International Smelting and Refining Superfund Site

Tooele, Utah

Record of Decision

INTERNATIONAL SMELTING AND REFINING SUPERFUND SITE

EPA CERCLIS NO. UTD093120921

TOOELE, UTAH

PART I

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

The International Smelting and Refining (IS&R) Superfund Site is located just east of Tooele, Utah. The IS&R Site (Figure 1-1) occupies the lower portion of Pine Canyon on the west flank of the Oquirrh Mountains approximately two miles northeast of Tooele in Tooele County, Utah, at latitude 40°33' and longitude 112°15'. The site includes the former smelter property known as the Pine Canyon Conservation Area, portions of the Tooele Valley Railroad (TVRR) grade, and the local community and surrounding area adjacent to the land owned by Atlantic Richfield Company (formerly ARCO), locally referred to as Lincoln Township or Pine Canyon.

The U. S. Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) site identification number is UTD093120921.

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for the IS&R Site. The selected remedy has been chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, 42 U. S. Code (USC) §9601 et. seq. as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the Administrative Record for the IS&R Site and, to the extent practicable, in accordance with the NCP.

The remedy was selected by EPA Region 8. The Utah Department of Environmental Quality (UDEQ) concurs with the selected remedy.

ASSESSMENT OF THE SITE

The response action selected in this Record of Decision (ROD) is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment. Such release or threat of release may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the IS&R Site addresses smelter wastes, including tailings and contaminated soils. The selected remedy consists of monitoring and institutional controls to protect the integrity of the previously completed reclamation and Removal Actions.

Previously implemented reclamation and Removal Actions include capping of contaminated soils within the conservation area and portions of the TVRR grade, and soil removal in the conservation area, Pine Canyon community, and on portions of the TVRR

grade. Removal Actions also included repair of erosion rills and construction of new storm water berms and channels.

The current conservation easement on the conservation area (former IS&R smelter and surrounding land owned by Atlantic Richfield) will remain in place. The easement was established by Atlantic Richfield and the State of Utah, Department of Natural Resources, Division of Wildlife Resources. The easement is an agreement to preserve and protect the wildlife, natural, scenic, open space, and educational values of the property. The easement will prevent any use of the property that might significantly impair or interfere with the wildlife habitat or other conservation values. Activities that would impact existing remedial features are prohibited, such as drilling and exploration, filling, excavating, mining, dredging, removal of top soil and other materials, and commercial, industrial and agricultural use as set forth in the conservation easement. Institutional controls (ICs) are needed to supplement the easement and to ensure it specifically addresses and protects the existing remedial features. Examples include further deed restrictions or modification of the conservation easement. In addition, upgraded engineering and updated informational controls, such as perimeter fencing and signage, will continue to be maintained by the Utah Division of Wildlife Resources and will help limit unauthorized use of the property. The performance and adequacy of the ICs will be reviewed by the County on a periodic basis.

For Pine Canyon, institutional controls consisting of governmental ordinances and permit programs administered through the Tooele County Building Department and the Tooele County Health Department are expected to apply to future developable areas where metal concentrations are below recreational cleanup levels but above residential human health cleanup levels, as set forth in this ROD. ICs through the Tooele County building and health departments are also expected to apply to existing development where soil contaminants in excess of cleanup levels might be disturbed during property modifications. Undeveloped lands are being developed and proposed for development in the vicinity of Pine Canyon. As these lands become developed, particularly for residential purposes, the levels of lead and arsenic may become a matter of concern. Some of the land may require remedial action prior to being developed for residential purposes. Properties with existing development that will undergo modifications may also require remedial measures to avoid unacceptable human exposures to soil contaminants. The Tooele County building and health departments will have a process for developers and landowners to follow. Atlantic Richfield, developers, or landowners seeking to change the use of undeveloped land, such as from agricultural to residential, recreational visitor, or commercial uses, will be required to meet all requirements and specifications for the new use. The Tooele County health and building departments, with assistance as necessary from EPA and UDEQ, are expected to enforce the ICs for soils in these developable areas.

For the TVRR grade, currently existing ICs are limited to private party agreements with the landowners and Atlantic Richfield and are required to limit future development and activities from penetrating the rock cover. Additional ICs, for example, county ordinances and deed restrictions, are necessary to supplement the existing controls and

are required to limit future development and activities from penetrating the rock cover. The selected remedy will ensure the performance and enforceability of such ICs and agreements. The performance and adequacy of the ICs will be reviewed by EPA on a periodic basis.

Monitoring will be required for all three areas of the site. Monitoring by Atlantic Richfield will consist of checking the integrity of the caps, covers, and storm water controls on a regular basis. Atlantic Richfield will monitor and maintain the conservation area because it is owned by the company, and the TVRR grade capped areas. Groundwater monitoring will be conducted at the conservation area to ensure that the former smelter area does not become a source of groundwater contamination in the future. In addition, EPA and UDEQ will monitor the institutional controls to ensure they remain in place and serve their intended purpose.

Because the preferred alternative does not allow for unlimited use and unrestricted exposure, the IS&R Site will be subject to five-year reviews of how well the remedy is meeting the objectives.

STATUTORY DETERMINATIONS

The selected remedy for the IS&R Site is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate for the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the extent practicable.

The selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. Treatment was not demonstrated to be practicable for the contaminants and wastes. Given the size of the site, the dispersion of some level of waste throughout much of the site, the type of waste present, and the flexibility desired for future site use, treatment of contaminants and waste materials was not the most preferred option. No source materials constituting principal threats have been identified on the site. Treatment is therefore not a principal element of this remedy.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the decision summary section of this ROD. Additional information can be found in the Administrative Record for this site.

- Contaminants of concern (COCs) and their respective concentrations (Sections 5.3 and 7.1)
- Baseline risk represented by the COCs (Section 7)

- Preliminary remediation goals (PRGs) established for COCs and the basis for the levels (Section 7.1.7)
- Whether source materials constituting principal threats are found at the site (Section 11)
- Current and future land and ground water use assumptions used in the Baseline Risk Assessment and ROD (Section 6)
- Potential land and ground water use that will be available at the site as a result of the selected remedy (Section 6)
- Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected (Section 9)
- Key factors that led to selecting the remedy (Section 12.1)

AUTHORIZING SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

This ROD documents the selected remedial action to address the contamination at the International Smelting and Refining Superfund Site.

EPA, as the lead agency for the IS&R Site (UTD093120921), formally issues this ROD.

Carol Rushin Date
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation
U. S. Environmental Protection Agency, Region 8

The UDEQ, as the supporting agency for the IS&R Site, formally concurs and adopts this ROD.

Richard W. Sprott Date
Executive Director
Utah Department of Environmental Quality

TABLE OF CONTENTS

PART I. DECLARATION OF THE RECORD OF DECISION

PART II. DECISION SUMMARY

APPENDICES

FIGURES

PHOTOGRAPHS

TABLES

ACRONYMS

AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
ARBC	Acute Risk-Based Concentration
BERA	Baseline Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
BLM	Bureau of Land Management
BRA	Baseline Risk Assessment
BSHW	Bureau of Solid and Hazardous Waste
CAG	Community Advisory Group
CDC	Center for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act

CERCLIS	Comprehensive Environmental Response, Conservation and Liability Information System
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
COPEC	Contaminant of Potential Ecological Concern
CRBC	Chronic Risk-Based Concentration
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
DERR	Division of Environmental Response and Remediation
EPA	U. S. Environmental Protection Agency
EPC	Exposure Point Concentration
ESD	Explanation of Significant Differences
FS	Feasibility Study
ft	Foot/feet
gpd	Gallons per Day
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
HRS	Hazard Ranking System
IC	Institutional Control
IEUBK	Integrated Exposure Uptake Bioavailability
IRIS	Integrated Risk Information System
IS&R	International Smelter and Refinery
ISS	Isolated Stained Soil
mg/kg	Milligrams per Kilogram
mg/kg/day	Milligrams of Chemical Ingested per Kilogram Body Weight per Day
mg/l	Milligrams per Liter
NCEA	National Center for Environmental Assessment
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operations and Maintenance
OAPI	Observed Area of Potential Impact
P10	Probability of Blood Lead Level Exceeding 10 Microgram/Deciliter
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RBA	Relative Bioavailability
RfD	Reference Dose
RI	Remediation Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act

SLERA	Screening Level Ecological Risk Assessment
TBC	To Be Considered
TCRA	Time-Critical Removal Action
TDS	Total Dissolved Solids
TRV	Toxicity Reference Value
TVRR	Tooele Valley Railroad
UCL	Upper Confidence Level
UDEQ	Utah Department of Environmental Quality
UDWR	Utah Division of Wildlife Resources
USC	U. S. Code
USGS	U. S. Geological Survey
WA	Work Area
WIS	Waste Isolation Cell
µg/dl	Microgram per Deciliter
µg/l	Microgram per Liter
95UCL	95 percent Upper Confidence Limit on the Mean Concentration
95UTL	95 percent Upper Confidence Limit on the 90 percent Upper Tolerance Limit

PART II

DECISION SUMMARY

DECISION SUMMARY

SECTION 1

SITE NAME, LOCATION, AND DESCRIPTION

The International Smelting and Refining (IS&R) Superfund Site is located approximately two miles northeast of Tooele in Tooele County, Utah, as shown on Figure 1-1. The site occupies the lower portion of Pine Canyon on the west flank of the Oquirrh Mountains at latitude 40°33' and longitude 112°15'.

Copper, lead, and zinc smelting and refining conducted at the IS&R Site between 1910 and 1972 impacted the smelter property and adjacent lands. Atlantic Richfield Company (formerly ARCO) owns the former smelting property and the surrounding land.

The IS&R Site comprises three areas:

- The former smelter property and surrounding land known as the Pine Canyon Conservation Area, which is owned by Atlantic Richfield; and comprised the majority of the site;
- Portions of the former Tooele Valley Railroad (TVRR) grade, which extends from the conservation area to the City of Tooele, Utah; and
- Pine Canyon, which is adjacent to the conservation area. This residential area is locally referred to as Lincoln Township or Pine Canyon.

The U. S. Environmental Protection Agency Region 8 (EPA) is the lead agency for the Potentially Responsible Party (PRP)-financed IS&R Site (CERCLIS No. UTD093120921), and the Utah Department of Environmental Quality (UDEQ) is the support agency.

Conservation Area (Former IS&R Smelter and Surrounding Land Owned by Atlantic Richfield)

The 3,000-acre conservation area includes the 1,200-acre area once occupied by the smelter and tailings impoundments and all of the adjacent property owned by Atlantic Richfield. Atlantic Richfield, in conjunction with the Utah Division of Wildlife Resources (UDWR), created a conservation easement in 1994 to protect reclaimed features. The conservation area and the area included within the conservation easement are one and the same. The current boundary for this conservation area coincides with the Atlantic Richfield property boundary.

Pine Canyon

Comprising approximately two square miles, Pine Canyon is located on the western edge of the IS&R former smelter property. There are approximately 135 properties within the township with a population of about 470 people. The Pine Canyon community includes

the properties that were impacted by smelter operations.

Tooele Valley Railroad (TVRR) Grade

The TVRR grade portion of the site is the former railroad right-of-way. The TVRR grade included in the site runs from Vine Street in the City of Tooele, east to where the right-of-way intersects the conservation area boundary. The length of the former rail line is approximately 10,000 feet, and because the land use changes along the former rail line from Tooele to the conservation area, the TVRR grade was sectioned into three study areas (Figure 1-1), termed the "town," "school," and "extension" sections to reflect different land uses.

SECTION 2

SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 HISTORICAL LAND USE

Conservation Area (Former IS&R Smelter and Surrounding Land Owned by Atlantic Richfield)

IS&R began operations in Tooele in 1910 on approximately 1,200 acres. At various times, from 1910 through 1972, IS&R operated copper and lead smelters and a lead-zinc flotation mill. Once considered state of the art, the smelter processed ores mined from several areas in Utah and Nevada. The copper plant was originally designed to process 4,000 tons of ore per day, although it never sustained a rate this high. In the early years of IS&R operation, tailings and slag were produced at an estimated annual rate of approximately 650,000 tons/year with declining output in later years. Approximately 326 acres of tailings of an unknown volume are located within the tailings impoundment. The copper smelter was closed in 1946, followed by the closure of the lead/zinc flotation mill in 1968, and finally, closure of the lead smelter in 1972. With the exception of a few incidental buildings, the smelter facility was demolished or scrapped in the mid-1970s.

From 1974 through 1981, the Anaconda Company constructed and operated a mine and mill known as the Carr Fork Operation. The main mill of the Carr Fork operation was one mile east of the IS&R smelter property in Pine Canyon on approximately 12.5 acres. The Carr Fork operation began processing ore in 1979 and ran for less than two years. Tailings from the Carr Fork Operations were transported down Pine Canyon to the original IS&R tailings impoundment location, where a new 100-foot high tailings dam was constructed. Because of the short duration of operations at the Carr Fork Mill, the tailings encompass only about 64 acres behind the constructed dam.

Pine Canyon/Lincoln Township

Lincoln was settled in the late 1800s as a farming and ranching area. When the smelter was constructed in 1908, much of the original farm land was purchased by the International Smelting Company for operation of the smelter. During the operational period of the smelter, Lincoln continued to be used for farming and also became the residence for some smelter employees. Since the smelter discontinued operations in 1972, the area has experienced a slow, steady growth to its current population of about 470 people.

Lincoln Township was established in 1996 to avoid annexation. The township operates as a separate planning district within Tooele County. Current land uses include residential, recreational visitor, and open agricultural.

Tooele Valley Railroad (TVRR) Grade

The TVRR was constructed in 1909 to connect the Union Pacific and Western Pacific lines at Warner, Utah, (west of Tooele) to the IS&R smelter – a distance of approximately seven miles. The primary reason for TVRR's existence was for the support of the IS&R smelter. The railroad was used for transporting smelter ores, concentrates, equipment, and personnel to and from the site.

At Tooele the railroad went through the center of Vine Street to First Street where the line curved slightly to the north, so that it approximately paralleled Vine Street to the mouth of Middle Canyon. Shortly after Middle Canyon the track split. The upper track followed along the foothills to the smelter, and the lower track provided railroad service to the lower portion of the property. The railroad was abandoned in 1981. Over a period of three months the track was systematically removed, Vine Street was repaved, and the engine house was dismantled. The railroad grade (Figure 2-6) between what is now the western conservation area boundary and Vine Street in Tooele was sold to various entities.

2.2 SITE INVESTIGATION HISTORY

The IS&R Site has been the subject of environmental concern since 1984. A number of federal, state, and local government agencies, as well as PRPs, have been involved in the site. The following information gives a brief summary of environmental activities pertaining to the IS&R Site, and Table 2.1 provides a detailed chronology of environmental activities.

1984 Utah Division of Environmental Health, Bureau of Solid and Hazardous Waste Site Investigation

The Utah Division of Environmental Health, Bureau of Solid and Hazardous Waste (BSHW) recommended a full site investigation based on a preliminary assessment of the site conducted in March 1984. During the site investigation performed at the smelter on June 30, 1984, the BSHW collected groundwater samples of the spring emanating from under the slag pile, the tap water at Boys Ranch (source was reported to be spring water), and waste and soil samples. For soil and waste samples, total arsenic concentrations ranged from 393 to 6,040 milligrams/kilogram (mg/kg), and total lead concentrations ranged from 1,720 to 10,700 mg/kg. For groundwater, the concentration of total arsenic was less than 50 micrograms per liter (µg/l) at the base of the slag pile and 1.5 µg/l at the Boys Ranch well. The concentration of total lead in groundwater was 110 µg/l at the base of the slag pile and less than 100 µg/l at the Boys Ranch well.

1985 EPA Investigation

The EPA Region VIII Field Investigation Team collected samples of tailings and subsurface soils and a groundwater sample from a Pine Canyon well upgradient of the site. The groundwater sample was analyzed for total and dissolved metals as well as

sulfate and cyanide concentrations. Constituents in the groundwater were reported below the primary and secondary drinking water standards.

