Fifth Five-Year Review Report
For
Colbert Landfill Superfund Site
EPA ID: WAD980514541
Spokane County, Washington

PREPARED BY
United States Army Corps of Engineers
Seattle District
Seattle, Washington

PREPARED FOR:
United States Environmental Protection Agency
Region 10
Seattle, Washington

Approved by: **Date:**

Cami Grandinetti 9/29/14

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Executive Summary

This document presents the Five-Year Review for the Colbert Landfill Superfund site, located approximately 2.5 miles north of Colbert, Washington, which is 15 miles north of Spokane, Washington. The landfill had been operating as a sanitary landfill from 1968 to 1986 when it officially began closure procedures. Landfill closure was completed in August 1996.

During a five year period between 1975 and 1980, the landfill accepted solvent and other chemical waste from a local manufacturing company, Key Tronic Corporation, and Fairchild Air Force Base (FAFB). These chemical wastes were delivered to the landfill in 55 gallon drums and were later poured into trenches to mix with existing refuse. It has been estimated that several hundred gallons of chemicals per month were disposed during this time frame.

The Washington Department of Ecology (Ecology) began to receive complaints from local residents about the disposal practices in 1980. This led to Phase I and Phase II domestic groundwater investigations, which found dissolved phase solvent contamination in the groundwater from both the upper and lower regional aquifers. A variety of volatile organic compounds (VOCs) were detected at concentrations greater than state and federal drinking water standards. Methylene chloride (MC), 1,1,1- trichloroethane (TCA), 1,1-dichloroethylene (DCE), tetrachloroethylene (PCE), 1,1-dichloroethane (DCA), and trichloroethylene (TCE) are the six primary contaminants of concern (COCs). Spokane County and Key Tronic Corporation were identified as Potentially Responsible Parties (PRPs).

The September 1987 Record of Decision (ROD) selected an interim final remedy to manage the migration of contamination using a groundwater interception system and to attempt source control through extraction in the areas of highest contaminant concentrations. It called for continuing to provide alternate water supplies to any residents deprived of their domestic water supply due to contamination from the landfill or due to the operation of the extraction system and institutional controls (IC) to ensure the remedy continues to protect human health and the environment. In addition, closure of the Colbert Landfill was required, which included capping, installation of a landfill gas management system, and a restrictive covenant for land use. The remedy was considered interim because it was not known how long the pump and treat system would have to operate and what, if any, modifications would be necessary to reach and maintain cleanup levels in the aquifer.

Performance criteria were developed in the ROD for discharge of treated water and termination of the remedial action. Performance criteria were based on federal Maximum Contaminant Levels (MCL) or calculated maximum acceptable concentrations (MAC). Adjustment criteria were developed in the Consent Decree to conservatively evaluate the need for extraction system operational changes and were used to determine when an extraction well could be put into standby mode.

The groundwater pump and treat (P&T) system has been operating since 1994, and was the subject of an independent technical review in October 2010. This review, referred to as a Remediation System Evaluation (RSE), was conducted by an independent team of experts that conducted a broad review with the objective of optimizing the site treatment remedy for protectiveness, cost-effectiveness, and sustainability. The RSE team agreed that the remedial design is appropriate, given the complex nature of the Site and the large extent of a diffuse plume. Recommendations from the RSE conducted for the site P&T system included implementation of a shutdown test for the portion of the P&T system that is

currently operating to determine whether continued groundwater extraction and treatment is needed to maintain the overall protectiveness of the site remedy.

A work plan was developed in 2013 for implementation of a shutdown test of the P&T system for groundwater contaminated with VOCs. The recommendations concluded that if the shutdown test indicates the P&T system does not provide significant benefit toward achieving cleanup levels and no other alternatives to achieve cleanup levels throughout the plume are identified, evaluating a Technical Impracticability waiver may be appropriate as part of the final remedy.

The interim remedy at the Colbert Landfill Site currently protects 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 development near the plume outside of the landfill property. Spokane County does not have any legal restrictions on the installation of new wells outside of the landfill property.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Colbert Landfill		
EPA ID: WAD980514541		
Region: 10	**State:** WA	**City/County:** Colbert/Spokane

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

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Christopher Guzzetti
Author affiliation: U.S. Environmental Protection Agency
Review period: 1/15/2014 – 9/30/2014
Date of site inspection: 2/25/2014
Type of review: Statutory
Review number: 5
Triggering action date: 9/30/2009
Due date *(five years after triggering action date)*: 9/30/2014

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): Colbert Landfill	**Issue Category: Remedy Performance**			
	Issue Finalize the ROD			
	Recommendation Issue a Final ROD and update or include cleanup levels for DCA and 1,4-dioxane			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Spokane County	EPA/State	9/30/2017

Sitewide Protectiveness Statement	
Operable Unit: **Colbert Landfill**	
Protectiveness Determination:	***Addendum Due Date (if applicable):***
Protective	***N/A***
Protectiveness Statement:	
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.	

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List of Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirements
BACT	Best Available Control Technology
BGS	Below Ground Surface
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminant of Concern
DCA	1,1Dichloroethane
DCE	1,1-Dichloroethylene
EPA	Environmental Protection Agency
FAFB	Fairchild Airforce Base
FS	Feasibility Study
FYR	Five-Year Review
GETS	Ground Water Extraction and Treatment System
gpm	Gallons Per Minute
IC	Institutional Control
IRIS	Integrated Risk Information System
LEL	Lower Explosive Limit
LFG	Landfill Gas
MAC	Maximum Acceptable Concentration
MC	Methylene Chloride
MCL	Maximum Contaminant Level
MTCA	Model Toxics Control Act
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
O&M	Operation and Maintenance
OU	Operable Unit
P&T	Pump and Treat
PCE	Tetrachloroethene
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSE	Remediation System Evaluation
SAP	Sampling Analysis Plan
TCA	1,1,1-Trichloroethane

TCE	Trichloroethene
µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
USACE	United States Army Corps of Engineers
VOCs	Volatile Organic Compounds
WAC	Washington Administrative Code

1. Introduction

This is the fifth Five-Year Review (FYR) for the Colbert Landfill (EPA ID: WA980514541). The triggering action for this FYR is the previous FYR, which was signed on September 30, 2009.

1.1. Purpose

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

1.2. Authority

The U.S. Environmental Protection Agency (EPA) is preparing this FYR report pursuant to the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

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

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

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

With oversight from the EPA Region 10 Remedial Project Manager (RPM), the United States Army Corps of Engineers (USACE) Seattle District conducted the FYR of the remedy implemented at the Colbert Landfill located in Colbert, Washington. This report documents the results of the review, which was conducted from January 2014 through September 2014.

This is the fifth FYR for the Colbert Landfill. The triggering action for this statutory review is the fourth FYR dated September 30, 2009. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

2. Site Chronology

Table 1 summarizes, in chronological order, the major milestones or notable events for the Colbert Landfill Superfund Site.

Table 1. Chronology of Site Events

Event	Date
Initial Problem Identification	4/24/80
Final NPL Listing	9/8/83
Interim Remedial Measure (alternative water supply)	Fall 1985
RI/FS Completed	9/29/87
Interim ROD Signed for Remedial Action	9/29/87
RD/RA Consent Decree (effective date)	2/28/89
RA Construction Started (monitoring wells)	8/28/89
Design Completed (extraction/treatment system)	7/12/93
First Five-Year Review (during construction period)	7/13/94
Construction Start (landfill closure)	8/15/96
Construction Completed (extraction/treatment system)	2/13/97
Construction Completed (landfill closure)	5/31/97
EPA Construction Closeout Report	9/9/97
Three of four south system extraction wells (CP-S1, CP-S5, and CP-S6) placed on standby	4/30/98
Monitoring well sampling frequency reduced to annual	8/31/99
Second Five-Year Review	9/20/99
Fourth south system extraction CP-S4 well placed on standby	6/2/04
Third Five-Year Review	9/30/04
West system extraction well CP-W1 placed on standby	1/26/05
Fourth Five-Year Review	9/30/2009
Restrictive Covenant filed	September 2009
Remediation System Evaluation	4/13/2010
Institutional Control Plan completed	2011
Final Work Plan Groundwater Pump & Treat System Shutdown Test	8/28/2013
Collect samples from new well CD-49 as part of the shutdown program	October 2013

3. Background

3.1. Physical Characteristics

The Colbert Landfill Superfund site is a closed, municipal solid waste landfill located approximately 15 miles north of Spokane, Washington and about 2.5 miles north of Colbert, Washington (Figure 1). Specifically, it is situated in the southeast corner of Section 3, Township 27 North, Range 43 East and covers an approximate area of about 40-acres along Elk-Chattaroy, Yale and Big Meadows Roads. The site is located within the Whitworth Water District and the Spokane County Health Department jurisdiction. The site is owned and operated by Spokane County.

The remedial action site, the area of potential impact surrounding the landfill, extends north of the landfill about a half mile, west about a mile to the Little Spokane river, east a similar distance, and south approximately five miles to Peone (or Deadman) Creek. The total area is approximately 6,800 acres which includes parts of Sections 2, 3, 10, 11, 14, 15, 16, 21, 22, 23, 26, 27, 28, 33, 34, and 35 of the same township and range. The site is entirely within the drainage basin of the Little Spokane River, mainly on a plateau bounded by bluffs down to the river on the west and knobby granite and basalt hills to the east.

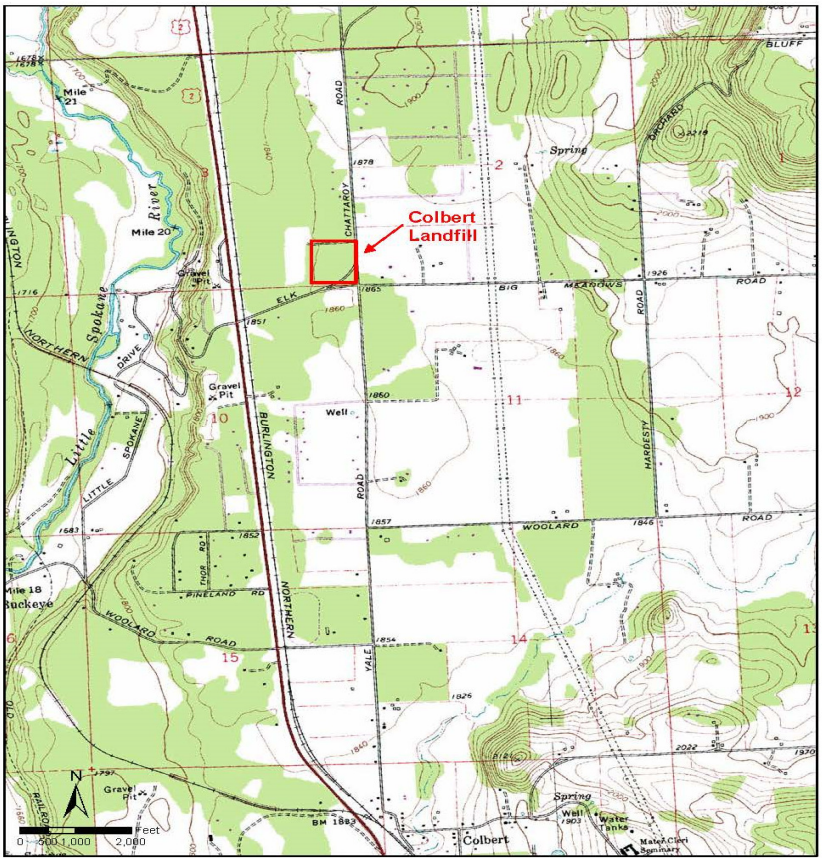

Figure 1. Location of Colbert Landfill

3.2. Land and Resource Use

The Colbert Landfill was operated as a sanitary landfill by the Spokane County Utilities Department from 1968 to 1986. The wastes disposed of at the landfill primarily included municipal and commercial wastes. For a period between 1975 and 1980, the landfill accepted electronic manufacturing wastes and a variety of spent organic solvents and other chemicals. The landfill did not accept hazardous waste for disposal; however, the solvents disposed between 1975 and 1980 have since been designated as hazardous wastes under state and federal laws. The landfill was filled to capacity and no longer accepted waste by 1986 and was subsequently covered. In 1996, the landfill cover was upgraded and was capped and closed to meet the new State of Washington regulations for solid waste units.

Between 1975 and 1980, a local electronics manufacturing company disposed of spent organic solvents at the landfill. These wastes typically were brought to the landfill in drums and were poured down the sides of open trenches containing soil and ordinary municipal refuse. During the same period, Fairchild Air Force Base (FAFB) disposed of various solvent wastes at the site. The six chemicals of concern at the site are: methylene chloride (MC), 1,1,1- trichloroethane (TCA), 1,1-dichloroethylene (DCE), tetrachloroethylene (PCE), 1,1- dichloroethane (DCA), and trichloroethylene (TCE).

The landfill is surrounded primarily by residential developments and open lands. The area south of the site contains forested lands, open fields and a few residential homes. The Spokane County Recycling Center and Transfer Station is located immediately west of the Site's groundwater treatment facility. There are residences located within the footprint of the groundwater plume (i.e., beyond the landfill) in all directions around the landfill. Residents affected by contamination from the landfill were connected to the municipal water system of the Whitworth Water District No. 2. Residential development of this area has become denser in the past 20 years.

3.2.1. Geology

The geology beneath the site consists of vertically stratified and laterally discontinuous geologic units derived from glacial and fluvial material, modified by erosional (and possibly landslide) process, overlaid on granitic bedrock. There are two primary aquifers that include the saturated portion of the Upper Sand and Gravel Unit and the saturated portion of the Lower Sand and Gravel Unit, which are separated by a Lacustrine Unit that serves as an aquitard. The Latah Formation serves as an aquitard that underlies the Lower Sand and Gravel Aquifer at most locations. A basalt unit forms a secondary aquifer interbedded in the Latah Aquitard and is referred to as the Basalt Aquifer. The Granite Unit is an aquitard that underlies the Latah Formation and serves as the lower boundary to the regional flow system.

The Upper Sand and Gravel Unit aquifer (Upper Aquifer) is unconfined with a water table that lies approximately 90 ft below the ground surface (BGS). Groundwater flow in this aquifer is generally north to south, changing to the southeast approximately 1 mile south of the Site. The direction of flow appears to be influenced by the topography of the upper surface of the Lacustrine Aquitard.

The Lower Sand and Gravel Unit aquifer (Lower Aquifer) is confined to the west of the landfill and unconfined to the east of the landfill. To the west of the landfill, the Upper and Lower aquifers are

separated by the Lacustrine unit, which causes the confined conditions in that area. Groundwater flow in the Lower Aquifer is predominantly toward the west with discharge to the Little Spokane River, however, there is a lobe of the Latah Aquitard extending into the aquifer from the east side of the landfill and appears to separate the aquifer flow so that north of the landfill flow is west to southwest and south of the landfill flow is northwest.

3.2.2. Hydrogeology

The hydrogeologic system in the vicinity of the Colbert Landfill can be divided into two primary aquifers. Both of these aquifers would be classified as drinking water sources according to the EPA groundwater classification system and are described below:

- The upper aquifer is unconfined and is considered a primary aquifer. It consists of a sand and gravel unit that extends from the eastern hills west to the bluffs of the Little Spokane River. Groundwater flow is predominantly toward the south. The fluvial unit associated with the Little Spokane River receives recharge from the upper aquifer.
- To the west of the landfill, the upper and lower aquifers are separated by the lacustrine unit. Therefore, the lower aquifer is confined to the west of the landfill and unconfined to the east. It consists of a lower sand and gravel unit (primary aquifer), the Latah and weathered Latah aquitard (interbedded basalts, sands, silts and clays), and the basalt aquifer (secondary aquifer interbedded with the Latah aquitard). Groundwater flow is predominantly toward the west.

3.2.3. Flora and Fauna

The vegetation in the vicinity of the landfill is dominated by Ponderosa pine, with an undergrowth of grasses. Along the Little Spokane River the forest is somewhat denser and includes more species of trees. This riparian zone supports a variety of shrub species and broadleafed herbaceous plants in addition to grasses. Game animals, small birds, and small mammals inhabit the wooded areas, and the river supports a variety of aquatic species, including trout. Bald eagles are seen occasionally along the river, especially in winter and one was observed flying over the landfill area during the site visit. Much of the landfill site itself was cleared of trees, and is now covered with a continuous layer of grasses. Adjacent to the Site are both wooded areas and private residences. Wildlife use of the landfill property is probably limited to birds, insects, and perhaps small reptiles and mammals, similar to species found in surrounding areas.

3.3. History of Contamination

During the five year period between 1975 and 1980 the Landfill accepted solvents, mainly MC and TCA, and other chemical waste from Key Tronic Corporation, a local electronic manufacturing company, and FAFB. Typically these wastes were delivered to the landfill in 55-gallon drums and were subsequently poured into open trenches to mix with the soil or ordinary municipal refuse already in the trench. It is reported that these solvents were disposed of at a rate of several hundred gallons per month for numerous years.

In 1980 nearby residents complained to the Eastern Regional Office of the Washington Department of Ecology about the chemical disposal practices. EPA and Ecology along with Spokane County Utilities

Department conducted an investigation into these complaints by initiating a groundwater sampling study of nearby domestic water wells. Twenty domestic water wells had contaminants above drinking water standards which could in part be traced to the spent solvents disposed of at the landfill.

3.4. Initial response

Following the initial domestic groundwater sampling investigation, Phase I and II studies resulted in the installation of monitoring wells, injection testing, and development of a groundwater monitoring program. In August 1983, EPA placed the Colbert Landfill on the National Priorities List (NPL) and identified Spokane County, Key Tronic Corporation and FAFB as potentially responsible parties (PRP). In 1984, Ecology entered into a cooperative agreement with EPA for conducting a Remedial Investigation/Feasibility Study (RI/FS). During that same year, bottled water was supplied to some of the households with high contaminant levels in their water wells. In 1985, the County extended the Whitworth Water District public water supply main to affected households. The hookup of residents was subsidized by the PRPs if: (1) concentrations of contaminants were greater than Maximum Contaminant Levels (MCL), (2) the resident was less than 500 feet from a water supply main, and (3) the resident signed a hold-harmless agreement. The final RI report was completed in 1987 and discovered that both the upper and lower sand and gravel aquifers were contaminated with solvents.

3.5. Basis for Taking Remedial Action

3.5.1. Contaminated media and structures

The ROD describes that the complete pathways evaluated in the risk assessment were ingestion (groundwater was used as potable water) and ingestion of crops irrigated by or grown in contaminated water. The risk assessment found that TCA (28 times the MCL), DCE (27 times the MCL), TCE (46 times the MCL), and MC (1,000 times the 10^{-6} cancer risk value) exceeded the human ingestion Maximum Allowable Contaminant concentrations (MAC) or MCL values for both of the aquifers. Dermal contact (via bathing) exceeded MAC values for MC and DCE. The ROD concluded that “there are contamination problems in the southern, western, and eastern areas of the site.” Even though little contamination was found in soil near the landfill, the RI revealed that both the upper and lower aquifers had been contaminated by hazardous substances released to groundwater. A variety of VOCs were detected at concentrations greater than state and federal drinking water standards.

