Proposed Plan
Air Force Proposes Environmental Restoration Alternatives for Trichloroethene (TCE) Area (Site SS006)/Building 1700-Refueler Maintenance Shop (Site SS019) with Soil and Groundwater Impacts – Public Comments Invited

A. INTRODUCTION

The purpose of this *Proposed Plan* (PP) is to present to the general public and interested stakeholders the preferred remedial alternative for managing potential risks associated with soil and *groundwater* contamination at Trichloroethene Area (Site SS006)/Building 1700-Refueler Maintenance Shop (Site SS019) at the Former Galena Forward Operating Location (FOL), Alaska, and to solicit comments on the recommended *remedial alternatives*. The PP summarizes information that can be found in greater detail in the *Remedial Investigation* (RI), Supplemental RI, *Feasibility Study* (FS) Reports and other documents contained in the *Administrative Record* (AR) for the site. Italicized words or phrases are defined in the glossary at the end of this document.

Sites SS006 and SS019 are subject to the *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* process. In accordance with the *Defense Environmental Restoration Program,* the U.S. Air Force (Air Force), representing the Office of the Secretary of Defense, is the CERCLA lead agency responsible for environmental response actions at the Former Galena FOL. The sites are not listed on the National Priorities List, and the *Alaska Department of Environmental Conservation (ADEC)* is the lead regulatory support agency. The PP is a document the lead agency (the Air Force) is required to issue to fulfill the requirements of CERCLA 117(a) (42 United States Code (U.S.C.) § 9617(a); and the *National Contingency Plan* (NCP) Title 40 Code of Federal Regulations (C.F.R.) §300.430(f)(2).

Figure 1 shows where Sites SS006 and SS019 are in the CERCLA process leading up to implementation of a remedy. Both a RI and a Supplemental RI have been conducted at Sites SS006 and SS019 to determine the types, quantities and extent of contamination, and to develop ways to address contamination at this site. The RI and Supplemental RI found that:

- Soil at Site SS006 is contaminated with volatile organic compounds (VOCs) which include trichloroethene (TCE), multiple petroleum-related compounds including diesel range organics (DRO), and multiple polynuclear aromatic hydrocarbons (PAHs). Sources of contamination

Community Involvement Opportunities

Public comments on this Proposed Plan (PP) will be considered before a final remedy is selected for this site.

Public Comment Period
Through 5:00 p.m., May 25, 2018
The public is encouraged to send written comments regarding information provided in this PP and supporting documents to:

Mrs. Christiana Hewitt
2261 Hughes Ave. Ste 155
JBSA Lackland, TX 78236-9853
E-mail: christiana.hewitt.1@us.af.mil
Phone: (210) 395-9426
** All mailed comments must be postmarked by May 11, 2018.

General Questions/Comments may also be referred to the Air Force Public Affairs team at (866) 725-7617 or afcec.pa@us.af.mil.

Public Meeting
Date: April 11, 2018 Time: 7:00 p.m.

The public is encouraged to attend a community meeting to discuss the information presented in this PP. There will be an opportunity to ask questions and provide formal comments during the meeting. Representatives from the Air Force and ADEC will participate. The meeting will be held at the following location:

Larsen Charlie Community Hall,
Galena, AK

Information Repository & Administrative Record (AR)
The Remedial Investigation (RI), Supplemental RI, Risk Assessment, and Feasibility Study can be found in the AR located at:

The Charles Evans Community Library,
Antoski Street (inside Galena High School),
Galena, AK 99741 (907) 656-1205.

All supporting documents can also be found online at:
http://www.afcec.af.mil/Home/BRAC/Galena.aspx
or directly at:
http://afcec.publicadmin-record.us.af.mil/Search.aspx
To search for supporting documents, select BRAC, select Galena, then enter the referenced AR# into the Full Metadata Search field for easy access. AR numbers for supporting documents can be found at the end of this PP.

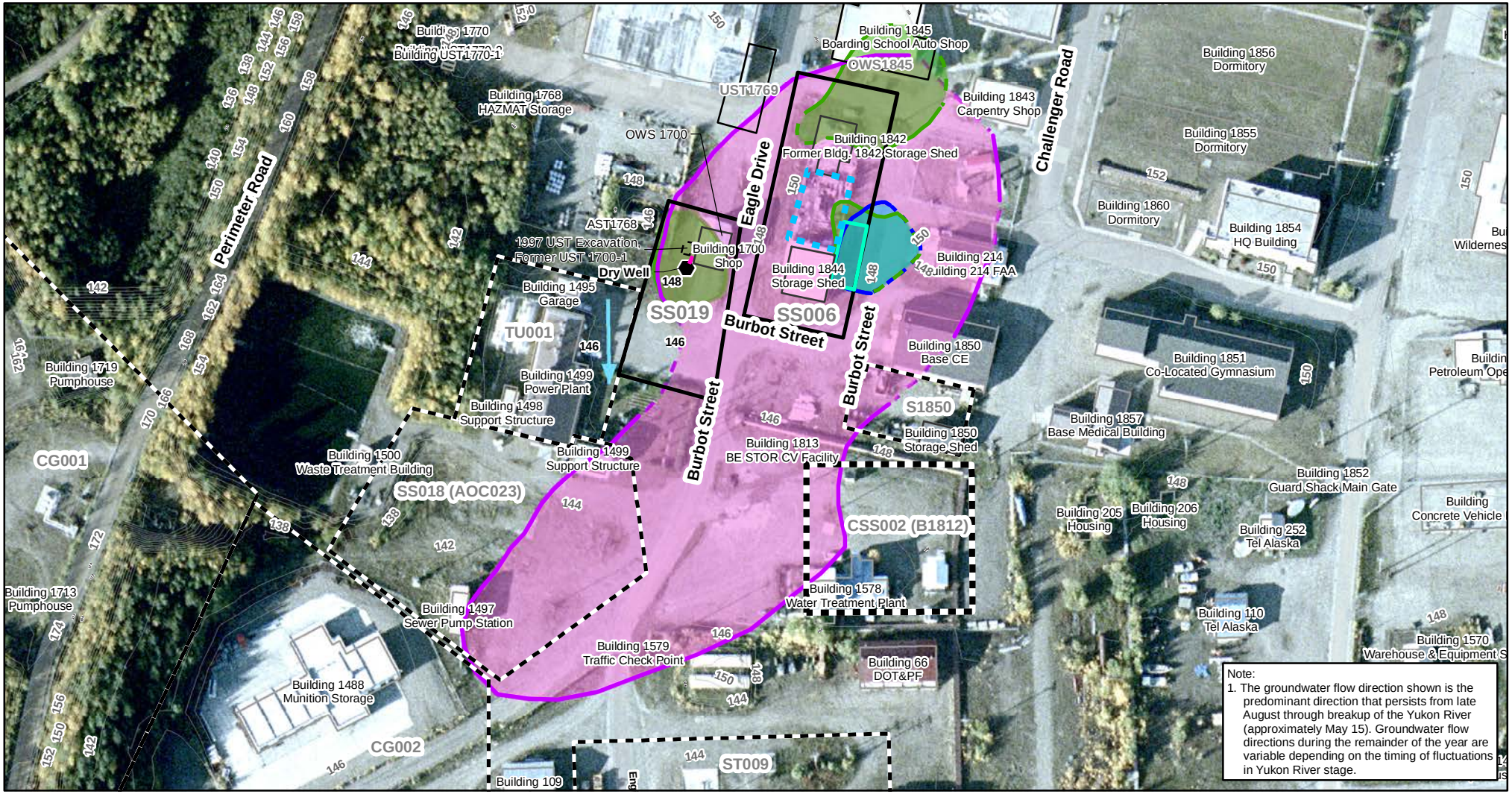
Figure 1 – CERCLA Process

at Site SS006 appear to be spills from parts cleaning activities in the area of the former liquid oxygen (LOX) plant (Building 1842, storage yard, and Building 1844), petroleum releases from unknown sources, and releases from storing utility poles on the bare ground northeast of Building 1844.

- Soil at Site SS019 is contaminated with TCE and petroleum-related contaminants that include DRO, gasoline range organics (GRO), and benzene. The primary sources of contamination at Site SS019 include releases from the former waste oil tank (UST 1700-1) and dry well associated with oil-water separator (OWS) 1700.
- Soil contamination of TCE extends across both Site SS006 and SS019 and extends to depths of approximately 71 feet below ground surface (bgs) over an area of approximately 180,000 square feet (4.1 acres). Contamination of petroleum-related compounds extends to depths of approximately 14 feet bgs over a combined area of approximately 12,300 square feet (0.28 acres). The area impacted by PAHs and the semi-volatile organic compound (SVOC) pentachlorophenol at Site SS006 is approximately 6,000 square feet (0.14 acres).
- Groundwater contamination at Site SS006 consists mainly of VOCs, specifically TCE. The TCE plume originates beneath Site SS006, is approximately 770 feet long and 340 feet wide, and has migrated southwest. DRO is another contaminant identified in groundwater at Site SS006.
- Groundwater at Site SS019 is contaminated with petroleum-related compounds, including DRO, benzene, toluene, and ethylene dibromide (EDB).

Figures 2 and 3 show the layout of the sites and areas of soil and groundwater contamination. In the FS for Sites SS006 and SS019, the following alternatives were evaluated to mitigate risks associated with soil and groundwater contamination at the sites:

Contents



Legend

- SS006/SS019
- Site Boundary
- Approximate Location of Former Feature
- Road
- Approximate Groundwater Flow Direction
- Ground Surface Contour
- Dry Well
- Former Pipelines
- Utility Pole Storage
- Fenced Concrete Pad Storage Area
- Area of TCE Contamination (dash where inferred)
- Area of Petroleum Constituent Contamination (dash where inferred)
- Area of PAH and Pentachlorphenol Contamination (dash where inferred)

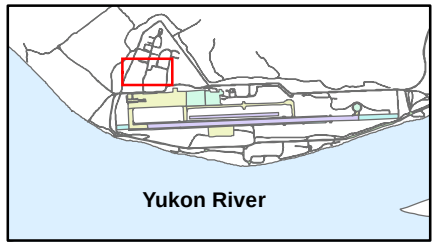


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FIGURE 2

Site SS006/SS019 Layout and Area of Soil Contamination

Proposed Plan for Site SS006/SS019
Former Galena Forward Operating Location, Alaska