1985 Atlantic Richfield Investigation

Atlantic Richfield collected waste, soil, groundwater, and surface water samples during a 1985 investigation. Soil samples were collected along transects radiating from the center of the former smelter. One surficial soil sample obtained in the center of the former smelter location had a total lead concentration of 55,500 mg/kg and an arsenic concentration of 1,375 mg/kg. These concentrations dropped by more than an order of magnitude within six inches of the surface. The concentrations in the surficial soils also dropped significantly with distance from the center point of the former smelter. At approximately the west property line, the lead concentration was 30 mg/kg and the arsenic concentration was 7 mg/kg in surficial soil. Three sets of groundwater samples were collected from the four groundwater wells located north and west (downgradient) of the site and a spring at the base of the slag pile. All parameters in groundwater were found to be within drinking water standards. Surface water samples were collected from Pine Creek and other locations during the 1985 investigation. All parameters in surface water were found to be within drinking water standards, with the exception of cadmium found in a spring at the base of the slag pile, and lead at both the Elton Tunnel discharge and in a small stream below the Pine Canyon landfill. All parameters were within drinking water standards at the downstream property line.

1986 - 1989 Atlantic Richfield Surface Water Samples

In September 1986 Atlantic Richfield collected three samples from Pine Creek down-gradient of the slag pile. The data from these samples show dissolved metals, except lead, were within drinking water standards. Concentrations of dissolved arsenic were all less than 10 µg/l and concentrations of dissolved lead ranged from 20 to 160 µg/l.

Subsequent to the 1986 reclamation activities, Atlantic Richfield continued to sample four locations on Pine Creek in 1987, 1988, and 1989. A spring that contributed flow to the creek after contacting slag material was also sampled in 1987, after which time it dried up and has remained dry. The results of the analyses for total and dissolved metals indicated one dissolved sample exceeded the drinking water standard for lead in January 1987; however, the concentrations in Pine Creek were below drinking water standards after 1987 (post-reclamation).

1995 Utah Division of Environmental Response and Remediation Surface Water Sampling

Based on a previous Hazard Ranking System (HRS) score and results of prior sampling, the UDEQ, Division of Environmental Response and Remediation (DERR) collected water samples from Pine Creek and Swenson Canyon, a tributary to Pine Creek, and analyzed the samples for total metals. Concentrations of total arsenic ranged from less than 3 to 39.4 µg/l. Concentrations of total lead ranged from less than 2.7 to 197 µg/l.

1996 Expanded Site Investigation

The Utah DERR completed an expanded Site Investigation for the EPA in 1996 that included collection of 13 waste samples and 19 soil samples from the tailings and surficial soil in the conservation area, and from the Pine Canyon area. Total lead concentration in tailing samples ranged as high as 61,300 mg/kg, and arsenic concentrations ranged as high as 5,420 mg/kg. Total lead concentration in surficial soil samples in other areas of the conservation area ranged as high as 1,310 mg/kg, and arsenic concentrations ranged as high as 368 mg/kg. Total lead concentrations in surficial soil samples obtained from 10 residences in Lincoln ranged as high as 1,040 mg/kg, and arsenic concentrations ranged as high as 79.5 mg/kg.

The 1996 study included sampling four groundwater wells for total and dissolved metals, including a well in Pine Canyon and a Boys Ranch well.

1999 and 2000 NPL Activities

In April 1999 EPA proposed to list the IS&R Site on the National Priorities List (NPL). The HRS scoring package prepared on February 24, 1999, concluded that the total site score was 58.31.

The final listing of the IS&R Site on the NPL occurred in July 2000.

2001 – 2006 Remedial Investigation

Atlantic Richfield conducted the Remedial Investigation (RI) between 2001 and 2006, with EPA's oversight. The chief objective of the RI was to determine the potential risk to human health and the environment of the IS&R Site and adjacent land by evaluating the site in its current condition, taking into account reclamation actions completed in 1986, verifying previous investigation sample results of the site prior to reclamation, and assessing conditions in areas not previously addressed by reclamation efforts, including near-by residential areas.

The conservation area was divided into work areas (WAs) during the RI to facilitate the inspection. These WAs are shown in Figure 2-1. During the RI, soils, slag, sediment, surface water, and groundwater were sampled, and site inspections were conducted to identify areas where future remedial action may be required. In addition to samples collected on the former smelter site and surrounding fields, residential yard samples and household dust samples were collected from selected residential dwellings in the community of Pine Canyon, located west of the smelter site. The investigation monitored groundwater wells in the area of the smelter, Pine Canyon, and nearby areas.

Soil and sediment samples were analyzed for 23 metals and pH. The metals included aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver,

sodium, thallium, vanadium, and zinc. Water samples were analyzed for the same 23 metals, 4 anions, and 4 physical properties, including all drinking water standards. Analytical results of the samples collected show that only when lead and arsenic are high are any of the other metals in concentrations high enough to pose a concern. Therefore, throughout the investigation, lead and arsenic were used as indicator metals to gauge the impact on areas from smelter operations.

Groundwater samples were collected on and near the site and from nearby areas from 2001 through February 2006 to determine what impacts, if any, to area aquifers are a result of past operations at the IS&R Site, and in an attempt to locate a source of elevated arsenic in the groundwater.

During site inspections, 451 locations were identified and mapped as areas of concern (AOCs). The AOCs were further divided as part of the Work Plan into observed areas of potential impact and isolated stained soil (ISS) areas. Ten percent of the areas were sampled for metals and other contaminants of concern (COCs), and then all locations were categorized into like groups. The areas of greatest concern were located in areas not previously addressed by reclamation work.

Tooele Valley Railroad Grade Investigation

In 2003-2004, Atlantic Richfield, under EPA oversight, performed sampling at the TVRR grade in response to an EPA-issued Unilateral Administrative Order for Sampling Activities, (EPA Docket No. CERCLA-08-2004-0002). The town, school, and extension sections within the TVRR right-of-way in Tooele were sampled for metals. The sampling results indicated that some areas exceeded cleanup levels for lead or arsenic for their respective sections.

Pine Canyon Investigation

As outlined in the Unilateral Administrative Lincoln Township Order, (EPA Docket No. CERCLA-08-2001-012) Atlantic Richfield conducted soil investigations to assess elevated metal concentrations within Lincoln. This order required Atlantic Richfield to conduct an investigation prior to EPA completing a risk assessment to determine if imminent and substantial concerns to the public health or the environment were present. Properties within Lincoln were sampled in a series of sampling rounds, which eventually included all properties within the core area of the community and extended in each cardinal direction until a minimum of three adjacent properties tested below the EPA-established cleanup levels.

2.3 SITE RECLAMATION AND REMEDIATION HISTORY

2.3.1 IS&R Smelter Property Reclamation/Stabilization

There have been several less extensive maintenance actions and several significant reclamation actions completed on the conservation area (former IS&R smelter and

surrounding land owned by Atlantic Richfield), which are discussed below. Since the 1980s, additional environmental reclamation and cleanup work has been conducted at the former IS&R smelter property. The reclamation addressed 330 acres of tailings, 28 acres of metal-contaminated slag, 13 acres of settling ponds, 50 acres of landfills, and 125 acres of smelting waste. This work included waste consolidation, drainage improvements to prevent erosion, soil capping, and revegetation. The only remaining feature that was not completely addressed in the reclamation effort is the slag pile. The slag pile is inert as indicated by the results of tests that showed that there is little available arsenic and that compounds were not leaching from the slag. In addition, results of samples collected downstream of the slag pile in Pine Creek indicate that the slag pile is not impacting the water quality within the stream. The slag pile is an historic landmark.

2.3.1.1 1986 Reclamation

The former IS&R smelter property covered an area of approximately 3,020 acres, of which about half was occupied by the smelter operation. Pre-reclamation (1952) features are shown in Figure 2-2. Extensive reclamation activities were conducted on the smelter property from 1986 to 1987 under a plan approved by the Utah Division of Oil, Gas, and Mining that mitigated most risks resulting from the smelter operation. An aerial photo of the site and various operation and reclamation features are shown on Figure 2-3, Conservation Area 1986 Reclamation Action Features. The reclaimed site tailings impoundment is shown in Photograph 2-1.

As detailed on Table 2.2, individual components of the reclamation effort included consolidation and isolation of waste; capping impacted surface areas with clean soil; demolition of the warehouse, miscellaneous out-buildings, and assay laboratory; installing storm water run-off controls; and soil capping and revegetation of disturbed areas with native vegetation. A detailed description of the reclamation work completed in 1986 can be found in the RI report.

2.3.1.2 Other Reclamation Actions

Since 1994 the UDWR has managed the conservation area, or smelter property, portion of the site for the purposes of wildlife habitat and preservation through a conservation easement. Supplemental seeding and minor maintenance actions on specific areas of the IS&R smelter property have been performed by Atlantic Richfield and the UDWR to preserve and enhance wildlife habitat. Atlantic Richfield, in cooperation with the UDWR, has continued to conduct maintenance of the reclaimed features as necessary. Required repair work has primarily been surficial in nature such as erosion repair and fence repair. Most maintenance work has been completed on a routine basis and has not warranted special reporting or notification to the EPA.

During the fall of 1998 and 1999, Atlantic Richfield completed maintenance work, including repair of shallow erosion rills, placement of an additional cover over an evaporation pond in Dry Canyon, construction of diversion berms on the edge of Dry Canyon, construction of a spillway at the Elton Tunnel water holding pond, demolition

and backfill of the Elton Tunnel portal, and placement of additional cover in areas of the slag pile that had settled, as reported in the Carr Fork maintenance operations final report.

In 2003 additional work was completed in the area of the former smelter plant to address maintenance issues that were discovered during the RI. This work included construction of a diversion berm to prevent erosion of the Carr Fork landfill cap and placement of a 12-inch clean soil cover over two areas of discolored soil located near the west entrance. The 12-inch cover was seeded with a native seed mix.

2.3.1.3 2006 Conservation Area Removal Action

During the RI, 18 locations of varying size were identified in the conservation area that exceeded the cleanup levels of 8,000 mg/kg lead and 900 mg/kg arsenic. During a Removal Action on this property, these locations (called observed areas of potential impact) were addressed by placing a 12-inch thick cap of clean soil over the source material and then re-planting the surface with native grasses and shrubs to establish healthy vegetation. Two isolated areas within the mined out portion of the slag pile could not be accessed safely by construction equipment. These two areas are not easily accessible by the public due to their location within the slag pile and additional measures, such as the installation of chain link and barbed wire fence, have been taken to prevent access to the slag pile.

This Removal Action also addressed other areas identified during the RI where the surface soils were stained and vegetation was limited or absent (called isolated stained soil [ISS] areas). Although lead and arsenic concentrations were below cleanup levels, Atlantic Richfield removed the top 24 inches of soil, backfilled with clean soil, and revegetated these ISS areas. The soil was disposed of at the tailings repository within the conservation area. In addition, some storm water controls constructed as part of the initial reclamation work in 1986 were modified and repaired during the summer of 2006. This work entailed constructing berms and ditches and introducing erosion control materials (for example, large stones known as rip-rap). Also, old foundations and vaults that had subsided since the reclamation work were backfilled and covered with clean soil and revegetated. A thorough discussion of the 2006 conservation area Removal Action is included in the 2006 Conservation Area Removal Action Final Construction Report. Figure 2-4 shows the areas addressed by the 2006 Removal Action.

2.3.2 2004-2005 Lincoln Township/Pine Canyon Residential Soil Removal Action

Studies conducted as part of the RI found that some of the properties located in the Pine Canyon community, west of the conservation area, had been impacted by smelter-related contaminants. Due to the high lead levels in a blood test taken by the Tooele County Health Department on a child in Lincoln and the risks identified by the Baseline Human Health Risk Assessment (BHHRA), EPA and the UDEQ determined that immediate implementation of remedial action was necessary to reduce local residents' exposure to lead and arsenic in the environment. In July 2004, EPA issued a Unilateral

Administrative Order for a Time-Critical Removal Action (TCRA) to address all remaining potential risks in the residential area.

EPA issued a Unilateral Administrative Order (EPA Docket No. CERCLA-08-2004-0016) on July 22, 2004, to complete the Removal Action in Lincoln Township/Pine Canyon. The Removal Action included excavation of up to 18 inches of soil on properties where lead and arsenic concentrations exceeded cleanup levels. Areas to be removed were determined by calculating the weighted average lead and arsenic concentrations on each property. When the average concentration for the property exceeded the chronic cleanup level (580 mg/kg lead; 100 mg/kg arsenic), those zones with sample results greater than the cleanup level were included in the Removal Action. In addition any individual zone that exceeded the acute cleanup level (870 mg/kg lead; 150 mg/kg arsenic) was also included in the Removal Action regardless of the weighted average.

Field implementation of this Removal Action began in the fall of 2004 and was completed during the summer of 2005. Figure 2-5 shows the properties sampled and those included in the Removal Action. Excavation was completed on 19 properties and included 9,100 cubic yards of material removed and transported to the tailings repository on the smelter property. Soil samples were not collected after excavation and no barrier was installed because the contamination was surface deposits made by wind and flash flood events. After excavation each property was backfilled and landscaped or restored similar to the pre-construction condition. Photograph 2-2 shows an example of a property that was restored after excavation and backfilling.

2.3.3 2005 Tooele Valley Railroad Grade Removal Action

The railroad grade of the TVRR extends from Vine Street in Tooele east to where it divides into two tracks and then intersects the conservation area. For Removal Action planning and remedial action, the former grade was divided into three corresponding sections that include the town, school, and extension sections (Figure 1-1). Figure 2-6 details the areas that were remediated by Atlantic Richfield pursuant to an EPA Cleanup Order. From 2003 through 2004, under a Unilateral Administrative Order issued November 21, 2003, Atlantic Richfield conducted field sampling to investigate the degree and extent of the metals impact on the grade. The sampling results of relevant zones and areas that exceeded cleanup levels (Table 7-12) were included in the TVRR grade Removal Action. The TCRA order required removal of up to 18 inches of soil in residential sections (town and school sections) where lead and arsenic concentrations exceeded cleanup levels and removal or capping of up to 18 inches of soil in the recreational sections (extension section).

Field construction in accordance with this Unilateral Administrative Order was completed during the summer of 2005. The work on the town and school sections included soil removal followed by backfill and surface features replacement. In the extension section similar work was completed on most reaches of the grade alignment. Soils that were removed were taken to tailings repository within the conservation area. In

areas where soil was not removed, a protective cap of soil and/or rock was placed. Figure 2-6 shows the areas along the TVRR grade that were included in the TCRA. Photographs 2-3 and 2-4 show reclaimed sections of the TVRR grade.

2.4 ENFORCEMENT HISTORY

Enforcement-related actions that have occurred at the IS&R Site include:

- April 1999 - EPA proposed to list the IS&R Site on the National Priorities List (NPL) (the Hazard Ranking System [HRS] scoring package prepared on February 24, 1999, concluded that the total site score was 58.31);
- July 2000 - Final listing of the IS&R Site on the NPL;
- September 18, 2001 - EPA issued Administrative Order on Consent for the site RI/FS (EPA Docket No. CERCLA-08-2001-12) that included the conservation area and Lincoln Township/Pine Canyon;
- November 21, 2003 - EPA issued Unilateral Administrative Order (EPA Docket No. CERCLA-08-2004-0002) for sampling activities at the Tooele Valley Railroad grade;
- July 22, 2004 - EPA issued Unilateral Administrative Order (EPA Docket No. CERCLA-08-2004-0016) to complete the Removal Action in Pine Canyon;
- October 4, 2004 - EPA issued Unilateral Administrative Order (EPA Docket No. CERCLA-08-2005-01) to complete the Removal Action at the Tooele Valley Railroad grade; and
- September 7, 2006 - EPA issued Unilateral Administrative Order (EPA Docket No. CERCLA-08-2006-0010) to complete the Removal Action at the conservation area.

SECTION 3

COMMUNITY PARTICIPATION

This section summarizes the community relations activities performed by EPA and UDEQ during the investigations and remedy selection process.

