SIXTH FIVE-YEAR REVIEW REPORT FOR
COLBERT LANDFILL SUPERFUND SITE
SPOKANE COUNTY, WASHINGTON

SEPTEMBER 2019

Prepared by

U.S. Environmental Protection Agency
Region 10
Seattle, Washington

------------------------------ 9/26/19 ------------------------------

David Allnutt, Acting Division Director
Superfund and Emergency Management Division

Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CD	Consent Decree
CIC	Community Involvement Coordinator
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CSM	Conceptual Site Model
DCA	1,1-Dichloroethane
DCE	1,1-Dichloroethylene
EPA	United States Environmental Protection Agency
FAFB	Fairchild Airforce Base
FYR	Five-Year Review
gpm	Gallons Per Minute
HQ	Hazard Quotient
IC	Institutional Control
ICIAP	Institutional Control Implementation and Assurance Plan
MAC	Maximum Acceptable Concentration
MC	Methylene Chloride
MCL	Maximum Contaminant Level
MFS	Minimal Functional Standard
µg/L	Micrograms per Liter
MTCA	Model Toxics Control Act
NCP	National Contingency Plan
ND	Not Detected
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCE	Tetrachloroethylene
PFAS	Per- and Polyfluoroalkyl Substances
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSE	Remediation System Evaluation
RSL	Regional Screening Level
TCA	Trichloroethane
TCE	Trichloroethylene
UU/UE	Unlimited Use and Unrestricted Exposure
VISL	Vapor Intrusion Screening Levels
VOC	Volatile Organic Compound

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, 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 sixth FYR for the Colbert Landfill Superfund site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE). The Site consists of one operable unit (OU), which addresses contaminated groundwater surrounding the landfill.

EPA remedial project manager (RPM) Patrick Hickey led the FYR. Participants included Huckleberry Palmer of the Washington Department of Ecology (Ecology) and EPA support contractor representatives Alison Cattani and Johnny Zimmerman-Ward. Spokane County, one of the potentially responsible parties (PRPs), was notified of the initiation of the FYR. The review began on 2/14/2019.

<u>Site Background</u>

The approximately 6,800-acre Site surrounds a 40-acre closed, municipal solid waste landfill in a semi-rural area about 2 miles north of Colbert, Washington, and 15 miles north of Spokane, Washington (Figure 1). The Groundwater contaminant plumes associated with the Site extend to the Little Spokane River approximately 3,000 feet to the west; more than a mile to the south; and to several thousand feet north and east of the closed landfill. A groundwater treatment system has been constructed near the landfill. Spokane County operated the landfill from 1968 through 1986. During that time, the landfill received household and commercial wastes. From 1975 to 1980, the landfill accepted solvent and other chemical waste from several entities, including Key Tronic Corporation (a local electronic manufacturing company) and Fairchild Air Force Base (FAFB).

Site surroundings are predominantly suburban residential areas with some agricultural uses, mainly crop and livestock production. Residences are located north and east of the landfill, some of which obtain water from individual drinking water wells. The Spokane County Regional Solid Waste North Transfer Station is directly west of the landfill (Figure 1). Residential wells are located in close proximity to the current groundwater plume. All residential wells in the area surrounding the Site are sampled regularly, and concentrations are below established standards. Some residences in the area of the Site were connected to the public water supply due to groundwater contamination detected in their residential wells at the time of the Record of Decision (ROD). The Whitworth Water District supply lines now extend to much of the impacted area. However, there are still some residents who continue to obtain water from individual wells. Other residences are connected to the public water supply given the convenience of the expanded public water system.

The geology consists of vertically stratified and laterally discontinuous geologic units. There are three aquifers defined at the Site:

- Upper aquifer: unconfined sand and gravel; flows southwest and south.
- The Lower aquifer is confined west of the landfill and unconfined east of the landfill, consists of sand and gravel, and flows predominantly to the west with discharge to the Little Spokane River.
- The Basalt aquifer is interbedded and forms a secondary aquifer that appears to be of limited extent.

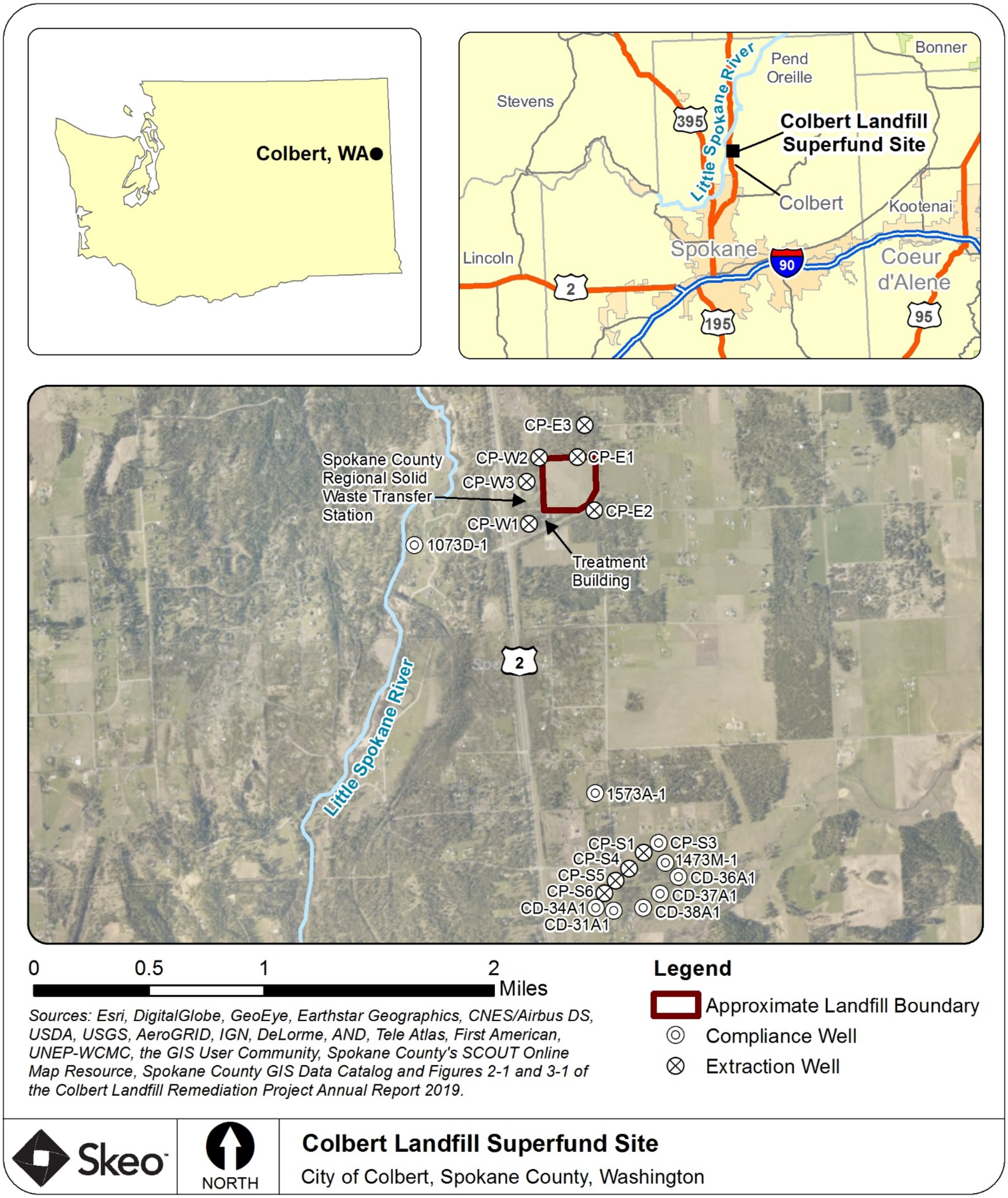
The Site's hydrogeology is complex and impacts contaminant distribution. A schematic of the geologic units and their distribution is provided in Appendix C, Figure C-1.

Appendix A provides a list of site-related information resources. Appendix B provides the Site's chronology of events.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Colbert Landfill		
EPA ID: WAD980514541		
Region: 10	**State:** WA	**City/County:** Spokane/Spokane
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the Site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Patrick Hickey, with support provided by Skeo		
Author affiliation: EPA Region 10		
Review period: 2/14/2019 – 9/19/2019		
Date of site inspection: 3/21/2019		
Type of review: Statutory		
Review number: 6		
Triggering action date: 9/29/2014		
Due date *(five years after triggering action date)*: 9/29/2019		

Figure 1: Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In 1980, nearby residents complained to Ecology about the chemical disposal practices at the Colbert Landfill. EPA, Ecology and the Spokane County Utilities Department sampled nearby domestic water wells. Twenty domestic wells had contaminants above drinking water standards. In August 1983, EPA placed the Site on the Superfund program's National Priorities List (NPL). The EPA identified Spokane County, Key Tronic Corporation and FAFB as PRPs.

In 1984, Ecology entered into a cooperative agreement with EPA for conducting the Site's remedial investigation and feasibility study (RI/FS). During that same year, bottled water was supplied to households with high contaminant levels in their water wells. In 1985, Spokane County extended the Whitworth Water District public water supply main to those affected households. The final RI Report was completed in 1987. It confirmed that the upper and lower sand and gravel aquifers were contaminated with solvents and that the completed exposure pathways at the Site were ingestion of contaminated groundwater and ingestion of crops irrigated by or grown in contaminated groundwater as well as dermal contact with groundwater via bathing.

Response Actions

On September 25, 1987, EPA issued a ROD for the Interim Final Remedial Action. The ROD identified the following objectives:

- Prevent further spread of contaminated groundwater (in the south and west) in two aquifers by installing and operating interception wells and treating the extracted groundwater.
- Remove contaminated materials (in the east) that have entered the aquifers and are contributing to the contaminant plume, by installing and operating extraction wells in the area where the plumes originate and treating the effluent[1].
- Provide an alternate water supply system to any residents who are deprived of their domestic supply by demonstrated contamination from the landfill or due to the action of the extraction systems.

The selected remedy included two primary components:

- Groundwater extraction and treatment.
- Providing an alternate water supply for affected residents.

Institutional controls were selected to ensure that the remedial action will continue to protect human health and the environment. However, the type of institutional controls was not specifically defined in the ROD.

The Landfill was to be closed in accordance with the Washington State Minimum Functional Standards (MFS) for landfill closure. The closure will be addressed in the final ROD. Thus, this FYR does not address the landfill itself.

The contaminants of concern (COC) identified in the RI/FS are:

- 1,1,1-Trichloroethane (TCA)
- 1,1-Dichloroethylene (DCE)
- 1,1-Dichloroethane (DCA)
- Trichloroethylene (TCE)
- Methylene chloride (MC)

Groundwater performance goals of the six site COCs were established at the maximum contaminant level (MCL) or $1x10^{-6}$ cancer risk level (Table 1).

[1] This objective was stated as two separate objectives in the Declaration.

Table 1: Groundwater COCs Performance Standards

Groundwater COC	ROD Performance Standards (µg/L)	Basis
1,1,1-TCA	200	MCL
1,1-DCE	7	MCL
1,1-DCA	4,050	MAC[2]
TCE	5.0	MCL
Tetrachloroethylene (PCE)	0.7	1 x 10^{-6} cancer risk
Methylene chloride	2.5	1 x 10^{-6} cancer risk

Notes:
MAC = maximum acceptable concentration that should not be exceeded, calculated in the risk assessment.
MCL = maximum contaminant level
µg/L = micrograms per liter
Source of Performance Standards is the ROD

<u>Status of Implementation</u>

In 1989, EPA & Ecology, entered into a Consent Decree (CD) with Spokane County and Key Tronic Corporation. The CD established Key Tronic Corporation as having a financial responsibility while Spokane County was charged being responsible for implementing the remedial action. In 1990, EPA and FAFB entered into an Administrative Order on Consent and Interagency Agreement that directed FAFB to provide funding for the Colbert Landfill Special Fund Trust in exchange for which the EPA covenants not to sue the Air Force for specified CERCLA and Resource Conservation and Recovery Act (RCRA) liability with regard to the Colbert Landfill site. Ecology provides oversight as the State Lead.

<u>Groundwater Extraction</u>

Spokane County initiated the remedial action design and construction in 1989 and construction was completed in 1994. Spokane County issued a Construction Closeout Report in May 1997 accepting all construction work. The South Extraction System has been completely shut down since January 2007. By April 1, 2014, all of the remaining extraction systems and treatment processing plant had been placed on standby mode. Spokane County currently conducts Operations and Maintenance on the system.

The groundwater extraction and treatment systems consist of the following components:

- Upper Aquifer System
  - Approximately one mile south of the landfill a line of interception wells was placed with the intent to prevent the southern expansion of the contaminant plume in the upper aquifer only.
    - 4 extraction wells - CP-S1 and CP-S4 to CP-S6 (Southern system).
    - System initially shutdown in 2004 due to contaminant concentrations being below evaluation and adjustment control criteria as defined in the 1999 Operations and Maintenance Plan for the Colbert Landfill. The system was restarted briefly in 2006 and was shut down again in 2007.
    - System has remained shut down as contaminant concentrations remain below adjustment criteria and plume shows no indication of expansion.
    - Post attainment compliance monitoring is currently ongoing at wells CD-31A1, CD-36A1, CD-37A1, CD-38A1, CP-S3 and CD-34A1.
- Lower Aquifer System

- West system consists of 3 extraction wells – CP-W1, CP-W2, and CP-W3 screened in the lower aquifer.
  - Designed to both lower contaminant concentrations and prevent further westward migration of the contaminant plume.
  - System pumping capacity is 400 – 450 gallons per minute (gpm).
  - Compliance monitoring wells associated with this extraction system include CD-41(C1/2/3), CD-42(C1/2/3), CD-48(C1/2/3), CD-43(C1/2/3), CD-44(C1/2/3), CD-45(C1/2/3), and CD-48(C1/2/3).
- East system has 3 extraction wells – CP-E1, CP-E2, and CP-E3 screened in the lower aquifer.
  - CP-E1 and CP-E3 provide a combined 225 – 250 gpm while CP-E23 delivers 0.5 – 2 gpm due to its being screened in the basalt aquifer.
  - System was installed for the sole purpose of reducing concentrations of contaminants/source control.
  - There are no compliance monitoring wells established for the eastern extraction system.