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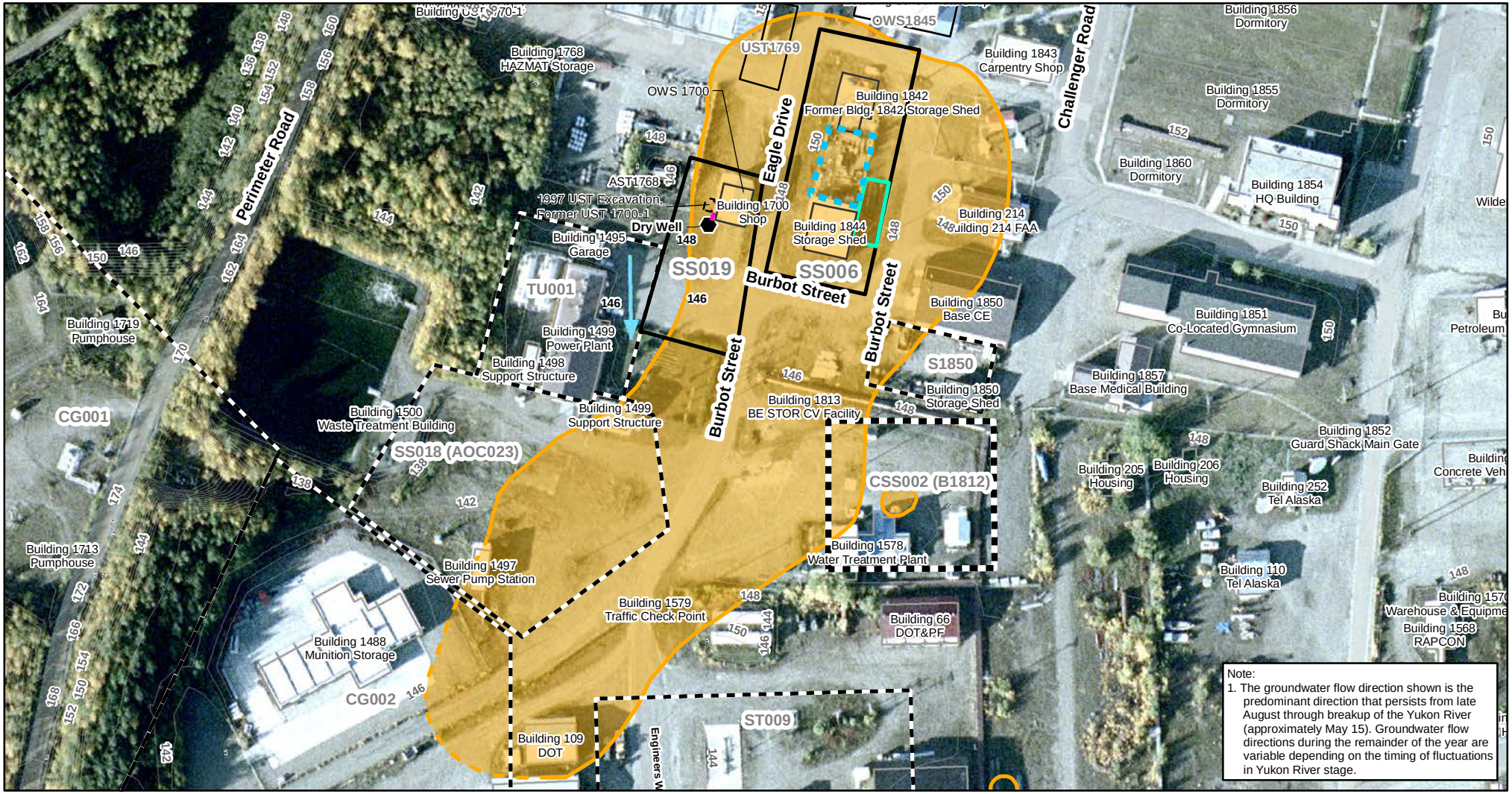

Legend

- SS006/SS019
- Site Boundary
- Approximate Location of Former Feature
- Road
- Approximate Groundwater Flow Direction
- Ground Surface Contour
- Dry Well
- Former Pipelines
- Utility Pole Storage
- Fenced Concrete Pad Storage Area
- Area of TCE Groundwater Contamination (dashed where inferred)

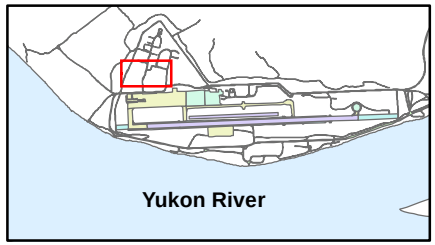

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FIGURE 3

Site SS006/SS019 Layout and Area of Groundwater Contamination

Proposed Plan for Site SS006/SS019
Former Galena Forward Operating Location, Alaska

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Site SS006

- **Alternative SS006-1**: No Action
- **Alternative SS006-2:** Install an asphalt/concrete cap to prevent exposure to contaminants in surface soil. *Monitor natural attenuation* (MNA) in groundwater to verify that the Constituent of Concern (COC) concentrations are stable or decreasing. Impose land use controls (LUCs) to mitigate potential exposures until all cleanup levels (CULs) are achieved.
- **Alternative SS006-3:** Excavate PAH-contaminated surface soil. Install *soil vapor extraction* (SVE) to remove VOCs from soil in the target treatment areas. VOCs in groundwater would be treated in situ using a combination of enhanced anaerobic bioremediation/ enhanced biogeochemical transformation (EAB/EBT) for the core of the VOC plume and MNA for the remainder of the plume. VOCs in downgradient soil would be addressed with intrinsic remediation and monitored indirectly with MNA for groundwater. Impose LUCs to mitigate potential exposures until all CULs are achieved.
- **Alternative SS006-4:** Excavate PAH-contaminated surface soil. Excavate a limited area of TCE-contaminated soil, and use SVE to remove remaining VOC and petroleum-related contaminants from soil. VOCs in downgradient soil would be addressed with intrinsic remediation and monitored indirectly with MNA for groundwater. EAB/EBT and MNA for groundwater remediation. Impose LUCs to mitigate potential exposures until all CULs are achieved.
- **Alternative SS006-5:** Excavate PAH-contaminated surface soil. Use in situ chemical oxidation (ISCO) to remove TCE-contaminated soil, and use SVE to remove remaining VOC and petroleum-related contaminants from soil. VOCs in downgradient soil would be addressed with intrinsic remediation and monitored indirectly with MNA for groundwater. EAB/EBT and MNA for groundwater remediation. Impose LUCs to mitigate potential exposures until all CULs are achieved.

Site SS019

- **Alternative SS019-1**: No Action
- **Alternative SS019-2**: Remove and administratively close the former dry well. MNA in groundwater to verify that the COC concentrations are stable or decreasing. Impose LUCs to mitigate potential exposures until all CULs are achieved.
- **Alternative SS019-3**: Apply SVE and bioventing to remove TCE and petroleum contamination in soil. MNA in groundwater to verify that the COC concentrations are stable or decreasing. Remove and administratively close the former dry well. Impose LUCs to mitigate potential exposures until all CULs are achieved.
- **Alternative SS019-4**: Apply ISCO to treat contamination in soil. MNA in groundwater to verify that the COC concentrations are stable or decreasing. Remove and administratively close the former dry well. Impose LUCs to mitigate potential exposures until all CULs are achieved.

The Air Force's preferred alternatives for Sites SS006 and SS019 are Alternative SS006-3 and Alternative SS019-3, respectively. These alternatives will achieve all *Remedial Action Objectives* (RAOs) to protect human health and the environment (see Section F), are cost effective, and will achieve *Cleanup Complete* in a shorter timeframe than the other alternatives evaluated.

Public input is important to the remedy selection process. New information or opinions the Air Force or ADEC learn during the *public comment period* could result in the selection of remedial actions that differ from the preferred alternative. The Air Force encourages the public to comment on this PP and all alternatives described, or other material in the AR. Comments may be made at the public meeting scheduled for April 11, 2018. Written comments may be submitted until the end of the comment period on May 11, 2018.

AFCEC and ADEC Contact Information

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A comment sheet is provided as an attachment to this PP. After comments from the public are received and considered, a Record of Decision (ROD) will be written. The ROD will include a summary of any comments received during the public review period along with an explanation of how the comments changed the decision that was reached, if applicable. After the ROD is finalized, the remedy at each site will be implemented following completion of the *Remedial Design/Remedial Action* Work Plan.

B. SITE BACKGROUND

B.1 Galena FOL History

The Former Galena FOL was established as an airfield during World War II and most recently served as a forward operating base for the Pacific Air Force's

611th Air Support Group headquartered at Elmendorf Air Force Base, Alaska. The Former Galena FOL was recommended for closure by the Department of Defense (DoD) *Base Closure and Realignment Act (*BRAC*)* Commission in 2005 and was officially closed September 30, 2008.

Today, the Air Force Civil Engineer Center (AFCEC) manages the environmental cleanup for the Air Force at the Former Galena FOL. Regulatory support is provided by ADEC.

B.2 Sites SS006 and SS019 History

Site SS006

Buildings 1842 and 1844 were built on the concrete pad formerly occupied by a warehouse and vehicle maintenance shop which burned down in 1959, and some unoccupied portions of the pad were used as storage areas.

Building 1842 was constructed at the north end of the concrete pad in 1959. Historically, the building was used as a LOX plant and a boiler maintenance facility, then was used for cold storage before it was demolished in 2008.

Building 1844 was constructed in 1962. Historical records indicate the building has been used for storage. In 2011, it was observed that Building 1844 was being used to store lumber.

The LOX Plant at Building 1842 was identified as a potential historical source of TCE groundwater contamination near the site. Equipment parts were thoroughly cleaned before use for LOX generation. Historically, the Air Force used TCE to perform the cleaning, and the disposal practice for used solvents, such as TCE, varied from base to base.

The Environmental Baseline Survey report for Building 1842 indicates that no OWS, storage tanks, or transformers are associated with the building. In addition, no hazardous materials, hazardous waste, or waste petroleum products were stored at Building 1842, and no pesticides were stored at the building. Solvents are not currently used at Site SS006. No specific information regarding historical solvent disposal practices was found.

Site SS019

Building 1700, in the northeast portion of Site SS019, was used for maintaining aircraft refueling trucks. Beginning in 1999, the building was used for boat and snowmachine storage and was later used for cold storage. The southern portion of Site SS019 is used for vehicle access from Burbot Street (formerly Engineer's Way) to the power plant (Building 1499) at Site TU001.

Building 1700 was constructed in 1963, and included a floor drain trough, an OWS, exhaust fans, an exterior 55-gallon waste oil drum (UST 1700-1), and a dry well to support maintenance activities, which involved opening and clearing fuel transfer pumps and hoses of petroleum fuels.

Records show that UST 1700-1 was removed in 1997. According to UST records, the tank was used to store "used oil (diesel)" or "oil/water separator waste" and had a capacity of 55 gallons. Contaminated soil was found in the excavation. However, ADEC records indicate that the original 55-gallon drum installed in 1963 was replaced at some point by a 300-gallon UST which was removed in 1997. According to the removal report, piping associated with the UST was removed to within 5 feet of Building 1700, any piping abandoned in place was drained and grouted, and the drain line from the OWS was capped within the building at the connection point to the OWS.

Site SS019 was initially identified as an area of interest during the RI of the Former Galena FOL from 1992 to 1994, when elevated organic vapor concentrations were detected in soil vapor samples collected southwest of Building 1700. The 1996 RI report recommended decommissioning the dry well and floor drain in place. Results of the 2011 geophysical survey show an anomaly at the estimated location of the dry well, which indicates the dry well is still in place. No anomaly is apparent at the estimated location of the piping from the OWS to the dry well, which suggests the piping may have been removed. Conditions observed during the site visit in 2011 suggested that the floor drain and OWS are inactive.

B.3 Previous Public Participation Activities

The Air Force and ADEC, through the Galena *Restoration Advisory Board*, works with local stakeholders, including the Louden Tribal Council and City of Galena to address any environmental concerns at the Former Galena FOL. The Galena Restoration Advisory Board consists of Air Force and ADEC representatives and government and community stakeholders including the Alaska Department of Transportation, the Bureau of Land Management, US Fish and Wildlife Service, City of Galena, Galena Interior Learning Academy, Louden Tribal Council, Gana-A'Yoo, and private citizens. The Restoration Advisory Board meets twice a year to promote community involvement and disseminate information on the progress of environmental restoration activities.

In an effort to involve the community in the decision-making process, the public is given the opportunity to comment on the Air Force's recommendations through public meetings and review and comment of PPs.

The Air Force also established a community outreach program to notify area residents and interested

parties about upcoming meetings, major site activities, and site restoration progress. Periodic newsletters, which are available on the Air Force website (http://www.afcec.af.mil/Home/BRAC/Galena.aspx) are published to inform the public about the progress of the environmental cleanup.

C. SITE CHARACTERISTICS

Sites SS006 and SS019 are adjacent sites in the west-central portion of the Former Galena FOL cantonment "triangle" and are located on property owned by the City of Galena.

Site SS006

Site SS006 is bordered by Eagle Drive to the west, Burbot Street to the south and east, and the former Vehicle Maintenance Shop (Building 1845) OWS (Site OW1845) to the north. Current use of Site SS006 includes indoor storage for the City of Galena within Building 1844 and outdoor storage within the fenced concrete pad storage area north of Building 1844 and the former site of Building 1842. **Figure 4** is a photograph of Site SS006.

Figure 4 –Site SS006 – View of the the north side of the fenced concrete pad storage area. The building on the left is 1844 and the building on the right is 1700.

Figures 2 and 3 show the estimated area of soil and groundwater contamination at Site SS006 and the location of major site features. The primary sources of contamination at Site SS006 include spills from parts cleaning activities at the former LOX plant, petroleum releases from unknown sources, and releases from storing utility poles on the bare ground northeast of Building 1844.

