



---

**UNITED STATES AIR FORCE  
JOINT BASE ELMENDORF-RICHARDSON  
ALASKA**

***ENVIRONMENTAL RESTORATION PROGRAM***

**TECHNICAL MEMORANDUM  
RISK-BASED CONCENTRATIONS FOR PCA AND PCE  
CG039 – POLELINE ROAD DISPOSAL AREA,  
OPERABLE UNIT B**

**FINAL**

**JULY 2016**

*This page intentionally left blank.*



FINAL

RISK-BASED CONCENTRATIONS FOR PCA AND PCE  
CG039 – POLELINE ROAD DISPOSAL AREA,  
OPERABLE UNIT B

JOINT BASE ELMENDORF-RICHARDSON, ALASKA

Prepared for  
Air Force Civil Engineer Center

Contract No. FA8903-09-D-8589 / Task Order 0016

JULY 2016

*This page intentionally left blank.*

## 1.0 INTRODUCTION

The purpose of this Technical Memorandum is to present a range of calculated risk-based concentrations (RBCs) for 1,1,2,2-tetrachloroethane (PCA) in groundwater and soil, and tetrachloroethene (PCE) in soil at Site CG039 – Poleline Road Disposal Area (CG039), Operable Unit (OU) B, Joint Base Elmendorf-Richardson (JBER). These RBCs will support updating the cleanup goals established in the *OU A and B Record of Decision* (ROD) (United States Army [Army], 1997). RBCs were adopted as cleanup goals for PCA in groundwater and soil and PCE in soil at CG039 since neither federal nor state cleanup goals were available prior to the signing of the ROD. Chemical-specific toxicity factors for these compounds have been revised since cleanup goals were established in the ROD signed in August 1997. In 2013, the Third Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Five-Year Review Report for JBER-Richardson (JBER-R) (United States Air Force [USAF], 2013) recommended “reevaluating the COC RAOs established in the ROD to consider current COC toxicity values to determine future protectiveness.” This technical memorandum completes the Five-Year Review recommendation and recommends revising cleanup goals for PCA in groundwater and soil and PCE in soil to promulgated cleanup levels (Title 18, Chapter 75 of the Alaska Administrative Code [18 AAC 75], June 17, 2015).

Work was conducted by CH2M HILL under subcontract to Weston Solutions, Inc. for the JBER and Clear Air Force Station Performance-Based Remediation (PBR) project. This work has been authorized by the Air Force Civil Engineer Center under Contract Number FA8903-09-D-8589, Task Order No. 0016.

## 2.0 SITE DESCRIPTION

CG039 is located approximately 1.2 miles southwest of Eagle River (see Figure 1). Groundwater and soil contamination at the site resulted from the historical activities associated with four chemical disposal areas that were used from 1950 to 1972. During this time, chemical agent identification sets (CAIS) and other military debris were burned and disposed of in trenches. Chlorinated solvents were used to neutralize the chemical agents in the CAIS.

Volatile organic compounds in groundwater (trichloroethene, PCE, PCA, benzene, carbon tetrachloride, and 1,2-dichloroethene) and soil (PCE and PCA) were identified as contaminants of concern (COCs) in the ROD (Army, 1997). Remedial action objectives were based on human health risk estimates that exceed or fall within the acceptable risk management range of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ , or on federal and state applicable or relevant and appropriate requirements (Army, 1997). Groundwater cleanup goals were based on state and federal maximum contaminant levels, with the exception of PCA, which was based on an RBC for residential drinking water. The cleanup goal for PCA is based on an increased cancer risk of  $1 \times 10^{-4}$  for residential drinking water, which corresponds with the United States Environmental Protection Agency (EPA) Region 3 RBC for drinking water. Cleanup goals for PCA and PCE in soil were based on protection of the groundwater from leaching of the contaminants (EPA Region 3 RBCs, based on increased cancer risk of  $1 \times 10^{-4}$ ).