- Treatment System
  - An air stripping system designed to remove volatile organic compounds (VOCs) from the extracted groundwater.
  - System may treat as much as 1,600 gpm of extracted groundwater, but prior to shutdown has treated approximately 650 gpm.
  - Treated groundwater is discharged via gravity to the Little Spokane River through an underground 12-inch diameter PVC pipeline.

In 2007, the southern extraction system was shut down. These Upper aquifer system wells continue to be in a shutdown/standby mode as COC concentrations remain well below the ROD performance standards. These low concentrations were discussed in the optimization review known as the 2010 Remediation System Evaluation (RSE). Supplemental well sampling in 2017 indicated that well CP-S4 had a tetrachloroethylene (PCE) level of 0.75 micrograms per liter (µg/L), above the ROD performance standard of 0.7 µg/L. Nonetheless, it appears that there has not been an attainment analysis compiled, and thus, one should be developed.

The RSE also evaluated the Lower aquifer system (east and west) extraction systems in greater depth. In the east system, the RSE authors noted that the decline of COC concentrations was substantial between the start of extraction until 1998. However, concentrations in the east wells had remained stable since 1998. The west extraction system well CP-W1 attained low concentrations and was shut down by 2005. Wells CP-W2 and CP-W3 had relatively low concentrations compared to the performance standards, and these decreases occurred primarily up to 1998. Based on supplemental data derived from the fourth FYR, the RSE team concluded the shape and size had not changed significantly since the extraction system was initiated. These data observations led the RSE team to theorize that the current extraction system may not adding to the overall protectiveness of the remedy. The RSE team felt a shut-down test may be appropriate to determine if terminating extraction has a negative impact on water quality.

Consistent with the RSE recommendation, a shutdown test workplan was developed and submitted by Spokane County in April 2013. The purpose and objective of the shutdown test, while not clearly stated, is to determine if terminating the extraction system operations has a negative water quality impact or promotes plume migration westward. Prior to the shutdown test implementation, the RSE recommended installing another monitoring well west of extraction well CP-W3 due to the lack of groundwater monitoring in that region and the predominantly westward groundwater flow in the lower aquifer. In April 2014, the initiation of the shutdown test saw all the remaining extraction wells shut-off. Data collected from the extraction wells themselves are not used to assess the need to restart pumping. Instead, this evaluation is based on data from a series of wells downgradient of the extraction wells. The lower aquifer wells designated as "compliance wells" are CD-41, CD-42, CD-43, CD-49, and at compliance well clusters CD-44, CD-45, and CD-48. These wells were sampled quarterly for the first-year, semiannually during the second year, and continue to be sampled annually as long as no significantly increasing trends in COC are observed. The sampling and analysis in the shutdown test work plan is active and ongoing. The monitoring wells are also used to evaluate the prevention of contaminated groundwater downgradient spread to the West. It is recommended that the evaluation of the contaminant plume movement not solely rely on 1,1,1-TCA data, but also evaluate and summarize the remainder of COC data to describe meeting the ROD objectives.

The Evaluation Criteria, which mirror ROD performance standards, and Action Level Criteria, set at 65% of the performance standards, are used to assess the need for system restart (Table 2). If an exceedance of evaluation criteria is reported and confirmed the system will be restarted. The extraction system may also be restarted if four consecutive quarters of an exceedance of the action level criteria in any compliance monitoring well, a confirmed exceedance of the evaluation criteria in any compliance monitoring well, or in order to maintain protectiveness of health, an exceedance of applicable criteria in a domestic well from the Residential Well Monitoring Program that is currently in place.

In keeping with the Shutdown Test Work Plan, Spokane County provides an annual report to both Ecology and the EPA on the progress of the test. This report includes results of the preceding year's monitoring activities, a summary table of current water levels, groundwater elevation contours for the Lower Aquifer, and an evaluation of groundwater flow under non-pumping conditions. Also included is a summary table of current analytical results plotted with historical data for selected wells to track any trends in concentration over time. A summary of analytes detected for the reporting period will be prepared and any exceedances of applicable performance standards will be identified. The report will also provide monitoring modification or extraction system restart recommendations. However, an ongoing analysis of the conceptual site model (CSM) and remedial action objectives are lacking from the report. For example, providing an estimation of the size, shape, and movement of the contaminant plume and providing modeled diagrams of COCs in excess of the performance standards. The EPA 2018 Optimization Review Report, Section 5.9, provided suggestions for improving annual reports. Refer to EPA Guidance Memorandum "Groundwater Remedy Completion Strategy" [OSWER 9200.2-144].

Table 2: 2013 Shutdown Test Work Plan Action Level and Evaluation Criteria

Groundwater COC	Action Level Criteria (µg/L)[a]	Evaluation Criteria (µg/L)[b]
1,1,1-TCA	130	200
1,1-DCE	4.55	7
1,1-DCA	2,632	4,050
TCE	3.25	5
PCE	0.5	0.7
Methylene chloride	1.6	2.5

Notes:
Source: 2013 Final Work Plan Groundwater Pump & Treat System Shutdown Test
a) Action Level Criteria are 65% of the ROD Performance Standards
b) Evaluation Criteria are the same as the ROD Performance Standards

In 2018 the EPA conducted another optimization review of the site remedy and several recommendations were developed from it. A key recommendation was to restart extraction well CP-W3 to capture contamination migrating past it to the West. They also recommended that extraction well CP-E2 also be restarted also. Furthermore, they recommended that plume delineation in the vicinity of CP-W3 be improved by adding a monitoring well between the two existing downgradient wells. Finally, they recommended that the supplemental wells that had detections of 1,1-DCE in April of 2017 be monitored annually.

Alternate Water Supply

Spokane County notified the residents of potential groundwater contamination in 1980. In 1984, residences affected by the groundwater contamination were supplied with bottled water. The county then requested to sample residential wells. Those wells that had an average concentration over 65% of the performance standards over a 12-month period were to be supplied with a potable water connection and, in 1985, provided the opportunity to connect to the Whitworth Water District extended pressurized potable water line. Twenty-three residences were connected to the new water line in 1985, and 12 additional residences have since been connected. The thirty-five residences that opted out of the new water district line have their wells periodically monitored to ensure health protectiveness.

Monitoring programs

Spokane County has five ongoing monitoring programs directly associated with the remedy. These include the shutdown test, upper aquifer compliance, 1,4-Dioxane sampling, supplemental sampling, and residential well monitoring (Table 3). The periodicity of sampling under these programs is between quarterly and once every five years. There is not a single monitoring plan that provides the overall monitoring objectives, sampling frequency, analysis performed and reporting requirements. The EPA recommends that the overall monitoring program be evaluated to ensure consistency with the current goals and conditions, and a single plan be developed.

Table 3: Current Monitoring Programs

Program	Aquifer	Parameters	Frequency
Shutdown test	Lower	VOCs	Annual (extraction wells quarterly)
Upper aquifer compliance	Upper	VOCs	Annual (extraction wells quarterly)
1,4-Dioxane sampling	Upper	1,4-Dioxane	Annual
Supplemental sampling	Lower/Upper	VOCs	Every Five Years
Residential well monitoring	Lower/Upper	VOCs	Various (monthly, quarterly, semi-annual, annual, biannual)
Notes: Source: Colbert Landfill Remedial Project Annual Report, 2019			

Vapor Intrusion

Vapor intrusion was evaluated in the 2009 FYR and the 2010 RSE. Both concluded that the vapor intrusion pathway did not appear to be a concern.

Institutional Control (IC) Review

The ROD required institutional controls are consistent with the final design to ensure that the remedial action will continue to protect human health and the environment. Installations of new wells are tracked by the Spokane County Health Department via permitting through Ecology consistent with Washington State regulations. If a well is to be placed within the boundaries of the Site, the health district will notify the Spokane County Colbert Landfill personnel. If the well is adjacent to or within a known area of site contamination, homeowners are made aware of the possibility the groundwater may be contaminated. Spokane County will request a sample from the well be analyzed for COCs. If any COCs are detected, the use of the well will be discontinued. The homeowner is made known of the available public water hook up through the Whitworth Water District. Well records from Ecology are periodically reviewed for new or unknown well construction near the Colbert Landfill site area to ensure no domestic use wells have been installed in areas of groundwater contamination. It is unclear if these procedures are being utilized effectively as the County does not track this process. The EPA recommends that the procedures and implementation plan be documented in an Institutional Control Implementation and Assurance Plan (ICIAP). It is also recommended that a map of the contaminant plume boundaries be developed and revised annually to assist in locating potential new wells.

To ensure the continued protectiveness of residential water supply, Spokane County implements a residential monitoring program that provides an opportunity for all potentially affected well owners to have their individual wells tested at least biannually.

Table 4: Summary of Planned and/or Implemented Institutional Controls (ICs)

Media, Engineered Controls, and Areas That Do Not Support UU/UE 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	Parcels potentially impacted by site contamination	Prevent installation of wells in areas and at depths of known contamination	County Information System

<u>Systems Operations/Operation and Maintenance (O&M)</u>
All O&M activities are conducted in accordance with the Site's 1999 O&M Plan. Inspections are required monthly, unless severe weather conditions restrict, in which the well vault and components are inspected. Extraction and flow rates are recorded and used to evaluate pump conditions and the need for well rehabilitation. Spokane County should consider adding a section to the annual report in which periodic inspections and their results are presented. The plan should be reviewed and updated to reflect current operations.

III. PROGRESS SINCE THE PREVIOUS REVIEW

This section includes the protectiveness determination and statement from the previous FYR Report as well as the recommendation from the previous FYR Report and the status of the recommendation.

Table 5: Protectiveness Determination/Statement from the 2014 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedy at the Colbert Landfill Site is protective of human health and the environment because residences with affected wells have been connected to Spokane County water supplies; the groundwater extraction systems are preventing further migration of the groundwater plume; domestic wells are sampled on a schedule to confirm that the drinking water exposure pathway is incomplete; and the Spokane County Health Department has procedures in place to detect any wells installed as part of new developments planned near the plume beyond the landfill property.

Table 6: Status of Recommendations from the 2014 FYR Report

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	Finalize the ROD.	Issue a Final ROD and update or include cleanup levels for DCA and 1,4-Dioxane.	Considered But Not Implemented	Due to the continued uncertainty in time to attainment, EPA has decided to postpone the final ROD. Any new toxicological information will be continued to be reviewed as a part of the FYR.	N/A

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was made available by a newspaper posting in The Spokesman Review on 5/24/2019. It stated that the FYR was underway and invited the public to submit any comments to EPA. The results of the review and the report will be made available at the Site's information repository, Spokane Public Library, located at 906 West Main Avenue Spokane, WA 99201. The press notice is provided in Appendix D.

During the FYR process, EPA community involvement coordinator (CIC) sent questionnaires to 32 residential well owners in June 2019. The interviews requested feedback on the cleanup process at the Site and to document any perceived problems or successes with the remedy that has been implemented to date. The interviews are summarized below. The completed interview forms are provided in Appendix E.

Three residents responded with written responses to the mailed questionnaire. Two respondents felt well informed about the Site and felt that the site had not impacted the community. One respondent did not feel well informed about the Site and would like to be provided more frequent, at least annual, groundwater information. The comment and contact information were provided to the County Water Resources Specialist.

On July 1, 2019 a resident in the vicinity of Colbert Landfill called after receiving a well-owner's questionnaire. After reading the letter the well owner requested clarifying information concerning contaminants from the landfill and the Little Spokane River. The caller expressed interest in receiving the information due to the perceived impacts of a potentially contaminated waterway would have on the sale of their home. The caller requested a phone call or letter be provided. Four attempts were made to contact the resident by phone. Subsequently, the concerns were passed along to more local folks; the Spokane County Water Resources Specialist at Colbert Landfill and the Ecology Site Manager for Colbert Landfill for follow-up.

Data Review

Groundwater data were collected during this FYR period in accordance with the monitoring programs in Table 3. This FYR reviewed the annual monitoring reports generated during this FYR period (2015-2019 Annual Reports). The groundwater data, annual reports, and 2018 Optimization Review are discussed below as they apply to the remedy and its objectives. Recommendations from the 2018 Optimization Review Report are discussed as well.