Features of concern at Site SS006 include the following:

- Building 1844 at the south end of Site SS006
- Former Building 1842 at the north end of Site SS006
- A fenced concrete pad storage area between Building 1844 and the former site of Building 1842
- A utility pole storage area northeast of Building 1844

Site SS019

SS019 is bordered by Power Plant Tank 49 (Site TU001) to the southwest, Aboveground Storage Tank (AST) 1768 to the northwest, Underground Storage Tank (UST) 1769 to the north, and Eagle Drive to the east. Building 1700 is currently used for cold storage. The southern portion of Site SS019 is currently used for vehicle access from Burbot Street to the power plant at Site TU001. **Figure 5** is a photograph of the site.

Figure 5 –Site SS019 – View of Building 1700 from the Southwest. The drywell is located to the left Building 1700

Figures 2 and 3 shows the estimated area of soil and groundwater contamination at Site SS019 and the location of major site features. Primary sources of contamination at Site SS019 include releases from the former waste oil tank (UST 1700-1) and dry well associated from OWS 1700. The UST was located west of Building 1700 but was removed in 1997. The dry well is at the southwest corner of Building 1700 and remains in place but is inactive.

Features of concern at Site SS019 include the following:

- The former site of UST 1700-1 west of Building 1700
- An inactive dry well southwest of Building 1700
- An inactive OWS (OWS 1700) built into the foundation along the western wall of Building 1700
- The former location of piping that connected the OWS to the dry well and the former UST

Sites SS006 and SS019

The geology of Sites SS006 and SS019 is dominated by unconsolidated (loose, not rock-like) sediments deposited by the Yukon River to depths of at least 550 feet bgs. The geology at Site SS006 consists of an upper layer that varies laterally in the upper 6 feet

bgs and consists of silt, silty sand, or sand. Below the upper layer is silt from 6 to 16 feet bgs, sand from 16 to 60 feet bgs, and a sand and gravel mix to 80 feet bgs. The geology of Site SS019 is primarily silt or silty sand with localized layers of sand up to 3 feet thick in the upper 17 feet bgs. Sand or sand and gravel predominate from 17 feet bgs to approximately 53 feet bgs.

Groundwater at Sites SS006 and SS019 exists in an aquifer that consists mainly of interlayered sand and gravelly sand. The aquifer extends to depths greater than 200 feet bgs.

The groundwater flow direction and elevation of the groundwater surface at Sites SS006 and SS019 varies throughout the year because both are dependent on the water level in the Yukon River. From August/September to May, groundwater surface elevations are generally higher in wells farther from the river, and groundwater flows south toward the river. As the water level in the river rises in May, the groundwater surface elevations become higher near the river and groundwater flows to the north, away from the river. The water level in the Yukon River typically decreases in mid to late June, and groundwater once again flows south toward the river. From mid-June to September, the groundwater surface elevation and flow direction can change often, depending on small fluctuations that occur in river water levels. If the water level in the river increases, groundwater will flow north, away from the river. Similarly, decreases in the river water level cause the groundwater to flow south, toward the river.

Ground surface elevations range from approximately 146 to 149 feet above mean sea level (amsl) at Site SS006 and approximately 144 to 149 feet amsl at Site SS019. Observed groundwater elevations range from approximately 114.5 to 137.5 feet amsl at Site SS06 and approximately 114 to 137.5 feet amsl at Site SS019. The depth to groundwater at Site SS006 is approximately 10.5 to 33.5 feet bgs and 9.5 to 33 feet bgs at Site SS019.

C.1 Environmental Investigations

Data used to determine the nature and extent of contamination at Sites SS006 and SS019 include data from RI field work (completed in 2010 and 2011), data from Supplemental RI field work (completed in 2013), and data collected during the installation of the SS019 SVE pilot test. Field work consisted of soil sampling, collecting groundwater grab samples, and installing and sampling monitoring wells. Soil samples were collected from “surface soil” (0 to 2 feet bgs), “combined surface and subsurface soil” (0 to 15 feet bgs), and “deep soil” (greater than 15 feet bgs) and analyzed for various contaminants. The most recent base-wide groundwater sampling events, which included sampling at Sites SS006 and SS019, were conducted from 2010 to 2016.

C.2 Soil

Soil samples collected at Sites SS006 and SS019 were analyzed for GRO, DRO, *residual range organics* (RRO), VOCs, SVOCs, PAHs, polychlorinated biphenyls (PCBs), and metals.

Site SS006

COCs for Site SS006 identified in soil are listed in **Table 1** and include VOCs including TCE, multiple petroleum-related contaminants including DRO, SVOCs, and PAHs. COCs are site-related contaminants that pose an unacceptable risk to human health and/or the environment. COCs are selected based on (1) results of the risk assessment, and (2) comparing concentrations of contaminants to applicable CULs and background threshold values. They are the basis for determining the design of the remedy for a site. Further information on selection of COCs can be found in the FS Report in the AR.

In samples collected from 2010 through 2013, the maximum concentration of each COC exceeded the cleanup level. The maximum concentration of COCs in soil at Site SS006, along with its respective CUL, is presented in **Table 1**.

Table 1. Site SS006 COCs in Soil

COC	Maximum Concentration (mg/kg)[1]			Cleanup Level [3] (mg/kg)
	Surface Soil 0-2 ft bgs[2]	Combined Surface and Subsurface Soil 0-15 ft bgs	Deep Soil >15 ft bgs	
Petroleum Contaminants				
DRO	1460	4600	NA	250
1-Methylnaphthalene	NA	6.26	NA	0.41
2-Methylnaphthalene	740	740	NA	1.3
Benzene	NA	1.56	NA	0.022
Naphthalene	2.83	3.56	NA	.038
PAHs				
Acenaphthene	3200	3200	NA	37
Benzo(a)anthracene	1400	1400	NA	0.28
Benzo(a)pyrene	420	420	NA	0.2
Benzo(b)fluoranthene	750	750	NA	2
Benzo(k)fluoranthene	510	510	NA	20
Chrysene	2000	2000	NA	82
Dibenz(a,h)anthracene	1.85	1.85	NA	0.2
Fluoranthene	8400	8400	NA	590
Indeno(1,2,3-c,d)pyrene	140	140	NA	2
Phenanthrene	13,000	13,000	NA	39
Pyrene	5900	5900	NA	87

COC	Maximum Concentration (mg/kg) [1]			Cleanup Level [3] (mg/kg)
	Surface Soil 0-2 ft bgs [2]	Combined Surface and Subsurface Soil 0-15 ft bgs	Deep Soil >15 ft bgs	
SVOCs				
Dibenzofuran	2300	2300	NA	0.97
Pentachlorophenol	44	44	NA	0.0043
VOCs				
1,1,2-Trichloroethane	NA	0.194	0.037	0.0014
cis-1,2-Dichloroethane	NA	30.5	1.46	0.12
Trichloroethene (TCE)	29	1900	73	0.011

Notes:
[1] mg/kg = milligrams per kilogram
[2] ft bgs = feet below ground surface
[3] Soil CULs are the lowest applicable levels from ADEC Tables B1 or B2 Method Two CULs (under 40-inch zone) per 18 AAC 75.341, updated November 2016
[4]NA = not applicable because the chemical was not classified as a COC in this medium

In surface soil and combined surface and subsurface soil, the extent of contamination from petroleum constituents is approximately 9,300 square feet (2.1 acres) and extends to depths of 9 ft bgs. The extent of PAH and pentachlorophenol contamination is approximately 6,000 square feet (0.14 acres) and extends to depths of approximately 2 feet bgs. TCE exceeds CULs over an area of approximately 180,000 square feet (4.1 acres).

Site SS019

COCs identified in soil for Site SS019 include TCE, petroleum contaminants DRO and GRO, and VOCs and PAHs associated with petroleum releases. COCs are presented in **Table 2** and discussed in the section below.

In samples collected from 2010 through 2013, the maximum concentration of each COC exceeded the cleanup level. The maximum concentration of COCs in soil at Site SS019, along with its respective CUL, is presented in **Table 2**.

In soil, the extent of contamination from petroleum constituents is approximately 3,000 square feet (0.07 acres) and extends to depths of 14 feet bgs. Subsurface and deep soil is contaminated with TCE, but it is not feasible to differentiate TCE attributed to the Site SS019 release from sources of TCE attributed to Site SS006.

Table 2. Site SS019 COCs in Soil

COC	Maximum Concentration (mg/kg)[1]			Cleanup Level [3] (mg/kg)
	Surface Soil 0-2 ft bgs[2]	Combined Surface and Subsurface Soil 0-15 ft bgs	Deep Soil >15 ft bgs	
Petroleum Contaminants				
1,2,4-Trimethylbenzene	11.1	220	5.3	0.16
1,3,5-Trimethylbenzene	NA	77.3	NA	1.3
1-Methylnaphthalene	NA	46.6	NA	0.41
2-Methylnaphthalene	NA	61.6	NA	1.3
Benzene	6.6	130	NA	0.022
GRO	1,200	61,000	NA	300
DRO	3670	14,000	NA	250
Ethylbenzene	35	182	2.12	0.13
Ethylene Dibromide	NA	0.429	NA	0.00024
Isopropylbenzene	NA	65	NA	5.6
Naphthalene	2.44	57.4	1.42	0.038
n-Butylbenzene	NA	43	NA	20
sec-Butylbenzene	NA	29	NA	28
Xylenes, total	43.2	1,500	NA	1.5
Toluene	NA	603	NA	6.7
VOCs				
Trichloroethene (TCE)	NA	1.12	0.689	0.011

Notes:
[1] mg/kg = milligrams per kilogram
[2] ft bgs = feet below ground surface
[3] Soil CULs are the lowest applicable levels from ADEC Tables B1 or B2 Method Two CULs (under 40-inch zone) per 18 AAC 75.341, updated November 216
[4]NA = not applicable because the chemical was not classified as a COC in this medium

C.3 Groundwater

Groundwater samples at Sites SS006 and SS019 were analyzed for GRO, DRO, RRO, VOCs, metals, SVOCs, and PAHs.

Site SS006

COCs for groundwater at Site SS006 include DRO, TCE, 1,1,2-trichloroethane, cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride. Maximum concentration of groundwater COCs from 2010 to 2013 are shown in **Table 3**.

Table 3. Site SS006 COCs in Groundwater

COC	Maximum Concentration (µg/L)[1]	Cleanup Level[2] (µg/L)
Petroleum Contaminants		
DRO	7,800	1,500
VOCs		
1,1,2-Trichloroethane	31	0.41
cis-1,2-Dichloroethene	5,700	36
TCE	40,000	2.8
Vinyl Chloride	3.1	0.19

Note:
[1] µg/L = micrograms per liter
[2]Groundwater CULs are ADEC Table C CULs per 18 AAC 75.345, updated November 2016

The TCE plume in groundwater at Site SS006 is approximately 770 feet long and 340 feet wide, extends to a depth of approximately 80 feet bgs. The DRO contamination in groundwater is limited to an area on the north side of Site SS006 and has an areal extent of approximately 7,200 square feet. (0.17 acres)

Site SS019

COCs for groundwater at Site SS019 include petroleum-related contaminants DRO, benzene, toluene, ethylbenzene, total xylenes, 1,2,4-trimethylbenzene, naphthalene, 1-methylnaphthalene, and ethylene dibromide. Three additional COCs (cis-1,2-DCE, vinyl chloride and TCE) were also identified for Site SS019 groundwater but are attributed to Site SS006. Maximum concentration of groundwater COCs from 2010 to 2013 are shown in **Table 4**.

The estimated areal extent of petroleum COCs in groundwater is approximately 1,200 square feet. Groundwater contamination from the VOCs cis-1,2-DCE, TCE, and vinyl chloride cannot be distinguished from the TCE-impacted groundwater associated with releases from Site SS006.

D. SCOPE AND ROLE OF RESPONSE ACTION

The overall cleanup strategy for Sites SS006 and SS019 is to achieve ADEC closure status of "Cleanup Complete". The proposed response actions for Sites SS006 and SS019 address all contaminated soil and groundwater and exposure pathways.