Access to CG039 is restricted and is currently used for military training and recreational activities. The site is in a low-lying, flat area bordered by an 80-foot hill to the west, wetlands to the south and southwest, and low wooded hills on the remaining borders.

Currently, groundwater beneath CG039 is not used for household, recreational, or industrial purposes. The nearest JBER water supply well is a standby drinking water well and is approximately 5.6 miles southwest of the site.

The nearest surface water is an unnamed wetland area just upgradient of CG039, approximately 255 feet to the southwest. The nearest downgradient surface water, Eagle River, is approximately 1.2 miles north of the site.

### 3.0 BASIS FOR RISK-BASED CONCENTRATIONS

EPA's regional screening levels (RSLs) are RBCs developed from EPA's standard human health exposure assumptions and toxicity values (EPA, 2015a and b). The following groundwater and soil RSLs are used as the basis for the RBCs for the COCs identified at CG039:

- **Groundwater.** Tap water RSLs are based on exposure through ingestion of water as a drinking water source, dermal contact through showering, and inhalation of volatile compounds emitted from water during household use of water under a residential exposure scenario (Table 1).
- **Soil.** Residential soil-to-groundwater RSLs are based on the tap water RSL and the soil screening level soil-to-groundwater leaching model (using a dilution attenuation factor of 13.2) (Table 2).

The EPA's RSLs are based on a target excess lifetime cancer risk (ELCR) of  $1 \times 10^{-6}$  and a noncancer hazard index (HI) of 1. A range of RBC values representing an ELCR of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ , and hazard quotients (HQs) from 0.1 to 1 were calculated for PCA in groundwater and soil, and PCE in soil.

For a cumulative ELCR for site-related contaminants, the acceptable risk management range is  $10^{-6}$  to  $10^{-4}$ . Remedial actions may not be warranted for site media with an ELCR of  $10^{-4}$  or below, or an HI of 1 or less. An HI is generated by adding the HQs for all contaminants of potential concern and pathways that affect the same target organ (e.g., liver), or that act through the same mechanism of action within a medium to which an individual may reasonably be exposed. An HI less than or equal to 1 indicates that adverse effects are unlikely from additive exposure to constituents. An HI greater than 1 indicates that adverse noncancer health effects may occur from exposure.

Since there are fewer than 10 COCs, use of an RBC based on an HQ of 0.1 is provided for informational purposes. RSLs based on an HQ of 0.1 are intended to be used as investigation screening levels (EPA, 2015b) and not for establishing cleanup goals. Assuming an HQ of 0.1 for each chemical assumes that noncancer effects are cumulative, but many chemicals have different toxicity endpoints (target organs/systems). Only those chemicals with the same endpoints should be considered for cumulative impact.

#### 4.0 CALCULATED RISK-BASED CONCENTRATIONS

RBCs were recalculated for PCA in groundwater and soil and PCE in soil at CG039. The range of calculated RBCs for PCA and PCE, representing an ELCR of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$  and HIs from 0.1 to 1, are as follows:

- PCA in groundwater:  $7.6 \times 10^{-5}$  to  $7.6 \times 10^{-3}$  milligram per liter compared with the cleanup goal established in the ROD of  $5.2 \times 10^{-2}$
- PCA in soil:  $3.9 \times 10^{-4}$  to  $3.9 \times 10^{-2}$  milligram per kilogram (mg/kg) compared with the cleanup goal established in the ROD of  $1 \times 10^{-1}$
- PCE in soil:  $6.8 \times 10^{-2}$  to  $2.4 \times 10^{-1}$  mg/kg compared with the cleanup goal established in the ROD of 4.

RBCs for groundwater are provided in Table 1, and RBCs for soil are provided in Table 2.

In 2008, the Alaska Department of Environmental Conservation (ADEC) established cleanup levels for PCA and PCE. A comparison of the cleanup goals established in the ROD with the RBCs (representing an ELCR of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ , and an HQ of 1) and ADEC cleanup levels (2008) is provided in Table 3.