An information repository containing the Administrative Record and other information about the site was established shortly after the site was listed in 2000 at the Tooele Public Library, 150 West Vine Street, Tooele, Utah 84074, and at the Superfund Records Center at EPA Region 8 in Denver. The UDEQ has numerous files and information related to this site, which is available to the public upon request; however, the UDEQ is not considered an information repository for the site.

EPA and UDEQ completed a community involvement plan for the site in November 2001. This plan outlined methods to enhance understanding and communication so that those impacted can become more informed about the site activities and be part of the decision making process. The plan was based primarily on discussions with residents, local officials and business leaders, and it enlisted the support of local groups, individuals and elected officials to collect and distribute information.

An informal community advisory group was formed shortly after the site was placed on the NPL. Meetings have been a joint effort between the EPA, UDEQ, Tooele County Health Department, and citizens, including a citizen co-chair; they have generally occurred two to three times each year or on an as-needed basis. Notices about the meetings and the proposed agenda were mailed and emailed to citizens in advance of all meetings; information was also placed in the *Tooele Transcript's* event section known as the Bulletin Board.

The EPA and UDEQ have maintained regular contact with members of the community and implemented a variety of community relations activities as new information about the site has become available. This has included holding public meetings; distributing fact sheets, brochures, and flyers; meeting with community members and local officials; developing and maintaining an EPA web fact sheet; and sharing information with the local media.

The EPA and UDEQ supported the Tooele County Health Department in conducting a survey with residents about the site in 2001. EPA also worked with the County to develop a brochure that was distributed to residents in 2002.

EPA developed and distributed a fact sheet in June 2004 to alert residents of soil sampling activities. The fact sheet included questions and answers about health effects of lead and arsenic in soil and included tips to reduce exposure. It also informed the community of the County's services for free blood lead testing.

Representatives from EPA, UDEQ, the Tooele County Health Department, and Atlantic Richfield hosted an open house April 19, 2005, to provide information, discuss construction site safety, and answers questions concerning residential soil removal at Pine Canyon and the TVRR grade. Atlantic Richfield also distributed an informational brochure about the Removal Action to affected residents. Representatives from EPA went door-to-door with contractors to talk with property owners about the need to conduct removal activities. EPA and UDEQ held a celebration September 21, 2005, when the residential cleanup work was completed.

EPA developed and distributed a fact sheet to citizens when the groundwater investigation was complete in March of 2007. The fact sheet provided an update on site status and provided a summary of the results of the groundwater investigation.

The remedial investigation/feasibility study reports, and the proposed plan, were released to the public for comment on June 16, 2007. These documents were made available to the public in both the Administrative Record and the information repository described above. In addition, approximately 100 copies of the proposed plan were mailed to citizens in the neighborhoods adjacent to the site. The notice of availability for the proposed plan was published in the *Tooele Transcript* on June 14, 2007. A public comment period on the proposed plan was held from June 16, 2007 to July 16, 2007.

A public meeting was held on June 26, 2007, at the Tooele County Health Department regarding the proposed plan for this site. At this meeting, representatives from EPA and UDEQ answered questions about the current conditions of the site, the remedial alternatives under consideration, and the preferred alternative. Several community members, including the co-chair of the community advisory group, expressed support for the preferred alternative and there were no objections to the preferred alternative. EPA did not receive any written comments during the comment period.

SECTION 4

SCOPE AND ROLE OF RESPONSE ACTION

This remedial action addresses all areas of the IS&R Site, including the conservation area (former smelter property and surrounding land owned by Atlantic Richfield), Pine Canyon, and the TVRR grade area. Removal Actions have been conducted at the conservation area, Pine Canyon and TVRR grade area. The response action described in this ROD is intended to be the final response action for the IS&R Site.

The remedy selected by EPA and documented in this ROD includes remedial actions necessary to protect human health and the environment. The risk assessment determined that exposures to contaminated smelter wastes and contaminated soil pose a risk to human health and the environment under current and future residential and visitation use scenarios.

The selected remedy is intended to mitigate or abate risks posed by site contamination. While waste will remain on site, it is isolated beneath soil or equivalent covers at the conservation area. These barriers will reduce or eliminate the direct contact exposure. Institutional controls will prevent future human contact with contamination. An integral aspect of the selected remedy is the use of the former smelter property as a conservation area. This use is enabled by the conservation easement that will remain in place. Monitoring and maintenance of reclamation features and institutional controls will ensure controls remain in place and serve their intended purpose. Monitoring of groundwater will ensure that the former smelter area and tailings repository do not become a source of groundwater contamination in the future.

SECTION 5

SUMMARY OF SITE CHARACTERISTICS

This section summarizes information obtained through the investigations and feasibility studies. It includes a description of the site conceptual model on which the investigations, risk assessment and response actions are based. The major characteristics of the IS&R Site and the nature and extent of contamination are summarized below. More detailed information is available in the Administrative Record for the site.

5.1 CONCEPTUAL SITE MODEL

The illustrated conceptual site model (CSM) depicted in Figure 5-1 shows potential COC sources and interconnecting relationships with pathways to receptors. This figure provides the basic framework for assessing and finding potential risks from COCs. The CSM and exposure pathways are discussed further in Section 7 of this ROD as part of the summary of site risks.

The CSM identifies the media historically associated with smelter sites in general and specifically with this site. Consistent with other smelters of the period, the primary source materials associated with the smelter include residue waste, tailings discharged from the mill, stack emissions, and slag. Through deposition from wind and water erosion, and leaching, these materials can impact surrounding areas. Consequently, receptors (both human and ecological) can potentially come in contact with the waste sources through various affected media types, including air (wind), soil, surface water, sediments, and groundwater. Because most waste materials, such as tailings and smelter wastes, have been removed or covered, and the slag pile is inert, the exposure potential by direct contact is relatively low.

The remaining smelter wastes and contaminated soils are the primary sources of contamination, with the lesser-contaminated soils a secondary source of contamination. The primary release mechanisms are erosion due to wind or water, and as a result of direct contact.

5.1.1 Pathways

The conservation area portion of the site was reclaimed in 1986; therefore, one of the stated RI objectives was to determine the risks associated with the area in its current condition. The RI was the first environmental study to look at the site taking into account the reclamation completed in 1986. The RI investigated the release mechanisms of erosion and leaching from both reclaimed and unreclaimed areas that potentially could affect the downstream pathways of soils, surface water, and groundwater. All media with the exception of certain soil-related wastes were eliminated as potential sources and pathways.

5.1.2 Receptors

The conservation easement, which includes the entire conservation area, heavily restricts the type of use within the area. These restrictions limit potential receptors to workers (primarily Utah Division of Wildlife Resources personnel performing non-intrusive work) and recreational users. Ecological receptors include a variety of flora and fauna, which are characteristic of wildlife habitat in semi-arid foothill habitats. The small stream in Pine Canyon is the only non-ephemeral waterway on the site, although it also normally recedes into the ground prior to leaving the conservation area.

Area residents living on property within Pine Canyon were identified in the CSM as receptors with the highest potential for being affected by former smelter operations. Receptors on the TVRR grade portion of the site include both residents in houses that have been built on the right-of-way as well as workers in the more open agricultural areas. Ecological receptors are similar to those found within the conservation area.

5.2 PHYSICAL CHARACTERISTICS OF THE SITE

5.2.1 Climate and Meteorology

Climatic conditions which affect the environmental conditions in the area include precipitation, temperature, wind speed and direction, and annual snow cover.

The average temperature of Tooele and the surrounding vicinity fluctuates from a mean of 31 degrees Fahrenheit (°F) in January to 91°F in July. Summer thunderstorms and snow melt are the most prevalent agents of erosion. Tooele averages 17.6 inches of precipitation a year, while the peaks of the Oquirrh Mountains above the site average nearly 35 inches per year. The former smelter area receives 18 to 24 inches of snow each year.

A wind rose from one year (1973) of actual weather station data (the only meteorology records available) indicates the dominant wind directions are north and south with westerly winds as the next most prevalent. Wind velocities in the area, as recorded at Salt Lake City Airport (approximately 20 miles north), average 8 to 10 miles per hour.

Weather extremes in the form of floods, tornados, and severe storms rarely occur in the Tooele area. The majority of severe storm events that were recorded for Tooele County were thunderstorms, high winds, hail, lightning, and dry microbursts.

5.2.2 Regional Geology

The area is characterized by a dynamic and diverse geologic history. Large inland seas, which repeatedly advanced and receded, glaciation, and intense episodes of mountain building and volcanism formed the thousands of feet of rock layers that comprise the Wasatch and Oquirrh Mountains and underlie the valleys. Thrusting and faulting are

responsible for the presence and form of the mountain ranges that surround the valley. These ranges are the source of the alluvial sediments, which make up much of the valley floor.

Many of the physiographic features in the basin and surrounding foothills resulted from or were strongly influenced by former Lake Bonneville. Lake Bonneville is believed to have formed as a result of glaciation about 25,000 years ago and diminished to the size of the present Great Salt Lake about 10,000 years ago. Lake Bonneville sediments range from gravelly beach deposits to deepwater siliceous and calcareous sediments, especially near canyon mouths, as the Oquirrh and Wasatch Ranges shed alluvial sediments.

The bedrock exposed in the mountains in the area is primarily composed of Pennsylvanian- and Permian-age formations, consisting of quartzite, sandstone, siltstone, and limestone. These formations have contributed to the alluvium underlying the area, which consists of inter-fingered sands, silts, gravels, and clays originating from lake-bottom, lakeshore, stream, and alluvial fan deposits. The thickness of the alluvial valley fill ranges from over 7,000 feet in parts of the northern portion of Tooele Valley to 0 feet where the fill pinches out at the margins of the valley.

5.2.3 Site Geology

The site is located within the Basin and Range Physiographic Province that is characterized by mountains and valleys formed by thrusting and faulting, and subsequent erosion, as described above. It is situated on the western flank of the Oquirrh Mountains, along the eastern edge of Tooele Valley in a graben formed by Cenozoic Era normal faulting.

The lower portion of the site (western) is situated on former Lake Bonneville shoreline deposits, consisting primarily of sandy beach deposits. The upper (eastern) portion of the site consists of alluvium containing sand, silt, clay, and gravel deposited in pre-Lake Bonneville alluvial fans. The alluvium underlying the majority of the area is at least 730 feet thick (and may be up to 1,400 feet thick in the vicinity of the tailings) and information from the USGS indicates that the alluvium in the vicinity of Lincoln is at least 900 feet thick. This is due, in part, to the location of the property on the down-dropped sides of two major fault systems which intersect southeast of the site.

The Occidental Fault, a normal fault with the downthrown side on the west, traverses the northeast corner of the property. Based on the inferred trace of the fault, it apparently caused the formation of Pine Canyon. The inferred fault trace follows the northwest trend of the canyon into the valley.

5.2.4 Hydrogeology

Valley-margin deposits are comprised of sand and gravel with varying amounts of silt and clay, while the deposits toward the center of the valley are predominantly silt and clay with sand interbeds. Smaller stream channel and colluvial deposits locally interfinger

with the alluvial and lacustrine deposits. The stream channel deposits are typically well sorted and very permeable, whereas the colluvial deposits are poorly sorted and have low permeability.

Recharge to area aquifers is primarily by rain and snow falling on the Oquirrh Range and subsequently percolating downward through alluvium, colluvium, and consolidated rock and alluvial beds into the Tooele Valley. Zones of heavy infiltration are also found at the mouths of the canyons (at the valley margins). In addition, but in a much smaller amount, surface infiltration in the valley itself may provide some recharge to area aquifers.

The groundwater aquifer under the site is over 500 feet below ground surface with a hydraulic gradient toward the west or northwest. Along the bench areas, where the smelter site was located, groundwater occurs under water table conditions in the valley margin deposits that consist mostly of alluvial fan and beach material. These deposits thicken rapidly and are very permeable, with transmissivity of up to 60,000 gallons per day (gpd)/ft not uncommon.

The transmissivity of the aquifer at the Boys Ranch has been calculated at 844,000 gpd/ft, and the average thickness of the aquifer was reported to be 500 feet. The unsaturated zone overlying the aquifer within the tailings pond area averages 600 feet in thickness. Fresh water was present from 426 to 950 ft below ground surface.

Shallow groundwater (underflow) along the Pine Creek drainage can discharge in the form of springs at the ground surface. Prior to 1987, there were springs and seeps down gradient from the slag pile and the Pine Canyon landfill on the site that discharged poor quality water. Water from these springs flowed overland in a small stream and eventually discharged to Pine Creek. Since the completion of the reclamation and stabilization activities in this area, these springs have dried up and no longer affect Pine Creek.

5.2.5 Regional Groundwater Chemistry

Based on information by the USGS and confirmed by the RI, groundwater in the basin fill aquifer in the Tooele Valley generally ranges between calcium magnesium bicarbonate type and sodium chloride type. In addition, some areas contain water that represents a mixture of the two types with sulfate being one of the major ions. In general, water in the southwestern part of the valley is of the calcium bicarbonate type, and water in the northern and middle parts of the valley is of the sodium chloride type. Usually the bicarbonate type water is representative of recharge areas, which may be indicative of the predominately carbonate bedrock in the area. The water quality in the recharge zone is generally good, with total dissolved solid (TDS) values of 1,000 milligram per liter (mg/l) or less. As water moves through the valley fill, it tends to pick up additional dissolved solids and become more sodium chloride rich. In Tooele Valley the chloride concentrations naturally increase towards the Great Salt Lake, northwest of the site.

Water produced in the middle of the valley is of lower quality, with TDS values of 1,000 to 3,000 mg/l, whereas the TDS concentrations are below 600 mg/l in all of the site wells.

5.2.6 Site Water Chemistry

Groundwater analytical results from water collected in the site wells indicated levels of sulfate between 150 mg/l and 380 mg/l in the past. Sulfate in groundwater is derived principally from gypsum and anhydrite, and to a lesser degree oxidation of iron sulfide. Sulfate concentrations have trended downward in the water collected during the RI, to a range from 68 mg/l to 190 mg/l, a value similar to the background range found throughout the Tooele Valley. Chloride concentrations in the site wells range from 12 mg/l to 56 mg/l, again a range that is similar to or less than that found in other areas within the valley. Chloride concentrations in the Great Basin region are typically higher than many other regions due to the Lake Bonneville sediments underlying the area. Chloride in groundwater is predominantly derived from weathering of crystalline and sedimentary rocks, lake bed sediments, and human and agricultural waste. Groundwater from the sampled well highest above the valley floor has the lowest chloride concentration, while groundwater from site wells lower in the valley has higher concentrations but does not appear to be abnormal relative to other valley wells.

Groundwater from the mouth of Pine Canyon and downgradient of the site all show similar water chemistries with relatively low concentrations of all ions. This is indicative of these wells being developed in a common groundwater source. This also suggests that all of these wells are located in a generally common flow path of mountain front recharge water, flowing out into the deeper valley fill sediments. This finding supports the understanding that groundwater flows in a west-northwesterly direction.

5.3 REMEDIAL INVESTIGATION RESULTS

The site investigations focused on the three areas comprising the IS&R Site, the conservation area, Pine Canyon, and the TVRR grade. Below is a summary of the RIs conducted at each area. COCs are lead and arsenic. Lead and arsenic, in addition to other constituents, were analyzed in all samples collected.

5.3.1 Soil

5.3.1.1 Conservation Area

Field characterization during the RI included strategically collected grab samples, systematic grid sampling, and a comprehensive field reconnaissance to identify areas not previously addressed or where reclamation efforts were not altogether successful. From the field reconnaissance, approximately 451 small areas or “observed area of potential impact” (OAPI) locations were identified which warranted further investigation. These OAPI locations consisted of debris, bare soil or stressed vegetatation, erosional areas, exposed soil, areas of staining, exposed Carr Fork tailings, other tailings, or exposed waste. Initially, 10 percent of each type of area was sampled for metals and other COCs

and then all locations were categorized into like groups. Sample results were then analyzed for uniformity of lead and arsenic values within the OAPI category. Based on the comparative analysis it was determined, with a high degree of confidence, that cleanup goals could be met by addressing remaining impacts on one OAPI category, exposed waste. The areas of greatest concern were located in areas not previously addressed by reclamation work. All anomalies, concerns, or potential risks were included in the identified OAPIs. Estimated waste volumes are presented in Table 5-1.