The site contaminants of concern (COCs) are TCA, DCE, DCA, TCE, PCE, and MC. The extent of the plume prior to implementation of the pump and treat (P&T) system extended to the southwest and south of the landfill in the Upper Aquifer, and radiated in all directions from the landfill in the Lower Aquifer. Drilling conducted during the RI found little evidence of contamination in soil near the landfill. This may have been because of the location of the borings or physical processes during drilling, such as volatilization. A soil gas survey was conducted in 1985 and found detectable levels of soil gas concentrations over much of the area of the groundwater plume. Maximum concentrations of TCA in soil gas were found around the landfill and to the east, an area where secondary sources may be present.

3.5.2. Resources

For the contaminants identified above, acceptable doses for carcinogenic and non-carcinogenic compounds were developed. Non-carcinogen acceptable doses were based on available toxicity data that indicate a no adverse effect level. Carcinogen acceptable doses were based on 10^{-6}, or 1in 1,000,000 incremental risk of developing cancer from a lifetime exposure, using the EPA Cancer Assessment Group evaluation of cancer potency. Exposure pathways analyzed include ingestion via drinking contaminated water or of crops, beef or dairy products irrigated with contaminated water, dermal contact from bathing with contaminated water or swimming in contaminated surface waters, inhalation of volatile contaminants during showering, and assessment of ecological receptors. The analysis resulted in the calculation of MAC values for DCA, PCE and MC which should not be exceeded in water used for drinking (ingestion) or bathing (dermal). For the carcinogenic compounds PCE and MC, the MAC value was based on risk of 10^{-6}. Where the MAC values were not developed (TCA, DCE, and TCE), federal drinking water MCLs were used instead.

4. Remedial Actions

4.1. Regulatory actions

On September 29, 1987, EPA issued an Interim ROD which selected an interim final remedy for the site based on the RI/FS. The ROD states "It is an interim final action because the extraction and interception well systems will be in operation for decades before remediation is complete and changes in the selected action may be required during that period. The design therefore will be reassessed and adjusted periodically, at intervals not to exceed five years. It builds on the Interim Remedial Measure which provided alternate water supply, through the Colbert Extension of the Whitworth Water District No. 2, to residents whose wells had shown contamination from the landfill at levels above public health concern."

On January 23, 1989, a Consent Decree between EPA, Ecology, Spokane County and Key Tronics Corporation was lodged in federal court. FAFB contributed waste to the landfill; however, they were not a party to the Consent Decree. The Consent Decree addressed implementation of remedial actions specified in the Interim ROD. On February 28, 1989, the Consent Decree was entered by the Court.

4.2. Remedial Action Objectives

The selected remedy included a groundwater extraction system to:

1. 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,
2. Remove contaminated materials (in the east) which 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, and
3. 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.

4.3. Remedy description

The interim final remedial action identified in the ROD addresses management of the migration of contaminants using a groundwater interception system in the south and west areas, and attempts source control in the east area through extraction of groundwater with the highest contaminant concentrations. The remedy includes treatment of extracted water to specified performance standards, compliance monitoring, and proper discharge of the effluent. The remedy included improvements to the water supply system in the area to assure sufficient supplies for all residents who require it. The ROD called for institutional controls to be developed consistent with the final design of the remedy to assure the effectiveness of the remedial action. Additionally, the remedy included closure of the Colbert Landfill in accordance with the State Minimum Functional Standards (MFS), Washington Administrative Code (WAC) 173-304 for landfill closure, including capping, regrading, groundwater and gas monitoring, and post-closure maintenance. The closure will be evaluated to ensure consistency with Resource Conservation and Recovery Act (RCRA) Hazardous Waste Regulations and addressed in the final ROD for the site.

The performance of the remedial action was defined in the ROD as:
*…treating the wastewater effluent to or below the MCLs (40 CFR 141.65) or a similar health-based level (the 10^{-6} risk level for carcinogens) for contaminants for which MCLs have not been determined. Numeric standards are presented in [*Table 2*] for discharge levels and for termination of the remedial action.*

Table 2. Colbert Landfill Performance Criteria from ROD and Consent Decree

Compound	Performance Criteria (ppb)	Basis	Adjustment Criteria (ppb)
1,1,1-Trichloroethane (TCA)	200	MCL[(a)]	103 (South), 101 (West)
1,1-Dichloroethylene (DCE)	7	MCL[(a)]	4.5
1,1-Dichloroethane (DCA)	4,050	MAC[(b)]	2026
Trichloroethene (TCE)	5	MCL[(a)]	3.3
Tetrachloroethene (PCE)	0.7	MAC[(c)]	NA
Methylene Chloride (MC)	2.5	MAC[(c)]	NA

Source: Colbert Landfill ROD, Table 6
(a) Federal drinking water maximum contaminant level as of the date of the Consent Decree
(b) Maximum acceptable concentration presented in the ROD
(c) Maximum acceptable concentration based on EPA Cancer Assessment Group evaluation (10^{-6} evaluation)

The Consent Decree identifies additional criteria to the performance criteria identified in the 1987 ROD (Table 2). Adjustment criteria were developed to conservatively evaluate the need for extraction system operational changes and are used to determine when an extraction well can be put into standby mode. The adjustment criteria are only used to manage operation of the extraction

systems. The termination of the entire remedial action will be complete when the performance criteria for groundwater have been met throughout the plume extent.

4.4. Remedy implementation

The following remedial measures have been completed:

1. Groundwater Extraction and Treatment Systems. The ROD identified the need for three separate groundwater extraction systems to treat groundwater at the site in order to address management of the migration of contamination using a groundwater interception system and attempt source control through extraction in the areas of highest impact. These three groundwater extraction systems are shown on the site map in Figure 2.

The south and west extraction systems were designed for management of contaminant migration. The south system was intended to intercept contaminated groundwater in the upper aquifer. It consists of four extraction wells located approximately 1.5 miles south and down-gradient of the landfill. The west system was intended to intercept contaminated groundwater in the lower aquifer. It consists of three extraction wells located near the western, down-gradient edge of the landfill.

The east system was intended for source control, rather than management of migration, and consists of three extraction wells located near the eastern edge of the Landfill. As stated in the ROD, "Extraction will continue until all wells in contaminated zones show that the contaminants from the landfill have been reduced to and consistently remain below the health protection maximum levels."

The extracted groundwater from each system is conveyed through a piping system to a treatment facility located in the southwest corner of the Landfill property. At the facility, the contaminants are removed through air stripping technology and then discharged to the Little Spokane River.

Concentrations of VOCs in the Upper Aquifer have decreased since implementation of the P&T system to the point that they are close to or below the performance standards established for the Site. Although the concentrations of VOCs in the Lower Aquifer have decreased dramatically since implementation of the P&T system, they are still above the performance standards in wells located in close proximity to the landfill.

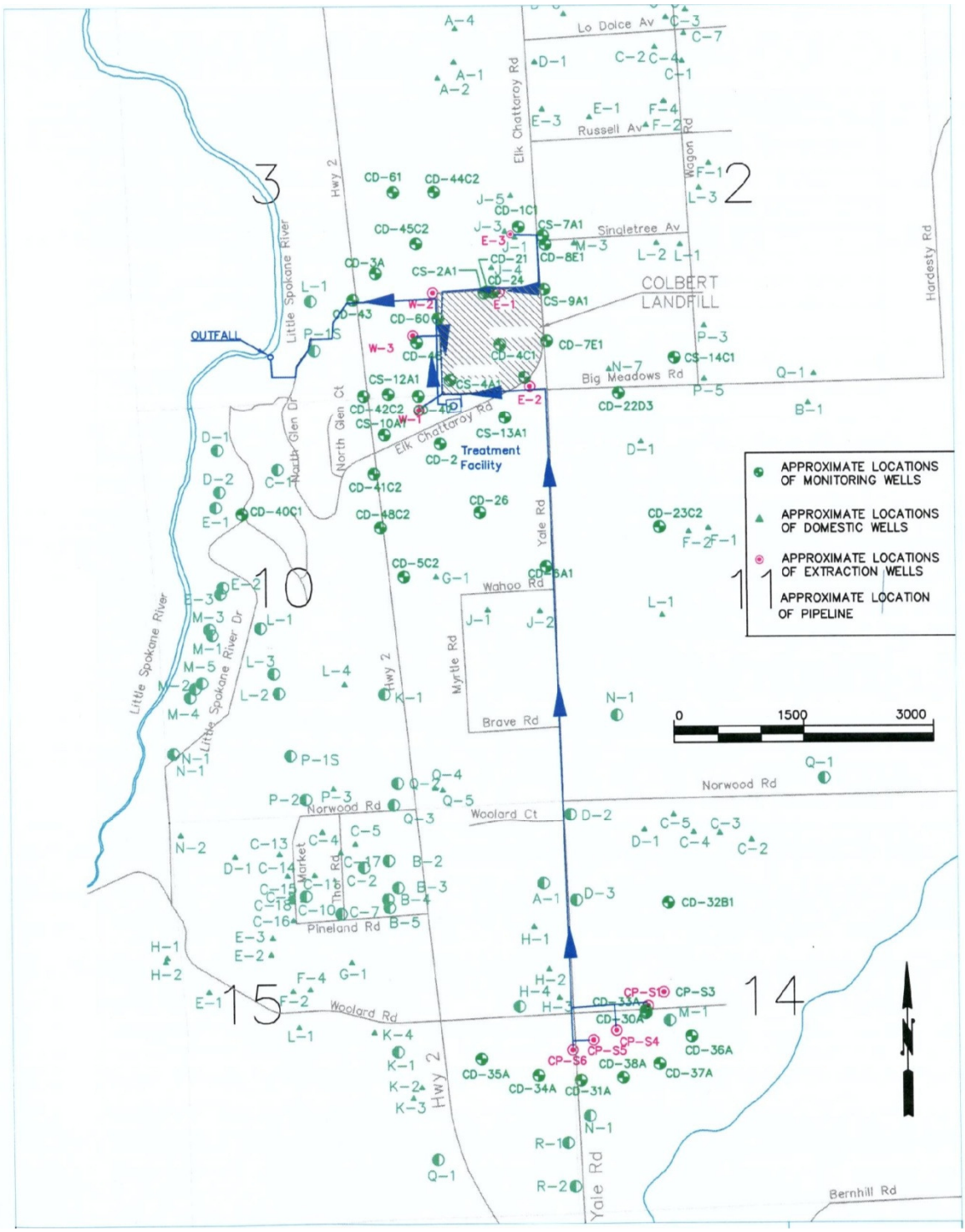

Figure 2. Colbert Landfill Map

2. Landfill Closure. As part of the remedy described in the ROD, the Colbert Landfill was closed in accordance with the State minimal functional standards (MFS) for landfill closure. As specified in the Consent Decree, "*The primary purposes of the cap are to: reduce the potential for infiltration and, thus, reduce the rate of leachate generation; address vector control; and restrict human access."* The

landfill closure requirements include a landfill cover system, drainage facilities, and a landfill gas collection and treatment system and are described in the Operation and Maintenance Manual for Colbert Landfill Closure (CH_2M Hill, 1997).

The Consent Decree states that the County shall develop a covenant restricting the use of the Colbert Landfill so that the function of the cover would not be impaired. A fence currently surrounds the landfill to limit access and a declaration of restrictive covenants was filed by the Spokane County in September 2009.

All elements to the landfill closure and cover, except a restrictive covenant, were complete in August 1996. The cover was installed on approximately 32 acres of the closed landfill. A landfill gas (LFG) management system was installed to extract methane gas from the refuse and transmit it to the treatment facility in order to prevent both off-site gas migration and build-up of gas pressure. LFG is treated using air stripping technology and then discharged to the atmosphere.

While remedial and closure actions under the federal Superfund program are exempt from specific permit acquisition requirements, the Colbert landfill was still required to meet the ARARs that would be required under those permits (ARARs are discussed in Section 7.2 Table 10). As such, the LFG management system met the Best Available Control Technology (BACT) by using the activated carbon adsorbers and Spokane Regional Clean Air Agency's Acceptable Source Impact Levels for toxic air contaminant impacts as defined in the Washington State Clean Air Act WAC-173-460 (CH_2M Hill 1997).

3. Alternate Drinking Water Supply. The ROD required an alternate water supply system be provided 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 Consent Decree describes the remedial actions to be taken if any compound originating from the site is identified in any domestic water supply well in use prior to issuing the Consent Decree. It states that if concentrations of any COC exceed performance standards in the follow up sample collected from the domestic well, Spokane County will promptly provide an alternative drinking water supply source to that resident. The new water supply could include either bottled water (on an interim basis) or connecting the residence to the Whitworth Water Supply System or an approved class IV system. The Whitworth water supply has been extended to include the residents affected by the groundwater contamination plume. Twenty-three residents were connected when the new water supply extension was completed in 1985. Since that time several additional residences have been connected to municipal water due to their proximity to the groundwater plume.

The Consent Decree states that institutional controls may be used to prevent the installation of domestic wells in areas known to be contaminated. Installation of new wells is tracked by the Spokane County Health Department however, there is no prohibition on drilling of new wells outside the landfill boundaries.

4.5. Systems Operations/Operations & Maintenance

4.5.1. Systems Operations/O&M Requirements

Groundwater Extraction and Treatment Systems.

The primary active components of the groundwater remedy include a P&T system that consists of three separate extraction systems. These include:

- West System -Consists of three extraction wells (CP-W1, CP-W2, and CP-W3) screened in the Lower Aquifer to provide hydraulic containment at the western edge of the closed landfill.
- East System -Consists of three extraction wells (CP-E1, CP-E2, and CP-E3) screened in the Lower Aquifer and/or weathered basalt/Latah to remove groundwater with the highest concentrations located near the eastern edge of the closed landfill.
- South System -Consists of four extraction wells (CP-S1, CP-S4, CP-S5, and CP-S6) located more than one mile south of the closed landfill, screened in the Upper Aquifer, and intended to control contaminant migration to the south of those wells.

At the treatment facility, the groundwater is processed through a counter current, forced draft air stripping tower (treating capacity of 1,600 gpm) and conveyed via an underground, gravity flow, 12 inch (in.) diameter pipeline to the discharge point in the Little Spokane River. Scale inhibitor chemicals are used in the stripper tower; therefore, acid washing to remove scale and biological buildup from the internal packing material has not been necessary.

Compliance monitoring was described in the Consent Decree and consists of sampling compliance monitoring wells at the South and West Systems annually and sampling extraction wells quarterly. More information on compliance monitoring can be found in Section 6.4.

In addition, flow in the Little Spokane River and contaminant concentrations in the treatment system effluent are measured to verify that the treated groundwater is meeting performance criteria and National Pollutant Discharge Elimination System (NPDES) substantive discharge monitoring requirements for protection of the Little Spokane River at the outfall. All monitoring has been completed in accordance with the Sampling Analysis Plan (SAP) as described in the Colbert Landfill Operations and Maintenance (O&M) Plan and the Quality Assurance and Field Sampling Plan. The results of the monitoring show that the groundwater treatment system has little to no impact to the water quality of the river.

The current sampling schedule is shown in Table 3.

Table 3. Colbert Landfill Sampling Schedule

	Compliance Wells		NPDES		MFS Wells	
Parameters and Method	Monitoring	Extraction	Influent	Effluent	Upper	Lower
VOC'S EPA 524.2	Annual	Quarterly	Monthly	Monthly	Annual	
Chloride EPA 300.0				Quarterly	Annual	Quarterly for first two years
NO3 + NO2 EPA 535.3				January, May, June, July		
Total Phosphorus EPA 365.3				January, May, June, July		
NO2/NO3/NH3 EPA 300.0/354.1/ 350.1					Annual	Quarterly for first 2 years
SO4/TOC/COD EPA 300.0/415.1/ 410.1					Annual	Quarterly for first 2 years
Fe, Mn EPA 6010				Quarterly	Annual	Quarterly for first 2 years
Zn EPA 6010					Annual	Quarterly for first 2 years
Toxicity				Semi-Annual		

Landfill Cover

The landfill cover was installed on approximately 32 acres of the closed landfill. The cover consists of one 60 millimeter High Density Polyethylene (HDPE) liner installed over a 6 inch prepared subgrade of 1 inch minus native material. The HDPE is covered with a free-draining 18 inch sand layer, then a 6 inch layer of topsoil. A strip drain collection system is installed directly on top of the cover system. These drains serve to carry surface water that has infiltrated through the topsoil and granular cover mater, off the liner to a toe discharge system or directly into the perimeter drainage ditch. The landfill does not have a bottom liner installed (CH_2M Hill 1997).

Spokane County regularly inspects the landfill cover for wear and settlement issues to prevent damage to the cover system. Landfill cover components such as toe discharge areas, soil/vegetation sloping and ditches are inspected monthly to ensure the cover is not being damaged and no settling is occurring. Twice a year, Spokane County officials perform tree sapling removal on the cover system as well as other vegetation maintenance to prevent cover damage.

Spokane County has performed regular monitoring at six locations on the landfill for settlement. There are several settlement markers installed on the cover and permanent bench markers just off the cover for elevation comparisons. Surveying was completed on a yearly basis from 1999 to 2005 (Table 4). Since surveying began in 1999, there has not been a change of elevation at any of the settlement markers greater than 0.1 ft. Because changes in elevations were negligible and the landfill has very low slopes, the county increased the period between surveys. The last survey was completed in 2009. The County has stated that there is currently no need for repair work in these areas.

Table 4: Settlement marker survey data.

Station ID	1999 Elevation	2000 Elevation	2001 Elevation	2002 Elevation	2003 Elevation	2004 Elevation	2005 Elevation	2009 Elevation	Change
CSM1	1863.941[a]	1864.005	1863.976	1863.97	1863.935	1863.938	1863.948	1863.956	0.015
CSM2	1865.319	1865.312	1865.323	1865.354	1865.314	1865.32	1865.327	1865.344	0.025
CSM3	1875.688	1875.708	1875.676	1875.693	1875.675	1875.628	1875.664	1875.643	-0.045
CSM4	1869.324	1869.371	1869.349	1869.326	1869.318	1869.292	1969.282	1869.248	-0.076
CSM5	1856.857	1856.886	1856.857	1856.875	1856.849	1856.849	1856.852	1856.854	-0.003
CSM6	1857.433	1857.494	1857.447	1857.459	1857.411	1857.415	1857.387	1857.355	-0.078

a - feet NGVD29

Landfill Gas System

The landfill gas system (LFG) consists of a network of interior and perimeter wells and trenches which collect gas and route it to the treatment facility where it is treated with activated carbon adsorbers. The gas is then discharged from the exhaust pipe that is secured to the air stripping tower adjacent to the gas collection system and discharged to the atmosphere.