#### 5.0 CONCLUSIONS AND RECOMMENDATION

The RBCs for soil and groundwater and ADEC cleanup levels are lower than the cleanup goals established in the ROD (Army, 1997), and the cleanup goals are no longer considered protective.

It is recommended that the promulgated cleanup levels for PCA in soil and groundwater and PCE in soil (18 AAC 75, June 17, 2015) are adopted as revised cleanup goals for CG039 and documented in the Addendum for the Third CERCLA Five-Year Review Report.

#### 6.0 REFERENCES

Alaska Department of Environmental Conservation. 2008. Table C. Groundwater Cleanup Levels and Table B1. Method 2 – Soil Cleanup Levels Table. October.

United States Air Force (USAF). 2013. *Third CERCLA Five-Year Review Report for JBER-Richardson, Alaska*. Joint Base Elmendorf-Richardson. Final. February.

United States Army (Army). 1997. *Record of Decision for Operable Units A and B, Fort Richardson, Anchorage, Alaska*. Final. August.

United States Environmental Protection Agency (EPA). 2015a. *Integrated Risk Information System*. <http://www.epa.gov/IRIS/>.

United States Environmental Protection Agency (EPA). 2015b. *Regional Screening Levels for Chemical Contaminants at Superfund Sites User's Guide*. <http://www.epa.gov/region09/waste/sfund/prg/index.html>. November.

This page intentionally left blank.



## **Tables**

---

*This page intentionally left blank.*

**Table 1: Groundwater Risk-based Concentrations**

Chemical of Concern	CAS No.	Toxicity and Chemical-specific Information									Carcinogenic Tapwater RSL <sup>a</sup>			Noncancer Tapwater RSL <sup>b</sup>		Risk-based Concentration (mg/L)					
		SFO (mg/kg-day) <sup>-1</sup>	Ref	IUR (µg/m <sup>3</sup> ) <sup>-1</sup>	Ref	RfDo (mg/kg-day)	Ref	RfCi (mg/m <sup>3</sup> )	Ref	Muta-gen	TR = 1 x 10 <sup>-4</sup>	TR = 1 x 10 <sup>-5</sup>	TR = 1 x 10 <sup>-6</sup>	HQ = 0.1	HQ = 1	RBC <sup>c</sup>			RBC <sup>d</sup>		
																TR = 1 x 10 <sup>-4</sup> or HQ = 0.1	TR = 1 x 10 <sup>-5</sup> or HQ = 0.1	TR = 1 x 10 <sup>-6</sup> or HQ = 0.1	TR = 1 x 10 <sup>-4</sup> or HQ = 1	TR = 1 x 10 <sup>-5</sup> or HQ = 1	TR = 1 x 10 <sup>-6</sup> or HQ = 1
Tetrachloroethane, 1,1,2,2- (PCA)	79-34-5	2.0E-01	I	5.8E-05	C	2.0E-02	I			--	7.6E-03	7.6E-04	7.6E-05	3.6E-02	3.6E-01	7.6E-03	7.6E-04	7.6E-05	7.6E-03	7.6E-04	7.6E-05

<sup>a</sup> Carcinogenic tapwater RSL are presented at three different Target Risk (TR) levels: Excess Lifetime Cancer Risk of 1x 10<sup>-4</sup>, 1x 10<sup>-5</sup>, and 1 x 10<sup>-6</sup>.

<sup>b</sup> Noncancer RSL is based on a Hazard Quotient (HQ) of 0.1 or 1.

Because there is less than 10 chemicals of concern use of a RBC based on a HQ of 0.1 is not applicable and is provided for informational purposes. RSLs based on a HQ of 0.1 are intended to be used as investigation screening levels (EPA, 201a5b).

In addition, assuming a HQ of 0.1 for each chemical assumes that non-cancer effects are cumulative but many chemicals have different toxicity endpoints (target organs/systems). Only those chemicals with the same endpoints should be considered for cumulative impact.

<sup>c</sup> The RBC is based on lower of the RBC based on the noncancer HQ of 0.1 and the RBC based on the carcinogenic TR.