Upper Aquifer

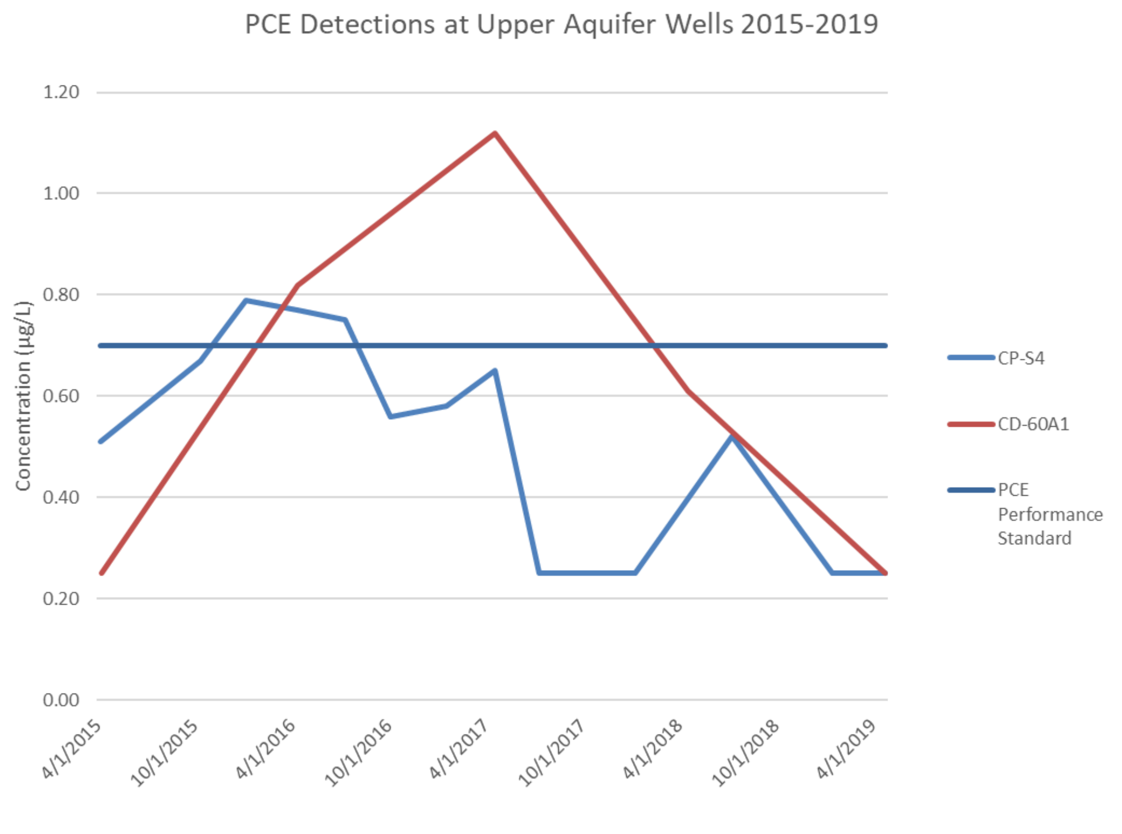
Since 2007 the southern extraction system has been placed in standby and is subject to ongoing compliance monitoring. The upper aquifer monitoring locations are shown in Figure H-3 in Appendix H. The data resulting from the southern compliance well sampling during this FYR period have shown most values one to several orders of magnitude less than the ROD's performance standards. There were no exceedances of the ROD performance standards for listed COCs in the upper aquifer during this FYR period except for PCE (see Table 7). The PCE exceedances were observed in 2016 and 2017 and ranged from 0.75 in CP-S4 to 1.12 in CD-60A1 (Figure 2).The overall concentrations appear to have decreased an order of magnitude or higher. All residential wells south of the southern extraction wells have values <0.5 µg/L. The data appear to support the remedy objective of preventing contaminant plume movement south of the southern extraction wells, thus reducing upper aquifer monitoring is a recommendation. Recommend Spokane County provide a distinct evaluation and discussion of ROD remedial objectives regarding the Upper Aquifer including modelled plume boundaries for all COCs.

Table 7: Maximum Detected Concentrations, 2015-2019

Date	Maximum Detected Concentration (µg/L)					
	1,1,1-TCA	**1,1-DCE**	**1,1-DCA**	**TCE**	**PCE**	**1,4-Dioxane**
Standard[a]	**200**	**7**	**4,050 (2.8)[b]**	**5**	**0.7**	**7[c]**
2015	6.44 (CD-40C1)	2.38 (CD-40C1)	**13.5** (CD-36A1)	2.05 (CP-S4)	0.51 (CP-S4)	**7.8** (CD-40C1)
2016	3.19 (CD-61A1)	1.42 (CD-36A1)	**14.9** (CD-36A1)	2.63 (CP-S4)	**0.82** (CD-60A1)	**7.7** (CD-40C1)
2017	2.41 (CD-61A1)	0.85 (CP-S1)	**3.3** (CP-S1)	2.04 (CP-S4)	**1.12** (CD-60A1)	**11.9** (CP-S1)
2018	1.98 (CD-61A1)	0.58 (CP-S1)	2.19 (CP-S1)	1.73 (CP-S1)	0.61 (CD-60A1)	3.4 (CP-S1)
2019	1.5 (CD-61A1)	1.06 (CD-40C1)	1.72 (CP-S1)	1.8 (CP-S4)	ND	2.6 (CP-S1)

Notes:
ND = Not detected
µg/L = micrograms per liter
Methylene chloride was not detected in the upper aquifer, so it is not included in the table.
a. ROD performance standards
b. EPA regional screening level (RSL) is provided for comparison because the toxicity of 1,1-DCA has changed since the ROD was issued
c. State Model Toxics Control Act (MTCA) criterion
Bold = exceeds listed standard

Figure 2: Upper Aquifer PCE Concentrations



Non-detect results reported at 1/2 the detection limit on this graph which is equal to 0.25 µg/L
All other upper aquifer monitoring location results were below the method detection limit of 0.50 µg/L and are not shown on this graph.

Lower Aquifer

While the southern extraction system has been placed in standby and is subject to ongoing compliance monitoring, the lower aquifer continues to exhibit persistent levels of contamination. Monitoring and analysis are conducted consistent with the 2014 work plan. The 2018 Optimization review found that, in the absence of pumping, the plume may be spreading westward, thus suggesting there is an ongoing source.

Data from monitoring well CD-49, the most westward shutdown test compliance well, described an increase in DCE and TCA concentrations from <0.5 µg/L for both in 2014 to a peak of 2.59 µg/L (DCE, 2018) and 7.81 µg/L (TCA, 2017). While concentrations decreased during the last 4 (DCE) and 6 (TCA) sample events and still below the performance standards, concentrations appear to be trending higher (Figure 3). Concentrations for all COCs at CD-49 are shown in Figure 4.

Figure 3: CD-49 DCE and TCA Concentrations 2014-2019

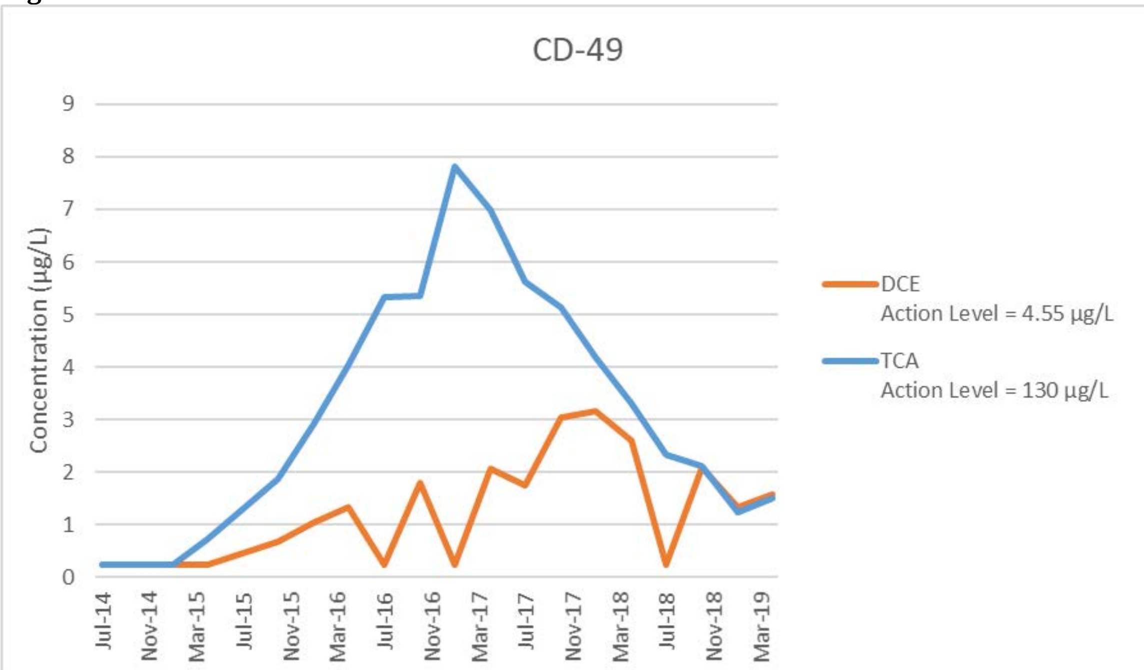
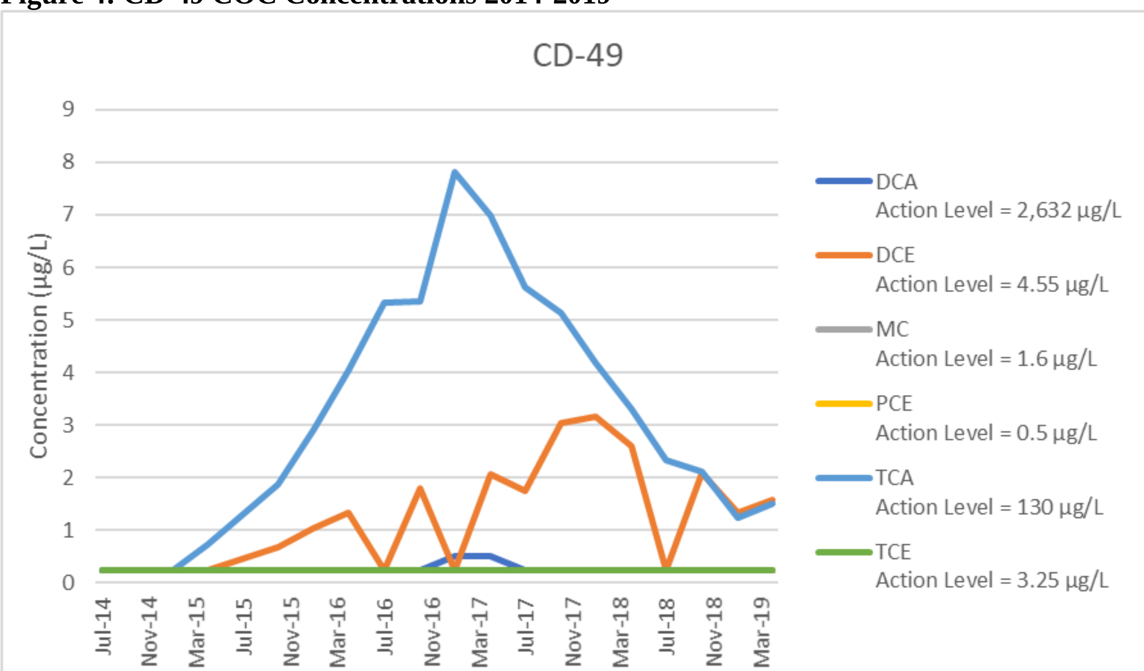


Figure 4: CD-49 COC Concentrations 2014-2019



With contamination plumes being of varied widths and heights, knowing where the center of the plume is in relationship to CD-49 is difficult due to sparse number of monitoring wells. Nonetheless, the increasing TCA and DCE concentration trends indicates that there may be plume movement westward in opposition to the remedy. Likewise, supplemental monitoring well 0273L-2, northeastern of Colbert Landfill, DCE samples have been recorded at 11.6 µg/L (2012) and 10.5 µg/L (2017), both above ROD performance standards. The 2018 EPA Optimization review hypothesized that residential groundwater pumping may be drawing contaminants to the northeast, spreading the plume.

The contamination source, while substantially reduced in concentration from years of extraction, appears to be persisting at levels well above the performance standards. The monitoring well CP-W3 is part of the network of extraction wells installed to reduce the plume source concentrations and to prevent plume migration. Prior to the 2014 shutdown test, normal extraction operations with wells CP-W2, CP-E1, and CP-E3 was thought to have redirected groundwater contamination into CP-W2 capture zone. Due to dilution from less contaminated captured groundwater, the CP-W2 capture zone samples resulted in much lower concentrations when compared to the levels found at the CD-04 cluster wells (near center of landfill). This presented an appearance of plume concentration reduction at CP-W2 and gave support to the shutdown plan execution. However, with the extraction system in standby, groundwater flow is now transporting contamination towards the CP-W3 capture zone and COC concentration increases have been observed. The sample data from CP-W3 indicates an initial increase in concentrations of TCA, DCE, and TCE to a peak in 2017 (Figure 5). The concentrations of the three COCs then decreased until mid-2018, and then slightly increased or remained steady to the present. 1,1,1-TCA remains far below the 200 µg/L ROD performance standard during this period. However, both DCE and TCE started the shutdown test slightly under the ROD performance standards of 7 and 5 µg/L respectively, and are currently over triple, 25.4 µg/L – DCE and 17.7 µg/L – TCE.

Although the 1,1,1-TCA concentrations remain below the action level of 130 µg/L and the performance standard of 200 µg/L, the migration of 1,1,1-TCA is still of concern because it degrades abiotically into 1,1-DCE, which has a much lower action level and performance standard. Data from extraction wells CP-W1 and CP-E1 are shown in Figure 6 and 7.

In order to support the remedy, it is recommended the extraction wells CP-W3 and CP-E2 be restarted to prevent plume migration and to continue to reduce the COC source concentrations. It is also recommended that additional monitoring wells be added to the western region of the site for better delineation of the contaminant plume.

