L (Table 4). There have been no additional changes in federal standards or criteria that affect the protectiveness of the remedy for groundwater.

Table 4. Changes in Chemical-Specific Standards

Contaminant	Media	ROD Cleanup Level	Standard	
			Previous	New
Arsenic	Groundwater	50 µg/L	50 µg/L	10 µg/L

Changes in Toxicity and Other Contaminant Characteristics

Human health oral toxicity factors for several contaminants evaluated during the risk assessment have changed since the time of remedy selection, including the arsenic cancer slope factor and arsenic, barium, chromium, manganese, uranium, and vanadium oral reference doses for noncarcinogenic effects. The changes to these toxicity factors were generally minor, except for uranium. In 2017, EPA changed its recommendation for the uranium oral reference dose lowering from 0.037 milligrams per kilogram per day to 0.0002 milligrams per kilogram per day. However, considering that uranium levels in soils at onsite and adjacent properties are generally consistent with those measured in background samples, this is not anticipated to affect the selected remedy. The inhalation toxicity factors used during the risk assessment are outdated for all contaminants because guidance for estimating risk from the inhalation pathway has changed since the time of the risk assessment (EPA, 2009). EPA (2009) now recommends using methodology for inhalation dosimetry that uses the concentration of the contaminant in air as the exposure metric (e.g., mg/m3), rather than inhalation intake of a contaminant in air (e.g., mg/kg-day). The impact of these changes on baseline risk is unknown without further calculations, although these methodology changes are unlikely to affect the remedy because exposures via the dust inhalation pathway are much less than through ingestion.

Ecological toxicity factors are not promogulated; however, EPA does provide recommendations in Ecological

Soil Screening Level (EcoSSL) documents. The toxicity factors currently recommended by EPA for several COCs differ from those that were used in the risk assessment. For example, the vanadium toxicity factors for birds used in the risk assessment and in the current vanadium Ecological Soil Screening Level are 5.5 and 1.19, respectively. Considering this, risk estimates for some COCs may have been understated in the risk assessment. It is uncertain if these differences in toxicity factors would change the overall findings of risk to wildlife populations.

Changes in Risk Assessment Methods

EPA has published many new risk assessment guidance documents since the ROD. The following new guidance documents were reviewed to verify that the remedy at the Site is valid:

- U.S. Environmental Protection Agency. 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final. June.
- U.S. Environmental Protection Agency. 2004. Risk Assessment Guidance for Superfund–Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final. July.
- U.S. Environmental Protection Agency. Various Dates 2005-2017. *Interim Ecological Soil Screening Level Documents*.
- U.S. Environmental Protection Agency. 2005a. Guidelines for Carcinogen Risk Assessment. March.
- U.S. Environmental Protection Agency. 2005b. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. March.
- U.S. Environmental Protection Agency. 2009. Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual – Part F, Supplemental Guidance for Inhalation Risk Assessment. January.
- U.S. Environmental Protection Agency. 2011. *Exposure Factors Handbook: 2011 Edition.*

Considering the ecological risk assessment was conducted prior to the release of EPA's 2009 *Ecological Risk Assessment Guidance for Superfund*, it is not unexpected to find that some elements of the guidance were not included. However, the methodology used during the risk assessment was overall sufficient to evaluate risk to those areas of the Site that were evaluated at that time. Methodology changes provided in new or updated guidance documents are not anticipated to be significant enough to result in changes to PSLs or to affect the validity of previous remedial action decisions at the Site.

Changes in Exposure Pathways

A preliminary overview of the data collected during the Phase I and Phase II SRI indicates that active COC sources remain on site, the COCs are leachable, and the molybdenum and vanadium plumes have migrated significantly south of the IC-controlled property boundary. A detailed technical evaluation of the submitted draft SRI is currently in progress, including the identification of new locations to sample, to fully define the nature and extent of the contamination plumes.

Since the last FYR, domestic well survey and water quality sampling reports were completed for the Soda Springs area south (downgradient) of the Site, where the plume may have migrated (Golder, 2015). The survey identified only four domestic wells that are operational in the study area. Three of the wells are used for drinking water, while the fourth well is used for irrigation and stock watering. Available data suggests that there is a high likelihood that COC plumes may interact with, or impact, existing wells downgradient of the facility. The risk assessment conducted during the remedial investigation evaluated the future residential use of groundwater at properties only adjacent to the Site and not further downgradient in the residential areas of Soda Springs.

Current information presented in the Supplemental SRI suggests that the plumes of site-related COCs may extend into these residential areas of Soda Springs, well beyond the areas considered in the risk assessment. However, recent sample results (Golder 2015) from the four domestic wells identified showed concentrations of molybdenum, arsenic, manganese, vanadium, and selenium are all below the performance standards identified in Table 3. Additionally, potable water is provided by the City for the citizens of Soda Springs. Considering this, along with the results of the well survey and water quality sampling report, groundwater contamination related to the Site is not believed to pose an unacceptable risk under the current conditions.

As identified in the 2012 FYR, a focused assessment of ecological risks was conducted at Finch Spring in support of the ROD and concluded that no significant ecological risks existed at this potential exposure area. However, the plume has extended to downgradient water bodies where other ecological and human recreational exposures

could occur. This raises questions about whether the conclusions related to ecological risks from earlier work at Finch Spring (and other downgradient areas) remain valid, as well as the possibility of additional human exposure pathways not previously evaluated (for example, recreational use of springs and ponds).

It has also been recognized that the 10-acre pond was not evaluated as part of the ROD and it is unclear to what extent this may pose a risk to wildlife. Future characterization of the pond is necessary to understand the nature of contamination present and to evaluate the potential ecological exposures.

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

No.

VI. ISSUES/RECOMMENDATIONS

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category:** Changed Site Conditions Pond Construction not part of selected remedy.			
	Issue: Potential ecological risks may exist from the migration of the COC plume beyond the current Site boundary and potential presence of high concentration source material located within the 10-Acre Pond could affect groundwater quality and ecological receptors.			
	Recommendation: Finalize the draft screening level assessment, including the identification of additional data gaps and characterize the nature of the source material in the 10-Acre Pond. Evaluate pond contents for COC concentration and distribution. Assess its potential as an active source for groundwater contamination (including data from downgradient monitoring wells), and evaluate whether COC concentrations could be high enough to pose an unacceptable risk to ecological receptors (such as, ducks, geese, and local terrestrial birds).			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	Trust	EPA	9/1/2018

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category:** Institutional Controls			
	Issue: Institutional Controls have not been established or implemented for locations downgradient of the industrial facility where COCs exceed MCLs or risk-based groundwater performance standards (including Trust owned properties. Plumes of COCs generated from the Site appear to have migrated significantly beyond the IC-controlled property boundary onto private and city owned land into the town of Soda Springs,			
	Recommendation: Develop an ICP and implement institutional controls governing groundwater use at locations downgradient of the industrial facility where COCs are known to exceed MCLs or risk-based groundwater performance standards.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Trust	EPA	9/1/2018

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category:** Remedy Performance			
	Issue: Nature and extent of groundwater plumes of site-related COCs are not well defined, and the monitoring well network is not adequate to provide necessary information. In addition, groundwater and surface water monitoring trends indicate that performance standards will not be met in the foreseeable future.			
	Recommendation: Finalize the multi-phased supplemental remedial investigation, including the identification of additional data gaps and evaluate whether additional remedial actions are needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Trust	EPA	9/1/2018

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
Protectiveness Determination: Not Protective
Protectiveness Statement: *The remedy for the Kerr-McGee Chemical Corporation (KMCC) Site is currently not protective because of the following issues:* • Potential ecological risks may exist from the migration of the COC plume beyond the current Site boundary and potential presence of high concentration source material located within the 10-Acre Pond could affect groundwater quality and ecological receptors. • Institutional Controls have not been established or implemented for locations downgradient of the industrial facility where COCs exceed MCLs or risk-based groundwater performance standards (including Trust owned properties). Plumes of COCs generated from the Site have migrated significantly beyond the IC-controlled property boundary onto private and city owned land into the town of Soda Springs, contributing to the non-protective status of the remedy. • Nature and extent of groundwater plumes of site-related COCs are not well defined, and the monitoring well network is not adequate to provide necessary information. In addition, groundwater and surface water monitoring trend indicate the performance standard will not be met in the foreseeable future. *The following actions need to be taken in order to ensure protectiveness:* • Finalize the draft screening level assessment, including the identification of additional data gaps and characterize the nature of the source material in the 10-Acre Pond. Evaluate pond contents for COC concentration and distribution. Assess its potential as an active source for groundwater contamination (including data from downgradient monitoring wells), and evaluate whether COC

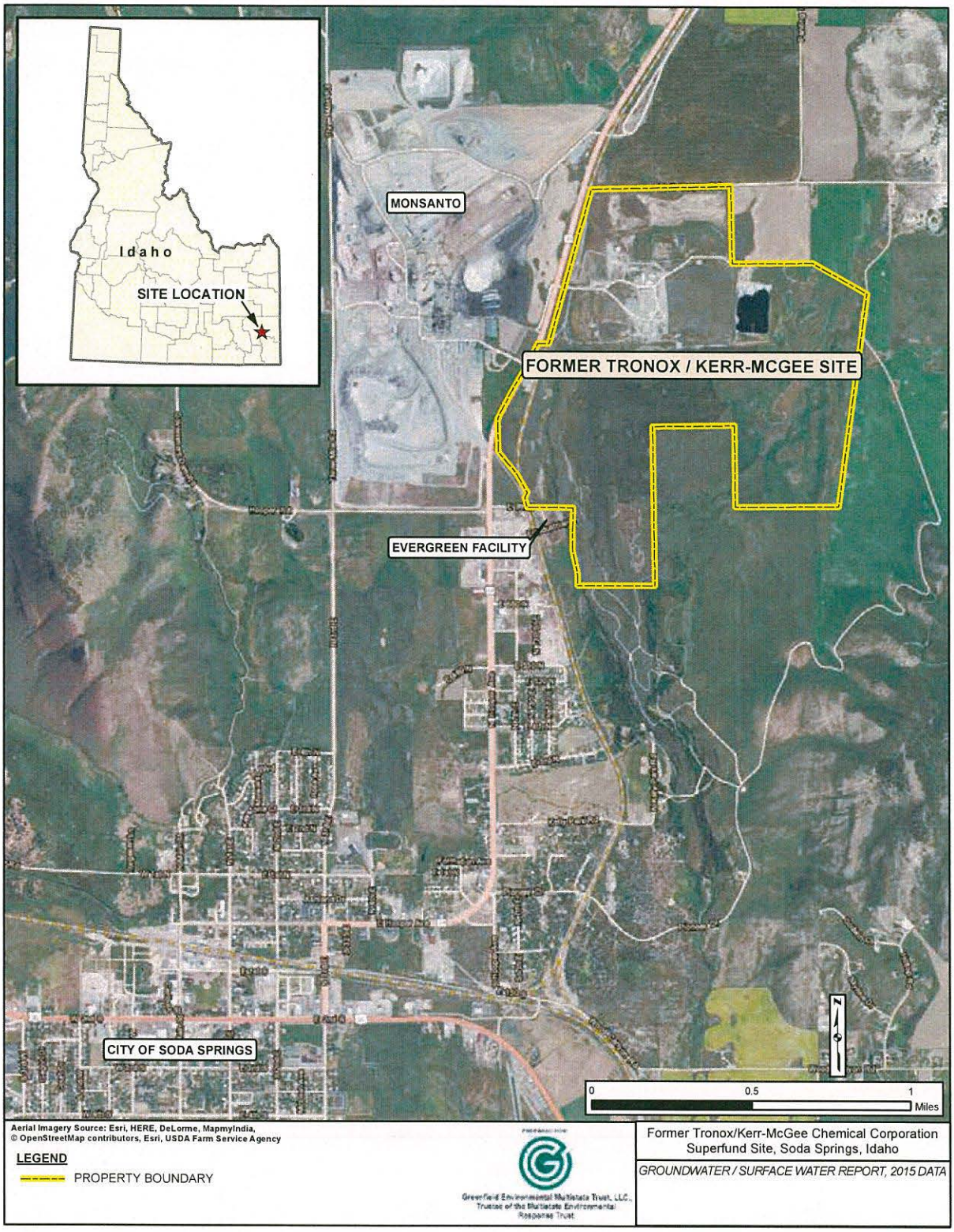
concentrations could be high enough to pose an unacceptable risk to ecological receptors (such as, ducks, geese, and local terrestrial birds).

- Develop an ICP and implement institutional controls governing groundwater use at locations downgradient of the industrial facility where COCs are known to exceed MCLs or risk-based groundwater performance standards.
- Finalize the multi-phased supplemental remedial investigation, including the identification of additional data gaps and evaluate whether additional remedial actions are needed.

VIII. NEXT REVIEW

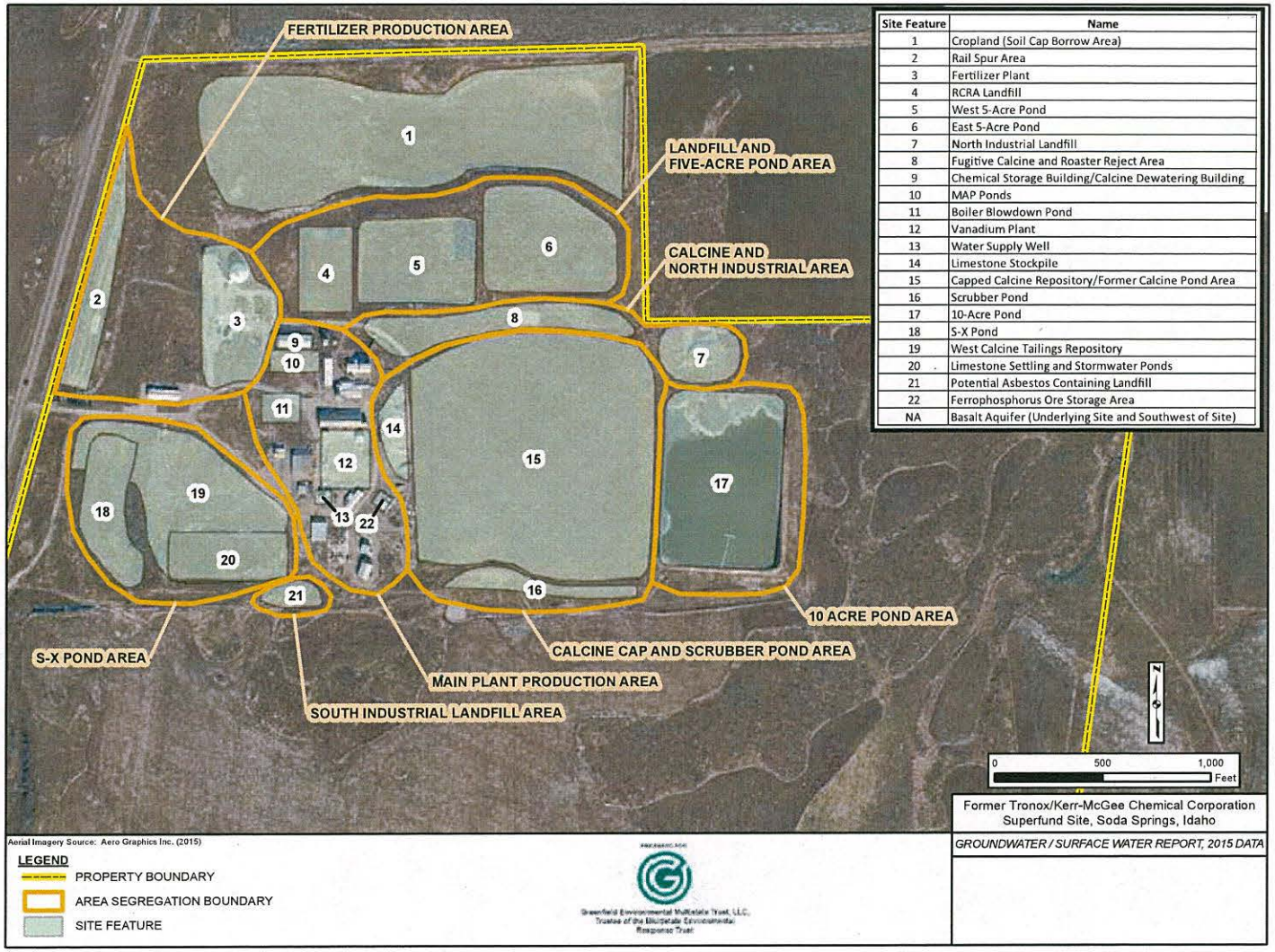
The next five-year review report for the Kerr McGee Chemical Corporation Superfund Site is required 5 years from the completion date of this review.