The concentrations of lead and arsenic in the conservation area are summarized in Table 5.2. Area-weighted average concentrations of lead and arsenic within each work area (WA) are presented in Table 5.3. Figures 5-2 and 5-3 show lead and arsenic concentrations at the individual sample locations on the IS&R smelter property as well as the weighted average concentration for lead and arsenic in each of the exposure units or WAs. These figures show that, based on the systematic sampling, the concentrations of COCs are below the cleanup level in each of the units. Figures 5-4 and 5-5 are similar to the previous figures; however, they also include the OAPI data set values in addition to the systematic sampling data. The locations of individual OAPIs that exceed cleanup values are also shown on these figures. There were only 18 OAPI samples collected from the 0 to 2-inch zone which had lead and/or arsenic concentrations in excess of the cleanup levels of 8,000 mg/kg lead and 900 mg/kg arsenic.

In general, cover materials placed during reclamation activities remain in sound condition. Samples collected from the cover material (2 to 6 inches) show that soil used consisted of clean material not elevated in metals. Samples collected below the cover in other areas found concentrations of COCs similar to those found by the 1985 investigation prior to the 1986 reclamation.

5.3.1.2 Pine Canyon/Lincoln Township

Surficial samples collected at 74 residential properties in Lincoln were tested for 23 metals and pH. For purposes of investigational sampling, each residential property was divided into zones based on the type of land use: garden, play area, etc. Within each of the zones a 5-point composite surficial sample (0 to 2 inches) was taken and analyzed for metals, including lead and arsenic. Figure 2-5 shows the residential properties that were sampled and those that exceeded cleanup levels.

A weighted average lead concentration was calculated for each property. Weighted averages of lead for the properties tested in Lincoln range from 67 mg/kg to 1,620 mg/kg. Sampling zones and analytical results for each property are described in detail in the individual lot summaries found in the Lincoln Township (Pine Canyon) Removal Action Final Construction Closure Report/Final Pollution Report.

Undeveloped property in Pine Canyon was also sampled during the RI. The field between the old IS&R dike and residents living along Blue Peak Drive contains lead and arsenic concentrations of 1,990 mg/kg and 330 mg/kg or less, respectively. Figure 5-6 shows the locations and analytical result for the collected samples. This particular field

exhibited the highest concentrations of lead or arsenic and lowest pH of samples off site of the Atlantic Richfield property. Contamination in this field may be a result of a tailings dike break during smelter operations as reported by Lincoln residents. The extent of the elevated levels appears to be mostly restricted to this field. All undeveloped areas that were sampled had lead and arsenic below recreational visitor cleanup levels. EPA, the State, Atlantic Richfield, and property owners are working together to protect human health and the environment should land use change. For example, the Boys Ranch parcel, a large tract of land to the northwest of the Pine Canyon/Blue Peak Road intersection, is planned for development. Sampling of soil was conducted of the proposed subdivision, which delineated some areas that exceed the residential action levels (Table 7-12). Currently the developer is planning to remove these soils in accordance with the proposed institutional controls that are being developed. Institutional controls are needed for this and other future development in this area to ensure the remedy remains protective.

5.3.1.3 Tooele Valley Railroad Grade

Lead concentrations in soils ranged from non-detect to greater than 33,000 mg/kg. Table 5-4 shows the range of lead and arsenic concentrations at the TVRR grade area and Figure 2-6 shows the areas of the TVRR grade that exceeded cleanup levels. Sampling indicated that certain lead levels in the town and school sections were above the health-based cleanup level established by EPA for site residential areas. Portions of the extension area east of town also contained lead concentrations above the cleanup level. Arsenic soil concentrations in the extension section were also above the cleanup level. Sampling on the Elton Tunnel railroad spur showed that soils did not exceed cleanup levels, and hence did not require remedial action.

5.3.2 Surface Water

Of the two streambeds present on site, only one, Pine Creek, has a perennial flow. Surface water flowing through the site and in particular adjacent to the slag pile was a concern reported in the HRS scoring package. Analysis of samples collected downstream of the slag pile in Pine Creek indicates that the slag pile is not impacting the water quality within the stream. All analytical results for Pine Creek were found to be within drinking water and ambient water quality standards.

5.3.3 Sediment

Sediments originate as surface soils that have been mobilized by erosion of finer native soils and suspended in the stream flow. Sediments can be impacted by COCs prior to mobilization or imbued with COCs that come out of suspension in the surface flow. Samples obtained from sediment basins were collected to represent upgradient drainage basins. Analytical results from sediment samples taken from the smelter site (WA1, WA3, WA4, WA6, WA7, WA8) contained lead and arsenic concentrations similar to those found in surficial soils within the respective drainage basin. Stream bed sediment samples collected in WA4, WA7, and WA9 likewise were similar or lower in

concentrations than nearby surface soils. Sediments collected from the old Dry Canyon channel within WA10 show lead and arsenic values reaching 1,800 mg/kg and 330 mg/kg, respectively. Streambed sediments taken at the bottom of the Boys Ranch ditch have lead and arsenic concentrations less than 330 mg/kg and 41 mg/kg respectively, both of which are below residential cleanup levels.

5.3.4 Groundwater

Groundwater investigations began in 2000 shortly after the site was placed on the NPL. Water samples were collected from wells on site and in the Pine Canyon area. The Boys Ranch wells were the only ones with arsenic concentrations above primary drinking water quality standards (currently 10 µg/l). The measured concentrations ranged from 120 to 140 µg/l, similar levels to those reported in the historic data from the 1970s when these wells were drilled. Due to the continued presence of arsenic in the Boys Ranch wells, the groundwater investigation was expanded to determine the source and extent of arsenic in groundwater.

The expanded groundwater investigations have demonstrated that there is no current connection between the site and the elevated arsenic concentrations in any downgradient wells. These investigations also indicate that groundwater from the Oquirrh Range is not a likely source of arsenic in the Boys Ranch wells. Efforts to locate a probable source of the elevated arsenic in the groundwater near the Boys Ranch did not identify a significant smelter-related source. The arsenic found in the Boys Ranch wells is likely a result of natural sources, that is, reactions between groundwater and native material containing naturally occurring arsenic. However, monitoring will still occur to ensure no contamination is migrating from upgradient sources.

5.4 MIGRATION PATHWAYS/FATE AND TRANSPORT

Historically, mill and smelter operations lead to two main pathways for impacting surrounding areas: stack emissions and solid waste comprised of tailings, slag, and waste rock.

Overall, the RI found that the reclamation work previously completed is effective in mitigating the potential for exposure and its associated risk to human health or the environment. Specifically, cap materials are of sufficient depth and content to withstand erosion forces and maintain a sustainable protective cover, and storm water controls are protecting reclaimed surfaces. Source control actions previously taken have resulted in the water in Pine Creek meeting water quality standards.

5.4.1 Soil

Soil particulate has the potential for mobilization through leaching, and wind and water erosion. Bore holes drilled to a depth of 50 feet as part of the investigation indicate that native soils just below the tailings and impacted smelter surface do not have elevated concentrations of COCs; therefore, leaching does not appear to be a concern. In most

instances areas that had high concentrations of COCs have been addressed through capping or excavation and disposal at the repository area within the former tailings impoundment. Clean soils were also placed on top of the tailings impoundment area. Other areas of contaminated and/or stained soils have been capped or covered with a minimum of 12 inches of clean soil. All capped or covered areas have been revegetated. In addition, erosion control features have been installed to help maintain the integrity of the caps and covers. Without maintenance of the existing caps, covers, and storm water controls the possibility of wind and water erosion may occur that would result in a potential human health or ecological exposure. Atlantic Richfield will conduct monitoring and maintenance on the conservation area, including checking the integrity of the caps, covers, and storm water controls on a regular basis.

5.4.2 Surface Water

Surface water flow in Pine Creek is no longer adversely impacted by the smelter site as evidenced by the results of surface water sampling in Pine Creek and because surface water from historical springs below the slag pile has not been present since 1987. Pine Creek is the only non-ephemeral stream on the site. Water behind the retention berms in the runoff ponds in WA3 contains metals concentrations that are slightly higher than drinking water quality standards; however, it is unlikely that any impacts to the runoff ponds will alter the overall aquatic community health when evaluated on a site-wide basis because of their relatively small area relative to the area for the rest of the site.

5.4.3 Sediment

Sediments originate as surface soils that have been mobilized by erosion of finer native soils and suspended in the stream flow. Sediments can be impacted by COCs prior to mobilization or imbued with COCs that come out of suspension in the surface flow. Surficial soil sources of COC-impacted soil have been significantly reduced or eliminated as a result of the reclamation and Removal Actions conducted at the site. In addition, surface water from historical springs below the slag pile has not been present since 1987. Because there is currently no exposed soil contaminated with COCs and surface water is only present as storm water runoff, maintenance of the caps and covers and storm water controls will ensure that sediment contaminated with COCs is not generated and does not migrate in the future.

5.4.4 Groundwater

Recent groundwater investigations have demonstrated that there is no current connection between the site and the elevated arsenic concentrations in any downgradient wells. These investigations also indicate that groundwater from the Oquirrh Range is not a likely source of arsenic in the Boys Ranch wells.

A review of historical site data suggests that it is possible the site could have released water with elevated arsenic concentrations to groundwater, but the groundwater investigations coupled with an understanding of arsenic behavior in surface water

environments suggests that historical sources are unlikely to be responsible for the elevated arsenic. It appears, based on site-specific investigation, that the elevated arsenic in the Boys Ranch wells is most likely due to natural sources, that is, geochemical reactions between groundwater and aquifer material containing naturally occurring arsenic. The Groundwater Fact Sheet attached as Appendix B to this ROD describes the groundwater investigation in greater detail.

SECTION 6

CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

This section discusses the current and reasonably anticipated future land uses and current and potential beneficial ground and surface water uses at the site. EPA policy directs that decision makers take into account "reasonably anticipated future land uses" when making remedial decisions. This information forms the basis for reasonable exposure assessment assumptions and risk characterization conclusions presented in Section 7.

6.1 LAND USES

The conservation area (Atlantic Richfield property) is designated as a wildlife conservation area in accordance with an easement agreement between Atlantic Richfield and the UDWR. This agreement precludes the property from being used for purposes other than the maintenance and enhancement of wildlife indigenous to the Oquirrh Range foothills. Activities that would impact remedial features are prohibited, such as drilling and exploration, filling, excavating, mining, dredging, and removal of topsoil and other materials, and commercial, industrial, and agricultural use as set forth in the conservation easement. Before and since the easement was originally issued in 1994, efforts have been made to develop and protect this area for wildlife purposes. The management plan prepared by UDWR and endorsed by Atlantic Richfield defines uses and periods of use allowable on the property. In general, current use of the area includes light recreational uses such as walking, wildlife observation, and hunting. Motorized vehicles are not permitted on site except for maintenance purposes, which is enforced by the UDWR. The property is fenced to prevent unauthorized use of the area. Use of the area is not expected to change in the future.

The nearest community, Pine Canyon (Lincoln Township), is a rural residential and farming area. Lincoln Township was established in 1996 to avoid annexation or incorporation from the neighboring City of Tooele. Pine Canyon is a non-incorporated community within Tooele County and is under the jurisdiction of the Tooele County government. The township operates as a separate planning district within the County and has its own planning commission which reviews local planning and land use issues, defines future land use and development, and makes recommendations for approval or denial to the County commission. Over the years the community has grown to a population of approximately 470 people.

The Tooele Valley, and in particular the City of Tooele, has grown rapidly during the last decade. Because of the perceived availability of open space in Lincoln, growth is edging toward Lincoln. Land use planning and infrastructure limitation will, however, deter significant growth. To maintain the rural agricultural flavor of the area, the master plan restricts the amount and type of growth in Pine Canyon.

Current land use within Pine Canyon includes residential, agricultural, and recreational designations. Though the actual township boundaries are large in area, the bulk of the

population is located along Ericson Road and near the intersection of Blue Peak Drive and Pine Canyon Road. Behind the houses are large open fields used for farming and pasture. The Boys Ranch parcel, a large tract of open land to the northwest of the Pine Canyon/Blue Peak Road intersection, is planned for development. Sampling of soil was conducted of the proposed subdivision, which delineated some areas that exceed the residential action levels (see Section 5.3.1.2 and Table 7-12). Currently the developer is planning to remove these soils in accordance with the proposed institutional controls that are being developed. Institutional controls are needed for this and other future development in this area to ensure the remedy remains protective.

Development of the community to the north and to the east will not occur as a result of the conservation easement on the Atlantic Richfield property and the "no development" policies on the Bureau of Land Management (BLM) property surrounding parts of the Pine Canyon. Land to the southwest of the central part of Pine Canyon is currently zoned for agriculture with a minimum lot size of 20 acres. As described in the Tooele County Master Plan, the area could be zoned for higher density after the core district is developed. Other areas are zoned as multiple use with a minimum lot size of 40 acres. Residential use in these areas is a permitted use; however, such use is unlikely because the intent of this designation is to preserve natural foothills and valleys from human habitation. The master planning document states, "When the central village zone is developed at 90% of its total density with lots at the minimum size, then the planning commission needs to consider expansion of the higher density area to accommodate future development." Tooele County is a master plan compliance county, which requires that all development must comply with the master plan. Master plan changes can only be made with extensive study and public input.

Over the past several years a Community Advisory Group (CAG) has participated with EPA in informing local residences of the RI progress and interim results. Residents who are members of the committee have expressed the desire to maintain the slow growth policies currently in place and wish to preserve the rural residential nature of the township. Future land use includes a potential for limited residential development coordinated through the master planning process.

6.2 WATER USE

Groundwater in the Tooele Valley is used for drinking water and irrigation. The subsurface allocations include groundwater diversions from tunnels, springs, and wells. Groundwater generally flows from recharge areas along the mountain front towards the west-northwest. With the exception of a few springs near Erda, a small town located approximately four miles northwest of Pine Canyon, and range front canyons, extraction of water from pumped wells is the primary water source in the Tooele Valley.

The nearest residents to the site are in the Pine Canyon area. As of November 2006, two water right applications for use of water downgradient of Pine Canyon (within 1 mile) have been submitted to the Utah state engineer's office. At present there are no perfected (wells developed) rights within this radius.

Drinking water is the controlling factor for growth in the Lincoln area. The township has a private user-owned water company, Lincoln Culinary Water Company, that is owned by the connected water users. Sources for this water are springs and wells located upgradient from site activity. Currently all Lincoln Culinary water is allocated to existing land owners with little to no capacity for future development. Also, as a result of limited resources, the state engineer's office is not approving new applications for water in the Tooele Valley water basin because of the already existing over-allocation of underground resources in the valley. There is a possibility for a landowner in Lincoln to obtain approval from the state engineer to transfer the point of diversion from another existing right within the same water basin.

Pine Canyon does have an emergency connection to the Tooele water system. However, because of the valley's limited water supply, Tooele is not accepting new users to their system outside of the existing city limits. Any new growth in the Lincoln area will require a comprehensive valley-wide solution to the limited water resources available.

Middle Canyon Irrigation Company provides the water now being used for irrigation purposes in Pine Canyon. This ditch flows adjacent to the IS&R Site and into the old Dry Creek (Canyon) channel where it flows northwest through town. Various users extract water from the ditch as it passes through town. The irrigation ditch and the Dry Creek (Canyon) streambed also serve as the primary drainages for surface water generated on community streets during storm water events.

There are no perennial streams that flow through the central part of Pine Canyon. Historically, irrigation water from Pine Canyon Creek, supplemented by flows from Elton Tunnel and the Carr Fork Mine, was diverted for use on fields in and around Lincoln. Since Kennecott has been diverting water from mine dewatering to the Salt Lake Valley side of the Oquirrh Range, Pine Canyon flows are so low that irrigation use is unfeasible.