Figure 5: CP-W3 COC Concentrations 2012, 2014-2019

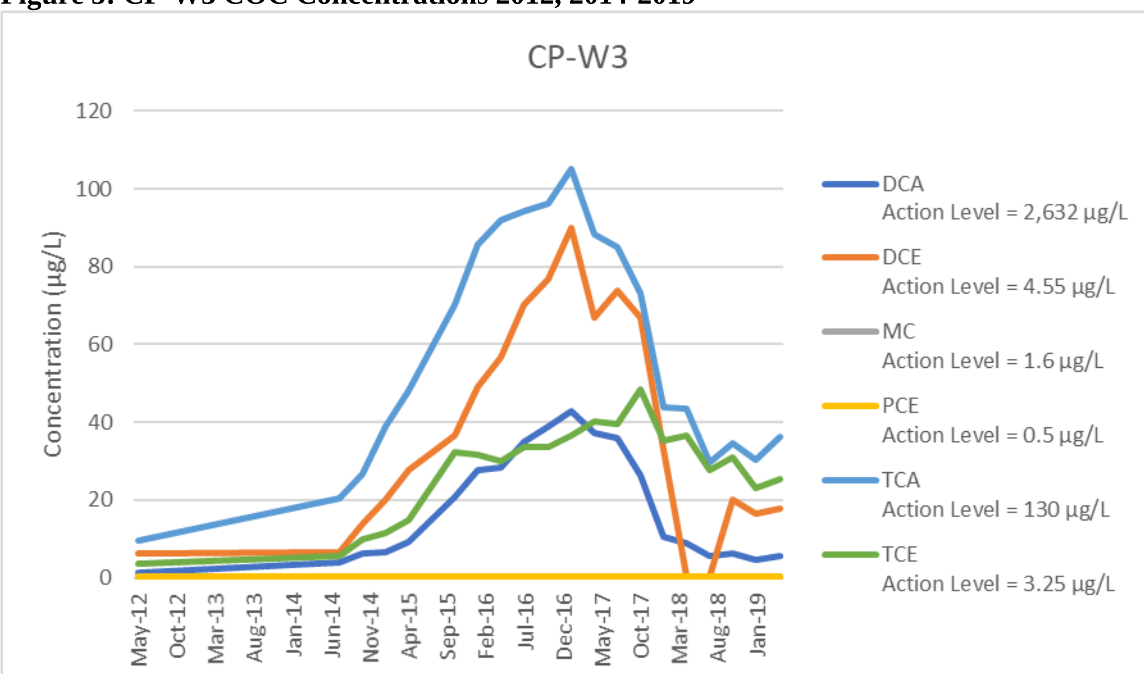


Figure 6: CP-W1 COC Concentrations 2012, 2014-2019

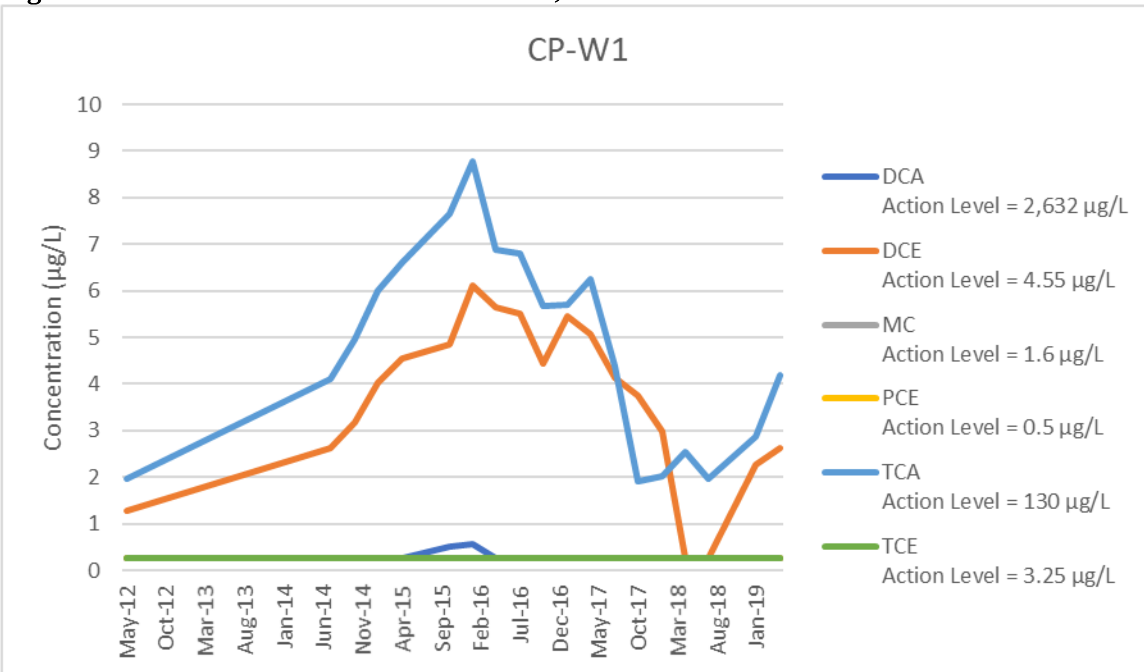
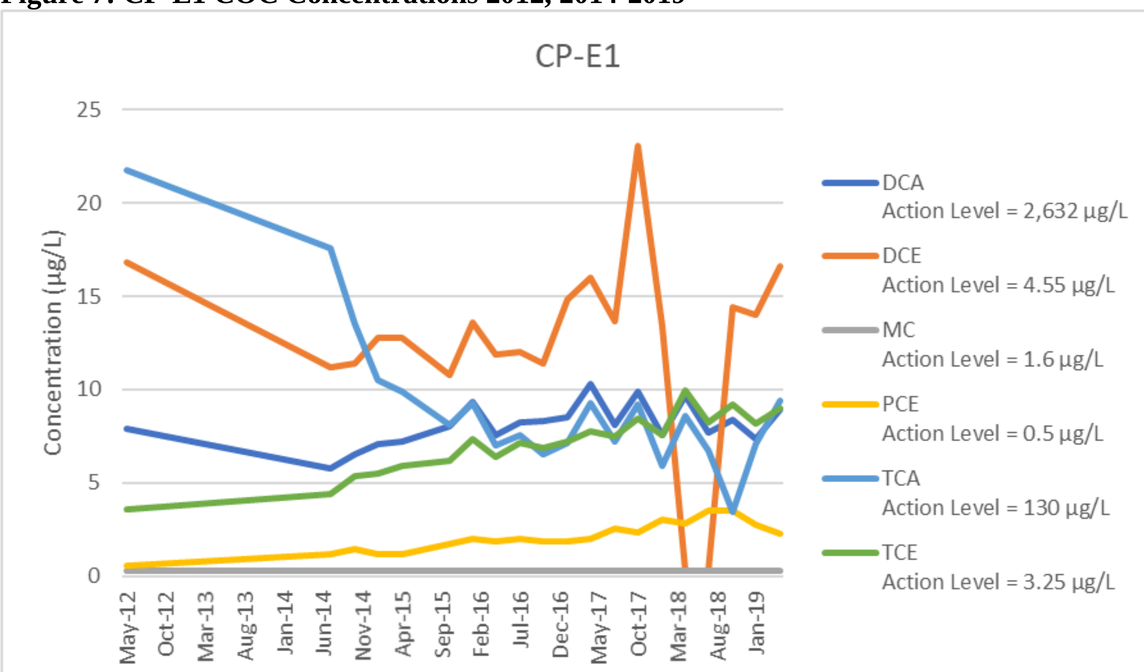


Figure 7: CP-E1 COC Concentrations 2012, 2014-2019



Residential Well Monitoring

Domestic wells within the Site are monitored in accordance with the 1991 Quality Assurance and Field Sampling Plan. The residential well locations and schedules are selected based on relative location to the plume.

During this FYR period, all residential well results were below the ROD performance standards and below the 65 percent action level threshold, most below detection levels COCs. In December 2018, a single methylene chloride reported a concentration of 1.35 µg/L, just below the action level of 1.6 µg/L and performance standard of 2.5

µg/L. While this may reflect an analytical error, the County has increased the sampling of that residential well from annual to semi-annual.

Supplemental Monitoring
During this FYR period, supplemental sampling was conducted in 2017 at 33 supplemental wells (Figure H-6 in Appendix H). The 33 supplemental wells do not include any compliance monitoring wells. The supplemental wells that exceeded the performance standard are shown in Table 8. However, wells at CD-01C1, CD-08E1 and CD-26 indicate persistent concentrations, from 2012 supplemental sampling, that aren't well understood.

The 2018 Optimization Review Report identified data gaps associated with wells CP-E3 and CD-26. Concentrations that exceeded Consent Decree Action Level Criteria in both 2012 and 2017 supplemental well analyses suggest little is known about the mechanics of source movement around CP-E1 and CP-E3. The contaminant concentrations near well CD-26 have never been addressed by the remedy and need to be evaluated. The 2018 Optimization team recommended annual sampling of wells that presented 1,1-DCE detections in 2017 will provide concentration data to better understand the contaminant movement near the landfill as well as track potential future exceedances or progress toward aquifer restoration.

Table 8: 2017 Supplemental Well Performance Standard Exceedances

Monitoring Location	Aquifer	2017 Detected Concentration (µg/L)				
		1,1,1-TCA	**1,1-DCE**	**1,1-DCA**	**TCE**	**PCE**
Standard[a]		**200**	**7**	**4,050 (2.8)[b]**	**5**	**0.7[c]**
0273L-2	lower	2.21	**10.5**	2.74	<0.5	<0.5
CD-01C1	lower	56.9	**53**	**6.32**	<0.5	<0.5
CD-04C1	lower	44.4	**372**	**276**	**13.7**	**2.26**
CD-04E1	lower	36.4	**326**	**241**	**13.4**	**2.26**
CD-08E1	lower	10.2	**32.6**	**3.76**	**6.49**	<0.5
CD-24C2	lower	8.24	6.88	**4.35**	1.27	<0.5
CD-26	lower	41.3	**18.9**	**8.65**	**67.6**	<0.5
CD-46	lower	50.7	**30.2**	**14.6**	**31.9**	<0.5

Notes:
a. ROD Performance Standard
b. EPA RSL as of June 2017
c. = State MTCA criterion
Bold = exceeds listed standard

1,4-Dioxane Monitoring
During the past five years, the maximum concentration was 11.9 µg/L at CP-S1 but since 2017, concentrations of 1,4-dioxane have decreased below the Model Toxics Control Act (MTCA) criterion of 7 µg/L (Table 7). Generally, the highest 1,4-dioxane concentrations are observed at CP-S1 at the far southern extraction wells and CD-40C1 far west and slightly south of the landfill (Table 7).

The 2018 Optimization Report recommended that due to a lack in plume capture and potential change in groundwater flow direction, sampling should be conducted for a minimum of 2 sample events at a broader network of monitoring wells, including lower aquifer extraction wells, compliance wells, supplemental wells and residential wells, to establish post-shutdown concentrations.

Site Inspection
The site inspection took place on 3/21/2019. Participants included EPA RPM Patrick Hickey; Huckleberry Palmer from Ecology; Austin Stewart, Lindsay Chapman, Mike Terris and Deb Geiger from Spokane County; and Alison Cattani and Johnny Zimmerman-Ward from Skeo (EPA FYR support contractor). The purpose of the inspection was to assess the protectiveness of the remedy.

Site inspection participants met at the Spokane County facility located on the landfill property. Inside the county office, Spokane County staff shared information on the history of the Site, the implemented remedy and site activities during this FYR period. Following the presentation, site inspection participants observed the groundwater pump-and-treat system. The pump-and-treat system, which is in standby mode, was well maintained. Site inspection participants observed the western and southern extraction wells, located outside the landfill property boundary, which were labeled and locked.

Following the inspection, EPA staff visited the site repository, Spokane Public Library. The librarians on staff were not aware of the documents or that the library serves as the site repository. No site-related documents were located. The EPA recommends that an electronic or paper repository be established in a location accessible to the local community.

The site inspection checklist and photographs are provided in Appendices F and G, respectively.

V. TECHNICAL ASSESSMENT

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

Question A Summary:
Yes, the remedy is generally functioning as intended by the ROD.

The Upper Aquifer has been in standby mode since 2017 when extraction was stopped due to most wells were below ROD performance standards. As of 2019, all upper aquifer wells were below ROD performance standards. A final attainability analysis is needed prior to closeout.

The Lower Aquifer extraction system has been placed in standby mode with the 2014 initiation of the shutdown test to evaluate whether the interim remedy was still contributing to achieving the remedial objectives. Wells are sampled and the data is evaluated annually. The contaminants of concern increased upon shutdown of the extraction system but appear to have leveled-off or decreased marginally. However, they are still above ROD performance standards at the extraction wells, which suggests the source may still be contributing to the contaminant plume. Data obtained by sampling should be evaluated against the remedial objectives to determine if refinements in the remedy are advisable. The data obtained from wells downgradient indicate that the contaminant plume is contained.

Most residents are connected to the extended public water system. The remaining residents' wells are tested periodically and remain below performance standards. The remedy is functioning as intended.

Institutional controls are in place and maintained by the county to prevent unauthorized wells from being established in areas of contamination or made use of without adequate testing.

Supplemental monitoring of wells is conducted on a periodic basis with the analysis of 1,4-Dioxane included as it is a known human health concern.

Monitoring plans need to be evaluated and updated to ensure the focus remains on containing the plume and reducing the source COC concentrations to below ROD performance standards. The monitoring plans are numerous, overly complex, and hinder the ability to effectively assess and track the remedy progression.

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:

Except for 1,1-DCA and 1,4 Dioxane, the exposure assumptions, cleanup levels and RAOs used at the time of the remedy are still valid. The PCE performance standard in the ROD (0.7 µg/L) is lower than the current MCL (5 µg/L) as the ROD performance standard was based on the 10^{-6} cancer risk screening. The regional screening level (RSL) for 1,1-DCA is 2.6 µg/L, which is far lower than the ROD performance standard of 4,050 µg/L but has been evaluated in earlier FYRs. 1,4-Dioxane has been previously identified (see 5th Five Year Review, Section 6.4.3) and is evaluated annually.

The RAOs at the Site include prevention of the further spread of contaminated groundwater, removal of contaminated materials and provision of an alternate water supply to residences affected by site contamination. These objectives remain valid. Contamination persists mostly in the lower aquifer. Additional source material not addressed by the extraction wells may be present. EPA's optimization review team recommended the installation of additional wells in several areas of the Site to better understand contaminant transport.