<sup>d</sup> The RBC is based on lower of the RBC based on the noncancer HQ of 1 and the RBC based on the carcinogenic TR.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirements

IUR = inhalation unit risk

mg/L = milligram(s) per liter

n/a = not available

RBC = risk-based concentration

RfCi = inhalation reference concentration

RfDo = oral reference dose

RSL = regional screening level

SFO = oral cancer slope factor

TR = target risk

References:

C = California EPA (EPA, 2015a)

I = EPA Integrated Risk Information System (IRIS) (EPA, 2015b)

United States Environmental Protection Agency (EPA). 2015a. Regional Screening Levels for Chemical Contaminants at Superfund Sites User's Guide. Available at <http://www.epa.gov/region09/waste/sfund/prg/index.html>. November.

United States Environmental Protection Agency (EPA). 2015b. Integrated Risk Information System. <http://www.epa.gov/IRIS/>.

*This page intentionally left blank.*

**Table 2: Soil Risk-based Concentrations - Protection of Groundwater Exposure Scenario**

Chemical of Concern	CAS No.	Toxicity and Chemical-specific Information									Carcinogenic SSL <sup>a,c</sup>			Noncancer SSL <sup>b,e</sup>		Residential Soil - Protection of Groundwater Risk-based Concentration (mg/kg)						
		SFO (mg/kg-day) <sup>-1</sup>	Ref	IUR (µg/m <sup>3</sup> ) <sup>-1</sup>	Ref	RfDo (mg/kg-day)	Ref	RfCi (mg/m <sup>3</sup> )	Ref	Muta- gen	TR = 1 x 10 <sup>-4</sup>	TR = 1 x 10 <sup>-5</sup>	TR = 1 x 10 <sup>-6</sup>	HQ = 0.1	HQ = 1	RBC <sup>c,e</sup>			RBC <sup>d,e</sup>			
																TR = 1 x 10 <sup>-4</sup> or HQ = 0.1	TR = 1 x 10 <sup>-5</sup> or HQ = 0.1	TR = 1 x 10 <sup>-6</sup> or HQ = 0.1	TR = 1 x 10 <sup>-4</sup> or HQ = 1	TR = 1 x 10 <sup>-5</sup> or HQ = 1	TR = 1 x 10 <sup>-6</sup> or HQ = 1	SSL (MCL- based)
Tetrachloroethane, 1,1,2,2- (PCA)	79-34-5	2.0E-01	I	5.8E-05	C	2.0E-02	I			--	3.9E-02	3.9E-03	3.9E-04	1.8E-01	1.8E+00	3.9E-02	3.9E-03	3.9E-04	3.9E-02	3.9E-03	3.9E-04	n/a
Tetrachloroethylene (PCE)	127-18-4	2.1E-03	I	2.6E-07	I	6.0E-03	I	4.0E-02	I	--	6.8E+00	6.8E-01	6.8E-02	2.4E-02	2.4E-01	2.4E-02	2.4E-02	2.4E-02	2.4E-01	2.4E-01	6.8E-02	4.6E-02

<sup>a</sup> Carcinogenic SSL are presented at three different Target Risk (TR) levels: Excess Lifetime Cancer Risk of 1 x 10<sup>-4</sup>, 1 x 10<sup>-5</sup>, and 1 x 10<sup>-6</sup>.

<sup>b</sup> Noncancer SSL is based on a Hazard Quotient (HQ) of 0.1 or 1.

<sup>c</sup> The RBC is based on lower of the RSL based on the noncancer HQ of 0.1 and the RBC based on the carcinogenic TR.

<sup>d</sup> The RBC is based on lower of the RSL based on the noncancer HQ of 1 and the RBC based on the carcinogenic TR.

<sup>e</sup> The soil-to-groundwater RBC is based on the risk-based soil screening level (SSL) (EPA, 2015a) and a dilution attenuation factor of 13.2 (ADEC, 2008).