There is no centralized sewer system in Lincoln. The size and location of the township make either creating or connecting into an existing centralized system very costly and economically unfeasible. Currently all residences are connected to individual septic tanks and drain fields.

6.3 RESOURCE USE CONCLUSION

Currently, additional residential development is planned in the Pine Canyon area, specifically in the Boys Ranch subdivision (see Section 6.1). The township planning commission has historically stated a desire to minimize new growth to the extent allowable in zoning regulations due to restrictions caused by the limited water resources available in the area. Because of the growth management emphasis by the township planning commission and the limited drinking water resources and infrastructure available to support new development, the population in Lincoln is not likely to change dramatically during the foreseeable future even in light of the proposed residential

development. Reasonably anticipated land use is similar to the current land use of light residential, recreational, and agricultural. Because of the limitations related to groundwater, future use of groundwater is not likely to change significantly from current groundwater use.

SECTION 7

SUMMARY OF SITE RISKS

A baseline risk assessment (BRA) was performed to evaluate the potential for adverse human health and environmental effects from exposure to site-related contaminants. Current and future risks were estimated for the baseline scenario (i.e., risks that might exist if no remediation or institutional controls were applied). The BRA and additional studies provide the basis for past actions, for taking additional actions at the site, and to identify the chemicals and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the BRA and risk-related studies.

Site characterization data developed during the RI were used by the EPA for evaluation of potential risks to human health and the environment at the site. The risk assessment is based on site conditions and concentrations of COCs in the soil prior to Removal Actions conducted at the site. Removal Actions at the conservation area and Pine Canyon have since reduced these risks.

The TVRR grade area was not specifically included within the BRA. However, the land use and potential receptors at the TVRR grade were similar to a combination of the conservation area (visitor and worker) and Pine Canyon (resident) so that the results from the BRA and subsequent cleanup levels were applicable to the TVRR grade. Removal Actions at the TVRR grade have also reduced the risks in that area.

7.1 BASELINE HUMAN HEALTH RISK ASSESSMENT

The Baseline Human Health Risk Assessment (BHHRA) estimates what risks the site poses if no action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action.

7.1.1 Contaminants of Potential Concern

Contaminants of Potential Concern (COPCs) are chemicals, which exist in the environment at concentration levels that might be of potential health concern to humans and which are or might be derived, at least in part, from site-related sources. The BHHRA identified COPCs to human health based on past experiences at mining sites and site-specific data. The metals identified as COPCs for quantitative evaluation in the BHHRA include aluminum, antimony, arsenic, barium, cadmium, copper, lead, manganese, mercury, selenium, silver, thallium, and zinc. The process is intended to ensure that any contaminant of plausible human health concern is retained for evaluation in the risk assessment.

Contaminants of concern (COCs) are those COPCs that were determined through the risk assessment process to pose a potential current or future risk to human populations. Lead and arsenic contributed most to potential risks in the BHHRA and were therefore selected

as COCs to be addressed by the remedial action with the expectation that other metals would also be addressed by remedial activities.

Table 5-2 provides the range of concentrations by work area (WA) for arsenic and lead at the conservation area. Table 7-1 provides the exposure point concentrations (EPCs) at the conservation area. These EPCs were based on concentrations of contaminants in both AOCs and non-AOCs. The AOCs are the Observed Areas of Potential Impact (OAPIs). The BHHRA should be consulted for detailed information regarding the derivation of EPCs in the conservation area. The COCs and EPCs for sediment and surface water at the conservation area are provided in Tables 7-2 through 7-3, respectively. The COCs and EPCs for surface soil and dust at Pine Canyon are provided in Tables 7-4 and 7-5, respectively. The COCs and EPCs for groundwater are provided in Table 7-6.

7.1.2 Exposure Assessment

The exposure assessment identifies scenarios through which people could contact COCs in site media and estimates the extent of exposure. The Conceptual Site Model (Figure 5-1) illustrates media of concern, exposure pathways, and human populations that were evaluated in the BHHRA.

The BHHRA evaluated exposure for several current and future human populations of concern, including on-site workers, on-site recreational visitors, and off-site residents (current and future hypothetical scenarios). The conservation easement, which covers the entire IS&R smelter property, heavily restricts the type of activity allowed on the former property. These restrictions limit potential receptors to workers, primarily Utah Division of Natural Resources personnel performing non-intrusive work, and visitors, such as recreational hikers at the conservation area. In addition, historic releases from the IS&R Site may have impacted off-site residential areas in and around Pine Canyon. Residents are potential receptors in Pine Canyon.

An exposure area is an area where a receptor (worker, resident, or recreational visitor) may be exposed to one or more environmental media. During sampling, the site was divided into a number of “work areas” as shown in Figure 2-1. These WAs were also utilized as exposure areas for evaluating potential human health risk. On-site exposures of workers and visitors were assessed for WAs 1-9 (combining WA11 with WA8), and risks to current and future residents were evaluated for WA10 (the town of Pine Canyon).

The BHHRA selected media of concern based on historical site activities, chemical fate and transport mechanisms, and the potential for human exposure. The environmental media selected for quantitative evaluation were groundwater, soil, dust, sediment, and surface water. The populations of concern and exposure pathways by which they may be exposed to COPCs are discussed in greater detail below.

7.1.2.1 On-Site Workers and Recreational Visitors

Even though few people intentionally ingest soil, workers and recreational visitors who have direct contact with soil at the site might ingest small amounts that adhere to their hands during outdoor activities. Incidental ingestion of soil is often one of the most important routes of human exposure at a site. Therefore, ingestion of surface soil and other soil-like media was considered a potentially complete and significant pathway for on-site workers and for recreational visitors.

Particles of contaminated surface soil may become suspended in air by wind or mechanical disturbance, and both site workers and recreational visitors may inhale those particles. This exposure pathway is usually small compared to oral exposure, but may become significant in a few cases. Therefore, this pathway was also considered potentially significant.

Workers and site visitors may occasionally have contact with on-site surface water and sediments during recreational site activities and/or site maintenance activities. Therefore, oral exposure to both surface water and sediment is identified as an exposure pathway of concern, as is dermal exposure to surface water.

Exposure to solid media through dermal contact and inhalation of airborne particulates was assumed to be minimal. Dermal exposure to sediment is likely to be minor compared to oral exposure. There are no exposure pathways to on-site workers and recreational visitors by groundwater.

7.1.2.2 Off-Site Resident

Residents may ingest contaminated soil both during outdoor activities that bring them into direct contact with the soil and also by ingestion of indoor dust that has become contaminated with outdoor soil. Both of these exposure pathways are potentially significant for residents. Inhalation exposure to airborne dust is usually small compared to oral exposure, but may become significant in a few cases, and was therefore considered potentially significant.

Dermal contact with soil was suspected to be a minor pathway. Most metals have little tendency to accumulate in plant tissue, and exposure from ingestion of washed garden vegetables is likely to be a minor source of exposure compared to direct ingestion of soil or dust. Similarly, most metals have little tendency to accumulate in the edible parts of animal tissues, and exposure from ingestion of local livestock is likely to be a minor source of exposure.

At present, off-site residents receive drinking water from a private water company that derives its water from multiple sources that are not influenced by site conditions. Consequently, exposure to groundwater is not a complete pathway. However, hypothetical future use of groundwater by residents was evaluated in order to determine whether there would be any basis for health concern if the groundwater were ever used for drinking in the future. Dermal exposure to drinking water (e.g., while showering or

bathing) is likely to contribute a much smaller dose than ingested water, so this pathway was considered minor.

7.1.2.3 Evaluation of Exposure

Risk from a chemical contaminant is related to the level of exposure or contact with the chemical. For every exposure pathway of potential concern, it is expected that there will be differences between different individuals in the level of exposure at a specific location due to differences in intake rates, body weights, exposure frequencies, and exposure durations. Thus, there is normally a wide range of average daily intakes between different members of an exposed population. Because of this, all daily intake calculations specify what part of the range of doses is being estimated. Typically, attention is focused on intakes that are "average" or are otherwise near the central portion of the range and on intakes that are near the upper end of the range. These two exposure estimates are referred to as Central Tendency Exposure (CTE) and Reasonable Maximum Exposure (RME), respectively. All estimates of CTE and RME were calculated in accordance with current EPA guidance for quantification of exposure. Exposure parameters were based on reliable site-specific data, where possible, and national default values or professional judgment whenever reliable site data were not available.

7.1.3 Toxicity Assessment

The purpose of the toxicity assessment is to review and summarize the potential for each COC to cause adverse effects in exposed individuals. The toxic effects of a chemical generally depend on its inherent toxicity, the pathway of exposure (ingestion, inhalation, contact with skin), exposure frequency and duration, and the level of exposure (intake).

There is generally a positive relationship between dose (chemical intake through an exposure pathway) and adverse effect. Typically, as the dose increases, the type and severity of adverse response also increases. Chemical toxicological information derived from either epidemiological or animal studies is used to estimate toxicity criteria, which are numerical expressions of the relationship between dose (exposure) and response (adverse health effects). Toxicity criteria are developed for assessment of carcinogenic and noncarcinogenic (systemic) health effects. All toxicity values used in this risk assessment were derived by EPA and were obtained either from the on-line database Integrated Risk Information System (IRIS), from EPA's Health Effects Assessment Summary Tables (HEAST), or from interim recommendations from EPA's Superfund Technical Assistance Center operated by the National Center for Environmental Assessment (NCEA).

Toxicity criteria for carcinogens are provided as cancer slope factors (CSFs) that are an estimate of risk per unit dose of chemical. CSFs are based on the assumption that no threshold exists for carcinogenic effects and that any amount is associated with some finite carcinogenic risk. The chemical-specific CSF is multiplied by the estimated daily chemical intake to provide an upper-bound estimate of the increased likelihood of cancer resulting from exposure to the chemical. This risk would be in addition to any

"background" risk of developing cancer over a lifetime due to other causes. Consequently, the risk estimates in this assessment are referred to as incremental or excess lifetime cancer risks. Cancer toxicity criteria for COCs for ingestion/dermal exposures are presented in Table 7-7.

Toxicity criteria for noncarcinogens are provided as reference doses (RfDs) and represent the daily intake of a chemical without resultant adverse effects, even if the exposure occurred continuously over a lifetime. Chemical intakes that are less than the RfD are not likely to be of concern even to sensitive individuals. Chemical intakes that are greater than the RfD indicate a possibility for adverse effects. Non-cancer toxicity values for COCs for ingestion/dermal exposures are also presented in Table 7-7.

EPA has not published toxicity criteria for lead. This is because available data suggest that there is no threshold for adverse effects even at exposure levels that might be considered background. Any significant increase in exposure above background levels could represent a cause for concern. Instead of evaluating risk using typical intake calculations and toxicity criteria, EPA has developed other methodologies for evaluating lead exposures.

The BHHRA utilized two different models to estimate blood lead levels. The Integrated Exposure Uptake Biokinetic (IEUBK) model is a computer model used to predict blood lead levels in children exposed to lead from a variety of sources, including soil, dust, groundwater, air, diet, lead-based paint, and maternal blood. Estimated blood lead levels are compared to target blood lead concentrations to assess possible risks. The IEUBK model is intended for use only for children up to the age of seven, as these are the most sensitive receptors to lead exposure. The IEUBK model assumes daily exposure in a residential setting. The approach described by Bowers is used to assess possible risks to adults from exposure to lead. When evaluating lead risks to adults, the primary sub-population of concern is pregnant women and women of child-bearing age. Detailed information regarding the selected input parameters for each model is included in the BHHRA.

Accurate assessment of human exposure to ingested metals requires knowledge of the amount of metal absorbed from the gastrointestinal tract into the body. This information is especially important for environmental media such as soil or residues at mine sites because metals in these media may exist, at least in part, in a variety of poorly water-soluble minerals and may also exist inside particles of inert matrix, such as rock or slag. These chemical and physical properties may tend to influence (usually decrease) the absorption (bioavailability) of the metals when ingested. Accordingly, adjustments were made to the toxicity criteria to account for the relative bioavailability (RBA). The BHHRA used site-specific RBA factors of 0.60 for lead and 0.33 for arsenic.

7.1.4 Risk Characterization

The BHHRA characterized risks to current and future human populations of concern, on-site workers, on-site recreational visitors, and off-site residents. The risk characterization

process was performed to estimate the likelihood and nature of the potential effects to human health that may occur as a result of exposure to the COCs at the site. Results of the risk characterization provided the risk managers with information regarding the potential need for remediation at the site.

7.1.4.1 Incremental Lifetime Cancer Risk

Cancer risk is described as the probability that an individual will develop cancer from site-related exposure before the end of his or her lifetime. For cancer risk, in general, EPA considers one additional case of cancer in 1,000,000 to be so small as to be negligible, and risks above one additional case in 10,000 to be sufficiently great to require remedial action. If excess cancer risks fall within this range, risk management decisions are made on a case-by-case basis using one case in 1,000,000 as a point of departure.

Excess cancer risks are summed across all COPCs and all exposure pathways that contribute to exposure of an individual in a given population. The BHHRA calculated potential cancer risk associated with exposure to site COPCs by multiplying the chemical-specific exposure estimates (i.e., lifetime dose) by the chemical and route specific CSF. The result is a unitless measure (e.g., 1 in 10,000) of an individual developing cancer as a result of chemical exposures at the site. Estimated carcinogenic risks for RME scenarios are presented in Tables 7-8, 7-9 and 7-10.

On-Site Workers

Table 7-8 presents a summary of cancer risks to on-site workers across all WAs (site-wide). The screening-level total cancer risk for on-site workers at specific WAs from all combined exposure pathways ranges from 2 in 1,000,000 to 30 in 1,000,000 (3 in 100,000). Site-wide cancer risks across all WAs were 5 in 1,000,000. As seen in Table 7-8, incidental ingestion of soil is the exposure pathway that tends to contribute most to overall risks. The results indicate that worker exposures are within EPA's acceptable risk range and not likely to be of health concern at the IS&R Site.

On-Site Recreational Visitors

Because a recreational visitor to the IS&R Site may be exposed beginning as a child and extending into adulthood, risks represent a time-weighted average exposure. Table 7-9 presents a summary of cancer risks to on-site recreational visitors based on a year-round exposure. The screening-level estimates of total cancer risk for on-site recreational visitors at specific WAs range from 7 in 1,000,000 to 1 in 10,000. Site-wide cancer risks across all WAs are 2 in 100,000. As seen in Table 7-9, incidental ingestion of soil is the exposure pathway that contributes most to overall risks. The results indicate that site-wide visitor exposures are within EPA acceptable risk range and not likely to be of health concern at the IS&R Site.

Off-Site Residents

Because a resident may be exposed beginning as a child and extending into adulthood, risks represent a time-weighted average exposure. Potential risks were evaluated for the

current residential area and for a hypothetical future residential area (i.e., areas that are not yet developed but may be developed for residential use in the future). Table 7-10 presents a summary of cancer risks to current residents and hypothetical future residents, respectively.

In the absence of an exposure from groundwater, combined cancer risks from arsenic in soil, dust, and air range from 30 in 1,000,000 for current residents to 60 in 1,000,000 for future residents. These results fall within EPA's acceptable cancer risk range.

If exposure from groundwater were to occur in the future, total risks could enter a range of concern as a result of arsenic in the water, with the magnitude of the total risk depending on what the estimated concentration of arsenic in groundwater may be in the future. If it is assumed that the concentration in the future is similar to what is currently observed from a well located at the center of town, then total cancer risks would be 40 in 1,000,000; still within EPA's risk range. If it is assumed that arsenic levels might increase to a level similar to that in a well located near the Boys Ranch, then total cancer risks would be 4 in 1,000, a value of potential concern. However, this latter scenario is not considered to be likely.