The effectiveness of the LFG management system is evaluated through regular monitoring of gas probes situated within and adjacent to the landfill for pressure (vacuum), methane and carbon dioxide concentrations. Gas samples for VOC analysis are collected on an annual basis at the main exhaust system and analyzed using Method TO-14A. The newly activated carbon in the inline adsorbers are changed every six months.

Sampling of the LFG management system occurs either annually, monthly or quarterly depending on the port being sampled. The trench stations, manifold stations and manifold valves are sampled annually. The trench risers are sampled quarterly and the gas probes, gas influent, and gas exhaust are sampled monthly.

4.5.2. Systems Operations/O&M Operational Summary

The extraction systems have seen few major improvements since their original installation in February 1997. The South System (Upper Aquifer) extraction wells were shut down and put in standby mode in 2004 because COC concentrations in the extraction wells had decreased to below the Evaluation Criteria. CP-W1 in the West System (Lower Aquifer) was put in standby mode in early 2005. Groundwater quality in these wells continues to be monitored.

System shutdown will include shutting down active extraction wells and associated treatment plant operations. West and East Extraction System wells CP-E1, CP-E2, CP-E3, CP-W2 and CP-W3 will be shut down remotely from the control room. West system extraction well CP-W1 and the South System extraction wells are currently in standby mode per Consent Decree specifications. Prior to the shutdown, water level measurements and groundwater quality samples will be collected from selected monitoring and extraction wells. Results from this pre-shutdown sample round will be used in conjunction with historical data to compare with data collected after the system is shut down. It is anticipated that monitoring for the shutdown test will need to continue for a minimum of 4 to 5 years

and possibly up to nine years to determine the impact the system shutdown has on the groundwater quality downgradient from the West System extraction wells.

4.5.3. Summary of Costs of System Operations/O&M Effectiveness

Original operations and maintenance costs were estimated to be approximately $300,000 per year. Actual costs over the last five years have ranged from $300,000 to $368,000 per year (Table 5).

Table 5. Annual System O&M Costs

Dates		Total Cost rounded to nearest $1,000
From	To	
Jan 2009	Dec 2009	$368,000
Jan 2010	Dec 2010	$330,000
Jan 2011	Dec 2011	$337,000
Jan 2012	Dec 2012	$320,000
Jan 2013	Dec 2013	$300,000

5. Progress since the Last Five-Year Review

5.1. Protectiveness statements from last review

The remedy at the Colbert Landfill Site currently protects 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 blocked; and the Spokane County Health Department has procedures in place to detect any wells installed as part of a new development outside the property boundaries.

However, in order for the remedy to be protective of human health and the environment in the long term the following actions need to be taken:

- Put restrictive covenants in place for the landfill and complete an Institutional Control Plan that documents procedures to control installation of domestic wells.
- Improve the current groundwater monitoring program to track the remaining contaminant concentrations within the plume area. Currently, the County voluntarily collects samples throughout the plumes (upper and lower aquifer) approximately every five years to account for this short coming.
- Conduct a RSE to determine if the current extraction system is adequate to maintain containment and/or achieve long term cleanup goals within a reasonable timeframe.

5.2. Status of recommendations and follow-up actions from last review

Issue 1

Status of landfill restrictive covenant unknown.

Recommendation 1: Determine if a restrictive covenant has been placed on the landfill. File if necessary.

Recommendation Status: A restrictive covenant was filed in September 2009. The restrictive covenant restricts the drilling of wells or extraction of groundwater, for any use, except for the purpose of the cleanup action within the Property as required by the Consent Decree. It requires the owner of the property to maintain fences and locked gates around the property and perform regular inspections to assure that the restrictions on access to the Property are effective. It restricts any activity within the boundaries of the Property that may result in the release of hazardous substances which were contained in the remedial action, and it prohibits any activity on the Property that would threaten the structural integrity of the landfill cap or otherwise interfere with the cleanup action, operation and maintenance, monitoring, or other measure necessary to assure the integrity of the remedial action and continued protection of human health and the environment.

Issue 2

An Institutional Control Plan, with designated lead agency oversight, has not been completed.

Recommendation 2: Document the procedures for groundwater protection (i.e. installation of new domestic wells) in an Institutional Control Plan. Designate a lead agency for oversight.

Recommendation Status: The procedures for monitoring for installation of new domestic wells was documented in a letter to EPA in response to a meeting and discussion conducted on 30 August 2011. The County has an information system in place to discourage the construction of wells adjacent to or in know areas of contamination. Washington State regulations require that prior to well drilling, the owner/driller must obtain a permit from the Washington State Department of Ecology and notify the local health district prior to well construction. In the event of a well drilling permit issued in the Colbert Landfill site area, the health district notifies owners/drillers of the site, and refers them to Spokane County Colbert Landfill personnel to discuss the location of the proposed well. If the intended well location is adjacent to or within a known area of site contamination, homeowners are made aware of the possibility the groundwater may be contaminated with compounds associated with the landfill site. The County will request that the homeowner have a sample from the well analyzed for the constituents of concern and advises if any of these are detected, that the use of the well be discontinued.

Issue 3

Groundwater flow line analyses in quarterly reports are inadequate.

Recommendation 3: Collect groundwater elevation measurements east of Elk Chattaroy/Yale Road. Include locations and measurements on groundwater flow maps or in a table to allow an accurate assessment of the flow line analysis.

Recommendation Status: Measurements east of Elk-Chattaroy Rd are being collected. Contour lines have been expanded in quarterly report maps to east of Elk-Chattaroy Rd. Groundwater elevation data tables are included in the quarterly reports.

Issue 4

East extraction system (CP-E2) may not be operating at maximum efficiency.

Recommendation 4: Evaluate need for continued operation of CP-E2 in its current condition.

Recommendation Status: CP-E2 is part of the shutdown test to evaluate further need for extraction.

Issue 5

The current groundwater monitoring program, as described in the Consent Decree, is inadequate to track the remaining contaminant concentrations within the plume area.

Recommendation 5: Include supplemental sampling in the groundwater monitoring program for the Site. Update the O&M Manual as necessary.

Recommendation Status: Supplemental sampling was mentioned in the Final Work Plan for the Groundwater Pump & Treat System Shutdown Test. The groundwater system is currently participating in the shutdown test. The shutdown work plan replaces the O&M until all results are in or the data indicates that the system needs to restart (B. Wedlake during Feb 2014 site visit). Spokane County voluntarily collects supplemental groundwater samples approximately every five years throughout the extent of the plume to track remaining contaminant concentrations within the plume area.

Issue 6

Residual contamination exists near monitoring well CD-40 down-gradient from the extraction systems near the Little Spokane River.

Recommendation 6: Continue sampling CD-40C1 on an annual basis and update the O&M Manual to include this location.

Recommendation Status: Sampling of CD-40C1 was added to the O&M Manual. Annual sampling of CD-40C1 has continued and concentrations of COCs are currently below the performance criteria.

Issue 7

1,4-dioxane concentrations detected in groundwater above MTCA cleanup levels.

Recommendation 7: Evaluate 1,4-dioxane data at the completion of 4 quarters of monitoring. Include sampling of wells with concentrations of 1,4-dioxane above cleanup criteria in long-term monitoring program.

Recommendation Status: Spokane County discussed this issue with Washington Department of Ecology and proposed continuation of annual sampling to be evaluated annually. Sampling for 1,4-dioxane has continued over the last five years and data are reported in the quarterly reports. The latest annual report found 1,4-dioxane concentrations are below criteria.

Issue 8

Extraction systems have been operating for almost 20 years and a Remedial System Evaluation (RSE) should be completed.

Recommendation 8: Complete RSE.

Recommendation Status: An RSE was completed in October 2010.

The groundwater P&T system has been operating since 1994, and was recently the subject of an independent technical review. This review, referred to as a RSE, was conducted by an independent team of experts that conducted a broad review with the objective of optimizing the site treatment remedy for protectiveness, cost-effectiveness, and sustainability. The RSE team agreed that the remedial design is appropriate, given the complex nature of the Site and the large extent of a diffuse plume. Recommendations from the RSE conducted for the site P&T system included implementation of a shutdown test for the portion of the P&T system that is currently operating to determine whether continued groundwater extraction and treatment is needed to maintain the overall protectiveness of the site remedy. In addition the RSE recommended future residential well samples be analyzed for 1,4-dioxane in addition to the other COCs, improve the process for documenting and implementing the institutional controls, including posted data values on future water level maps and including an executive summary indicating important (non-routine) changes or observations in the quarterly reports.

A work plan was developed in 2013 for implementation of a shutdown test of the P&T system to treat groundwater contaminated with VOCs. A new monitoring well (CD-49) was installed due west of extraction well CP-W3 in summer of 2013 for monitoring during a shut-down test of the extraction system. The recommendations concluded that if the shutdown test indicates the P&T system does not provide significant benefit toward achieving cleanup levels and no other alternatives to achieve cleanup levels throughout the plume are identified, evaluating a Technical Impracticability waiver may be appropriate as part of the final remedy. The shut-down test began on March 31, 2014.

Issue 9

Toxicity information for DCA and PCE has been revised.

Recommendation 9: Evaluate the need for revising the risk-based performance criteria for DCA and PCE.

Recommendation Status: MTCA cleanup levels for DCA and PCE have not changed since the previous FYR so a revision to the risk-based performance criteria is not warranted at this time.

Issue 10

Landfill cover has not been surveyed since 2005.

Recommendation 10: Survey the landfill cover.

Recommendation Status: The last *s*urvey of the settlement monuments was conducted in October 2009. Settlement between 1999 and 2009 has been less than 0.1 ft.

Issue 11

A final Record of Decision has not been completed.

Recommendation 11: Write a final Record of Decision for the site that will include any new, or modified ARARs, since interim final ROD was signed in 1987 (e.g., State Department of Ecology's Model Toxics Control Act) and recommendations from the RSE.

Recommendation Status: A final ROD has not been completed. During the Feb 2014 site visit EPA staff indicated they would consult with their legal staff on whether or not the existing ROD by default is a final ROD or will another process be instituted instead such as a TI waiver or ESD. EPA contacted their legal staff and they determined that the existing ROD is an interim ROD.

Issue 12

There is a potential for contaminated groundwater to act as a source of contamination to soil gas that may impact indoor air.

Recommendation 12: Evaluate vapor intrusion issues during the RSE.

Recommendation Status: The RSE report evaluated the potential for soil gas to impact indoor air. The report found "The two constituents with relatively low threshold concentrations were PCE (~1 ug/l) and TCE (~ 5 ug/l). However, based on the groundwater data presented in Attachments 3 to 5 of the fourth five-year review (Compliance Monitoring Wells, Compliance Extraction Wells, and MFS Wells) the concentrations of PCE and TCE are below these threshold levels in the upper aquifer. Coupled with the conservatively shallow depth to groundwater utilized for the J&E analysis, the RSE team did not feel that vapor intrusion was a concern."

Table 6. Actions Taken Since the Last Five-Year Review

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
1	Determine if a restrictive covenant has been placed on the landfill. File if necessary.	County	12/31/2009	A Restrictive Covenant was filed in September 2009	9/2009
2	Document the procedures for groundwater protection (i.e. installation of new domestic wells) in an Institutional Control Plan. Designate a lead agency for oversight.	County	6/1/2010	The procedures for monitoring for installation of new domestic wells was documented in a letter to EPA in response to a meeting and discussion conducted on 30 august 2011.	9/2009
3	Collect groundwater elevation measurements east of Elk Chattaroy/Yale Road. Include locations and measurements on groundwater flow maps or in a table to allow an accurate assessment of the flow line analysis.	County	3/1/2010	Groundwater contour lines and elevations are currently being included in quarterly reports	2010 – 2013 reports

4	Evaluate need for continued operation of CP-E2 in its current condition during the RSE.	EPA	6/30/2010	CP-E2 is part of the shutdown test to evaluate further need for extraction.	4/13/2010
5	Include supplemental sampling in the groundwater monitoring program for the Site. Update the O&M Manual as necessary.	County	6/1/2010	Supplemental sampling was mentioned in the Final Work Plan for the Groundwater Pump & Treat System Shutdown Test	August 2013
6	Continue sampling CD-40C1 on an annual basis and update the O&M Manual as necessary.	County	12/31/2009	Annual sampling of CD-40C1 has continued and concentrations of COCs are currently below the performance criteria.	2010 – 2013 reports
7	Evaluate 1,4-dioxane data at the completion of 4 quarters of monitoring. Include sampling of wells with concentrations of 1,4-dioxane above cleanup criteria in long-term monitoring program.	County	12/31/2009	Sampling for 1,4-dioxane has continued over the last five years and data are reported in the quarterly reports.	2010 – 2014 reports
8	Complete RSE.	EPA	12/31/2009	Completed	4/13/2010
9	Evaluate the need for revising the risk-based performance criteria for 1,1-DCA and PCE during the RSE.	EPA	12/31/2009	MTCA cleanup levels for 1,1-DCA and PCE have not changed since the previous FYR so a revision to the risk-based performance criteria is not warranted at this time.	12/31/2009

10	Conduct regular surveys of the Landfill cover.	County	12/31/2010	Landfill cover has not been surveyed however, the landfill settlement monitoring monuments were last surveyed in 2009	2009
11	Complete Final ROD.	EPA	9/30/2011	A final ROD has not been completed. EPA staff verified with counsel that the existing ROD is an interim ROD.	2014
12	Evaluate vapor intrusion issues during the RSE.	EPA	12/31/2010	The RSE team determined vapor intrusion was not a concern.	4/13/2010

5.3. Results of implemented actions, including whether they achieved the intended effect

A RSE report was completed in April 2010 and a shutdown test work plan was prepared in 2013. The shutdown test is scheduled for 2014.

5.4. Status of any other prior issues

No other prior issues were presented that needed to be addressed in this FYR.

6. Five-Year Review Process

6.1. Administrative Components

EPA Region 10 initiated the FYR in January 2014 and scheduled its completion for September 2014. The EPA review team was led by Christopher Guzzetti (EPA RPM) for the Colbert Landfill Site, and included Deborah Johnston (Biologist) and Amy Ebnet (Geologist) of the USACE Seattle District. In January 2014, EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. A review schedule was established that consisted of the following:

- Community Involvement
- Document Review
- Data Review

- Site Inspection
- Local Interviews
- FYR report development and review

6.2. Community Involvement

Activities to involve the community in the FYR included a notice run in the Spokesman Review on May 7, 2014 that a FYR was to be conducted. The press notice is available in Appendix B.

6.3. Document review

This FYR consisted of a review of relevant documents as summarized in Appendix A.

6.4. Data Review

6.4.1. Groundwater Extraction and Treatment Systems.

Data reviewed for the extraction systems included compliance groundwater monitoring data, groundwater level data, extraction well operational parameters, treatment system performance data, and supplement groundwater monitoring data.

6.4.1.1 Compliance Monitoring Data

The compliance monitoring program is intended to focus on the down-gradient boundaries to determine if the interception systems are containing the groundwater plume. Figure 3 shows the location of the monitoring and extraction wells. Monitoring wells are sampled annually and analyzed for VOCs and extraction wells are sampled quarterly and analyzed for VOCs (Table 7).

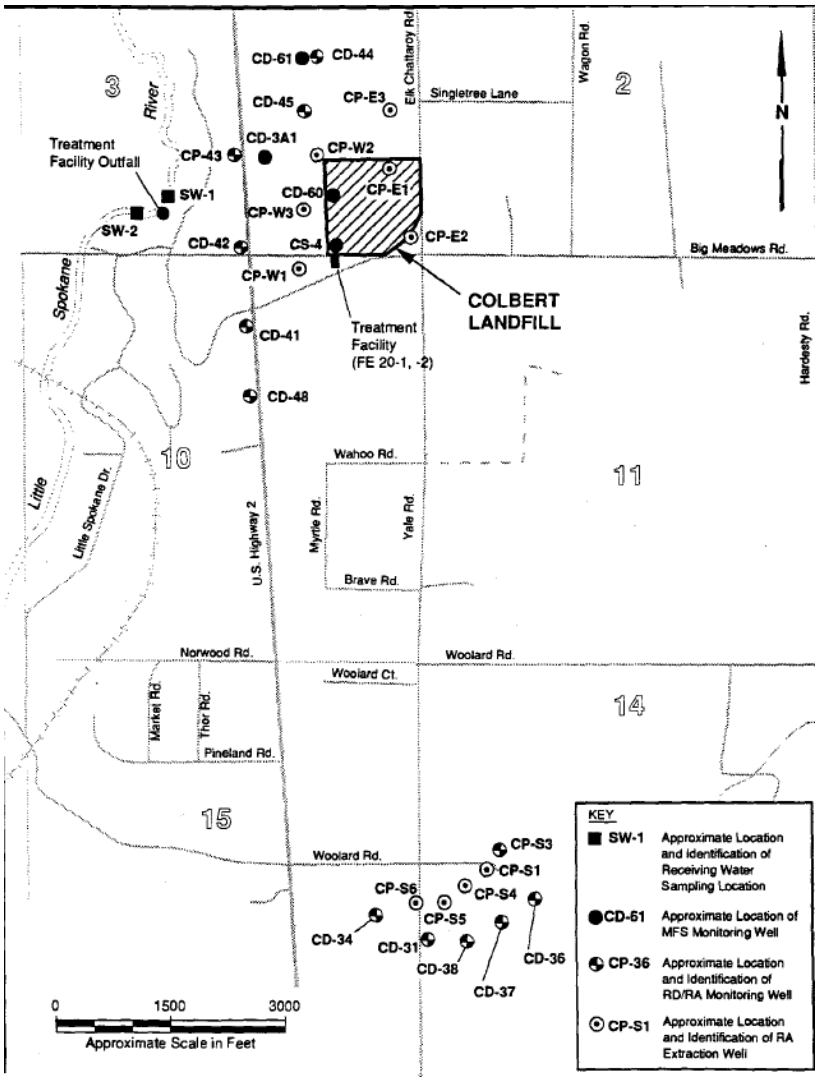

Figure 3. Extraction, Compliance and MFS Monitoring Location Map

Table 7: Current Compliance Monitoring Schedule: Extraction and Compliance Monitoring Wells.