Notes:

ARAR = Applicable or Relevant and Appropriate Requirements

IUR = inhalation unit risk

mg/L = milligram(s) per liter

n/a = not available

RBC = risk-based concentration

RfCi = inhalation reference concentration

RfDo = oral reference dose

RSL = regional screening level

SFO = oral cancer slope factor

References:

C = California EPA (EPA, 2015a)

I = EPA Integrated Risk Information System (IRIS) (EPA, 2015b)

Alaska Department of Environmental Conservation (ADEC). 2008. Table C. Groundwater Cleanup Levels and Table B1. Method 2 – Soil Cleanup Levels Table. October.

United States Environmental Protection Agency (EPA). 2015b. Integrated Risk Information System. <http://www.epa.gov/IRIS/>.

*This page intentionally left blank.*

**Table 3: Comparison of Risk-based Concentrations with ADEC Cleanup Levels**

Chemical of Concern	Maximum Detected Concentration <sup>a</sup>	Cleanup Goal <sup>b</sup>	Risk-based Concentration (mg/L)			ARARs	
			TR = 1 x 10 <sup>-6</sup> or HQ = 1	TR = 1 x 10 <sup>-5</sup> or HQ = 1	TR = 1 x 10 <sup>-4</sup> or HQ = 1	MCL (mg/L)	ADEC Cleanup Level <sup>d</sup>
<b>Groundwater (mg/L)</b>							
PCA	0.279	0.052	0.000076	0.00076	0.0076	n/a	0.0043
<b>Soil (mg/kg)</b>							
PCA	2,030	0.1	0.000391	0.00391	0.0391	n/a	0.0170
PCE	159	4.0	0.0677	0.243	0.243	n/a	0.0240

<sup>a</sup> Soil concentrations presented in the ROD (Army 1997) and groundwater concentrations detected in 2015.

<sup>b</sup> Army, 1997.

<sup>c</sup> Groundwater risk-based concentration based on Tap Water Regional Screening Level.

<sup>d</sup> ADEC 2008 Cleanup Levels, Table C and B1 Migration to Groundwater

Notes:

ADEC = Alaska Department of Environmental Conservation

ARAR = Applicable or Relevant and Appropriate Requirements

HQ = hazard quotient

MCL = Maximum Contaminant Level (EPA, 2015)

mg/L = milligram(s) per liter

n/a = not available

TR = Target Risk

References:

United States Environmental Protection Agency (EPA). 2015. Regional Screening Levels for Chemical Contaminants at Superfund Sites User's Guide. Available at <http://www.epa.gov/region09/waste/sfund/prg/index.html>. November.

United States Army (Army). 1997. Record of Decision for Operable Units A and B, Fort Richardson, Anchorage, Alaska. Final. August.