Contaminated soils at Site SS006 are considered a *principal threat waste.* No *principal threat wastes* are present at Site SS019. *Principal threat wastes* are those source materials considered to be highly toxic or highly mobile that would present a significant risk to human health or the environment should exposure occur. The NCP expects that

Table 4. Site SS019 COCs in Groundwater

COC	Maximum Concentration (µg/L)[1]	Cleanup Level[2] (µg/L)
Petroleum Contaminants		
1,2,4-Trimethylbenzene	290	15
1-Methylnaphthalene	27	11
Benzene	1,200	4.6
DRO	6,700	1,500
Ethylbenzene	540	15
Ethylene Dibromide	2.2	0.075
Naphthalene	170	1.7
Toluene	4,000	1,100
Total Xylenes	2,900	190
VOCs		
cis-1,2-Dichloroethene	1,400	36
TCE	7,900	2.8
Vinyl Chloride	1.8	0.19

Note:
[1] µg/L = micrograms per liter
[2]Groundwater CULs are ADEC Table C CULs per 18 AAC 75.345, updated November 2016

treatment to reduce the toxicity, mobility and volume of *principal threat wastes* will be used to the extent practicable.

E. SUMMARY OF SITE RISKS

All areas impacted by soil or groundwater contamination associated with SS006 and SS019, as shown on Figures 2 and 3, have been evaluated for human health and ecological risk.

E.1 Human Health Risks

The comparison of contaminant concentrations in soil and groundwater at Sites SS006 and SS019 to the ADEC Method Two CULs for soil and ADEC Table C CULs for groundwater indicate that there may be unacceptable risks to the following *receptors*:

Site SS006

Future excavation/construction workers: Potential exposure to chemicals in soil, outdoor air and groundwater. Potentially complete routes of exposure to soil include ingestion, dermal contact, and inhalation of ambient vapors or dust. Potentially complete routes of exposure to groundwater include incidental ingestion and dermal contact with groundwater.

Current and future occupational workers: Potential exposure to chemicals in surface soil, indoor air, outdoor air, and groundwater. Potentially

Trichloroethene (TCE)

TCE is an organic compound (i.e., contains carbon) that evaporates readily at room temperature. It was used as an industrial solvent for maintenance and degreasing operations, as well as an anesthetic and dry-cleaning compound. Once released into the environment, TCE can move through the soil, groundwater and air. People can be exposed to TCE through direct contact with contaminated soil or by breathing vapors.

complete routes of exposure to surface soil include ingestion, dermal contact, and inhalation of ambient vapors or dust. Potentially complete routes of exposure to groundwater include ingestion and inhalation of VOCs emitted into indoor air.

Hypothetical future residents: Potential exposure to chemicals in soil, indoor air, outdoor air, and groundwater. Potentially complete routes of exposure to soil include incidental soil ingestion, dermal contact, and inhalation of ambient vapors or dust. Potentially complete routes of exposure to groundwater include ingestion, dermal contact, and inhalation of VOCs emitted into indoor air.

Current and future students: Potential exposure to chemicals in surface soil. Potentially complete routes of exposure to surface soil include incidental soil ingestion, dermal contact and inhalation.

Site SS019

Current and future occupational workers: Potential exposure to chemicals in indoor air and groundwater. Potentially complete routes of exposure to groundwater include ingestion and inhalation of VOCs emitted into indoor air.

Hypothetical future residents: Potential exposure to chemicals in soil, indoor air, outdoor air, and groundwater. Potentially complete routes of exposure to soil include incidental soil ingestion and inhalation of ambient vapors or dust. Potentially complete routes of exposure to groundwater include ingestion, dermal contact, and inhalation of VOCs emitted into indoor air.

Additional information regarding current and future effects of all contaminants detected at Sites SS006 and SS019 on human health including carcinogenic risks and non-carcinogenic hazards can be found in the AR in the *Human Health Risk Assessment* completed for Sites SS006 and SS019.

E.2 Ecological Risk

A reconnaissance-level site visit was completed in October 2009 and August 2010 as part of the Preliminary Assessment of the Former Galena FOL. Because the site is located more than 1,000 feet from the Yukon River, there are no potentially complete aquatic ecological exposure pathways. It was concluded that no further terrestrial or aquatic ecological evaluation was necessary for Sites SS006 and SS019 because no viable habitat for plants or animals were observed and there are no potentially complete terrestrial ecological exposure pathways, therefore ecological risk is not a concern for the sites.

E.3 Risk Assessment Conclusion

It is the lead agency's current judgment that the Preferred Alternatives identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

F. REMEDIAL ACTION OBJECTIVES

RAOs are specific goals for protecting human health and the environment from risks and hazards associated with site-related contamination. RAOs can be accomplished by ensuring people are not exposed to contamination or by reducing concentrations of COCs to levels considered to be protective. Specifically, the Air Force proposes the following RAOs for response actions at Sites SS006 and SS019:

RAO 1: Prevent the exposure of human receptors to concentrations of contaminants in soil and groundwater that pose a cumulative *carcinogenic risk* greater than 1 in 100,000 or a cumulative *non-carcinogenic hazard index* greater than 1 across all exposure pathways, in accordance with ADEC cumulative risk standards.

RAO 2: Reduce COC concentrations in groundwater to the ADEC Table C groundwater CULs, as listed in Tables 3 and 4 of this Proposed Plan.

RAO 3: Prevent further degradation of groundwater by reducing concentrations of COCs in soil to levels protective of groundwater quality, as listed in Tables 1 and 2 of this Proposed Plan.

Based on the RAOs and *Applicable or Relevant and Appropriate Requirements* (ARARs), a number of technologies and approaches were identified and screened using criteria such as effectiveness for achieving RAOs, implementability, and cost.

F.1 Preliminary Remediation Goals

The proposed soil CULs for Sites SS006 and SS019 are the lowest applicable levels for ADEC Tables B1 or B2 Method Two CULs (Under 40-inch Zone) per

18 Alaska Administrative Code (AAC) 75.341 or Method Three CULs for migration to groundwater per 18 AAC 75.340. CULs for human health exposures (i.e., direct contact and outdoor inhalation) will be achieved up to a depth of 15 feet bgs. Migration to Groundwater CULs that are protective of groundwater quality will be achieved at all depths. The proposed groundwater CULs for Sites SS006 and SS019 are ADEC Table C CULs per 18 AAC 75.345. The preliminary remediation goals for soil and groundwater are chemical-specific ARARs for Sites SS006 and SS019.

There are no specific CULs proposed for soil vapor at Sites SS006 and SS019. The potential for future vapor intrusion will be reevaluated in accordance with ADEC's Vapor Intrusion Guidance for Contaminated Sites, or the most current applicable vapor intrusion guidance, upon achievement of the proposed soil and groundwater CULs or if land use changes.

After completing site cleanup, the risk from hazardous substances will be evaluated to ensure it does not exceed an excess cumulative carcinogenic risk standard of 1 in 100,000 or a cumulative non-carcinogenic hazard index of 1 across all exposure pathways per 18 AAC 75.325(g).

G. SUMMARY OF REMEDIAL ALTERNATIVES

In the Sites SS006 and SS019 FS, *general response actions* that could potentially be implemented to manage risks and treat contaminants at Sites SS006 and SS019 were identified. Specific response actions for each general response action were then identified and screened based on their likely site-specific effectiveness, implementability, and relative cost. The site-specific response actions retained from this screening process were combined into five remedial alternatives for Site SS006 and four remedial alternatives for Site SS019. The preferred remedial alternative for Site SS006 is Alternative SS006-3. The preferred remedial alternative for Site SS019 is Alternative SS019-3. The remedial alternatives evaluated for each site are described below:

Alternative SS006-1 – No Action

Capital Cost:	*$0*
Operations and Maintenance (O&M) Cost:	*$0*
Total Present Value:	*$0*

Under the Defense Environmental Restoration Program, evaluation of a no-action remedial alternative is required, pursuant to the NCP, 40 Code of Federal Regulations [CFR] 300.430[e][6], to provide a baseline for comparison with other remedial alternatives. Under Alternative SS006-1, No Action would be taken to address the impacted media identified at the site. With the No Action alternative, no formal programs would be put into place to control or monitor potential receptor exposures to site contaminants. Over time, the organic contaminants would attenuate naturally. Alternative SS006-1 does not meet the RAOs and does not comply with the ARARs.

Alternative SS006-2 – Asphalt/Concrete Cap, Land Use Controls, and Monitored Natural Attenuation

Capital Cost:	*$600,000*
O&M Cost:	*$1,500,000*
Total Present Value:	*$2,100,000*

Alternative 2 consists of the following actions:

- File a Notice of Environmental Contamination with the state recorder's office.
- Utilize administrative procedures and policies (LUCs) to prevent receptors from coming into contact with contamination at the site, until cleanup goals are achieved.
- Design and install an asphalt or concrete cap over the area of surface soil above human health CULs.
- Evaluate existing wells to be used for MNA sampling. Apply MNA to verify that COC concentrations in groundwater are stable or decreasing and that the contaminant *plume* is not expanding.
- Conduct Five-Year Reviews to evaluate the protectiveness of the remedy.

Alternative SS006-2 would require long-term maintenance of institutional controls that would be used to prevent uncontrolled exposure of potential receptors to contaminated soil and groundwater. Controls/monitoring would be required if any excavation activities are performed that are unrelated to site restoration. In addition, land use would be restricted to preclude residential development and withdrawal of groundwater for any beneficial use over the groundwater plume. Any structures built at the site would need to be designed and constructed to mitigate vapor intrusion concerns. Implementation of Alternative SS006-2 would require documentation of the LUCs, maintenance of administrative controls through review of work clearance permits, periodic inspections of the site, periodic monitoring of contaminant concentrations, and corrective action for LUC violations. A LUC implementation plan would be prepared, and LUCs would be maintained until cleanup goals are achieved. An asphalt or concrete cap would be added to the site to prevent exposure of receptors to surface soil. Periodic soil sampling would be conducted once every ten years to track the natural attenuation of COCs in soil. Groundwater monitoring would be conducted to ensure

contaminants in groundwater are not migrating. Details of the MNA sampling would be described in a work plan.

A time period of at least 100 years is anticipated for Alternative SS006-2. RAO 1 would be achieved after installing the cap and implementing LUCs. LUCs would not achieve RAOs 2 and 3; however, LUCs should effectively protect human receptors from exposure to COCs at concentrations that could pose a hazard. All RAOs would eventually be met through MNA, but only over a long timeframe.

Alternative SS006-3 – Excavation of PAH-Contaminated Surface Soil, Soil Vapor Extraction, Enhanced Anaerobic Bioremediation/Enhanced Biogeochemical Transformation, Land Use Controls, and Monitored Natural Attenuation

Capital Cost:	*$3,500,000*
O&M Cost:	*$5,100,000*
Total Present Value:	*$8,600,000*

Alternative SS006-3 consists of the following actions:

- All the components of Alternative SS006-2, except the asphalt/concrete cap.
- Excavate PAH-contaminated surface soil exceeding ADEC Method Two CULs for human health on the east side of Building 1844. Move utility poles to a location that does not pose a risk to soil or groundwater contamination (on a concrete pad or off the ground.
- Apply SVE to remove TCE and other VOC contamination in soil.

Soil Vapor Extraction (SVE)

SVE will extract soil gas (including TCE vapors) from the ground and discharge it into the air. Once in the air, TCE will disperse and be rapidly degraded by ultra violet rays from the sun. The SVE system will be designed and operated, and air will be monitored, to ensure that TCE concentrations do not exceed ADEC standards.

- Use a combination of EAB/EBT to treat the contaminants in groundwater.

With Alternative SS006-3, excavation would remove PAH- and pentachlorophenol-contaminated soil associated with utility poles. Soil would either be disposed of outside of Galena or treated at the Galena Landfarm depending on the results of additional analysis to determine if PAH-contaminated soil is co-located with TCE-contaminated soil.