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

The Colbert Landfill received wastes from FAFB that were subsequently labeled as hazardous. In addition, groundwater near the FAFB has been found to contain Per- and Polyfluoroalkyl Substances (PFAS), likely associated with the use of aqueous film forming foam containing PFAS. While disposal of PFAS was possible, a preliminary EPA review of the records do not suggest their presence at the Colbert Landfill Superfund Site.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None

Issues and Recommendations Identified in the FYR:

OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: Ongoing analysis of the conceptual site model and remedial action objectives lack reporting. A single monitoring plan providing overall monitoring objectives, sampling frequencies, analyses to be performed, and reporting requirements does not exist.			
	Recommendation: Update and combine the monitoring plans at the Site to better reflect the current site conditions and extent of groundwater contamination at the Site. Ensure plan provides criteria for proper and timely action as necessary to prevent the plume from rebounding or extending beyond the current footprint and to address remaining contamination.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	10/1/2020

<table>
<tr><td rowspan="3">OU(s): 1</td><td colspan="4">Issue Category: Monitoring</td></tr>
<tr><td colspan="4">Issue: 1,4-Dioxane is sampled annually at select wells. These wells were selected prior to the system shutdown based on sampling events conducted in 2007 and 2008 and groundwater flow conditions and contaminant transport may have changed since the shutdown.</td></tr>
<tr><td colspan="4">Recommendation: Sampling for 1,4-Dioxane should be performed across a broader network of monitoring wells, including residential wells for at least two sampling events. Continue analyzing samples for 1,1-DCA, PCE, and 1,4-Dioxane; include analytes in updated monitoring plan and evaluate the data using current human health values.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>PRP</td><td>State</td><td>10/1/2020</td></tr>
</table>

<table>
<tr><td rowspan="3">OU(s): 1</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: At the time of the ROD, 1,1-DCA was considered a noncarcinogenic compound. Since that time, it has been reclassified by EPA as a potential human carcinogen. In addition, the PCE performance goal is less than the current MCL. 1,4-Dioxane is not included in the ROD, but has been detected in site wells above the MTCA cleanup goal of 7 µg/L.</td></tr>
<tr><td colspan="4">Recommendation: Develop a scoping document evaluating the final ROD</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>PRP</td><td>EPA</td><td>12/1/2023</td></tr>
</table>

<table>
<tr><td rowspan="3">OU(s): 1</td><td colspan="4">Issue Category: Institutional Controls</td></tr>
<tr><td colspan="4">Issue: It is unclear in institutional control procedures are being utilized effectively as the County does not track this process. Additionally, there is no IC plan in place for the Site and it is unknown how effective the groundwater institutional controls are given the informal county information system.</td></tr>
<tr><td colspan="4">Recommendation: Develop an Institutional Control Implementation and Assurance Plan (ICIAP) that provides for recordable and enforceable controls.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>PRP</td><td>State</td><td>10/1/2020</td></tr>
</table>

OTHER FINDINGS

Several additional recommendations were identified during the FYR. These recommendations do not affect current and/or future protectiveness.

- Re-establish site information repository and/or make Site documents available online.

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The sitewide remedy currently protects human health and the environment because the domestic wells in the area of the Site are regularly sampled, most residences are connected to public water supply and water from individual wells is being monitored. In addition, Spokane County has established procedures to reduce potential exposure to groundwater contamination. However, for the remedy to be protective in the long-term, the following actions need to be taken: - Update and combine the monitoring plans at the Site to better reflect the current site conditions and extent of groundwater contamination at the Site. Ensure plan provides criteria for proper and timely action as necessary to prevent the plume from rebounding or extending beyond the current footprint and to address remaining contamination. - Sampling for 1,4-Dioxane should be performed across a broader network of monitoring wells, including residential wells for at least two sampling events. Continue analyzing samples for 1,1-DCA, PCE, and 1,4-Dioxane; include analytes in updated monitoring plan and evaluate the data using current human health values. - Develop a scoping document evaluating the final ROD - Develop an Institutional Control Implementation and Assurance Plan (ICIAP) that provides for recordable and enforceable controls.

VIII. NEXT REVIEW

The next FYR Report for the Colbert Landfill Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Colbert Landfill Quarterly Report for the Fourth Quarter 2006. Prepared by Spokane County. 2006.

Colbert Landfill Quarterly Progress Report, Second Quarter 2012. Prepared by Spokane County. 2012.

Colbert Landfill Remediation Project Annual Report 2015. Prepared by Spokane County Landfill Closure. 2015.

Colbert Landfill Remediation Project Annual Report 2016. Prepared by Spokane County Landfill Closure. 2016.

Colbert Landfill Remediation Project Annual Report 2017. Prepared by Spokane County Landfill Closure. July 13, 2017.

Colbert Landfill Remediation Project Annual Report 2018. Prepared by Spokane County Landfill Closure. October 12, 2018.

Colbert Landfill Remediation Project Annual Report 2019. Prepared by Spokane County Landfill Closure. June 12, 2019.

Consent Decree No. C-89-033-RJM. United States District Court, Eastern District of Washington. January 9, 1989.

Fact Sheet for Landfill Reuse and Redevelopment, Colbert Landfill Superfund Site, Colbert, Washington. Spokane County.

Fifth Five-Year Review Report, Colbert Landfill Superfund Site, Colbert, Washington. Prepared by the United States Army Corps of Engineers, Seattle District for the EPA Region 10. September 29, 2014.

Final Remediation System Evaluation, Colbert Landfill Superfund Site, Colbert, Washington. Spokane County, Washington. October 14, 2010.

Final Work Plan – Groundwater Pump & Treat System, Shutdown Test, Colbert Landfill Superfund Site, Colbert, Washington. Prepared by Spokane County Public Utilities. August 28, 2013.

Operations and Maintenance Manual for Colbert Landfill Closure, Colbert Landfill Superfund Site, Colbert, Washington. Prepared by CH2M HILL for Spokane County Utilities. May 1997.

Operations and Maintenance Plan, Colbert Landfill Superfund Site, Colbert, Washington. Prepared by Landau Associates, Inc. for Spokane County. December 15, 1999.

Optimization Recommendation Comments, Colbert Landfill Superfund Site, Colbert, Washington. Prepared by Spokane County, Washington. April 5, 2018.

Optimization Review Report, Operation and Maintenance Optimization Study, Colbert Landfill Superfund Site, Colbert, Washington. EPA Region 10. January 2018.

Phase II Remedial Design/Remedial Action, Final Groundwater Monitoring Plan, Colbert Landfill Superfund Site, Colbert, Washington. Prepared by Landau Associates, Inc. for Spokane County, Washington. August 7, 1992.

Phase II Remedial Design/Remedial Action, Quality Assurance Project Plan, Colbert Landfill Superfund Site, Colbert, Washington. Prepared by Landau Associates, Inc. for Spokane County, Washington. February 28, 1992.

Proposed Groundwater Monitoring Plan, Colbert Landfill Superfund Site, Colbert, Washington. Prepared by Spokane County, Washington. March 13, 1996.

Quality Assurance and Field Sampling Plan, Colbert Landfill Superfund Site, Colbert, Washington. Spokane County Utilities. October 1990.

Record of Decision, Colbert Landfill Superfund Site, Colbert, Washington. EPA Region 10. September 29, 1987.

Response Comments to Fifth Five-Year Review Report, Colbert Landfill Superfund Site, Colbert, Washington. Spokane County, Washington. July 30, 2014.

Reuse Assessment, Colbert Landfill Superfund Site, Colbert, Washington. EPA Region 10. November 2018.

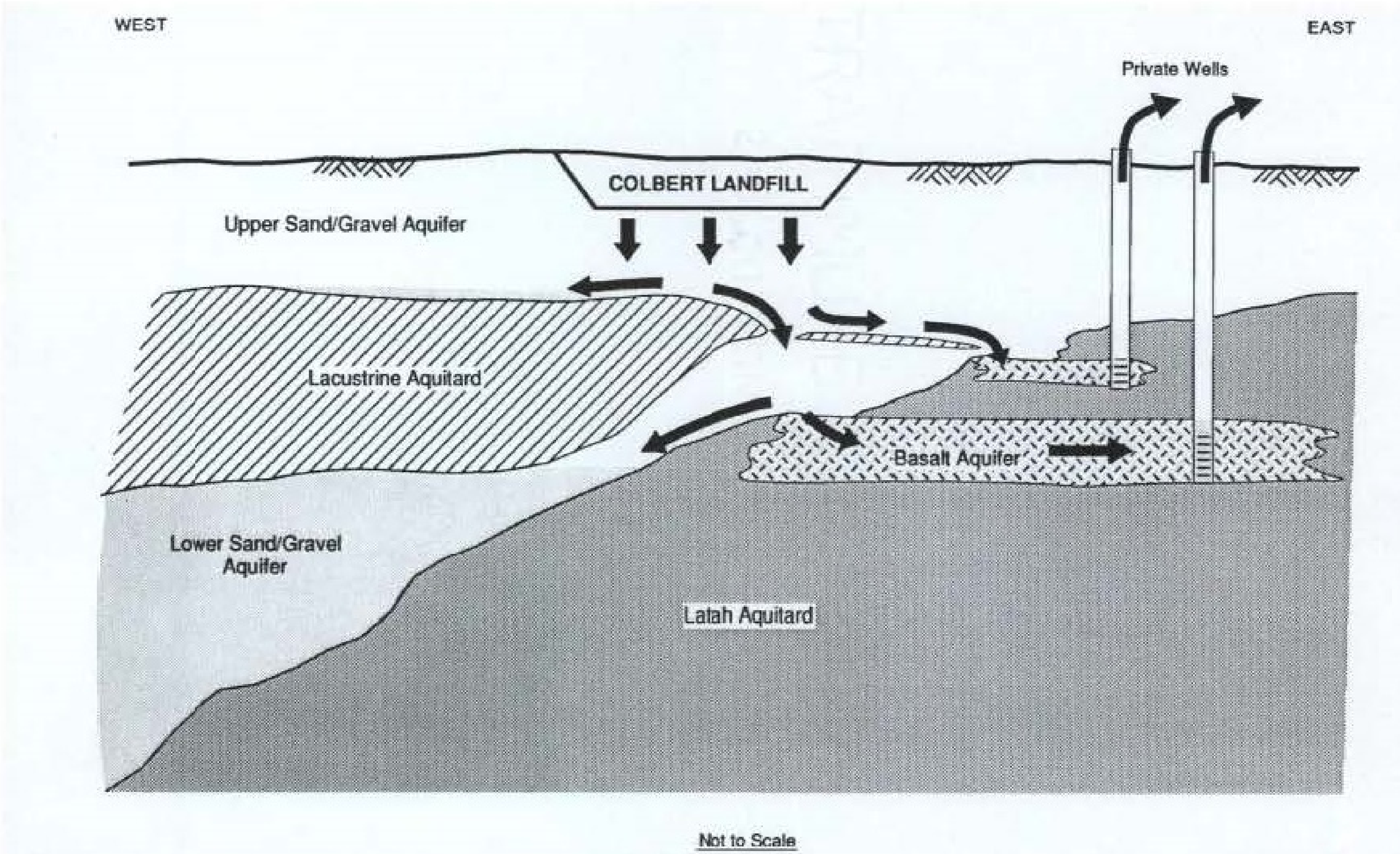
APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
EPA, Ecology, and Spokane County sampled nearby domestic wells after resident complaints	4/24/1980
EPA listed the Site on the NPL	9/8/1983
Spokane County extended the public water supply main to affected households	1985
Ecology completed the RI/FS	9/29/1987
EPA issued the interim ROD	9/29/1987
Remedial Design/Remedial Action Consent Decree (effective date)	2/28/1989
Spokane County started remedial action construction	8/28/1989
Spokane County completed the remedial design for groundwater treatment system	7/12/1993
First FYR was issued	7/13/1994
Spokane County started the landfill closure activities	8/15/1996
Groundwater treatment system construction completed	2/13/1997
Spokane County completed the landfill closure	5/31/1997
EPA issued Construction Closeout Report	9/9/1997
Spokane County placed the south system extraction wells CP-S1, CP-S5 and CP-S6 on standby	4/30/1998
Second FYR was issued	9/20/1999
Spokane County placed the south system extraction well CP-S4 on standby	6/2/2004
Third FYR was issued	9/30/2004
Spokane County placed the west system extraction well CP-W1 on standby	1/26/2005
Fourth FYR was issued	9/30/2009
EPA and Ecology filed a restrictive covenant with Spokane County	2009
EPA completed a Remediation System Evaluation	4/13/2010
Spokane County completed the Final Work Plan Groundwater Pump and Treat System Shutdown Test	8/28/2013
Army Corps of Engineers completed the fifth FYR	9/29/2014
Spokane County initiated the shutdown test	2014
EPA completed the Optimization Review Report	1/23/2018
Site Visit for sixth FYR	3/21/2019
Sixth FYR was issued	9/2019

APPENDIX C – SITE MAP

Figure C-1: Geologic Units[3]



[3] 2018 Operation Review Report

APPENDIX D – PRESS NOTICE

Colbert Landfill Superfund Site Cleanup Review Underway

EPA is reviewing the cleanup for the Colbert Landfill Superfund Site north of Spokane along Highway 2. We would like to hear from you and get your thoughts on how you and the community regard the cleanup. To share your questions, observations or concerns about the site, please visit the EPA Colbert Landfill web page and complete a survey: **https://www.epa.gov/superfund/colbert-landfill**

Colbert Landfill Superfund Site

The 40-acre Colbert Landfill was in use from 1968 until 1986 when, at capacity, it closed. From 1975 to 1980, solvent and other chemical waste was poured into open trenches and contaminated soil and groundwater. Contaminated groundwater spread west to the Little Spokane River, several thousand feet north and east, and about one mile south of the landfill.

What has been done?

- The landfill was sealed and covered.
- Residents with domestic water wells were connected to the public water supply. Domestic water wells are regularly sampled and monitored.
- A pump and treat system for groundwater was installed. Treated groundwater discharges to the Little Spokane River through a pipeline.
- Evaluation and monitoring the groundwater contamination continues.
- A third-party study, known as an *Optimization Review*, was completed in 2018 for the Colbert Landfill Site.

What's Next?

The initial cleanup for the site is complete. Any further work will focus on any remaining groundwater contamination. Regular reviews, like this one, will be done every five years to assess the progress of the cleanup, determine any future measures, and to make sure the cleanup continues to protect people and the environment. The report for this review, the *Colbert Landfill 2019 Five-Year Review Report*, will be available after September 2019.

Questions? Thoughts? Want more information?

If you have additional questions, issues or concerns contact:

Patrick Hickey, EPA Project Manager, at **hickey.patrick@epa.gov** or **206-553-6295**

If you have concerns about well water quality, please contact:

Deb Geiger, Spokane County, at **DGeiger@spokanecounty.org** or **509-477-7281**

For more information go to the EPA web page:

https://www.epa.gov/superfund/colbert-landfill

TDD and/or TTY users may call the Federal Relay Service at 800-877-8339. Please give the operator phone number 206-553-6295 for Patrick Hickey.