Figures



Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

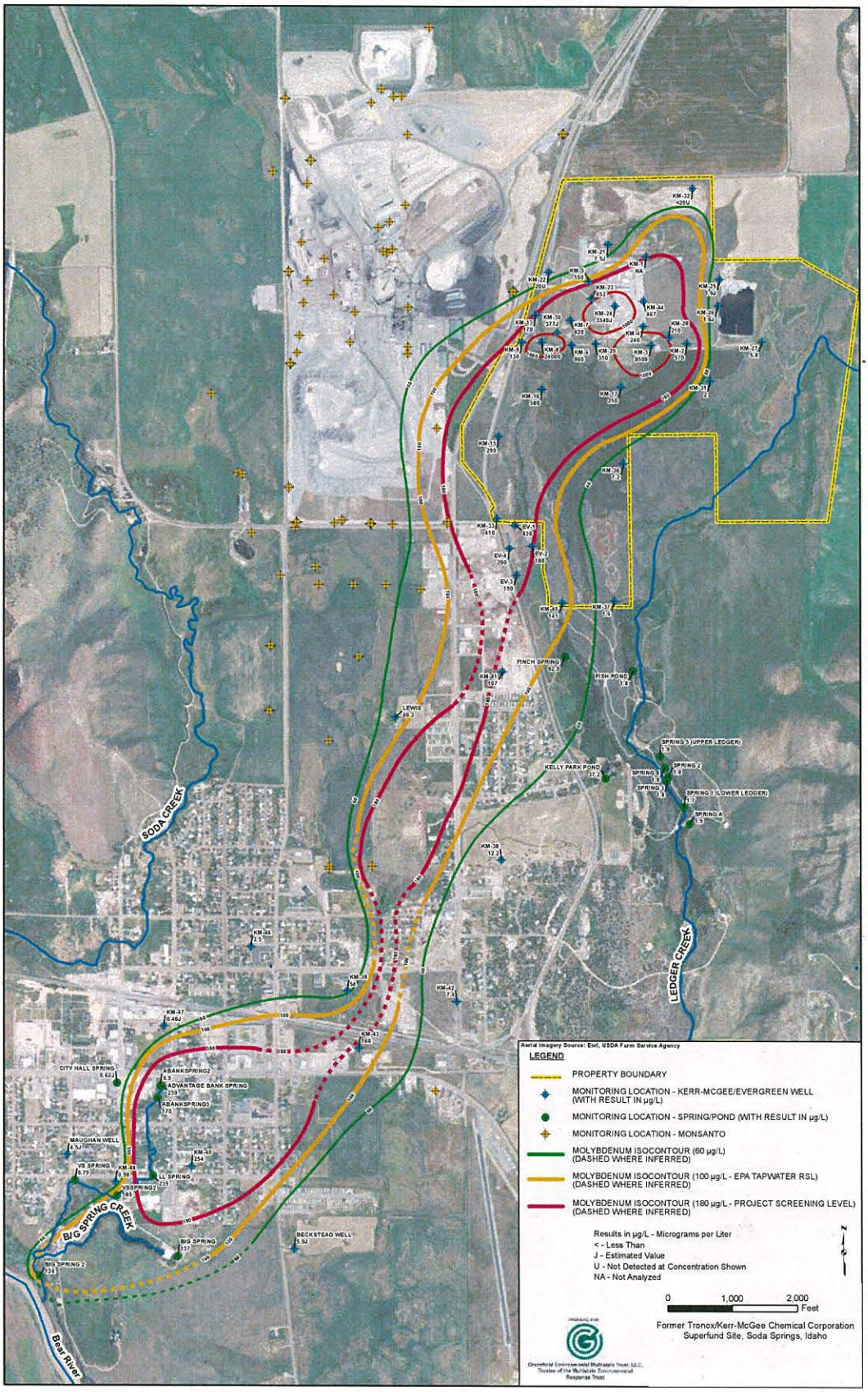
Figure 1.
Site Location Map
Kerr-McGee 2017 Five Year Review



Site Feature	Name
1	Cropland (Soil Cap Borrow Area)
2	Rail Spur Area
3	Fertilizer Plant
4	RCRA Landfill
5	West 5-Acre Pond
6	East 5-Acre Pond
7	North Industrial Landfill
8	Fugitive Calcine and Roaster Reject Area
9	Chemical Storage Building/Calcine Dewatering Building
10	MAP Ponds
11	Boiler Blowdown Pond
12	Vanadium Plant
13	Water Supply Well
14	Limestone Stockpile
15	Capped Calcine Repository/Former Calcine Pond Area
16	Scrubber Pond
17	10-Acre Pond
18	S-X Pond
19	West Calcine Tailings Repository
20	Limestone Settling and Stormwater Ponds
21	Potential Asbestos Containing Landfill
22	Ferrophosphorus Ore Storage Area
NA	Basalt Aquifer (Underlying Site and Southwest of Site)

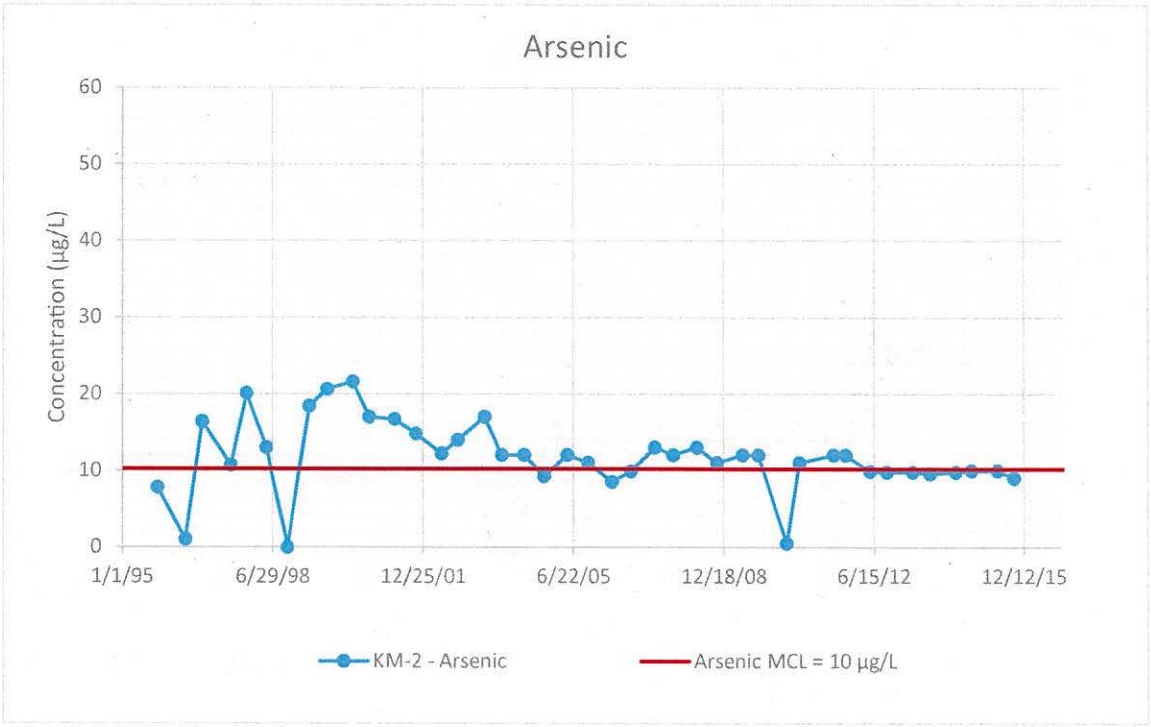
Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

Figure 2.
Facility Features
Kerr-McGee 2017 Five Year Review



Source: Tetra Tech, Inc. 2017. *Draft Phase I and Phase II Supplemental Remedial Investigation Report. Tetra Tech, Inc. June 9.*

Figure 3.
Shallow Groundwater and Spring Sampling Locations and Results – Molybdenum
Kerr-McGee 2017 Five Year Review



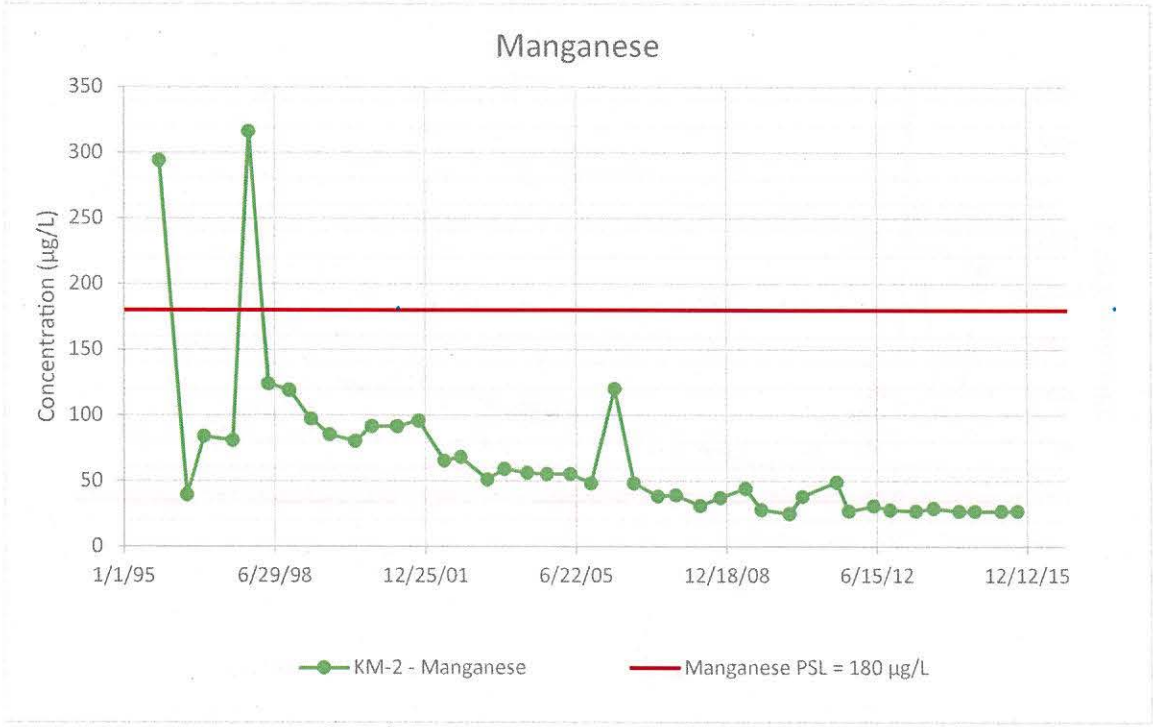


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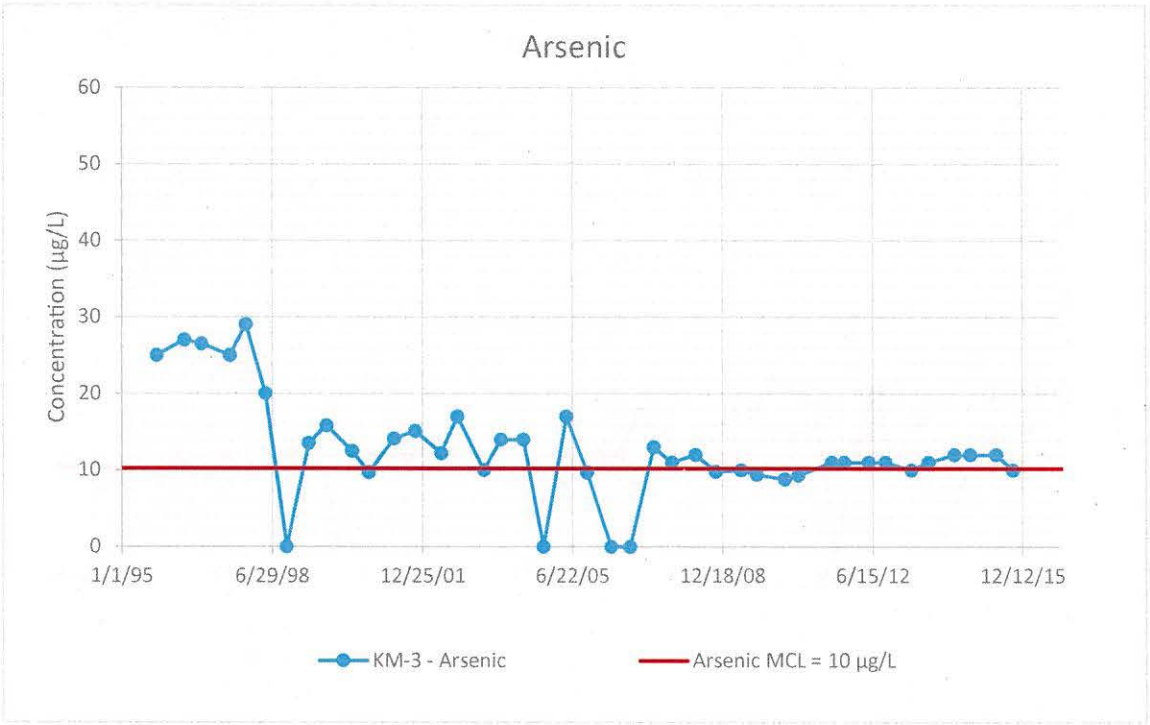
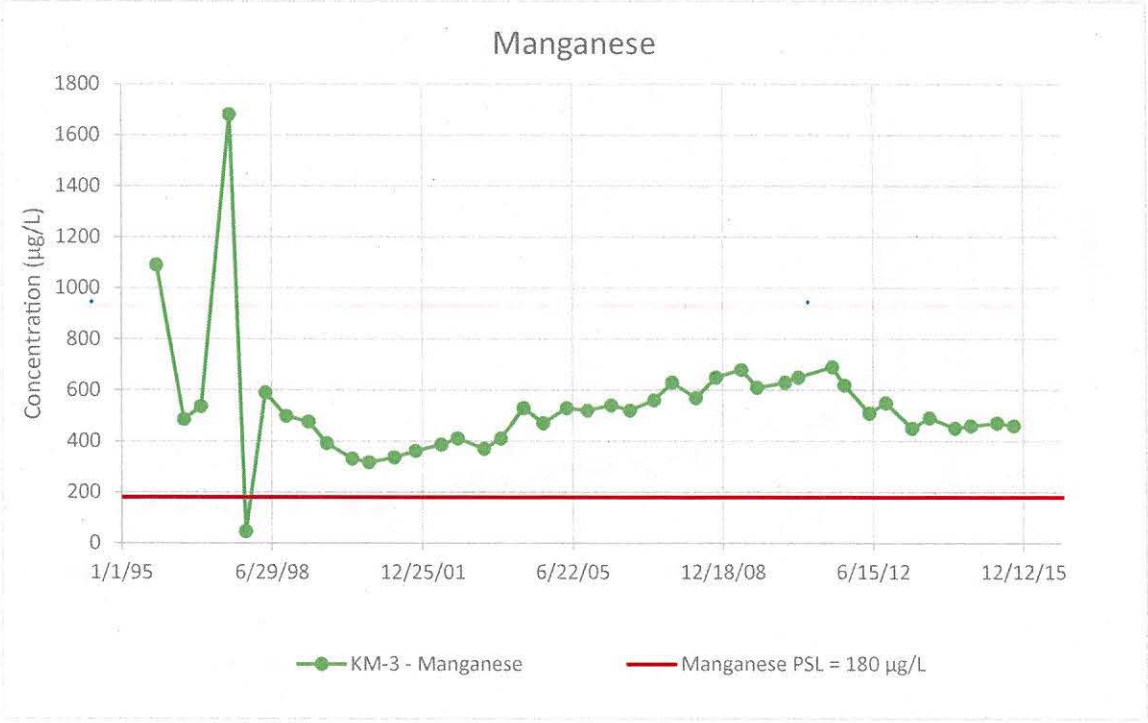
Figure 4.
KM-2 COC Data Trends
Kerr-McGee 2017 Five Year Review





Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

Figure 5.
KM-3 COC Data Trends
Kerr-McGee 2017 Five Year Review

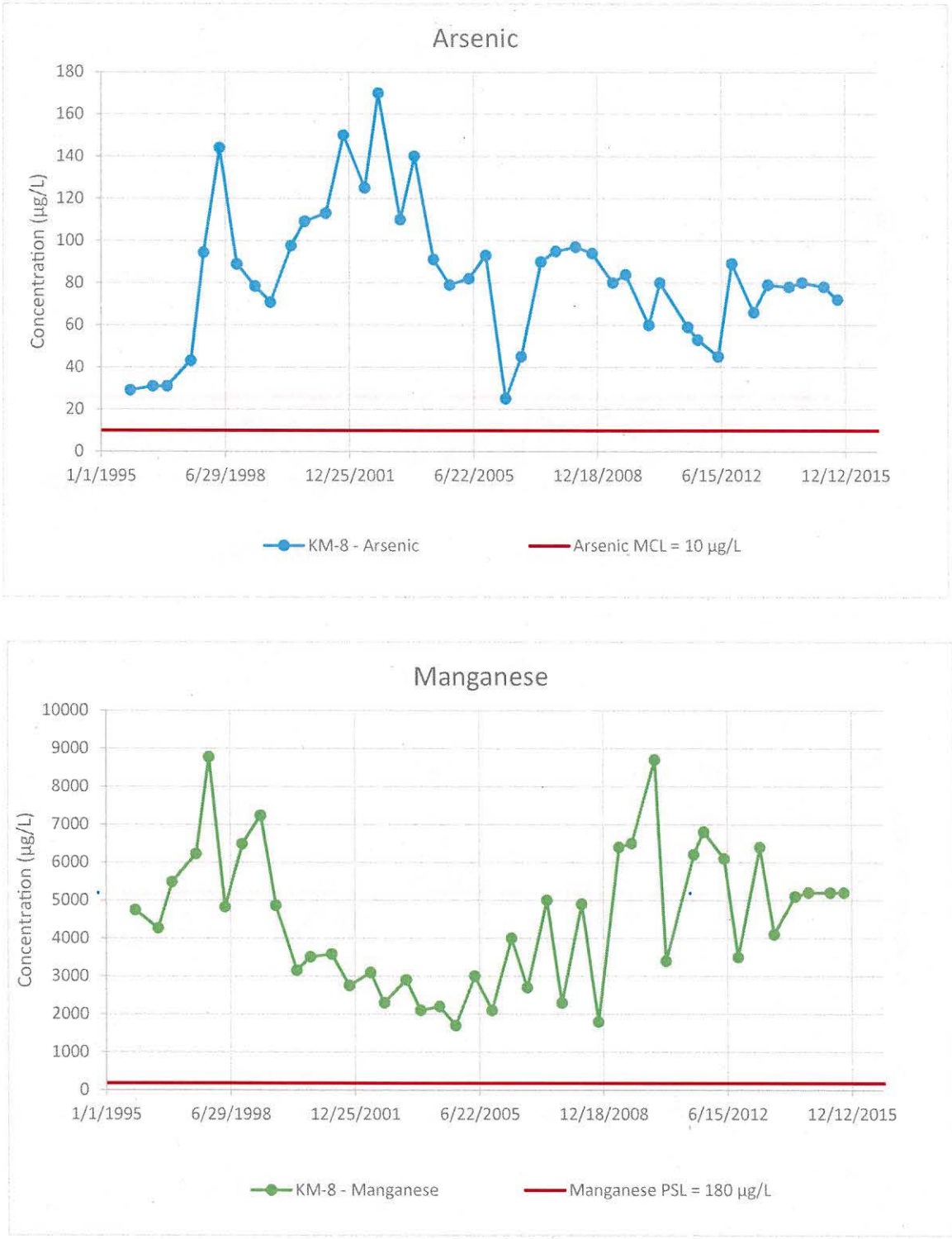


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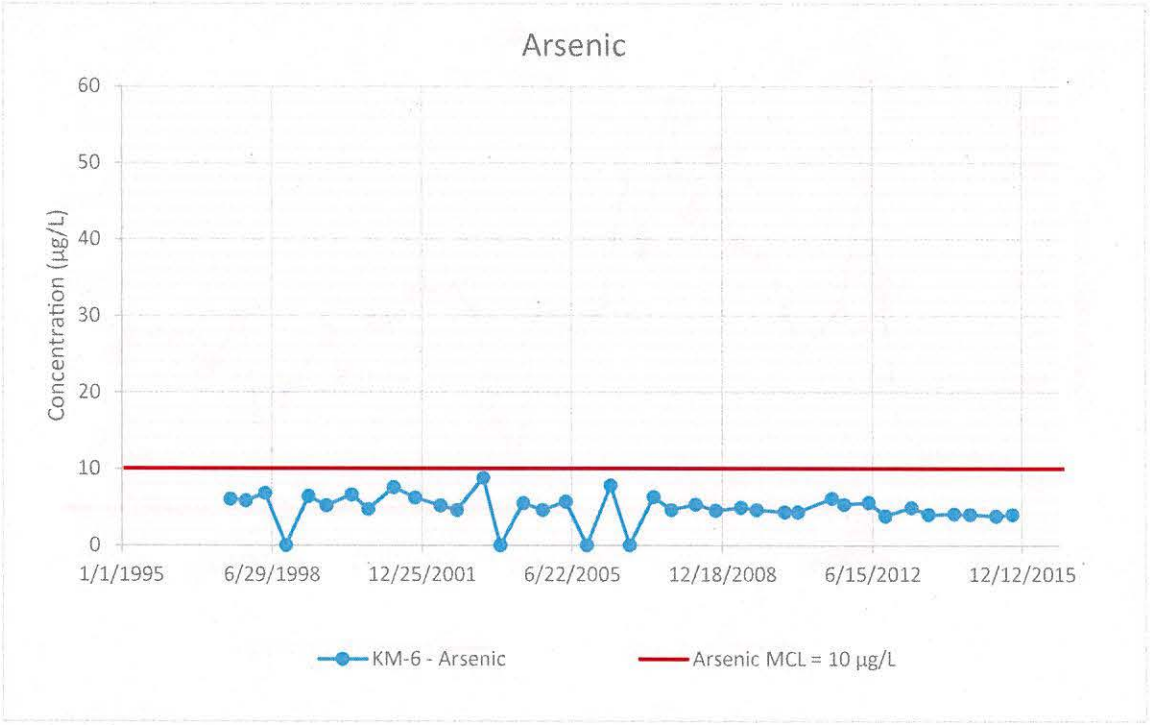
Figure 6.
KM-8 COC Data Trends
Kerr-McGee 2017 Five Year Review



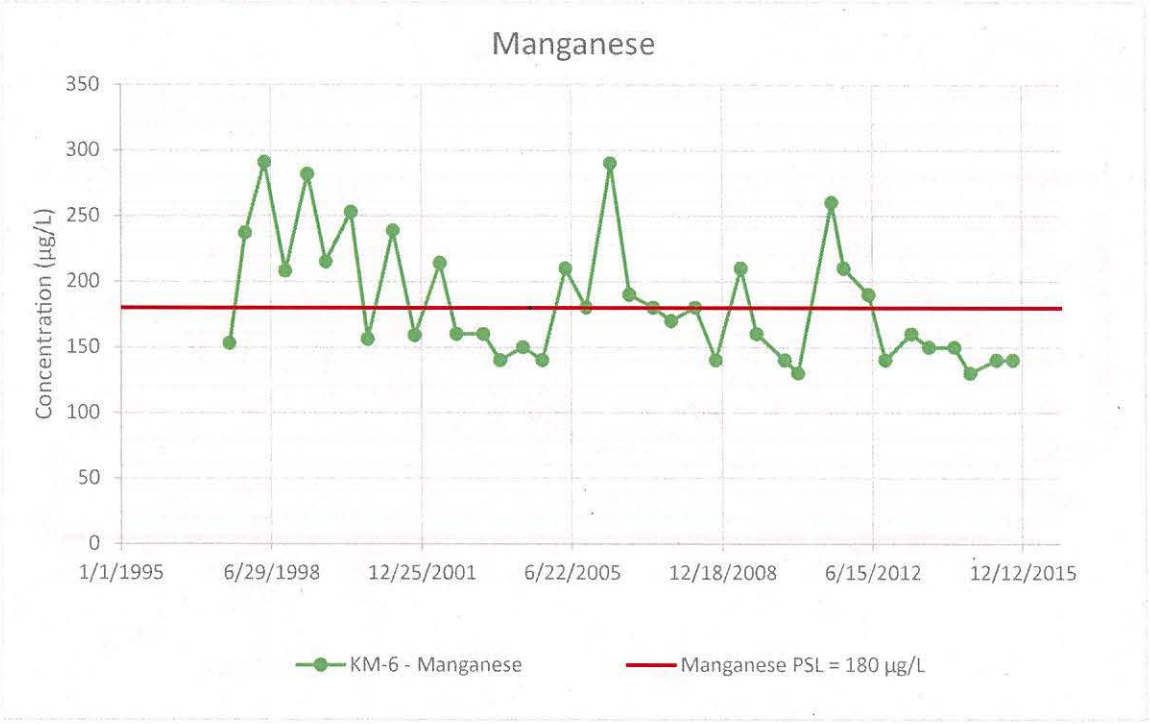


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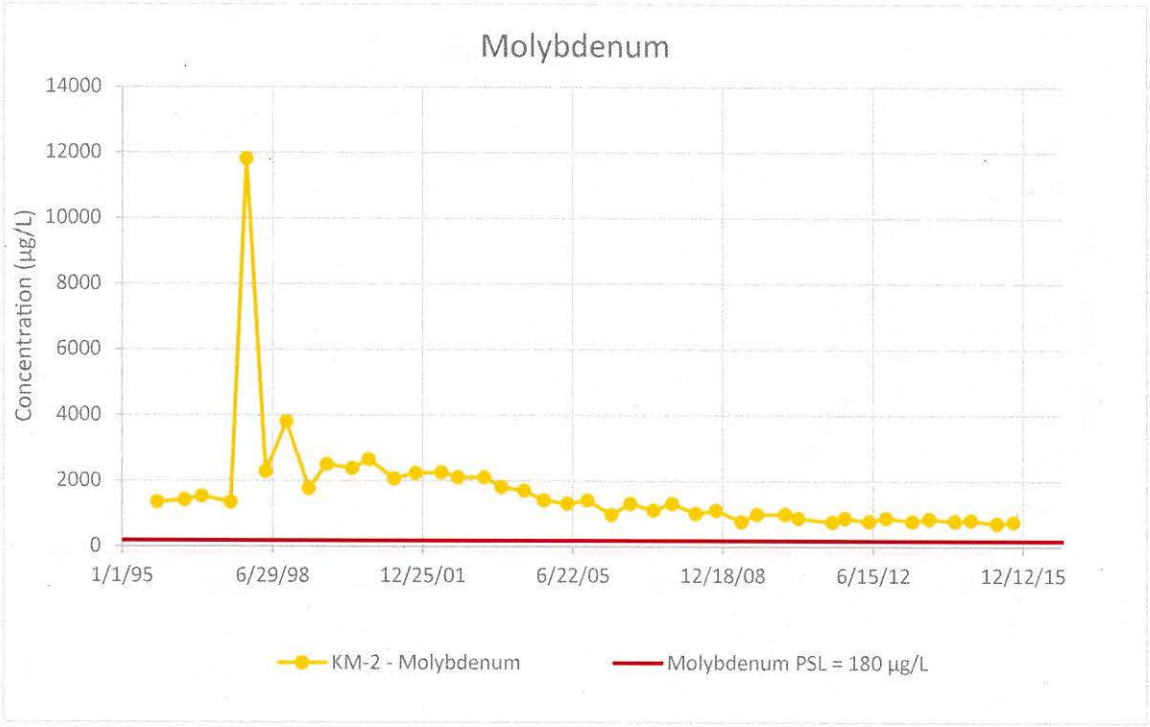
Figure 7.
KM-6 COC Data Trends
Kerr-McGee 2017 Five Year Review



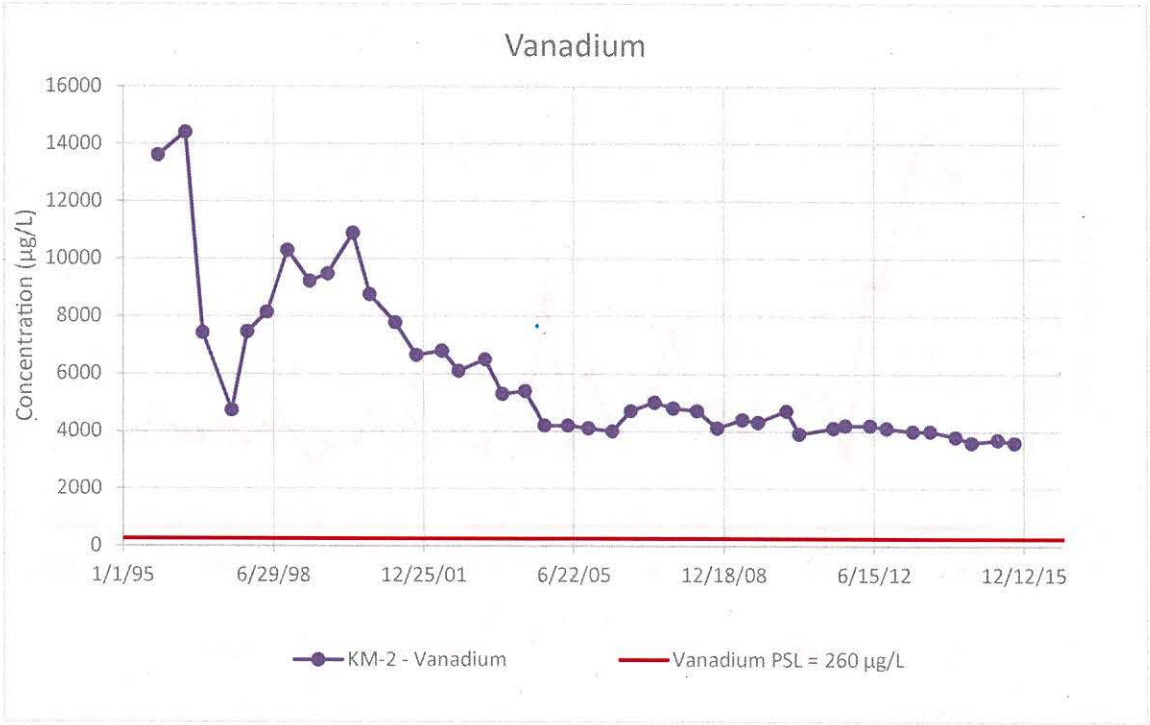


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Figure 8.
KM-2 COC Data Trends
Kerr-McGee 2017 Five Year Review