An SVE system would be installed in the source area to remove VOCs from the soil. The SVE system would consist of a blower that would be installed in a small shed near the site, and electrical power would be connected from a nearby transformer. The blower would be plumbed to a network of extraction wells installed in the area with VOCs in soil. Piping would be buried underground and heat traced to prevent freezing. Several vapor monitoring points also would be installed in order to measure the vacuum influence of the system at various locations at the site. The SVE system would require periodic maintenance and sampling to ensure it is operating properly. The SVE technology targets VOCs such as TCE in unsaturated soil (i.e., above the water table). SVE works by creating a vacuum in the soil at the extraction well. As air moves through the contaminated soil to the extraction well, contamination is transferred from the soil to the extracted vapor. The extracted vapors are discharged to the atmosphere. Discharge of vapors from the SVE system would be subject to federal regulations under 40 CFR 63.40-44 for the National Emissions Standards for Hazardous Air Pollutants. Petroleum-contaminated soil outside of the surface soil excavation area would also be treated indirectly with SVE, as the increased airflow from the SVE system is expected to increase the biodegradation of these contaminants.

Following the installation of the SVE system, EAB/EBT would be implemented to reduce concentrations of contaminants in groundwater. EAB/EBT consists of injecting an organic substrate such as vegetable oil and other amendments as necessary into the groundwater using a small drill rig and a series of temporary wells. The injections would occur in the areas with the highest concentrations in groundwater near the source area. Injection of the organic substrate creates an anaerobic groundwater treatment zone that is conducive to stimulating the microbial population necessary for biodegrading CVOCs in groundwater. TCE, 1,1,2-trichloroethane, cis-1,2-DCE and VC are ultimately transformed to innocuous end products (e.g., chloride, ethane, ethene, carbon dioxide, acetylene). Injection of organic substrates and amendments into the subsurface soil would be subject to federal regulations under 40 CFR 144.82 for the Underground Injection Control Program.

As with Alternative SS006-2, Alternative SS006-3 would include MNA for groundwater, establishing and maintaining LUCs, and conducting CERCLA Five-Year Reviews until Cleanup Complete is attained.

With Alternative SS006-3, the SVE system is assumed to be in operation for 15 years. This alternative is expected to take approximately 20 years to reach cleanup goals.

As with Alternative SS006-2, LUCs and MNA would be required until CULs are achieved. RAO 1 would

be achieved once LUCs are implemented and contaminant concentrations reach levels protective of human health. RAO 2 (achieve Table C CULs) would be achieved once EAB/EBT and MNA have reduced concentrations of COCs in groundwater to below CULs. RAO 3 (control further degradation of groundwater) would be achieved following completion of shallow soil excavation and disposal and once SVE treatment and natural attenuation of contaminants in soil have reduced concentrations of COCs in subsurface soil to concentrations protective of groundwater.

Alternative SS006-4 – Excavation of PAH-Contaminated Surface Soil, Limited Excavation of TCE-Contaminated Soil, Soil Vapor Extraction, Enhanced Anaerobic Bioremediation/Enhanced Biogeochemical Transformation, Land Use Controls, and Monitored Natural Attenuation

Capital Cost:	*$11,400,000*
O&M Cost:	*$4,000,000*
Total Present Value:	*$15,400,000*

Alternative SS006-4 consists of the following actions:

- Implement LUCs and MNA as described in Alternative SS006-2.
- Remove and dispose of concrete slab in area to be excavated.
- Excavate soil with TCE concentrations exceeding 10 milligrams per kilogram (mg/kg) to a depth of approximately 15 feet bgs, including PAH-contaminated soil east of Building 1844.
- Transport excavated soil to the lower 48 states for disposal.
- Implement SVE similar to Alternative SS006-3 and operate the system for 10 years.
- Use a combination of EAB/EBT to treat the contaminants in groundwater.

Alternative SS006-4 is similar to Alternative SS006-3 except that instead of using SVE alone to remove TCE from soil, soil with the highest concentrations (greater than 10 mg/kg) would be excavated and transported to a landfill in the lower 48 states for disposal. This alternative would more rapidly reduce the highest concentrations of TCE in soil than Alternative SS006-3 and may also more quickly reduce concentrations in groundwater in the area of the excavation. Compared to Alternative SS006-3, soil within the excavation areas would reach CULs immediately upon soil removal. However, soil outside the excavation boundaries and deeper in the variably saturated zone below 15 feet bgs would take similar times to reach CULs compared to Alternative SS006-3. The SVE design and implementation considerations would be the same as discussed above for SS006-3. Following the installation of the SVE system, EAB/EBT would be implemented, identical to Alternative SS006-3.

As described in Remedial Alternatives SS006-2 and SS006-3, LUCs and MNA would also be included in Alternative SS006-4. A groundwater monitoring program would be established to document reductions in COC concentrations/mass and plume stability or contraction via MNA and to monitor the effectiveness of the source area SVE system. As with Alternatives SS006-2 and SS006-3, LUCs and MNA would be required until CULs are achieved.

With Alternative SS006-4, the SVE system is assumed to be in operation for 10 years. This alternative is expected to take approximately 10 years to reach soil cleanup goals and 20 years to reach groundwater cleanup goals.

RAO 1 would be achieved once LUCs are implemented and COC concentrations in soil meet the ADEC Method Two CULs protective of human health. RAO 2 (achieve Table C CULs) would be achieved once EAB/EBT and MNA have reduced concentrations of COCs in groundwater to below CULs. RAOs 3 (control further degradation of groundwater) would be achieved within the excavation boundaries immediately following the hotspot soil removal but would not be achieved in other areas until SVE has reduced concentrations of COCs in subsurface soil to concentrations protective of groundwater.

Alternative SS006-5 – Excavation of PAH-Contaminated Surface Soil, Limited *In Situ* Chemical Oxidation of TCE-Contaminated Soil, Soil Vapor Extraction, Enhanced Anaerobic Bioremediation/Enhanced Biogeochemical Transformation, Land Use Controls, and Monitored Natural Attenuation

Capital Cost:	*$5,200,000*
O&M Cost:	*$4,000,000*
Total Present Value:	*$9,200,000*

Alternative SS006-5 consists of the following actions:

- All the components of Alternative SS006-4, except that chemical oxidation would be used to treat the TCE-contaminated soil instead of excavation.

Alternative SS006-5 is similar to Alternative SS006-4 except that instead of using excavation to address TCE hotspot soil concentrations, this contamination would be treated with chemical oxidation. An advantage to using ISCO verses excavation for Site SS006 is that ISCO could be injected deeper than the 15-foot limit for excavation. Also, with ISCO it is assumed that the concrete slab would not need to be removed prior to implementing the remedy. Chemical oxidation would involve the injection of oxidants into

the soil using temporary wells or a small drill rig. Once injected, the oxidant chemically transforms the contamination to innocuous end products (carbon dioxide and water and chloride if TCE is also present). The specific oxidant to be used would be determined following the collection of additional soil samples to refine the area with TCE concentrations greater than 10 mg/kg. The oxidation process would be complete within days or weeks, but multiple applications may be required. Confirmation sampling would be completed to determine monitor the effectiveness of chemical oxidation. Injection of chemical oxidants into the subsurface soil would be subject to federal regulations under 40 CFR 144.82 for the Underground Injection Control Program.

Once chemical oxidation is complete, the SVE system will be installed. SVE design and implementation considerations will be the same as discussed for Alternatives SS006-3 and -4. With Alternative SS006-5, the SVE system is assumed to be in operation for 10 years. This alternative is expected to take approximately 10 years to reach soil cleanup goals and 20 years to reach groundwater cleanup goals. After the installation of the SVE system, EAB/EBT would be implemented to reduce concentrations of contaminants in groundwater.

As with Alternatives SS006-2, SS006-3, and SS006-4, LUCs and MNA would be required until Cleanup Compete is achieved. RAO 1 would be achieved once contaminant concentrations in soil achieve the ADEC Method Two CULs for human health; however, excavation of PAH-contaminated soil would reduce the greatest risk to receptors. LUCs would be implemented to prevent receptors from being exposed to contaminants until Cleanup Complete is achieved. RAO 2 (achieve Table C CULs) would be achieved once EAB/EBT and MNA had reduced concentrations of COCs in groundwater to below CULs. RAO 3 (control further degradation of groundwater) would be achieved once ISCO, SVE, and natural attenuation of contaminants in soil have reduced concentrations of COCs in subsurface soil to concentrations protective of groundwater.

Alternative SS019-1 – No Action

Capital Cost:	*$0*
O&M Cost:	*$0*
Total Present Value:	*$0*

Under the Defense Environmental Restoration Program, evaluation of a no-action remedial alternative is required, pursuant to the NCP, 40 CFR 300.430[e][6], to provide a baseline for comparison with other remedial alternatives. Under Alternative SS019-1, No Action would be taken to address the impacted media identified at the site. With the No Action alternative, no formal programs would be put into place to control or monitor potential receptor exposures to site contaminants. Over time, the organic contaminants would attenuate naturally. Alternative SS019-1 does not meet the RAOs and does not comply with the ARARs.

Alternative SS019-2 – Land Use Controls, Monitored Natural Attenuation, and Removal of Dry Well

Capital Cost:	*$44,000*
O&M Cost:	*$1,056,000*
Total Present Value:	*$1,100,000*

Alternative 2 consists of the following actions:

- File a Notice of Environmental Contamination with the state recorder's office.
- Utilize administrative procedures and policies (LUCs) to prevent receptors from coming into contact with contamination at the site, until cleanup goals are achieved.
- Evaluate existing wells to be used for MNA sampling. Apply MNA to verify that COC concentrations in groundwater are stable or decreasing and that the contaminant plume is not expanding.
- Remove and administratively close the former dry well following the substantive requirements of the USEPA underground injection control procedures for class V injection wells.
- Conduct Five-Year Reviews to evaluate the protectiveness of the remedy.

Alternative SS019-2 would require long-term maintenance of institutional controls that would be used to prevent uncontrolled exposure of potential receptors to contaminated soil and groundwater. Controls/monitoring would be required if any excavation activities are performed that are unrelated to site restoration. In addition, land use would be restricted to preclude residential development and withdrawal of groundwater for any beneficial use over the groundwater plume. Any structures built at the site would need to be designed and constructed to mitigate vapor intrusion concerns. Implementation of Alternative SS019-2 would require documentation of the LUCs, maintenance of administrative controls through review of work clearance permits, periodic inspections of the site, periodic monitoring of contaminant concentrations and corrective action for LUC violations. A LUC implementation plan would be prepared, and LUCs would be maintained until cleanup goals are achieved. Periodic soil sampling would be conducted once every ten years to track the natural attenuation of COCs in soil. Groundwater monitoring would be conducted to ensure contaminants in groundwater are not migrating. Details of the MNA sampling would be described in a work plan.

The former dry well would be removed by excavating the buried 55-gallon drum, connecting piping, and gravel that reportedly surrounds the buried drum. Connecting piping would be plugged with grout if it cannot be removed. The hole would be backfilled with clean soil. Any soil, gravel, or sludge that is removed would be characterized and either treated and disposed of at the Galena landfarm or, if the soil has TCE, it could be treated *ex situ* at an approved location at Galena or transported to an appropriate disposal facility for disposal outside of Galena.

A time period of at least 100 years is anticipated for Alternative SS019-2. RAO 1 would be achieved after installing the cap and implementing LUCs, however this alternative is not expected to achieve all RAOs within this time period. All RAOs would eventually be met through MNA, but only over a long timeframe.

Alternative SS019-3 – Soil Vapor Extraction, Bioventing, Land Use Controls, and Monitored Natural Attenuation

Capital Cost:	*$300,000*
O&M Cost:	*$700,000*
Total Present Value:	*$1,000,000*

Alternative SS019-3 consists of the following actions:

- All the components of Alternative SS019-2 with the addition of SVE and bioventing.
- Use SVE to treat VOCs in soils. Modify the existing SVE pilot test systems by installing additional wells.
- After VOCs have been removed to the extent practicable, convert the SVE system into a bioventing system to treat remaining petroleum constituents in the soil.

The existing SVE pilot test system would be expanded in the source area to remove VOCs from the soil. Discharge of vapors from the SVE system would be subject to federal regulations under 40 CFR 63.40-44 for the National Emissions Standards for Hazardous Air Pollutants.

Once VOCs meet the CULs, the SVE system would be modified to a bioventing system, which injects air into the soil to biodegrade the remaining petroleum contamination in soil. Bioventing works by supplying oxygen to the existing soil microorganisms. The microorganisms utilize the oxygen and break down the petroleum compounds to carbon dioxide and water.