APPENDIX E – INTERVIEW FORM

Colbert Landfill Superfund Site

EPA United States Environmental Protection Agency Region 10

Cleanup Review Underway

Colbert, Washington

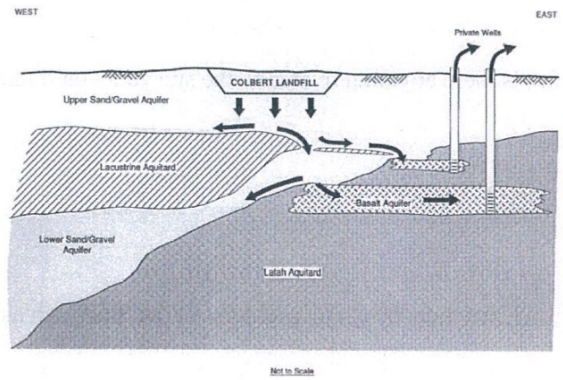
June 2019

Feedback Requested

EPA is asking for feedback on the cleanup for the Colbert Landfill Superfund Site north of Spokane along Highway 2. As a residential well owner, we would like to hear from you and get your thoughts on how you regard the cleanup. Please complete and the short survey on the back or complete the same survey on-line: https://www.epa.gov/superfund/colbert-landfill

Colbert Landfill Superfund Site

The 40-acre Colbert Landfill was in use from 1968 until 1986 when, at capacity, it closed. From 1975 to 1980, solvent and other chemical waste was poured into open trenches, and contaminated soil and groundwater. Contaminated groundwater spread west to the Little Spokane River, several thousand feet north and east, and about one mile south of the landfill.



Schematic of Contaminant Migration in the Various Geologic Units at the Site. [Excerpted from Phase 1 Engineering Report (Landau, 1991).]

What has been done?

- The landfill was sealed and covered.
- Residents with domestic water wells were connected to the public water supply. Domestic water wells are regularly sampled and monitored.
- A pump and treat system for groundwater was installed. Treated groundwater discharges to the Little Spokane River through an underground pipeline.
- Evaluation and monitoring the groundwater contamination continues.
- A third-party study, known as an *Optimization Review*, was completed in 2018 for the Colbert Site.

What's Next?

The initial cleanup for the site is complete. Any further work will focus on any remaining groundwater contamination. Regular reviews, like this one, will be done every five years to assess the progress of the cleanup, determine any future measures, and to make sure the cleanup continues to protect people and the environment. The report for this review, the *Colbert Landfill 2019 Five-Year Review Report*, will be available after September 2019.

For more information:

Contact: Patrick Hickey, EPA Project Manager, at **hickey.patrick@epa.gov** or 206-553-6295

On-line: ***https://www.epa.gov/superfund/colbert-landfill***

For well water quality: Deb Geiger, Spokane County, at **DGeiger@spokanecounty.org** or 509-477-7281

EPA is asking for feedback on the cleanup for the Colbert Landfill Superfund Site north of Spokane along Highway 2. As a local residential well owner, we would like to hear from you and get your thoughts on how you regard the cleanup. Please share your questions, observations, concerns or issues about the site.

1. Do you feel that you and/or the community in general know enough about the site, site contamination and site cleanup activities?

   no

2. Is there anything related to the site you would like to know more about?

   none that know of.

3. Have there been any problems at the Site, such as trespassing or vandalism, or with site activities?

   no

4. What site-related information would be useful? What would be the best way to keep you and the community informed and up to date? How often?

   Its been fine that I know of.

5. What has been the impact of the site on the community? Are there ongoing impacts?

   None

6. Do you have any additional questions, comments, suggestions, or recommendations about the site?

   no.

EPA is asking for feedback on the cleanup for the Colbert Landfill Superfund Site north of Spokane along Highway 2. As a local residential well owner, we would like to hear from you and get your thoughts on how you regard the cleanup. Please share your questions, observations, concerns or issues about the site.

1. Do you feel that you and/or the community in general know enough about the site, site contamination and site cleanup activities? yes

   Water smapler does a good job
   well informed. I get results very quickly.

2. Is there anything related to the site you would like to know more about?

   not really

3. Have there been any problems at the Site, such as trespassing or vandalism, or with site activities?

   no it looks well
   supervised

4. What site-related information would be useful? What would be the best way to keep you and the community informed and up to date? How often?

   well done

5. What has been the impact of the site on the community? Are there ongoing impacts?

   none I am aware

6. Do you have any additional questions, comments, suggestions, or recommendations about the site?

   any reason why I shouldn't
   drink the water. Results
   from the samples show ND.

EPA is asking for feedback on the cleanup for the Colbert Landfill Superfund Site north of Spokane along Highway 2. As a local residential well owner, we would like to hear from you and get your thoughts on how you regard the cleanup. Please share your questions, observations, concerns or issues about the site.

1. Do you feel that you and/or the community in general know enough about the site, site contamination and site cleanup activities? Not really

2. Is there anything related to the site you would like to know more about?
The ground water flow / Whats contaminated + whats still clean according to areas around the dump

3. Have there been any problems at the Site, such as trespassing or vandalism, or with site activities?
Unknown

4. What site-related information would be useful? What would be the best way to keep you and the community informed and up to date? How often? I would like to know about #2 at least once a year

5. What has been the impact of the site on the community? Are there ongoing impacts?
Unknown

6. Do you have any additional questions, comments, suggestions, or recommendations about the site?
Back to #2. How long will our well stay clean?

APPENDIX F – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Colbert Landfill	**Date of Inspection:** 03/21/2019
Location and Region: Colbert, WA 10	**EPA ID: WAD980514541**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature:** 50s, sunny

Remedy Includes: (check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other: Alternate water supply
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** _____ Name _____ Title _____ Date
Interviewed ☐ at site ☐ at office ☐ by phone : _____
Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** _____ Name _____ Title _____ Date
Interviewed ☐ at site ☐ at office ☐ by phone : _____
Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

Agency _____
Contact _____Name _____ Title _____ Date _____ Phone No.
Problems/suggestions ☐ Report attached:______

Agency _____
Contact _____ Name _____ Title _____ Date _____ Phone No.
Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☐ Report attached: _____

III. ON-SITE DOCUMENTS AND 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: _____

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: _____

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: <u>Effluent was discharged under substantive discharge monitoring requirements.</u>

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

Remarks: _____

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

Remarks: _____

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

Remarks: _____

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: _____

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
☐ _____	

2. **O&M Cost Records**

☒ Readily available	☒ Up to date
☐ Funding mechanism/agreement in place	☐ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: ______ Date	To: ______ Date	______ Total cost	☐ Breakdown attached
From: ______ Date	To: ______ Date	______ Total cost	☐ Breakdown attached
From: ______ Date	To: ______ Date	______ Total cost	☐ Breakdown attached
From: ______ Date	To: ______ Date	______ Total cost	☐ Breakdown attached
From: ______ Date	To: ______ Date	______ Total cost	☐ Breakdown attached

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

Describe costs and reasons: ______

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

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Fence in good condition, restricts access to the groundwater pump-and-treat system, offices and landfill.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Signs are present at both entrances to the Site.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

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

Frequency: constant on-site presence, quarterly monitoring in area

Responsible party/agency: county and state

Contact	Name	Title	Date	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** ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A

Remarks: ICs around and on the plume should be recorded and enforceable.

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: The area continues to slowly fill in with more rural residential properties.	
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		
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A		
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A		
A. Groundwater Extraction Wells, Pumps and Pipelines ☒ Applicable ☐ N/A		
1.	**Pumps, Wellhead Plumbing and Electrical** ☒ Good condition ☒ All required wells properly operating ☒ Needs maintenance ☐ N/A Remarks: ______	
2.	**Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances** ☒ Good condition ☐ Needs maintenance Remarks: ______	
3.	**Spare Parts and Equipment** ☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks: ______	
B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A		
1.	**Collection Structures, Pumps and Electrical** ☐ Good condition ☐ Needs maintenance Remarks: ______	
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances** ☐ Good condition ☐ Needs maintenance Remarks: ______	
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks: ______	
C. Treatment System ☒ Applicable ☐ N/A		

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☒ Air stripping ☒ Carbon adsorbers

☐ Filters: _____

☒ Additive (e.g., chelation agent, flocculent): Scale control

☐ Others: _____

☒ Good condition ☐ Needs maintenance

☒ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☒ Equipment properly identified

☐ Quantity of groundwater treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: Pump-and-treat system is currently in standby mode.

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☒ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☒ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair

☒ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. 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 and 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 designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). The remedy consists of a groundwater pump-and-treat system that is currently in standby mode, and an alternate water supply for nearby residences. The pump-and-treat system, designed to contain contaminated groundwater and prevent migration, has been on standby mode since 2014. Generally concentrations of COCs in the upper aquifer are below performance standards. After the shutdown, some wells in the lower aquifer had COC concentration increases, including CP-W3 and CD-49 west of the landfill. In 2017, COC concentrations began to decrease again. These locations are monitored quarterly to track concentration trends in these wells.
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. O&M activities are conducted regularly and the Site, the pump-and-treat system and the landfill cover were in excellent condition.
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. COC concentration increases in a few wells may indicate that the plume is migrating. However, concentrations are still below action levels and current monitoring results indicate concentrations are declining. Additional monitoring is necessary to determine if extraction should be restarted in this area.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None.

APPENDIX G – SITE INSPECTION PHOTOS

Signage at entrance of pump-and-treat facility

Pump-and-treat facility

Piping inside pump-and-treat facility

Looking toward pump-and-treat facility from landfill

Monitoring well CD-60

CP-W3


Interior of CP-W3

Fencing above effluent piping running west of the Site toward Little Spokane River

APPENDIX H – DATA TABLE and FIGURES

Table H-1: Maximum Concentration by Year – Select Wells

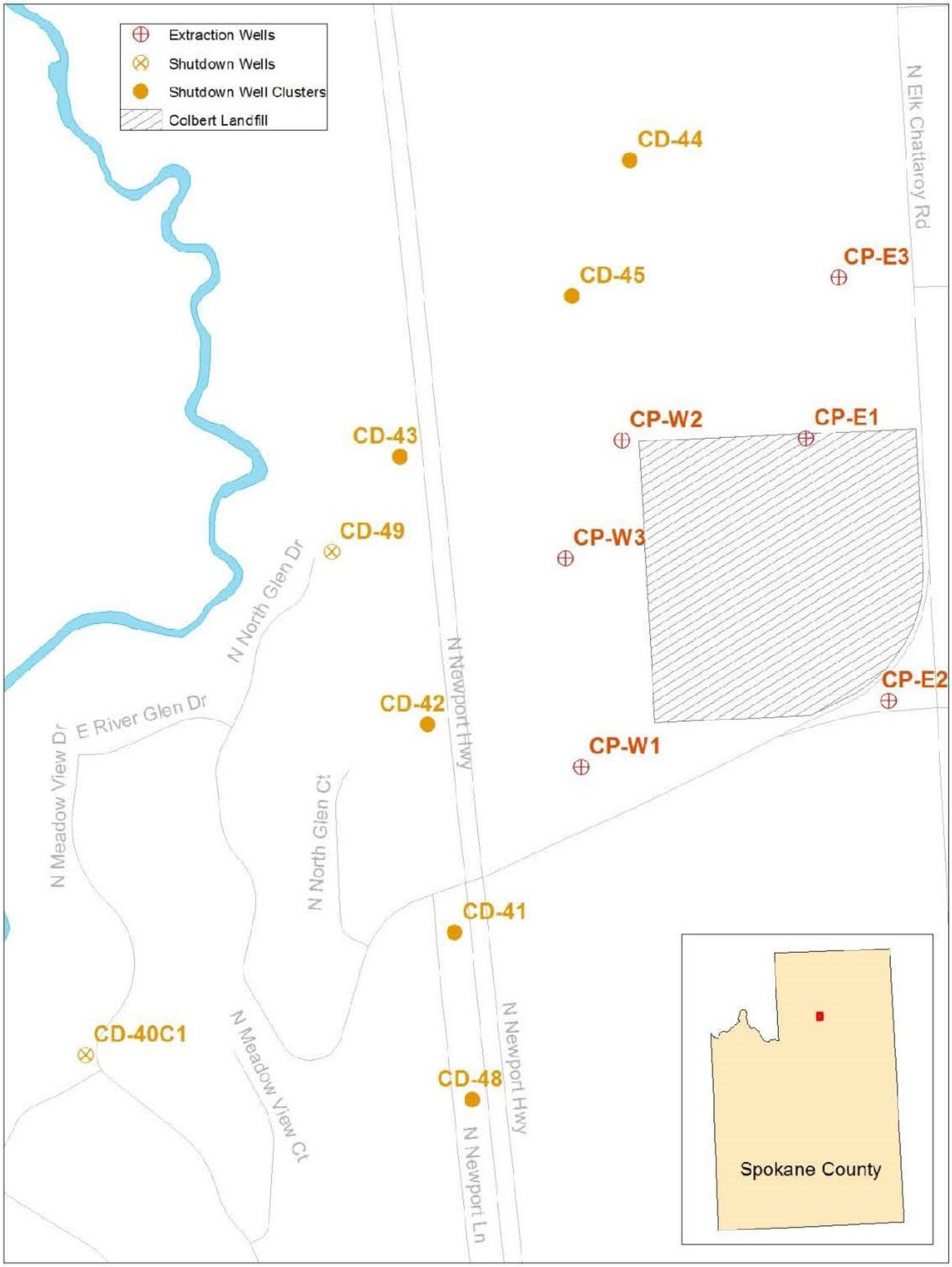
Location/Date	Concentration (µg/L)				
	1,1,1-TCA	**1,1-DCE**	**1,1-DCA**	**TCE**	**PCE**
Performance Standard	**200**	**7**	**4,050**	**5**	**0.7**
Action Level	**130**	**4.55**	**2,632**	**3.25**	**0.5**
CP-W1					
2012 (pre-shutdown)	1.96	1.29	<0.5	<0.5	<0.5
2014	4.97	3.16	<0.5	<0.5	<0.5
2015	7.65	4.86	0.52	<0.5	<0.5
2016	8.77	6.11	0.57	<0.5	<0.5
2017	6.26	5.45	<0.5	<0.5	<0.5
2018	2.54	2.97	<0.5	<0.5	<0.5
2019	4.19	2.63	<0.5	<0.5	<0.5
CP-E1					
2012 (pre-shutdown)	21.8	**16.8**	7.91	3.58	**0.53**
2014	17.6	**11.4**	6.53	**5.39**	**1.42**
2015	10.5	**12.8**	8.03	**6.17**	**1.75**
2016	9.3	**13.6**	9.31	**7.32**	**1.99**
2017	9.26	**23.1**	10.3	**8.48**	**2.57**
2018	8.58	**13.4**	9.66	**9.93**	**3**
2019	9.4	**16.6**	8.9	**8.97**	**2.78**
CP-W3					
2012 (pre-shutdown)	9.7	6.32	1.39	3.78	<0.5
2014	26.6	**14**	6.29	**9.88**	<0.5
2015	70.3	**36.6**	20.7	**32.2**	<0.5
2016	96.3	**76.8**	38.8	**33.7**	<0.5
2017	105.0	**90.0**	42.7	**48.4**	<0.5
2018	43.7	**32.9**	10.7	**36.6**	<0.5
2019	36.2	**17.7**	5.58	**25.4**	<0.5
CD-49					
2012 (pre-shutdown)	NA	NA	NA	NA	NA
2014	<0.5	<0.5	<0.5	<0.5	<0.5
2015	1.87	0.68	<0.5	<0.5	<0.5
2016	5.36	1.79	<0.5	<0.5	<0.5
2017	7.81	3.04	0.51	<0.5	<0.5
2018	4.18	3.17	<0.5	<0.5	<0.5
2019	1.5	1.57	<0.5	<0.5	<0.5
CD-43C1					
2012 (pre-shutdown)	ND	ND	ND	ND	ND
2014	<0.5	<0.5	<0.5	<0.5	<0.5
2015	<0.5	<0.5	<0.5	<0.5	<0.5
2016	<0.5	<0.5	<0.5	<0.5	<0.5
2017	0.63	<0.5	<0.5	<0.5	<0.5
2018	1.45	<0.5	<0.5	<0.5	<0.5
2019	4.19	<0.5	<0.5	<0.5	<0.5