7.1.4.2 Non-Carcinogenic Effects

The potential for noncarcinogenic effects due to exposure to a particular chemical is expressed as the hazard quotient (HQ). An HQ was calculated by dividing the estimated intake of a chemical by the reference dose. The HQ calculation assumes that there is a threshold level of exposure below which no adverse effects will occur. If an individual is exposed to more than one chemical, an estimate of the total non-cancer risk is derived simply by summing the HQ values for that individual. This total is referred to as the Hazard Index (HI). If the HI value is less than one, there is little potential for adverse non-cancer effects from any chemical, alone or in combination with others. If the screening level HI exceeds one, it indicates a potential exists for adverse non-cancer effects from exposure to all COCs, assuming that all chemicals have the same toxic effect and that toxic effects are additive. Estimated RME non-cancer hazards for populations evaluated in the BHHRA are presented in Tables 7-8, 7-9, and 7-10.

On-Site Workers

Table 7-8 presents a summary of non-cancer HIs to on-site workers across individual WAs and site-wide (across all WAs). The screening level total non-cancer HI for on-site workers from all exposure pathways combined does not exceed one for any WA or across all WAs. These results indicate that worker exposures are not likely to be of health concern at the IS&R Site.

On-Site Recreational Visitors

As described previously, because the same recreational visitor may be exposed beginning as a child and extending into adulthood, risks represent a time-weighted average exposure. Table 7-9 presents a summary of non-cancer HIs to recreational visitors across individual WAs and site-wide (across all WAs) based on a year-round exposure.

The screening level total non-cancer HI for on-site recreational visitors from all exposure pathways combined does not exceed one for any WA or across all WAs. These results indicate that recreational visitor exposures are not likely to be of health concern at the IS&R Site, even if the site were open to the public year-round.

Off-Site Residents

As described previously, because a resident may be exposed beginning as a child and extending into adulthood, risks represent a time-weighted average exposure. Potential risks were evaluated for the current residential area and for a hypothetical future residential area (i.e., areas that are not yet developed but may be developed for residential use in the future). Table 7-10 presents a summary of non-cancer HIs to current residents and hypothetical future residents, respectively.

Most residents will be exposed to site-related contaminants by all of the exposure pathways that exist in the residential area (WA10). In the absence of an exposure from groundwater, the screening-level total non-cancer HI from all exposure pathways combined does not exceed one for current or future residents. This indicates that risks to current and future residents from arsenic in soil, dust, and air are not likely to be of concern.

If exposure from groundwater were to occur in the future, the estimated total non-cancer HI for off-site residents from ingestion of groundwater could be above the level of concern, with the magnitude of the total HI depending on what the estimated concentration of arsenic in groundwater may be in the future. If it is assumed that the concentration in the future is similar to what is currently observed in a well located at the center of town, then the total non-cancer HI would be 2. If it were assumed that arsenic levels might increase to a level similar to that seen in a well located near the Boys Ranch, then the total non-cancer HI would be 20. However, this latter scenario is not considered to be likely. These results indicate that groundwater at some locations on or near the site would pose a potential risk to residents if it were ever used in the future for drinking water. It is unlikely that these groundwater wells will be used as a future drinking water source.

7.1.4.3 Lead

In the case of lead, risks are evaluated using a somewhat different approach, as mentioned previously. Because studies of lead exposures and resultant health effects in humans have traditionally been described in terms of blood lead level, lead exposures and risks are typically assessed using an uptake-biokinetic model.

The EPA has identified 10 micrograms per deciliter (µg/dl) as the blood lead level at which effects from lead begin to occur that warrant avoidance and has set as a goal that there should be no more than a five percent chance that a child will have a blood lead value above 10 µg/dl. The Centers for Disease Control (CDC) has also established 10 µg/dl as a guideline in preschool children, which is believed to prevent or minimize lead-

associated cognitive deficits. Health risks are therefore judged to be acceptable if there is no more than a five percent chance that an exposed individual (a child or a woman of child-bearing age) will have a blood lead level that exceeds 10 µg/dl. This probability is referred to as P10.

Tables 7-8 through 7-10 present a summary of potential lead risks for workers, visitors (adult and child), and residents (adult and child). The most sensitive adult was considered to be a pregnant worker, and the fetus the most sensitive part of the pregnant worker.

On-Site Workers and On-Site Recreational Visitors
Although soil lead levels are elevated in most site WAs, P10 values for on-site workers and on-site recreational visitors do not exceed EPA's health-based goal for any WAs or across all WAs. In addition, the probability that a pregnant worker (most sensitive population) will have a blood lead value that could be of concern to a fetus due to incidental ingestion of soil is well below EPA's health-based goal. These results indicate that on-site exposures to lead in surface soil are not likely to be of concern at the IS&R Site.

Off-Site Residents
The risks to current residents as well as hypothetical future residents are considered. As seen, P10 values at most residences are below EPA's health-based goal. However, P10 values for a child exceed five percent at one residence (P10 = 8 %) and in a hypothetical future residential area (P10 = 6 %). For off-site adult residents, the probability that a pregnant resident will have a blood lead value that could be of concern to a fetus is well below EPA's health-based goal (P10 < 0.1 % for both current and future exposures).

7.1.4.4 Combined On-Site and Off-Site Risk

Some on-site workers or recreational visitors may also be residents of Pine Canyon and hence may be exposed to site-related contaminants both at the site and at home. In order to estimate the combined risks from both exposures at both locations, risks were summed for two different scenarios: an individual who is a resident and is also a site visitor, and a resident who is also a site worker. This approach is expected to be conservative because the same individual cannot simultaneously be exposed on-site and off-site. However, it is a useful screening level approach that establishes an upper bound for the maximum level of risk which could occur. The results are shown in Table 7-11. As seen, estimated risks are below a level of concern for both scenarios, even for RME receptors. These results indicate that risks for individuals exposed by multiple receptor pathways at the IS&R Site are not likely to be of health concern.

7.1.5 Assessment of Uncertainties

Quantitative evaluation of the risks to humans from environmental contamination is frequently limited by uncertainty regarding a number of key data items. Sources of uncertainty include concentration levels in the environment, the true level of human

contact with contaminated media, and true dose-effect curves in humans. This uncertainty is usually addressed by making assumptions or estimates for uncertain parameters based on available data. Because of these assumptions and estimates, the results of risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment.

Because the magnitude of underestimation of risk is thought to be relatively small, and magnitude of overestimation of risk ranges from small to large, risk estimates derived in this assessment are more likely to overestimate than underestimate risk. Because of the high levels of arsenic and lead at this site, these two chemicals are considered risk drivers. It is unlikely that the other contaminants contribute as significantly to total site risk as arsenic and lead. At this site, some complete pathways have not been quantified because it is believed that these are minor sources of exposure compared to those that have been quantified. These uncertainties lead to a relatively small underestimation of risk.

In keeping with EPA guidance, the values used to estimate human exposure levels to soil and other media have generally been selected in a way that is intended to be conservative. That is, estimates of intake are more likely to be high than low. Uncertainty in toxicity values stem from limited toxicity data, extrapolation of toxicity data from animals to humans, extrapolation from high doses to low doses, and exposure frequency and duration. These uncertainties lead to an overestimation of risk, especially those associated with the toxicity assessment, and these overestimates might be moderate to large.

7.1.6 Human Health Risk Assessment Conclusions

The conservation area does not pose a health risk to on-site workers or recreational visitors. The BHHRA showed that excess cancer risks from non-lead (arsenic) contaminants in soil to workers and visitors ranged up to 3 in 100,000. In the case of lead, health risks are considered acceptable if there is no more than a five percent chance that an exposed individual (a child or a woman of child-bearing age) will have a blood lead level that exceeds 10 µg/dl. The risk assessment showed that there is no risk to on-site workers and recreational visitors, including children, as long as access to the conservation area is limited (see Section 12.2). To be protective, EPA risk assessors evaluated an exposure scenario assuming human visitation would increase in this area in the future. Because preferential visitation (wildlife viewing) may occur in some areas of the conservation area, cleanup levels were established for the remediation work that was conducted on this property. The results of the BHHRA showed that some of the yards in Pine Canyon could pose an unacceptable risk.

7.1.7 Cleanup Levels

Preliminary Remediation Goals (PRGs) were derived for arsenic and lead in surface soil which were protective of chronic exposures of workers, recreational visitors, and residents. A PRG represents the mean concentration of a contaminant in a medium that

yields a specified level of risk to a specified receptor for a specified level of exposure. In brief, chronic PRGs were calculated using the same exposure and toxicity values used in the BHHRA risk calculations, except that the calculations were reversed; rather than calculating the risk from a specified concentration, the concentration is calculated for a specified level of risk.

The PRGs, Chronic Risk-Based Concentration (CRBC), and Acute Risk-Based Concentration (ARBC) are shown in Table 7-12. From these values the cleanup levels considered to be protective of human health are also shown in Table 7-12 for the conservation area, Pine Canyon, and TVRR grade. The cleanup levels have been selected conservatively so as "not to exceed" values for the Removal Actions. By choosing "not to exceed" values, all work areas or exposure units are well within the limits set by the EPA.

Site characterization data, developed during the sampling phase in the conservation area and Pine Canyon, was used by the EPA for evaluation of potential risks to human health and the environment. Even though the TVRR grade sampling work was completed under a separate order, the COCs had the same source. Therefore, the site was considered similar enough that the cleanup levels derived in the BHHRA prepared for the conservation area and Pine Canyon were also used for the TVRR grade.

7.2 ECOLOGICAL RISK ASSESSMENT

A baseline ecological risk assessment (BERA) was performed as part of the BRA process to identify and estimate the potential ecological impacts associated with the COCs at the site. The purpose of the BERA was to describe the likelihood, nature, and extent of adverse effects to ecological receptors resulting from exposure to contaminants released to the environment as a result of past or present site activities.

The overall management goal identified for ecological health at the conservation area is to ensure adequate protection of ecological systems within the impacted areas of the IS&R Site against the deleterious effects of acute and chronic exposures to site-related COPCs. The focus is on ensuring sustainability of the local plant and wildlife populations, rather than on protection of every individual in the population.

The ecological systems identified for adequate protection include terrestrial soil organisms and plant communities, aquatic life in Pine Creek and the run-off ponds, aquatic and terrestrial mammal and bird populations, and any threatened and endangered species (including candidate species) and species of special concern.

Since 1994 the IS&R Site has been managed by the UDWR. The overall goals for the area include increasing the species diversity in both plant and wildlife communities as well as increasing the carrying capacity for upland and big game.

Results of the BERA indicate that contaminants in media may pose potential risks to ecological receptors. However, these areas generally correspond to those areas

determined to pose a potential risk to human health. BERA results are discussed below; however, Removal Actions on areas that pose a potential for human health risks also address areas that pose potential risk to ecological receptors.

7.2.1 Identification of Contaminants of Potential Ecological Concern

Contaminants of potential ecological concern (COPECs) for each ecological receptor and exposure pathway were selected based on a conservative screening process that eliminated only those chemicals that were not likely to contribute significant risks to these receptors. Twenty-three metals that might be of potential concern were retained as COPECs for further evaluation. The metals included aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium and zinc.

7.2.2 Exposure Assessment

7.2.2.1 Exposure Areas

Aquatic and terrestrial ecological communities were evaluated in the BERA. Two distinct aquatic exposure areas were evaluated in the BERA: Pine Creek and the run-off ponds. Both of these aquatic exposure areas are expected to provide potential habitat for aquatic invertebrates, but are not expected to sustain fish. Several other ephemeral streams are located within the IS&R Site boundary (Dry Creek, Spring Creek, Swensons Creek, other unnamed drainages); however, these streams are expected to contain water only during spring run-off periods. Therefore, these ephemeral streams provide minimal aquatic habitat and are not expected to support fish or benthic invertebrates.

Eleven terrestrial exposure areas, or WAs, were evaluated in the BERA corresponding to the work areas used for the RI and BHHRA (See Figure 2-1). During site inspections, an area was identified as an AOC if it contained exposed tailings, erosional gullies, stressed or absent vegetation, or debris associated with mining and smelting activities. The AOCs are the OAPIs. Less than two percent of the IS&R Site is characterized as an AOC. All locations outside of an AOC are referred to as “non-AOC” locations. Potential exposures of terrestrial receptors (e.g., plants, terrestrial invertebrates, wildlife) were evaluated separately for non-AOCs and AOCs.

7.2.2.2 Exposure Pathways

Figure 7-1 presents the ecological CSM, which illustrates media of concern, exposure pathways, and ecological populations that were evaluated in the BERA. As seen, the following exposure pathways were the primary pathways by which ecological receptors could be potentially exposed to site COCs:

Aquatic Invertebrates – Direct contact with surface water and sediment
Wildlife – Ingestion of surface water, sediment/soil, and dietary items

Terrestrial Plants and Invertebrates – Direct contact with surface soil

7.2.2.3 Selected Representative Wildlife Receptors

Because it is not feasible to evaluate exposures and risks for each bird and mammal species potentially present at the site, several representative wildlife receptors were selected. These wildlife receptors were selected to represent a variety of simplified food chain scenarios based on habitat types, site observations, and general site knowledge. Selected wildlife receptors include the following:

Aerial Insectivore: Big Brown Bat and Cliff Swallow
Aquatic Insectivore: Mallard
Terrestrial Omnivore: Masked Shrew, Deer Mouse, and American Robin
Terrestrial Insectivore: Northern Flicker
Herbivore: Mourning Dove and Mule Deer
Carnivore: Red-Tailed Hawk and Red Fox

U.S. Fish and Wildlife was involved in the RI, and was consulted and briefed by the wildlife biologist who performed the wildlife survey on the conservation area. No endangered species were identified during the survey.

7.2.2.4 Exposure Point Concentrations (EPCs)

The basis of the EPCs used in the risk characterization depended upon the receptor being evaluated. For receptors that are immobile or have limited mobility (i.e., aquatic invertebrates, plants, terrestrial invertebrates), EPCs were calculated for each sampling station. BERA summary statistics showed the minimum and maximum concentrations in each work area, for surface soil, surface water, bulk sediment, and sediment porewater.

For wildlife receptors, EPCs were calculated for each work area for non-AOCs and AOCs. The EPC statistic, used to assess potential risks to wildlife, depended upon the relative home range size of each selected representative wildlife receptor. For wildlife with large home ranges (e.g., deer, fox, hawk, bat), it was assumed that receptors will tend to roam across the entire WA to feed. For wildlife with small/medium home ranges (e.g., mouse, shrew, bat, swallow, flicker, robin, dove, mallard), variability in exposure will tend to depend upon differences in concentrations encountered within the WA. Site-wide ecological EPCs for lead and arsenic for surface soil are 888 mg/kg and 128 mg/kg, respectively. EPCs for AOC and non-AOCs site-wide (across all WAs) for other media are provided in the BERA.

7.2.3 Toxicity Assessment

Toxicological literature was reviewed to identify toxicological benchmarks for COPCs in soil that were protective of the indicator species at the site. These benchmarks may be concentration-based (e.g., the concentration in soil, sediment, surface water), or may be dose-based (e.g., milligram of chemical ingested per kilogram body weight per day,

[mg/kg BW/day]). Toxicity benchmarks are contaminant-specific, receptor-specific, and usually medium-specific. All toxicity benchmarks used in the risk characterization were based on values developed by various regulatory agencies and published in the literature. Table 7-13 summarizes the dose-based Toxicity Reference Values (TRVs) used to evaluate potential risks to wildlife from ingestion exposures.

7.2.4 Risk Characterization

Assessment and measurement endpoints were selected for the risk characterization. The assessment endpoint selected was the protection of ecological receptors from adverse effects related to exposure and overall health and integrity of the ecosystem. Measurement endpoints selected to evaluate this assessment endpoint consisted of hazard quotient calculations (exposure to a site contaminant relative to the toxicity reference value), site-specific toxicity tests, and observations of population and community demographics. Because each type of measurement endpoint has both advantages and limitations, conclusions based on only one method of evaluation may be misleading. Risks to ecological receptors were therefore assessed by a weight of evidence approach based on findings from all the lines of evidence for which data were available, taking the relative strengths and weaknesses of each method into account.

The risks posed to ecological receptors based on the weight of evidence are summarized in Table 7-14.