With Alternative SS019-3, the SVE system would be in operation for four years, followed by six years of bioventing. Site SS019 is estimated to achieve Cleanup Complete in approximately 10 years. Because the Site SS006 TCE plume underlies Site SS019, it is assumed that Site SS006 LUCs would remain in effect on the footprint of Site SS019 until Site SS006 reaches Cleanup Complete.

RAO 1 would be achieved when LUCs are implemented and COC concentrations meet the ADEC Method Two CULs for protection of human health. RAO 2 (achieve Table C CULs) would be achieved through source treatment (SVE and bioventing) and MNA. RAO 3 (control further degradation of groundwater) would be achieved after SVE and bioventing have reduced concentrations of COCs in soil to levels that are protective of groundwater.

Alternative SS019-4 – *In Situ* Chemical Oxidation, Land Use Controls, and Monitored Natural Attenuation

Capital Cost:	*$8,600,000*
O&M Cost:	*$1,100,000*
Total Present Value:	*$9,700,000*

Alternative SS019-4 consists of the following actions:

- All the components of Alternative SS019-2 with the addition of chemical oxidation.
- Remove the existing SVE pilot test blower shed and use chemical oxidation to treat COCs in soil.

Alternative SS019-4 uses ISCO to rapidly reduce concentrations of COCs in soil to the ADEC Method Two CULs. ISCO would target COCs in soil above the ADEC Method Two migration to groundwater CULs (approximately 7,700 square feet) from approximately 0 to 15 feet bgs.

As with Alternative SS019-2, and -3, CERCLA Five-Year Reviews would be conducted and LUCs would be maintained until concentrations of all COCs in soil and groundwater are at levels that allow for Cleanup Complete. Alternative SS019-4 also would include removal and administrative closure of the dry well. It is assumed that the dry well would be removed along with the initial ISCO application. Soil confirmation sampling in year one followed by a second ISCO application in year two, is assumed. Baseline and five years of groundwater monitoring is assumed. For cost estimating, a timeframe of five years was used for maintaining LUCs at Site SS019; however, because the TCE plume from Site SS006 underlies Site SS019, LUCs associated with Site SS006 LUCs would likely remain in effect after Site SS019 has achieved Cleanup Complete.

RAO 1 would be achieved immediately after development and implementation of the LUCs and would be achieved as long as LUCs were enforced. Alternative SS019-4 would actively treat contamination in soil and groundwater more quickly than with natural attenuation alone, resulting in more rapid attainment of RAOs 2 and 3. RAO 2 (achieve Table C CULs) would be achieved through source

reduction. RAO 3 (control further degradation of groundwater) would be achieved after ISCO has reduced COC concentrations in soil to levels that are protective of groundwater.

H. EVALUATION OF ALTERNATIVES

During the detailed analysis phase, remedial alternatives were evaluated with respect to seven of the nine evaluation criteria outlined by the NCP (40 CFR 300.430) and USEPA guidance for conducting FSs under CERCLA. These evaluation criteria are divided into three categories: *threshold criteria, primary balancing criteria, and modifying criteria*. Threshold criteria are those that must be met for an alternative to be viable for selection in the ROD. Primary balancing criteria form the basis for comparing alternatives for the site-specific conditions. Modifying criteria are addressed in the ROD after the RI, FS, and this PP are completed, incorporating state and community feedback.

The nine evaluation criteria are categorized as follows:

Threshold Criteria

- Overall protection of human health and the environment
- Compliance with ARARs

Primary Balancing Criteria

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume (TMV) through treatment
- Short-term effectiveness
- Implementability
- Cost

Modifying Criteria

- State acceptance
- Community acceptance

Each remedial alternative was evaluated against the criteria. The Site SS006 and SS019 results are summarized in **Tables 5** and **6**, respectively, and explained in further detail in the following sections.

H.1 Threshold Criteria

The two threshold criteria (Overall Protection of Human Health and the Environment, and Compliance with ARARs) are used as pass/fail criteria to reflect the emphasis on these criteria over other evaluation criteria.

Remedial alternatives that fail to meet the threshold criteria were removed from further evaluation and not evaluated with respect to the balancing criteria. **Tables 5** and **6** summarizes the comparative analysis of the remedial alternatives for Sites SS006 and SS019, respectively, and includes both the threshold and balancing criteria.

H.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is measured by whether the RAOs are achieved. Achievement of RAOs could not be demonstrated by Alternatives SS006-1 or SS019-1, and therefore these alternatives fail to meet this threshold criterion. Alternatives SS006-2 (concrete/asphalt cap, LUCs, and MNA) and SS019-2 (LUCs and MNA) would protect human health through implementation of LUCs and ECs and would ultimately achieve all RAOs through natural attenuation processes. Alternatives SS006-3, SS006-4, SS006-5, SS019-3, and SS019-4 would achieve all RAOs and are considered protective of human health and the environment.

H.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Except for Alternatives SS006-1 and SS019-1, No Action, each of the alternatives complies with ARARs. Detailed information on the ARARs can be found in the FS report for Sites SS006/SS019.

H.2 Primary Balancing Criteria

A numerical ranking system was developed for comparing and ranking the remedial alternatives that pass the threshold criteria. The five primary balancing criteria are weighted to provide a maximum possible 20 points each for a total possible score of 100 points. Modifying criteria (state and community acceptance) are not included in the ranking system, but will be considered in the selection of the final remedy in the ROD through the comments received on the PP. Ranking assignments were simplified to provide relative indications of very low (0), low (6), moderate (13), or high (20) conformance with the specified criteria. **Tables 5** and **6** summarize the comparative analysis of the remedial alternatives for Sites SS006 and SS019, respectively, and list their numerical scores against the evaluation criteria.

H.2.1 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of the remedial alternative to maintain reliable protection of human health and the environment over time. This criterion includes the consideration of residual risk that would remain onsite following remediation (if any), and the adequacy and reliability of controls.

Alternative SS006-2 was scored “low” (6) because CULs are not expected to be achieved through natural processes in a reasonable timeframe (i.e., assumed to be on the order of 100 years or more) and long-term management of contamination in soil

and groundwater would be required. Because Alternatives SS006-3 and SS006-5 actively remove or treat contaminants to ultimately achieve Cleanup Complete, they were scored “high” (20). Alternative SS006-4 was also scored “high” (20) because a significant mass of contaminants would be permanently removed through excavation and disposal outside of Galena and the remaining contaminant mass would ultimately be reduced to levels allowing Cleanup Complete through SVE, EAB/EBT, and MNA.

Alternative SS019-2 was scored “low” (6) because, although it may eventually achieve CULs, CULs are not expected to be achieved through natural processes in a reasonable timeframe (i.e., assumed to be on the order of 100 years or more). Alternatives SS019-3 and SS019-4 treat contaminants to achieve CULs and therefore offer a higher level of long-term effectiveness and permanence. Alternatives SS019-3 and SS019-4 were scored “high” (20) because both alternatives are expected to achieve Cleanup Complete

H.2.2 Reduction in Toxicity, Mobility, or Volume through Treatment

Reduction in TMV through treatment refers to the anticipated performance of the treatment technologies that may be included as part of the remedial alternative.

Alternatives SS006-3, SS006-4, and SS006-5 all would implement EAB/EBT for *in situ* treatment of TCE in soil and groundwater, and each of these alternatives would implement excavation for PAH-contaminated surface soil. These alternatives differ in how they address the most highly contaminated soil. Alternatives SS006-3 and SS006-5 use engineered *in situ* treatment technologies that would be implemented to reduce COC concentrations in both soil and groundwater. Alternative SS006-5 would mineralize TCE in place using ISCO, while Alternative SS006-3 would rely on extraction of TCE and may or may not require treatment of the extracted vapor. Alternatives SS006-3 and SS006-5 were scored “high” (20). Alternative SS006-4 would excavate the highest concentrations of TCE. Because this alternative only addresses soils down to 15 ft bgs, and doesn’t excavate all of the contamination in soil, Alternative SS006-4 was scored “low” (6). Alternative SS006-2 relies solely on natural processes to reduce the TMV of contaminants and was scored “very low” (0) because this alternative does not utilize treatment.

Alternatives SS019-3 and SS019-4 use engineered *in situ* treatment technologies that would reduce COC concentrations in both soil and groundwater and therefore these alternatives were scored high (20). Alternative SS019-2 relies solely on natural processes to reduce contaminants at Site SS019 and was scored “very low” (0) because this alternative does not utilize treatment.

H.2.3 Short-Term Effectiveness

Short-term effectiveness addresses the time needed to implement the remedy and any adverse impacts on workers, the community, and the environment during construction and operation of the remedy.

Alternative SS006-2 does not include engineered cleanup, and the only construction-related activity is the installation of a concrete or asphalt cap. Because there is little risk posed to construction workers, the community, or the environment by Alternative SS006-2, this alternative was scored “high” (20) against this criterion. Alternatives SS006-3, SS006-4, and SS006-5 are similar except that Alternatives SS006-4 and SS006-5 include excavation of TCE-contaminated soil and ISCO of TCE-contaminated soil, respectively, which are not included in SS006-3. Alternative SS006-3 presents lower risk to construction workers, the community, or the environment when compared to Alternatives SS006-4 and SS006-5, and therefore, it was scored “moderate” (13). Because of the construction and demolition activity associated with Alterative SS006-4 and the use of chemical oxidants with Alternative SS006-5, these alternatives were scored “low” (6) against this criterion.

Alternatives SS019-2, SS019-3, and SS019-4 are similar in that they each include removal of the dry well. Alternative SS019-3 includes SVE followed by bioventing, and SS019-4 consists primarily of ISCO treatment of soil. Because of the relatively low level of construction activity, there is little risk posed to construction workers, the community, or the environment by Alternative SS019-2, and therefore, this alternative was scored “high” (20) against this criterion. Alternative SS019-3 includes installation of an SVE system. Alternative SS019-3 was scored “Moderate” (13) against this criterion due to the construction activity associated with the SVE and bioventing system. Alternative SS019-4, which would implement ISCO presents the highest risk to workers, the community, or the environment for these three alternatives and was scored “low” (6), against this criterion.

H.2.4 Implementability

Implementability addresses the technical and administrative feasibility of a remedial alternative from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Table 5 - Comparative Analysis of Remedial Alternatives for Site SS006

CRITERIA	Alternatives				
	1 No Action	2 Asphalt/Concrete Cap, LUCs, and MNA	3 Excavation of PAH-Contaminated Surface Soil, SVE, EAB/EBT, LUCs, and MNA	4 Excavation of PAH-Contaminated Surface Soil, Limited Excavation of TCE-Contaminated Soil, SVE, EAB/EBT, LUCs, and MNA	5 Excavation of PAH-Contaminated Surface Soil, Limited ISCO of TCE-Contaminated Soil, SVE, EAB/EBT, LUCs, and MNA
THRESHOLD CRITERIA					
Overall Protection of Human Health and the Environment	Fail	Pass	Pass	Pass	Pass
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)	Fail	Pass	Pass	Pass	Pass
BALANCING CRITERIA (1)					
Long-Term Effectiveness and Permanence	N/A	6	20	20	20
Reduction of Toxicity, Mobility, or Volume Through Treatment	N/A	0	20	6	20
Short-Term Effectiveness	N/A	20	13	6	6
Implementability	N/A	13	20	13	6
Cost	N/A	20	13	6	13
MODIFYING CRITERIA					
State Acceptance	N/A	Neutral	Accept	Neutral	Neutral
Community Acceptance	N/A	TBD	TBD	TBD	TBD
TOTAL SCORE	N/A	59	86	51	65

Notes: ISCO = in situ chemical oxidation, MNA = monitored natural attenuation, N/A = not applicable because the alternative failed threshold criteria, TBD = to be determined.

1. Balancing Criteria Scores based on the following: Very Low = 0, Low = 6, Moderate = 13, High = 20. Scoring for Table 3 was updated in response to input from ADEC subsequent to the finalization of the Site FT001 FS report.