System	Well ID	Designation	Aquifer	Sampling Frequency
West	CD-41C1 CD-41C2 CD-41C3	Downgradient Compliance	Lower	Annual Annual Annual
	CD-42C1 CD-42C2 CD-42C3	Downgradient Compliance	Lower	Annual Annual Annual
	CD-43C1 CD-43C2 CD-43C3	Downgradient Compliance	Lower	Annual Annual Annual
	CD-44C1 CD-44C2 CD-44C3	Crossgradient Compliance	Lower	Annual Annual Annual

System	Well ID	Designation	Aquifer	Sampling Frequency
	CD-45C1 CD-45C2 CD-45C3	Crossgradient Compliance	Lower	Annual Annual Annual
	CD-48C1 CD-48C2 CD-48C3	Crossgradient Compliance	Lower	Annual Annual Annual
	CP-W1 CP-W2 CP-W3	Extraction	Lower	Quarterly Quarterly Quarterly
East	CP-E1 CP-E2 CP-E3	Extraction	Lower	Quarterly Quarterly Quarterly
South	CD-31A1	Downgradient	Upper	Annual
	CD-34A1	Outboard	Upper	Annual
	CD-36A1	Downgradient	Upper	Annual
	CD-37A1	Downgradient	Upper	Annual
	CD-38A1	Downgradient	Upper	Annual
	CP-S3	Outboard	Upper	Annual
	CP-S1 CP-S4 CP-S5 CP-S6	Extraction	Upper	Quarterly Quarterly Quarterly Quarterly
	CD-03A1	MFS	Upper	Annual
	CD-60A1	MFS	Upper	Annual
	CD-61A1	MFS	Upper	Annual
	CD-04A1	MFS	Upper	Annual

6.4.1.1.1 South Interception System (Upper Aquifer)

The South Interception System monitoring program includes four wells located directly down-gradient of the south extraction system (CD-31A1, CD-36A1, CD-37A1, and CD-38A1) and two wells located near the western and eastern outboard limits of the system (CP-S3 and CD-34A1) (Table 7 and Figure 3). These wells are sampled annually. There have been no exceedances of the performance criteria in the last five years at the south interception compliance monitoring wells.

All of the south interception extraction wells have been shutdown since June 2004 and are sampled quarterly. TCA, DCA, DCE, TCE, and MC have been below the performance criteria for the past 5 years at all of the south extraction wells. The south interception extractions wells have been below the adjustment criteria for all COCs during the last five years except for one occasion on 6 April 2011 when CP-S1 had a concentration of TCE at the adjustment criteria of 3.3 ppb. Since then, concentrations of TCE have declined in CP-S1 (Figure 4). PCE has been detected above the performance criteria at extraction well CP-S4 at concentrations ranging from 0.54 to 1.06 ppb during the last five years (Figure 5). As stated in the Consent Decree (Appendix B, Section X), *if groundwater monitoring at a standby extraction well exceeds performance standards in three consecutive samples, the appropriate portion of the interception system will be placed in operation until standby criteria is achieved again*. In the last five years, there was one occasion where more than three consecutive samples exceeded the performance criteria (samples collected on 12 Oct 2010, 1 Oct

2011, 6 April 2011, and 19 July 2011). However, the system was not placed in operation at that time. Since then there has only been intermittent exceedances of the performance criteria. Additionally, since detections of PCE are only slightly above the performance criteria, there may be little benefit to human health and the environment for re-starting extraction well CP-S4.

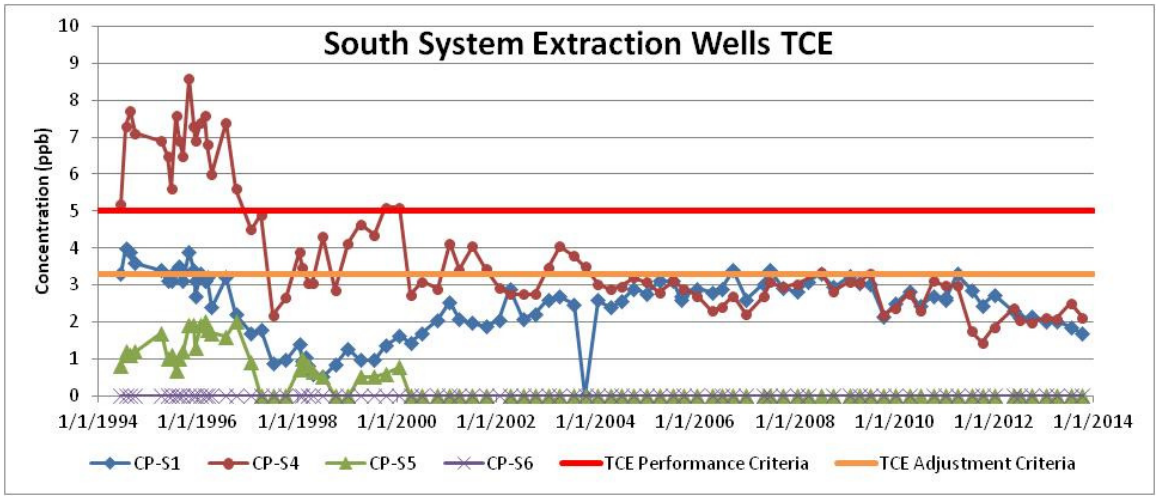

Figure 4: TCE Concentrations in South System Extraction Wells.

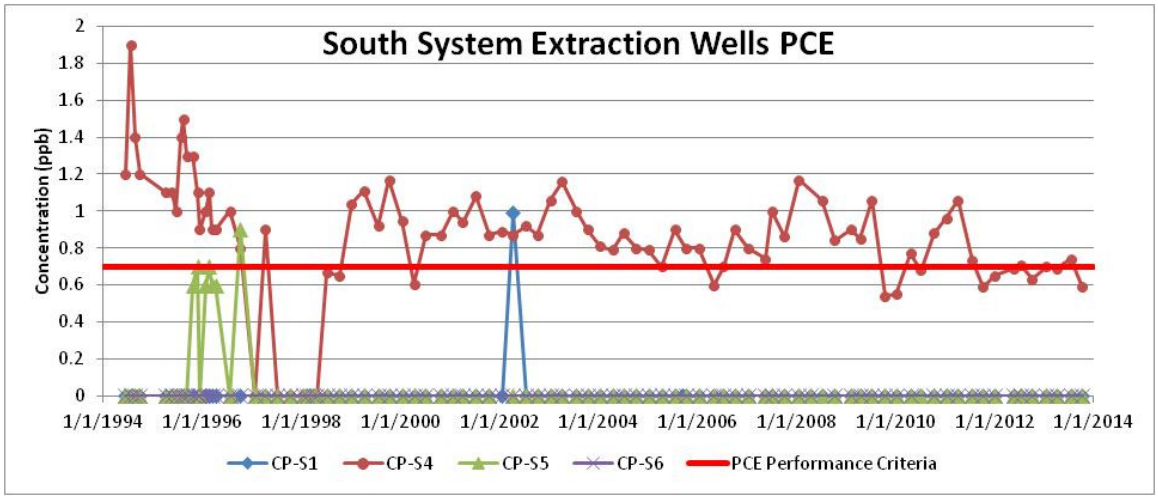

Figure 5: PCE Concentrations in South System Extraction Wells.

6.4.1.1.2 West Interception System (Lower Aquifer)

The West Interception System monitoring program includes monitoring wells located down-gradient of the extraction system and monitor those portions of the lower aquifer believed to be within the capture zone of existing supply wells (CD-41C1/2/3, CD-42C1/2/3, and CD-48C1/2/3); monitoring wells to monitor the portions of the lower aquifer not directly impacting the water quality of the existing supply wells (CD-43C1/2/3 and CD-44C1/2/3); and monitoring wells placed at the outboard limit of the interception system (CD-45C1/2/3) (Table 7 and Figure 3). There have been no exceedances of the performance criteria at any of the west interception system compliance monitoring wells in the last 5 years.

TCA, DCA, MC, and PCE have been below the performance criteria in all of the west extraction wells during the last 5 years. Extraction well CP-W1 was shutdown in January 2005 as all COCs were below the adjustment criteria. All COCs have remained below the adjustment criteria in CP-W1 since it was shutdown. Concentrations of DCE and TCE (shown in Figure 6 and Figure 7 respectively) in extraction wells CP-W2 and CP-W3 are above the adjustment and performance criteria. The overall trend of TCE in CP-W2 has been increasing since the system started; indicating the center of mass of the plume is migrating towards CP-W2. Concentrations of TCE and 1,1-DCE in CP-W3 have dropped below the performance criteria in late 2011 and early 2012 respectively.

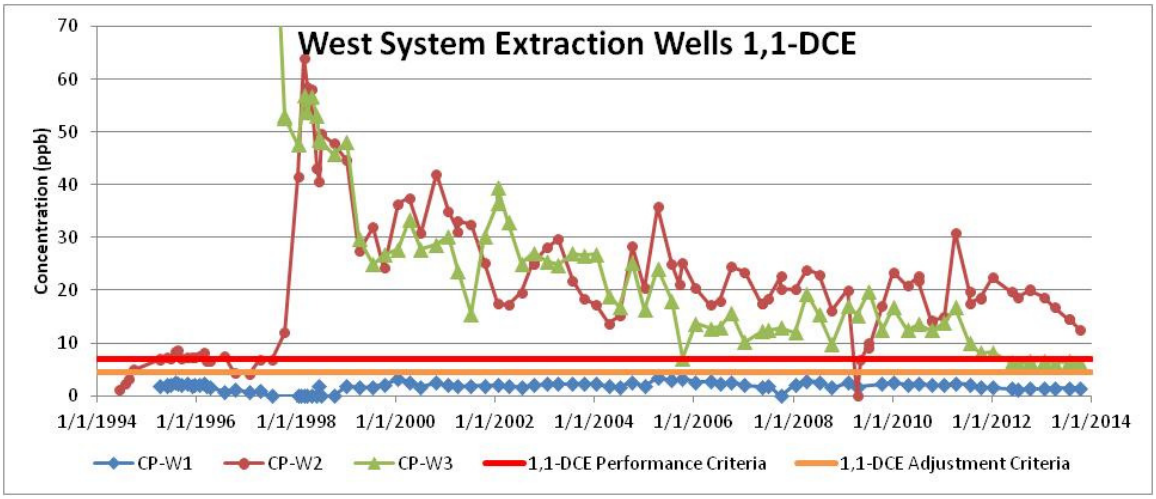

Figure 6: 1,1-DCE Concentrations in West System Extraction Wells.

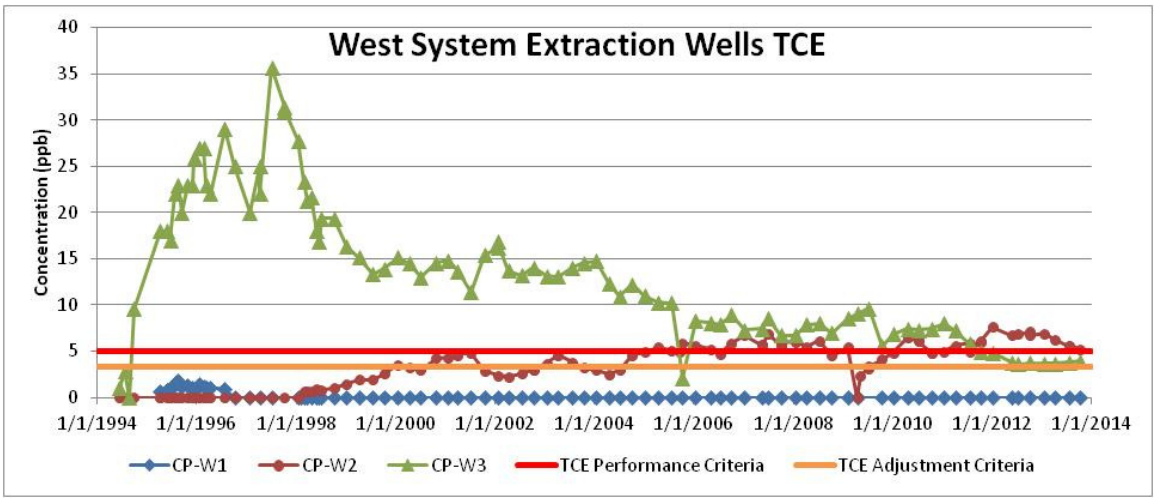

Figure 7: TCE Concentrations in West System Extraction Wells.

6.4.1.1.3 East Extraction System (Source Contaminant Control)

The East Extraction System (Lower Aquifer) was intended for source control. Because the focus of the compliance monitoring program is on the down-gradient boundaries of the groundwater plume, they are not required compliance monitoring wells for the East Extraction System.

DCA, MC, and TCA have been below the performance criteria in all the east extraction wells during the last 5 years. However, concentrations of TCE, PCE, and DCE remain above performance criteria

(Figure 8, Figure 9, and Figure 10). Concentrations of TCE exceed the performance criteria in CP-E2 and the adjustment criteria in CP-E1. CP-E2, located at the southeast corner of the landfill, contains the highest concentrations of COCs; however, it has the lowest extraction rate (averages less than 1 gallon per minute). PCE exceeds the performance criteria in CP-E2 and dropped below the performance criteria in CP-E1 in October 2009. Concentrations of DCE exceed the performance criteria in all three extraction wells. Concentrations of COCs in the east extraction wells have decreased significantly since system startup. Most of the decrease occurred during the first 4 to 6 years of operation. Since then, concentrations in CP-E1 and CP-E2 appear to be leveling off at concentrations above the performance criteria. If these trends continue, it is unlikely that remedy goals will be achieved in a reasonable time frame.

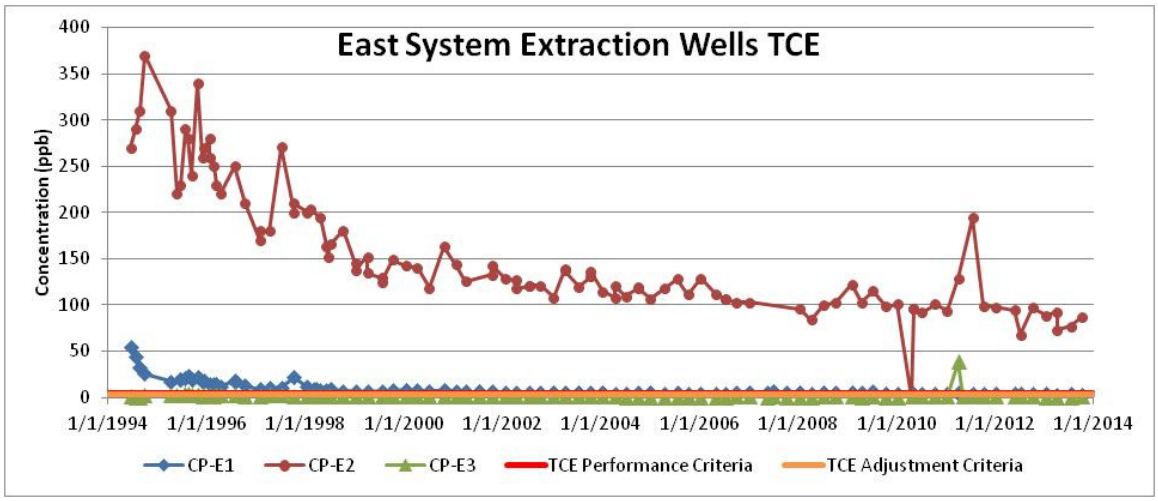

Figure 8: TCE Concentrations in East System Extraction Wells.

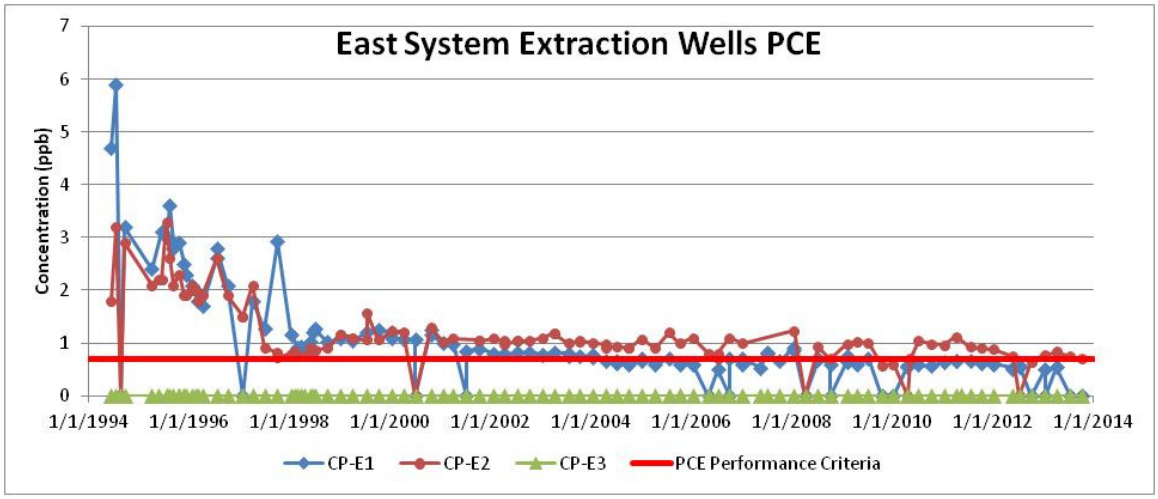

Figure 9: PCE Concentrations in East System Extraction Wells.

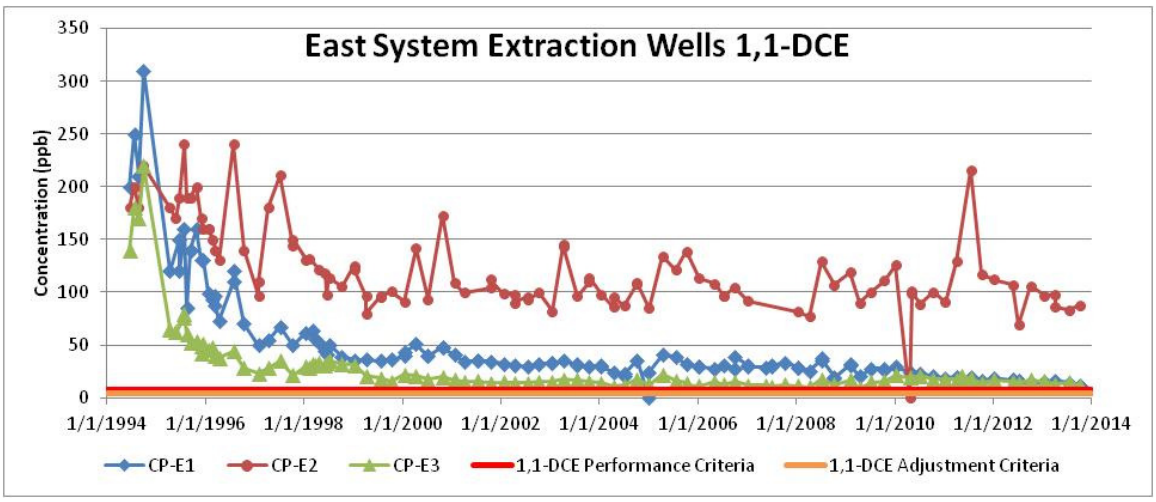

Figure 10: 1,1-DCE Concentrations in East System Extraction Wells.