Notes:
< = not detected above listed detection limit

Location/Date	Concentration (µg/L)				
	1,1,1-TCA	1,1-DCE	1,1-DCA	TCE	PCE
Performance Standard	**200**	**7**	**4,050**	**5**	**0.7**
Action Level	**130**	**4.55**	**2,632**	**3.25**	**0.5**

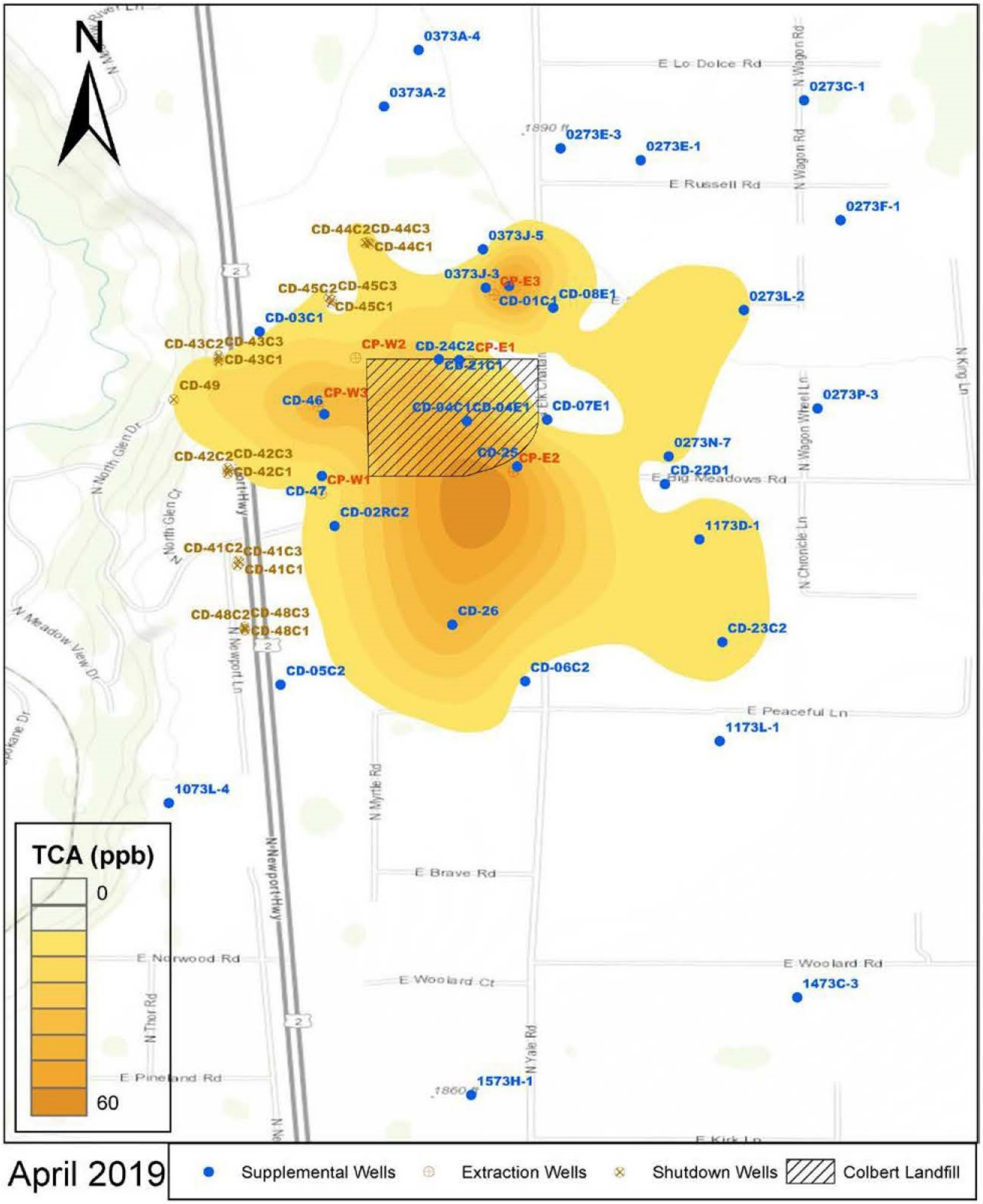
NA = not analyzed (CD-49 was installed in 2013)
ND = not detected (detection limit not provided)
Bold = exceeds performance standard
Performance standard and action levels not applicable to extraction well CP-W1, CP-W3 or CP-E1
Methylene chloride is a COC but has not been detected in wells during this FYR period

Figure H-1: Shutdown Compliance Monitoring Locations[4]



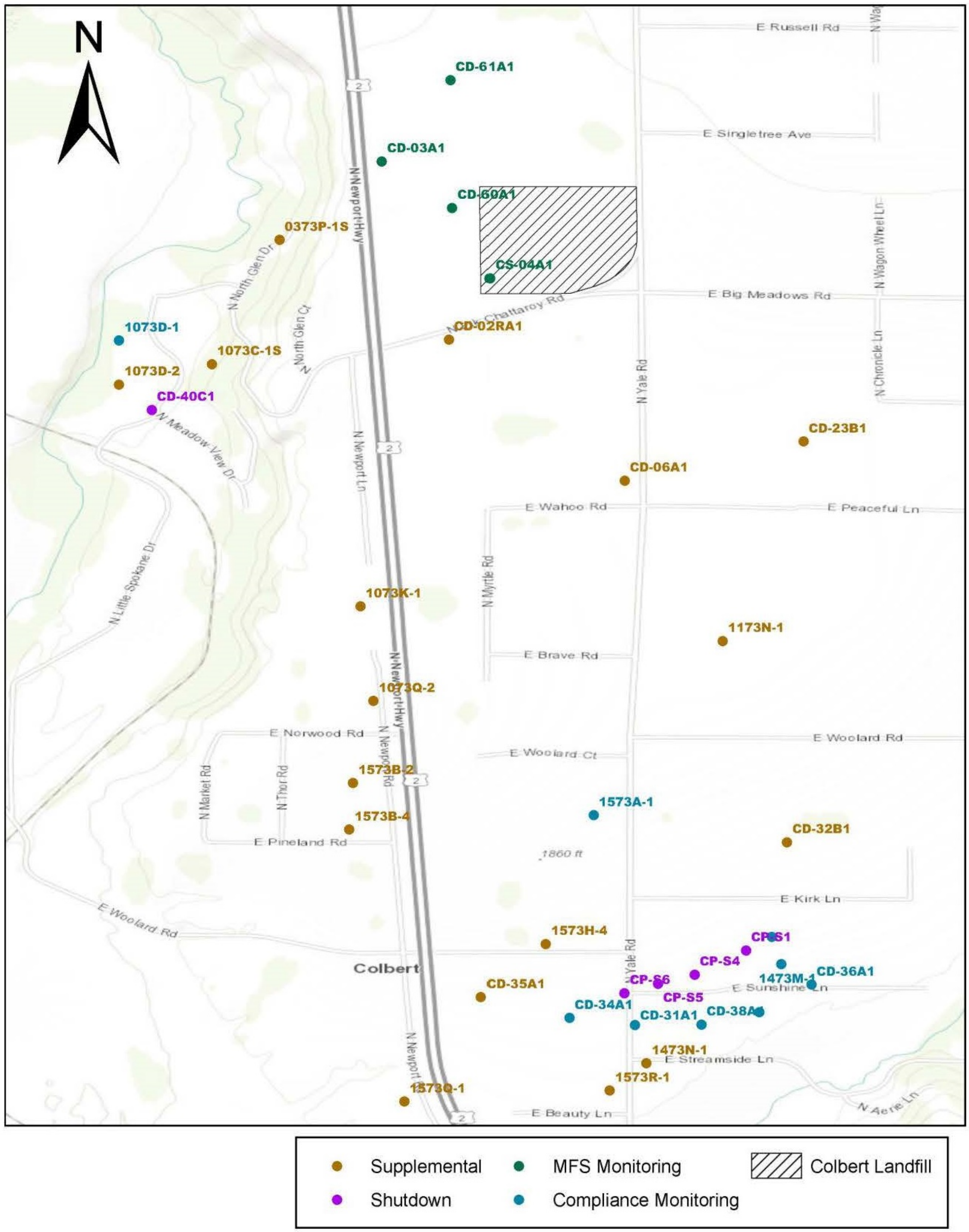
[4] Source: Colbert Landfill Remediation Project Annual Report 2019

Figure H-2: Lower Aquifer Estimated 1,1,1-TCA Plume[5]



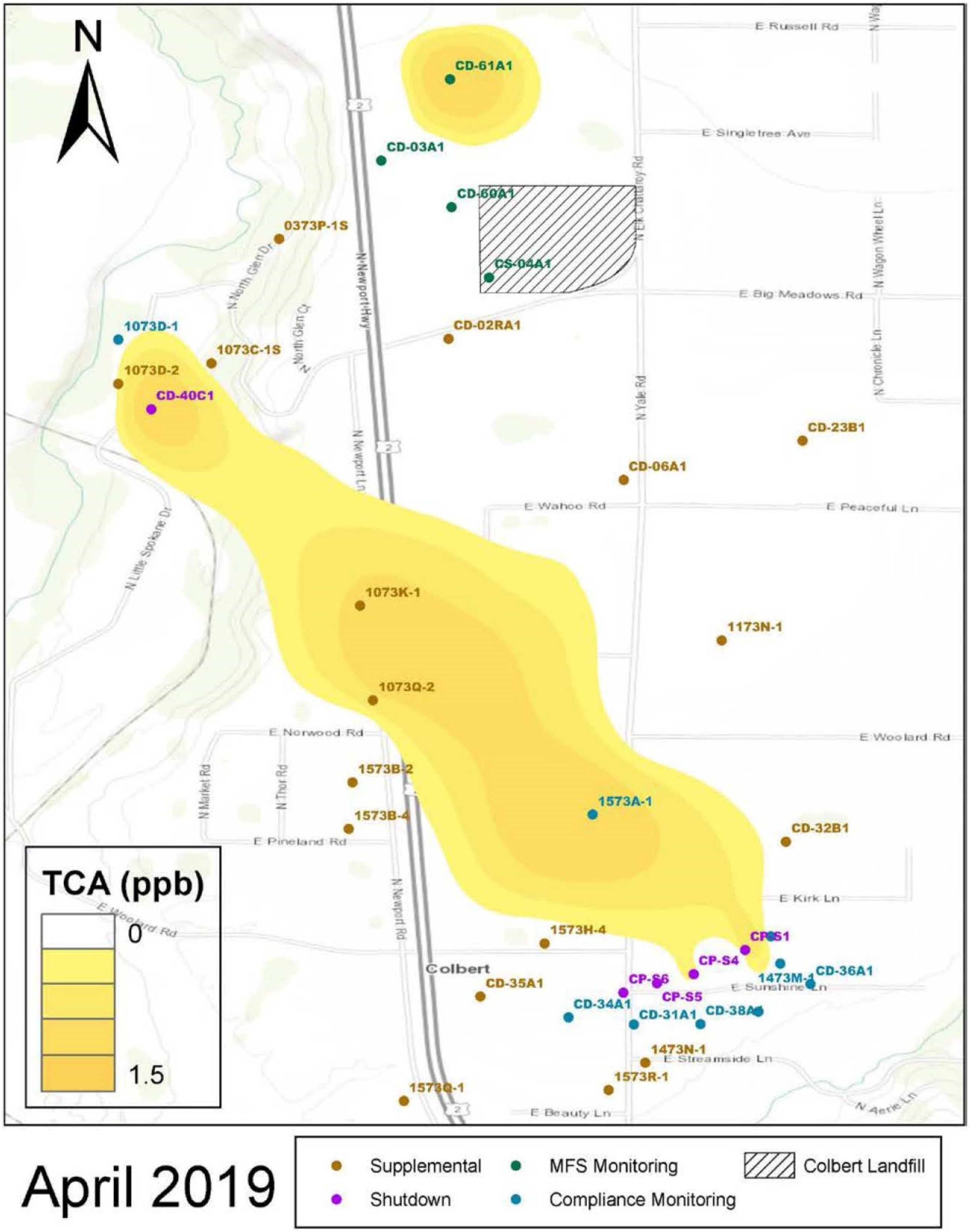
[5] Source: Colbert Landfill Remediation Project Annual Report 2019