Table 6 - Comparative Analysis of Remedial Alternatives for Site SS019

CRITERIA	Alternatives			
	1 No Action	2 LUCs, MNA, and Removal of Dry Well	3 LUCs, MNA, and SVE/Bioventing	4 LUCs, MNA, and ISCO
THRESHOLD CRITERIA				
Overall Protection of Human Health and the Environment	Fail	Pass	Pass	Pass
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)	Fail	Pass	Pass	Pass
BALANCING CRITERIA (1)				
Long-Term Effectiveness and Permanence	N/A	6	20	20
Reduction of Toxicity, Mobility, or Volume Through Treatment	N/A	0	20	20
Short-Term Effectiveness	N/A	20	13	6
Implementability	N/A	6	20	13
Cost	N/A	20	20	6
MODIFYING CRITERIA				
State Acceptance	N/A	Neutral	Accept	Neutral
Community Acceptance	N/A	TBD	TBD	TBD
TOTAL SCORE	N/A	52	93	65

Notes: ISCO = in situ chemical oxidation, MNA = monitored natural attenuation, N/A = not applicable because the alternative failed threshold criteria, TBD = to be determined.

1. Balancing Criteria Scores based on the following: Very Low = 0, Low = 6, Moderate = 13, High = 20. Scoring for Table 3 was updated in response to input from ADEC subsequent to the finalization of the Site FT001 FS report.

Alternative SS006-3 has the highest implementability of the SS006 alternatives and was scored "high" (20) against this criterion. In comparison to Alternatives SS006-4 and SS006-5, Alternative SS006-3 does not include the ISCO component of Alternative SS006-5 or the demolition and excavation component of Alternative SS006-4. Alternative SS006-4 was scored "moderate" (13) against this criterion because the equipment and operators are readily available to complete excavation and demolition activities in Galena. Alternative SS006-5 was scored low because of the logistical challenges of shipping over 200,000 pounds of chemical oxidant to Galena and safely storing it until use. Alternative SS006-2 also was scored moderate (13) because of the challenges of importing the materials needed for the concrete/asphalt cap compared to the logistical challenges of the other alternatives.

Alternative SS019-3 has the highest implementability of the Site SS019 alternatives and was scored "high" (20) against this criterion. Compared to Alternative SS019-4, Alternative SS019-3 does not include ISCO but instead would use SVE and bioventing, which would use the same infrastructure. Alternative SS019-4 was scored "moderate" (13) against this criterion. Although Alternative SS019-4 would require more coordination and effort to implement than Alternative SS019-2, Alterative SS019-2 would require long-term management of LUCs and restrictions on the use of the contaminated property. Alternative SS019-2, which relies on LUCs to prevent exposure of receptors to contaminants would be administratively burdensome to the landowner and the Air Force. Although Alternatives SS019-3 and SS019-4 also include LUCs, these LUCs would eventually be removed once Cleanup Complete is achieved. Alternative SS019-2 was scored "low" (6) against this criterion.

H.2.5 Cost

The estimated TPV costs for the remedial alternatives that passed the threshold criteria for Site SS006 are:

Remedial Alternative SS006-2: $2,100,000

Remedial Alternative SS006-3: $8,600,000

Remedial Alternative SS006-4: $15,400,000

Remedial Alternative SS006-5: $9,200,000

Based on relative cost, Alternative SS006-2 was scored "high" (20), Alternatives SS006-3 and SS006-5 were scored "moderate" (13), and Alternative SS006-4 was scored "low" (6) against this criterion.

The estimated TPV costs for the remedial alternatives that passed the threshold criteria for Site SS019 are:

Remedial Alternative SS019-2: $1,100,000

Remedial Alternative SS019-3: $1,000,000

Remedial Alternative SS019-4: $9,700,000

Based on relative cost, Alternatives SS019-2 and SS019-3 were scored "high" (20) and Alternative SS019-4 was scored "low" (6) against this criterion.

The total present value cost is based on a 0.7 percent discount rate. Cost estimates were developed following USEPA guidance and are considered accurate to within -30 percent to +50 percent of actual expected costs.

I. PREFERRED ALTERNATIVE

Site SS006

Based on the comparative analysis of alternatives described above and the scoring results summarized in **Table 5**, Alternative SS006-3 is the preferred remedial alternative for Site SS006. Alternative SS006-3 received the highest cumulative score based on the evaluation criteria applied.

With this alternative, surface soil contaminated with PAHs would be excavated, characterized, and either disposed of outside of Galena or treated in the Galena landfarm. Additional soil samples will be collected to determine the appropriate disposal or treatment option. Alternative SS006-3 uses SVE to remove VOCs from the vadose zone and variably saturated zone. VOCs in groundwater would be treated *in situ* using a combination of EAB/EBT for the core of the VOC plume and MNA for the remainder of the plume. Intrinsic remediation would be used for contaminated soil outside of the SVE treatment area. Monitoring would be used to verify the effectiveness of the initial EAB/EBT by documenting reductions in COC concentrations/mass and plume stability or contraction. Subsequent EAB/EBT injection events may be conducted based on the results of the performance monitoring. Utility poles will be moved to a location that does not pose a risk for release to soil or groundwater. LUCs would be implemented and maintained until Cleanup Complete is achieved.

The proposed preferred alternative is based on current information and could change in response to public comments or new information.

With Alternative SS006-3, RAO 1 (prevent exposure of human receptors to unacceptable carcinogenic and noncarcinogenic risk) would be achieved once LUCs are implemented and contaminant concentrations reach the ADEC Method Two CULs for the protection of human health. RAO 2 (achieve

Table C CULs) would be achieved once EAB/EBT and MNA have reduced concentrations of COCs in groundwater to below CULs. RAO 3 (control further degradation of groundwater) would be achieved following completion of SVE, EAB/EBT, and natural attenuation of contaminants in soil have reduced concentrations of COCs in subsurface soil to concentrations protective of groundwater.

With Alternative SS006-3, Site SS006 is expected to reach "remedy in place" within two years of finalizing the ROD. Baseline and annual soil vapor sampling of VOCs will monitor the progress of the remedy, and soil samples will be collected to confirm that contaminant concentrations in soil have been reduced below CULs. Groundwater monitoring will be conducted in association with MNA to document achievement of groundwater CULs. The time-frame for achieving Cleanup Complete is expected to be on the order of 20 years. LUCs and Five-Year Reviews will be required until Cleanup Complete is achieved. Alternative migration to groundwater CULs are developed under Method Three per 18 AAC 75.340(e) (presented in Appendix E) and should minimize the timeframe for LUCs.

Remedy details will be provided in a work plan, which will detail the design of the remediation systems and the performance monitoring program. The work plan will specify performance metrics and outline a plan for system modification, optimization, and contingencies.

After completing site cleanup, the risk from hazardous substances will be evaluated to ensure it does not exceed a cumulative carcinogenic risk of 1 in 100,000 or a cumulative non-carcinogenic hazard index of 1 across all exposure pathways per 18 AAC 75.325(g). Alternative SS006-3 is expected to take 20 years to meet CULs at an estimated total present value cost of $8,600,000.

Site SS019

Based on the comparative analysis of alternatives described above and the scoring results summarized in **Table 6**, Alternative SS019-3 is the preferred remedial alternative for Site SS019. Alternative SS019-3 received the highest cumulative score based on the evaluation criteria applied.

With this alternative, SVE would be used to remove VOCs from soil (and potentially also via enhanced aerobic biodegradation of fuel hydrocarbons) within 15 feet of the ground surface to levels that are protective of human health. After VOCs have been removed to the extent practicable, soil sampling would be conducted to evaluate the remaining concentrations of COCs in soil. Then, the SVE system would be converted to a bioventing system in order to aerobically treat any remaining petroleum constituents in soil. The dry well will be removed and administratively closed in the USEPA underground injection control program.

The SVE portion of the Site SS019 remedy was installed as a pilot system. Additional remedy details will be provided in a work plan following completion of the ROD.

The proposed preferred alternative is based on current information and could change in response to public comments or new information.

With Alternative SS019-3, RAO 1 (prevent exposure of human receptors to unacceptable carcinogenic and noncarcinogenic risk) would be achieved when LUCs are implemented and COC concentrations meet the ADEC Method Two CULs for protection of human health. RAO 2 (achieve Table C CULs) would be achieved through source treatment (SVE and bioventing) and MNA. RAO 3 (control further degradation of groundwater) would be achieved after SVE and bioventing have reduced concentrations of COCs in soil to levels that are protective of groundwater.

With Alternative SS019-3, Site SS019 is expected to reach "remedy in place" within one year of finalizing the ROD. Baseline and annual soil vapor sampling of VOCs will monitor the progress of the remedy, and soil samples will be collected to confirm that contaminant concentrations in soil have been reduced below CULs. Groundwater monitoring will be conducted in association with MNA to document achievement of groundwater CULs. The time-frame for achieving Cleanup Complete is expected to be on the order of 10 years. LUCs and Five-Year Reviews will be required until Cleanup Complete is achieved.

Remedy details will be provided in a work plan, which will detail the design of the remediation systems and the performance monitoring program. The work plan will specify performance metrics and outline a plan for system modification, optimization, and contingencies.

After completing site cleanup, the risk from hazardous substances will be evaluated to ensure it does not exceed a cumulative carcinogenic risk of 1 in 100,000 or a cumulative non-carcinogenic hazard index of 1 across all exposure pathways per 18 AAC 75.325(g). Alternative SS019-3 is expected to take 10 years to meet CULs at an estimated total present value cost of $1,000,000.

Sites SS006 and SS019

Based on information currently available, the Air Force believes the preferred remedial alternatives for Sites SS006 and SS019 meet the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the

balancing and modifying criteria. The Air Force expects the preferred remedial alternatives to satisfy the statutory requirements of CERCLA § 121(b):

1) Be protective of human health and the environment;
2) Comply with ARARs;
3) Be cost-effective;
4) Utilize permanent solutions and alternative treatment technologies to the maximum extent practicable; and
5) Satisfy the preference for treatment as a principal element, including treatment of *principal threat wastes* (contaminated soil) at Site SS006.

ADEC concurs that the alternative selected complies with state law and has approved the FS for Sites SS006 and SS019. ADEC can also provide additional comments to the Air Force during the public comment period for this PP.

J. COMMUNITY PARTICIPATION

A public meeting will be held to allow the public the opportunity to review and provide comments on this PP. Details of the meeting are provided in the "Community Involvement Opportunities" text box, together with the location of the AR for the Former Galena FOL.

Relevant documents found in the AR include:

- Remedial Investigation Results Report, Sites SS006 and SS019, Former Galena Forward Operating Location, Alaska, Final (AR #714).
- Supplemental Remedial Investigation Report, Trichloroethene (TCE) Area (Site SS006) and Building 1700-Refueler Maintenance Shop (Site SS019), Former Galena Forward Operating Location, Alaska, Final (AR #456403).
- Feasibility Study Report for Trichloroethene (TCE) Area (Site SS006)/Building 1700 – Refueler Maintenance Shop (Site SS019), Former Galena Forward Operating Location, Final (AR #569773).
- Human Health Risk Assessment Report for TCE Area and Building 1700 (Sites SS006 and SS019), Former Galena Forward Operating Location, Alaska, Final (AR #459013).

Additional Relevant documents include:

- Technical Memorandum: Additional Information about Exposure to TCE, Alaska Department of Environmental Conservation Division of Spill Prevention and Response Contaminated Sites Program, November 2017.

Acronyms and Abbreviations

µg/L	microgram(s) per liter
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFCEC	Air Force Civil Engineer Center
AR	Administrative Record
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
COC	constituent of concern
CUL	cleanup level
DoD	Department of Defense
DRO	diesel range organics
EAB	enhanced anaerobic bioremediation
EBT	enhanced biogeochemical transformation
EDB	ethylene dibromide
FOL	Forward Operating Location
FS	Feasibility Study
GRO	gasoline range organics
ISCO	*in situ* chemical oxidation
LOX	liquid oxygen
LUC	land use control
mg/kg	milligram(s) per kilogram
MNA	monitored natural attenuation
NCP	National Contingency Plan
O&M	operations and maintenance
OWS	oil-water separator
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PP	Proposed Plan
RAO	remedial action objective
RI	remedial investigation
ROD	Record of Decision
RRO	residual range organics
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
TCE	trichloroethene
TMV	toxicity, mobility, or volume
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound

Glossary

Administrative Record (AR): A record maintained by the USAF of all reports, studies, evaluations, records, or other information relating to the environmental restoration program for a specific installation.