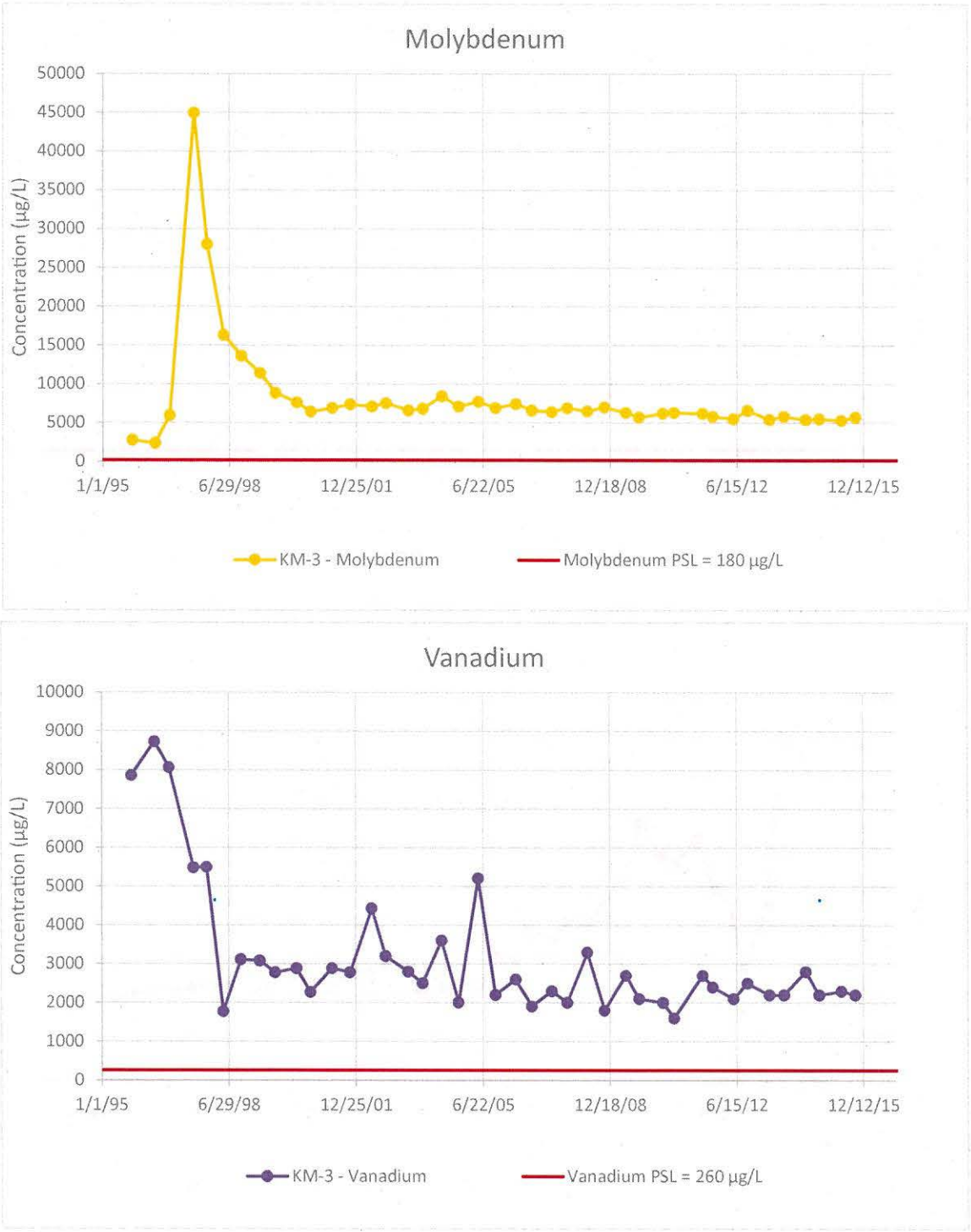

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Figure 9.
KM-3 COC Data Trends
Kerr-McGee 2017 Five Year Review

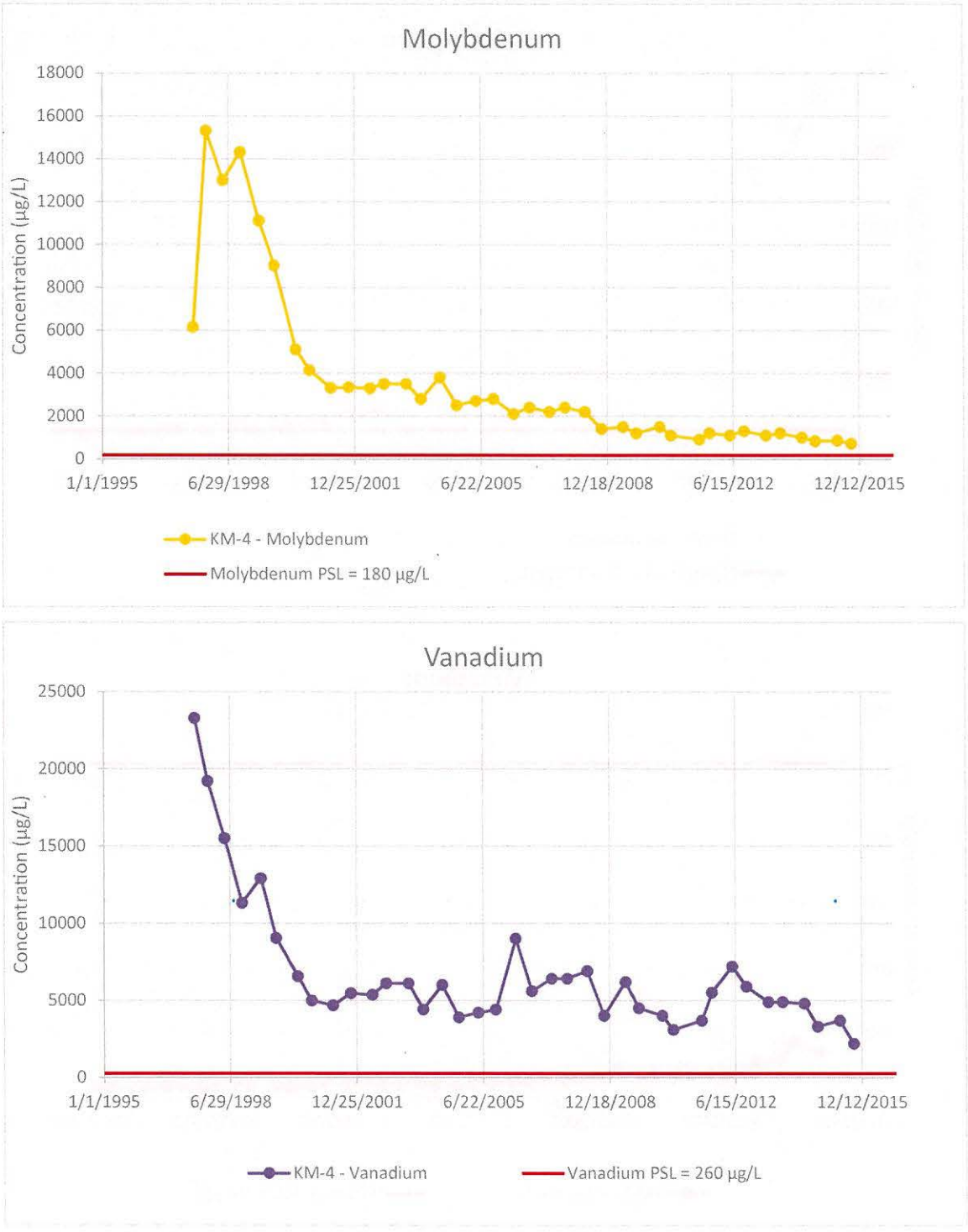

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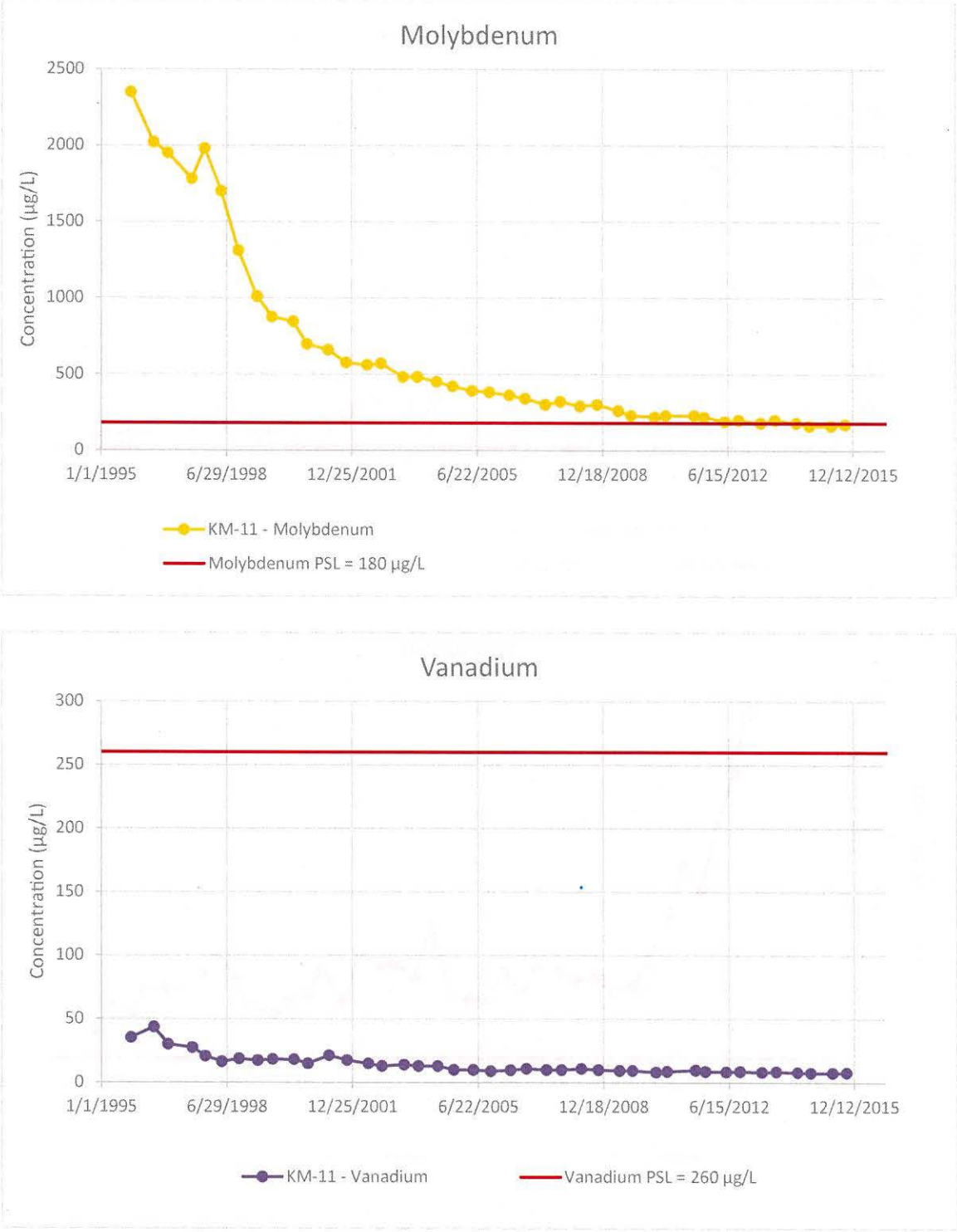
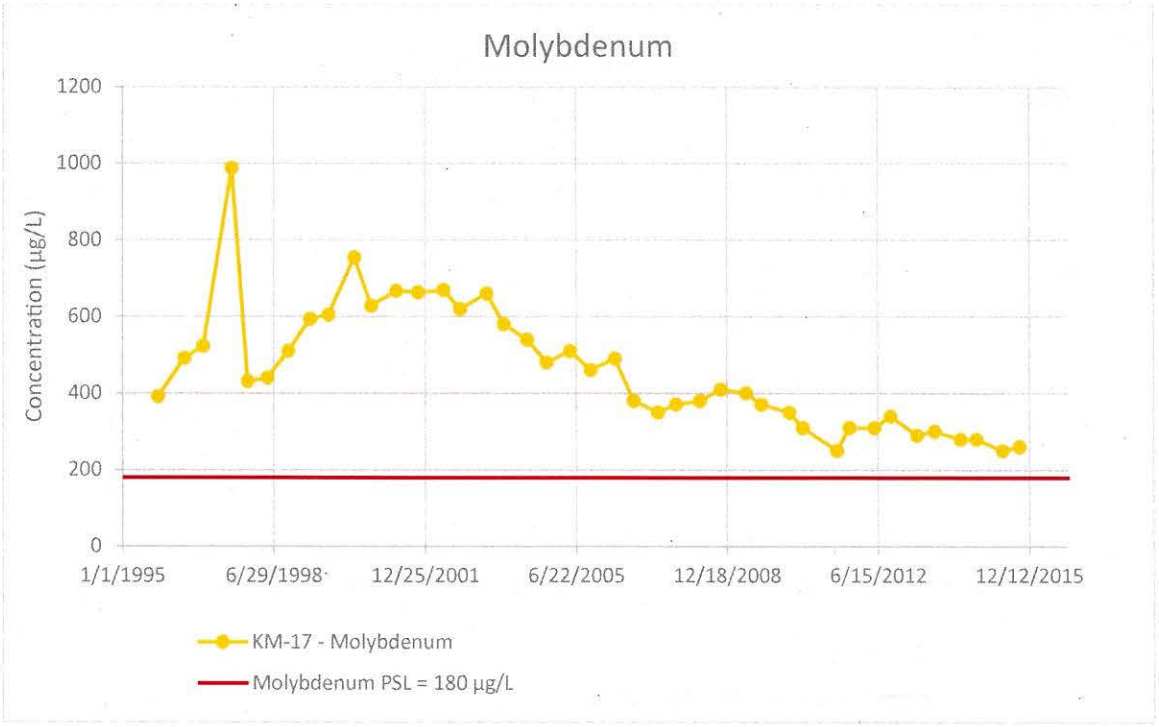
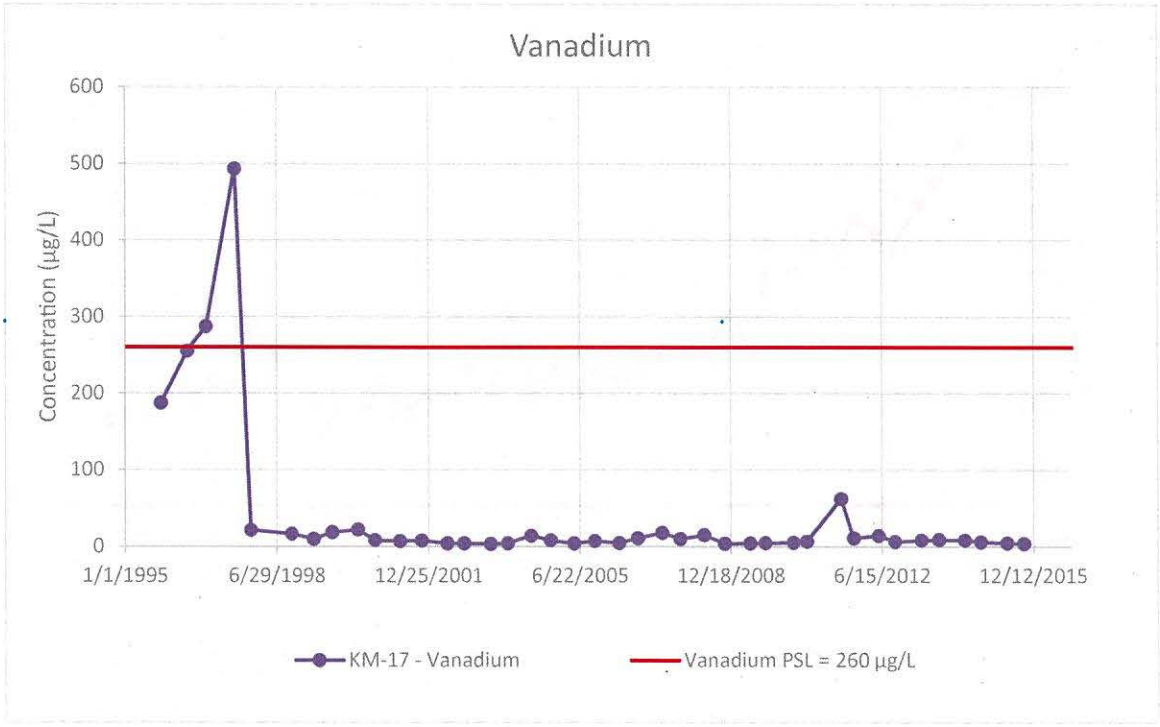
Figure 10.
KM-4 COC Data Trends
Kerr-McGee 2017 Five Year Review



Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

Figure 11.
KM-11 COC Data Trends
Kerr-McGee 2017 Five Year Review





Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

Figure 12.
KM-17 COC Data Trends
Kerr-McGee 2017 Five Year Review

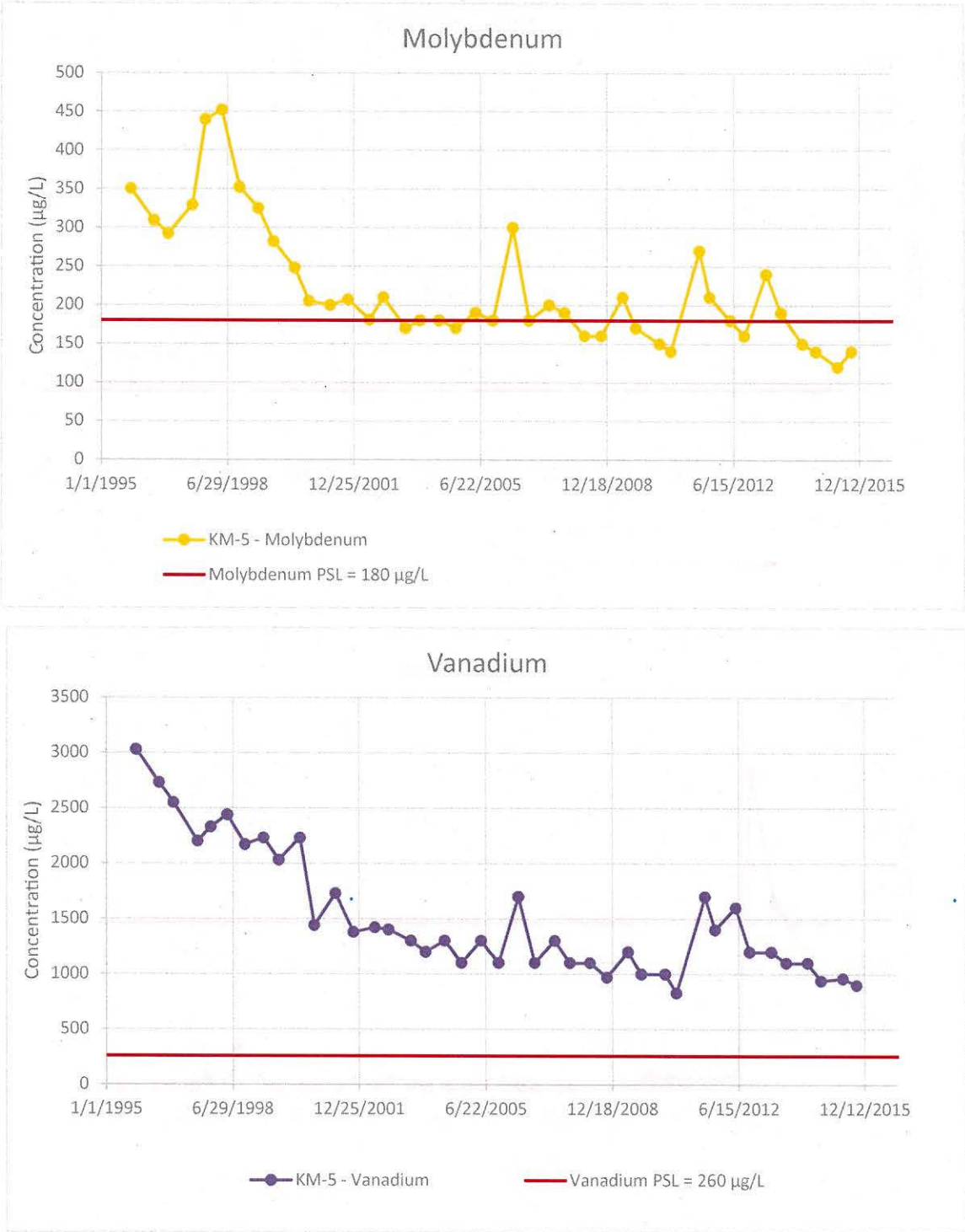


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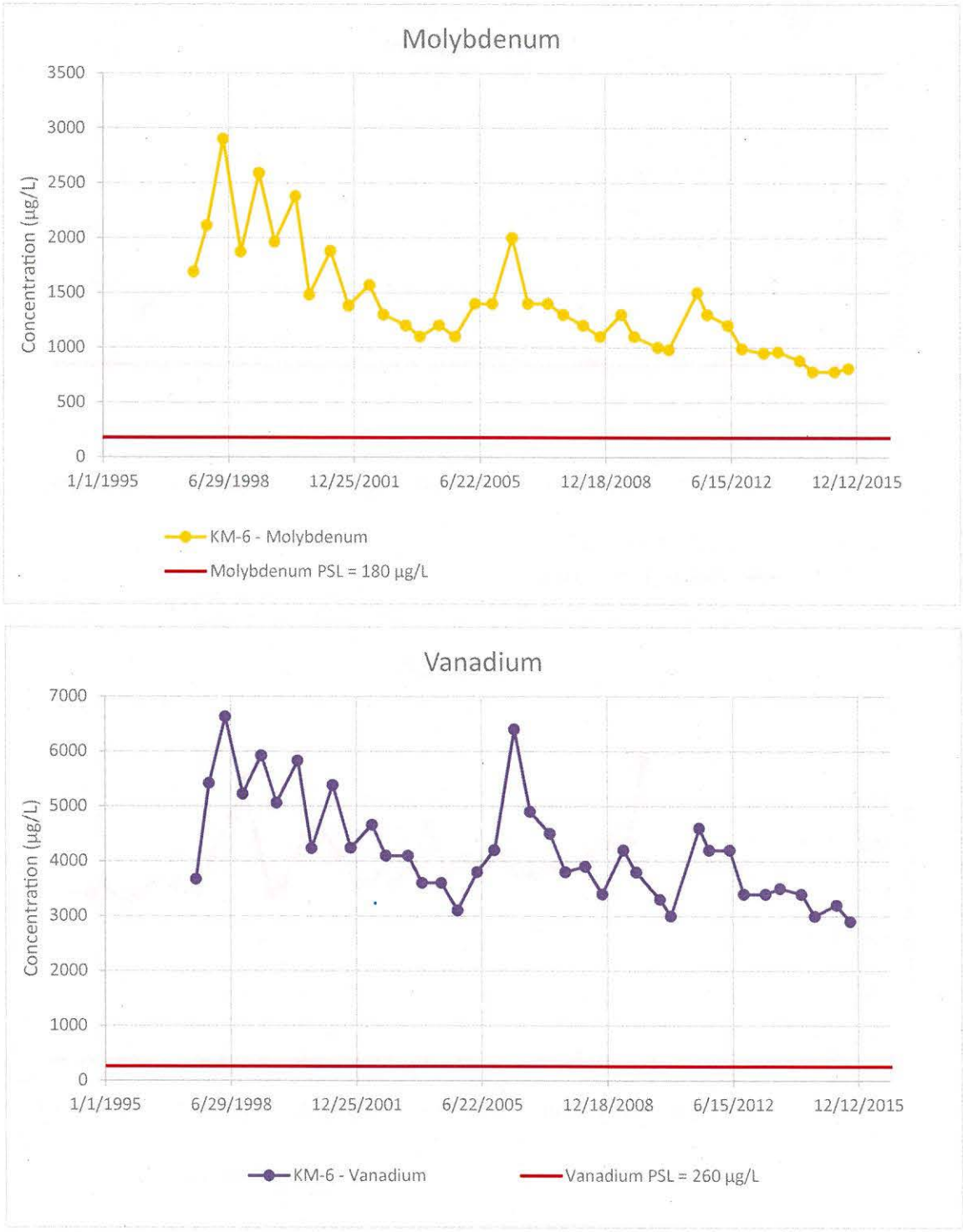
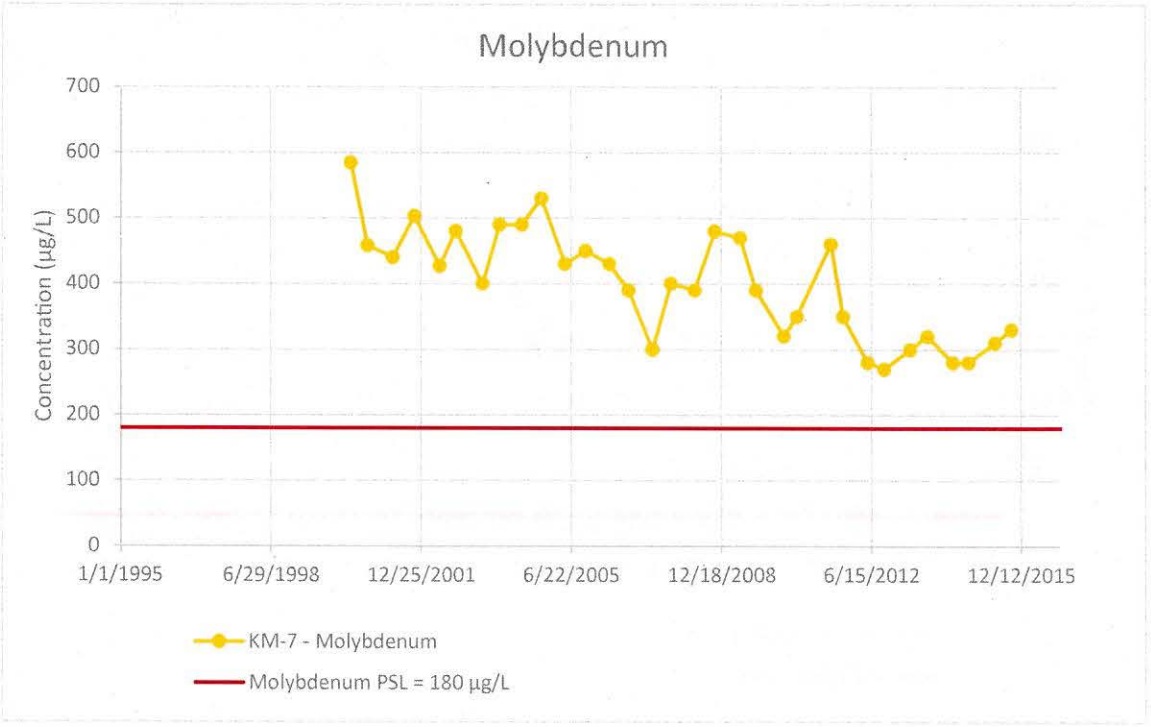
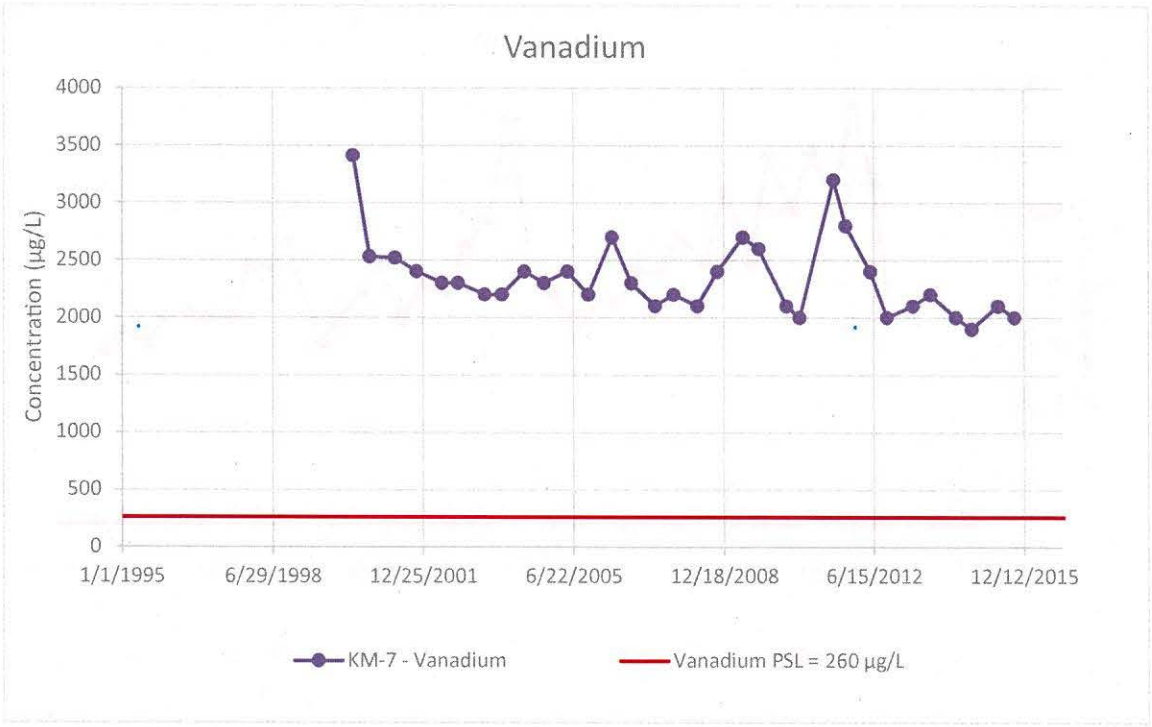
Figure 13.
KM-5 COC Data Trends
Kerr-McGee 2017 Five Year Review



Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

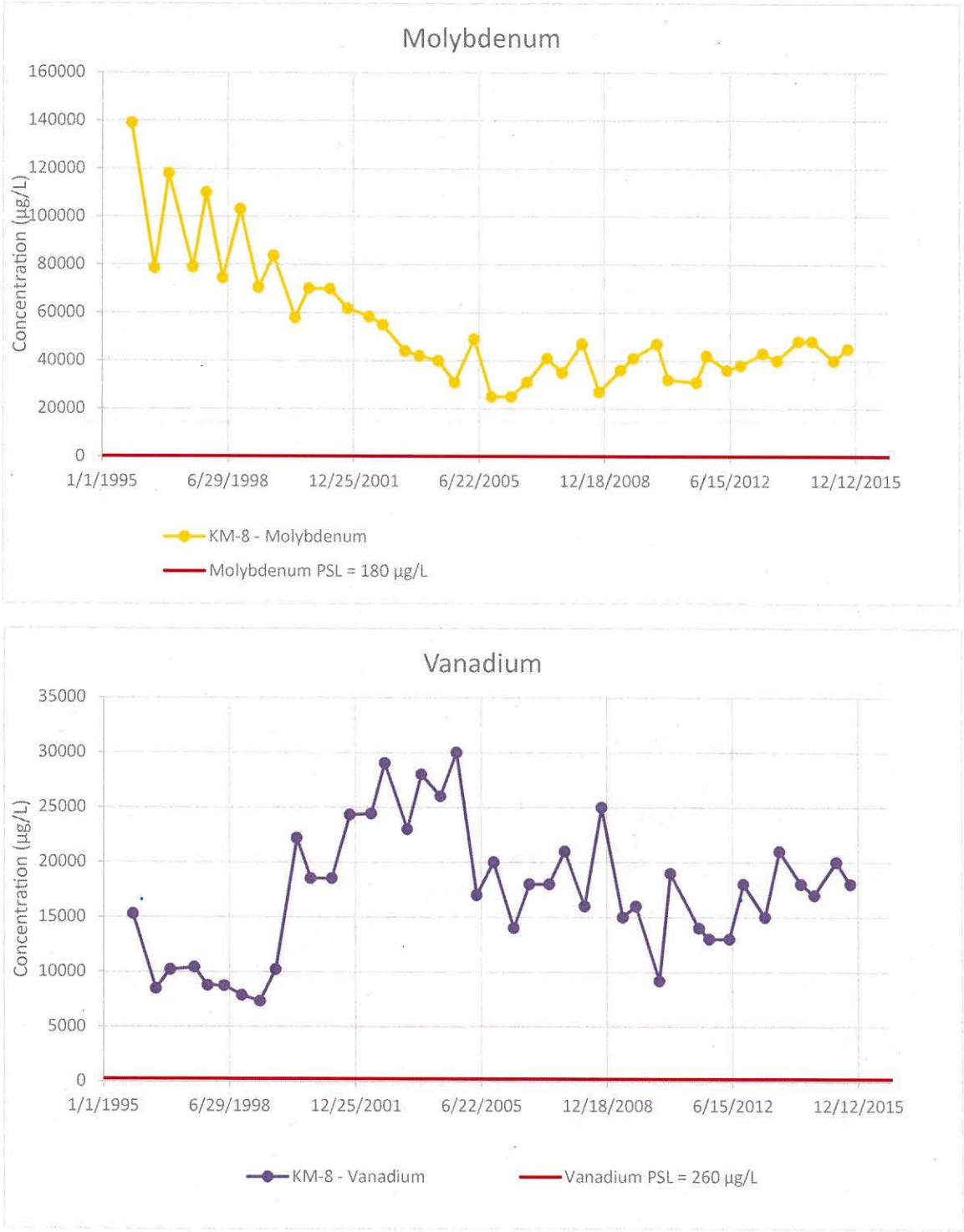
Figure 14.
KM-6 COC Data Trends
Kerr-McGee 2017 Five Year Review





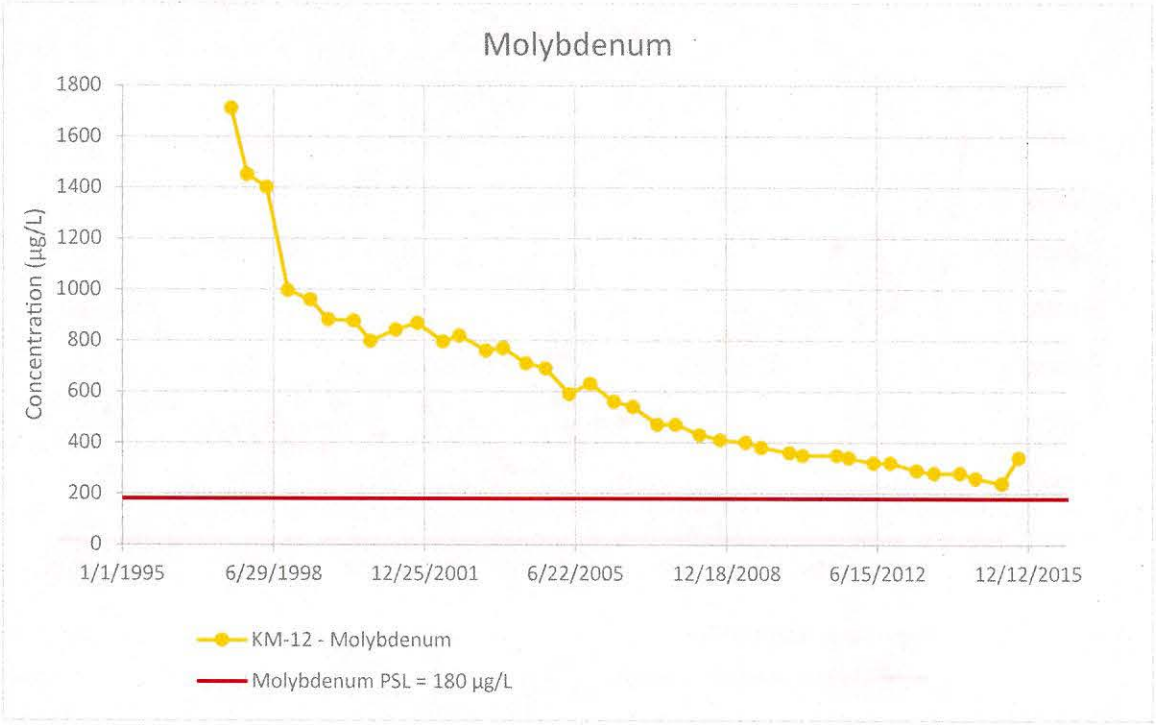
Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

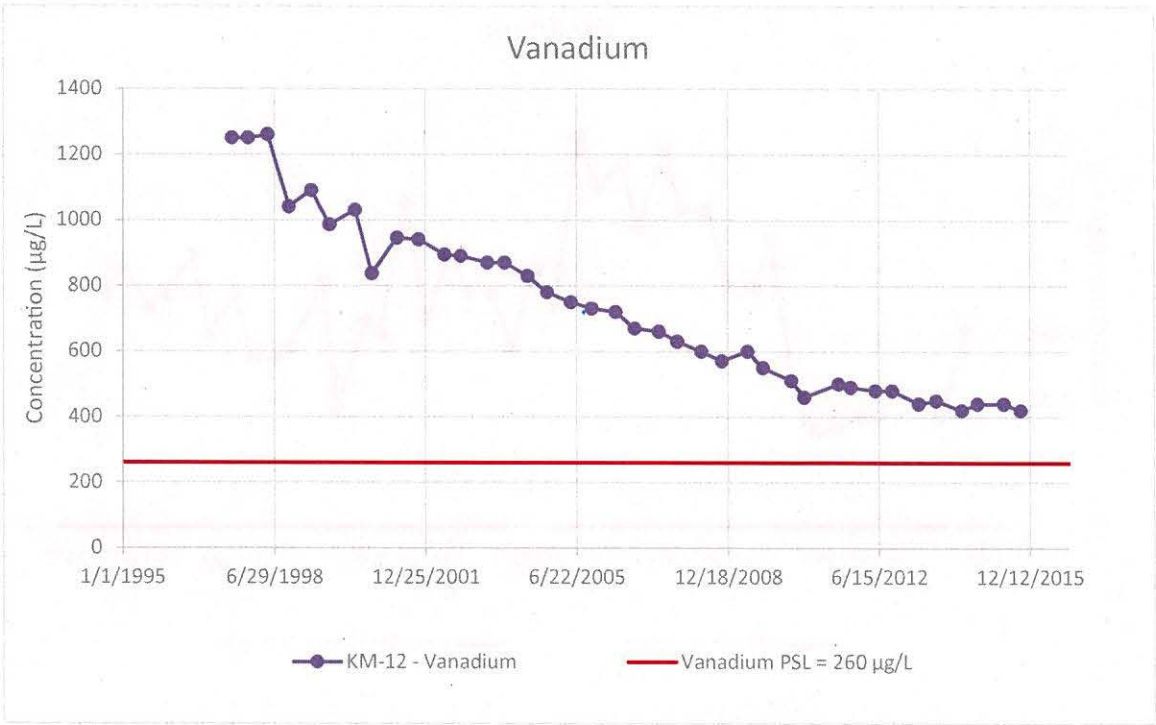
Figure 15.
KM-7 COC Data Trends
Kerr-McGee 2017 Five Year Review



Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

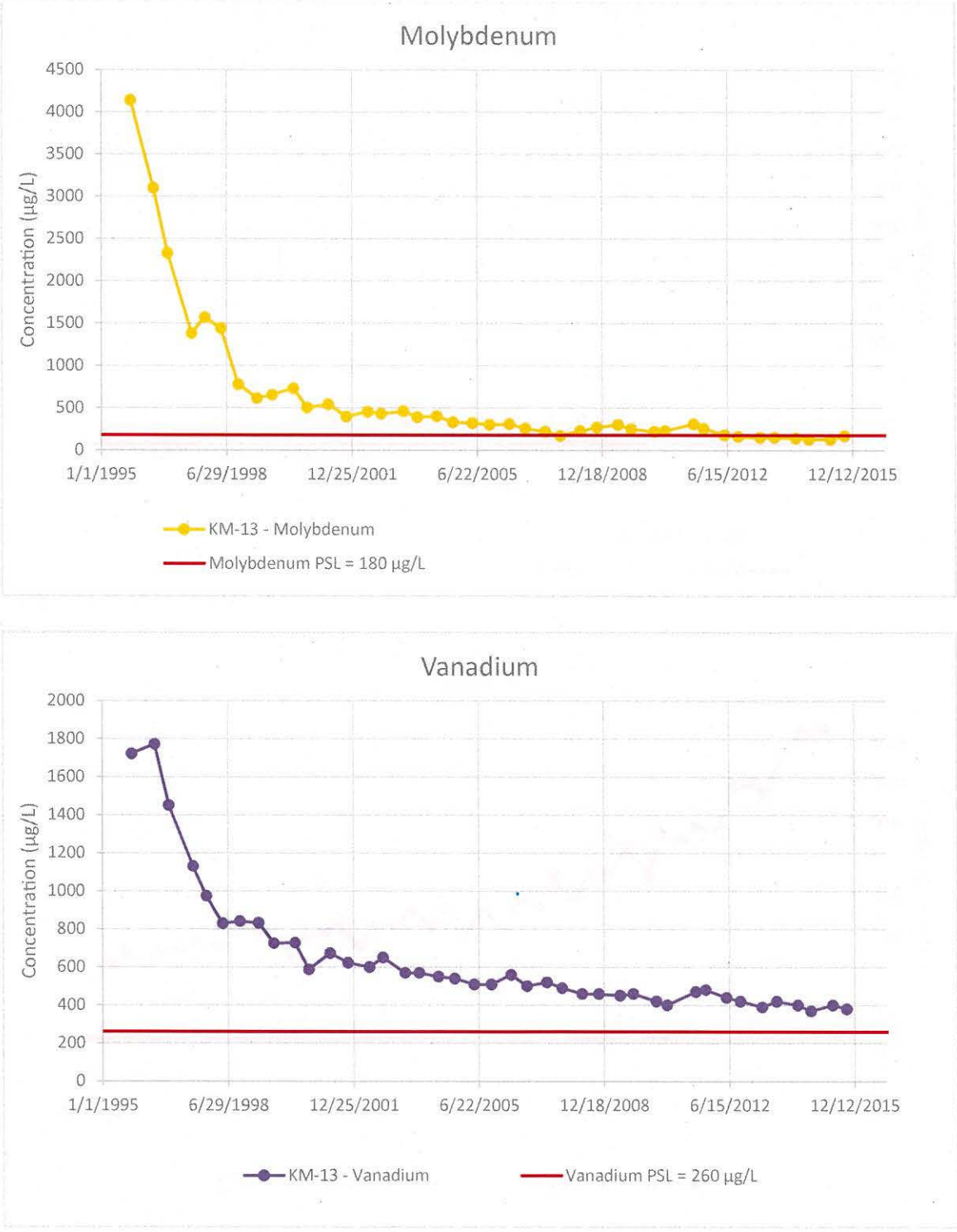
Figure 16.
KM-8 COC Data Trends
Kerr-McGee 2017 Five Year Review





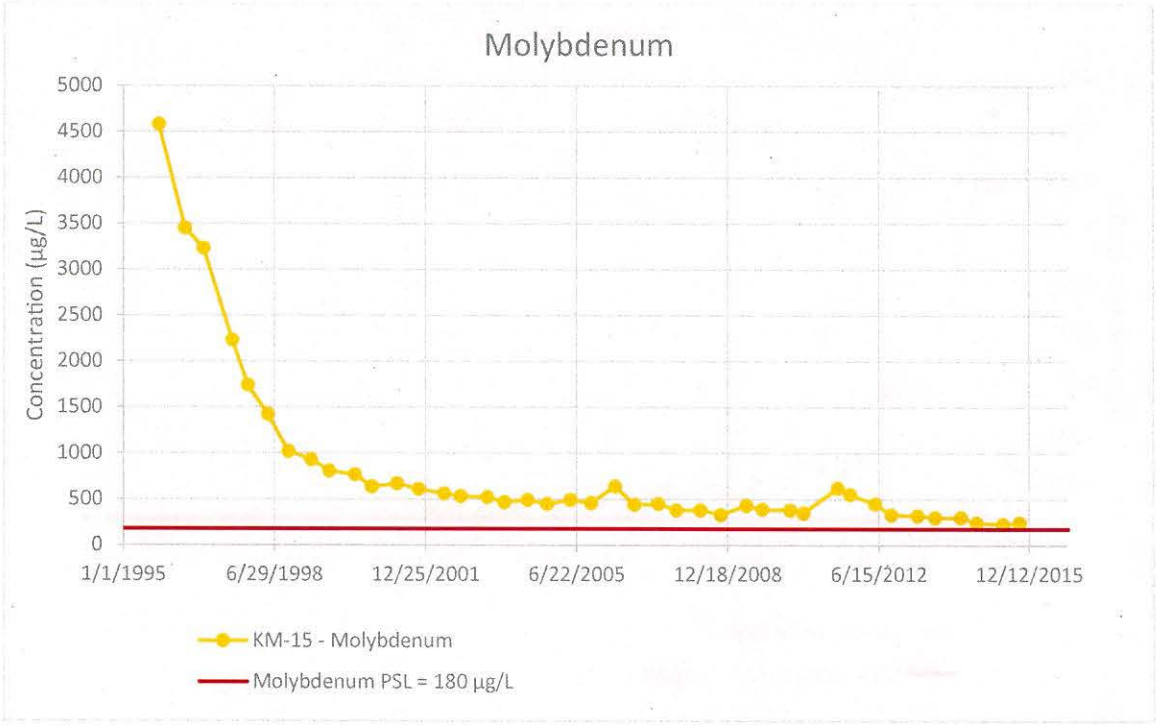
Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