7.2.4.1 Risk Characterization for Aquatic Receptors

The BERA provides detailed results for each line of evidence, including detailed HQ calculations and site-specific toxicity test results, utilized in the weight of evidence. Based on available lines of evidence, it is concluded that risks of population-level effects to aquatic invertebrates in Pine Creek are minimal. Because multiple lines of evidence are available, confidence in this conclusion is moderate to high.

Based on available lines of evidence, it is concluded that the run-off ponds are likely to be toxic to aquatic invertebrates. However, HQs are based on limited data collected during a single sampling event. In addition, predicted risks from sediment are based on bulk toxicity benchmarks, which have been demonstrated to be generally overprotective at this site. Therefore, confidence in this conclusion is low to moderate. It is unlikely that impacts to biota in the run-off ponds will alter the overall aquatic community health when evaluated on a site-wide basis. This is because these ponds are currently intermittent in nature, and hence are unlikely to constitute a critical part of the aquatic ecosystem at the IS&R Site.

7.2.4.2 Risk Characterization for Terrestrial Receptors

Because plants and terrestrial invertebrates reside directly in the soil and are generally not mobile, direct contact with soil is the exposure pathway of chief concern. Risks to terrestrial receptors were evaluated separately for non-AOC and AOC locations.

The weight of evidence suggests that metals in soils from non-AOCs are likely contributing to a decrease in plant community health at the site, but the magnitude of the effect compared to other factors that influence plant community status is likely to be relatively low. Because multiple lines of evidence are generally consistent, confidence in this conclusion is moderate. Although the data for AOCs are limited, lines of evidence support the conclusion that metals in soils from AOCs are severely impacting plants in these locations. Therefore, confidence in this conclusion is moderate.

Only one line of evidence was available to characterize potential risks to terrestrial invertebrates and soil organisms at the IS&R Site. The estimated HQs suggest that terrestrial invertebrates and soil organism communities may be slightly impacted in non-AOCs and severely impacted in AOCs due to metals in soil. Because there are no other lines of evidence available to support this conclusion, the confidence in the conclusion is low.

7.2.4.3 Risk Characterization for Wildlife

Wildlife receptors (birds and mammals) that reside and/or feed at the IS&R Site may be exposed to site-related contaminants through several ingestion exposure pathways, including ingestion of surface water, sediment/soil, and food web items. Only one line of evidence (the HQ approach) was available to evaluate risks to wildlife receptors with large home ranges (e.g., deer) from contaminants in environmental media at the IS&R Site. Based on the HQ approach, it is concluded that populations of large home range wildlife receptors are not likely to be adversely impacted by ingestion of metals in contaminated media in non-AOC locations. HQs indicate that there is the potential for slight impacts due to elevated levels of metals, if receptors were to preferentially feed in AOC locations. However, given the small spatial extent of AOCs relative to the total home range size, this exposure scenario is unlikely.

Only one line of evidence (the HQ approach) was available to evaluate risks to wildlife receptors with small/medium home ranges (e.g., mouse) from contaminants in environmental media at the IS&R Site. Based on the HQ approach, it is concluded that populations of small/medium home range wildlife receptors are likely to be adversely impacted by ingestion of metals in contaminated media from both non-AOCs and AOCs.

7.2.5 Uncertainties

Quantitative evaluation of ecological risks is generally limited by uncertainty regarding a number of data. This lack of knowledge is usually circumvented by making estimates based on whatever limited data are available, or by making assumptions based on professional judgment when no reliable data are available. Because of these assumptions and estimates, the results of risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment.

Uncertainties include the fact that some exposure pathways were not evaluated, exposure parameters were based on studies at other sites, and toxicity values lacked reliability. Because of the inherent conservatism in the derivation of many of the exposure estimates and toxicity benchmarks, HQ values should generally be viewed as being more likely to be high than low, which leads to an overestimation of risk.

7.2.6 Summary

The BERA found that the conservation area was predominantly characterized by areas with low concentrations of metal contaminants, which caused no unacceptable or significant area-wide or population-level risks to ecological receptors. There were other portions of the conservation area where levels of metal compounds existed in soils that could adversely impact plants and animals though none were considered to be significant enough to be of concern to the overall population. These areas were cleaned up or capped during the past three summers, including during the 2006 Removal Action at the conservation area.

7.3 CONCLUSIONS

The BRA found that human health risks to residents, workers, and visitor scenarios were within EPA's acceptable risk ranges but that some of the yards in Pine Canyon could pose an unacceptable risk. Cleanup levels for arsenic and lead in surface soils that are protective of workers, recreational visitors, and residents were derived for the site. Interim Removal Actions at the conservation area, Pine Canyon, and TVRR grade have reduced the immediate risk posed by soil contaminated with lead and arsenic above cleanup levels. Remedial action is required to address current and future potential risks that result from land development in Pine Canyon, the potential for erosion of protective caps and covers at the conservation area and TVRR grade, and the permanent storage of waste material at the conservation area.

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

SECTION 8

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) consist of medium-specific or location-specific goals for protecting human health and the environment. This section presents the RAOs for soil and tailings at the site and provides the basis for evaluating cleanup options presented in Section 9.

8.1 NEED FOR REMEDIAL ACTION

The smelting operations at the site have resulted in contamination of soils at the conservation area, Pine Canyon, and TVRR grade. Lead and arsenic pose the majority of risk to human health at the site. Interim Removal Actions at the conservation area, Pine Canyon, and TVRR grade have mitigated the immediate risk posed by soil contaminated with lead and arsenic above cleanup levels. Remedial action is required to address current and future risks that result from land development in Pine Canyon, the potential for erosion of protective caps and covers at the conservation area and TVRR grade, and the permanent storage of waste material at the conservation area.

8.2 REMEDIAL ACTION OBJECTIVES

At the conservation area, locations containing residues related to the smelter operation, which are exposed on the surface, were found or estimated to contain lead and/or arsenic concentrations above the cleanup level. These locations were addressed as part of the 2006 conservation area Removal Action. Additional Isolated Stained Soil (ISS) areas that were determined to be restrictive to vegetation or to possibly pose a physical hazard were addressed during the Removal Action to improve soil conditions.

The RAOs for the site, identified to be protective of human health and the environment for the conservation area, the TVRR grade area, and Pine Canyon, are as follows:

- For human and ecological receptors, prevent direct contact/ingestion with soil having lead and/or arsenic concentrations in excess of cleanup levels identified for the site, and
- For human and ecological receptors, protect water quality in streams by minimizing migration of soil with lead and/or arsenic concentrations above cleanup levels into streams.

RAOs are not necessary for surface water and sediments as these media do not pose a risk to human health and the environment. RAOs for groundwater are not necessary because the arsenic in groundwater is likely from naturally occurring sources. Groundwater monitoring will ensure that the former smelter does not become a source for groundwater contamination in the future.

The remedial actions resulting from meeting the RAOs will address the risks posed to current and future human populations by contact, ingestion, and/or inhalation of soil containing lead and arsenic.

SECTION 9

DESCRIPTION OF ALTERNATIVES

Currently there is no unacceptable human health and ecological risk that has not been mitigated with past reclamation and Removal Actions. Previously completed actions, including the 1986 reclamation work, have included capping of contaminated soils within the conservation area and portions of the TVRR grade, and soil removal in some of the Pine Canyon yards, in the conservation area, and on portions of the TVRR grade. In addition, storm water management controls, such as dikes and ditches, were constructed on the conservation area. Fences and informational signs were placed to restrict access and to advise visitors of access and activity restrictions and are properly maintained by the UDWR.

Alternatives are limited to the soils/tailings medium because that is the only medium found to be of potential concern. Potential remedial site alternatives were identified, screened, and evaluated. Due to the fact that the site has been reclaimed through various previous reclamation and Removal Actions, the alternatives are limited to how best to maintain the reclaimed features and to prevent future exposure. Site alternatives were developed by identifying remedial technologies and process options, which protect the integrity of the soil cover and provide guidelines for future development.

Because current site risks were addressed under prior Removal Actions and reclamation, only two remedial alternatives were evaluated. The alternatives apply to each of the three areas of the IS&R Site: the conservation area, Pine Canyon, and TVRR grade. The alternatives include: Alternative 1 - No Further Action and Alternative 2 - Monitoring and ICs.

Elements Common to Both Alternatives

The current conservation easement on the conservation area established by Atlantic Richfield and the UDWR will remain in place under both remedial alternatives. The conservation easement is a legal agreement to preserve and protect forever the wildlife, natural, scenic, open space, and educational values of the property, and to prevent any use of the property that will significantly impair or interfere with the wildlife habitat or other conservation values (see Appendix A).

Alternative 1 – No Further Action

This alternative calls for no further action to be taken to address existing contamination or to control or further restrict future human activity at the site. The no further action alternative would maintain the site in its present condition. The conservation easement currently in place would remain in place; however, no additional efforts beyond those described in the easement, which includes maintenance, would be taken to control access or maintain the current integrity and effectiveness of the Removal Actions.

Expected costs for Alternative 1 are limited to costs associated with existing operation and maintenance obligations in the conservation area, which range from $10,000 to $25,000 per year. There is not an additional incremental cost associated with this alternative.

Alternative 2 – Monitoring and Institutional Controls

This alternative takes into account all remedial work completed to date, includes no further remedial construction, and includes implementation of ICs and monitoring as needed to protect the integrity of the previously completed removal and reclamation actions.

ICs are administrative or legal controls on property use that help reduce potential exposure to the contaminants (metals) at the site. ICs such as zoning regulations, deed restrictions, easements, and public education serve to limit use of reclaimed areas to acceptable activities or guide behavior to avoid exposure to health risks.

ICs may be private, governmental, enforcement/permitting, or informational. Private controls typically involve landowner agreements that restrict certain activities on the property. Governmental controls impose land or resource restrictions using government authority, such as building codes, permits, and zoning regulations. Enforcement/permit controls may be specified in administrative orders or consent decrees. Informational controls, such as state registries and advisories, provide information to interested parties. The implementability and enforceability of all such institutional controls must be ensured for the controls to be effective.

Conservation Area

Activities that would impact remedial features are prohibited, such as drilling, exploration, filling, excavating, mining, dredging, removal of top soil and other materials, and commercial, industrial, and agricultural use as set forth in the conservation easement (see Appendix A). ICs are needed to supplement the conservation easement and to ensure it specifically addresses and protects the existing remedial features. Examples include further deed restrictions or modification of the conservation easement. In addition, upgraded engineering and updated informational controls, such as perimeter fencing and signage, would continue to be maintained by the UDWR and would help limit unauthorized use of the property. The performance and adequacy of the institutional controls will be reviewed on a periodic basis by the County. The County will work with Atlantic Richfield and UDWR to correct any deficiencies.

Pine Canyon

Undeveloped lands are being developed and proposed for development in the vicinity of Pine Canyon. As these lands become developed, particularly for residential purposes, the levels of lead and arsenic may become a concern. Some of the land may require remedial

action prior to being developed for residential purposes. Properties with existing development that will undergo modifications may also require remedial measures to avoid unacceptable human exposures to soil contaminants. The Tooele County Health Department will have a process for developers and landowners to follow.

ICs consisting of governmental ordinances and permit programs administered through the Tooele County building and health departments are expected to apply to future developable areas where metal concentrations are below recreational visitor cleanup levels but above residential human health cleanup levels, as set forth in this ROD. ICs through the Tooele County building and health departments are also expected to apply to existing development where soil contaminants in excess of cleanup levels might be disturbed during property modifications. An overlay zone for portions of Pine Canyon with developer/landowner guidelines will be identified. The ICs will state that within this overlay zone the County may request soil sampling for changes to land use within Pine Canyon, such as for new development or modifications to existing development. If soil concentrations of lead or arsenic exceed human health cleanup levels (Table 7-12), the developer or landowner will be required to remove and/or manage the soils so that there is no potential exposure.

When undeveloped lands are proposed for development, all of the following will be required:

- Coordination with the Pine Canyon Township Planning Commission, Tooele County, Tooele County building and health departments, the EPA, and the UDEQ to ensure that the developers and their contractors understand and comply with the requirements of the regulations governing development in areas with elevated lead and/or arsenic;
- Sampling soils prior to development to determine the extent and concentrations of lead and arsenic in soils;
- If sampling indicates unacceptable levels of lead or arsenic in the soils, affected areas will be cleaned up or managed following EPA guidance prior to development;
- If soils are excavated, the remaining soils will be sampled to ensure that the cleanup was effective and that development can proceed; and
- Appropriate management of any excavated soils. Soil will be accepted for disposal in the on-site repository in the conservation area by the property owner. Access to the repository for soils removed by developers or landowners will be provided on an as-needed basis. The legal description of the repository is as follows:

  > Beginning at the northwest section corner of Section 24; thence S0^{o}2’24”W along the section line between Sections 23 and 24 a distance of 478.87 feet; thence east 240.00 feet to the true point of beginning. From the true point of beginning N38^{o}25’59”E a distance of 300 feet; thence S38^{o}25’59”E a distance of 100 feet; thence S38^{o}25’59”W a

distance of 300 feet; thence N38°25'59"W a distance of 100 feet to the point of beginning encompassing an area of 0.69 acres.

Atlantic Richfield, developers, or landowners seeking to change the use of undeveloped land, such as from agricultural to residential, recreational visitor, or commercial, will be required to meet all requirements and specifications for the new use. The Tooele County building and health departments, with assistance as necessary from EPA and UDEQ, are expected to enforce the ICs for soil. More information regarding land development and soil disposal can be found in the Lincoln Township Removal Action Final Construction Closure Report, dated January 2007, for details on sampling procedures, soil removal action levels, and procedures used to remove and dispose of contaminated soils. This report is available at the Tooele Public Library and the Tooele County Health Department. Moreover, the draft Developer Guidelines will be finalized next year.

Tooele Valley Railroad

Because contaminated soil was removed from most of the TVRR grade, ICs are only necessary for approximately 3,000 ft on the eastern end of the extension section of the TVRR grade and the 300-ft long trestle area. The City of Tooele owns the trestle area that was capped with 12 inches of rip-rap. Currently existing ICs are limited to private party agreements with the landowners and Atlantic Richfield. Additional ICs, such as county ordinances and deed restrictions, are necessary to supplement the existing controls and are required to limit future development and activities from penetrating the rock cover. This remedy will ensure the performance and enforceability of such ICs and agreements. The Tooele County website, http://www.co.tooele.ut.us, provides codes and ordinances for the County. The performance and adequacy of the institutional controls will be reviewed by EPA on a periodic basis. Atlantic Richfield will work with the private landowners, Tooele County, and the City of Tooele, as applicable, to correct any deficiencies identified by the periodic reviews.

Monitoring

For Alternative 2, monitoring will be required for all three areas of the site. Monitoring by Atlantic Richfield will consist of checking the integrity of the caps and covers and storm water controls on a regular basis. Atlantic Richfield will monitor and maintain the conservation area because it is owned by the company, and the TVRR grade capped areas. Maintenance of caps and covers, vegetation, storm water controls, erosion controls and fencing will be conducted as required to preserve the integrity of the selected remedy. Groundwater will be monitored at the conservation area to ensure that the former smelter area does not become a source of groundwater contamination in the future. Atlantic Richfield will fund the cost of the ICs and long-term monitoring. In addition, EPA and UDEQ will monitor the ICs to ensure they remain in place and serve their intended purpose.

Because the remedy does not allow for unlimited use and unrestricted exposure, the IS&R Site will be subject to reviews of how well the remedy is meeting the objectives. These reviews are conducted by EPA at least every five years and are referred to as Five-Year Reviews.

Costs

Costs expected for Alternative 2 are approximately $25,000 to $100,000 per year for monitoring, periodic reviews, repair, and enforcement. Most costs associated with ICs will be incurred during the planning and initial set-up. The net present value of the ICs anticipated to be necessary is within the range of $400,000 to $1.5 million dollars, calculated for a period of 30 years.