6.4.1.2 Supplemental Monitoring Data

Spokane County voluntarily collects supplemental groundwater samples (Figure 11) approximately every five years throughout the extent of the plume to track remaining contaminant concentrations within the plume area. The last supplemental sampling was completed in May 2012 and data were presented in the second quarter 2012 monitoring report. The 4th five year review recommended that this supplemental sampling be included in the groundwater monitoring program for the Site and that the O&M Manual be updated to include these supplemental monitoring events.

All of the upper aquifer supplemental monitoring wells had concentrations below the performance criteria for all COCs.

For the lower aquifer, the 2012 data indicated that DCE, PCE, and TCE concentrations above performance criteria remain near the landfill. These concentrations are summarized in Table 8. Figure 12 through Figure 17 show the compliance monitoring and supplemental monitoring wells that detected DCE, PCE and TCE in the upper and lower aquifer during the May 2012 sampling.

Table 8: Supplemental Monitoring Wells that exceeded COC performance criteria during May 2012 sampling event.

Chemical	Performance Criteria (ppb)	Well 0273L-2	Well CD-01C1	Well CD-04E1	Well CD-08E1	Well CD-23C2	Well CD-26	Well CD-46
DCE (ppb)	7	11.6	46.9	271	37.4	8.03	30.7	7.35
PCE (ppb)	0.7			2.17				
TCE (ppb)	5			13.9	6.78		59.3	

Figure 11: Supplemental Well Locations.

Figure 12: DCE concentrations detected in upper aquifer in compliance and supplemental wells in May 2012.

Figure 13: PCE concentrations detected in upper aquifer in compliance and supplemental wells in May 2012.

Figure 14: TCE concentrations detected in upper aquifer in compliance and supplemental wells in May 2012.

Figure 15: DCE concentrations detected in lower aquifer in compliance and supplemental wells in May 2012.

Figure 16: PCE concentrations detected in lower aquifer in compliance and supplemental wells in May 2012.

Figure 17: TCE concentrations detected in lower aquifer in compliance and supplemental wells in May 2012.

6.4.1.3 Groundwater Flow Analysis

As recommended in the O&M manual, groundwater flow maps with associated flow lines are created quarterly to evaluate hydraulic control of the extraction systems. Figure 18 and Figure 19 show the

groundwater contours in the upper aquifer (South wells) when the system was operating in January 2004 and most recently July 2013. The July 2013 groundwater contour map shows groundwater flow in the upper aquifer towards the south. There appears to be no influence by the south interception system as compared to the January 2004 contour map when the system was still running.

Figure 20 and Figure 21 show the groundwater contours in the lower aquifer (East and West wells) when all extraction wells were in operation (January 2004) and the most recent data (July 2013). Due to their proximity, the east and west systems can be considered as a single system for evaluation of hydraulic containment. The flow maps show hydraulic containment near the landfill except for groundwater south of the landfill, where two supplemental wells show contamination above the performance criteria for TCE and DCE (CD-26 and CD-23C2), and is therefore not hydraulically contained by the extraction wells.

Figure 22 and Figure 23 show the estimated boundaries of the TCA plume in the upper aquifer in 1994/1995 and July 2013 respectively. Figure 24 and Figure 25 show the estimated boundaries of the TCA plume in the lower aquifer in 1994/1995 and July 2013 respectively. These maps show little change in the overall extent of the plume.

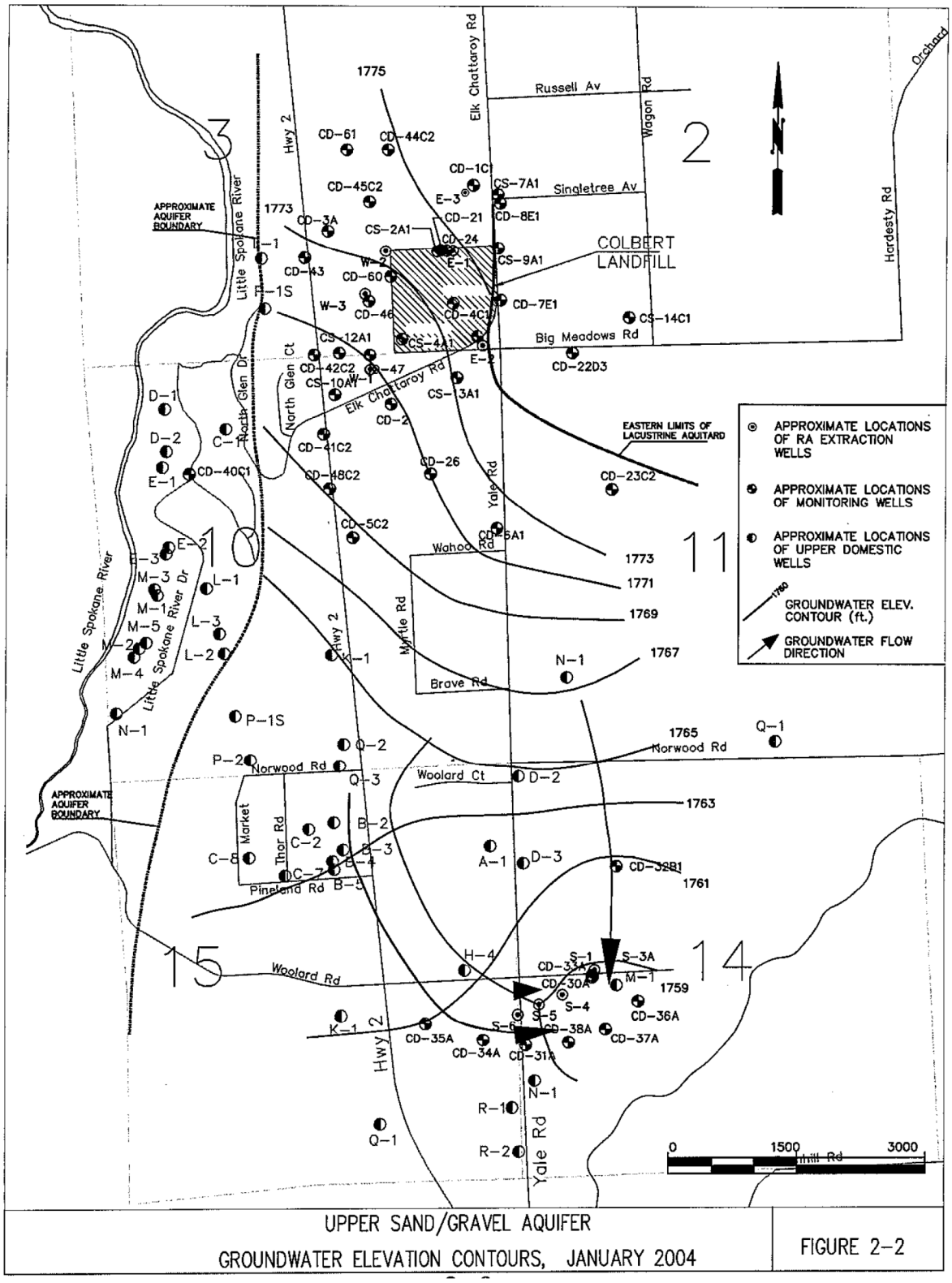

Figure 18: Upper Aquifer, January 2004 Groundwater Elevation Contours.

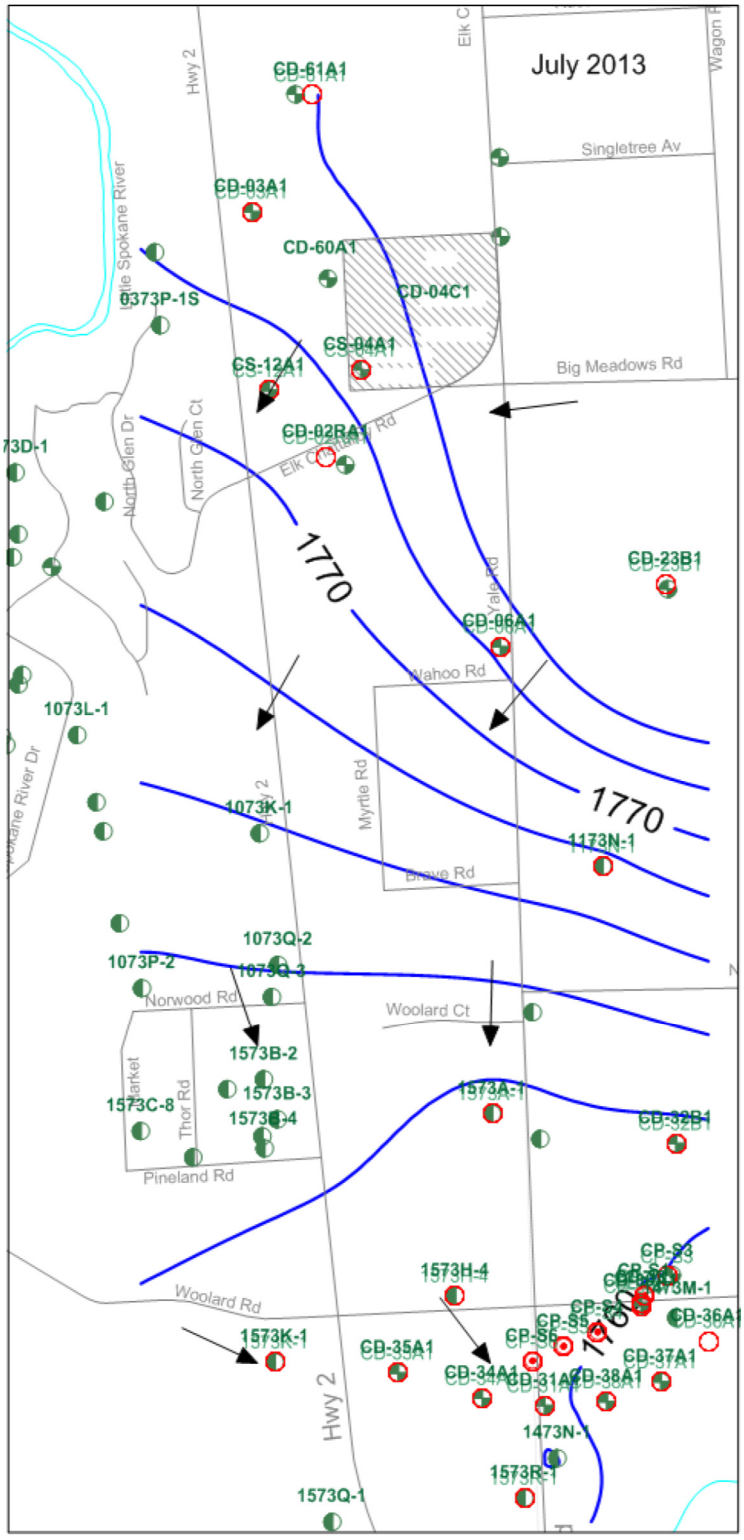

Figure 19: Upper Aquifer, July 2013 Groundwater Elevation Contours.

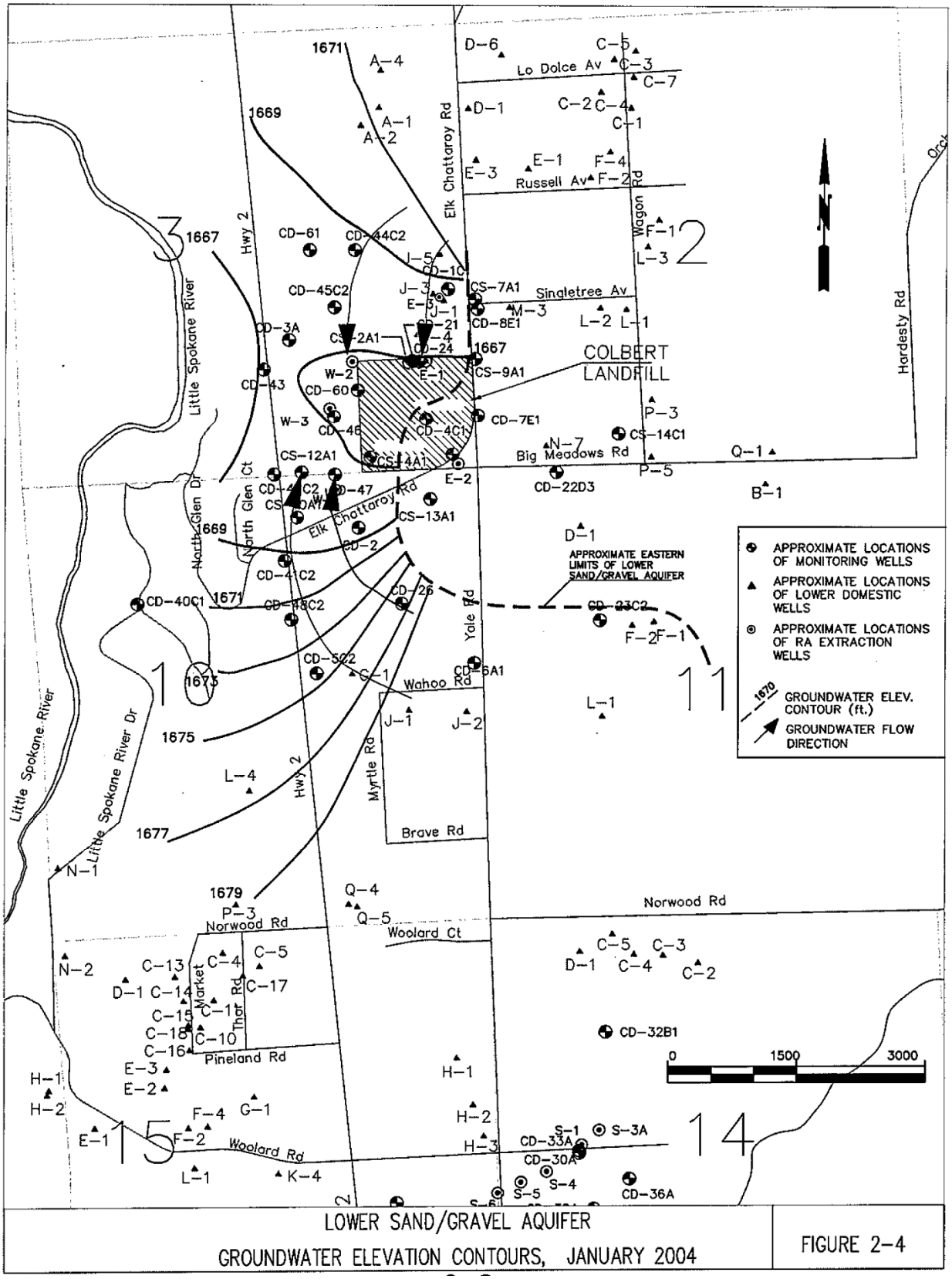

Figure 20: Lower Aquifer, January 2004 Groundwater Elevation Contours.

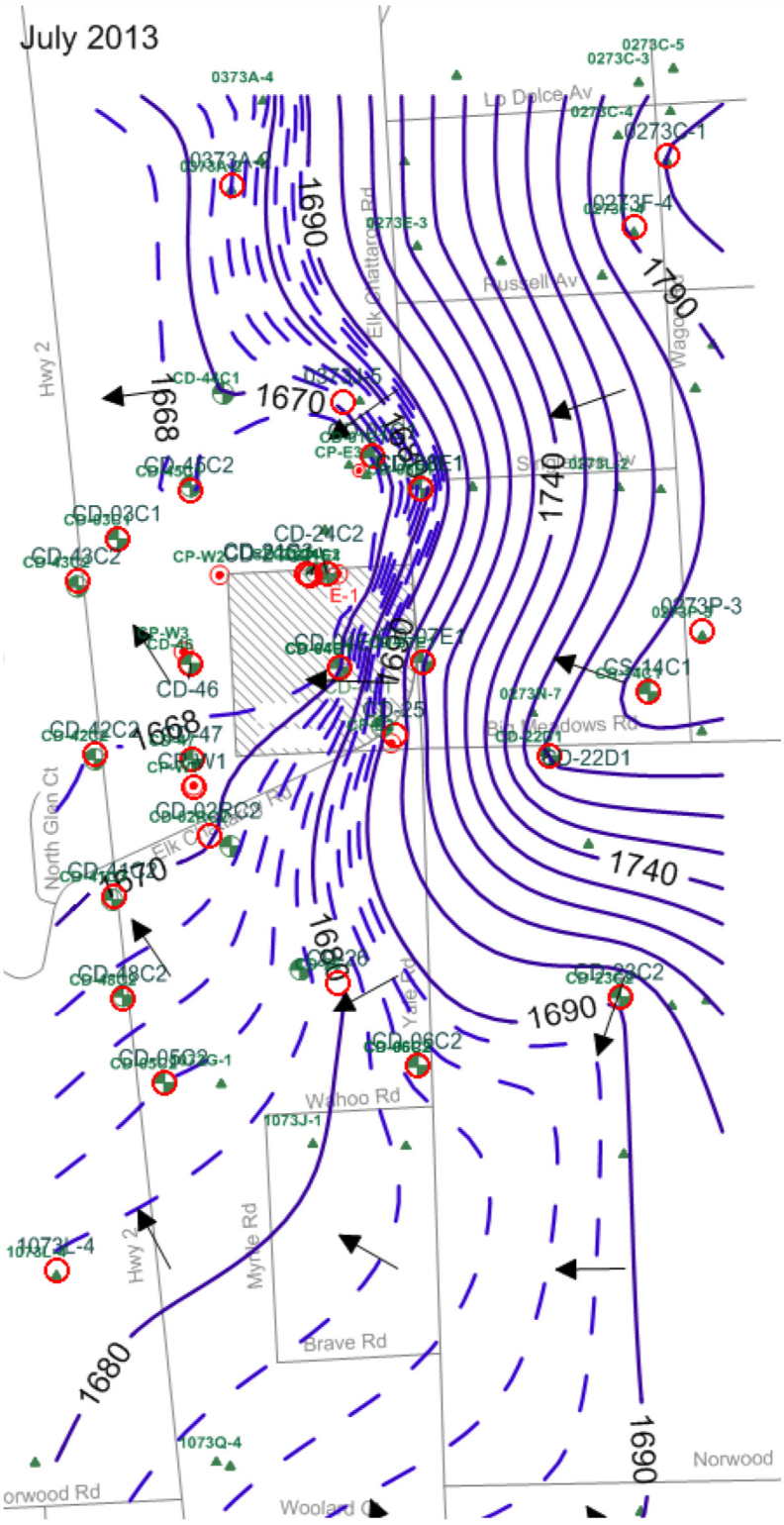

Figure 21: Lower Aquifer, July 2013 Groundwater Elevation Contours.