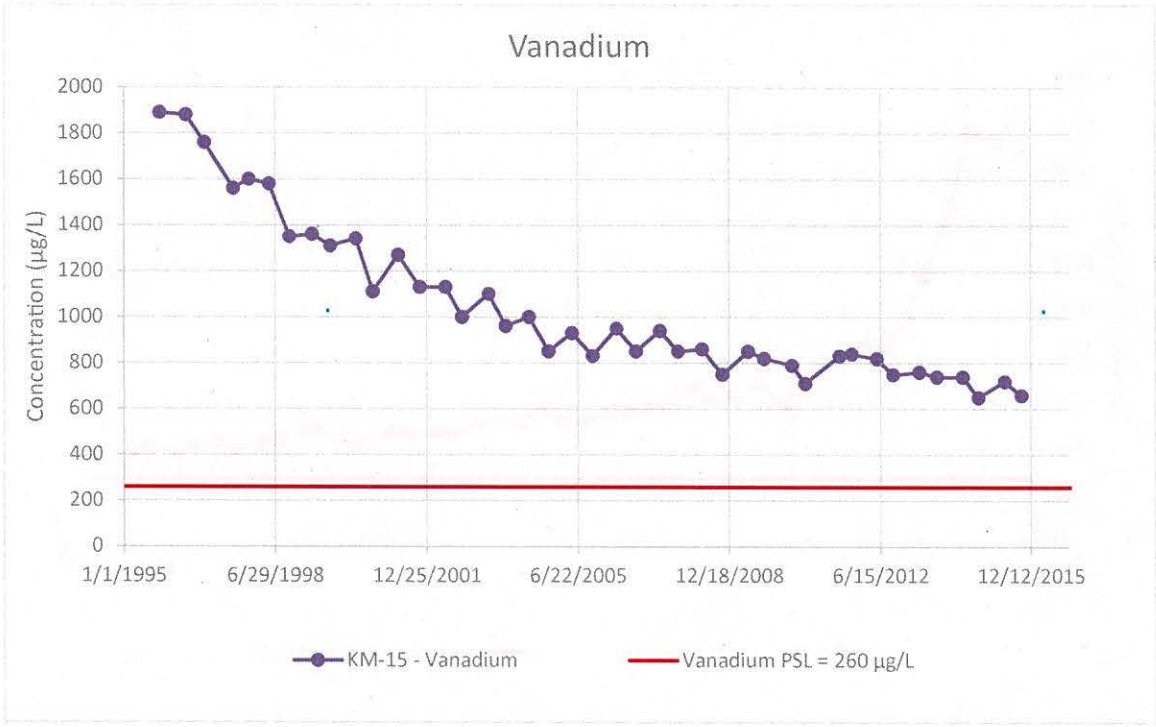
Figure 17.
KM-12 COC Data Trends
Kerr-McGee 2017 Five Year Review



Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

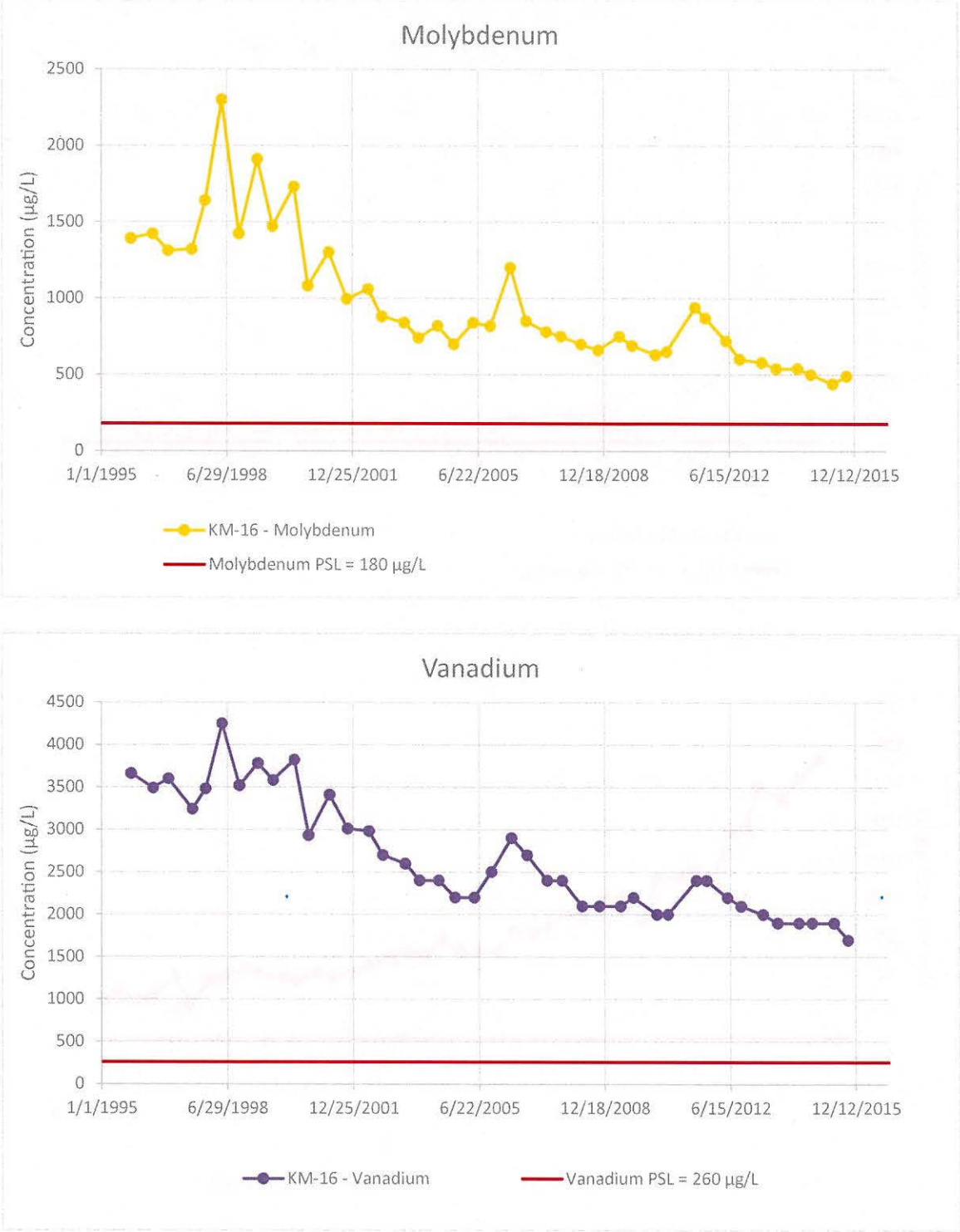
Figure 18.
KM-13 COC Data Trends
Kerr-McGee 2017 Five Year Review





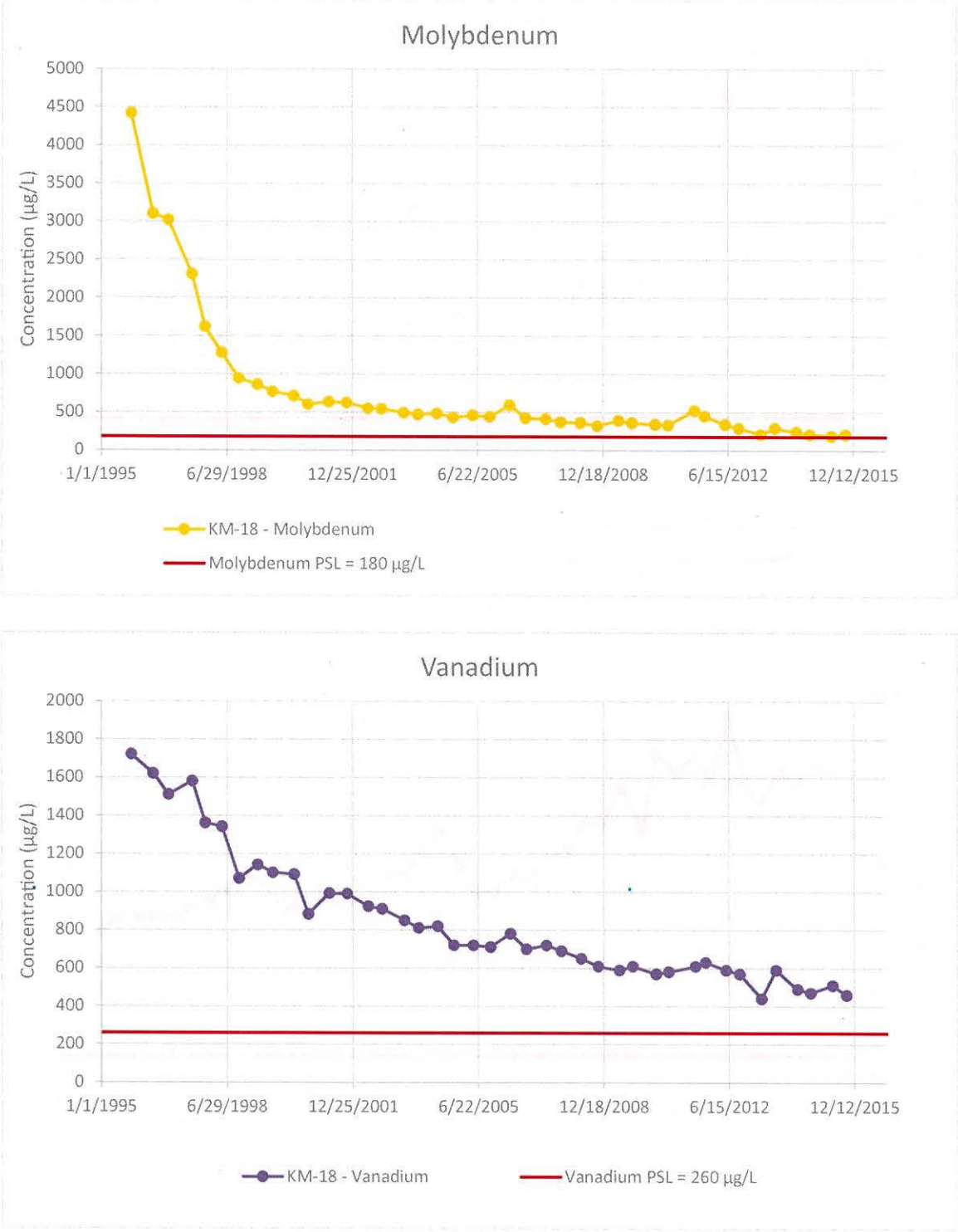
Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

Figure 19.
KM-15 COC Data Trends
Kerr-McGee 2017 Five Year Review



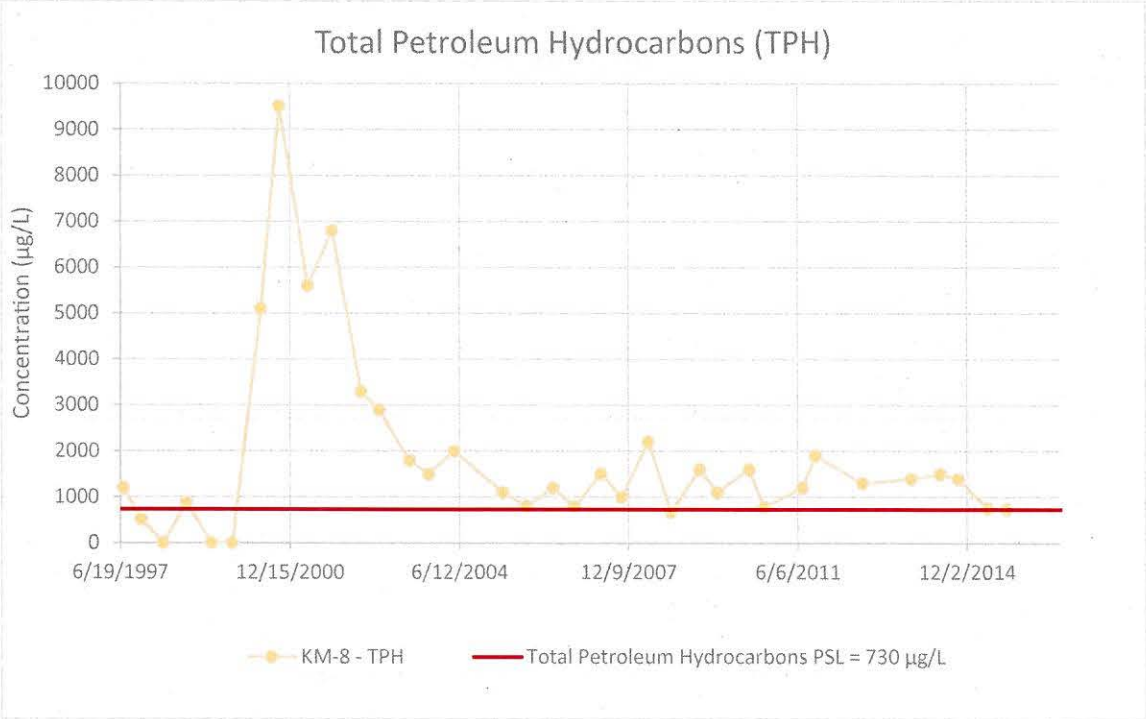
Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

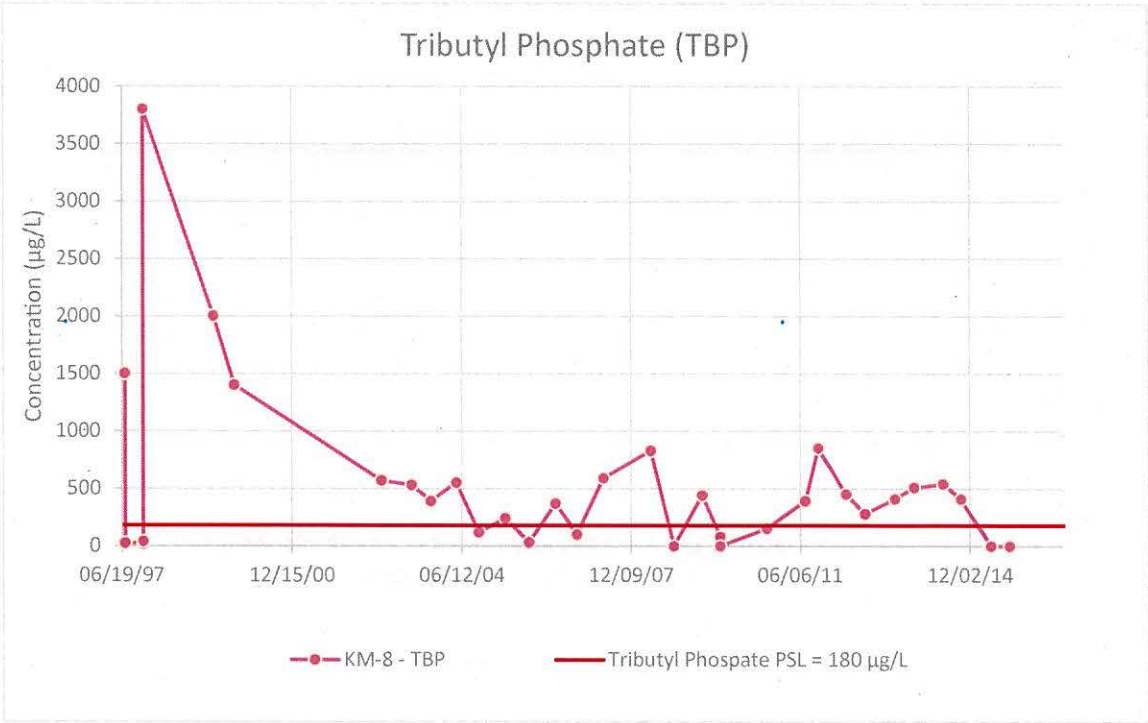
Figure 20.
KM-16 COC Data Trends
Kerr-McGee 2017 Five Year Review



Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

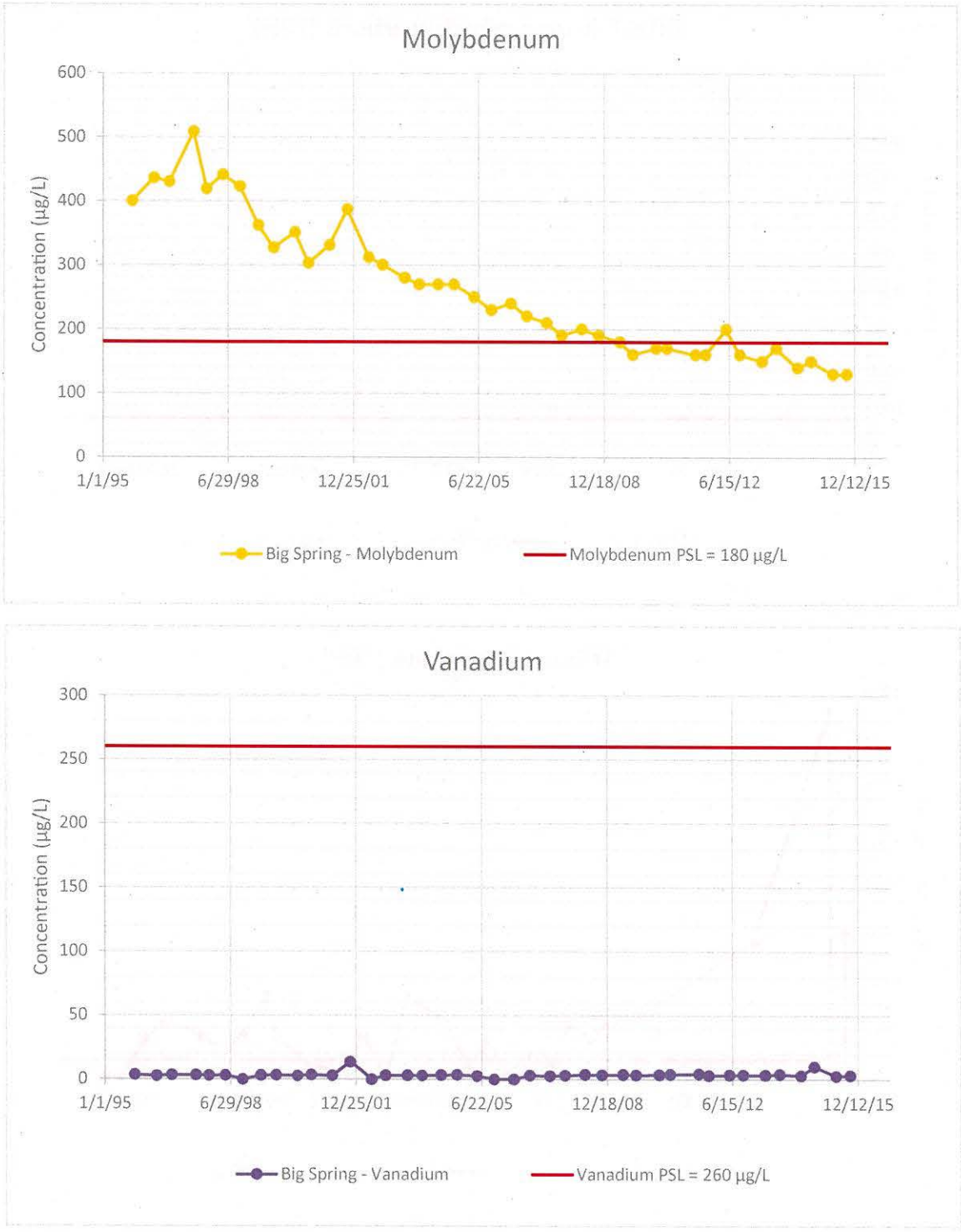
Figure 21.
KM-18 COC Data Trends
Kerr-McGee 2017 Five Year Review





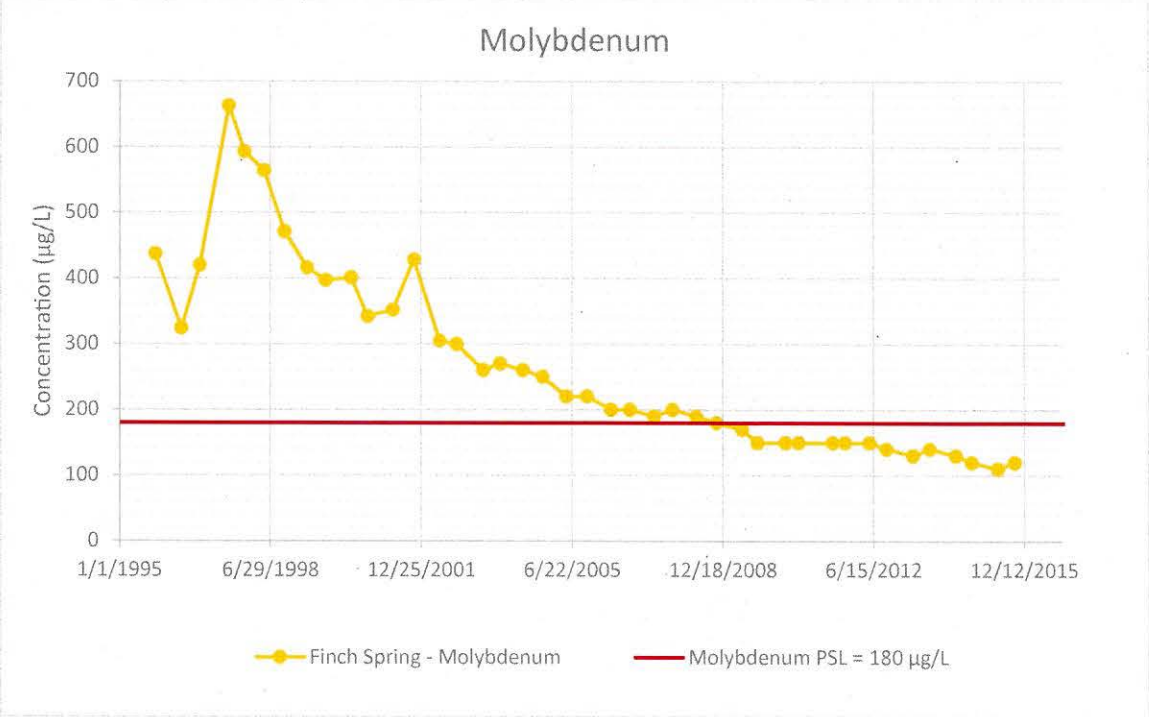
Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

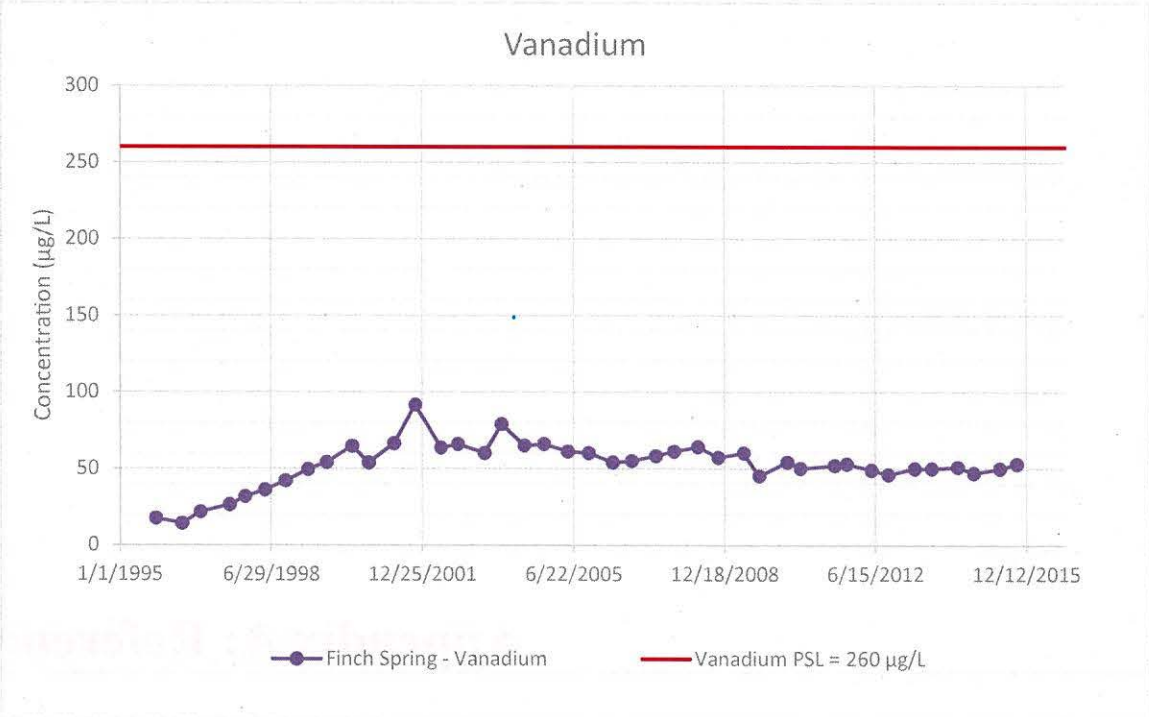
Figure 22.
KM-8 COC Data Trends
Kerr-McGee 2017 Five Year Review



Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

Figure 23.
Big Springs COC Data Trends
Kerr-McGee 2017 Five Year Review





Source: Tetra Tech, Inc. 2016. *Draft Final Annual Comprehensive Report of Groundwater and Surface Water Quality, 2015 Monitoring, Former Tronox/Kerr-McGee Chemical Corporation Superfund Site, Soda Springs, Idaho.* Prepared for Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust. December.

Figure 24.
Finch Springs COC Data Trends
Kerr-McGee 2017 Five Year Review

Appendix A: References

APPENDIX A – REFERENCES

CH2M HILL. 2012. Third Five-Year Review Report, Kerr-McGee Chemical Corporation Superfund Site Caribou County, Idaho. September

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U.S. Environmental Protection Agency. 1995. Record of Decision, Kerr□McGee, Soda Springs, September 28.

U.S. Environmental Protection Agency. 2000. Record of Decision Amendment, Kerr□McGee, Soda Springs. September 13.

U.S. Environmental Protection Agency. 2001. Comprehensive Five□Year Review Guidance. EPA 540□R□01□007. U.S. Environmental Protection Agency. June.

U.S. Environmental Protection Agency. 2002. First Five□Year Review Report, Kerr□McGee Superfund Site, Soda Springs, Idaho. September.

U.S. Environmental Protection Agency. 2008. Memorandum; Five□Year Review of Risk□Based Concentrations, Kerr□McGee Chemical Corporation (Soda Springs) Superfund Site, Caribou County, Idaho. October 23.

U.S. Environmental Protection Agency. 2016. Memorandum; Five-Year Review Recommended Template. January.

Appendix B: Site Inspection Checklist

I. SITE INFORMATION	
Site name: TRONOX SODA SPRINGS, IDAHO FACILITY (FORMERLY Kerr-McGee Chemical LLC	**Date of inspection: 05/18/17**
Location and Region: Soda Springs, Idaho REGION X	**EPA ID: IDD041310707**
Agency, office, or company leading the Five-Year Review: CH2M HILL, INC.	**Weather/temperature: Partly cloudy, cool, 80 degrees F**

Remedy Includes: (Check all that apply)

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

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

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

   Remarks: O&M is for the cap only. Covers inspection of the landfill cap. Landfill water level controlled by sump to concrete evaporation pond. No weeds or trees. Institutional Controls in place.

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

   Remarks_____

3. **O&M and OSHA Training Records** Readily available ☐ Up to date ■ **N/A**

   Remarks_____Site is an OSHA Star site since 1987. No reportable accidents.

4. **Permits and Service Agreements**
   - ☐ Air discharge permit ☐ Readily available ☐ Up to date ■ **N/A**
   - ☐ Effluent discharge ☐ Readily available ☐ Up to date ■ **N/A**
   - ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ■ **N/A**
   - ☐ Other permits_____ ☐ Readily available ☐ Up to date ■ **N/A**

   Remarks_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ■ **N/A**

   Remarks_____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ■ **N/A**

   Remarks: None, site is compacted.

7. **Groundwater Monitoring Records** ■ **Readily available** ☐ Up to date ☐ N/A

   Remarks: Onsite and available to review.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ■ N/A
Remarks

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ■ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ■ N/A
Remarks

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ■ N/A
Remarks Site is gated and a daily sign-in and sign-out log is maintained.

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ■ **Contractor for PRP**
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
■ Funding mechanism/agreement in place
Original O&M cost estimate **$1,000,000** ☐ Breakdown attached

Total annual cost by year for review period if available

From ____ To ____ ____ ☐ Breakdown attached
Date Date Total cost
From ____ To ____ ____ ☐ Breakdown attached
Date Date Total cost
From ____ To ____ ____ ☐ Breakdown attached
Date Date Total cost
From ____ To ____ ____ ☐ Breakdown attached
Date Date Total cost
From ____ To ____ ____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: Nothing to report.

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. **Fencing** ■ **Location shown on site map** ☐ Gates secured ☐ N/A
Remarks: Damage was observed in the fencing to the land fill perimeter fence and to the calcine cap perimeter fence.

B. Other Access Restrictions

1. **Signs and other security measures** ■ **Location shown on site map** ☐ N/A
   Remarks: Signs on all gates.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ■ **Yes** ☐ No ☐ N/A
   Site conditions imply ICs being fully enforced ■ **Yes** ☐ No ☐ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by): Daily Inspection
   Frequency Daily
   Responsible party/agency GMET
   Contact Lars Peterson (Name) Project Manager (Title) 5/18/17 (Date) **(480) 319-3638** (Phone no.)

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

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

2. **Adequacy** **X ICs are adequate** ☐ ICs are inadequate ☐ N/A
   Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ **No vandalism evident**
   Remarks

2. **Land use changes on site** ■ N/A
   Remarks

3. **Land use changes off site** ■ N/A
   Remarks: Property ownership transferred to Tronox in 2004. No change in land use.

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ **Roads adequate** ☐ N/A
   Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ■ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ■ **Settlement not evident**
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ■ **Cracking not evident**
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ■ **Erosion not evident**
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ■ **Grass** ■ **Cover properly established** ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks **No Trees, spraying for weeds required.**

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

7. **Bulges** ☐ Location shown on site map ■ **Bulges not evident**
   Areal extent_____ Height_____
   Remarks_____

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

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ■ **No evidence of slope instability**
   Areal extent_____
   Remarks: Nothing steeper than 3/1. Mostly 6/1.

B. Benches ☐ Applicable ■ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ■ **N/A or okay**
   Remarks_____

2. **Bench Breached** ☐ Location shown on site map ■ **N/A or okay**
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ■ **N/A or okay**
Remarks_____

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

1. **Settlement** ☐ Location shown on site map ■ **No evidence of settlement**
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ■ **No evidence of degradation**
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ■ **No evidence of erosion**
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ■ **No evidence of undercutting**
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ■ **No obstructions**
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

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

D. Cover Penetrations ☐ Applicable ■ **N/A**

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

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

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ■ **Functioning** ■ **Routinely sampled** ■ **Good condition**
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks: Dedicated pumps installed in all wells.

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

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ■ **N/A**
Remarks

E. Gas Collection and Treatment ☐ Applicable ■ **N/A**

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks

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

F. Cover Drainage Layer ■ **Applicable** ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ■ **N/A**
Remarks

2. **Outlet Rock Inspected** ☐ Functioning ■ **N/A**
Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ■ **N/A**

1. **Siltation** Areal extent_____ Depth_____ ■ **N/A**
☐ Siltation not evident
Remarks

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks

4. **Dam** ☐ Functioning ☐ N/A
Remarks

H. Retaining Walls ☐ Applicable ■ **N/A**

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

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

I. Perimeter Ditches/Offsite Discharge G Applicable ■ **N/A**

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

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

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

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ■ **N/A**

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

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

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   ☐ Properly secured/locked ■ **Functioning** ■ **Routinely sampled** ■ **Good condition**
   ■ **All required wells located** ☐ Needs Maintenance ☐ N/A
   Remarks_____

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

Purpose is to contain further migration of COC from sources to groundwater allowing for natural attenuation to reduce the overall concentrations observed in the contaminant plume. Actions taken to date have had a dramatic impact on groundwater concentrations. However, concentrations remain above risk-based groundwater performance standards in multiple monitoring wells. Continued monitoring is warranted to track decline of well concentrations in off site wells and surface water.

B. Adequacy of O&M

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

No issues identified.

C. Early Indicators of Potential Remedy Problems

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

No issues identified.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Collect further data to determine other possible sources of COCs that were not investigated during the RI.