*This page intentionally left blank.*

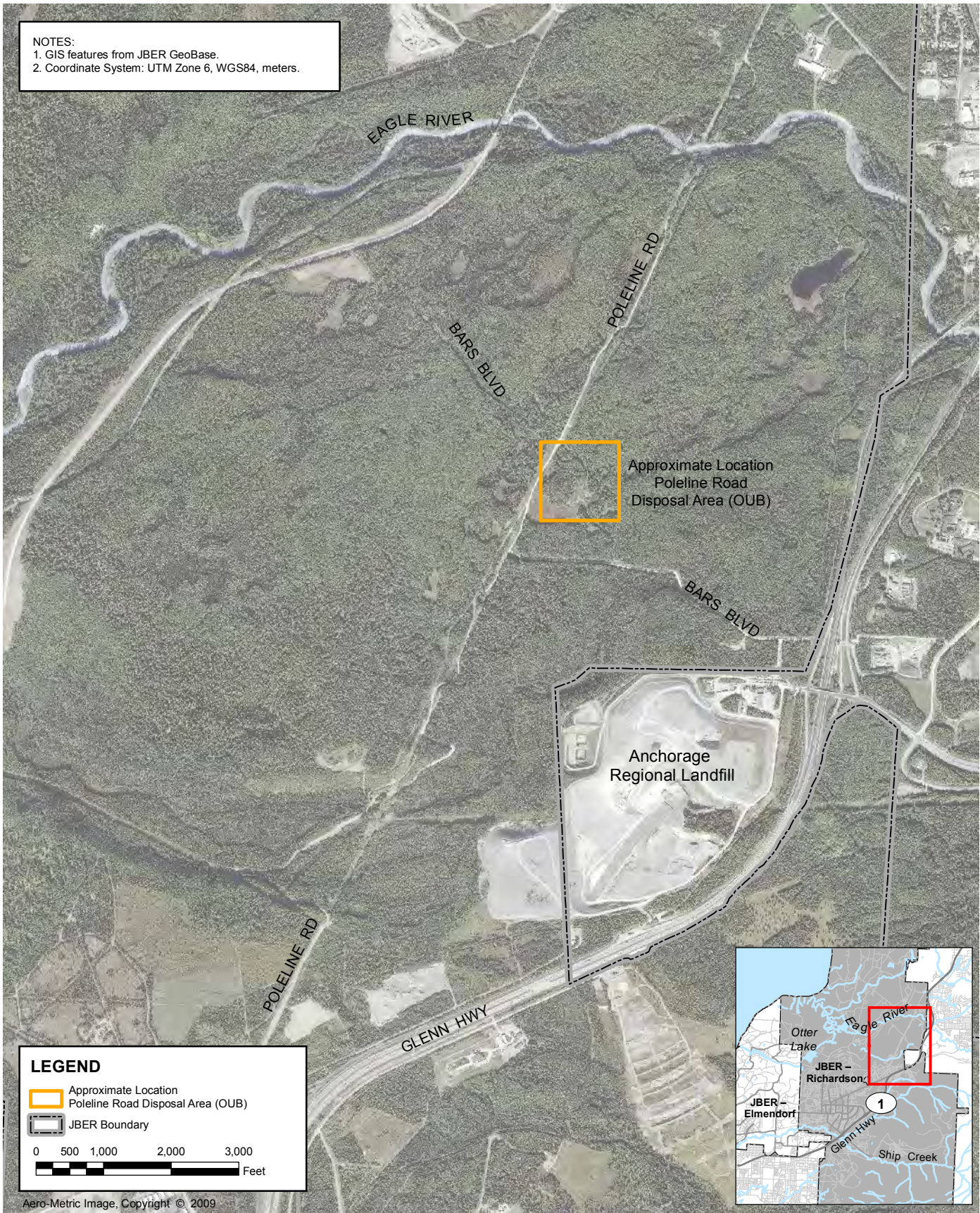


**Figure**



---

*This page intentionally left blank.*

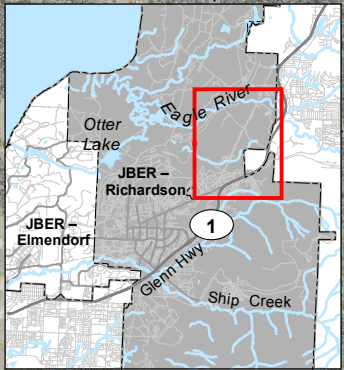
NOTES:  
 1. GIS features from JBER GeoBase.  
 2. Coordinate System: UTM Zone 6, WGS84, meters.



**LEGEND**

-  Approximate Location Poleline Road Disposal Area (OUB)
-  JBER Boundary

0 500 1,000 2,000 3,000 Feet



Aero-Metric Image, Copyright © 2009



**CG039 SITE LOCATION AND FEATURES MAP**

Memorandum to Site File for  
 CG039 – Poleline Road Disposal Area, Operable Unit B  
 Joint Base Elmendorf-Richardson, Alaska

Figure

Date: 25 Jun 2015 Drawn by: J:\Carr\_ch2\mhillevigis R:\AFCEE\_JBER\_20001102\MapFiles\Special\_Reports\CG039\Figure1\_CG039\_Sitelocation.mxd