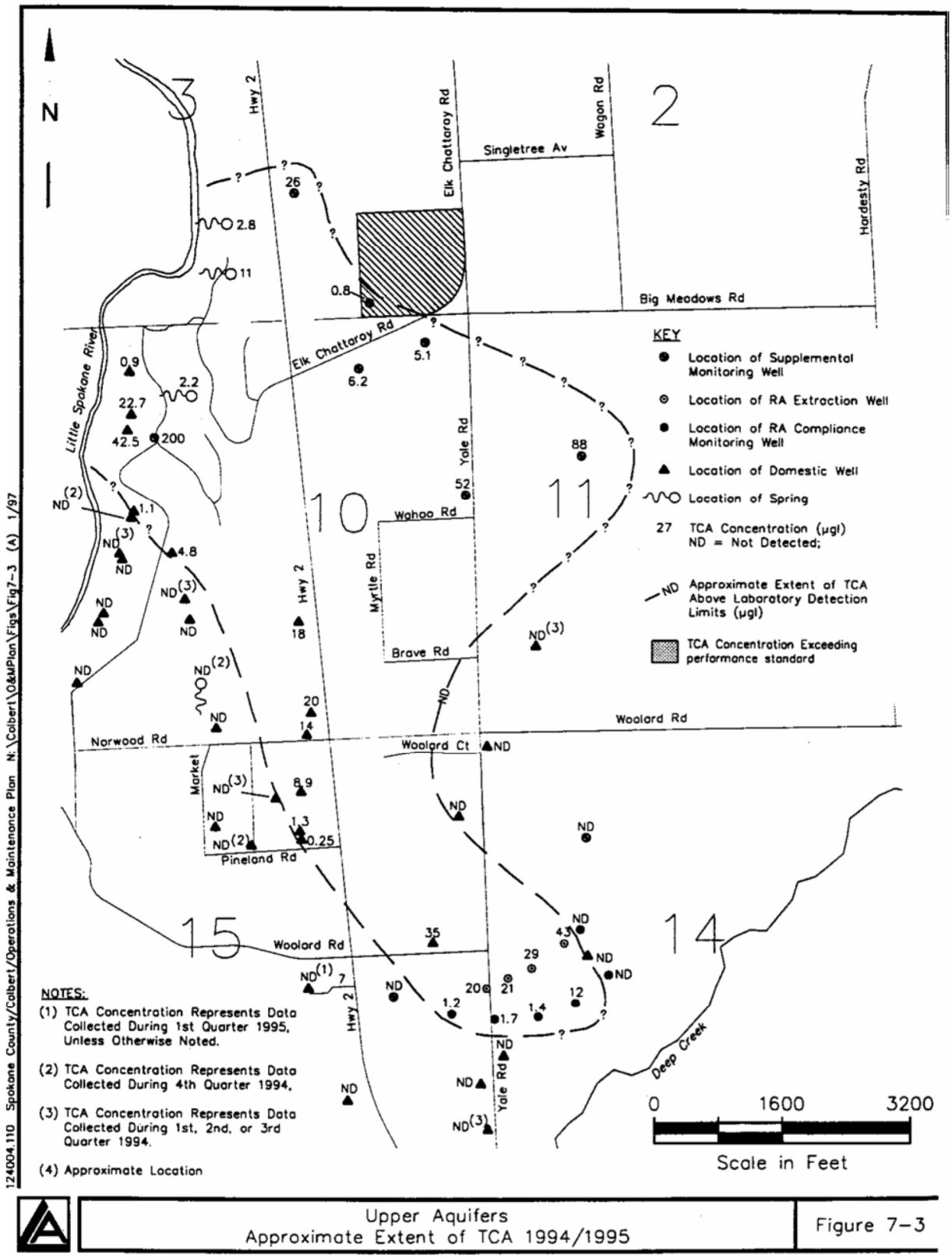

Figure 22: 1,1,1-TCA Plume Extent in the Upper Aquifer, 1994/1995

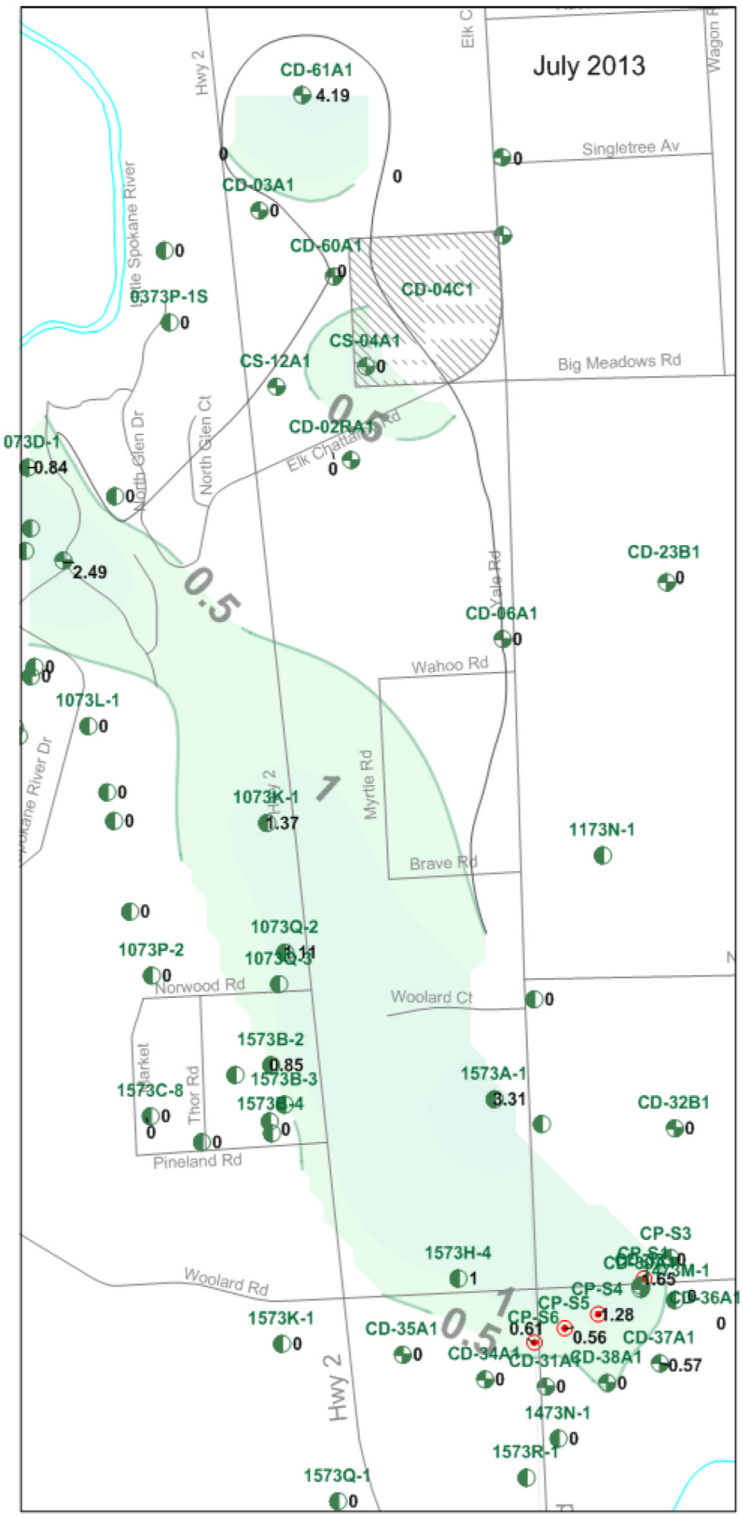

Figure 23: Estimated 1,1,1-TCA Plume Extent in the Upper Aquifer, July 2013

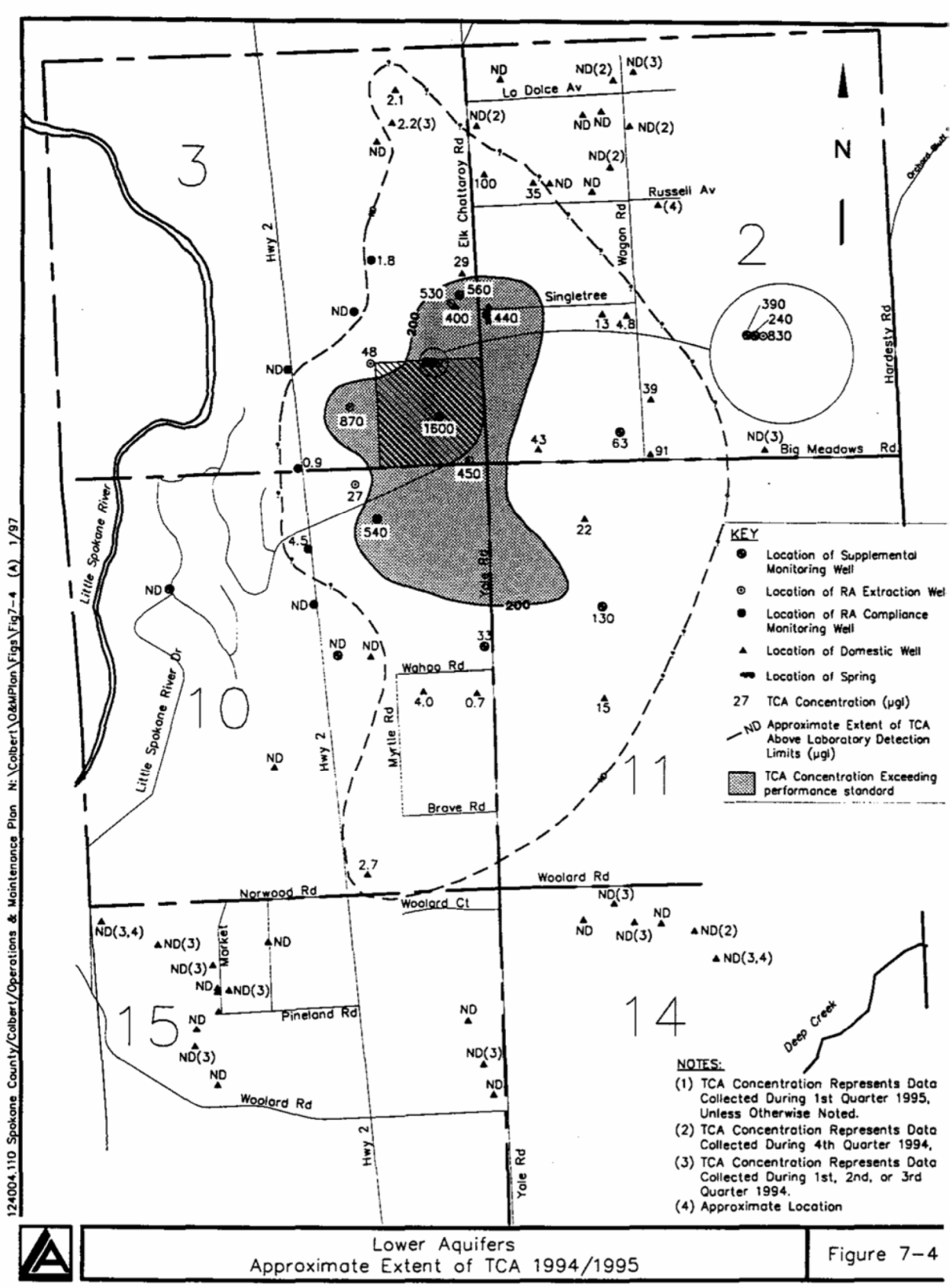

Figure 24: 1,1,1-TCA Plume Extent in Lower Aquifer, 1994/1995.

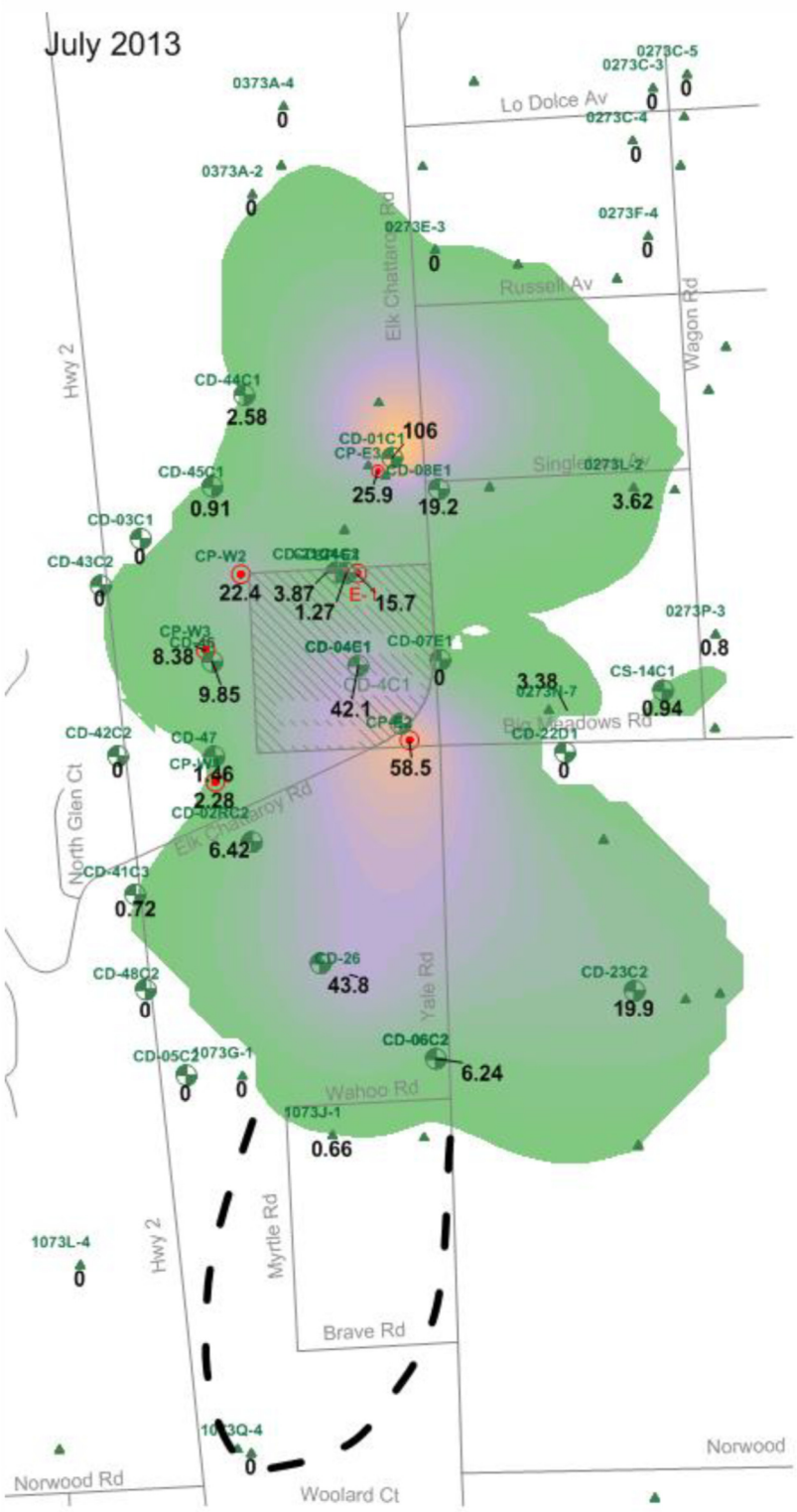

Figure 25: Estimated 1,1,1-TCA Plume Extent in the Lower Aquifer, July 2013

6.4.1.4 Treatment System Performance Data

Grab samples are collected monthly from the treatment system effluent and analyzed for COCs, chloride, iron, manganese, and nitrite + nitrate prior to being discharged to the Little Spokane River. All concentrations for the past five years have been below the NPDES substantive requirement with the exception of one detection of manganese above 0.05 mg/L in November 2010. The monitoring indicates that the groundwater treatment system has little to no impact on the water quality of the river.

6.4.2. Domestic Well Monitoring.

According to Section VII of the Consent Decree, all wells in the domestic well monitoring program are required to be sampled annually. Specific wells can be sampled more frequently if necessary. Sampling of a well may be discontinued or reduced if (1) an alternative water supply has been provided, (2) it is determined the well is not threatened by contamination from the Colbert Landfill Site or (3) the remedial action is complete. The County uses the following methodology to determine the appropriate sampling frequency on an annual basis and included review of all COCs and 1,4-dioxane:

- Quarterly – Wells near the leading edge of the plume or in areas where contaminants are not migrating in the direction of groundwater flow and contaminants have been detected at levels below Evaluation Criteria; wells in areas where contaminants exceeding Evaluation Criteria were detected in nearby wells; multiple user wells where contaminants were previously detected at levels below Evaluation Criteria.
- Semi-Annual – Wells in close proximity of the leading edge of the plume that are not separated from the plume by another well currently in the sampling program.
- Annual – Previously contaminated wells that currently show non-detectable levels of contaminants; wells without detectable concentrations of contaminants and that do not fall into the Bi-annual sampling category.
- Bi-Annual – wells previously in the sampling program that do not fall into any of the above categories (could be used as a transition from annual to no sampling).
- No Sampling – Wells hooked up to an Alternate Water Supply; wells not sued for domestic purposes; wells that the owner requests not to be tested; no access to the property or sampling site.

Approximately 40 domestic wells are monitored for VOCs according to the schedule in Figure 26. Figure 27 shows the locations of the domestic wells being monitored. Review of the domestic well monitoring data presented in the quarterly monitoring reports show that there have been no exceedances of the performance criteria during the past five years.

Colbert Residential Sampling Plan 2012

StatIonID	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	School Comments
0273C-3	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	BiAnnual 10'
0273C-4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	
0273D-6	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	
0273F-4	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	
0373A-1	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	
0373A-2	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	
0373A-4	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	
0373L-1	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	
1073D-1	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	
1073E-2	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Alt w/1073E-3
1073E-3	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	Alt w/1073E-2
1073G-1	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	
1073J-1	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	
1073L-1	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	
1073L-2	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Alt w/1073L-3
1073L-3	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Alt w/1073L-2
1073L-4	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	
1073M-1	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Alt w/1073M-3
1073M-3	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Alt w/1073M-1
1073P-1	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	
1073P-2	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	
1073Q-4	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	
1173B-1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	
1473C-5	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	BiAnnual (11) Alt w/1473D-2
1473D-1	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Alt w/1473C-5
1473D-2	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	Alt w/1473C-5
1473M-1	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	
1573C-10	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	
1573C-17	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	
1573C-5	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	
1573C-7	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	
1573C-8	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	BiAnnual (10)
1573G-1	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	BiAnnual (11)
1573H-1	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	
1573K-1	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	
1573Q-1	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	
1573R-2	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	
3483M-1	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	

Figure 26: Domestic Well Sampling Schedule.

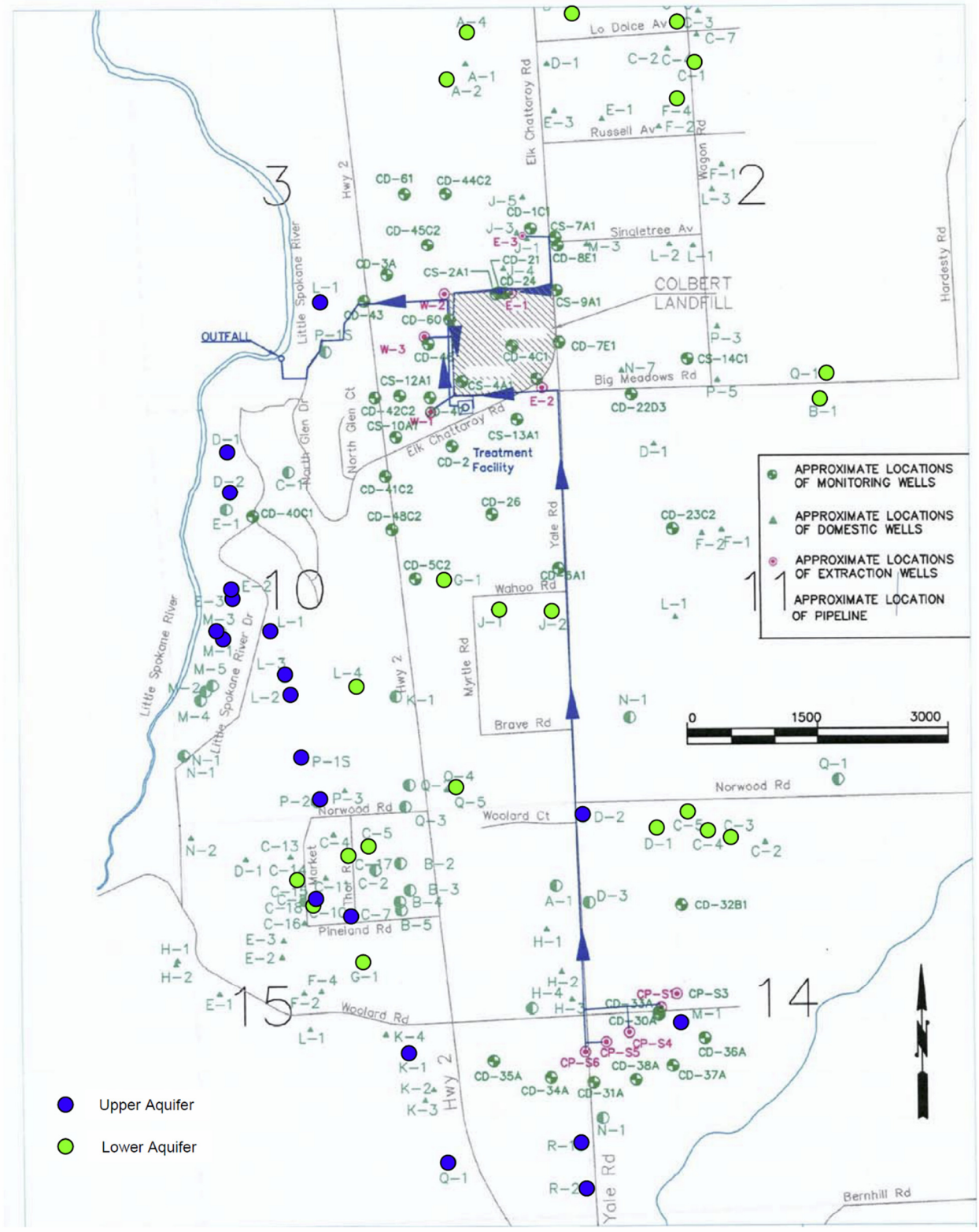

Figure 27: Domestic Well Monitoring Locations.

6.4.3. 1,4-Dioxane Monitoring

The RSE found that "Low concentrations of 1,4-dioxane, which was frequently used as a stabilizer for TCA, have been detected in groundwater within the footprint of the VOC plume. That chemical is often found in association with TCA, and it is likely associated with the solvents disposed of in the landfill. There is currently no attempt made at the site to actively capture and treat groundwater with 1,4-dioxane levels above standards (i.e., in locations beyond the capture zone of the P&T system); rather, if 1,4-dioxane is found at supply wells the approach is for Spokane County to provide bottled water and then pay for a hook-up to public water. This approach for 1,4-dioxane is essentially the same approach that is used in the domestic well program for the other site COCs."

1,4-dioxane was identified as a new COC in the 3rd Five Year Review. Spokane County first sampled and analyzed for 1,4-dioxane in 2005 after it was identified as an emerging contaminant. It was detected in wells in three distinct areas: at the landfill (CP-W2 and CD-04C1/E1), in the upper aquifer near the Little Spokane River (1073D-1, 1073D-2, CD-40C1/2), and in the upper aquifer near the south interception system (CP-S1, 1573A-1, and 1473M-1).

Five locations were selected for one year of quarterly 1,4-dioxane sampling to further evaluate the extent of the analyte as well as to protect residential wells at the Colbert Landfill site. These locations are shown in Figure 28. Two of the six monitoring wells are located west of the landfill (1073D-1, former 1073D-2, and CD-40C1). Three monitoring wells are located south of the landfill just west of the southern extraction system (1573A-1, CP-S1 and 1473M-1). The quarterly sampling was concluded at the April 2009 sample event. Since then, the county has continued sampling five wells annually (1073D-2 was decommissioned). The most recent sample event was April 2014.

Time series plots of 1,4-dioxane concentrations are presented in Figure 29. The Ecology WAC 173-200 water quality standards for groundwaters of the State of Washington cleanup level for 1,4-dioxane is 7 µg/L. As shown in Figure 29, all concentrations of 1,4-dioxane measured in these wells since 2013 have dropped below the cleanup level. If 1,4-dioxane is encountered in supply wells Spokane County plans to provide bottled water and hook-up to public water for those residents.

Figure 28: Colbert Landfill 1,4-Dioxane Sample Location.

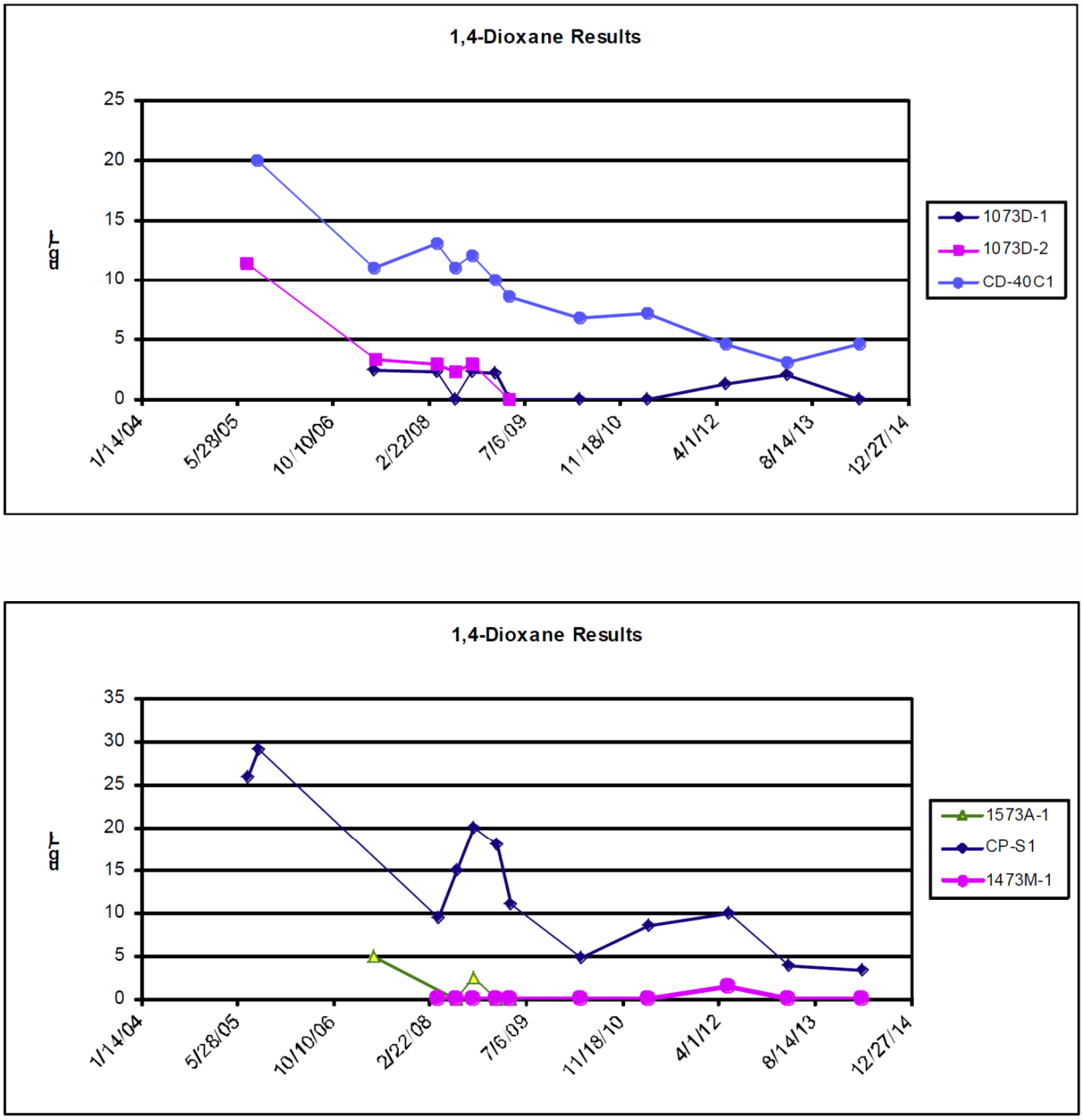

Figure 29: 1,4-Dioxane Concentrations from *Colbert Landfill Annual Progress Report 2014* (Spokane County, 2014).

6.4.4. Landfill Closure

Data reviewed as part of the landfill closure included the landfill gas monitoring and minimal functional standards (MFS) groundwater monitoring data.

6.4.4.1 Minimal Functional Standards (MFS) Groundwater Monitoring

The MFS groundwater monitoring is required as a component of the landfill post-closure according to WAC 173-304 and has been completed in accordance with the Colbert Landfill O&M Plan. Initially MFS groundwater samples were collected quarterly at four upper aquifer monitoring wells and two

lower aquifer monitoring wells. Quarterly monitoring and monitoring of the lower aquifer wells stopped in January 1999. Currently, annual samples are collected at four upper aquifer monitoring wells: CD-3A1, CD-60A1, CD-61A1, and CS-4A1. All samples are analyzed for COCs and the parameters listed in WAC 173-304-490 (chloride, nitrite/nitrate/ammonia, sulfate, total organic carbon, chemical oxygen demand, iron, manganese, and zinc). During the last five years, only CD-60-A1 has exceeded the performance criteria for PCE in 2009, 2011, and 2012. Additionally CS-04A1 had a manganese concentration which exceeded the secondary contaminant groundwater criteria of 0.05 mg/L in 2010 and 2011.

6.4.4.2 Landfill Gas Monitoring

According to WAC 173-304, gas levels at the landfill property boundary should not be above the Lower Explosive Limit (LEL) (5% methane by volume). All gas monitoring probes around the perimeter of the landfill have been below the LEL during the past four years.

6.4.5. Summary

The only upper aquifer wells with concentrations above the performance criteria for PCE were CD-60A1 located near the landfill and south extraction well CP-S4. All of these detections were less than twice the performance criteria. The supplemental and compliance monitoring data indicate that, with the exception of PCE, the upper aquifer COC plumes have been reduced to concentrations below the performance criteria.

Compliance monitoring and supplemental monitoring has indicated that DCE, PCE, and TCE concentration above performance criteria remain in the lower aquifer near the landfill.

There have been no exceedances of the performance criteria in monitored domestic wells during the past five years.

6.5. Site Inspection

An inspection of the site was conducted on 25 February 2014 by the Christopher Guzzetti and Dennis Faulk of EPA, the USACE review team Deborah Johnston and Amy Ebnet, and Bill Wedlake and Deb Geiger of Spokane County Utilities Department. The Site Inspection Check list is presented in Appendix D and site photographs are presented in Appendix E. The purpose of the inspection was to observe ongoing remedial measures and system operation.

Overall the site appeared to be in good condition with no apparent maintenance issues for the groundwater extraction and treatment system or the gas extraction system. The landfill was covered with snow at the time of the site inspection, so the landfill cover was not inspected. The groundwater treatment system appeared to be in good condition. The extraction well vaults are below grade covered with a metal door and pad locks. One well vault was inspected and appeared to be clean and in good condition. The air stripper tower and external gas extraction piping appeared to be in good condition.

The landfill property is surrounded by a fence that was in good condition.

6.6. Interviews

Interviews were conducted with Deb Geiger and Bill Wedlake of Spokane County and Chris Guzzetti and Dennis Faulk of EPA on 25 February 2014 at the landfill treatment plant during the site visit. The interview record is presented in Appendix C and site visit record is presented in Appendix D.

Both the EPA and County had a good overall impression of the project and both felt that the remedy was functioning as expected. The County stated that the first five years of pump and treat resulted in a dramatic decrease in concentration in the plume and they are meeting the drinking water standards at the compliance boundary. The County and EPA are comfortable enough with the groundwater data to perform a shut-down test. No unexpected O&M difficulties or costs have occurred at this site over the last five years.

7. Technical Assessment

7.1. Question A

Is the remedy functioning as intended by the decision documents?

Yes. Monitoring documents indicate that the drinking water standards are being met at the compliance boundary. The monitoring data does not show any new trend due to the low concentrations of the COCs but overall the concentrations have been decreasing. There have been no exceedances of the performance criteria in monitored domestic wells during the past five years.

As of the Annual Progress Report 2014, the total volume of water treated to date is 7,328 million gallons. Total mass of COCs removed from the influent to date is 10,911 pounds. The effluent from the facility has achieved all applicable criteria since facility startup. The south system (upper aquifer) extraction wells have achieved shutdown/standby status. West system extraction well CP-W1 has achieved stand-by status. A restrictive covenant for the landfill has been filed and an Institutional Control Plan with designated lead agency (Spokane County) oversight has been completed.

A Remediation System Evaluation was completed in April 2010. The report provides recommendations which are based on an independent evaluation. Based on EPA's review of the data, a work plan has been approved for the shutdown of the wells (Section 5.3) and the shutdown is in progress.

7.2. 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?

No, the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection are not valid for DCA but are still valid for the other COCs (Table 9). The risk assessment in the ROD described three primary pathways: ingestion through potable water supply, ingestion of crops irrigated by or grown in contaminated water, and ingestion of beef or dairy products from livestock

grazing in the area. Dermal contact from bathing and inhalation of volatile contaminants were pathways of less concern. The concentrations were based on either a 10^{-6} or 10^{-5} chance of developing cancer from a lifetime exposure (Table 2 Performance Criteria). The ROD concluded that the only pathway that presented a risk was drinking water from contaminated wells. All other pathways "does not appear to pose a risk to human health." At the time of the ROD, DCA was considered a non-carcinogenic compound. Since that time, it has been reclassified by EPA as a potential human carcinogen. Ecology's WAC 173-200 (MTCA) water quality standard for DCA groundwater criteria is 1.0 ug/L. The DCA carcinogenic RSL for tapwater is 2.4 ug/L, which is more conservative than the performance goal in the ROD (4,050 ug/L) and therefore, the performance goal in the ROD is not protective of human health. There are extraction wells, supplemental monitoring wells, and MFS wells in both the upper and lower aquifers that have had concentrations of DCA greater than 2.4 ug/L during the last five years (maximum in 2014 was 27.1 ug/L). Domestic drinking water well DCA results for 2014 were less than 0.5 ug/L.

Ecology's WAC 173-200, water quality standards for groundwaters of the State of Washington, cleanup level for 1,4-dioxane is 7 µg/L. As shown in Figure 29, all monitoring wells show concentrations of 1,4-dioxane below this cleanup level since April 2013. If 1,4-dioxane is encountered in supply wells Spokane County plans to provide bottled water and hook-up to public water for those residents.

As indicated earlier, a final ROD has not been completed and it has been determined that the existing ROD currently in place is an interim ROD. When a final ROD is written it will include any new, or modified ARARs, since the interim final ROD was signed in 1987. This will result in a new cleanup level being established for DCA and 1,4-dioxane since is known to be at the site.

Table 9. Changes in Chemical-Specific Standards

Contaminant	Media	ROD Cleanup Level (ug/L)	RSL Nov 2013 (ug/L)		Affect Protectiveness
TCA	groundwater	200	Previous	200	No effect on protectiveness. MCL is 200 ug/L
			New	7500	
DCE	groundwater	7	Previous	7	No effect on protectiveness. MCL is 7 ug/L
			New	2600	
DCA	groundwater	4050	Previous	4050	Yes, protectiveness may be affected if ICs are altered to remove supplied drinking water. At the time of the ROD it was considered non-carcinogen and was changed to possible carcinogen in 1990.
			New	2.4	
TCE	groundwater	5	Previous	5	No effect on protectiveness. MCL is 5 ug/L
			New	0.45	
PCE	groundwater	0.7	Previous	0.7	No effect on protectiveness. MCL is 5 ug/L
			New	9.7	
Methylene chloride	groundwater	2.5	Previous	2.5	No effect on protectiveness. MCL is 5 ug/L
			New	9	

Table 10. Applicable or Relevant and Appropriate Requirements

Medium	ARAR	Status	Change since last FYR
Groundwater	Federal Safe Drinking Water Act Section 1412; the appropriate remedial goal for each indicator chemical in groundwater is the MCLG (if not equal to zero), the federal maximum contaminant level (MCL), or the State MCL, whichever is most stringent.	Relevant and Appropriate	No
Surface water	National Pollutant Discharge Elimination System 40 CFR Part 122, the effluent limitations and monitoring requirements of an NPDES permit or WDRs legally apply to point source discharges such as those from a treatment system with an outfall to surface water or storm drains.	Relevant and Appropriate	No
Air	Clean Air Act, Control of air emissions from superfund air strippers at superfund groundwater sites EPA OSWER Directive 9355.0-28, the directive provides guidance on control of emissions from air strippers at Superfund sites.	Relevant and Appropriate	No

7.3. Question C

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

No new information has become available that could possibly call into question the effectiveness of the remedy. There are no known new ecological risks, no expected impacts from natural disasters, or any other general activities or information that could change the protectiveness of the remedy.