Figure H-3: Upper Aquifer Compliance Monitoring Locations[6]



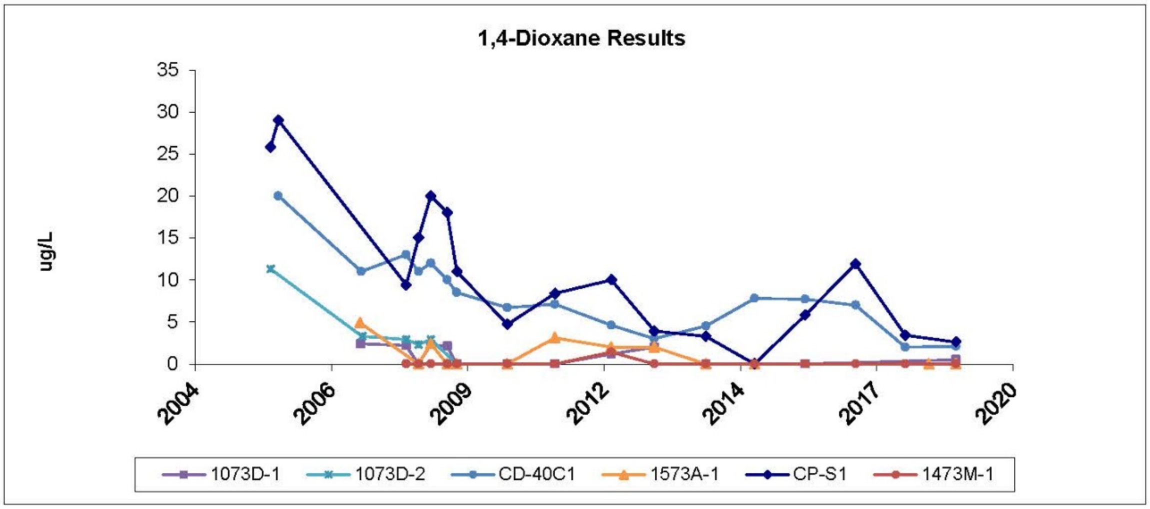
[6] Source: Colbert Landfill Remediation Project Annual Report 2019

Figure H-4: Upper Aquifer Estimated 1,1,1-TCA Plume[7]



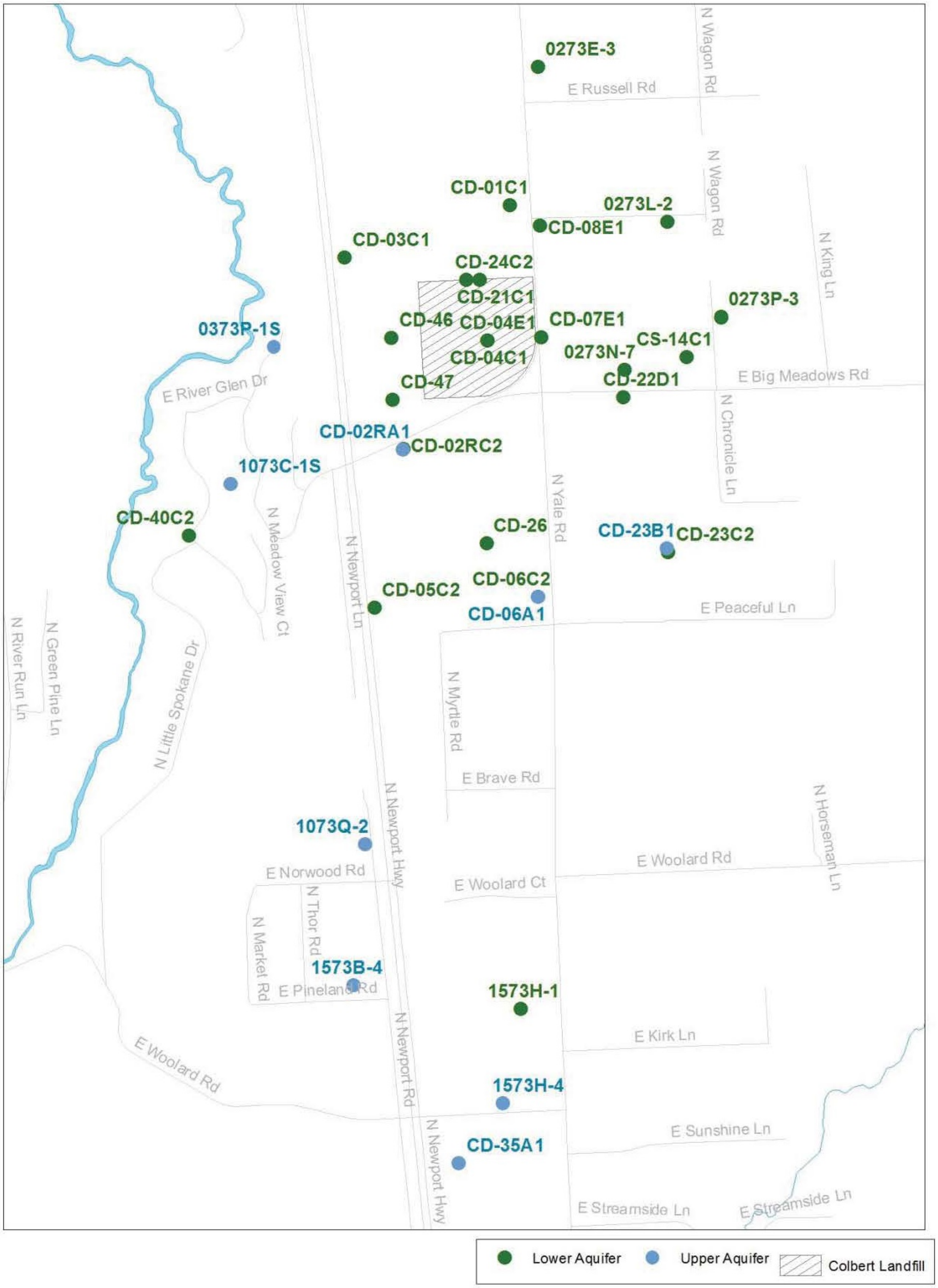
[7] Source: Colbert Landfill Remediation Project Annual Report 2019

Figure H-5: 1,4-Dioxane Concentrations Over Time[8]



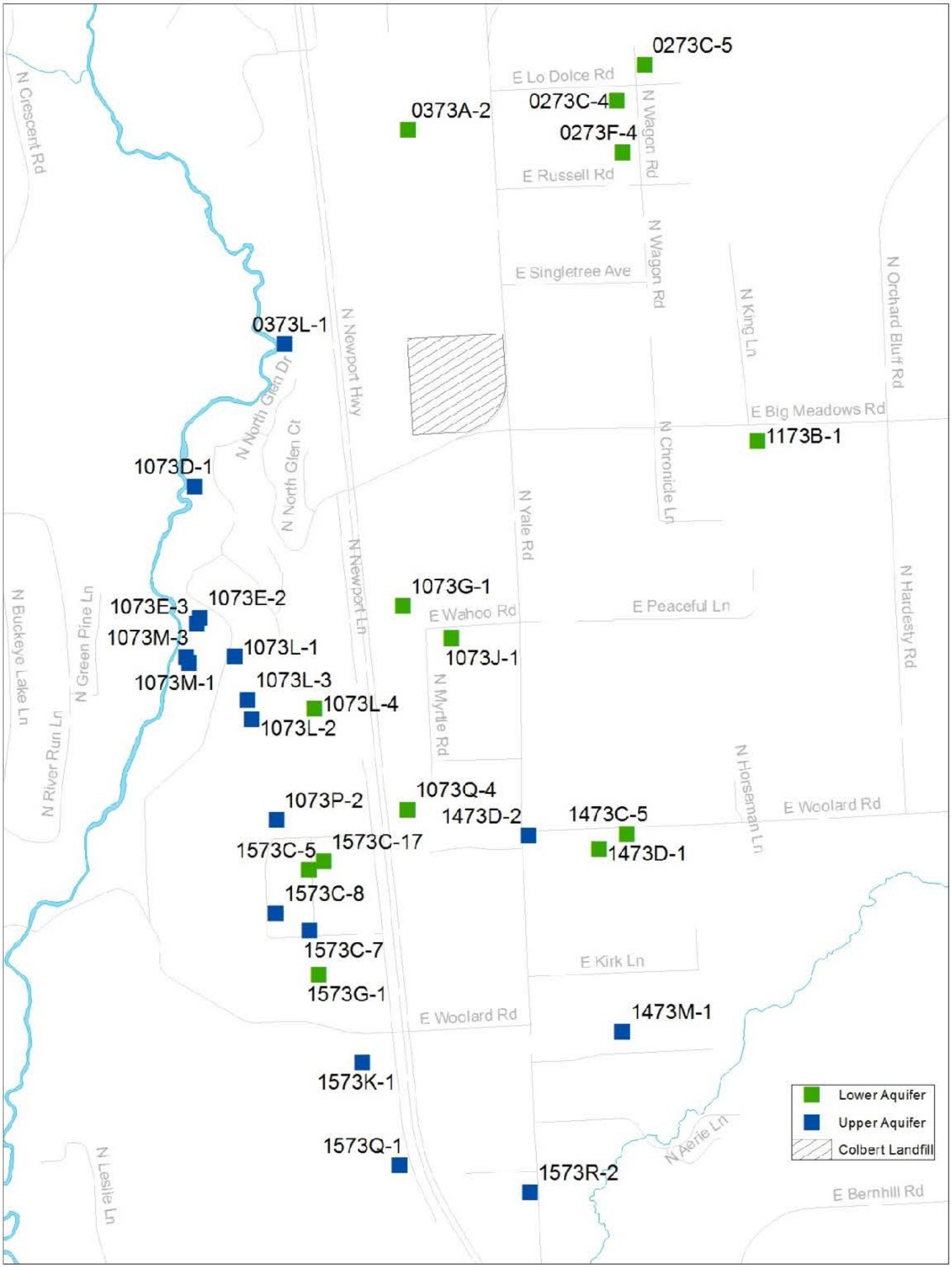
[8] Source: Colbert Landfill Remediation Project Annual Report 2019

Figure H-6: Supplemental Well Sampling Locations[9]



[9] Source: Optimization Review Report 2018

Figure H-7: Residential Well Locations[10]



[10] Source: Colbert Landfill Remediation Project Annual Report 2019

APPENDIX I – DETAILED APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENT (ARAR) REVIEW

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed. The ROD established chemical-specific ARARs for groundwater for select COCs. The chemical-specific ARARs are based on federal drinking water standards. These ARARs have not changed (Table J-1). In the ROD, the cleanup goal for PCE was risk-based. However, there is now an MCL for this COC. It is included in Table I-1.

Table I-1: Groundwater ARAR Review

Groundwater COC	ROD Performance Standard (µg/L)	Current ARAR[a] (µg/L)	ARAR Change
1,1,1-TCA	200	200	no change
1,1-DCE	7	7	no change
TCE	5.0	5	no change
PCE	0.7	5	less stringent[b]

Notes:
a. National Primary Drinking Water Regulations (unless otherwise noted) located here: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations (accessed 5/1/2019)
b. ROD was risk-based; however, the current Federal standard is listed

APPENDIX J – SCREENING-LEVEL RISK REVIEW

The groundwater cleanup goals for PCE and methylene chloride were risk-based in the ROD. 1,1-DCA was based on the maximum acceptable concentration (MAC). The 1,1-DCA, PCE and methylene chloride groundwater cleanup goals were compared to the current EPA residential tapwater RSLs. The cleanup goals for PCE and methylene chloride remain below EPA's acceptable risk range for cancer and less than the hazard quotient (HQ) for non-cancer risk. The cleanup goal for 1,1-DCA exceeds EPA's acceptable risk range of 1.0 x 10^{-6} to 1.0 x 10^{-4} (Table J-1).

Table J-1: Screening-Level Risk Evaluation of Risk-Based Groundwater Cleanup Goals

COC	Groundwater Cleanup Goal (µg/L)	Residential Tapwater RSL[a] (µg/L)		Cancer Risk[b]	Noncancer HQ[c]
		Cancer-Based	Noncancer HQ=1		
1,1-DCA	4,050	2.8	3,800	**1.4 x 10^{-3}**	1
PCE	0.7	11	41	6.4 x 10^{-8}	0.02
Methylene chloride	2.5	11	110	2.3 x 10^{-7}	0.02

Notes:
NA = not applicable; EPA has not established a cancer-based toxicity value for this COC
Bold = exceeds EPA's acceptable risk range
a. RSLs obtained from EPA's website: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed 4/30/2019)
b. Cancer risks were calculated using the following equation, since RSLs are derived based on 10^{-6} risk: cancer risk = (cleanup level ÷ cancer RSL) × 10^{-6}
c. Noncancer HQs were calculated using the following equation and reported as one significant figure per EPA Region 4 risk assessment guidance: HQ = cleanup level ÷ RSL

To confirm that vapor intrusion is not a concern at the Site, this FYR use EPA's Vapor Intrusion Screening Levels (VISL) calculator. The highest detected concentration of site COCs in the upper aquifer from 2019 were used (Appendix J, Table J-2). The results are within EPA's acceptable risk range for cancer and below the non-cancer hazard quotient of 1. These results confirm vapor intrusion is not a concern on site or in the residential areas surrounding the Site.

Table J-2: Summary of Screening-Level Residential Risks for Vapor Intrusion

COC	2019 Maximum Detected Concentration (µg/L)	Cancer Risk[a]	Noncancer HQ[a]
1,1,1-TCA	1.5	NA	0.0002
1,1-DCE	1.06	NA	0.005
1,1-DCA	1.72	2.3x10^{-7}	NA
TCE	1.8	1.5x10^{-6}	0.3
PCE	0.61[b]	4.1x10^{-8}	0.01

Notes:
a. Risk and hazard quotient calculated using EPA's November 2018 VISL calculator (http://www.epa.gov/oswer/vaporintrusion/guidance.html) assuming a residential exposure and default groundwater temperature of 25 degrees Celsius.
b. Maximum detected concentration from 2018 because PCE was not detected in 2019.
µg/L = micrograms per liter
NA = not applicable