SECTION 10

SUMMARY OF COMPARATIVE ANALYSES OF ALTERNATIVES

The NCP requires that each remedial alternative, analyzed in detail in the FS, be evaluated according to specific criteria. The purpose of this evaluation is to promote consistent identification of the relative advantages and disadvantages of each alternative, thereby guiding selection of remedies offering the most effective and efficient means of achieving site cleanup goals. There are nine criteria by which feasible remedial alternatives are evaluated. While all nine criteria are important, they are weighed differently in the decision-making process depending on: (1) whether they describe or involve protection of human health and the environment or compliance with federal or state statutes and regulations (threshold criteria), (2) a consideration of technical or socioeconomic merits (primary balancing criteria), or (3) the evaluation of non-EPA reviewers that may influence an EPA decision (modifying criteria).

Threshold Criteria

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (ARARs)

Primary Balancing Criteria

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

Modifying Criteria

- State acceptance
- Community acceptance

The first two criteria, overall protection of human health and the environment, and compliance with regulations (called ARARs), are considered threshold criteria. Threshold criteria must be attained by the action selected for implementation. The next five criteria, short- and long-term effectiveness, treatment, implementability, and cost, are considered balancing criteria. Balancing criteria allow or may consider tradeoffs to achieve the best overall cleanup solution. The last two criteria, state and community acceptance, are considered modifying criteria. They are last, but not because they are least important. Rather, comments and concerns expressed by the State and affected communities are important. EPA can modify a preferred remedy based on state and community input.

The comparison of alternatives with respect to these criteria is discussed below. Table 10-1 provides a comparative analysis of the alternatives.

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Alternative 1, No Further Action, is currently protective of human health and the environment, but future protection cannot be assured because of the lack of ICs and lack of monitoring and maintenance of soil covers.

Alternative 2, Monitoring and ICs, provides for current and future protection of human health and the environment by restricting activities that may affect the soil covers over waste remaining in place. Monitoring and ICs provide a mechanism to assess and ensure the protectiveness of the remedy.

Compliance with Federal and/or State Requirements – ARARs

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations, which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA §121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.

The NCP Final Rule for CERCLA defines relevant and appropriate requirements as those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or circumstance at a CERCLA site, addresses problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes or provides a basis for invoking a waiver.

In addition to applicable or relevant and appropriate requirements (ARARs), the NCP provides a list of federal non-promulgated criteria, advisories and guidance and state standards "to be considered" (TBC).

The chemical-specific, action-specific, and location-specific ARARs are shown in Tables 10-2 through 10-4.

Alternative 1 would not be in compliance with federal or state ARARs because closure standards would not be met if covers are eroded or compromised or ICs were not in place to prevent unacceptable human exposure to contaminants.

Alternative 2 meets federal and state ARARs.

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on site following remediation and the adequacy and reliability of controls.

Alternative 1 is minimally effective in protecting reclaimed features within the conservation area due to the activity restrictions in the conservation easement. Alternative 1 would be effective at meeting the cleanup objectives where waste was removed in Pine Canyon and TVRR grade. However, long-term effectiveness could not be assured for Alternative 1 in the areas of future development within Pine Canyon or where waste remains in place at the TVRR grade.

Alternative 2 provides long-term effectiveness and permanence by restricting activities that may damage the caps, covers, and storm water controls. In addition, Alternative 2 includes monitoring of caps, covers, and controls to ensure that these remedial features remain effective.

Reduction in Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternatives 1 and 2 do not involve treatment that would destroy contaminants or irreversibly reduce their mobility. Since contaminated materials have already been removed from certain areas of the site, treatment is not a consideration in those areas.

Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Neither of the alternatives involves short-term remedial construction so there are no short-term effects related to construction activities.

Implementability

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

Alternatives 1 and 2 are both implementable as no additional construction work is required. Monitoring and ICs are implementable for Alternative 2. Atlantic Richfield is expected to be responsible for helping to establish and provide resources for institutional controls implemented by the Tooele County Health Department. Atlantic Richfield will also be responsible for ICs on property it owns (conservation area) and some areas of the TVRR grade. Both EPA and UDEQ will monitor the remedy as required under CERCLA to ensure that the remedy remains protective. Groundwater monitoring on the conservation area will be conducted by Atlantic Richfield. Groundwater monitoring will ensure that the conservation area does not become a source for groundwater contamination in the future.

Costs

Expected costs for Alternative 1 ($10,000 - $25,000/year) are lower than Alternative 2 ($25,000 - $100,000/year). However, Alternative 1 may not provide future protection of human health and the environment.

State Acceptance

The UDEQ has been involved in the RI/FS and concurs with the EPA on the selected remedy.

Community Acceptance

This criterion evaluates whether the local community agrees with EPA's analyses and preferred alternative. The community is supportive of the selected remedy. EPA solicited public comment on the proposed plan during a formal public comment period extending from June 16, 2007, through July 16, 2007; EPA also held a public meeting June 26, 2007. EPA did not receive any written comments during the comment period.

Citizen comments during the public meeting were generally favorable and there were no objections to the preferred alternative. Section III, Responsiveness Summary, provides comments from the community and EPA's responses.

SECTION 11

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address principal threats posed by a site wherever practical. A principal threat concept is applied to the characterization of "source material" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that acts as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. EPA has defined principal threat wastes as those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

Principal threat waste has not been identified on the IS&R Site.

SECTION 12

THE SELECTED REMEDY

The selected remedy for the IS&R Site is monitoring and institutional controls.

12.1 SUMMARY OF THE RATIONALE FOR THE SELECTED REMEDY

The key factors upon which the remedy decision is based are:

- Past Removal Actions have addressed areas with soil containing concentrations of COCs above cleanup levels through excavation and backfill, placement of soil covers, and revegetation;
- The selected remedy provides future protectiveness through the application of institutional controls and monitoring; and
- The selected remedy will be protective of human health and the environment, comply with ARARs, and be cost-effective.

12.2 DESCRIPTION OF THE SELECTED REMEDY

The remedy takes into account all removal work completed to date, includes no further remedial construction, and includes implementation of institutional controls and monitoring as needed to protect the integrity of the previously completed removal and reclamation actions.

ICs are administrative or legal controls on property use that help reduce potential exposure to the contaminants (metals) at the Site. ICs such as zoning regulations, deed restrictions, easements, and public education serve to limit use of reclaimed areas to acceptable activities or guide behavior to avoid exposure to health risks.

ICs may be private, governmental, enforcement/permitting, or informational. Private controls typically involve landowner agreements that restrict certain activities on the property. Governmental controls impose land or resource restrictions using government authority, such as building codes, permits, and zoning regulations. Enforcement/permit controls may be specified in administrative orders or consent decrees. Informational controls, such as state registries and advisories, provide information to interested parties. The implementability and enforceability of all such ICs must be ensured for the institutional controls to be effective.

Conservation Area

The current conservation easement on the conservation area established by Atlantic Richfield and the UDWR will remain in place. The conservation easement is a legal agreement to preserve and protect forever the wildlife, natural, scenic, open space, and educational values of the property, and to prevent any use of the property that will

significantly impair or interfere with the wildlife habitat or other conservation values (see Appendix A).

Activities that would impact remedial features are prohibited, such as drilling and exploration, filling, excavating, mining, dredging, and removal of top soil and other materials, and commercial, industrial, and agricultural use as set forth in the conservation easement (see Appendix A). ICs are needed to supplement the conservation easement, and to ensure it specifically addresses and protects the existing remedial features. Examples include further deed restrictions or modification of the conservation easement. In addition, upgraded engineering and updated informational controls, such as perimeter fencing and signage, would continue to be maintained by the UDWR and would help limit unauthorized use of the property. The performance and adequacy of the institutional controls will be reviewed by the County on a periodic basis. The County will work with Atlantic Richfield and the UDWR to correct any deficiencies identified by the periodic reviews.

Pine Canyon

Undeveloped lands are being developed and proposed for development in the vicinity of Pine Canyon. As these lands become developed, particularly for residential purposes, the levels of lead and arsenic may become a concern. Some of the land may require remedial action prior to being developed for residential purposes. Properties with existing development that will undergo modifications may also require remedial measures to avoid unacceptable human exposures to soil contaminants. The Tooele County Health Department will have a process for developers and landowners to follow.

ICs consisting of governmental ordinances and permit programs administered through the Tooele County building and health departments are expected to apply to future developable areas where metal concentrations are below recreational visitor cleanup levels but above residential human health cleanup levels, as set forth in this ROD. ICs through the Tooele County building and health departments are also expected to apply to existing development where soil contaminants in excess of cleanup levels might be disturbed during property modifications. An overlay zone for portions of Pine Canyon with developer/landowner guidelines will be identified. The ICs will state that within this overlay zone the County may request soil sampling for changes to land use within Pine Canyon, such as for new development or modifications to existing development. If soil concentrations of lead or arsenic exceed human health cleanup levels (Table 7-12), the developer or landowner will be required to remove and/or manage the soils so that there is no potential exposure.

When undeveloped lands are proposed for development, all of the following will be required:

- Coordination with the Pine Canyon Township Planning Commission, Tooele County, Tooele County building and health departments, the EPA, and the UDEQ to ensure that the developers and their contractors understand and comply with the

requirements of the regulations governing development in areas with elevated lead and/or arsenic;

- Sampling soils prior to development to determine the extent and concentrations of lead and arsenic in soils;
- If sampling indicates unacceptable levels of lead or arsenic in the soils, affected areas will be cleaned up or managed following EPA guidance prior to development;
- If soils are excavated, the remaining soils will be sampled to ensure that the cleanup was effective and that development can proceed; and
- Appropriate management of any excavated soils. Soil will be accepted for disposal in the on-site repository in the conservation area by the property owner. Access to the repository for soils removed by developers or landowners will be provided on an as-needed basis. The legal description of the repository is as follows:

> Beginning at the northwest section corner of Section 24; thence S0°2'24"W along the section line between Sections 23 and 24 a distance of 478.87 feet; thence east 240.00 feet to the true point of beginning. From the true point of beginning N38°25'59"E a distance of 300 feet; thence S38°25'59"E a distance of 100 feet; thence S38°25'59"W a distance of 300 feet; thence N38°25'59"W a distance of 100 feet to the point of beginning encompassing an area of 0.69 acres.

Atlantic Richfield, developers, or landowners seeking to change the use of undeveloped land, such as from agricultural to residential, recreational visitor, or commercial, will be required to meet all requirements and specifications for the new use. The Tooele County building and health departments, with assistance as necessary from EPA and UDEQ, are expected to enforce the ICs for soil. More information regarding land development and soil disposal can be found in the Lincoln Township Removal Action Final Construction Closure Report, dated January 2007 for details on sampling procedures, soil removal action levels, and procedures used to remove and dispose of contaminated soils. This report is available at the Tooele Public Library and the Tooele County Health Department. Moreover, the draft Developer Guidelines will be finalized next year.

TVRR Grade

Because contaminated soil was removed from most of the TVRR grade, ICs are only necessary for approximately 3,000 feet on the eastern end of the extension section of the TVRR grade and 300-ft long trestle area. The City of Tooele owns the trestle area that was capped with 12 inches of rip-rap. Currently existing ICs are limited to private party agreements with the landowner and Atlantic Richfield. Additional ICs, for example county ordinances and deed restrictions, are necessary to supplement the existing controls and are required to limit future development and activities from penetrating the rock cover. This remedy will ensure the performance and enforceability of such ICs and agreements. The Tooele County website, http://www.co.tooele.ut.us, provides codes and ordinances for the County. The performance and adequacy of the institutional controls

will be reviewed by EPA on a periodic basis. Atlantic Richfield will work with the private landowners and the City of Tooele, as applicable, to correct any deficiencies identified by the periodic reviews.

Monitoring

Monitoring will be required for all three areas of the site. Monitoring by Atlantic Richfield will consist of checking the integrity of the caps and covers and storm water controls on a regular basis. Atlantic Richfield will monitor and maintain the conservation area. Maintenance of caps and covers, vegetation, storm water controls, erosion controls, and fencing will be conducted as required to preserve the integrity of the selected remedy. Groundwater will be monitored at the conservation area to ensure that the former smelter area does not become a source of groundwater contamination in the future. In addition, EPA and UDEQ will monitor the ICs to ensure they remain in place and serve their intended purpose.

Costs

Expected cost for the remedy is approximately $25,000 to $100,000 per year for monitoring, periodic reviews, repair and enforcement. The cost estimate includes maintenance and repair of caps and covers, vegetation, storm water controls, erosion controls, and fencing. Most costs associated with ICs will be incurred during the planning and initial set-up. The net present value of the ICs anticipated to be necessary is within the range of $400,000 to $1.5 million dollars, calculated for a period of 30 years.

Minor changes to the remedy may occur during the remedial design and remedial action. Any significant changes to the remedy described in this ROD will be documented using a technical memorandum, an explanation of significant differences (ESD), or a ROD amendment, which would be included in the Administrative Record, depending on the nature and magnitude of the change from the selected remedy in the ROD.

12.3 EXPECTED OUTCOMES OF THE SELECTED REMEDY

EPA expects that, upon implementation, this remedy will protect human health and the environment and comply with ARARs.

All future direct and indirect contact risks presented by potential exposure to COCs are eliminated through long-term monitoring, institutional controls, and maintenance of caps and covers.

Land use is not expected to change as a result of the selected remedy. The conservation easement for the conservation area will remain in place. Land use in Pine Canyon is expected to continue to include residential and agricultural uses. Additional remedial action may be required in cases where current agricultural or recreational land is developed for residential purposes. Developers with assistance from the County will be responsible for soil sampling and removal, if required. Institutional controls will be

required for undeveloped property and other areas in Pine Canyon. EPA and UDEQ will conduct oversight of the institutional controls. Groundwater use is not expected to change as a result of the selected remedy.

Monitoring and maintenance of the caps and covers, and the conservation easement, are expected to continue to protect and develop the natural and wildlife resources of the conservation area.

Because the remedy does not allow for unlimited use and unrestricted exposure, the IS&R Site will be subject to reviews of how well the remedy is meeting the objectives. These reviews are conducted at least every five years and are referred to as Five-Year Reviews.

SECTION 13

STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions to the extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the selected remedy meets these statutory requirements.

13.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will protect human health and the environment by:

- Preventing unacceptable exposure risk to current and future human populations presented by direct contact, inhalation, or ingestion of smelter wastes consisting of contaminated soils or tailings;
- Preventing unacceptable exposure risks to current and future ecological receptors presented by direct contact, inhalation, or ingestion of contaminated soils or tailings;
- Implementing institutional controls and maintenance to ensure the existing remedial features are protected and maintained, and that undeveloped lands, if developed, will be required to meet the same cleanup levels and standard of protection previously implemented for residential soils; and
- Monitoring any possible future migration of COCs in groundwater.

13.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy will comply with federal and state ARARs that have been identified. No waiver of any ARAR is being sought for the selected remedy. Only the state ARAR is identified when a situation occurs in which the state ARAR is more stringent than the corresponding federal ARAR, or where requirements from the state program have been federally authorized. The ARARs for the remedy are identified in Tables 10-2 through 10-4.

13.3 COST-EFFECTIVENESS

The selected remedy is determined to be cost effective. In making this determination, the following definition set forth in the NCP was used: “A remedy shall be cost-effective if its costs are proportional to its overall effectiveness.” (40 CFR §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the “overall effectiveness” of those alternatives that satisfy the threshold criteria. Overall effectiveness was evaluated by assessing three of

the five balancing criteria in combination (long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs, and, hence, this alternative represents a reasonable value for the money to be spent.

13.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY) TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering state and community acceptance.

13.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The selected remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. Treatment was not demonstrated to be practicable for the contaminants and wastes. Given the size of the site, the dispersion of some level of waste throughout much of the site, the type of waste present, and the flexibility desired for future site use, treatment of contaminants and waste materials was not a viable option. No source materials constituting principal threats were identified on the site. Treatment is therefore not a principal element of this remedy.

13.6 FIVE-YEAR REVIEW REQUIREMENTS

In accordance with CERCLA §121 (c), because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

PART III

RESPONSIVENESS SUMMARY

APPENDIX A

CONSERVATION EASEMENT

APPENDIX B

GROUNDWATER FACT SHEET

FIGURES

PHOTOGRAPHS

TABLES