7.4. Technical Assessment Summary

The P&T system has been reasonably successful at lowering the concentrations outside of the vicinity of the landfill. The RSE recommended a shutdown program for the wells that are no longer showing exceedances of COCs. The shutdown began on March 31, 2014 and will continue for 4.5 to 9 years depending on the sampling results. Groundwater samples will continue to be collected and analyzed.

As of the Annual Progress Report 2014, the total volume of water treated to date is 7,328 million gallons. Total mass of chemicals of concern removed from the influent to date is 10,911 pounds. The effluent from the facility has achieved all applicable criteria since facility startup. A restrictive covenant for the landfill has been filed and an Institutional Control Plan with designated lead agency oversight has been complete during the shutdown period.

The issues raised in the previous FYR have been addressed except for the finalizing the ROD. At the site visit, EPA indicated that they were planning to meet with counsel to determine if the ROD can be converted to a final or if some other mechanism is needed to finalize the ROD. Counsel concluded that the existing ROD is an interim ROD.

Ecology's WAC 173-200 water quality standards for groundwaters of the State of Washington cleanup level for 1,4-dioxane is 7 µg/L and 1.0 µg/L for DCA. Concentrations of 1,4-dioxane measured in the wells have not exceed this cleanup level since 2013. If 1,4-dioxane is encountered in supply wells Spokane County plans to provide bottled water and hook-up to public water for those residents. The performance criteria in the ROD for DCA was based on a non-carcinogenic category. It has since been classified as a carcinogen with a RSL of 2.4 µg/L; significantly lower than the criteria in the ROD (2.4 vs. 4,050 µg/L respectively). The pathway is not complete as drinking water is supplied to affected residents.

8. Issues

The RSE report indicated that a shutdown test of the remaining extraction wells may be appropriate, in conjunction with some increased monitoring, to determine if terminating extraction has a negative impact on water quality. It further recommended adding a monitoring well west of CP-W3 to sample VOCs during the shutdown test. Spokane County added monitoring well CD-49 in fall 2013.

Table 11 provides the issues for this FYR.

Table 11. Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Finalize the ROD	**N**	**Y**

9. Recommendations and Follow-up Actions

Table 12 provides recommendations and followup actions. Issue 1 is the same as in the previous FYR.

Table 12. Recommendations and Followup Actions

Issue	Recommendations and Followup Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1	**Issue a Final ROD and update or include cleanup levels for DCA and 1,4-dioxane**	**EPA**	**EPA**	**2017**	**N**	**Y**

While not affecting protectiveness, in the course of this review, the EPA identified the following O&M-type issues which are listed here to ensure they receive adequate attention and follow-up:

Minor Issues Not Affecting Protectiveness

- Groundwater sampling for 1,4-dioxane should continue at the five monitoring wells (1073D-1, CD-40C1, 1573A-1, CP-S1 and 1473M-1) identified in Figure 28 of this FYR**.**

10. Protectiveness Statements

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.

11. Next Review

The next FYR for the Colbert Landfill Site is required by September 2019, five years of the signature date of this FYR.

12. References

Colbert Landfill Consent Decree. January 23, 1989.

Spokane County. 2014. Colbert Landfill Quarterly Progress Report Third Quarter 2013

Environmental Protection Agency (EPA), 1987. Record of Decision, Colbert Landfill. EPA ID: WAD980514541, OU 01, Spokane, WA. 9/27/1987. EPA/ROD/R10-87/010.

GeoTrans, Inc. 2010. Remediation System Evaluation Colbert Landfill Superfund Site Spokane County, Washington.

Spokane County. 1999. Operation and Maintenance Plan Colbert Landfill Colbert, Washington

US Department of Health and Human Services. 2006. Health Consultation 1,4 Dioxane Contamination in North Glen Water Association Well near Colbert Landfill NPL Site Colbert, Spokane County, Washington

Appendix A: List of Documents Reviewed

CH2M Hill, 1997. Operations and Maintenance Manual for Colbert Landfill Closure. Prepared for Spokane County Utilities. May 1997.

Colbert Landfill Consent Decree. January 23, 1989.

Spokane County. 2014. Colbert Landfill Quarterly Progress Report Third Quarter 2013

Environmental Protection Agency (EPA), 1987. Record of Decision, Colbert Landfill. EPA ID: WAD980514541, OU 01, Spokane, WA. 9/27/1987. EPA/ROD/R10-87/010.

EPA, 1994. First Five-Year Review Report for the Colbert Landfill.

EPA, 1999. Second Five-Year Review Report for the Colbert Landfill.

EPA, 2004. Third Five-Year Review Report for the Colbert Landfill.

EPA, 2009. Fourth Five-Year Review Report for the Colbert Landfill.

GeoTrans, Inc. 2010. Remediation System Evaluation Colbert Landfill Superfund Site Spokane County, Washington.

Spokane County, 1999. Operation and Maintenance Plan Colbert Landfill Colbert, Washington.

Spokane County, 2010 through 2013. Colbert Landfill Quarterly Progress Report First Quarter 2010 through Third Quarter 2013.

Spokane County. 2014. Colbert Landfill Annual Progress Report 2014.

Spokane County and Landau Associates, 2013. Final Work Plan Groundwater Pump & Treat System Shutdown Test, Colbert Landfill CERCLA Site.

US Department of Health and Human Services. 2006. Health Consultation 1,4 Dioxane Contamination in North Glen Water Association Well near Colbert Landfill NPL Site Colbert, Spokane County, Washington

Appendix B: Press Notices

The following add ran in the Spokesman Review on May 7, 2014.

EPA United States Environmental Protection Agency

EPA to Review Cleanup at Colbert Landfill Superfund Site

What Is This About?

The U.S. Environmental Protection Agency is preparing the fifth Five-Year Review for the Colbert Landfill Superfund Site. The Site spans forty acres and is located about two miles north of Colbert, Washington. Cleanup measures included closing and covering the landfill, installing a groundwater extraction system, providing an alternate source of water for those with contaminated domestic wells, and continued well sampling. The purpose of the Five-Year Review is to ensure that cleanup measures continue to be protective of people and the environment.

Where Are We Now?

The previous review in 2009 reevaluated the spread of contaminated groundwater, increased monitoring and sampling of domestic wells, and evaluated the effectiveness of the groundwater extraction system. This review, scheduled for completion by September 2014, will evaluate all cleanup measures to date to make sure they continue to be effective.

Where Can I Get More Information?

The 2009 Five-Year Review and other documents about the cleanup effort can be found on the EPA website at: **http://go.usa.gov/KekA.** Or at the following locations:

Spokane Public Library
906 West Main
Spokane, WA 99201
(509) 444-5300

U.S. EPA Superfund Records Center
1200 Sixth Avenue, Suite 900
Seattle, WA 98101
(206)-553-4494

How Can I Provide Input?

As someone living in the area you may know things that can help the review team determine whether the area continues to be safe. If you have information you would like to be considered or questions please contact Christopher Guzzetti, Project Manager, at: **Guzzetti.Christopher@epa.gov** or call **(509) 376-9529.**

If you have concerns about well water quality, please contact **Debra Geiger**, Spokane County at:**dgeiger@spokanecounty.org** or call **(509) 238-6607.**

TDD/TTY users please call the Federal Relay Service at 800-877-8339 and give the operator Christopher Guzzetti's phone number: (509) 376-9529.

Appendix C: Interview Forms

Five-Year Review Interview Record			
Site:	Colbert Landfill	**EPA ID No:**	WAD980514541

Interview Type: Site Visit
Location of Visit: Colbert Landfill
Date: 25 Feb 2014
Time: 0900

Interviewers

Name	Title	Organization
Deborah Johnston	Biologist	USACE
Amy Ebnet	Geologist	USACE

Interviewees

Name	Organization	Title	Telephone	Email
Deb Geiger	Spokane County	Sr. Environmental Tech	509.238.6607	dgeiger@spokanecounty.org
Bill Wedlake	Spokane County	Project Manager	509.477.7281	wwedlake@spokanecounty.org
Chris Guzzetti	US EPA	Remedial Project Manager	509.376.9529	guzzetti.christopher@epa.gov
Dennis Faulk	US EPA	Program Manager	509.376.8631	faulk.dennis@epa.gov

Summary of Conversation

1) **What is your overall impression of the project?** Both the EPA and County felt that this is a good project. The County has updated their equipment. The plume has been adequately characterized. The County is in the process of implementing the shutdown plan starting in April 2014. "Final Work Plan Groundwater Pump & Treat System Shutdown Test Colbert Landfill CERCLA Site August 28, 2013 prepared by Spokane County Public Utilities."

2) **Is the remedy functioning as expected? How well is the remedy performing?** The remedy is performing as expected according to the County and EPA. The 1st five years showed a dramatic decrease in concentration of chemicals in the plume. The County is meeting the drinking water standards at the compliance boundary.

3) **What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?** Over the previous 5 years, no trend is visible due to the low concentrations of the COCs, however, the overall trend is decreasing since implementation of the remedy. There is a steady downward trend during the early years which has appears to level off due to the scale of the graph's time line. The County and EPA are comfortable enough with the groundwater data to perform a shut-down test. The data shows that there is no continuing source of COCs.

4) **Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.** The facility is currently staffed at 1.5 FTE. The operation is fully automated with alarms for problems. The O&M has been updated to include the activities from the shutdown report work plan.

5) **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.** The major change in the O&M since the last 5 year report is the development of a shut down work plan which is planning to be implemented in April 2014. The plan has trigger criteria in place to restart the GW extraction/treatment if needed. The current monthly sampling program of the residents affected by the landfill plume will not change. These changes to not affect the protectiveness of the remedy.

6) What are the annual operating costs for your organization's involvement with the site?

7) **Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, please give details.** No unexpected O&M difficulties or costs have occurred at this site over the last five years.

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency. The RSE provided recommendations which included the shut-down test, analysis of 1,4-dioxane during future analysis at residential wells, include posted data values on future water level maps, and include executive summary in the quarterly reports.

9) **Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?** None as per EPA information presented at the site visit.

10) **Do you have any comments, suggestions, or recommendations regarding the project?** The quarterly monitoring will continue during the shutdown process to ensure that the equipment continues to function.

Additional Site-Specific Questions

1) **Has a restrictive covenant been placed on the landfill?** This action was completed in September 2009.

2) **Has an institutional Control Plan been completed?** This action was completed in 2011.

3) **Have there been any updates to the O&M manual since the last 5YR?** The shutdown work plan (August 2013) replaces the O&M until all results are in or the data indicates that they system needs to restart.

4) **Has a final ROD been completed and/or are there plans to complete a final ROD?** EPA will review with their counsel on whether the existing ROD by default is a final ROD or will another process such as an ESD or TI waiver be instituted instead.

Appendix D: Site Inspection Checklist

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Colbert Landfill	**Date of inspection: 25 Feb 2014**
Location: Colbert, Washington	**EPA ID: WAD980514541**
Agency, office, or company leading the five-year review:	**Weather/temperature 29oF, sunny, previous day ~2-3" snow**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☐ Monitored natural attenuation
- ☒ Access controls
- ☒ Groundwater containment
- ☒ Institutional controls
- ☐ Vertical barrier walls
- ☒ Groundwater pump and treatment
- ☒ Surface water collection and treatment
- ☒ Other: *e.g. Groundwater monitoring*

_____

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** __Bill Wedlake _____Project Manager _ ___25 Feb 2014____

   Name Title Date

   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____

   Problems, suggestions; ☐ Report attached _____

   _____

2. **O&M staff** ___ Deb Geiger _____ ___ Sr. Environmental Tech ____ __25 Feb 2014__

   Name Title Date

   Interviewed ☒ at site ☐at office ☐ by phone Phone no. _____

   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, etc.) Fill in all that apply.

Agency: EPA

Contact: _Chris Guzzetti_____ _Remedial Project Manager_ __509.376.9529_____

Name Title Phone no.

Problems; suggestions; ☐ Report attached _____

_____

Agency _EPA_____

Contact ___Dennis Faulk_____ __Program Manager__ ___509.376.8631__

Name Title Phone no.

Problems; suggestions; ☐ Report attached _____

_____

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 & 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

G 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____Since this is a CERCLA Site no permits are required but the substantive requirements for air and NDPES permits have been completed for current discharges to air (from stripping tower) and surface water drainage_(to Little Spokane River)_____

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

Remarks_____

_____

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

Remarks_Settlement monuments were last surveyed in 2009.

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

☒ Other County – in-house._____

_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place

Original O&M cost estimate_____ ☐ 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: _____

_____

_____

_____

_____

_____

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

A. Fencing

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

Remarks____fence and gates in good condition_____

_____

B. Other Access Restrictions

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

Remarks_Sign is located at the entrance 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) _Alarm System_____

Frequency _____

Responsible party/agency __County_____

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_____

_____

_____

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_____

_____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

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

Remarks____Perimeter road appeared to be in good condition but did not travel entire road due to snow conditions during site visit._____

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 The county is monitoring a few areas for settlement. They installed a pipe at the top of the landfill cover to monitor for continued settlement. One location near CD-24 was inspected.

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

   Lengths_____ Widths_____ Depths_____

   Remarks____due to snow cover cracks were not evident but the landfill cover is uneven and undulating to a small degree_____

   _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident

   Areal extent_____ Depth_____

   Remarks____ due to snow cover erosion features were not evident but the landfill cover is uneven and undulating to a small degree _____

   _____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident

   Areal extent_____ Depth_____

   Remarks_____ due to snow cover holes were not evident but the landfill cover is uneven and undulating to a small degree _____

   _____

5. **Vegetative Cover** ☒ Grass ☒Cover properly established ☐ No signs of stress

   ☒ Trees/Shrubs (indicate size and locations on a diagram)

   Remarks_____small pine trees are present but will be removed during regularly scheduled cover maintenance_____

   _____

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

   Remarks_____

   _____

7.	**Bulges**	☐ Location shown on site map ☒ Bulges not evident
	Areal extent_____	Height_____
	Remarks__ due to snow cover bulges were not evident but the landfill cover is uneven and undulating to a small degree _____	
	_____	
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_____no wet or ponded areas were present, perimeter drainage ditch in good condition_____	
	_____	
9.	**Slope Instability** ☐ Slides	☐ Location shown on site map ☒ No evidence of slope instability
	Areal extent_____	
	Remarks___ due to snow cover slope instability features were not evident but the landfill cover is uneven and undulating to a small degree however there are no major slopes in the landfill cover _____	
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_____

   ☐ 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_____gas probes are sampled monthly_____

_____

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___the 2 monitoring wells are sampled annually_____

_____

4. **Leachate Extraction Wells**

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

☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A

Remarks_____

_____

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

Remarks__There are small localized settling areas which are monitored. The settlement monuments have not changed within 20 years of operations and were last surveyed in 2009._____

_____

E. Gas Collection and Treatment ☒ Applicable ☐ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☒ Good condition G Needs Maintenance

Remarks___The landfill gases are passed through a carbon absorption system that is vented through a scrubbing tower to the air._____

_____

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_____The cover drainage layer consists of strip drains, 12” of sand, and 6” of topsoil.

_____

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___the detention pond only has water on extreme events as the soils are able to infiltrate any water that may be present in the detention pond._____

_____

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/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident

Areal extent_____ Depth_____

Remarks__perimeter ditches appeared in good condition however, snow conditions prevented inspection of the entire site_____

_____

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__the discharge structure between the perimeter ditch and detention pond was in good condition. Due to snow conditions, the discharge structure to the Little Spokane River was not inspected but it was inspected in July 2013 by County staff and found to be in good condition _____

_____

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_____

_____

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 G Needs Maintenance G N/A

Remarks___During the site visit the vault for well CP-W2_was inspected and found to be in good condition. The vaults are inspected annually and all are below ground. Manholes are inspected quarterly._____

_____

_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☒ Good condition ☐ Needs Maintenance

Remarks__Inspected annually._____

_____

3. **Spare Parts and Equipment**

☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks__backup pumps and exhaust fans are available_____

_____

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__273,750,000_gallons per year_____

☒ Quantity of surface water treated annually__none as surface water infiltrates_____

Remarks_____

_____

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

☐ N/A ☒ Good condition G Needs Maintenance

Remarks_____

_____

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

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

Remarks___The NE corner has an UST for condensate collection of the landfill which is collected and treated through the air stripping tower. _____

_____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs Maintenance

Remarks___Due to snowy conditions the discharge structure was not inspected. The structure is a 12" pipe to the Little Spokane River with a diffusion concrete box to slow down the flow. It was previously inspected in July 2013._____

_____

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___One additional MW was added per EPA direction as a component of the shutdown process._____

_____

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

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.).

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.

Concentrations have been declining slowly over recent years. They may have reached the point of diminishing returns. Quarterly sampling of the lower aquifer will continue as part of the shutdown program.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. _____None_____ _____ _____ _____ _____ _____ _____ _____ _____
D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. _____ A shut-down test is being enacted starting in April 2014. Sampling during the shutdown test will start off quarterly but they frequency will gradually be reduced depending on performance. _____ _____ _____

Appendix E: Photographs from Site Inspection

Colbert Landfill Site Visit Photographs 25 February 2014

Drainage canals and outlet structure in the NW corner of the landfill.

Landfill looking SE

Detention/infiltration pond across the road from the outlet structure shown in the first photo. Pine trees are on the bank of the pond structure.

Fence around landfill from SW corner.

Area of localized settling which is visually monitored near CD-24.

Underground vault of CP-W2. Double metal covers are padlocked and prevent rain water from entering the vault.

Treatment building in background, activated carbon tanks in foreground, air stripping tower in midground.

Interior of treatment building with electric panel and schematic diagram.

Three inlet pipelines.

Large pipe on right hand of photo exits to air stripper tower.

Region 10 Routing and Concurrence

Author:	Chris Guzzetti	Date:	9/10/2014

Addressee:	Cami Grandinetti
Subject:	Fifth Five-Year Review for the Colbert Landfill Superfund Site in Spokane County, Washington
File Location/Name:	

PROGRAM ADMIN REVIEW:

Name:						
Initials/Date:						

PROGRAM OFFICE CONCURRENCE:

Name:	Chris Guzzetti RPM	Ted Yackulic ORC	Dennis Faulk Manager	Cami Grandinetti Program Manager		
Initials/Date:	9/10/14	voice message concur	9/10/14 for DAF	9/29/14		

RA OFFICE CONCURRENCE/SIGNATURE:

Name:						
Initials/Date:						

cc(s) (include name, title, organization, mailing address, and email if PDF is required—attach a list if necessary)

bcc(s) (include name, title, organization, mailing address, and email if PDF is required—attach a list if necessary)

Mailing Deadline:		**Certified Mail:**	
FAX to:		**FAX #:**	

ADDITIONAL INFO/INSTRUCTIONS:

Filing Instructions:					
Program	ECL	Chrono.		Other	