Alaska Department of Environmental Conservation (ADEC): The state agency responsible for protecting public health and environment within the state. The Spill Prevention and Response Division is charged with protecting public health and the environment from sites contaminated by oil or other hazardous substances.

Applicable, relevant, or appropriate requirements (ARARs): State and federal laws and regulations that need to be met or considered in development and implementation of cleanup alternatives for a site. These include cleanup standards, standards of control, and other substantive environmental protection requirements, factors, or limitations under state and federal law.

Base Closure and Realignment Act: The federal law that provides the authority, process, and schedule for closing an operating DoD facility.

Bioventing: A technique to treat soil contaminated with petroleum products or other organic chemicals. Air is forced into the soil through specially designed wells. The oxygen enhances growth of naturally occurring bacteria in soil. The bacteria feed on the contaminants in the soil, chemically breaking down the contaminants into non-hazardous components. The air can be heated to enhance bacteria growth.

Carcinogenic Risk: Cancer risk is assessed by examining the likelihood of cancer resulting from exposure to contaminants at a site. Cancer risk is expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to carcinogens. For example, a 1 in 100,000 risk (usually written as "1 x 10^{-5}") means for every 100,000 people (receptors) exposed to site contaminants, one extra case of cancer may occur than normally would be expected from all other causes in the area. ADEC has established a target cumulative cancer risk standard of 1 in 100,000 ($1x10^{-5}$) per 18 Alaska Administrative Code (AAC) 75.325(g).

Chemical Oxidation: An innovative treatment technology that oxidizes contaminants in soil or dissolved in groundwater and converts them into insoluble compounds. This technology is sometimes referred to as In Situ Chemical Oxidation or ISCO because it cleans up contamination "in place".

Cleanup: Efforts to mitigate environmental damages or threat to human health, safety, or welfare from hazardous substances or oil. It may include removal of hazardous substances from the environment, including restoration, remediation, and other measures necessary to mitigate or avoid further threat to public health, safety and welfare, or the environment. Cleanup is often used interchangeably with terms like corrective action, remedial action, removal action, or response action. It is often used broadly to describe various actions or phases of an action, such as the RI/FS in the CERCLA process.

Cleanup Complete: A determination made by ADEC for a contaminated site when efforts to reduce hazardous substance contamination have either achieved the strictest levels established in state regulation, or the possibility of human exposure to any residual contamination is highly unlikely. When "cleanup complete" is achieved, land use and/or activity controls to protect human health and the environment from future exposure are not required.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): Commonly known as the Superfund law, CERCLA is a federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. Per CERCLA 117(a) (42 United States Code (U.S.C.) § 9617(a); and the *National Contingency Plan* (NCP) Title 40 Code of Federal Regulations (C.F.R.) §300.430(f)(2), the USEPA is responsible for implementing these laws. Under the program, USEPA can either: 1) pay for the site cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work, and/or 2) take legal action to force parties responsible for site contamination to clean up the site or pay back the federal government for the cost of the cleanup.

Current and Future Occupational Worker: This receptor is a standard industrial worker who works at the same location for multiple years and whose work involves incidental contact with soil, either indoors (as dust) or outdoors. This worker is not involved in excavation work, but work activities may include outdoor maintenance activities such as light landscaping. Current and future occupational workers may be exposed to constituents in soil to 2 feet bgs by incidental ingestion, dermal contact, and inhalation of ambient dust and vapors in ambient air; and inhalation of vapors migrating from subsurface soil and groundwater to indoor air. Potential exposure to constituents in groundwater may occur by ingestion as drinking water. Dermal contact with groundwater is not anticipated for the occupational worker. Additionally, dermal contact with, incidental ingestion of, and inhalation of ambient dust from

subsurface soil (below 2 feet bgs) is not anticipated for the occupational worker.

Defense Environmental Restoration Program: A program establishing authorities and responsibilities for conducting environmental restoration activities at facilities under DoD jurisdiction. This law establishes DoD and Component Environmental Restoration Accounts (ERAs) to fund DERP activities (10 USC § 2701 et seq.). The Air Force conducts its DERP activities as the Environmental Restoration Program.

Diesel Range Organics (DRO): Consists of compounds that generally represent the diesel fuel range of petroleum hydrocarbons.

Feasibility Study (FS): A CERCLA document that analyzes potential remediation methods based on human health and ecological risk assessment results. The FS emphasizes RAOs and evaluates the relative advantages and disadvantages of selected potential remedial alternatives at contaminated sites.

Future Construction/Excavation Worker: The excavation/construction worker receptor is considered primarily to address short-term, but more intense exposure to surface and subsurface soil and potentially to groundwater. Excavation/trench work is assumed. Excavation/construction workers may be exposed to constituents in soil to 15 feet bgs and to shallow groundwater by incidental ingestion, dermal contact, and inhalation of ambient dust and vapors in outdoor air. For Sites SS006 and SS019, ingestion of groundwater as drinking water is not anticipated for the excavation/construction worker.

Gasoline Range Organics (GRO): Consists of compounds that generally represent the gasoline range of petroleum hydrocarbons.

General Response Action: A broadly defined group, class, or type of action that could possibly be used to achieve the RAOs.

Groundwater: Water found beneath the earth's surface that fills pores between soil/sediment particles (such as silt, sand, or gravel) creating a saturated zone. In aquifers, groundwater is present in sufficient quantities that it can be used for drinking water, irrigation, or other purposes.

Human Health Risk Assessment: An estimate of the potential harmful effects humans may experience as a result of exposure to chemicals in contaminated soil or groundwater.

Hypothetical Future Resident: The on-site resident receptor is evaluated to address unrestricted land use, even where future residential land use is unlikely. This receptor is a standard child/adult resident who lives at the same location for multiple years and whose activities involve contact with soil and groundwater. Hypothetical long-term future residents may be exposed to constituents in soil to 15 feet bgs by incidental ingestion, dermal contact, and inhalation of ambient dust and vapors in ambient air; and inhalation of vapors migrating from subsurface soil and groundwater to indoor air. Hypothetical near-term future residents may be exposed to constituents in soil to 2 feet bgs by incidental ingestion, dermal contact, and inhalation of ambient dust and vapors in ambient air; and inhalation of vapors migrating from subsurface soil and groundwater to indoor air. Potential exposure to groundwater may occur by ingestion as drinking water and dermal contact. The long-term future resident scenario addresses residential development following deep excavation and redistribution of soil. The near-term future resident scenario addresses residential development without deep excavation; therefore, dermal contact with, incidental ingestion of, and inhalation of ambient dust from subsurface soil is not anticipated for near-term residents.

Modifying Criteria: Modifying criteria for remedial alternatives, which include state and community acceptance, may be considered to the extent that information is available during the FS, but can be fully considered only after public comment on the PP is received. In the final balancing of trade-offs between alternatives upon which the final remedy selection is based, modifying criteria are of equal importance to the balancing criteria.

Monitored Natural Attenuation (MNA): The remedial approach that allows natural processes to reduce concentrations of contaminants to acceptable levels. MNA involves periodic monitoring of the impacts of physical, chemical, and biological processes that act to reduce the mass, toxicity, and mobility of subsurface contamination. Physical, chemical, and biological processes involved in MNA include biodegradation, chemical stabilization, dispersion, sorption, and volatilization.

National Contingency Plan (NCP): The National Oil and Hazardous Substances Pollution Contingency Plan (Title 40 CFR 300), more commonly called the NCP, is the federal government's plan for responding to both oil spills and releases of hazardous substances (actual and potential). The NCP is at the heart of the National Response System, under which federal departments and agencies help state and local officials protect public health and the environment during hazardous materials emergencies, including emergency removal actions at hazardous waste sites.

Non- Carcinogenic Hazard Index: The measure used to describe the potential for non-cancer health effects to occur in an individual is expressed as a "*hazard index*". The hazard index is a comparison of the estimated exposure level (considering all

contaminants present at the site and all potential pathways of exposure) to an exposure level that is considered to be without an appreciable risk of adverse effects (a "safe" level). If the hazard index (the ratio of the estimated exposure level to the "safe" exposure level) is less than 1, there is low potential for adverse human health effects resulting from exposure to contaminants at the site.

Plume: The volume of water, soil, or air impacted by the migration of contamination away from a given point of origin. The plume of a contaminant in groundwater is the volume of water which, as it moves underground, carries the contaminant with it. Portions of the plume close to the source will typically have higher concentrations than portions farther away from the source. Natural physical, chemical, and biological processes diminish the concentration levels as the water carries the contaminant away from the source.

Primary Balancing Criteria: Criteria used to weigh major trade-offs among remedial alternatives. The five criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost.

Principal Threat Waste: Principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur.

Proposed Plan (PP): This document summarizes for the public the preferred cleanup strategy, rationale for the preference, and alternatives presented in the detailed analysis of the RI/FS. It must actively solicit public review and comment on all the alternatives under consideration.

Public Comment Period: The time period for the public to review and submit comment on various documents and actions. A comment period cannot be less than 30 days and upon timely request to the lead agency, the comment period will be extended by a minimum of 30 additional days.

Receptors: The organism(s) or ecological resource(s) of interest that might be adversely affected by contact or exposure to a stressor. "Stressor" means any physical, chemical or biological entity that can induce an adverse effect.

Record of Decision (ROD): A document that explains which cleanup alternative(s) will be used at a site or that justifies no further action. The ROD is based on information and technical analysis generated during the RI/FS and consideration of public comments and community concerns.

Remedial Action: The actual construction or implementation of the selected cleanup plan.

Remedial Action Objectives (RAOs): The specific goals for protecting human health and the environment. RAOs are developed by evaluating the ARARs that are protective of human health and the environment and results of the RIs, including the human and ecological risk assessments. RAOs provide a general description of what the cleanup will accomplish.

Remedial Alternatives: General response actions that have the potential to meet the RAOs for a specific site.

Remedial Design: The phase of the project where engineering plans, technical drawings, and specifications are developed for the selected cleanup plan.

Remedial Investigation (RI): A CERCLA process to determine the nature and extent of the contamination resulting from the release of a hazardous substance. The RI emphasizes characterization and associated data collection at hazardous waste sites.

Residual Range Organics (RRO): Consists of compounds that contain heavy fuel products such as Bunker C fuel or asphalt.

Source Area: Area where contamination originated or was released at the site, including soil that is contaminated as a result of contaminant migration. Source areas are typically located in unsaturated or variably saturated soil above the groundwater surface. ADEC regulatory guidance also considers a source area to include all areas of the site impacted with contamination above cleanup levels, including groundwater extent.

Soil Vapor Extraction (SVE): A treatment technique that removes volatile contaminants from subsurface soil by removing air from the soil through vacuum extraction wells.

Threshold Criteria: Requirements that each remedial alternative must meet in order to be eligible for selection. They include overall protection of human health and the environment and compliance with ARARs.

Vapor Intrusion: The migration of released volatile chemicals from the subsurface into overlying buildings.

The Air Force encourages the public to comment on the remedial alternatives described in this Proposed Plan. Comments may be provided in writing or verbally at the community meeting to be held on April 11, 2018, at 7:00 p.m. at the Larsen Charlie Community Hall, Galena, Alaska. Written comments may be submitted using the comment form below. If additional space is needed, comments may be written neatly on plain white paper.

In addition, the Air Force welcomes written comments submitted directly to our office. Comments may be submitted to:

Mrs. Christiana Hewitt
2261 Hughes Ave. Ste 155
JBSA Lackland, TX 78236-9853
(210) 395-9426
or via E-mail at Christiana.Hewitt.1@us.af.mil

General Questions/Comments may also be referred to the Air Force Public Affairs team at (866) 725-7617 or afcec.pa@us.af.mil.

After the comment period closes on May 11, 2018, the Air Force will respond to all comments, which will be included in the responsiveness summary of the ROD.

Please complete the following information and mail to the address above or copy into an email to Mrs. Hewitt.

Name: _____
Address: _____

_____

Phone: _____
E-mail: _____

☐ I support the Air Force's preferred alternative
☐ I do not support the Air Force's preferred alternative

Additional Comments: