3.7 NOISE

Noise is defined as "unwanted sound." At high levels noise can damage hearing, cause sleep deprivation, interfere with communication, and disrupt concentration. In the context of protecting the public health and welfare, noise implies adverse effects on people and the environment.

The sound we hear is the result of a source inducing vibration in the air, creating sound waves. These waves radiate in all directions from the source and may be reflected and scattered or, like other wave actions, may turn corners. Sound waves are a fluctuation in the normal atmospheric pressure, which is measurable. This sound pressure level is the instantaneous difference between the actual pressure produced by a sound wave and the average or barometric pressure at a given point in space. This provides us the fundamental method of measuring sound, which is in "decibel" (dB) units.

The dB scale is a logarithmic scale because the range of sound intensities is so great that it is convenient to compress the scale to encompass all the sound pressure levels that need to be measured. The sound pressure level is defined as 20 times the logarithm, to the base 10, of the ratio of the pressure of the sound measured to the reference pressure, which is 20 µPa (0.0002 dyne/cm^2). In equation form, sound pressure level in units of dB is expressed as:

$$dB = 20 \, Log_{10} \, P/Pr$$

Where:
P = measured sound pressure level µPa (dyne/cm^2)
Pr = reference sound pressure level, 20 µPa (0.0002 dyne/cm^2)

Due to its logarithmic scale, if a noise increases by 10 dB, it sounds as if the noise level has doubled. If a noise increases by 3 dB, the increase is just barely perceptible to humans. Additionally, as a rule-of-thumb the sound pressure level from an outdoor noise source radiates out from the source, decreasing 6 dB per doubling of distance. Thus, a noise that is measured at 80 dB 15 m (50 ft) away from the source will be 74 dB at 30.5 m (100 ft), 68 dB at 61 m (200 ft), and 62 dB at 122 m (400 ft). However, natural and man-made features such as planted trees, buildings, land contours, etc., will often reduce the sound level further due to dissipation and absorption of the sound waves. Occasionally buildings and other reflective surfaces may slightly amplify the sound waves, through reflected and reverberated sound waves.

The rate at which a sound source vibrates determines its frequency. Frequency refers to the energy level of sound in cycles per second, designated by the unit of measurement Hertz (Hz). The human ear can recognize sounds within an approximate range of 16 Hz to 20,000 Hz, but the most readily predominant sounds that we hear are between 500 Hz and 6,000 Hz (EPA, 1973). To measure sound on a scale that approximates the way it is heard by people, more weight must be given to the frequencies that people hear more easily. The "A-weighted" sound scale is used as a method for weighting the frequency spectrum of sound pressure levels to mimic the human ear. A-weighting was recommended by the EPA to describe noise because of its convenience and accuracy, and it is used extensively throughout the world (EPA, 1974). For the purpose and scope of this report and sound level testing, all measurements will be in the A-weighted scale (dBA).

3.7.1 Extent of Noise Analysis

Community noise levels are often measured by the Day-Night Average Sound Level (L_{dn}). The L_{dn} is the A-weighted equivalent sound level for a 24-hour period. Due to the potential for sleep disturbance, loud noises between 10 p.m. and 7 a.m. are normally considered more annoying than loud noises during the day. This is a psychoacoustic effect that can also contribute to communication interference, distraction, disruption of concentration and irritation. A 10 dB weighting factor is added to nighttime equivalent sound levels due to the sensitivity of people during nighttime hours (EPA, 1974). For example, a measured nighttime (10 p.m. to 7 a.m.) equivalent sound level of 50 dBA can be said to have a weighted nighttime sound level of 60 dBA (50 + 10).

For the purposes of this report, an Equivalent Sound Level (L_{eq}) is used to measure average noise levels during the daytime hours. The L_{eq} is a single value of sound level for any desired duration, which includes all of the time-varying sound energy in the measurement period. To further clarify the relationship between these two factors, the daytime sound level equivalent averaged with the nighttime sound level equivalent equals the Day-Night Average: L_{eq} (Day) averaged with L_{eq} (Night) = L_{dn}. Since the nighttime noise levels are significantly lower than the daytime noise levels, the daytime L_{eq} is used alone, without averaging the lower nighttime value, to provide a more conservative representation of the actual exposure.

3.7.2 Community Distribution

The area immediately surrounding the proposed site is unpopulated and used primarily for farming and seasonal cattle grazing. Noise receptors include wildlife using the proposed site and vicinity, agricultural workers who infrequently work on the properties surrounding the proposed site, visitors to a Bureau of Land Management (BLM) hiking trail, and residents. The BLM hiking trail is on Wilderness Study Area about 0.5 km (0.3 mi) southwest of the proposed site. The nearest resident is about 7.7 km (4.8 mi) east of the site along U.S. Highway 20. The nearest town is Idaho Falls, which is approximately 32 km (20 mi) away. In addition, a group of archaeological sites (Wasden complex) is about 1.0 km (0.6 mi) from the boundary of the proposed site on private land.

3.7.3 Background Noise Levels

Since there were no previous measurements performed for noise levels, background noise was surveyed at six locations near the borders of the proposed site on June 1 though 7, 2008. In addition, measurements were taken at an operating irrigation well pump in the northeast portion of the proposed site on June 17, 2008. A Bruel & Kjaer 2250 Integrating Sound Level Meter was used to record noise measurements. The A-weighted decibel scale (dBA) was used to record and weigh noise that is audible to the human ear. Measurements were taken over six, 24-hour periods. The measurement methods were consistent with the guidance provided in American Society of Testing and Materials (ASTM) Standard E1686-03 (ASTM, 2003). Measurement locations are shown in Figure 3.7-1, Noise Measurement Locations. The six locations selected for the noise measurements along boundaries of the proposed site represent the nearest potential receptor locations for the general public and the locations of expected highest noise levels when the facility is operational.

Noise instrumentation included foam windscreens that covered the microphones. Meteorological data collected on-site showed average wind speeds ranging from 2.2 to 15.6 m/s (5 to 35 mi/hr) during the period of the noise survey on June 1 through 7, 2008.

The operating irrigation well pump in the northeast portion of the proposed site is the only current point noise source on the proposed site. Traffic on U.S. Highway 20 immediately south of the proposed site is the sole line noise source.

Average background noise levels ranged from 30.4 to 78.2 dBA (see Table 3.7-1, Background Noise Levels for the Proposed Eagle Rock Enrichment Facility Site. With the exception of noise measurements at the irrigation well, these noise levels are considered moderate, and are below the average range of speech of 48 to 72 dBA (HUD, 1985). See Figure 3.7-2, Sound Level Range Examples. Lower noise levels reflect periods when wind speeds were below 9 m/s (20 mi/hr) during the sampling period and from measurements distant from U.S. Highway 20 and the irrigation pump. Noise levels exceeding 50 dBA were from measurements taken within 10 m (33 ft) of U.S. Highway 20 during peak traffic periods, which included heavy-duty tractor-trailer trucks passing the proposed site. Noise levels also exceeded 50 dBA in the northeast corner of the site because wind speeds exceeded 40 kph (25 mph) during the measurement period. Noise levels were 78.2 dBA when measured about 6.1 m (20 ft) from the operating irrigation well pump.

3.7.4 Topography and Land Use

The topography of the proposed site has an average slope of approximately 1.4 %. Elevation varies from about 1,556 m (5,106 ft) near U.S. Highway 20 to about 1,600 m (5,250 ft) in a small area at the eastern edge of the property. The lowest site elevation is about 1,556 m (5,106 ft) along the southern boundary of the property.

Rangeland comprises 53%, agriculture comprises 18%, and non-irrigated seeded pasture comprises 10% of the area within an 8 km (5 mi) radius of the proposed site, encompassing 39,723 hectares (98,159 acres) within Bonneville County, Idaho (See Figure 3.1-1, Land Ownership Within 80 Km (50 Mi)). Rangeland is an extensive area of open land on which livestock graze and includes a plant community dominated by sagebrush (Artemisia spp.). Crops grown on the agricultural areas include potatoes and grains. Non-irrigated seeded pastures are typically crested wheatgrass. Barren land (e.g., lava flows) is the other land use classification in the site vicinity, comprising 19% of the area (7685 hectares (18,990 acres)) within an 8 km (5 mi) radius of the proposed site. Refer to Section 3.1 for further discussion of land use.

With regard to noise mitigation, land contours that have changes in elevation will help to absorb sound pressure waves that travel outward from a noise source. A flat surface would allow noise from a source to travel a greater distance without losing its intensity (perceived volume). Wooded areas, trees, and other naturally occurring features will also mitigate noise sources, provided those features are located between the noise and the noise receptor. See Section 4.7.5, Mitigation, for further discussion of noise mitigation at the proposed site.

3.7.5 Meteorological Conditions

The meteorological conditions at the proposed site have been evaluated and summarized in order to characterize the site climatology. See ER Section 3.6, Climatology, Meteorology, and Air Quality, for a detailed discussion.

Average Monthly mean wind speeds for three recording stations on Idaho National Laboratory (INL) property is presented in Table 3.6-5, Eagle Rock Enrichment Facility Site Climate: Average Monthly and Annual Wind Speeds for Idaho Falls 46 W, KET and EBR. The average annual mean wind speeds were 3.4 m/s (7.5 mph), 5.5 m/s (12.2 mph), and 4.2 m/s (9.3 mph) at Idaho Falls 46 W, Kettle Butte (KET), and Argonne National Lab-West (EBR), respectively. The highest hourly average wind speed and concurrent wind direction was 23 m/s (51 mph) from the west-southwest (see Table 3.6-6. Eagle Rock Enrichment Facility Site Climate:

Highest Hourly Average Wind Speed and Concurrent Wind Direction for Idaho Falls 46 W, KET and EBR).

Five years of data (2003-2007) from the EBR tower on INL property were used to generate joint frequency distributions of wind speed and direction as a function of atmospheric stability. This data summary is provided in Table 3.6-9, EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables. The prevailing wind direction for all stability classes combined is from the southwest at approximately 16% of the time.

Noise intensities are affected by weather conditions for a variety of reasons. Snow-covered ground can absorb more sound waves than an uncovered paved surface that would normally reflect the noise. Operational noise can be masked by the sound of a rainstorm or high winds. Additionally, seasonal differences in foliage, as well as temperature changes, can affect the environmental efficiency of sound wave absorption (i.e., a fully leafed tree or bush will mitigate more sound than one without leaves). Because of those variables, the noise levels, both background and after the plant is built, will be variable. However, even when such variations are taken into consideration, the background noise levels are within the HUD and EPA guidelines.

3.7.6 Sound Level Standards

Agencies with applicable standards for community noise levels include the U.S. Department of Housing and Urban Development (HUD, 1985) and the Environmental Protection Agency (EPA, 1974). There are no county or Idaho State ordinances or regulations governing environmental noise. In addition, there are no affected American Indian tribal agencies within the sensitive receptor distances from the site. Thus, the proposed site is not subject either to local, tribal, or state noise regulations. Nonetheless, anticipated facility noise levels are expected to fall below the HUD and EPA standards and are not expected to be harmful to the public's health and safety, nor a disturbance of public peace and welfare.

HUD has developed land use compatibility guidelines for acceptable noise versus the specific land use (see Table 3.7-2, U.S. Department of Housing and Urban Development Land Use Compatibility Guidelines). The EPA has defined a goal of 55 dBA for L_{dn} in outdoor spaces, as described in the EPA Levels Document (EPA, 1974). Background noise measurements shown in Table 3.7-1, Background Noise Levels for the proposed Eagle Rock Enrichment Facility site met the HUD guidelines for “clearly acceptable” for all land uses with the exception of the noise measurement near the operating irrigation pump, which met the normally acceptable HUD guideline for industrial land uses. When compared to the EPA goal, the noise measurements did not consistently meet the EPA goal. Five of the noise measurements met the EPA goal for outdoor spaces, while two measurements exceed the EPA goal. The two exceedance measurements were associated with the irrigation pump and highway traffic. If Table 3.7-1 measurements had been averaged to reflect nighttime levels, the average ambient noise levels would be even lower.

TABLES

Table 3.7-1 Background Noise Levels for the Proposed Eagle Rock Enrichment Facility Site

(Page 1 of 1)

Measurement Location	**Location Description** (see Figure 3.7-1)	**Average A-Weighted Sound Level (L_{eq})**
Location 1	Northwest corner of proposed site	30.4 dBA
Location 2	North central boundary of proposed site	39.8 dBA
Location 3	Northeast corner of proposed site (high wind conditions)	54.7 dBA
Location 4	Southeast corner nearest to proposed facility	37.1 dBA
Location 5	South boundary of proposed site next to U.S. Highway 20	57.5 dBA
Location 6	Southwest corner nearest to proposed facility	31.1 dBA
Location 7	Irrigation Well Pump in northeast portion of proposed site	78.2 dBA

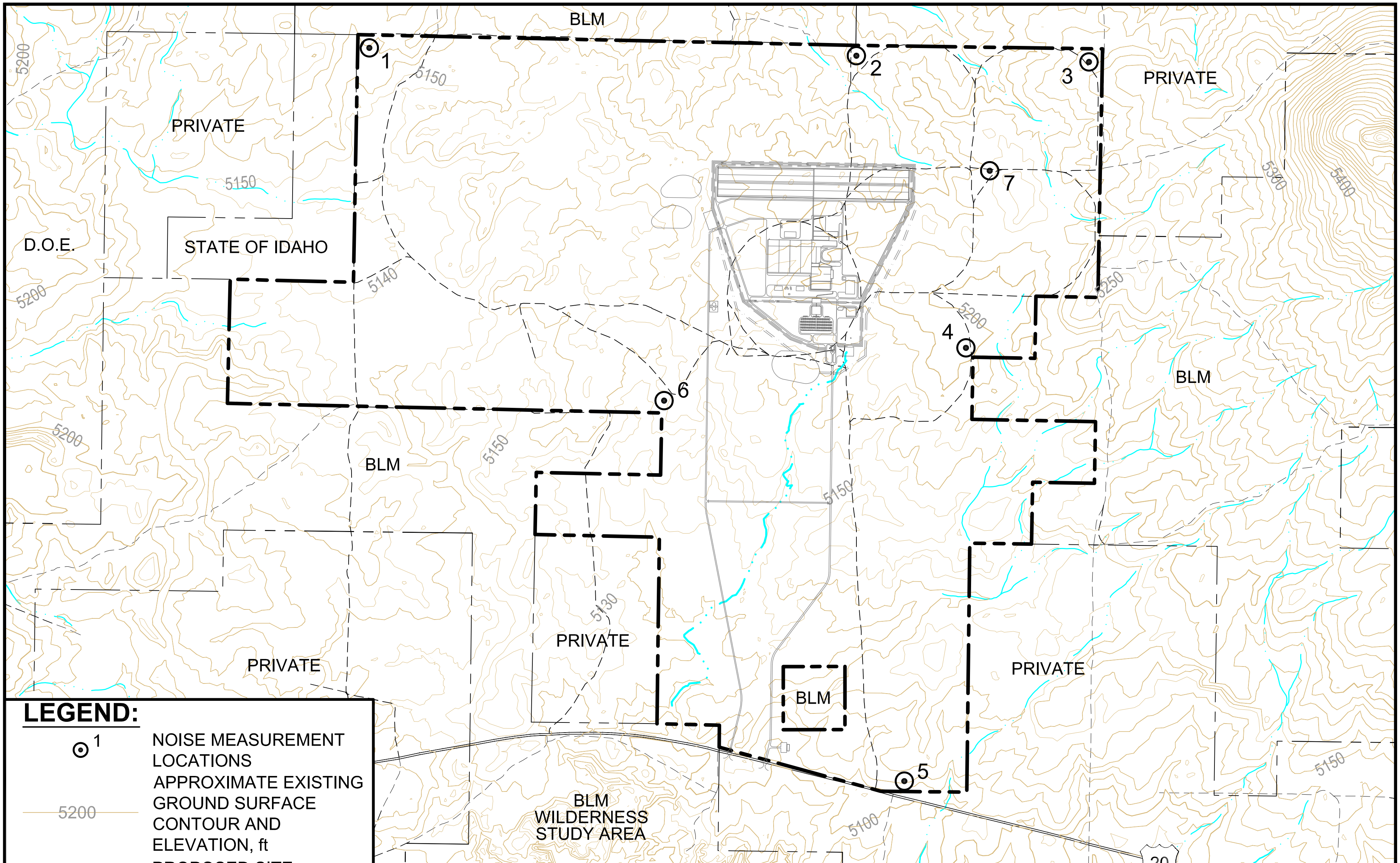
Table 3.7-2 U.S. Department of Housing Urban Development Land Use Compatibility Guidelines

(Page 1 of 1)

	Sound Pressure Level (dBA L_{dn})			
Land Use Category	**Clearly Acceptable**	**Normally Acceptable**	**Normally Unacceptable**	**Clearly Unacceptable**
Residential	<60	60-65	65-75	>75
Livestock farming	<60	60-75	75-80	>80
Office Buildings	<65	65-75	75-80	>80
Wholesale, industrial, manufacturing and utilities	<70	70-80	80-85	>85

Source: HUD, 1985

FIGURES



LEGEND:

⊙ 1	NOISE MEASUREMENT LOCATIONS
5200	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEVATION, ft
— — — —	PROPOSED SITE BOUNDARY
- - - - -	EXISTING ROAD

NOTES:

1. GROUND SURFACE CONTOUR ELEVATIONS ARE SHOWN IN FEET. METRIC CONVERSION IS 1 m = 3.281 ft.

SCALE
0 800 1600 m

SCALE
0 2500 5000 ft

N

Figure 3.7-1 **Rev. 1**

Noise Measurement Locations

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT

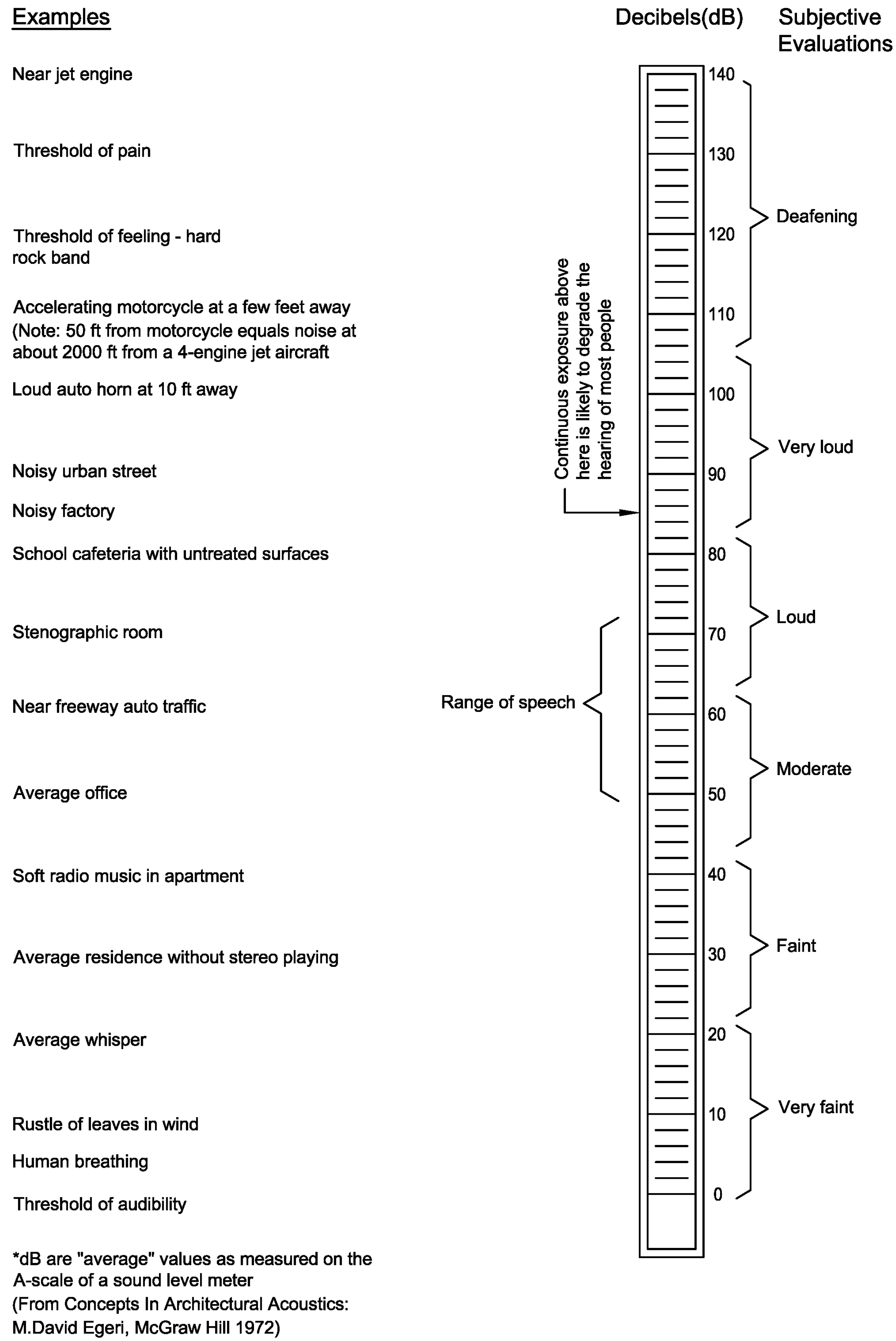


Figure 3.7-2 **Rev. 1**

Sound Level Range Examples

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT

3.8 HISTORIC AND CULTURAL RESOURCES

3.8.1 Extent of Historical and Cultural Analysis

The proposed Eagle Rock Enrichment Facility (EREF) site in Bonneville County, Idaho, had not been surveyed for cultural resources prior to site selection. Therefore, AREVA Enrichment Services, in consultation with the Idaho State Historic Preservation Officer (SHPO), determined that a survey would be conducted to identify and evaluate any cultural resource properties that may be present within the approximately 381-hectare (941-acre) area proposed for disturbance.

3.8.2 Known Cultural Resources in the Area

The Snake River Plain has been an area of human occupation by hunter and gathering populations for at least 12-15,000 years. Within southeastern Idaho, the prehistoric cultural chronology is organized into three major periods: Early Prehistoric (15,000-7,500 Before Present (B.P.)), Middle Prehistoric (7,500-1,300 B.P.), and Late Prehistoric (1,300-300 B.P.). The Protohistoric Period (300-150 B.P.) began with the presence of European trade goods in archaeological assemblages. The Euro-American presence in the area dates from the early 1800s.

There are no prior cultural resource surveys at the proposed site although five surveys have been conducted in close proximity (Gilbert, 1991; Hill, 1990; Miller, 1985; Reed, 1987; Vrem, 2005). A file search at the Idaho SHPO indicated that there are several known cultural resource sites located within an approximate 1.6 km (1 mi) buffer area around the proposed site which covers 1,684 hectares (4,160 acres) in its entirety. These archaeological sites include three rockshelters (known as the Wasden Complex), a lithic scatter with a fluted point, and three other archaeological sites without available documentation.

3.8.3 Archaeological or Historical Surveys

3.8.3.1 Physical Extent of Survey

The physical extent of the survey area (approximately 381 hectares (941 acres)) included two access roads and the footprint to be disturbed by construction. An intensive pedestrian survey was conducted and revealed potentially eligible prehistoric archaeological site components and eligible historic site components within 8.6 hectares (21.3 acres) of this area.

3.8.3.2 Description of Survey Techniques

The survey of the 381-hectare (941-acre) area included a pedestrian surface inventory at 15 m (49 ft) zigzag transects. Cultural resource sites were recorded by mapping the surface remains, plotting the sites on a 7.5 minute USGS topographic map of the area, and plotting the site locations using Global Positioning System (GPS) receivers.

Special attention was given to depressions, rodent burrows, and anthills. When an isolated occurrence was encountered, its attributes were recorded and a GPS coordinate was taken. Cultural resource sites were recorded on sketch maps produced by compass and pace with GPS assistance. Sites located during the survey were recorded on Archaeological Survey of Idaho Site Inventory Forms and photographs of the sites and study area were taken. No artifacts were collected.

3.8.3.3 Cultural Resource Specialist Qualifications

The survey was conducted within the EREF footprint. The survey at the proposed EREF site was performed by personnel with professional experience in prehistoric and historic archaeology in the Great Basin. Crew experience ranged between five and 32 years. The personnel were supervised by a degreed anthropologist.

3.8.3.4 Survey Findings

The survey of approximately 381 hectares (941 acres) at the proposed EREF site located north of U.S. Highway 20 and about 113 km west (70 mi) of the Idaho/Wyoming state line in Bonneville County, Idaho, resulted in the recording of eleven sites and 17 isolated occurrences (finds) (WCRM, 2008). There are three prehistoric, four historic, and four multi-component sites. As a result of the survey effort, the prehistoric components of three sites (MW002, MW012, and MW015) were recommended as needing further information to assess their national Register of Historic Places eligibility, while the historic component of one site (MW004) is recommended as eligible. Seven sites (MW003, MW006, MW007, MW009, MW011, MW013, and MW014) are recommended not eligible for inclusion in the NRHP. The historic component of the site (MW004) recommended as eligible consists of a historic homestead complex and a possible ranching field camp; this site will provide information regarding the historic ranching practices in the area. The isolated finds include lithic flakes, stone tool fragments, a rock feature, cans, galvanized tubs, a land pail, agricultural machinery/implements, board fragments, and wire nails. None of the isolated finds are recommended as eligible for inclusion in the NRHP.

AES in consultation with the Idaho State Historic Preservation Officer (SHPO) determined that further investigation was needed to assess the NRHP eligibility for the prehistoric cocmponents of sites MW002, MW012, and MW015. The prehistoric components consist of a lithic scatter (MW002), a lithic and ground stone scatter with an associated feature (MW012), and a prehistoric artifact is associated with a feature (MW015). A subsurface testing approach was developed in consultation with the SHPO.

The results of the survey will be submitted to the Idaho SHPO in 2009 for a determination of eligibility. The location of these sites will not be included in this ER so the sites will remain protected from curiosity seekers and vandals.

The Wasden Complex, an important archaeological site, is about 1.0 km (0.6 mi) from the boundary of the EREF site. At the request of the Idaho SHPO, AES has assessed the potential impact of the EREF on the Wasden Complex viewshed. The assessment of the viewshed looking from the Wasden Complex to the EREF suggests that most of the facilities when constructed would be obscured due to an intervening ridgeline, and due to distance. Construction activities should also be difficult to observe due to these topographical features. Therefore, construction and operation of the proposed EREF would have a small impact on the Wasden Complex

Subsurface evaluative testing was conducted from October 1 through October 4, 2008 on sites MW002, MW012, and MW015. A subsurface testing plan was developed in consultation with the SHPO. The results of the testing program found that the prehistoric components of each will not yield further significant data; they have been recommended as not eligible for inclusion in the NRHP.

3.8.4 List of Historical and Cultural Properties

A review of existing information revealed that no previously recorded cultural properties are located within the proposed EREF site.

3.8.5 Agency Consultation

Consultation will be performed with all appropriate federal and state agencies and affected Native American tribes. Copies of consultation letters are included in Appendix A.

3.8.6 Statement of Significance

Eleven sites (MW002, MW003, MW004, MW006, MW007, MW009, MW011, MW012, MW013, MW014, and MW015) and 17 isolated occurrences (finds) have been identified in the 381-hectare (941-acre) parcel of land. The prehistoric components of three sites (MW002, MW012, and MW015) requiring further investigation for a NRHP eligibility were tested and found to be not eligible for inclusion in the NRHP, while the historic component of one site (MW004) is recommended as eligible for inclusion in the NRHP. The results of the survey and testing programs will be submitted to the Idaho SHPO in 2009 for an official determination of eligibility.

3.9 VISUAL/SCENIC RESOURCES

3.9.1 Viewshed Boundaries

Urban development is relatively sparse in the vicinity of the proposed Eagle Rock Enrichment Facility (EREF) site. The nearest city, Idaho Falls, is approximately 32 km (20 mi) to the east; the proposed site is not visible from the city. The site is visible by traffic on U.S. Highway 20, which borders the proposed site to the south. Traffic on U.S. Highway 20 can observe the area where the proposed facility would be located from approximately 0.4 km (0.25 mi) east of the site to about 6.4 km (4 mi) west of the site. Traffic will only be able to see tall structures when they are immediately south of the site due to topography. Topography is relatively level with small rises. Elevation varies from about 1,556 m (5,106 feet) near U.S. Highway 20 to about 1,600 m (5,250 feet) in a small area at the eastern edge of the property. The proposed site is also visible from adjacent properties to the north (Bureau of Land Management (BLM) and private land), east (private land), west (State of Idaho, BLM, and Idaho National Laboratory (INL)) and south (primarily BLM). On-site structures would be visible from nearby locations, but their details would be weak and would tend to merge into larger patterns because of distances to the proposed facility and its location near the center of the site.

3.9.2 Site Photographs

Figures 3.9-1A through 3.9-1H are photographs of the existing site. The only existing structures on the proposed site include an irrigation well, six pivot irrigation systems, livestock handling pens, and barbed wire fences. There are two potato cellars and four grain bins on the property adjacent to U.S. Highway 20 (Figures 3.9-1I through 3.9-1L).

3.9.3 Affected Residents/Visitors

Most of the neighboring private, State, and Federal lands are used for farming, grazing, or wildlife habitat. The nearest resident is 7.7 km (4.8 mi) east of the proposed site. U.S. Highway 20 is about 2.4 km (1.5 mi) from proposed facility buildings. Most of the traffic on U.S. Highway 20 is from workers and suppliers traveling between Idaho Falls and the DOE INL west of the proposed site. Some tourists travel U.S. 20 to visit recreational areas in the western part of the state, and local areas including Craters of the Moon National Monument 80 km (50 mi) west of the proposed site and the BLM Hell's Half Acre Wilderness Study Area (WSA) (and National Park Service National Natural Landmark) immediately south of the proposed site across U.S. Highway 20. Each year, about 9,000 to 10,000 people visit BLM Hell's Half Acre WSA and about 6,600 people use the loop hiking trail. The trail head would be about 0.8 km (0.5 mi) from the nearest boundary of the proposed site. The nearest portion of the loop hiking trail would be within 0.5 km (0.3 mi) from the nearest boundary of the proposed site.

3.9.4 Important Landscape Characteristics

The landscape of the proposed site and its surroundings is typical of a semi-arid cold desert climate and consists of light-colored silt soils dominated by big sagebrush (*Artemisia tridentata*) plant communities. The area is relatively flat with occasional buttes. Distant mountains form the northern extent of the eastern Snake River Plain. The proposed site is a mixture of open rangeland and crop land on relatively level ground. The nearby landscapes are similar in appearance. Primary agricultural activities on the site and in the vicinity are livestock grazing and farming (e.g., potatoes, wheat).

Landscape characteristics surrounding the proposed site include Kettle Butte about 1.6 km (1 mi) east of the proposed site, the Lemhi Range about 45 km (28 mi) northwest of the proposed site, and East and Middle Buttes about 18 km (11 mi) west, southwest of the proposed site. In addition, the lava flow known as Hell's Half Acre is immediately south of the proposed site and U.S. Highway 20. The Snake River is about 32 km (20 mi) east of the proposed site. Market Lake and Mud Lake are over 24 km (15 mi) north of the proposed site.

Recreational areas include Craters of the Moon National Monument 80 km (50 mi) west of the proposed site, the INL test reactor visitor center about 43 km (26.7 mi) west of the proposed site, and the BLM Hell's Half Acre WSA and National Natural Landmark immediately south of the proposed site.

3.9.5 Location of Constructed Features

There are a few minor man-made features on the proposed site. There is a potato storage facility at the south end of the property, irrigated fields in the northeast, and roads and fences running throughout the property. There are a few potato storage facilities, stock handling areas, and irrigation systems within 3.2 km (2 mi) of the proposed site. In addition, there is a powerline that runs to a transformer near the southeast boundary of the proposed site. A U.S. Department of Energy seismic station is located on Kettle Butte, 1.6 km (1 mi) east of the site. A communication tower is located about 9.2 km (5.7 mi) east of the proposed site. Three other communication towers are located between 9.7 and 16 km (6 and 10 mi) west of the proposed site. Figure 3.9-2, Constructed Features (Site Plan), illustrates the location of the facility features to be constructed on the proposed site.

3.9.6 Access Road Visibility

Visibility of proposed site facilities from U.S. Highway 20 would be limited to the taller on-site structures because of the 2.4 km (1.5 mi) distance from the facilities to U.S. Highway 20. Most of the proposed site facilities would be visible from a dirt road immediately east of the proposed site, which provides access to BLM and private lands to the east and north of the proposed site. Visibility from Mud Lake Road on the west boundary would be limited to the taller on-site structures (e.g., buildings and construction cranes) due to distance and topography.

3.9.7 High Quality View Areas

BLM has classified the Hell's Half Acre WSA, south of the proposed site, as a Visual Resource Management (VRM) Class I area. The objective of this class is to preserve the existing character of the landscape. Based on site visits and discussion with local officials, there are no other regionally or locally important or high-quality views associated with the proposed site. The proposed site is considered common in terms of scenic attractiveness, given the large amount of land in the area that appears similar.

3.9.8 Viewshed Information

The proposed site is visible from neighboring properties and from U.S. Highway 20. However, few local residents or visitors would be affected aesthetically by changes to the site. The distance from facility structures to U.S. Highway 20 (about 2.4 km (1.5 mi)), the distance to the nearest residence (7.7 km (4.8 mi)), and the distance to Hell's Half Acre WSA (2.4 km (1.5 mi)) would limit the visual impact the construction and operation of the proposed facility would have on residences and visitors. Refer to Figures 3.9-1A through 3.9-1H.

The Wasden Complex, a group of important archaeological sites, is about 1.0 km (0.6 mi) from the boundary of the EREF site. At the request of the Idaho SHPO, AES has assessed the potential impact of the EREF on the Wasden Complex viewshed. The assessment of the viewshed looking from the Wasden Complex to the EREF suggests that most of the facilities when constructed would be obscured due to an intervening ridgeline, and due to distance. Construction activities should also be difficult to observe due to these topographical features. Therefore, construction and operation of the proposed EREF would have a small impact on the Wasden Complex.

3.9.9 Regulatory Information

Currently the proposed site is zoned to include industrial development. Based on discussions with Bonneville County officials, there are no local or county zoning, land use planning or associated review process requirements. Development of the proposed site would meet federal and state requirements for nuclear and radioactive material sites regarding design, siting, construction materials, effluent treatment, and monitoring. In addition, all applicable local ordinances and regulations would be followed during construction and operation of the proposed facility.

3.9.10 Aesthetic and Scenic Quality Rating

The visual resource inventory process provides a means for determining visual values (BLM, 1984a; BLM, 1984b; BLM, 1986; BLM 2008b). The inventory consists of a scenic quality evaluation, sensitivity level analysis, and a delineation of distance zones. Based on these three factors, lands are placed into one of four Visual Resource Classes that are established through the Resource Management Planning (RMP) process. These classes represent the relative value of the visual resources: Classes I and II are the most valued, Class III represents a moderate value, and Class IV is of least value. The classes provide the basis for considering visual values in the RMP process.

BLM's draft classification of BLM lands surrounding the proposed site is VRM Class II. These lands serve as a buffer to the Class I designation for the Hell's Half Acre WSA (VRM Class I) and provide an open visual landscape to the north of U.S. Highway 20. The objective of VRM Class II is to retain the existing character of the landscape. The level of change to the characteristic landscape of VRM Class II land should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

The proposed site was evaluated between June 4, 2008 and June 7, 2008 by AREVA Enrichment Services using the BLM visual resource inventory process (BLM, 1984b; BLM 1986) to determine the scenic quality of the site. The proposed site received a "B" rating. Refer to Table 3.9-1, Scenic Quality Inventory and Evaluation Chart. Scenic quality is a measure of the visual appeal of a tract of land which is given an A, B, or C rating (A-highest, C-lowest) based on the apparent scenic quality using the seven factors outlined in Table 3.9-1, Scenic Quality Inventory and Evaluation Chart.

While the proposed site falls within an area identified as VRM Class II, this designation is for BLM lands. Private lands and INL lands within this Class II area have some development, including potato cellars, equipment barns, and industrial facilities. In addition, the county has zoned this area G-1 that allows for industrial development along with agriculture and grazing. Therefore, the site could be considered a VRM Class III or IV area.

The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape (BLM, 1984b).

VRM Class IV has the least value and allows for the greatest level of landscape modification. The proposed use of the site falls within the objectives for Class IV, which allows management activities that include major modifications of the existing character of the landscape. The level of change to landscape characteristics may be extensive under Class IV. Management activities in areas rated as Class IV may dominate the view and be the major focus of viewer attention (BLM, 1984b).

3.9.11 Coordination with Local Planners

As noted in Section 3.9.9, Regulatory Information, discussions were held between AREVA Enrichment Services and Bonneville County officials to coordinate and discuss local area community planning issues. No local or county zoning, land use planning, or associated review process requirements were identified. The Bonneville County Planning Department did not participate in the visual resource assessment since there are no County visual resource requirements for the area where the EREF will be constructed. The Bureau of Land Management Upper Snake River Field Office visual resource specialist visited the site and discussed visual resources. All applicable local ordinances and regulations will be followed during the construction and operation of the proposed facility.

TABLES

Table 3.9-1 Scenic Quality Inventory and Evaluation Chart
(Page 1 of 2)

Key Factors	Rating Criteria and Score		
Landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variations or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. Score: 5	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosion patterns or variety in size and shape or landforms; or detail features which are interesting though not dominant or exceptional. Score: **3**	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. Score: 1
Vegetation	A variety of vegetative types as expressed in interesting forms, textures, and patterns. Score: 5	Some variety of vegetation, but only one or two major types. Score: **3**	Little or no contrast in vegetation. Score: 1
Water	Clear and clean appearing, still, or cascading white water; any of which are a dominant factor in the landscape. Score: 5	Flowing or still; but not dominant in the landscape. Score: 3	Absent or present, but not noticeable Score: **0**
Color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water, or snow fields Score: 5	Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element Score: **3**	Subtle color variations, contrast, or interest; generally mute tones. Score: 1
Influence of Adjacent Scenery	Adjacent scenery greatly enhances visual quality. Score: 5	Adjacent scenery moderately enhances overall visual quality. Score: **3**	Adjacent scenery has little or no influence on overall visual quality. Score: 0

Table 3.9-1 Scenic Quality Inventory and Evaluation Chart
(Page 2 of 2)

Key Factors	Rating Criteria and Score		
Scarcity	One of a kind; or unusually memorable or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. Score: 5	Distinctive, though somewhat similar to others within the region. Score: 3	Interesting within its setting, but fairly common within the region. Score: **1**
Cultural Modifications	Modifications add favorably to visual variety while promoting visual harmony. Score: 2	Modifications add little or no visual variety to the area, and introduce no discordant elements. Score: **0**	Modifications add variety but are very discordant and promote strong disharmony. Score: -4

Notes:

1. Total score for the proposed site: **13** (sum of key factor scores)
2. Scenic Quality: A = 19 or more; B = 12-18; C = 11 or less
3. Scores in bold represent scores assigned to the proposed site. Unbold scores are from the BLM rating guide.

FIGURES

Figure 3.9-1A **Rev. 1**

View of Proposed Site From
Northwest Boundary Corner

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT

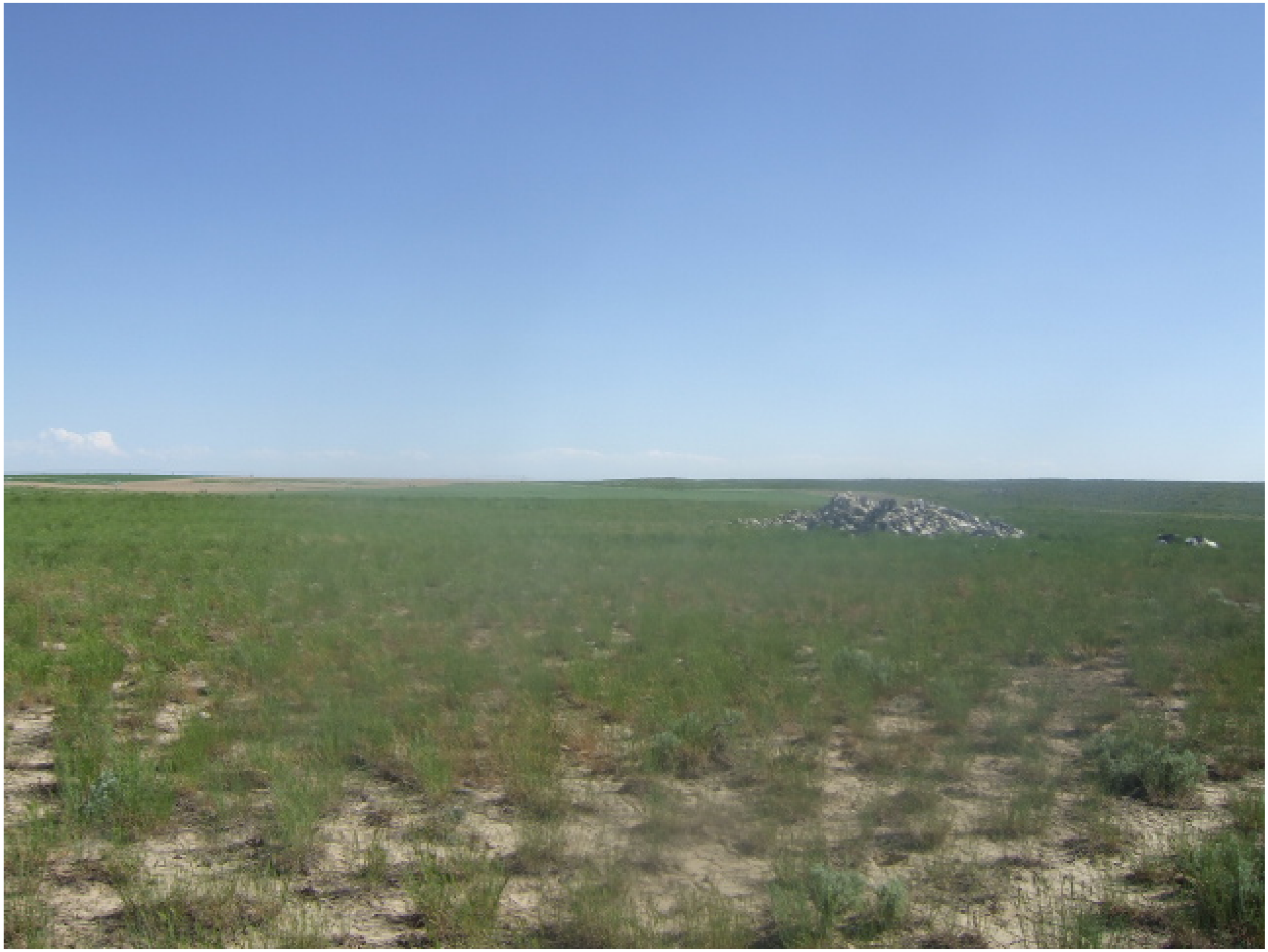


Figure 3.9-1B **Rev. 1**

View of Proposed Site From North Boundary Centered on Area Where Proposed Facility Would be Located

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT

Figure 3.9-1C **Rev. 1**

View of Proposed Site From North Boundary West of Area Where Proposed Facility Would be Located

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

Figure 3.9-1D **Rev. 1**

View of Proposed Site From Southwest Boundary Corner Nearest to Where Proposed Facility Would be Located

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

Photo is toward Hell's Half Acre WSA, U.S. Highway 20, and Potato Shed.

Figure 3.9-1E **Rev. 1**

View Offsite From Southwest Boundary Corner Nearest to Where Proposed Facility Would be Located

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

Figure 3.9-1F **Rev. 1**

View From Southeast Boundary Corner Nearest to Where Proposed Facility Would be Located

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

Figure 3.9-1G **Rev. 1**

View From East Boundary Nearest to Where Proposed Facility Would be Located

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

Figure 3.9-1H **Rev. 1**

View From Center of Location of Proposed Facility to the South

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

Figure 3.9-1l **Rev. 1**

Existing Site Structures:
Irrigation Pump on Proposed Site

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT

Figure 3.9-1J **Rev. 1**

Existing Site Structures: Pivot Irrigation System on Proposed Site

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

Figure 3.9-1K **Rev. 1**

Existing Site Structures: Animal Corral and Handling Area on Proposed Site

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

Figure 3.9-1L **Rev. 1**

Existing Site Structures: Potato Cellars and Grain Bins on Proposed Site

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

Figure 3.9-2, Constructed Features (Site Plan), contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

3.10 SOCIOECONOMICS

This section describes the social and economic characteristics of the three-county area around the proposed Eagle Rock Enrichment Facility (EREF). Information is provided about population, including minority and low-income areas (i.e., environmental justice as discussed in Section 4.11), economic trends, housing, and community services in the areas of education, health, public safety, and transportation. The information was gathered from telephone conversations with local and regional officials, and documents from public sources. Local and regional offices and officials included public safety (police and fire), tax assessor, education, and social services. Other contacts included health providers and county officials.

The proposed site is in Bonneville County, Idaho, near the border with Bingham County, Idaho, as shown on Figure 3.10-1, 80 km (50 mi) Area Surrounding the Proposed Site. The figure also shows the city of Idaho Falls, Idaho, the closest population center to the site, at a distance of about 32 km (20 mi). Other population centers are located at about the following driving distances from the site:

- Shelley, Bingham County: 45 km (28 mi) southeast
- Blackfoot, Bingham County: 77 km (48 mi) southeast
- Pocatello, Bannock County: 113 km (70 mi) south
- Rexburg, Madison County: 82 km (51 mi) northeast
- St. Anthony, Freemont County: 101 km (63 mi) northeast

Figure 3.10-1, 80 km (50 mi) Area Surrounding the Proposed Site, shows population centers within 80 km (50 mi) of the EREF. Aside from these communities, the population density around the site and region is generally low.

Bonneville County Bingham County, and Jefferson County were selected as the primary region of influence (ROI), and where impacts could occur, because the project will be located in Bonneville County and will be in close proximity to the border with Bingham County, with U.S. Highway 20 directly linking the two counties. Jefferson County shares a border with Bonneville County and is linked by U.S. Highway 20 and 15. In addition, it is assumed that the primary labor market for the project will likely come from within 80-driving km (50-driving miles) of the facility that, as shown above, includes the three counties.

In addition, a secondary labor market for the operation of the proposed facility will come from within about 82 to 113 driving-km (51 to 70 driving-mi) of the site. It is less likely that the labor force for the EREF would originate from this secondary labor market area, but it was included because some workers might want to reside in the larger city of Pocatello or other population centers even if it requires additional driving time. This is the farthest distance from which AREVA Enrichment Services expects the bulk of the labor force to originate.

Bonneville County was established on February 7, 1911, 21 years after Idaho was admitted to the Union as a State in 1890. The county seat is located in Idaho Falls, 32 km (20 mi) east of the site. The site area is very rural and semi-arid, with the most western part of the county characterized by vast expanses of lava and sagebrush; much of the remainder of the county is characterized by irrigated croplands (e.g., potatoes, grains, and alfalfa) and forest lands. (BCHA, 2006; BC, 2008; IFCC, 2007)

Bonneville County covers 4,839 km^2 (1,868 mi^2) or approximately 483,934 hectares (1,195,822 acres). The county population density in 2000 was about 183% greater than the Idaho state average (17.1 versus 6.0 population density per km^2 (44.2 versus 15.6 population density per mi^2)). The county housing density in 2000 was 155% greater then the Idaho state average (6.3 versus 2.5 housing units per km^2 (16.3 versus 6.4 housing units per mi^2)). Bonneville County is served by one local library and two daily newspapers, the Cable Scene and Post Register.

Bingham County was established on January 13, 1885. The county seat is located in the city of Blackfoot, about 77 km (48 mi) southeast of the site. Like Bonneville County, Bingham County has irrigated farmland and is known as the "potato capital of the world." Other crops grown there include alfalfa hay, sugar beets, oats, barley, wheat (spring and winter), and mixed grains (BGC, 2007).

Bingham County covers 5,425 km^2 (2,095 mi^2) or approximately 542,533 ha (1,340,622 acres). Of this area, the Fort Hall Indian Reservation comprises 930 km^2 (359 mi^2). The county population density in 2000 was about 28% greater than the Idaho state average (7.7 versus 6.0 per square kilometer (19.9 versus 15.6 population density per square mile)). The county housing density is low, at 4% below the Idaho state average (2.6 versus 2.5 housing units per km^2 (6.8 versus 6.4 housing units per mi^2)). Bingham County is served by four libraries and two newspapers; The Morning News and the Shelley Pioneer.

Jefferson County was established in 1914 with its county seat at Rigby (Jefferson County, 2009). Other cities within the county include Hamer, Lewisville, Menan, Mud Lake, a portion of Ririe, and Roberts. Agriculture and food processing are the largest basic industries within the Jefferson County economy, but government and trade sectors provide the largest employment (IDC, 2009).

Jefferson County covers a 2,836 km^2 (1,095 mi^2) or approximately 283,630 hectares (700,865 acres). Of this area, 132,828 hectares (328,226 acres) are owned by the Bureau of Land Management, National Forests, and other federal agencies. The Jefferson County population density in 2000 was approximately 11% greater than the State of Idaho average (6.7 versus 6.0 per square kilometer) (17.5 versus 15.6 per square mile) (IDC, 2009). Jefferson County is served by twelve public libraries and one newspaper, the Jefferson Star (NCES, 2009).

3.10.1 Population Characteristics

3.10.1.1 Population and Projected Growth

The combined population of Bonneville County, Bingham County, and Jefferson County in the EREF vicinity, based on the 2000 U.S. Census, was 143,412. This population represents an average annual increase of 1.4% from the 1990 population of 126,333 (Table 3.10-1, Population Census and Projections). This rate of increase is less than experienced by the state of Idaho during the same decade, with a 2.9% average annual increase from the 1990 population of 1,006,749 to the 2000 population of 1,293,953. Over that same 10-year period, Bonneville County had an average annual population increase of 1.4% (from 72,207 to 82,522), Bingham County had an increase of 1.1% (from 37,583 to 41,735), and Jefferson County had an average annual population increase of 1.6% (from 16,543 to 19,155). The raw census data was tabulated and used to calculate these percentages. No other sources of data or information were used.

Projections show that the population in the ROI is anticipated to increase from about 143,400 in 2000 to about 158,600 in 2010, about 169,900 in 2020, about 179,000 in 2030, and about 186,000 in 2040 (Table 3.10-1, Population Census and Projections). During these decennial periods, Bonneville County's population is projected have a minor average annual increase of 0.7% to a moderate increase of 1.3%. In comparison, Bingham County's population is projected to have a minor average annual increase of 0.1% to 0.5% from 2000 through 2020, but then have a minor average annual decline of 0.1% to 0.4% from 2020 through 2040. Jefferson County's population is projected to have an average annual increase of 0.6% to 1.3%. These projections are below those for the state of Idaho, which is projected to have moderate average annual increases of 1.3% to 1.7% from 2000 through 2030.

There are several developments planned within the region. The Power County Energy Center is a private energy production project near American Falls. Construction will start in the second half of 2009 and continue for about five years. Idaho Falls has several mixed residential-commercial developments being planned. These developments are intended to accommodate tourism growth and general city growth.

3.10.1.2 Minority Populations

The term "minority population" is defined for the purposes of the U.S. Census Bureau (USCB) to include the five racial categories of black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and other races. It also includes those individuals who declared two or more races, an option added as part of the 2000 census. The minority population, therefore, was calculated to be the total population less the white population. In contrast to USCB data, NUREG-1748, Appendix C, Environmental Justice Procedures (NRC, 2003b) defines minority populations to include individuals of Hispanic or Latino origin. This results in a difference between the minority population data discussed here and presented in Table 3.10-2, Racial Composition, and the data presented in Section 4.11, Environmental Justice.

Based on USCB data, in 2000 minority populations comprised 7.2% of Bonneville County and 17.6% of Bingham County and 9.1% of Jefferson County. The percentage for Bonneville County was somewhat lower than the 9.0% for the state of Idaho, Bingham County was significantly greater than the state percentage, and Jefferson County was similar to the state level (see Table 3.10-2, Racial Composition). In 2006, minority populations comprised 5.4% of Bonneville County residents, which was less than the 7.5% of state of Idaho residents (see Table 3.10-2, Racial Composition). Because of the small population level, the USCB did not provide estimates of minority populations for Bingham County and Jefferson County for 2006. Raw census data was tabulated and used to calculate the above percentage statistics. No other sources of data or information were used.

The USCB data was used to calculate the minority populations, reported above, consistent with the USCB definition of minority populations. This same data was also used in the Environmental Justice assessment (see Section 4.11), which used the census data to yield minority population estimates consistent with the NRC definition applicable to environmental justice.

Section 4.11, Environmental Justice, provides the results of the AREVA Enrichment Services assessment that demonstrates that no disproportionately high minority or low-income populations exist in proximity to the proposed site that would warrant further examination of environmental impacts upon such populations.

3.10.2 Economic Characteristics

3.10.2.1 Employment, Jobs, and Occupational Patterns

In 1990, the civilian labor force was 33,619 in Bonneville County, 16,048 in Bingham County, and 6,840 in Jefferson County, as shown in Table 3.10-3, Labor Force and Employment. Of these, 1,603 were unemployed in Bonneville County for an unemployment rate of 4.8%.

Unemployment in Bingham County was 1,045 persons, for an unemployment rate of 6.5%. Unemployment in Jefferson County was 251 persons, for an unemployment rate of 3.7%. The unemployment rates for Bonneville County and Jefferson County were lower than the 6.1% for the state, while the Bingham County rate was similar to the state rate.

In 2000, the civilian labor force was 40,321 for Bonneville County, 18,935 for Bingham County, and 8,669 for Jefferson County, as shown in Table 3.10-3, Labor Force and Employment. Of these, 2,012 were unemployed in Bonneville County, for an unemployment rate of 5.0%. Unemployment in Bingham County was 1,094 persons, for an unemployment rate of 5.8%. Unemployment in Jefferson County was 380 persons, for an unemployment rate of 4.4%. The unemployment rates for both Bonneville and Bingham counties were relatively similar to the 5.8% rate for the state of Idaho, while Jefferson County's rate was lower.

In 2006, the civilian labor force of Bonneville County was 47,558, as shown in Table 3.10-3, Labor Force and Employment. Of these, 2,377 were unemployed in Bonneville County, for an unemployment rate of 5.0%. This unemployment rate was similar to the 5.3% rate for the state of Idaho. Because of the small population level, the USCB did not provide employment estimates for Bingham County and Jefferson County for 2006.

The distribution of jobs by occupation in Bonneville County differed in some industries from Bingham County, Jefferson County, and the state of Idaho (Table 3.10-4, Employment by Industry). In 2000, the top three employment sectors in Bonneville County were the education, health, and social services industry (18.4%); the professional, scientific, management, administrative, and waste services industry (17.3%); and the retail trade industry (14.1%). By 2006, this had changed somewhat to 17.0% for the education, health, and social services industry; 15.8% for the professional, scientific, management, administrative, and waste services industry; and to 12.2% for the retail trade industry and also the construction industry. In comparison, the three top employment industries in the state of Idaho in 2000 and 2006 were education, health, and social services (19.2% and 19.4%, respectively); manufacturing (13.1% and 11.1%, respectively); and retail trade (12.6% and 12.1%, respectively).

Bingham County's employment across industrial sectors was somewhat different than the distribution in Bonneville and Jefferson Countyies. In Bingham County in 2000, 19.6% of the workforce was employed in the education, health, and social services industry; 15.4% were employed in the manufacturing industry; and 10.9% were employed in the retail trade industry (Table 3.10-4, Employment by Industry). These were the same three top employment industries as existed for the state of Idaho in 2000, but with slight variations in the percentages of employment.

Jefferson County's three top employment sectors were unlike the other two counties and the State of Idaho. In 2000, the top three employment sectors were education, health, and social services (19.4%); agriculture, forestry, fishing and hunting, and mining (12.1%), and retail trade (11.3%).

Despite the importance of agriculture to the area's economy, in 2000 only about 3.0% of jobs in Bonneville County, 8.8% in Bingham County, and 12.1% in Jefferson County were in the agriculture, forestry, fishing and hunting, and mining industry, as compared to approximately 5.8% for the state of Idaho. (Table 3.10-4, Employment by Industry).

3.10.2.2 Income

Within the three-county area, per capita income was $18,326 in Bonneville County, $14,365 in Bingham County, and $13,838 in Jefferson County, as compared to $17,841 for the State of Idaho. Thus, in 2000 per capita income was 2.7% greater in Bonneville County than in the state, Bingham County was 19.5% less than in the state, and Jefferson County was 22.4% less than in the state (Table 3.10-5, Income Characteristics). Also in 2000, the median household income of $41,805 in Bonneville County was 11.3% greater than the median of $37,572 for the State, while the median of $36,423 for Bingham County was 3.1% less than the State median. The median income in Jefferson County was $37,737, which was 0.4% greater than the State's median.

The 10.1% of individuals living below the poverty level in Bonneville County in 2000 was less than the 11.8% in the state of Idaho, but the 12.4% in Bingham County was greater than the state level (Table 3.10-5, Income Characteristics). The percentage of individuals living below the poverty level in Jefferson County was similar to Bonneville County at 10.4%.

In 2006, the Bonneville County per capita income was $20,933, similar to the $21,000 for the state of Idaho (Table 3.10-5, Income Characteristics). However, the median household income of $45,325 in Bonneville County was 5.7% greater than the $42,865 for state of Idaho.

In 2006, the percentage of individuals living below the poverty level was 12.3% in Bonneville County, about equal to the 12.6% in the state of Idaho (Table 3.10-5, Income Characteristics). Data for Bingham County and Jefferson County is not available for the year 2006.

3.10.2.3 Tax Structure

Most of Idaho's tax revenue comes from three sources: income taxes (personal and corporate); sales and use taxes; and property taxes. The Idaho State Tax Commission collects income taxes and sales and use taxes. Property taxes are imposed and collected by the county where the property is located and fund local government (ISTC, 2005).

Personal income taxes are assessed in a graduated manner, so that greater annual earnings are taxed at greater, increasing rates. For example in 2006, the personal income tax rate ranged from 1.6% to 7.8%, with the first $1,198 of taxable income taxed at 1.6%, the next $1,198 taxed at 3.6%, etc. The maximum 7.8% tax rate was reached at $23,963 of taxable income for single filers and $47,926 for married couples filing jointly. Idaho residents are taxed on their total income, even if it is earned in another state or country. Idaho income tax brackets are adjusted for inflation each year (ISTC, 2005).

Taxpayers are not required to make estimated payments for their personal income tax return. Most wage earners have income taxes withheld by their employers. Credits to offset the income taxes due include: a $20 grocery credit to residents over 62 who are not required to file an income tax return ($35 for people age 65 or over); a credit for taxes paid to other states; and credits for donations to Idaho educational entities and some nonprofit youth and rehabilitation facilities. Idaho does not tax Social Security income or Tier 1 and Tier 2 Railroad Retirement benefits. Retired taxpayers also may receive a partial tax exemption for civil service and military retirement income received after the age of 65 (62 if disabled) (ISTC, 2005).

The Idaho sales and use tax rates are 6%. The sales tax is applied to the sale, rental, or lease of tangible personal property and some services. Food is taxed, but prescription drugs are not. Hotel, motel, and campground accommodations are taxed at a higher rate (8% to 12%). Some counties and resort cities also collect a local sales tax. The use tax is applied to goods that are used or stored in Idaho. If one has not paid sales taxes on those goods, then he/she owes a use tax on those goods (unless an Idaho exemption applies). The use tax is paid directly to the state, instead of to the seller of the goods. Individuals and businesses that do not make retail sales pay use taxes with their annual Idaho income tax return or a use tax return, or they can submit it directly to the Tax Commission. Businesses that make retail sales pay use taxes with their sales tax return (ISTC, 2005).

The total property tax rates throughout the state of Idaho for 2005 ranged from an average of 1.57% in urban areas to an average rate of 1.13% in rural areas. According to the Idaho Tax Commission, the actual tax rate is the sum of the tax rates of all of the taxing districts in one location. A rough estimate of total property taxes can be calculated by multiplying the average tax rate by the property value, less any exemptions. Owner-occupied primary residences in Idaho qualify for a homeowner's exemption; this exempts 50% of the taxable value of the home and up to 0.4 hectare (one acre) of land, up to a maximum of $75,000 for 2006 property taxes and $89,325 for 2007 property taxes. Farms qualify for a partial exemption. Retirees can qualify for the Idaho Property Tax Reduction (formerly Circuit Breaker) of up to $1,320 for those persons age 65 and older, widowed or disabled persons of any age, and POWs who meet income and residence requirements (ISTC, 2005).

The 2007 average property tax rates for Bonneville County were 1.6% for the average urban rate, 1.01% for the average rural rate, and 1.4% for the overall average property tax rate. The 2007 average property tax rates for Bingham County were 2.1% for the average urban rate, 1.2% for the average rural rate, and 1.5% for the overall average property tax rate. The 2007 average property tax rates for Jefferson County were 1.6% for the average urban rate, 0.9% for the average rural rate, and 1.0% for the overall average property tax rate (ISTC, 2005).

The 2007 revenues and expenditures for Bonneville County included slightly more than $44.6 million in revenues and $40.3 million in expenditures. Refer to Table 3.10-6, Bonneville County, Idaho Budget Ending September 30, 2007. The greatest revenue sources included $18.3 million in property taxes, $11.8 million in intergovernmental transfers, and $9.7 million in charges for services. The greatest departmental expenditures included $16.2 million for public safety, $10.5 for general government, $4.8 million for public works, and $3.2 million for health and sanitation.

The 2007-2008 fiscal year proposed revenues and expenditures for the City of Idaho Falls included almost $131.5 million in revenues and slightly more than $151.0 million in expenditures. Refer to Table 3.10-7, City of Idaho Falls 2007-2008 Proposed Revenues and Expenditures. The greatest revenue sources and departmental expenditures came from fees for electricity and from water/sewer services. Within the General Fund only, property taxes accounted for $21.7 million of revenues (16.5% of total revenues), sales taxes and revenue sharing accounted for $6.3 million (4.8% of total revenues), and other revenue sources accounted for $7.2 million (5.5% of total revenues). (IF, 2008)

Refer to Section 4.10.2.2, Community Characteristic Impacts, for the estimated tax revenue and estimated allocations to the State of Idaho and Bonneville County resulting from the construction and operation of the EREF.

3.10.3 Community Characteristics

3.10.3.1 Housing

The density of housing units in 2000 was greater for two of the three counties than for the State of Idaho. The densities of 6.3 units per km^2 (16.3 units per mi^2) in Bonneville County and 2.6 units per km^2 (6.8 units per mi^2) in Bingham County were about 155% and 6% more than the state average of 2.5 units per km^2 (6.4 units per mi^2). In Jefferson County, the number of housing units was 10.9% less than the State of Idaho average with 2.2 units per km^2 (5.7 units per mi^2). In 2006, the density of housing units was also greater for Bonneville County than for the state of Idaho. The densities were 7.5 units per km^2 (19.3 units per mi^2) in Bonneville County, compared to 2.9 units per km^2 (7.4 units per mi^2) in the state of Idaho. Data was not available for Bingham County and Jefferson County in 2006.

In 2000, there were a total of 28,753 occupied housing units in Bonneville County, with 21,467 (74.7%) being owner-occupied and 7,286 (25.3%) being renter-occupied. In Bingham County, there were a total of 13,317 units with 10,564 (79.3%) owner-occupied and 2,753 (20.7%) renter-occupied. In Jefferson County, there were a total of 5,901 units with 5,008 (84.9%) owner-occupied and 893 (15.1%) renter-occupied. The percentage of occupied housing units in 2000 was 94.3% for Bonneville County, 93.1% for Bingham County, and 93.9% for Jefferson County. All three were somewhat greater than the 89.0% for the State of Idaho. The percentage of occupied housing units in 2006 was 92.8% for Bonneville County, greater than the State of Idaho occupied housing of 89.1% (Table 3.10-8, Housing). Because of the small population level, the USCB did not provide housing estimates for Bingham County and Jefferson County for 2006.

In 2000, there were a total of 1,731 (5.7%) unoccupied housing units in Bonneville County and there were 986 (6.9%) unoccupied units in Bingham County. In Jefferson County, there were 386 (6.1%) unoccupied units. These vacancy rates were significantly lower than the 11.0% for the State of Idaho. In comparison in 2006, 7.2% of housing units were vacant in Bonneville County, less than the 10.9% vacancy rate in the State of Idaho (Table 3.10-8, Housing).

The number of rooms per housing unit in 2000 for Bonneville County, Bingham County, and Jefferson County was 6.1,5.8, and 5.3, respectively and was greater in two of the three counties than the state average of 5.4 rooms per unit. In 2000, the median cost of a home in Bonneville County was $93,500, in Bingham County it was $84,400, and in Jefferson County it was $119,600. The cost of a home in two of the three counties was substantially less than the $106,300 median value for the State of Idaho, while the median value in Jefferson County was higher (Table 3.10-8, Housing).

The number of rooms per housing unit in 2006 was greater in Bonneville County than the state, 6.1 and 5.5 rooms per unit, respectively. The value of housing in 2006 was also greater for Bonneville County than for the state of Idaho. The median cost of a home was $131,000 in Bonneville County in 2006, substantially below the state median of $163,900 (Table 3.10-8, Housing). Data for 2006 was not available for Bingham County and Jefferson County.

3.10.3.2 Education

In the three-county ROI, there are eleven school districts with a total of 86 public schools. The ROI has 14 high schools, 14 middle/junior high schools, 43 elementary schools, 1 kindergarten only school, 1 K-12 school, 1 K-8 school, 9 alternative schools, 1 vocational school, and 2 special education schools (Table 3.10-9, Public and Private Educational Facilities). Table 3.10-9, Public and Private Educational Facilities, lists the schools that are near the proposed site, including details about the location of the educational facilities, the number of students, and the number of students per full-time equivalent (FTE) teacher (2005-2006 school year) (NCES, 2008) (NCES, 2009).

There are 41 educational institutions within a radius of about 48 km (30 mi) of the proposed site, which includes 5 high schools, 6 middle schools, 23 elementary schools, 5 alternative schools, 1 K-12 school, and 1 vocational school. The closest schools in Bonneville County are in Idaho Falls, approximately 32 km (20 mi) east of the proposed site. The Swan Valley School District 92 is also in Bonneville County and is located about 72 km (45 mi) east of Idaho Falls. One elementary school (PK-8) resides in that district and has 53 students (NCES, 2008).

Table 3.10-10, Educational Enrollment and Attainment, shows the percentages of school enrollment for the population 3 years old and older for Bonneville County, Bingham County, Jefferson County, and the State of Idaho. The table also shows the percentages of educational attainment for the population 25 years old and older in those same areas. About 26.5% of people 25 years old and older living in Bonneville County in 2000 had obtained a high school diploma only, less than the 31.1% in Bingham County, the 29.4% in Jefferson County, and the 28.5% in the State of Idaho. However, in general, the population in Bonneville County had more advanced educational levels, with 17.3% graduating from college in 2000, compared to 10.7% in Bingham County, 11.6% in Jefferson County, and 14.8% in the State of Idaho. Educational enrollment and attainment data are not available for Bingham County and Jefferson County for 2006.

3.10.3.3 Health Care, Public Safety, and Transportation Services

3.10.3.3.1 Health Care

There are three hospitals in Bonneville County, all located in Idaho Falls approximately 32 km (20 mi) east of the proposed site. The Eastern Idaho Regional Medical Center is the largest of three hospitals. It is a short-term acute care hospital with 242 beds, of which 195 are adult and pediatric beds and 29 are intensive care beds. The Idaho Falls Recovery Center is a 7-bed acute care facility and the Mountain View Hospital is a 20-bed acute care facility. There are also 4 nursing homes or retirement facilities in the area.

3.10.3.3.2 Public Safety

There are four fire departments within about a 48-km (30-mi) radius of the site; the Idaho Falls Fire Department, the Ucon Volunteer Fire Department, the Shelley Firth Rural Fire Department, and the Central Fire District, which operates in Jefferson County. Fire support service for Idaho Falls is provided by the Idaho Falls Fire Department, located approximately 32 km (20 mi) from the proposed EREF. The Idaho Falls Fire Department serves an Emergency Fire Service population of approximately 75,000 residents occupying approximately 1,036 km^2 (400 mi^2). The area includes the city of Idaho Falls and the Bonneville County Fire Protection District.

The Idaho Falls Fire Department also serves an Emergency Medical Services population of approximately 112,000 residents occupying approximately 3,885 km^2 (1,500 mi^2). The area includes Bonneville County and portions of Bingham and Jefferson counties. All Idaho Falls Fire Department personnel are well trained and versatile in their abilities to perform many different functions. All emergency response personnel are trained as Emergency Medical Technicians, and there are currently 31 personnel trained as Intensive Care Paramedics.

The Idaho Falls Fire Department currently employs:

- 1 Chief Officer,
- 4 Staff Officers,
- 2 Fire Prevention Inspectors,
- 2 Secretarial/Clerical Staff,
- 1 Mechanic, and
- 84 Fire Fighters.

The Idaho Falls Fire Department currently has the following 29 Emergency Response Vehicles:

- 10 pumper trucks,
- 8 ambulances,

- 2 rescue trucks,
- 2 tanker trucks,
- 1 hazmat response vehicle,
- 1 snorkel truck, and
- 5 staff cars.

The Idaho Falls Fire Department has several teams with specially trained members, including:

- Hazardous Materials Team,
- Fire Investigation Team,
- Bicycle Response Team,
- High Angle and Confined Space Rescue Team,
- Water Rescue Team, and
- Juvenile Fire Starter Education Team

The Central Fire District (CFD) headquartered in Eastern Jefferson County is comprised of four fire stations. The CFD operates EMS Quick Response Units in addition to providing fire protection, rescue, and hazardous materials (HAZMAT) services. Departments are located in Rigby, Ririe, Lewisville, and Menan within Jefferson County. The CFD serves a population of 13,000 residents and approximately 570 km^2 (200 mi^2), which includes part of Jefferson County and portions of Bonneville and Madison Counties (CFD, 2008).

- The CFD currently employs:
- 1 Secretary,
- 1 Fire Chief,
- 4 Battalion Chiefs,
- 70 Volunteers,
- 1 Emergency Medical Services (EMS) Coordinator,
- 1 Technical Rescue Coordinator,
- 1 HAZMAT Coordinator, and
- 1 Fire Training Coordinator.

The CFD currently has the following vehicles:

- 18 emergency response vehicles, plus specialized equipment,
- 20 vehicles,
- 1 snorkel truck,
- 5 Class A pumpers,
- 6 mini pumpers,
- 2 rescue trucks,
- 2 tankers,

- 2 HAZMAT response vehicles, and
- 2 staff pick-ups.

The CFD received 1,151 calls in 2007 (CFD, 2008).

3.10.3.3.3 Transportation

The main north-south freeway through eastern Idaho is Interstate 15. The freeway passes through Idaho Falls and then Pocatello, where it intersects Interstate 86. The project site is located on the north side of U.S. Highway 20, which runs east-west and intersects with Interstate 15 in Idaho Falls, about 32 km (20 mi) from the proposed site.

The nearest active rail transportation is the Union Pacific Railroad. It crosses southern Idaho traveling between Portland, Oregon, and Ogden, Utah, and serves Boise, Nampa, Twin Falls, and Pocatello and is about 32 km (20 mi) at the nearest point to the proposed site. There is no Amtrak service in southern Idaho.

The nearest airport facility is Idaho Falls Regional Airport, located in the northwestern part of Idaho Falls in Bonneville County. The airport is located about 32 km (20 mi) from the proposed site. The airport has two runways measuring about 2,744 m (9,002 ft) and 1,235 m (4,051 ft) each. The current terminal was built in 1959, was expanded in 1982, and the boarding area was torn down and retrofitted to accommodate smaller aircraft with jet ways in the mid-2000s. Alaska Airlines, Allegiant Air, Northwest Airlines, and United Airlines provide commercial passenger services at the airport.

TABLES

Table 3.10-1 Population Census and Projections
(Page 1 of 1)

	Jurisdiction				
Year(s)	Bonneville County	Bingham County	Jefferson County	ROI Total	State of Idaho
Decennial Census					
1970	52,457	29,167	11,740	93,364	713,008
1980	65,980	36,489	15,304	117,773	944,038
1990	72,207	37,583	16,543	126,333	1,006,749
2000	82,522	41,735	19,155	143,412	1,293,953
Population Projection					
2010	93,177	43,854	21,606	158,637	1,517,291
2020	101,781	44,505	23,615	169,901	1,741,333
2030	109,648	43,958	25,437	179,043	1,969,624
2040	116,776	42,211	27,071	186,058	N/A
Average Annual Percent Change for Specified 10-Year Periods					
1970-1980	2.6	2.5	3.0	2.6	3.2
1980-1990	0.9	0.3	0.8	0.7	0.7
1990-2000	1.4	1.1	1.6	1.4	2.9
2000-2010	1.3	0.5	1.3	1.1	1.7
2010-2020	0.9	0.1	0.9	0.7	1.5
2020-2030	0.8	-0.1	0.8	0.5	1.3
2030-2040	0.7	-0.4	0.6	0.4	N/A

Sources: USCB, 1970; USCB, 1980; USCB, 1990a; USCB, 1990b; USCB, 1990c; USCB, 1990g; USCB, 2000a: USCB, 2000b; USCB, 2000c; USCB, 2000x; USCB, 2005

Notes:
The U.S. Census Bureau does not provide population projections down to the county level, and the State of Idaho no longer provides population projections. 2010-2040 county population projections were prepared by AREVA Enrichment Services, LLC.

N/A = Not Available

Table 3.10-2 Racial Composition
(Page 1 of 2)

Year/Race	Bonneville County		Bingham County		Jefferson County		Total ROI		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2000										
Total Population	82,522	100	41,735	100	19,155	100	143,412	100	1,293,953	100
Minority Population*	5,948	7.2	7,332	17.6	1,749	9.1	15,029	10.5	116,649	9.0
One Race:	81,316	98.5	40,840	97.9	18,901	98.7	141,057	98.4	1,268,344	98.0
White	76,574	92.8	34,403	82.4	17,406	90.9	128,383	89.5	1,177,304	91.0
Black or African American	403	0.5	70	0.2	53	0.3	526	0.4	5,456	0.4
American Indian & Alaska Native	535	0.6	2,798	6.7	89	0.5	3,422	2.4	17,645	1.4
Asian	675	0.8	236	0.6	44	0.2	955	0.7	11,889	0.9
Native Hawaiian and other Pacific Islander	56	0.1	13	0.0	15	0.1	84	0.1	1,308	0.1
Other races	3,073	3.7	3,320	8.0	1,294	6.8	7,687	5.4	54,742	4.2
Two or more races	1,206	1.5	895	2.1	254	1.3	2,355	1.6	25,609	2.0

Table 3.10-2 Racial Composition
(Page 2 of 2)

Year/Race	Jurisdiction									
	Bonneville County		Bingham County		Jefferson County		Total ROI		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2006**										
Total Population	94,630	100	N/A	N/A	N/A	N/A	N/A	N/A	1,466,465	100
Minority Population*	5,089	5.4	N/A	N/A	N/A	N/A	N/A	N/A	109,336	7.5
One Race:	93,218	98.5	N/A	N/A	N/A	N/A	N/A	N/A	1,435,012	97.9
White	89,541	94.6	N/A	N/A	N/A	N/A	N/A	N/A	1,357,129	92.5
Black or African American	53	0.1	N/A	N/A	N/A	N/A	N/A	N/A	6,842	0.5
American Indian & Alaska Native	1,247	1.3	N/A	N/A	N/A	N/A	N/A	N/A	16,250	1.1
Asian	985	1.0	N/A	N/A	N/A	N/A	N/A	N/A	15,335	1.0
Native Hawaiian and other Pacific Islander	0	0.0	N/A	N/A	N/A	N/A	N/A	N/A	2,021	0.1
Other races	1,392	1.5	N/A	N/A	N/A	N/A	N/A	N/A	37,435	2.6
Two or more races	1,412	1.5	N/A	N/A	N/A	N/A	N/A	N/A	31,453	2.1

Notes: *Calculated as total population less white population
** Bingham County and Jefferson County 2006 data is not available (N/A). Counties with a population less than 65,000 people are not surveyed.
Sources: USCB, 2000a; USCB, 2000b; USCB, 2000x; USCB, 2000c; USCB, 2006a; USCB, 2006b

Table 3.10-3 Labor Force and Employment
(Page 1 of 4)

Year/Employment	Jurisdiction									
	Bonneville County		Bingham County		Jefferson County		Total ROI		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1990 Labor Force										
Population 16 years old and older:	49,561	100.0	24,541	100.0	10,489	100.0	84,591	100.0	729,819	100.0%
Individuals in labor force:	34,714	70.0	16,122	65.7	6,854	65.3	57,690	68.2	478,286	65.5
Civilian labor force	33,619	67.8	16,048	65.4	6,840	65.2	56,507	66.8	472,773	64.8
Employed	32,016	64.6%	15,003	61.1	6,589	62.8	53,608	63.4	443,703	60.8
Unemployed	1,603	3.2	1,045	4.3	251	2.4	2,899	3.4	29,070	4.0
Percent of civilian labor force unemployed		4.8		6.5		3.7		N/A		6.1
Armed Forces	1,095	2.2	74	0.3	14	0.1	1,183	1.4	5,513	0.8
Individuals not in labor force:	14,847	30.0	8,419	34.3	3,635	34.7	26,901	31.8	251,533	34.5
2000 Labor Force										
Population 16 years old and older:	59,636	100.0	28,926	100.0	13,058	100.0	101,620	100.0	969,872	100.0
Individuals in labor force:	40,370	67.7	18,961	65.6	8,682	66.5	68,013	66.9	641,088	66.1
Civilian labor force	40,321	67.6	18,935	65.5	8,669	66.4	67,925	66.8	636,237	65.6
Employed	38,309	64.2	17,841	61.7	8,289	63.5	64,439	63.4	599,453	61.8
Unemployed	2,012	3.4	1,094	3.8	380	2.9	3,486	3.4	36,784	3.8
Percent of civilian labor force		5.0		5.8		4.4		N/A		5.8

Table 3.10-3 Labor Force and Employment
(Page 2 of 4)

Year/Employment	Jurisdiction									
	Bonneville County		Bingham County		Jefferson County		Total ROI		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
unemployed										
Armed Forces	49	0.1	26	0.1	13	0.1	88	0.1	4,851	0.5
Individuals not in labor force:	19,266	32.3	9,965	34.4	4,376	33.5	33,607	33.1	328,784	33.9

Table 3.10-3 Labor Force and Employment
(Page 3 of 4)

Year/Employment	Jurisdiction									
	Bonneville County		Bingham County		Jefferson County		Total ROI		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2006 Labor Force										
Population 16 years old and older:	69,549	100.0	N/A	N/A	N/A	N/A	N/A	N/A	1,115,916	100.0
Individuals in labor force:	47,670	68.5	N/A	N/A	N/A	N/A	N/A	N/A	734,750	65.8
Civilian labor force	47,558	68.4	N/A	N/A	N/A	N/A	N/A	N/A	729,018	65.3
Employed	45,181	65.0	N/A	N/A	N/A	N/A	N/A	N/A	690,638	61.9
Unemployed	2,377	3.4	N/A	N/A	N/A	N/A	N/A	N/A	38,380	3.4
Percent of civilian labor force unemployed		5.0		N/A		N/A		N/A		5.3
Armed Forces	112	0.2	N/A	N/A	N/A	N/A	N/A	N/A	5,732	0.5
Individuals not in labor force:	21,879	31.5	N/A	N/A	N/A	N/A	N/A	N/A	381,166	34.2
2000-2006 Average Annual Percent Change Labor Force										
Population 16 years old and older:		2.8		N/A		N/A		N/A		2.5
Individuals in labor force:		3.0		N/A		N/A		N/A		2.4
Civilian labor force		3.0		N/A		N/A		N/A		2.4
Employed		3.0		N/A		N/A		N/A		2.5
Unemployed		3.0		N/A		N/A		N/A		2.5
Armed Forces		21.4		N/A		N/A		N/A		
Individuals not in labor force:		2.3		N/A		N/A		N/A		2.7

Table 3.10-3 Labor Force and Employment
(Page 4 of 4)

Note: N/A = not available

Sources: USCB, 1990d; USCB, 1990e; USCB, 1990f; USCB, 1990h; USCB, 2000d; USCB, 2000e; USCB, 2000f; USCB, 2000z; USCB, 2006c; USCB, 2006d

Table 3.10-4 Employment by Industry (Page 1 of 2)

Sector/Industry	Jurisdiction																	
	Bonneville County				Bingham County				Jefferson County				Total ROI		State of Idaho			
	2000	%	2006	%	2000	%	2006	%	2000	%	2006	%	2000	%	2000	%	2006	%
Total, All Industries	38,309	100	45,181	100	17,841	100	N/A	N/A	8,289	100	N/A	N/A	64,439	100	599,453	100	690,638	100
Agriculture, Forestry, Fishing & Hunting, and Mining	1,144	3.0	1,518	3.4	1,572	8.8	N/A	N/A	1,001	12.1	N/A	N/A	3,717	5.8	34,503	5.8	38,784	5.6
Construction	2,843	7.4	5,504	12.2	1,410	7.9	N/A	N/A	735	8.9	N/A	NA	4,988	7.7	48,388	8.1	73,688	10.7
Manufacturing	2,885	7.5	3,895	8.6	2,746	15.4	N/A	N/A	848	10.2	N/A	N/A	6,479	10.1	78,625	13.1	76,377	11.1
Wholesale Trade	1,793	4.7	1,240	2.7	755	4.2	N/A	N/A	478	5.8	N/A	N/A	3,026	4.7	21,495	3.6	20,895	3.0
Retail Trade	5,403	14.1	5,504	12.2	1,953	10.9	N/A	N/A	938	11.3	N/A	N/A	8,294	12.9	75,477	12.6	83,257	12.1
Transportation and Warehousing, Utilities	1,425	3.7	1,467	3.2	732	4.1	N/A	N/A	476	5.7	N/A	N/A	2,633	4.1	27,891	4.7	31,069	4.5
Information	902	2.4	1,267	2.8	314	1.8	N/A	N/A	139	1.7	N/A	N/A	1,355	2.1	13,779	2.3	14,095	2.0
Finance, Insurance, Real Estate, and Rental and Leasing	1,853	4.8	3,135	6.9	596	3.3	N/A	N/A	253	3.1	N/A	N/A	2,702	4.2	30,618	5.1	43,110	6.2
Professional, Scientific, Management, Administrative, and Waste Services	6,627	17.3	7,142	15.8	1,312	7.4	N/A	N/A	673	8.1	N/A	N/A	8,612	13.4	47,744	8.0	62,390	9.0
Educational, Health, and Social Services	7,040	18.4	7,685	17.0	3,499	19.6	N/A	N/A	1,604	19.4	N/A	N/A	12,143	18.8	115,154	19.2	134,136	19.4

Table 3.10-4 Employment by Industry (Page 2 of 2)

Sector/Industry	Jurisdiction																			
	Bonneville County				Bingham County				Jefferson County				Total ROI		State of Idaho			
	2000	%	2006	%	2000	%	2006	%	2000	%	2006	%	2000	%	2000	%	2006	%
Arts, Entertainment, Recreation, Accommodation, and Food Services	2,912	7.6	3,362	7.4	1,147	6.4	N/A	N/A	416	5.0	N/A	N/A	4,475	6.9	47,902	8.0	52,558	7.6
Other Services (except public administration)	1,517	4.0	1,230	2.7	758	4.2	N/A	N/A	353	4.3	N/A	NA	2,628	4.1	27,228	4.5	27,446	4.0
Public Administration	1,965	5.1	2,232	4.9	1,047	5.9	N/A	N/A	375	4.5	N/A	NA	3,387	5.3	30,649	5.1	32,833	4.8
Class of Workers																		
Private wage and salary workers	28,323	73.9	34,363	76.1	12,116	67.9	N/A	N/A	5,714	68.9	N/A	N/A	46,153	71.6	442,529	73.8	516,615	74.8
Government workers	6,696	17.5	6,582	14.6	3,789	21.2	N/A	N/A	1,526	18.4	N/A	N/A	12,011	18.6	98,089	16.4	105,130	15.2
Self-employed workers in own not incorporated business	3,136	8.2	4,111	9.1	1,813	10.2	N/A	N/A	984	11.9	N/A	N/A	5,933	9.2	56,018	9.3	66,077	9.6
Unpaid family workers	154	0.4	125	0.3	123	0.7	N/A	N/A	65	0.8	N/A	N/A	342	0.5	2,817	0.5	2,816	0.4

Note: N/A = not available

Sources: USCB, 2000d; USCB, 2000e; USCB, 2000f; USCB 2000z; USCB, 2006c, USCB, 2006d

Table 3.10-5 Income Characteristics
(Page 1 of 1)

Year/Income Characteristics	Jurisdiction			
	Bonneville County	Bingham County	Jefferson County	State of Idaho
2000				
Percent of Individuals Below the Poverty Level	10.1	12.4	10.4	11.8
Median Household Income	$41,805	$36,423	$37,737	$37,572
Per Capita Income	$18,326	$14,365	$13,838	$17,841
Mean Household Income	$52,112	$44,586	$44,907	$48,114
2006				
Percent of Individuals Below the Poverty Level	12.3	N/A	N/A	12.6
Median Household Income	$45,325	N/A	N/A	$42,865
Per Capita Income	$20,933	N/A	N/A	$21,000
Mean Household Income	$56,875	N/A	N/A	$54,659

Note: N/A = not available
Sources: USCB, 2000d ; USCB, 2000e; USCB, 2000f; USCB, 2000g; USCB, 2000z; USCB, 2000cc; USCB, 2006c ; USCB, 2006d

Table 3.10-6 Bonneville County Budget Ending September 30, 2007
(Page 1 of 1)

Revenues/Expenditures	Total Governmental Funds
Revenues	
Property Taxes	18,258,931
Fees and Fines	1,177,187
Licenses and permits	594,853
Intergovernmental	11,763,233
Charges for services	9,699,729
Investment Earnings	2,139,643
Miscellaneous	987,645
Revenues Subtotal	44,621,221
Expenditures	
Current:	
General government	10,451,696
Public safety	16,247,869
Public works	4,809,707
Health and sanitation	3,233,371
Culture and recreation	636,503
Education	34,500
Conservation and economic development	1,215,875
Debt Service:	
Principal	1,014,967
Interest and other charges	238,927
Capital outlay	2,442,489
Expenditures Subtotal	40,325,904
Excess (deficiency) of revenues over expenditures	4,295,317
Other Financing Sources (Uses)	
Proceeds from long term debt	250,000
Proceeds from capital leases	-
Other source	24,405
Payments to refunded bond escrow agent	-
Transfers in	2,040,880
Transfers out	(2,040,880)
Other Financing Subtotal	274,405
Special Items	
Proceeds from sale of assets	-
Net change in fund balances	4,569,722
Fund Balances, October 1, 2006	31,913,194
FUND BALANCES, SEPT. 30, 2007	36,482,916

Table 3.10-7 City of Idaho Falls 2007-2008 Proposed Revenues and Expenditures (Page 1 of 1)

Funds	Proposed Revenues	Proposed Expenditures
General*	37,027,847	39,757,887
Street	3,186,854	3,557,478
Recreation	1,139,677	1,113,326
Library	2,341,852	2,886,947
Airport Passenger Facility	600,000	600,000
Municipal Equipment Replacement	1,489,500	1,568,000
Elect. Light Public Purpose	550,000	550,000
Business Improvement Dist.	60,000	60,000
Electric Light Rate Stabilization	400,000	0
Golf	1,782,700	1,790,015
Sanitary Sewer	216,750	0
Municipal Capital Improvement	636,130	3,500,000
Street Capital Improvement	1,000	0
Bridge & Arterial	255,000	1,000,000
Water Capital Improvement	283,750	500,000
Surface Drainage	50,000	200,000
Traffic Light Capital Improvement	281,900	1,000,000
Airport	9,081,409	8,914,839
Water & Sewer	12,478,000	12,536,549
Sanitation	3,605,000	3,734,860
Ambulance	2,661,239	2,787,893
Electrical	53,356,060	64,975,485
Total	**131,484,668**	**151,033,279**

* The General Fund for the year ending September 30, 2007, received $21,694,620 in revenues from property taxes, $6,312,994 in revenues from sales taxes and revenue sharing, and an additional $7,202,379 in revenues came from miscellaneous sources.

Source: IF, 2008.

Table 3.10-8 Housing
(Page 1 of 2)

Year	Jurisdiction									
	Bonneville County		Bingham County		Jefferson County		Total ROI		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2000										
Total Housing:	30,484	100	14,303	100	6,287	100	51,074	100	527,824	100
Total Occupied Units:	28,753	94.3	13,317	93.1	5,901	93.9	47,971	93.9	469,645	89.0
Owner-occupied	21,467	74.7	10,564	79.3	5,008	8.49	37,039	72.5	339,960	72.4
Renter-occupied	7,286	25.3	2,753	20.7	893	15.1	10,932	21.4	129,685	27.6
Total Unoccupied Units:	1,731	5.7	986	6.9	386	6.1	3,103	6.1	58,179	11.0
Year-round units	1,354	4.4	883	6.2	333	5.3	2,470	4.8	30,701	5.8
Seasonal, recreational, or occasional use units	377	1.2	103	0.7	53	0.8	533	1.0	27,478	5.2
Cost of Specified Owner-occupied Units (Median Dollars)	$93,500		$84,400		$119,600		N/A		$106,300	
2006										
Total Housing:	36,141	100	N/A	N/A	N/A	N/A	N/A	N/A	615,703	100
Total Occupied Units:	33,538	92.8	N/A	N/A	N/A	N/A	N/A	N/A	548,555	89.1
Owner-occupied	24,602	73.4	N/A	N/A	N/A	N/A	N/A	N/A	390,982	71.3
Renter-occupied	8,936	26.6	N/A	N/A	N/A	N/A	N/A	N/A	157,573	28.7
Total Unoccupied Units:	2,603	7.2	N/A	N/A	N/A	N/A	N/A	N/A	67,148	10.9
Year-round units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Seasonal, recreational, or occasional use units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cost of Specified Owner-occupied Units (Median Dollars)	$131,000		N/A		N/A		N/A		$163,900	

Table 3.10-8 Housing
(Page 2 of 2)

Year	Jurisdiction									
	Bonneville County		Bingham County		Jefferson County		Total ROI		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2000-2006 Average Annual Percent Change										
Total Housing:		3.1		N/A		N/A		N/A		2.8
Total Occupied Units:		2.8		N/A		N/A		N/A		2.8
Owner-occupied		2.4		N/A		N/A		N/A		2.5
Renter-occupied		3.8		N/A		N/A		N/A		3.6
Total Unoccupied Units:		8.4		N/A		N/A		N/A		2.6
Year-round units		N/A		N/A		N/A		N/A		N/A
Seasonal, recreational, or occasional use units		N/A		N/A		N/A		N/A		N/A

Note: N/A = not available
Sources: USCB, 2000a; USCB, 2000b; USCB, 2000c; USCB, 2000h; USCB, 2000i; USCB, 2000j; USCB, 2000aa; USCB, 2000bb; USCB, 2006e; USCB, 2006f

Table 3.10-9 Public and Private Educational Facilities
(Page 1 of 3)

County/Public Educational Facilities	City	Grades Taught	Number of Students(1)	Students per FTE Teacher(1)
Bonneville County:				
3-D Detention Center	Idaho Falls	7-12	19	11.2
A H Bush Elementary School	Idaho Falls	Kindergarten (K)-6	444	19.2
Ammon Elementary School	Idaho Falls	K-5	543	22.6
Behavior Health Alternative High School	Idaho Falls	7-12	27	27
Bonneville High School	Idaho Falls	9-12	1,098	20.3
Clair E. Gale Jr. High School	Idaho Falls	7-9	655	16.4
Cloverville Elementary School	Idaho Falls	K-5	551	19.8
Dora Erickson Elementary School	Idaho Falls	K-6	464	19.5
Eagle Rock Junior High School	Idaho Falls	7-9	888	18.5
Eastern ID Prof-Tech High Center	Idaho Falls	9-12	N/A	N/A
Edgemont Gardens Elementary School	Idaho Falls	K-6	438	20
Ethyl Boyes Elementary School	Idaho Falls	K-6	407	21.5
Fairview Elementary School	Idaho Falls	Preschool (P)-5	240	17.8
Falls Valley Elementary School	Idaho Falls	P-5	670	23.5
Foxhollow Elementary School	Idaho Falls	P-6	496	20.9
Hawthorne Elementary School	Idaho Falls	P-6	330	19.3
Hillcrest High School	Idaho Falls	9-12	1,234	20.6
Hillview Elementary School	Idaho Falls	P-5	521	24.2
Idaho Falls Senior High School	Idaho Falls	10-12	1,242	18.8
Iona Elementary School	Iona	K-5	493	22.4
Lincoln High School (Alt)	Idaho Falls	9-12	172	14.3
Linden Park Elementary School	Idaho Falls	K-6	491	21.4
Longfellow Elementary School	Idaho Falls	K-6	463	21.7
Rocky Mountain Middle School	Idaho Falls	6-8	805	18.5
Sandcreek Middle School	Idaho Falls	6-8	1,014	20.1
Skyline Senior High School	Idaho Falls	10-12	1,066	17.2
Special Services Center	Idaho Falls	K-12	0	0
Sunnyside Elementary School	Idaho Falls	K-6	485	18.4
Swan Valley Elementary School	Irwin	P-8	53	12.1
Taylorview Junior High School	Idaho Falls	7-9	879	18.3
Telford Academy (Alt)	Idaho Falls	6-12	24	6.5
Temple View Elementary School	Idaho Falls	K-6	487	21.1
Theresa Bunker Elementary School	Idaho Falls	P-6	329	19.5
Tiebreaker Elementary School	Idaho Falls	K-5	567	20.2
Ucon Elementary School	Idaho Falls	P-5	425	20.7
Westside Elementary School	Idaho Falls	K-6	465	22.4
Westview Alternative Evening	Idaho Falls	9-12	150	33.3
White Pine Charter School	Idaho Falls	K-8	308	21.4
Subtotals	38 Schools		14,254	

Table 3.10-9 Public and Private Educational Facilities
(Page 2 of 3)

County/Public Educational Facilities	City	Grades Taught	Number of Students(1)	Students per FTE Teacher(1)
Bingham County:				
A W Johnson Elementary School	Firth	P-4	293	18.3
Aberdeen Elementary School	Aberdeen	P-5	405	17.9
Aberdeen High School	Aberdeen	9-12	280	15.1
Aberdeen Middle School	Aberdeen	6-8	210	16.9
Bingham Professional-Technical Center	Blackfoot	7-12	0	0
Blackfoot Community Learning Charter School	Blackfoot	K-6	81	16.5
Blackfoot High School	Blackfoot	9-12	1,171	19.7
Blackfoot Sixth Grade Elementary School	Blackfoot	6	297	17
Donald D. Stalker Elementary Center	Blackfoot	P-5	263	15.7
Donald J Hobbs Middle School	Shelley	6-8	506	18.8
Firth High School	Firth	9-12	266	15.6
Firth Middle School	Firth	5-8	245	15.6
Fort Hall Elementary School	Pocatello	K-5	140	12.5
Groveland Elementary School	Blackfoot	P-5	368	19.7
Hazel Stuart Elementary School	Shelley	2-5	394	21.9
I T Stoddard Elementary School	Blackfoot	P-5	318	18
Idaho Leadership Academy	Pingree	9-12	118	31.1
Independence Alternate High School	Blackfoot	9-12	100	10.5
Irving Kindergarten Center	Blackfoot	P-K	348	33.1
Moreland Elementary School	Moreland	P-2	314	22.6
Mountain View Middle School	Blackfoot	7-8	625	16.9
Mountain View Middle School (Alt)	Blackfoot	7-8	12	12
Ridge Crest Elementary School	Blackfoot	P-5	323	14.5
Riverside Elementary School	Blackfoot	3-4	201	18.3
Rockford Elementary School	Blackfoot	K-4	197	19.7
Shelley Senior High School	Shelley	9-12	613	19.6
Snake River High School	Blackfoot	9-12	590	17.9
Snake River Jr High School	Blackfoot	7-8	294	16.8
Snake River Middle School	Blackfoot	5-6	273	21.5
State Hospital South	Blackfoot	4-12	16	16
Sunrise Elementary School	Shelley	P-3	587	21
Vaughn Hugie Family Ed Center	Blackfoot	P	28	28
Wapello Elementary School	Blackfoot	1-5	166	16
Subtotals	33 Schools		10,042	

Table 3.10-9 Public and Private Educational Facilities
(Page 3 of 3)

County/Public Educational Facilities	City	Grades Taught	Number of Students[1]	Students per FTE Teacher[1]
Jefferson County:				
Hamer Elementary School	Hamer	K-6	65	13
Harwood Elementary School	Rigby	P-5	623	22.3
Jefferson Alternative High School	Rigby	9-12	57	9.5
Jefferson Alternative Junior High School	Menan	7-8	5	5
Jefferson Elementary School	Rigby	P-5	796	23.6
Midway Elementary School	Menan	P-5	526	22.5
Midway Middle School	Menan	6-7	632	19.8
Rigby Junior High School	Rigby	8-9	645	19.7
Rigby Senior High School	Rigby	10-12	823	18.7
Ririe Elementary School	Ririe	P-4	243	16.8
Ririe High School	Ririe	9-12	222	14.1
Ririe Middle School	Ririe	5-8	193	15.7
Roberts Elementary School	Roberts	K-5	172	15.2
Terreton Elementary-Junior High School	Terreton	P-8	374	16.4
West Jefferson High School	Terreton	9-12	222	13.7
Subtotals	15 Schools		5,600	
Total of Public Schools	86 Schools		29,896	
Bonneville County:				
Adventist Christian School	Idaho Falls	4-8	6	6
Calvary Chapel Christian School	Idaho Falls	P-8	189	13.1
Holy Rosary Elementary School	Idaho Falls	P-6	229	17.6
Hope Lutheran School	Idaho Falls	P-6	128	13.8
Little Peoples Academy	Idaho Falls	P-K	66	11.2
Snake River Montessori School	Idaho Falls	K-6	78	11.8
The King's Academy	Idaho Falls	1-12	32	13.3
Subtotals	7 Schools		728	
Bingham County:				
The Lillian Valley School	Blackfoot	K-5	30	15
Subtotals	1 School		30	
Jefferson County:				
Jefferson Montessori	Rigby	P-12	107	7.8
Subtotals	1 School			
Total of Private Schools	9 Schools		865	

Note: [1] 2005-2006 school year.
N/A = not available
Source: NCES, 2008; NECS, 2009; Schooltree, 2009.

Table 3.10-10 Educational Enrollment and Attainment
(Page 1 of 2)

Year and Educational Enrollment/Attainment	Jurisdiction									
	Bonneville County		Bingham County		Jefferson County		Total ROI		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2000										
School Enrollment (>3 years of age)	24,784	100	13,297	100	6,224	100	44,305	100	368,579	100
Nursery School, pre-school	1,555	6.3	774	5.8	387	6.2	2,716	6.1	20,764	5.6
Kindergarten	1,214	4.9	771	5.8	415	6.7	2,400	5.4	19,149	5.2
Elementary school (grades 1-8)	11,785	47.6	6,574	49.4	3,130	50.3	21,489	48.5	165,698	45.0
High School (grades 9-12)	6,683	27.0	3,755	28.2	1,690	27.2	12,128	27.4	85,576	23.2
College or graduate school	3,547	14.3	1,423	10.7	602	9.7	5,572	12.6	77,392	21.0
School Attainment (>25 years of age)	48,502	100	23,155	100.0	10,335	100	81,992	100	787,505	100
Less than 9th grade	2,002	4.1	1,802	7.8	698	6.8	4,502	5.5	41,039	5.2
9th to 12th grade, no diploma	3,917	8.1	2,696	11.6	916	8.9	7,529	9.2	79,322	10.1
High School graduate (includes equivalency)	12,831	26.5	7,204	31.1	3,034	29.4	23,069	28.1	224,322	28.5
Some college, no degree	12,936	26.7	6,409	27.7	2,925	28.3	22,270	27.2	215,204	27.3
Associate's degree	4,142	8.5	1,715	7.4	1,187	11.5	7,044	8.6	57,003	7.2
Bachelor's degree	8,381	17.3	2,468	10.7	1,194	11.6	12,043	14.7	116,901	14.8
Graduate or professional degree	4,293	8.9	861	3.7	381	3.7	5,535	6.8	53,714	6.8

Table 3.10-10 Educational Enrollment and Attainment
(Page 2 of 2)

Year and Educational Enrollment/Attainment	Jurisdiction									
	Bonneville County		Bingham County		Jefferson County		Total ROI		State of Idaho	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2006										
School Enrollment (>3 years of age)	25,244	100	N/A	N/A	N/A	N/A	N/A	N/A	394,245	100
Nursery school, pre-school	1,838	7.3	N/A	N/A	N/A	N/A	N/A	N/A	19,766	5.0
Kindergarten	1,651	6.5	N/A	N/A	N/A	N/A	N/A	N/A	21,251	5.4
Elementary school (grades 1-8)	11,400	45.2	N/A	N/A	N/A	N/A	N/A	N/A	165,445	42.0
High school (grades 9-12)	6,329	25.1	N/A	N/A	N/A	N/A	N/A	N/A	92,822	23.5
College or graduate school	4,026	15.9	N/A	N/A	N/A	N/A	N/A	N/A	94,961	24.1
School Attainment (>25 years of age)	57,474	100	N/A	N/A	N/A	N/A	N/A	N/A	919,203	100
Less than 9th grade	2,155	3.7	N/A	N/A	N/A	N/A	N/A	N/A	41,007	4.5
9th to 12th grade, no diploma	3,549	6.2	N/A	N/A	N/A	N/A	N/A	N/A	75,813	8.2
High school graduate (includes equivalency)	18,957	33.0	N/A	N/A	N/A	N/A	N/A	N/A	277,120	30.1
Some college, no degree	14,358	25.0	N/A	N/A	N/A	N/A	N/A	N/A	233,228	25.4
Associate's degree	5,099	8.9	N/A	N/A	N/A	N/A	N/A	N/A	77,659	8.4
Bachelor's degree	9,161	15.9	N/A	N/A	N/A	N/A	N/A	N/A	148,953	16.2
Graduate or professional degree	4,195	7.3	N/A	N/A	N/A	N/A	N/A	N/A	65,423	7.1

Note: N/A = not available
Sources: USCB, 2000k; USCB, 2000l; USCB, 2000m; USCB, 2000y; USCB, 2006g; USCB, 2006h

FIGURES

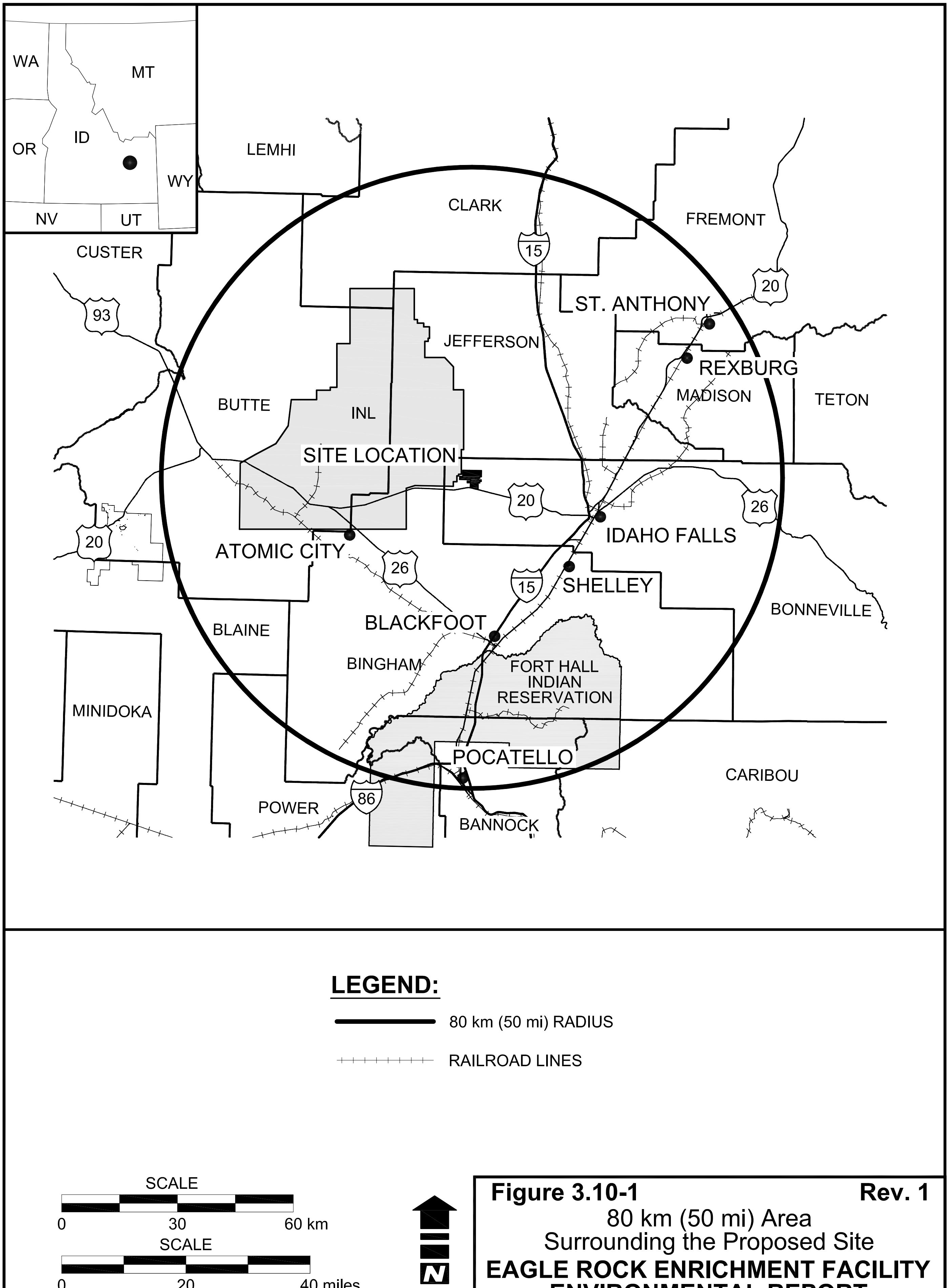


Figure 3.10-1 **Rev. 1**

80 km (50 mi) Area
Surrounding the Proposed Site

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT

3.11 PUBLIC AND OCCUPATIONAL HEALTH

Routine operations at the Eagle Rock Enrichment Facility (EREF) create the potential for radiation exposure to plant workers, members of the public, and the environment. Workers at the EREF are subject to higher potential radiation exposures than members of the public because they are involved directly with handling UF_6 feed and product cylinders, depleted UF_6 cylinders, processes for the enrichment of uranium, and decontamination of containers and equipment. In addition to the radiological hazards associated with uranium, workers may be potentially exposed to the chemical hazards associated with uranium. However, workers at the EREF are protected by the combination of a Radiation Protection Program and a Health, Safety, and Environment Program. The Radiation Protection Program complies with all applicable NRC requirements contained in 10 CFR 20 (CFR, 2008x), Subpart B, and the Health, Safety and Environment Program at the EREF complies with all applicable OSHA requirements contained in 29 CFR 1910 (CFR, 2008n).

Members of the general public also may be subject to potential radiation exposure due to routine operations at the EREF. Public exposure to plant-related uranium may occur as the result of gaseous discharges, including controlled releases from the uranium enrichment process lines during decontamination and maintenance of equipment, and transportation and storage of UF_6 feed, product, and depleted UF_6 cylinders. In each case, the amount of exposure incurred by the general public is expected to be very low.

Engineered effluent controls, effluent sampling, and administrative limits as described in Section 6.1.1, Effluent Monitoring Program, are in place to assure that any impacts on the health and safety of the public resulting from routine plant operations are maintained as low as reasonably achievable (ALARA). The effectiveness of the effluent controls will be confirmed through implementation of the Radiological Environmental Monitoring Program described in ER Section 6.1.2, Radiological Environmental Monitoring Program.

For the public, the potential radiological impacts from routine operations at the EREF are those associated with chronic exposure to very low levels of radiation. It is anticipated that the total annual amount of uranium released to the environment via air effluent discharges from the EREF will be approximately 20 g (0.71 ounces) per year. Radiological impacts to the public are discussed in ER Section 4.12, Public and Occupational Health Impacts.

This section also describes levels of background radiation, major sources and levels of background chemical exposure, occupational injury rates, and health effects studies performed in the region of the selected site.

3.11.1 Major Sources and Levels of Background Radiation

3.11.1.1 General Background Radiation

The current sources of radiation at the EREF site are associated with natural background radiation sources and residual man-made radioactivity from fallout associated with the atmospheric testing of nuclear weapons in the western United States and overseas in the 1950s and 1960s. Naturally-occurring radioactivity includes primordial radionuclides (nuclides that existed or were created during the formation of the earth and have a sufficiently long half-life to be detected today) and their progeny, as well as radionuclides that are continually produced by natural processes other than the decay of the primordial nuclides. These primordial radionuclides are ubiquitous in nature, and are responsible for a large fraction of radiation exposure referred to as background exposure. The majority of primordial radionuclides are isotopes of the heavy elements and belong to the three radioactive series headed by ^{238}U

(uranium series), ^{235}U (actinium series), and ^{232}Th (thorium series) (NCRP, 1987a). Alpha, beta, and gamma radiation is emitted from the radionuclides in these series. The relationship among the nuclides in a particular series is such that, in the absence of chemical or physical separation, the members of the series attain a state of radioactive equilibrium, wherein the decay rate of each radionuclide is essentially equal to that of the radionuclide that heads the series. The radionuclides in each series decay eventually to a stable nuclide. For example, the decay process of the uranium series leads to a stable isotope of lead. There are also primordial radionuclides, specifically ^{40}K and ^{87}Rb, which decay directly to stable elements without going through a series of decay sequences. The primordial series of radionuclides represents a significant component of background radiation exposure to the public (NCRP, 1987a). Cosmogenic radionuclides make up another class of naturally occurring nuclides. Cosmogenic radionuclides are produced in the earth's atmosphere and crust by cosmic-ray bombardment, but are much less important as radiation sources than the primordial series (NCRP, 1987a).

Naturally-occurring radioactivity in soil or rock near the earth's surface belonging to the primordial series represents a significant component of background radiation exposure to the public (NCRP, 1987a). The radionuclides of primary interest are ^{40}K and the radioactive decay chains of ^{238}U and ^{232}Th. These nuclides are widely distributed in rock and soil. Soil radioactivity is largely that of the rock from which it was derived. The original concentrations may have been diminished by leaching and dilution by water and organic material added to the soil, or may have been augmented by adsorption and precipitation of nuclides from incoming water. Nevertheless, a soil layer about 0.25 m (0.8 ft) thick furnishes most of the external radiation from the ground (NCRP, 1987a). In general, typical soil and rock contents of these radionuclides indicate that the ^{232}Th series and ^{40}K each contribute an average of about 150 to 250 µGy per year (15 to 25 mrad per year) to the total absorbed dose rate in air for typical situations, while the uranium series contribute about half as much (NCRP, 1987a).

The public exposure from naturally-occurring radioactivity in soil varies with location. In the U.S., background radiation exposures in the Southwest and Pacific areas are generally higher than those in much of the Eastern and Central regions. Some of the variation is linked to location, but factors such as moisture content of soil, the presence and amount of snow cover, the radon daughter concentration in the atmosphere, the degree of attenuation offered by housing structures, and the amount of radiation originating in construction materials may also account for variation (NCRP, 1987b).

Background radiation for the public also includes various sources of man-made radioactivity, such as fallout in the environment from weapons testing, and radiation exposures from medical treatments, x-rays, and some consumer products. All of these types of man-made sources contribute to the annual radiation exposure received by members of the public. Of these, fallout from weapons testing should be included as an environmental radiation source for the EREF site. The two nuclides of concern with regard to public exposure from weapons testing are ^{137}Cs and ^{90}Sr due to their relative abundance, long half lives (30.2 and 29.1 years, respectively) and their ability to be incorporated into human exposure pathways, such as external direct dose and ingestion of foods.

The geographic distribution of external dose from global fallout shows little variation across the United States. In Idaho, the external doses were 3 mGy (300 mrad) or less, assuming an individual was resident in the same county throughout the period 1953-2000 (CDC, 2005). Use of radiation in medicine and dentistry is also a major source of man-made background radiation exposure to the U.S. population. Although radiation exposures from medical treatments, X-rays, and some consumer products are considered to be background exposures, these sources do not comprise the background at the EREF site. Nevertheless, as a point of reference, medical procedures contribute an average of 0.39 mSv (39 mrem) for diagnostic X-rays and nuclear medicine contributes an average of 0.14 mSv (14 mrem) to the annual average dose equivalent received by the U.S. population (NCRP, 1989). The increased use of radiation in medical procedures, particularly CT scanning, suggests that per capita radiation dose from medical procedures has increased significantly since the 1980s (NCRP, 2008).

Consumer products (e.g., television receivers, ceramic products, tobacco products) also contribute to annual background radiation exposure. The average annual dose equivalent from consumer products and other miscellaneous sources (e.g., X-ray machines at airports, building materials) can range from fractions of a microsievert (millirems) to several Sieverts (hundreds of rems), as illustrated in Table 5.1 of NCRP Report No. 95 (NCRP, 1987b).

3.11.1.2 Area Background Radiation

According to the U.S. Bureau of Land Management (BLM), Pocatello Field Office (PFO), the Western Phosphate Field of southeast Idaho is one of the world's major phosphate producing regions (BLM, 2008c). Phosphate mining has been an important industry in Idaho since 1907. Phosphorus is essential to crop production. The PFO administers federal leases that produce ore that is a major source of phosphate fertilizer and elemental phosphorus. Phosphate fertilizer and phosphorus are produced at industrial plants located in Pocatello and Soda Springs, Idaho. As of June, 2008 there are four active phosphate mines operating on federal leases within the PFO area in Caribou County, Idaho. Refer to Table 3.11-1, Bureau of Land Management–Administered Phosphate Mines in Pocatello Field Office Area for a listing of mines. The mining region is located approximately 50 miles from the EREF site.

The phosphorus portion of fertilizer may have substantial concentrations of uranium and thorium as well as their decay products. In the United States, natural uranium and thorium concentrations in phosphate ores vary from approximately 100 to 900 mBq (3 to 24 pCi) per gram and 15 to 150 mBq (0.4 to 4 pCi) per gram, respectively (NCRP, 1987c). The mining and processing of phosphate ores redistributes the uranium, thorium, and their decay products into the various products, by-products, and wastes.

Commercial fertilizer products include normal superphosphate, diammonium phosphate (DAP), monoammonium phosphate (MAP), triple superphosphate (TSP), and phosphoric acid. The uranium decay series is the most significant contributor to the public radiation dose due to the use of fertilizer products (NCRP, 1987c). Table 3.11-2, Natural Radionuclide Concentrations in Fertilizer Made from Idaho Phosphates, which was taken from the previously cited NCRP report, summarizes the activity concentrations in these products.

The NCRP notes that crops such as potatoes and tomatoes require more than 91 kg per 0.4 hectare (200 lbs per acre) each year of phosphorus pentoxide (P_2O_5). Over a 50-year period, the buildup of ^{226}Ra and ^{238}U due to the application of fertilizer may range up to 37 and 59 mBq/g (1 and 1.6 pCi/g) in soil, respectively. Typical ^{226}Ra and ^{238}U concentrations in United States soils range from about 3.7 to 74 mBq/g (0.1 to 2 pCi/g). Therefore, the long-term application of phosphate fertilizers may lead to enhanced concentrations of radionuclides from the ^{238}U series in the plow layer.

It is estimated that the average annual effective dose equivalent rate to the U.S. population would be less than 10 to 20 µSv/yr (1 to 2 mrem/yr) due to the ingestion of foods grown on land that utilizes phosphate fertilizers.

According to the U.S. Environmental Protection Agency (EPA), the State of Idaho has prohibited the use of phosphate slag in the construction of buildings but slag has been used as aggregate in road construction (EPA, 2008e).

3.11.1.3 Radiation Monitoring at Idaho National Laboratory (INL)

The location of the proposed EREF is near the Department of Energy's (DOE) Idaho National Laboratory (INL) in eastern Idaho. A Site Environmental Report is published annually for DOE summarizing environmental monitoring programs and other environmental activities at the INL site. (DOE, 2007b)

The monitoring programs sample ambient air, drinking water, surface water, groundwater, soils, vegetation, agricultural products, wildlife, and direct radiation. Analyses of these samples include gross alpha and beta activity, and specific radionuclides (e.g., tritium, ^{90}Sr, and isotopes of plutonium). Since air transport is considered the major potential pathway for releases from the INL Site to receptors, the environmental surveillance programs emphasize measurement of airborne radionuclides. Note that uranium is the principle radionuclide at the EREF. The EREF will not emit tritium, ^{90}Sr, ^{131}I, ^{137}Cs, $^{239/240}$Pu, or ^{241}Am, which are commonly monitored by the DOE and the state of Idaho in the environment around the INEL.

In its report for 2006, DOE estimates that a total of 234.58 TBq (6,340 Ci) of radioactivity (primarily short-lived noble gases) was released to the air from the INL Site. Airborne particulates, atmospheric moisture, and precipitation were analyzed for tritium, ^{90}Sr, ^{131}I, ^{137}Cs, $^{239/240}$Pu, and ^{241}Am. All results were found to be below regulatory limits and were consistent with historical data.

Most site wastewater and groundwater results were also below applicable limits in 2006. The maximum effective dose equivalent from drinking water for workers on the INL Site in 2006 was 3 µSv/yr (0.3 mrem/yr). This was less than the 40 µSv/yr (4 mrem/yr) limit established by the U.S. Environmental Protection Agency for public drinking water systems.

The DOE Site Environmental Report for 2006 describes the results of studies of the Eastern Snake River Plain Aquifer and surface water that were conducted by the U.S. Geologic Survey (USGS) in and around the INL site. Tritium concentrations in two monitoring wells on the INL Site showed decreasing tritium concentration over time.

A total of 30 semiannual drinking water samples were collected from 14 locations off the INL Site and around the Snake River Plain. Two samples had measurable tritium, three had measurable gross alpha activity, and 26 had measurable gross beta activity. In addition, 13 offsite surface water samples were collected from six locations. All samples had measurable gross beta activity, while two had measurable gross alpha and two had measurable tritium. All results were within background levels.

Agricultural products, including lettuce, wheat, potatoes, and sheep as well as wildlife, and soil were sampled and reported on in the DOE Site Environmental Report. Direct radiation was also measured at both INL onsite and offsite locations, as well as at boundary locations in 2006. The results were consistent with background radiation levels.

The maximum calculated dose to the maximally exposed individual was 0.4 to 0.5 µSv (0.04 to 0.05 mrem). The dose from natural background radiation was estimated to be 3.57 mSv (357 mrem). The estimated dose from consuming waterfowl and big game animals at the INL ranged from 0.07 to 0.13 µSv (0.007 to 0.013 mrem).

3.11.1.4 State of Idaho Environmental Surveillance of INL

The State of Idaho Department of Environmental Quality (DEQ) conducts an environmental surveillance program in and around the INL. Samples are collected and measurements are taken at locations on the INL site, on public lands off the INL site, at population centers near the

INL site, and at locations distant to the INL. Using their own data, DEQ-INL scientists also verify DOE monitoring results for air, radiation, water, soil and milk. The program is designed to provide the people of the state of Idaho with independently evaluated information about the impacts of the DOE's activities in Idaho.

As part of this oversight program, the state maintains 12 high pressure ion chambers (HPICs) that provide real-time radiation exposure rates. Data are collected by the Idaho DEQ via radio telemetry and are available to the public on the World Wide Web.

The HPIC closest to the proposed EREF site ("Rover Met Tower") has recorded an average exposure rate of $3.55 \times 10^{-9} \pm 0.24 \times 10^{-9}$ C/kg (13.75 ± 0.92 μR/hr) over the last 3.5 years (DEQ-INL, 2008). The difference between this value and that of the location with highest ("Rest Area") and lowest average ("Idaho Falls") HPIC result is 4.02×10^{-10} C/kg (1.56 μR/hr) and 6.14×10^{-10} C/kg (2.38 μR/hr), respectively.

The DEQ-INL's Oversight Annual Report for 2006 (DEQ-INL, 2006) concluded that, in general, there is very good agreement between the DEQ-INL data and that of the DOE.

3.11.1.5 Current Proposed Site Radiation Sources

Workers at the EREF are subject to higher potential exposures than members of the public because they are involved directly with handling cylinders containing uranium, processes for the enrichment of uranium, and decontamination and maintenance of equipment. During routine operations, workers at the plant may potentially be exposed to direct radiation, airborne radioactivity, and limited surface contamination. These potential exposures include various types of radiation, including gamma, neutron, alpha, and beta. Annual doses to workers performing various tasks in an operating uranium enrichment plant have been evaluated. Activities primarily contributing to worker annual exposures include transporting cylinders, coupling and uncoupling containers, and other feed, product, and tail cylinder handling tasks. Workers may also incur radiation exposure while performing other tasks, such as those related to the decontamination of cylinders and equipment. Office workers at the EREF may be exposed to direct radiation from plant operation associated with handling and storing feed, product, and tail cylinders.

The EREF site has previously been used for farming. Other than the possible application of agricultural fertilizer products, there are no known past uses of the property that would have involved man-made or enhanced concentrations of radioactive materials. Agricultural fertilizer products contain trace elements including several radionuclides. The principal radionuclides contained in fertilizers are members of the uranium and thorium decay series and ^{40}K. The concentration of the radionuclides in fertilizer products is determined by the origin of the phosphate ore in the fertilizer (NCRP, 1987c). Use of fertilizers has the potential to increase the internal exposure of members of the public through the ingestion of foodstuffs. Since the site will no longer be used for farming, the only sources of radiation exposure to members of the public currently present at the EREF site are associated with natural background radiation and the residual radioactivity from weapons testing fallout.

Ten surface soil samples were taken from the proposed facility location for the initial characterization of the site. Samples were collected in various locations across the property. Analyses included gamma spectrometry and radiochemical analyses for thorium and uranium. The laboratory results are summarized in Table 3.11-3 , Radiological Analyses of EREF Site Soil. Refer to Section 3.3.3, Soils at the Proposed Site, of this Environmental Report for further information on these soil samples, including the sampling locations.

All 10 samples indicated the presence of the naturally-occurring primordial radionuclides: ^{40}K, the thorium decay series (as indicated by ^{228}Ac and ^{228Th}) and the uranium decay series (including both ^{238}U and ^{234}U). In addition, ^{137}Cs produced by past weapons testing, was also detected in all but one of the samples.

The average soil concentration for ^{40}K was determined to be 660 Bq/kg (17,800 pCi/kg). This result falls in the higher end of the typical range in North America of ^{40}K in soil, which is reported to be from 0.5 x 10^{-6} to 3.0 x 10^{-6} g/g_{soil} (NCRP, 1976). This range equates to approximately 130 to 777 Bq/kg (3,500 to 21,000 pCi/kg). The State of Idaho DEQ INL Oversight Program report for the third quarter of 2005 (DEQ-INL, 2005) provides the most recent *in situ* gamma spectroscopy results of soil monitoring for ^{40}K in and around the INL. (With in situ monitoring, a soil sample is not physically taken for laboratory analysis.) The average of the results from 16 monitoring stations (near the HPICs) was 719 Bq/kg (19,440 pCi/kg). The results of the DEQ INL *in situ* gamma spectroscopy and the laboratory analyses of the actual site soil samples, agree to within 10 percent.

The concentration of ^{238}Ac/^{238}Th was found to average 37.8 Bq/kg (1,022 pCi/kg) in the EREF site soils. If it is assumed that the observed ^{238}Ac/^{238}Th is in secular equilibrium with the parent of the Thorium decay series (^{232}Th), then this observed average concentration falls in the higher end of the typical range for ^{232}Th in North America of 2 x 10^{-6} to 12 x 10^{-6} g/g_{soil} (NCRP, 1976). This range is equivalent to approximately 8.1 to 49 Bq/kg (220 to 1,320 pCi/kg). The separately reported ^{232}Th results averaged 44.1 Bq/kg (1,192 pCi/kg), thus confirming the results implied by the ^{238}Ac/^{238}Th analyses. Radioactive equilibrium is only roughly attained in soils due to the possibility of chemical and physical separation of the progeny.

For the Uranium decay series, ^{238}U and its progeny, ^{234}U, were detected in the site samples in the concentrations of 29.8 and 29.0 Bq/kg (805 and 784 pCi/kg), respectively. (The ^{234}U concentration is within 97 percent of that of the ^{238}U.) The typical range of ^{238}U concentrations in soil is from about 1 x 10^{-6} to 4 x 10^{-6} g/g_{soil} (NCRP, 1976). This range corresponds to approximately 12.6 to 50.3 Bq/kg (340 to 1,360 pCi/kg), placing the site results in about the middle of the typical range.

All but 1 of the 10 soil samples exceeded their respective laboratory minimum detectable concentrations for ^{137}Cs. The average ^{137}Cs concentration in the soil samples taken from the proposed site was 10.4 Bq/kg (282 pCi/kg). The presence of this radionuclide is attributed to past weapons testing fallout. The annual report of the State of Idaho DEQ INL Oversight Program for 2006 (DEQ-INL, 2006) summarizes the ^{137}Cs results from *in situ* gamma spectrometry measurements made at 40 locations in and around the INL. The average DEQ INL ^{137}Cs result was 14.4 Bq/kg (390 pCi/kg). The lowest result observed was 2.22 Bq/kg (60 pCi/kg) and the highest result was 31.8 Bq/kg (860 pCi/kg). The DEQ INL results and the laboratory analyses of the actual site soil samples are in reasonable agreement, given that the ^{137}Cs is due to fallout. Fallout from atmospheric testing of nuclear weapons was not uniform. Soil sample collection was confined to the proposed EREF site. The DEQ INL on the other hand, monitored over a wider area that included the INL site, as well as locations distant from the INL.

ER Section 6.1.2, Radiological Environmental Monitoring Program, describes the Radiological Environmental Monitoring Program (REMP) for the EREF. The REMP includes the collection of data during pre-operational years in order to establish baseline radiological information that will be used in determining and evaluating impacts from operations at the plant on the local environment. The REMP will be initiated at least 2 years prior to plant operations in order to develop a sufficient database.

The data summarized above, supplemented with the REMP data, will fully characterize the background radiation levels at the EREF site.

3.11.1.6 Historical Exposure to Radioactive Materials

Annual whole-body dose equivalents accrued by workers at an operating uranium enrichment plant are typically low. The maximum individual annual dose equivalents for the most recent five-year period, 2003-2007, at the Urenco Capenhurst plant, located in the United Kingdom are summarized in Table 3.11-4, Annual Maximum and Average Worker Doses at Capenhurst. (Urenco, 2003; Urenco, 2004; Urenco, 2005; Urenco, 2006; and Urenco, 2007). The doses ranged from 0.22 mSv to 0.44 mSv. To put these doses in perspective, note that in the United States, individuals receive an annual effective dose equivalent of approximately 3.0 mSv (300 mrem) from background radiation (NCRP, 1987c).

There have been no criticality events or events causing personnel overexposure at Urenco enrichment facilities (NRC, 2002c). During the period from 1972 to 1984, there were 13 reportable worker exposure events at the Urenco Almelo facility in the Netherlands involving releases of small quantities of UF_6. These releases were due to flange or valve leakage. Urenco has stated (NRC, 2002c) that there was no impact to the public in any of these releases. In these events, 14 workers were found to have greater than 50 μg of uranium in their urine. After two days, no uranium was detected in urine tests. There have been no reportable events at the Capenhurst or Gronau Urenco facilities. There have been no reportable worker exposure events since 1984.

Urenco stated to the NRC (NRC, 2002c) that there were two airborne releases to the environment at the Almelo facility in 1998 and 1999. During the releases, air concentrations were 0.8 Bq/m^3 (2.2×10^{-11} μCi/mL) and 1.1 Bq/m^3 (3.0×10^{-11} μCi/mL), respectively. These concentrations persisted for less than one hour. In both cases, the Dutch release limit of 0.5 Bq/m^3 (1.3×10^{-11} μCi/mL) in one hour was exceeded. The total release in each case was less than the 24-hour release limit and much less than the annual release limit. These two releases resulted in a modification to the ventilation system design to add carbon and high efficiency particulate air filters. This modification is incorporated into the EREF design.

According to the 2007 Urenco Capenhurst Health, Safety, and Environment Report (Urenco, 2007), the latest independent assessment of direct radiation exposures to members of the public from activities on the combined (enrichment and decommissioning) site remain very low. The doses measured ranged from less than 10 to 100 μSv (less than 1 to 10 mrem). During 2006, the doses were from less than 10 to 85 μSv (less than 1 to 8.5 mrem). Note that compared with 2005, Urenco Capenhurst Limited (UCL) increased its enrichment capacity 11% in 2006 and 19% in 2007.

For the purpose of effluent dose calculation, the UCL defines the critical group as a population group that is representative of those individuals likely to be most exposed. The assessment of the discharge of low-level aqueous wastes from the UCL site to the postulated critical group (children playing in a nearby brook) resulted in a dose estimate of 0.035 μSv/yr (3.5 μrem/yr). For gaseous effluents the doses to all age groups in any of the critical groups defined by UCL were considerably less than 1 nSv/yr (0.1 μrem/yr). The highest dose was 0.59 nSv/yr (0.059 μrem/yr).

Because the operations at the Capenhurst site and the Eagle Rock Enrichment Facility are similar, the public and occupational exposures are comparable.

3.11.1.7 Summary of Health Effects

Health effects from radiation exposure became evident soon after the discovery of X-rays in 1895 and radium in 1898. Following World War II, many studies were initiated to investigate the effect of radiation on Japanese populations who survived the atomic bombing of Hiroshima and Nagasaki. The reports of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) (UNSCEAR, 1986) (UNSCEAR, 1988) and the National Academy of Sciences Committee of the Biological Effects of Ionizing Radiation (BEIR) (NAS, 1980) (NAS, 1988) are comprehensive reviews of the Japanese data. In addition, numerous radiobiological studies have been conducted in animals (e.g., mouse, rat, hamster, dog), and in cells and tissue cultures. Extrapolations to humans from these experiments are problematic and despite the large amount of accumulated data, uncertainties still exist regarding the effects of radiation at low doses and low dose rates. The most reliably estimated risks are those associated with relatively high doses (i.e., greater than 1 Gy (100 rad)) (NCRP, 1989). The radiation health community is in general agreement that risks at smaller doses are at least proportionally smaller (e.g., no more than 1/100 the risk at 1/100 the dose). It is likely that the risks may be considerably smaller (NCRP, 1980).

Serious radiation-induced diseases fall into two categories: stochastic effects and nonstochastic effects. A stochastic effect is defined as one in which the probability of occurrence increases with increasing absorbed dose but the severity in affected individuals does not depend on the magnitude of the absorbed dose (NCRP, 1989). A stochastic effect is an all-or-none response as far as the individuals are concerned. Cancers such as solid malignant tumors, leukemia and genetic effects are regarded as the main stochastic effects to health from exposure to ionizing radiation at low absorbed doses (NCRP, 1989). It is generally agreed among members of the scientific community that a radiation dose of 100 mGy (10 rads) increases the risk of developing cancer in a lifetime by about one percent (NCRP, 1989). In comparison, a nonstochastic effect of radiation exposure is defined as a somatic effect which increases in severity with increasing absorbed dose in affected individuals, owing to damage to increasing numbers of cells and tissues (NCRP, 1989). Examples of nonstochastic effects from radiation exposure are damage to the lens of the eye, nausea, epilation, diarrhea, and a decrease in sperm production in the male (NCRP, 1980); (NCRP, 1989). These effects have been observed only following high dose exposures, typically greater than 1 Gy (100 rads) to the whole body (NCRP, 1989). The potential doses to the public due to routine operations at the EREF are presented in ER Section 4.12, Public and Occupational Health Impacts, are several orders of magnitude below the natural background doses discussed here. For further information, NCRP Report No. 64 (NCRP, 1980) provides an overview of research results and data relating to biological effects from radiation exposures.

3.11.2 Major Sources and Levels of Chemical Exposure

The EREF site has been operated as a farm. Consequently, there are currently no known major sources of chemical exposure at the site that may impact the public. Section 3.3.3, Soils at the Proposed Site, describes the soils and the results of tests conducted on the soil samples. All surface soils sample analyses resulted in no detections of organic, pesticide, or herbicide compounds with the exception of chlorpropham (Table 3.3-5, Concentrations of VOCs and SVOCs in Soils, and Table 3.3-6, Concentrations of Pesticides and Herbicides in Soils). This compound is used to inhibit sprouting of potatoes sent to storage.

Chemicals that may be brought onto the EREF site during construction or operation of the plant are identified in Section 3.12.2.2, Construction Wastes. Section 3.6.3, Air Quality, discusses the regional air quality for Bonneville County, Idaho for those parameters or pollutants tracked under EPA requirements, including a listing of existing sources of criteria pollutants, such as volatile organic compounds (VOC). In general, ambient air quality in Bonneville county in 2007 was characterized as good 95.7% of the time and moderate 4.3% of the time (EPA, 2007). ER Section 4.6, Air Quality Impacts, discusses expected EREF emissions of criteria pollutants.

3.11.3 Occupational Injury Rates

The occupational injury rate at the EREF is expected to be similar to that of other operating uranium enrichment plants. Common occupational accidents at those plants involve hand and finger injuries, tripping accidents, burns and impacts due to striking objects or falling objects (Urenco 2003; Urenco 2004; Urenco 2005; Urenco 2006; and Urenco 2007). Table 3.11-5, Lost Time Accidents in Urenco Capenhurst Limited (UCL), tabulates lost time accidents for UCL for the five-year period 2003-2007. Although the desirable number of lost time accidents is zero, Urenco set a target maximum number of lost time accidents (LTAs) each year. The table specifies this goal as “target max LTAs.” Urenco’s intent was to foster improvement over time and ultimately bring the goal down to zero LTAs. The target maximum number of LTAs for the EREF will be zero.

A review of the injury reports in the Urenco Capenhurst Health, Safety, and Environment Reports for the period was conducted. No injuries involving the public were reported. Injuries to workers occurred due to accidents that occurred in parking lots and office environments, as well as in the plant. Non-radiological accidents to equipment that did not result in injury to workers are not reported.

According to the 2007 Capenhurst Health, Safety, and Environment Report (Urenco, 2007), the top cause of accidents in 2007 was the same as it has been since 1998; namely handling tools, equipment, and other items. There were 24 accidents to UCL employees, the same number as in 2006. There were 17 in 2005. Twenty of the accidents occurring in 2007 required only first aid.

In 2006, approximately 79% of the injuries were simple cuts and bruises, mostly to the hand. In 2007, injuries to the hand dropped to 37% of the total. According to UCL, this reduction was achieved by finding better gloves for different work applications (Urenco 2007). A UCL safety team also made other recommendations for reducing hand injuries. In 2007, the handling problems were related to the ergonomics of the tasks being performed, e.g., manipulation of heavy crane hooks and working in areas with limited space. Ergonomics is now being targeted for improvement.

Because the operations at the Capenhurst site and the Eagle Rock Enrichment Facility are similar, the types and rates of injuries incurred at the EREF are expected to be similar to those at the Capenhurst site. The EREF safety program will incorporate the lessons learned from the Urenco Capenhurst health and safety reports with the goal of minimizing occupational injuries.

3.11.4 Public and Occupational Exposure Limits

The radiation exposure limits for the general public have been established by the NRC in 10 CFR 20 (CFR, 2008x) and by the EPA in 40 CFR 190 (CFR, 2008f). Table 3.11-6, Public and Occupational Radiation Exposure Limits, summarizes these exposure limits.

The NRC exposure limits place annual restrictions on the total dose equivalent exposure (1 mSv (100 mrem)), which includes external plus internal radiation exposures and dose equivalent rate (0.02 mSv (2 mrem)) in any one hour in unrestricted areas that are accessible by members of the public who are not employees, but who may be present during the year at the EREF. The annual whole body (0.25 mSv (25 mrem)), organ (0.25 mSv (25 mrem)), and thyroid (0.75 mSv (75 mrem)) dose equivalent limits established by the EPA apply to members of the public who are at offsite locations (i.e., at or beyond the plant's site boundary). Public exposure at offsite locations due to routine operations comply with the more restrictive EPA limits. Annual exposure to the public is maintained ALARA through effluent controls and monitoring (refer to Section 6.1, Radiological Monitoring).

The NRC also places restrictions on radiation exposures incurred by employees at the EREF. The NRC restricts the annual radiation exposure that an employee may receive to a total effective dose equivalent (TEDE) of 50 mSv (5 rem), which includes external and internal exposure. In addition, the NRC places restrictions of the dose equivalent to the lens of the eye (0.15 Sv (15 rem)), skin (0.5 Sv (50 rem)), extremities (0.5 Sv (50 rem)), and on the committed dose equivalent to any internal organ (0.5 Sv (50 rem)). Annual radiation exposure for an employee is controlled, monitored, and maintained ALARA through the radiation safety program at the EREF.

The Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) have developed exposure limits for Hydrogen Fluoride (HF) that are enforceable by law. The EPA has also established accidental release criteria for reporting purposes and public health protection. In addition, government and private organizations have developed guidelines and recommendations for HF exposure. Federal organizations that develop recommendations for public health from toxic substances are the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH). The American Conference of Governmental Industrial Hygienists (ACGIH) also provides occupational exposure limits for HF, which are updated periodically and whose research is used by NIOSH, which in turn provides data and recommendations to OSHA. Lists of these regulations and guidelines are detailed in Table 3.11-7, Hydrogen Fluoride (HF) Regulations and Guidelines.

Of primary importance to the EREF is the control of uranium hexafluoride (UF_6). The UF_6 readily reacts with air, moisture, and some other materials. The most significant UF_6 reaction products in this plant are hydrogen fluoride (HF), uranyl fluoride (UO_2F_2), and small amounts of uranium tetrafluoride (UF_4). Of these, HF is the most significant hazard, being toxic to humans. When $UF_{\mathbf{6}}$ reacts with moisture, it breaks down into UO_2F_2 and HF. Refer to Table 3.11-8, Properties of $UF_{\mathbf{6}}$ and Table 3.11-9, UF_6 Chemical Reaction Properties, for further physical and reaction properties.

HF is a colorless, fuming liquid with a sharp, penetrating odor, which is also a highly corrosive chemical. The health dangers of UF_6 stem more from its chemical properties than from its radiological properties. Contact with HF can cause severe irritation of the eyes, inhalation can cause extreme irritation of the respiratory tract, and ingestion can cause vomiting, diarrhea and circulatory collapse. Initial exposure to HF may not cause the appearance of a typical acid burn; instead the skin may appear reddened and painful, with increasing damage occurring over a period of several hours or days. Tissue destruction and loss can occur with contact to HF, and in worst cases large doses of HF can cause death due to the fluoride affecting the heart and lungs. The actual amount of HF that can cause death has not been quantified. Breathing moderate amounts of HF for several months caused rats to develop kidney damage and nervous system changes, as well as learning problems. Inhalation of HF or HF-containing dust will cause skeletal fluorosis or changes in bones and bone density (HHS, 2003).

OSHA has set a limit of 2.0 mg/m^3 for HF for an 8-hr work shift, while the NIOSH recommendation is 2.5 mg/m^3 (OSHA, 2008). As with most toxicological information and health exposure regulations, limits have been established based on past exposures, biological tests, accident scenarios and lessons learned, and industrial hygiene data that is continually collected and researched in occupational environments.

The state of California has adopted a chronic Reference Exposure Level (REL) of 14 μg/m^3 (CAO, 2003). A chronic REL is a dose or concentration at or below which adverse health effects are not likely to occur. The California limit is a factor of 143 times lower than the OSHA occupational limit of 2.0 mg/m^3 and is by far the most stringent of any state or federal agency. However, this limit applies to chronic exposure, not occupational exposure situations. The annual expected average HF concentration emission from a 6 million SWU/yr centrifuge enrichment plant is estimated to be 7.8 μg/m^3 at the point of discharge (rooftop) without atmospheric dispersion taken into consideration. This comparison demonstrates that the EREF gaseous HF emissions (at rooftop without dispersion considered) are below any existing standards and therefore will have a negligible environmental and public health impact.

3.11.5 Work Force Safety Training

The safety training for the EREF will comply with the applicable sections of Occupational Safety and Health Administration (OSHA) regulations such as 29 CFR 1910 (Occupational Safety and Health Standards) (CFR, 2008bb), 1910.1200 (Hazard Communication) and NRC's regulations 10 CFR 20 (Standards for Protection Against Radiation) (CFR, 2008x) and 10 CFR 19 (Notices, Instructions and Reports to Workers: Inspection and Investigations).

Safety training will be carried out for all site personnel using a training manual and through the use of specific safety instructions for contractors. The manual used for safety training will provide new employees with an understanding of the conditions, procedures, and safety principles required on-site. The manual will cover topics such as security, safety, emergency alarms and actions. The safety portion of the training will include safety instructions, which are mandatory for all personnel and are used to ensure compliance with regulatory and other health, safety, and environmental requirements. Safety instruction categories include administration, nuclear site license, industrial safety, ionizing radiation, occupational hygiene, and emergency planning.

The safety instruction used for safety training of on-site contractors will cover the procedures to ensure contractors have the competence and resources to perform their work safely and not endanger other plant personnel or the environment. Contractors will be supervised at all times while on site to ensure compliance with the relevant health, safety, and environmental management system requirements.

All persons under the supervision of facility management (including contractors) will be required to participate in General Employee Training. In part, the scope of this training includes:

- Industrial safety, health, and first aid
- Chemical safety
- Nuclear safety
- Emergency Plan and implementing procedures
- Use of dosimetry
- Use of equipment and protective clothing

Additionally, Job Hazard Analysis (JHA), sometimes referred to as Job Safety Analysis (JSA) (i.e., a step-by-step process used to evaluate job hazards), will be used as part of on-the-job training for providing employees the skills necessary to perform their jobs safely at the EREF.

TABLES

Table 3.11-1 Bureau of Land Management–Administered Phosphate Mines in Pocatello Field Office Area

(Page 1 of 1)

Mine	Lessee/Operator		Status	Surface Owner or Agency
Dry Valley	Agrium		T	B, F, S, P
Rasmussen Ridge	Agrium		A	F, S
Enoch Valley	Monsanto		R	F, S, P
South Rasmussen Ridge	Monsanto		A	F,S
Smoky Canyon	J.R. Simplot Co.		A	F
Gay	Simplot/FMC		R	I

Status column:
A = Active, T = Active, but temporarily idle, R = Mining complete, reclamation in progress

Surface Owner/Management Agency column:
B = BLM, F = Forest Service, S = State of Idaho, I = Fort Hall Indian Reservation, P = Private

Table 3.11-2 Natural Radionuclide Concentrations in Fertilizer Made from Idaho Phosphates in mBq/g (pCi/g)

(Page 1 of 1)

Material	^{226}Ra	^{238}U	^{230}Th	^{232}Th
Triple superphosphate (Ts) (0-45-0)*	500 (13.5)	1,600 (43.2)	2,000 (54.1)	170 (4.6)
Ammonium sulphate (21-0-0)*	5 (0.14)	150 (4.1)	5 (0.14)	5 (0.14)
Ammonium phosphate (11-54-0)*	30 (0.81)	1,000 (27)	2,300 (62.2)	70 (1.9)
Diammonium phosphate (18-64-0)*	25 (0.68)	800 (21.6)	200 (5.4)	5 (0.14)
Phosphoric acid (mBq/L) (10-34-0)*	900 (24.3)	5,200 (140.5)	16,000 (432.4)	140 (3.78)

* Biologically available nitrogen, phosphorus, potassium (%N-%P-%K)

Table 3.11-3 Radiological Analyses of EREF Site Soil
(Page 1 of 1)

Analytical Results Bq/kg (pCi/kg)										
Sample No.	**SS1**	**SS2**	**SS3**	**SS4**	**SS5**	**SS6**	**SS7**	**SS8**	**SS9**	**SS10**
Nuclide[1]										
^{228}Ac ^{228}Th	31.5 (851)	39.2 (1060)	39.6 (1070)	35.1 (950)	38.8 (1050)	37.4 (1010)	34.8 (940)	41.3 (1120)	38.0 (1030)	42.2 (1140)
^{137}Cs	*	18.8 (507)	11.0 (297)	10.7 (288)	5.5 (148)	9.8 (265)	6.6 (177)	15.8 (428)	8.9 (240)	7.0 (188)
^{40}K	551 (14,900)	706 (19,100)	639 (17,300)	668 (18,100)	657 (17,800)	735 (19,900)	677 (18,300)	713 (19,300)	671 (18,100)	585 (15,800)
^{228}Th	43.6 (1180)	49.8 (1350)	46.2 (1250)	54.8 (1480)	43.0 (1160)	41.2 (1110)	49.8 (1350)	51.6 (1390)	40.5 (1100)	50.1 (1360)
^{230}Th	43.4 (1170)	48.6 (1310)	41.6 (1130)	50.4 (1360)	48.9 (1320)	38.7 (1050)	48.0 (1300)	53.8 (1460)	39.7 (1070)	48.7 (1320)
^{232}Th	41.9 (1130)	42.6 (1150)	42.1 (1140)	47.5 (1280)	40.5 (1100)	40.2 (1090)	46.7 (1260)	48.9 (1320)	41.7 (1130)	48.9 (1320)
^{234}U	32.4 (876)	28.6 (773)	27.4 (740)	26.8 (724)	28.5 (771)	26.9 (728)	34.5 (933)	29.2 (789)	28.4 (768)	27.3 (738)
^{235}U	4.5 (121)	7.5 (203)	1.4 (39)	2.0 (56)	2.2 (60)	2.1 (57)	3.6 (96)	3.5 (95)	2.0 (56)	4.4 (118)
^{238}U	30.1 (813)	31.2 (842)	24.0 (648)	27.3 (737)	32.3 (873)	29.8 (806)	30.8 (833)	30.9 (835)	28.3 (764)	33.3 (901)

[1] No other nuclides were detected above their laboratory measured MDC

* Sample result less than the laboratory measured MDC

Table 3.11-4 Annual Maximum and Average Worker Doses at Capenhurst
(Page 1 of 1)

Year	Maximum Annual Worker Dose Equivalent	Average Annual Worker Dose Equivalent
2003	2.03 mSv (203 mrem)	0.22 mSv (22 mrem)
2004	2.57 mSv (257 mrem)	0.31 mSv (31 mrem)
2005	2.15 mSv (215 mrem)	0.22 mSv (22 mrem)
2006	2.61 mSv (261 mrem)	0.39 mSv (39 mrem)
2007	3.41 mSv (341 mrem)	0.44 mSv (44 mrem)

Table 3.11-5 Lost Time Accidents in Urenco Capenhurst Limited (UCL)
(Page 1 of 1)

Year	Total Number of Lost Time Accidents (LTAs)	Target Max LTAs[1]	RIDDOR[2] Reportable LTAs	Frequency Rate[3] for Reportable LTAs	OSHA[4] Lost Work Day Case Rate
2003	2	0	0	0.26	0.52
2004	5	0	4	0.65	1.62
2005	0	0	1	0.15	0
2006	0	0	0	0	0
2007	2	0	1	0.16	0.63

1 Target maximum number of LTAs is set annually with the intent to foster improvement over time and bring the goal or target down to zero. Target max LTAs for the EREF is zero.

2 RIDDOR Reportable LTA - A lost time accident leading to a major injury or an absence from work of greater than three days (RIDDOR - Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations-UK)

3 Frequency Rate for Reportable LTAs - Total number of major and greater than three days lost time accidents x 100,000/total hours worked.

4 OSHA Lost Work Day Case Rate - Total number of injuries resulting in absence x 200,000/total hours worked.

Table 3.11-6 Public and Occupational Radiation Exposure Limits
(Page 1 of 1)

Individual	Annual Dose Equivalent Limit	Reference
Worker	50 mSv (5 rem) TEDE 0.5 Sv (50 rem) CDE to any organ 0.15 Sv (15 rem) lens of eye 0.5 Sv (50 rem) skin 0.5 Sv (50 rem) extremity	10 CFR 20 (CFR, 2008x)
General Public	1 mSv (100 mrem) TEDE 0.02 mSv (2 mrem) in any 1 hour period	10 CFR 20 (CFR, 2008x)
	0.25 mSv (25 mrem) whole body 0.25 mSv (25 mrem) any organ 0.75 mSv (75 mrem) thyroid	40 CFR 190 (CFR, 2008f)

Table 3.11-7 Hydrogen Fluoride (HF) Regulations and Guidelines
(Page 1 of 1)

Agency	Description	Concentration or Quantity of Material	Reference
ACGIH	STEL (ceiling)	2.3 mg/m^3	(OSHA, 2006)
NIOSH	REL (TWA)	2.5 mg/m^3	(OSHA, 2006)
NIOSH	IDLH	30 ppm	(OSHA, 2006)
OSHA	PEL (8-hr TWA)	2.0 mg/m^3	(OSHA, 2006)
CA	REL*	14 $\mu g/m^3$	(CAO, 2003)
EPA	Accidental release prevention Toxic end point	0.0160 mg/L	(CFR, 2008vv)
EPA	Accidental release prevention Threshold quantity	454 kg (1,000 lbs)	(CFR, 2008z)
OSHA	Highly hazardous chemicals Threshold quantity	454 kg (1,000 lbs)	(CFR, 2008bb)
EPA	Reportable Quantity	45.4 kg (100 lbs)	(CFR, 2008aa)

STEL, Short Term Exposure Limit

REL, Recommended Exposure Limit

REL* , Reference Exposure Level – chronic

IDLH, Immediately Dangerous to Life and Health

TWA, Time Weighted Average

PEL, Permissible Exposure Limit

ACGIH, American Conference of Governmental Industrial Hygienists

NIOSH, National Institute for Occupational Safety and Health

OSHA, Occupational Safety and Health Administration

EPA, Environmental Protection Agency

CA, California OEHHA, Office of Environmental Health Hazard Assessment

Table 3.11-8 Properties of UF_6
(Page 1 of 1)

Sublimation Point	101 kPa (14.7 psia) (760 mm Hg) 56.6°C (133.8°F)
Triple Pont	152 kPa (22 psia) (1140 mm Hg) 64.1°C (147.3°F)
<u>Density</u> Solid 20°C (68°F) Liquid, 64.1°C (147.3°F) Liquid, 93°C (200°F) Liquid, 113°C (235°F)	5.1 g/cm^3 (317.8 lb/ft^3) 3.6 g/cm^3 (227.7 lb/ft^3) 3.5 g/cm^3 (215.6 lb/ft^3) 3.3 g/cm^3 (207.1 lb/ft^3) 3.3 g/cm^3 (203.3 lb/ft^3)
Heat of Sublimation, 64.1°C (1473°F)	135,373 J/kg (58.2 BTU/lb)
Heat of Fusion, 64.1°C (147.3°F)	54,661 J/kg (23.5 BTU/lb)
Heat of Vaporization, 64.1°C (147.3°F)	81,643 J/kg (35.1 BTU/lb)
Critical Pressure	4610 kPa (668.8 psia) (34,577 mm Hg)
Critical Temperature	230.2°C (446.4°F)
Specific Heat, Solid, 27°C (81°F)	477 J/kg/°K (0.114 BTU/lb/°F)
Specific Heat, Liquid, 72°C (162°F)	544 J/kg/°K (0.130 BTU/lb/°F)

Table 3.11-9 UF_6 Chemical Reaction Properties
(Page 1 of 1)

Major Reactions	Heat of Reaction* kJ/kg-mole (Btu/lb-mole)	Free Energy of Reaction* kJ/kg-mole (Btu/lb-mole)
UF_6 Decomposition $UF_6 \rightarrow U + 3F_2$ $UF_6 \rightarrow UF_4 + F_2$	 $+2.16x10^6$ ($+ 9.29x10^5$) $+1.32x10^5$ ($+ 1.3x10^5$)	 $+2.03x10^6$ ($+ 8.73x10^5$) $+2.65x10^5$ ($+ 1.14x10^5$)
UF6 Hydrolysis $UF_6(g) + 2H_2O(g) \rightarrow UO_2F_2(s) + 4HF(g)$	$-2.11x10^5$ ($- 9.1x10^4$)	$-1.41\ x10^5$ ($- 6.05x10^4$)
HF Reaction with Glass $HF + SiO_2 \rightarrow SiF_4 + 2H_20$	$-1.06x10^5$ (- 4.58x104)	$-8.37x10^4$ ($- 3.60x10^4$)

*Reference point = 25°C (77°F) at 101.3 kPa (14.7 psia)

- UF_6 is completely stable with H_2, N_2, 0_2, and dry air at ambient temperature.
- UF_6 reacts with most organic compounds to form HF and carbon fluorides.
- Fully fluorinated materials are quite resistant to UF_6 at moderate temperatures.
- UF_6 has metathesis reactions with oxides and hydroxides, for example:

$$UF_6 + 2NiO \rightarrow UO_2F_2\ (s) + 2NiF_2(s)$$

$$UF_6 + Ni(OH)_2 \rightarrow UO_2F_2\ (s) + NiF_2(s) + 2HF$$

- UF_6 oxidizes metals, for example:

$$2UF_6 + Ni \rightarrow 2UF_5 + NiF_2$$

The reaction of UF_6 with nickel, copper and aluminum produces a protective fluoride film, which slows or stops the reaction.

3.12 WASTE MANAGEMENT

This section provides descriptions of nonradioactive, radioactive, mixed, and hazardous waste systems. Included are quantities, composition, and frequency of waste generation. All sources of radioactive liquid, solid, and gaseous waste material within the Eagle Rock Enrichment Facility (EREF) are described, along with a description of direct radiation sources stored onsite.

3.12.1 Effluent Systems

The following is a comprehensive description of the EREF gaseous and liquid effluent processing systems. The effectiveness of each system for effluent control is discussed.

3.12.1.1 Gaseous Effluent Vent Systems

The function of the Gaseous Effluent Vent System (GEVS) is to remove particulates containing uranium and hydrogen fluoride (HF) from potentially contaminated process gas streams. Prefilters and high efficiency particulate air (HEPA) filters remove particulates and potassium carbonate impregnated activated carbon filters are used for the removal of any HF. Oil ingress into the GEVS is minimized by GEVS suction pressure control on the vent pump discharges, together with discharge filters on the pumps.

The systems produce solid wastes from the periodic replacement of prefilters, HEPA filters, and chemical filters. The systems produce no gaseous effluents of their own, but discharge effluents from other systems after treatment to remove hazardous materials. Two separate and independent GEVS arrangements serve each Separations Building Module (SBM). These are the Safe by Design GEVS and Local Extraction GEVS. The SBM 1 GEVS also serves the Blending, Sampling and Preparation Building. The Technical Support Building (TSB) is also provided with a GEVS.

3.12.1.1.1 Source and Flow Rates

Potentially contaminated exhaust air comes from the rooms and services within the TSB. The total airflow to be handled by the GEVS for the TSB is 18,000 m^3/hr (10,600 cfm). In Separations Building Modules 1, 2, 3 and 4, the individual flow rate for each Safe by Design GEVS and each Local Extraction GEVS is 500 m^3/hr (294 cfm).

The design requirements for the facility provide a large safety margin between normal and accident conditions so that no single failure could result in the release of significant hazardous material. The amounts of UF_6 in the system also preclude the release of significant quantities of hazardous material from a single failure or multiple failures. Instrumentation is provided to detect abnormal process conditions so that the process can be returned to normal by operator actions.

These requirements and operating conditions also provide assurance that personnel exposure to hazardous materials are maintained "as low as reasonably achievable" and that effluent discharges comply with environmental and safety criteria.

3.12.1.1.2 System Description

The GEVS for the SBMs and the TSB consists of the following major components:

- Duct system

- Prefilter
- High Efficiency Particulate Air (HEPA) Filters
- Gamma monitor and controls (prefilter and HEPA filter) (TSB GEVS only)
- Activated carbon filter (impregnated with potassium carbonate)
- Monitoring and controls (alpha and HF) before and after filters
- Temperature sensors on discharge of carbon filter
- Variable speed Centrifugal Fan
- Monitoring and controls (alpha and HF) in exhaust vent
- Automatically controlled inlet and outlet isolation dampers
- Exhaust vent
- Exhaust Vent Sampling System

The GEVS serving the SBM and Blending, Sampling, and Preparation Building consists of a duct network that serves all of the UF_6 processing systems and operates at negative pressure. The ductwork is connected to two filter stations, each venting through its individual fan. Each filter station and the fan can handle 100% of the effluent. There is a standby filter station and fan. The total system capacity considering all SBMs, the Blending, Sampling and Preparation Building, and all UF_6 handling areas, is estimated to be approximately 4,000 m^3/hr (2,354 cfm). A differential pressure controller controls the fan speed and maintains negative pressure in front of the filter station.

Gases from the UF_6 processing systems pass through a 65% efficient prefilter. The prefilter removes dust particles and thereby prolongs the useful life of the HEPA filter. Gases then flow through a 99.97% efficient HEPA filter. The HEPA filter removes uranium aerosols which consist of UO_2F_2 particles. The gases pass through a 99% efficient activated charcoal filter for removal of HF and finally, a second 99.97% efficient HEPA filter. The cleaned gases pass through the fan, which maintains the negative pressure upstream of the filter stations. The cleaned gases are then discharged through the vent stack.

As noted previously, two GEVS serve each SBM. The Safe by Design GEVS operates at negative pressure. The Safe by Design GEVS is sized to handle the flow from all permanently ducted process locations, as well as any local flexible connections that can have direct contact with enriched uranic material. The ductwork for the Safe by Design GEVS is limited to a maximum external diameter of 210 mm (8.3 in). The end of each "leg" of the duct system is fitted with an orifice plate, to maintain a minimum airflow and velocity of approximately 12.7 m/s (2,500 ft/min), together with a damper to balance the individual flows in the system. The continuous influx of air at the orifice plate prevents excessive pressure reduction on closing inlet valves or dampers and stabilizes the airflow at the extraction fans. The ductwork is connected to two parallel filter stations. Each is capable of handling 100% of the effluent. One is online and the other is a standby. A switch between the operational and standby systems can be made using automatically controlled dampers. Each safe-by-design system total airflow capacity is estimated to be 500 m^3/hr (294 cfm). A differential pressure controller controls the fan speed and maintains negative pressure upstream of the filter station.

Gases from the UF_6 processing systems pass through the prefilter which removes dust and protects the HEPA filter, then through the HEPA filter which removes uranium aerosols (mainly UO_2F_2 particles), then through the potassium carbonate impregnated activated carbon filters which captures HF. Each station consists of a 65% efficient prefilter, a 99.97% efficient HEPA filter and a 99% efficient activated charcoal filter for removal of HF followed by a second 99.97% efficient HEPA filter. The remaining clean gases pass through the fan, which maintains the negative pressure upstream of the filter stations. Finally, the clean gases are discharged through rooftop vents on each of the SBMs. One vent is common to each operational and standby system.

The second system that serves each of the SBMs is the Local Extraction GEVS. The Local Extraction GEVS is used for work place ventilation excluding enriched sources such as product stations and product pump maintenance. The Local Extraction GEVS is sized to accept the flow for all flexible connections within the SBM not serviced by the Safe by Design GEVS and can handle the simultaneous use of a number of flexible hose extraction points (5 hoses in use at anytime) which are used for cylinder connection/ disconnections and maintenance procedures. Flexible connections are sized to have a capture velocity of 0.75 m/s (2.5 ft/sec). Each "leg" of the duct system is fitted with an orifice plate, to maintain a minimum airflow and velocity of approximately 12.7 m/s (2,500 ft/min), together with a damper to balance the individual flows in the system. The continuous in-leakage of air at the orifice plate prevents excessive pressure reduction on closing inlet valves/dampers and stabilizes the airflow at the extraction fans.

The filter stations vent through one of two fans. Each fan is capable of handling 100% of the effluent. One fan is online, and the other is a standby. A switch between the operational and standby systems can be made using automatically controlled dampers. Each local extraction system total airflow capacity is estimated to be 500 m^3/hr (294 cfm). A differential pressure controller controls the fan speed and maintains negative pressure upstream of the filter station. Gases from the UF_6 processing systems pass through the prefilter which removes dust and protects the HEPA filter, then through the 99.97% efficient HEPA filter which removes uranium aerosols (mainly UO_2F_2 particles), then through the potassium carbonate impregnated activated carbon filters which captures HF and finally, a second 99.97% efficient HEPA filter. The remaining clean gases pass through the fan, which maintains the negative pressure upstream of the filter stations. Finally, the clean gases are discharged through rooftop vents on each of the SBMs. One vent is common to each operational and standby system.

The TSB GEVS provides exhaust of potentially hazardous contaminants from potentially contaminated exhaust air from the rooms and services within the TSB. Thus, the total airflow to be handled by the TSB GEVS is estimated to be approximately 18,000 m^3/hr (10,600 cfm).

The GEVS serving the TSB consists of a duct network that serves all of the uranium processing systems and operates at negative pressure. The ductwork is connected to one filter station and vents through one fan. Both the filter station and the fan can handle 100% of the effluent. A standby filter station with fan is provided for redundancy. Operations that require the GEVS to be operational are shut down if the system shuts down. The system capacity is estimated to be approximately 18,000 m^3/hr (10,600 cfm). A pressure controller controls the fan speed and maintains negative pressure in front of the filter station.

Gases from the UF_6 processing systems pass through the 65% efficient prefilter which removes dust and protects the HEPA filter, then through the 99.97% efficient HEPA filter which removes uranium aerosols (mainly UO_2F_2 particles). The air passes through the 99% efficient activated carbon (potassium carbonate impregnated) filter which captures HF and finally, another 99.97% efficient HEPA filter. The remaining clean gases pass through the fan, which maintains the negative pressure upstream of the filter stations. The clean gases are then discharged through the exhaust vent on the TSB.

A velocity of about 12.7 m/s (2,500 ft/min) is maintained in the duct system in order to ensure that particulate contaminants are conveyed through the ductwork without settling. Each main section of the duct system has an orifice plate to maintain a minimum air velocity. Each section also has a damper to balance the individual flows in the system. Flexible exhaust hoses have a capture velocity of 0.75 m/s (150 ft/min or 2.5 ft/sec). Fume hoods shall have a capture velocity of 0.5 m/s (100 ft/min).

The TSB GEVS provides hazardous contaminant removal for the TSB through ductwork, via fume hoods and glove boxes, flexible connections and pumped connections from laboratories and maintenance areas in the TSB.

3.12.1.1.3 System Operation

For the TSB GEVS, and the SBM Safe by Design GEVS and Local Extraction GEVS, the HF content of the gases is monitored upstream and immediately downstream of the filter section and in the discharge vent. The Safe by Design GEVS prefilters and HEPAs have activity monitors to give warning of upstream uranic releases into the GEVS. The alarms are monitored in the Control Room.

The units will be located in a dedicated room in the TSB. The filters are “bag-in bag-out” for containment of contamination during filter changes. It is estimated that the filters will be changed on a yearly basis or multi-yearly basis.

If the GEVS stops operating, material within the duct will not be released into the building. Each of the GEVS connections will be provided with a device such as a P-trap, or other means to prevent entrained material from falling back into the building from the ductwork during system failure.

3.12.1.1.4 Effluent Releases

Under normal operating conditions, the system will not be contaminated. In the event that an abnormal situation occurs, the GEVS is designed to protect plant personnel against UF_6 and HF exposure. The GEVS is designed to meet all applicable NRC requirements for public and plant personnel safety and effluent control and monitoring. The system design also complies with all standards of OSHA, EPA, and state and local agencies.

The annual discharge of uranium in routine gaseous effluent discharged from the EREF is expected to be less than 20 grams (0.71 ounces). The environmental impacts of gaseous releases and associated doses to the public are described in detail in Section 4.12.1.1, Routine Gaseous Effluent.

3.12.1.2 Centrifuge Test and Post Mortem Facilities

The Centrifuge Test and Post Mortem Facilities are served by two ventilation systems as described below.

3.12.1.2.1 Centrifuge Test and Post Mortem Facilities Gaseous Effluent Ventilation System

The Centrifuge Test and Post Mortem Facilities Gaseous Effluent Ventilation System (GEVS) exhausts potentially hazardous contaminants from the Centrifuge Test and Post Mortem Facilities. The Centrifuge Test and Post Mortem Facilities Gaseous Effluent Ventilation System is located in the Centrifuge Assembly Building and is monitored from the Control Room.

The ductwork is connected to one filter station and vents through a fan. The filter station and fan can handle 100% of the effluent. Operations that require the Centrifuge Test and Post

Mortem Facilities Gaseous Ventilation System to be operational are manually shut down if the system shuts down. The filter system includes a single train of filters consisting of a prefilter, HEPA filter, potassium carbonate impregnated activated carbon filter, and a final HEPA filter. The prefilter has an efficiency of 65% which removes dust and protects the HEPA filter, then through the HEPA filter which removes uranium aerosols (mainly UO_2F_2 particles), then through the potassium carbonate impregnated activated carbon filters which captures HF and then through the second 99.97% efficient HEPA filter.

After filtration, the clean gases pass through a fan, which maintains the negative pressure upstream of the filter station. The clean gases are then discharged through the monitored (alpha and HF) exhaust vent on the Centrifuge Assembly Building.

3.12.1.2.2 Centrifuge Test and Post Mortem Facilities Exhaust Filtration System

The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System provides ventilation exhaust for the Centrifuge Test and Post Mortem Facilities. This system also ensures that the Centrifuge Post Mortem Facility is maintained at a negative pressure with respect to adjacent areas. The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System is located in the Centrifuge Assembly Building and is monitored in the Control Room.

The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System consists of a 100% filter-fan unit. The filter-fan unit can handle 100% of the effluent. The filter-fan unit operates when the Centrifuge Test Facility or Post Mortem Facility are in operation and is manually shut down if the Centrifuge Test Facility and Post Mortem Facility are shutdown. The exhaust flow from the filter-fan unit is discharged to atmosphere through the monitored (alpha and HF) discharge vent located on the Centrifuge Assembly Building roof. The estimated HVAC exhaust flow rate from the Centrifuge Test Facility and Post Mortem Facility areas is 6,800 m^3/hr (4,000 cfm).

3.12.1.3 Liquid Effluent Collection and Treatment System

Quantities of radiologically contaminated, potentially radiologically contaminated, and nonradiologically contaminated aqueous liquid effluents are generated in a variety of operations and processes in the TSB and in the Separations Building Modules. The majority of all potentially radioactive contaminated aqueous liquid effluents are generated in the TSB. All aqueous liquid effluents are collected in tanks that are located in the Liquid Effluent Collection and Treatment Room in the TSB. The collected effluent is sampled and analyzed to determine if treatment is required before release to the atmosphere by evaporation.

In general, liquid effluent that requires treatment is collected and undergoes filtration and precipitation processes to remove uranium and fluorine. These filtration and precipitation cycles are repeated as necessary until acceptable levels of uranium and fluorine are attained. At this point, the liquid is sent to an evaporator for vaporization and final discharge to the atmosphere.

Non-contaminated aqueous effluents that are generated are collected, monitored for contamination, and evaporated and discharged directly to the atmosphere, if found to meet all regulatory and administrative requirements.

3.12.1.3.1 Effluent Sources and Generation Rates

Numerous types of aqueous and non-aqueous liquid wastes are generated in the plant. These effluents may have significant, or low, or no radiological contamination. Liquid wastes include:

- Laboratory Effluent

  These liquid effluents are generated in the Analytical Chemical Laboratory, Sample Preparation Room, Uranium Analysis Room, Physical Analysis Room, ICPAES/ICPMS Room, the Environmental Storage and Preparation Room, the Fluorimetry Room, and the Mass Spectrometry Laboratory. These wastes are sampled to determine their uranic content and then pumped to the agitated Miscellaneous Effluent Collection Tank. The tank contents are constantly agitated to provide a homogeneous solution.

- Degreaser Water

  This is water which has been used in the Decontamination Workshop for degreasing contaminated pump and plant components coated in Perfluoropolyether (PFPE) oil. Most of the soluble uranium components dissolve in the degreaser water. The Degreaser Tank in the Decontamination Workshop is drained to the Degreaser Water Collection Tank. The contents of this tank are constantly agitated to provide a homogeneous solution. A sludge remains in the in the bottom of the Degreaser Tank after the degreasing water is drained. The sludge from the Degreaser Tank is also flushed to the Degreaser Water Collection Tank using DI water. Prior to treating the water in the Degreaser Water Collection Tank, the PFPE oil and sludge are removed by circulating the contents of the tank through a small centrifuge. From the centrifuge, the oil and sludge are collected in a container and sent for off-site low-level waste disposal.

- Citric Acid

  The decontamination process in the Decontamination Workshop removes uranic material from the surfaces of components using citric acid. The cleaning process associated with this equipment utilizes a 5%-10% by volume citric acid solution which is transferred to the Citric Acid Tank. The other sources of citric acid are the Sample Bottle and Flexible Hose Decontamination Cabinets, which are manually transferred to the Citric Acid Tank. The Citric Acid Tank in the Decontamination Workshop is drained to the Spent Citric Acid Collection Tank. The contents of this tank are constantly agitated to provide a homogeneous solution. The sludge that remains in the Citric Acid Tank is flushed out with DI water and is also transferred to the Spent Citric Acid Collection Tank.

- Laundry Effluent

  There is no laundry system on-site to generate any effluent water. Protective clothing worn by plant personnel to prevent contamination is laundered by an offsite licensed commercial laundry. Therefore, there is no laundry waste water generated at the EREF.

- Floor Washings

  This is water, which is generated from the UF_6 Handling Area, Laboratories, Decontamination Workshop and other potentially contaminated areas in the TSB. The main constituents of this wastewater are detergents and very low levels of dissolved uranium based contaminants. This water is sampled to determine uranic content and then manually emptied into the Miscellaneous Effluent Collection Tank.

- Miscellaneous Condensates

  The defrost cycle of the low temperature take off stations in the production plant produces this water. The condensate may be either manually transported or pumped through piping to the Miscellaneous Effluent Collection Tank.

- Radiation Areas Emergency Hand Washing and Shower Water

Emergency hand washing and shower water is collected, monitored, and treated by the Liquid Effluent Collection Treatment System as necessary. This water is not expected to be contaminated. Sampling and analysis determines if this effluent meets regulatory and administrative levels prior to release to the Domestic Sanitary Sewage Treatment Plant. If the effluent is found to be contaminated, it is sent to the Miscellaneous Effluent Collection Tank.

3.12.1.3.2 System Description

Aqueous laboratory effluents with uranic concentrations are sampled to determine their uranic content and then pumped from the laboratory to the agitated Miscellaneous Effluent Collection Tank in the Liquid Effluent Collection and Treatment Room. Floor washings are sampled to determine their uranic content and then manually emptied into the Miscellaneous Effluent Collection Tank. Condensate may be either manually transported or piped to the tank after sampling.

Only water which is determined to be radiologically contaminated from the emergency hand washing and shower areas in the radiologically controlled areas goes to the Liquid Effluent Collection and Treatment System. Otherwise, emergency hand wash and shower water is discharged to the domestic sanitary sewage treatment system. Laboratory testing determines pH, soluble uranic content, and insoluble uranic content.

A Suspect Effluent Tank is used to collect and analyze effluents with atypical characteristics. It is also constantly agitated to maintain a homogeneous solution.

Liquid effluents containing uranium are treated in the KDU Precipitation Tank to remove the majority of the uranium that is in solution. After the effluent is transferred to the KDU Precipitation Tank, a precipitating agent, potassium hydroxide (KOH), is added. The addition of the precipitating agent raises the pH of the effluent to the range of 9 to 12. This treatment renders the soluble uranium compounds insoluble and they precipitate from the solution. The precipitation process also eliminates citric acid by producing potassium citrate. The tank contents are constantly agitated to provide a homogeneous solution. The solution is transferred through a tangential microfiltration unit to concentrate the suspended material. The precipitated compounds are then removed from the effluent by circulation through a KDU Candle Filter. The material removed by the KDU Candle Filter is deposited in a container and sent for off-site low-level radioactive waste disposal.

The treated effluent from the KDU Candle Filter and microfiltration unit is transferred to the Uranium Filtrate Tank where it is analyzed to determine the uranium content. If the uranium concentration is acceptable, the effluent is transferred to the agitated Fluoride Precipitation Tank. The tank contents are constantly agitated to provide a homogeneous solution. A precipitating agent, such as lime ($Ca(OH)_2$), is added to the Fluoride Precipitation Tank which renders the soluble fluoride compounds insoluble and they precipitate from the solution as calcium fluoride (CaF_2) sludge. The sludge is removed by a filter. The filter and sludge are placed in a container and sent for off-site low-level waste disposal. Finally, the effluent is transferred to the Treated Effluent Monitor Tank and where it is sampled for fluoride concentration. If the fluoride concentration is acceptable, the effluent is transferred to the Pot-Evaporator. As the effluent enters the Pot-Evaporator, the effluent is heated, vaporized, and discharged to atmosphere. On-line instruments are provided to monitor the discharge.

The Pot-Evaporator will periodically discharge concentrate into a container. The container contents are monitored for dry content and ultimately shipped off-site to a radioactive waste disposal facility.

3.12.1.3.3 System Operation

Handling and eventual disposition of the aqueous liquid effluents is accomplished in two stages, collection and treatment. All aqueous liquid effluents are collected in tanks that are located in the Liquid Effluent Collection and Treatment Room in the TSB.

There are other tanks in the Liquid Effluent Collection and Treatment Room used for monitoring and treatment prior to evaporation.

The Spent Citric Acid Collection Tank, Degreaser Water Collection Tank, Miscellaneous Effluent Collection Tank, Suspect Effluent Tank and the KDU Precipitation Tank are all located in a contained area. The containment consists of a curb around all the above-mentioned tanks. The confined area is capable of containing at least one catastrophic failure of one tank (1000 L (265 gal)). In the event of a tank failure, the effluent in the confined area is pumped out with a portable pump set.

Reduced in volume, radiologically contaminated wastes that are a by-product of the treatment system, as well as contaminated non-aqueous wastes, are packaged and shipped to a licensed low-level radioactive waste disposal facility.

3.12.1.3.4 Effluent Discharge

The design basis for the liquid effluent treatment system at the EREF assumes an annual input of approximately 114 kg/yr (251 lbs/yr) of uranium. A margin of 20 percent was built into the system design. Due to the anticipated low volume of uranium contaminated liquid waste and the effectiveness of treatment processes, no waste in the form of liquid effluent discharges is expected. As noted above, treated aqueous effluent is vaporized in an evaporator. Evaporation produces a chemically decontaminated gaseous effluent. The anticipated atmospheric distillate release is expected to be less than 0.0356 g/yr (1.26E-03 oz/yr) of total uranium. Assuming natural uranium, this mass is equivalent to 900 Bq (2.43E-02 µCi). Refer to Table 3.12.-4, Estimated Annual Liquid Effluent, and Section 4.12.2.1.2, Routine Liquid Effluent, for further information.

Total gross mean precipitation falling on the developed portion of the site associated with the detention and retention basins of the EREF is estimated at 420,090 m^3/yr (11.098E+07 gal/yr). Discharge of treated effluent from the domestic sanitary sewage treatment plant is approximately 18,700 m^3/yr (4,927,500 gal/yr). The stormwater runoff and domestic sanitary sewage treatment plant effluent is expected to contain no uranic content.

There is no plant connection to a Publicly Owned Treatment Works (POTW). Instead, all effluents are treated on the EREF site and evaporated. Decontamination, Laboratory, and Miscellaneous Liquid Effluents are treated to meet the requirements of 10 CFR 20.2003, 10 CFR 20, Appendix B (CFR, 2008cc), Table 3 (CFR, 2008dd) and the administrative levels recommended by Regulatory Guide 8.37 (NRC, 1993a).

Hand Wash and Shower Effluents are treated when necessary. Otherwise, these effluents are discharged to the domestic sanitary sewage treatment system. Two single-lined Cylinder Storage Pads Stormwater Retention Basins will be used specifically to retain runoff from the Cylinder Storage Pads (Full Tails Cylinder Storage Pads, Empty Cylinder Storage Pads, Full Feed Cylinder Storage Pads, and Full Product Cylinder Storage Pad) during heavy rainfalls. The retention basins will also receive treated effluent from the packaged domestic sanitary sewage treatment plant. The unlined Site Stormwater Detention basin will receive rainfall runoff from the balance of the developed plant site.).

The sanitary sewage treatment system is capable of handling approximately 18,700 m^3/yr (4,927,500 gal/yr) based on the design number of employees of approximately 550. Figure 3.12-1, Domestic Sanitary Sewage Treatment Plant, shows the planned location of the Domestic Sanitary Sewage Treatment Plant. Treated domestic sanitary effluent is discharged to the lined Cylinder Storage Pads Stormwater Retention Basin and allowed to evaporate.

3.12.2 Solid Waste Management

Solid waste generated at the EREF will be grouped into industrial (nonhazardous), radioactive and mixed, and hazardous waste categories. In addition, solid radioactive and mixed waste will be further segregated according to the quantity of liquid that is not readily separable from the solid material. The solid waste management systems will be a set of facilities, administrative procedures, and practices that provide for the collection, temporary storage, (no solid waste processing is planned), and disposal of categorized solid waste in accordance with regulatory requirements. All solid radioactive wastes generated will be Class A low-level wastes as defined in 10 CFR 61 (CFR, 2008ee).

Industrial waste, including miscellaneous trash, vehicle air filters, empty cutting oil cans, miscellaneous scrap metal, and paper will be shipped offsite for minimization and then sent to a licensed waste landfill. The EREF is expected to produce approximately 70,307 kg (155,000 lbs) of this industrial waste annually. Table 3.12-2, Estimated Annual Non-Radiological Wastes, identifies normal waste streams and quantities.

Radioactive waste will be collected in labeled containers in each Restricted Area and transferred to the Solid Waste Collection Room for inspection. As appropriate, waste will be volume-reduced and all radioactive waste disposed of at a licensed low-level waste disposal facility. The EREF is expected to produce approximately 146,500 kg (323,000 lbs) of radioactive waste annually.

Hazardous wastes (e.g., spent blasting sand, empty spray paint cans, empty propane gas cylinders, solvents such as acetone and toluene, degreaser solvents, hydrocarbon sludge, and chemicals, such as methylene chloride and petroleum ether) and some mixed wastes will be generated at the facility. These wastes will be collected at the point of generation, transferred to the Solid Waste Collection Room, inspected, and classified. Any mixed waste that may be processed to meet land disposal requirements may be treated in its original collection container and shipped offsite as low-level waste for disposal. Table 3.12-2, Estimated Annual Non-Radiological Wastes, lists anticipated hazardous wastes and quantities. The EREF is expected to produce approximately 5,062 kg (11,160 lbs) of hazardous wastes annually.

3.12.2.1 Radioactive and Mixed Wastes

Solid radioactive wastes are produced in a number of plant activities and require a variety of methods for offsite treatment and disposal. These wastes are categorized into wet solid waste and dry solid waste due to differences in storage and disposal requirements found in 40 CFR 264 (CFR, 2008gg) and 10 CFR 61 (CFR, 2008ee), respectively. Dry wastes are defined in 10 CFR 61, Subpart 61.56(a)(3) (CFR, 2008ff), as containing "as little free standing and non-corrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume." Wet wastes for the EREF are defined as those that have as little free liquid as reasonably achievable but with no limit with respect to percent of volume.

All solid radioactive wastes generated are Class A low-level wastes as defined in 10 CFR 61 (CFR, 2008ee). Wastes are transported offsite for disposal by contract carriers. Transportation is in compliance with 49 CFR 107 and 49 CFR 173 (CFR, 2008i) (CFR, 2008k).

The Solid Waste Collection System is simply a group of methods and procedures applied as appropriate to the various solid wastes. Each individual waste is handled differently according to its unique combination of characteristics and constraints. Wet and dry waste handling is described separately below. Wastes produced by waste treatment vendors are handled by the vendors and are not addressed here.

3.12.2.1.1 Wet Solid Wastes

The wet waste portion of the Solid Waste Collection System handles all radiological, hazardous, mixed, and solid wastes from the facility that do not meet the above definition of dry waste. This portion handles several types of wet waste: wet trash, oil recovery sludge, oil filters, miscellaneous oils (e.g., cutting machine oil), solvent recovery sludge, and uranic waste precipitate. The system collects, identifies, stores, and prepares these wastes for shipment.

Waste that may have reclamation or recycle value (e.g., miscellaneous oils) may be packaged and shipped to an authorized waste reclamation firm for that purpose.

Wet solid wastes are segregated into radioactive, hazardous, mixed, or industrial waste categories during collection to minimize recycling and disposal problems. Mixed waste is that which includes both radioactive and hazardous waste. Industrial waste does not include either hazardous or radioactive waste.

The Solid Waste Collection System for the various wet wastes involves a number of manual steps. Handling of each waste type is addressed below.

3.12.2.1.1.1 Wet Trash

In this facility trash typically consists of waste paper, packing material, clothing, rags, wipes, mop heads, and absorption media. Wet trash consists of trash that contains water, oil, or chemical solutions.

Generation of radioactive wet trash is minimized insofar as possible. Trash with radioactive contamination is collected in specially marked plastic-bag-lined drums. These drums are located throughout each Restricted Area. Wet trash is collected in separate drums from dry trash. When the drum of wet trash is full, the plastic bag is removed from the drum and sealed. The bag is checked for leaks and excessive liquid. The exterior of the bag is monitored for contamination. If necessary, excess liquids are drained and the exterior is cleaned. The bag may be placed in a new clean plastic bag. The bag is then taken to the Solid Waste Collection Room where the waste is identified, labeled, and recorded.

The radioactive trash is shipped offsite to a Control Volume Reduction Facility (CVRF) that can process wet trash. The licensed CVRF reduces the volume of the trash and then repackages the resulting waste for disposal. The waste package is then shipped to a licensed radioactive waste disposal facility.

Trash with hazardous contamination is collected in specially marked plastic-lined drums. Wet trash is collected separately from dry trash. When full, the drum is taken to the Solid Waste Collection Room and the plastic bag containing wet trash is removed from the container, sealed, and the exterior is monitored for hazardous material, and cleaned if necessary. The trash is identified, labeled, and pertinent information about the waste is recorded. All hazardous trash is stored in the Solid Waste Collection Room until it is shipped to a hazardous waste disposal facility. Different types of hazardous materials are not mixed in order to avoid accidental reactions.

Empty containers that at one time contained hazardous materials are a special type of hazardous waste, as discussed in 40 CFR 261 (CFR, 2008v). After such a container is emptied, it is resealed and taken to the Solid Waste Collection Room for identification, labeling, and recording. The container is handled as hazardous waste and is shipped to a hazardous waste processing facility for cleaning or disposal. Alternatively, the container is used to store compatible hazardous wastes and to ship those wastes to a hazardous waste processing facility for processing and container disposal.

"Mixed" trash results from using wipes and rags with solvent on uranium-contaminated components. It is collected in appropriate containers and segregated from other trash. The waste is identified, labeled, recorded, and stored in accordance with regulations for both hazardous and radioactive wastes. Mixed waste is shipped to a facility licensed to process mixed waste. Waste resulting from the processing is then forwarded to a qualified disposal facility licensed to dispose of the particular resulting waste.

Industrial trash is collected in specially marked receptacles in all parts of the plant. The trash from Restricted Areas is collected in plastic bags and taken to the Solid Waste Collection Room in the TSB for inspection to ensure that no radioactive contamination is present. The inspected trash and the trash from the Controlled Area are then taken to one of several large containers around the plant. The trash is stored in these containers until a contract carrier transports them to a properly permitted sanitary landfill.

3.12.2.1.1.2 Perfluoropolyether Oil

A total of 1,070 L (283 gal) of perfluoropolyether (PFPE) oil is used annually. The waste PFPE oil is disposed of at a licensed low-level radioactive waste disposal facility.

3.12.2.1.1.3 Oil Filters

Used oil filters are collected from the diesel generators and from plant vehicles. No filters are radioactively contaminated. The used filters are placed in containers and transported to the Solid Waste Collection Room of the TSB. There the filters are drained completely and transferred to a drum. The drained waste oil is combined with other waste oil and handled as hazardous waste. The drum is then shipped to an offsite waste disposal contractor.

3.12.2.1.1.4 Solvent Recovery Sludge

Solvent is used in degreasers and in the workshops. The degreasers are equipped with solvent recovery stills. The degreasers in the decontamination area and the contaminated workshop areas handle radioactive components. Solids and sludge removed from these stills and degreasers are collected, labeled, and stored as mixed waste. The waste is shipped to a facility licensed to process mixed waste. Waste resulting from the processing is then forwarded to a licensed disposal facility for the particular resulting waste.

The Vacuum Pump Rebuild Workshop degreaser handles only decontaminated components, so the solids and sludge removed from this degreaser (after checking for radioactivity) are collected, labeled, and stored as hazardous waste. This hazardous waste is shipped to a licensed hazardous waste disposal facility.

3.12.2.1.1.5 Uranic Waste Precipitate

Aqueous uranic liquid waste is processed to remove most of the uranium prior to evaporation of the liquid stream in the Evaporator, which is in the Liquid Effluent Collection and Treatment System. This aqueous waste is primarily from the decontamination degreaser, citric acid baths and the laboratory. The uranium is precipitated out of solution and water is removed by filtration. The remaining precipitate is collected, labeled, and stored in the radioactive waste storage area. The waste is sent to a licensed low-level radioactive waste disposal facility.

3.12.2.1.2 Dry Solid Wastes

The dry waste portion of the Solid Waste Collection System handles dry radiological, hazardous, mixed, and industrial solid wastes from the plant. These wastes include: trash (including miscellaneous combustible, non-metallic items), activated carbon, activated alumina, activated sodium fluoride, HEPA filters, scrap metal and laboratory waste. The system collects, identifies, stores, and prepares these wastes for shipment.

All solid radioactive wastes generated are Class A low-level wastes as defined in 10 CFR 61 (CFR, 2008ee).

The Solid Waste Collection System for dry solid wastes involves a number of manual steps. Handling for each waste type is addressed below.

3.12.2.1.2.1 Trash

Trash consists of paper, wood, gloves, cloth, cardboard, and non-contaminated waste from all plant areas. Some items require special handling, and are not included in this category, notably: paints, aerosol cans, and containers in which hazardous materials are stored or transported. Trash from Restricted Areas is collected and processed separately from noncontaminated trash.

The sources of dry trash are the same for the wet trash, and dry trash is handled in much the same way as wet trash. Section 3.12.2.1.1.1, Wet Trash, describes the handling of wet trash in more detail. Only the differences between wet and dry trash handling are discussed below.

Steps to remove liquids are of course unnecessary for dry trash. The dry waste portion of the Solid Waste Collection System accepts wet trash that has been dewatered, as well as dry trash.

Radioactive trash is shipped to an offsite CVRF. The CVRF reduces the volume of the trash and then repackages the resulting waste for disposal. Waste handled by the CVRF will be disposed of in a radioactive waste disposal facility.

Trash containing hazardous material is handled as described above in Section 3.12.2.1.1.1, Wet Trash, regarding the wet waste portion of the Solid Waste Collection System.

Aerosol spray cans may be disposed of as trash if they are first totally discharged and then punctured. Special receptacles for spray cans used in the Separations Building are provided.

Each can is inspected for radioactive contamination to ensure total discharge and a puncture hole before it can be included with industrial trash.

"Mixed" trash is handled as described above in Section 3.12.2.1.1.1. Mixed trash is generated by the use of rags and wipes soaked with solvent on radioactively contaminated components.

3.12.2.1.2.2 Activated Carbon

Activated carbon is used in a number of systems to remove uranium compounds from exhaust gases. Due to the potential hazard of airborne contamination, personnel use respiratory protection equipment during activated carbon handling to prevent inhalation of material. Spent or aged carbon is carefully removed, immediately packaged to prevent the spread of contamination and transported to the Chemical Trap Workshop in the TSB. There the activated carbon is removed and placed in an appropriate container to preclude criticality. The contents of that container are sampled to determine the quantities of HF and ^{235}U present. The container is then sealed, monitored for external contamination, and properly labeled. It is then temporarily stored in the Solid Waste Collection Room with radioactive waste. Depending on the mass of uranium in the carbon material, the container may be shipped directly to a low-level radioactive waste disposal facility or to a CVRF. The CVRF reduces the volume of the waste and then repackages the resulting waste for shipment to a low-level radioactive waste disposal facility. The EREF shall comply with all limitations imposed by the burial site and the CVRF on the contained mass of ^{235}U in the carbon filter material that is shipped to their facilities by the EREF.

GEVS carbon filters are discussed in ER Section 3.12.2.1.2.5, Filter Elements. Carbon filters are also used in the laboratories where they can become contaminated with hazardous as well as radioactive material. The filters are handled according to their known service. Those filters that are potentially hazardous are handled as hazardous waste, and those potentially containing both hazardous and radioactive material are handled as mixed wastes. Each type of waste is collected, labeled, stored, and recorded, and is then shipped to an appropriately licensed facility for processing/disposing of hazardous and/or mixed waste.

3.12.2.1.2.3 Activated Alumina

Activated alumina in alumina traps is used in a number of systems to remove HF from exhaust gases. Activated alumina (Al_2O_3) as a waste is in granular form. Most activated alumina in the plant is contaminated; instrument air desiccant is not contaminated. The hold up of captured contaminants on the alumina is checked by weighing and the alumina is changed out when near capacity.

Spent or aged alumina is carefully removed in the Chemical Trap Workshop in the TSB to prevent the spread of contamination. There the activated alumina is removed and placed in an appropriate container. The contents of a full container are sampled to determine the quantity of ^{235}U present. The container is then sealed, the exterior is monitored for contamination, and the container is properly labeled. It is stored in the Solid Waste Collection Room until it is shipped to a radioactive waste disposal facility.

Activated alumina is also used as a desiccant in the Compressed Air System. This alumina is not radioactively contaminated, is non-hazardous and is replaced as necessary. It is disposed of in a landfill.

3.12.2.1.2.4 Activated Sodium Fluoride

Activated sodium fluoride (NaF) is used in the Dump System to remove UF_6 and HF from exhaust gases. NaF adsorbs up to either 150% of its weight in UF_6 or 50%, of its weight in HF. The Dump System is not expected to operate except during transient conditions that occur during a power failure. The NaF is not expected to saturate during the life of the plant. However, if the system is used often and the NaF saturates, the NaF is removed by personnel wearing respirators and using special procedures for personnel protection. A plastic bag is placed over the vessel and sealed, and the vessel is turned upside down to empty the NaF. Spent contaminated NaF, if ever produced, is processed by a contractor to remove uranium so the wastes may be disposed at a licensed waste facility. It is expected that NaF will not require treatment and disposal until decommissioning.

3.12.2.1.2.5 Filter Elements

Prefilters and HEPA filters are used in several places throughout the plant to remove dust and dirt, uranium compounds, and hydrogen fluoride. Air filters, as a waste, consist of fiberglass or cellulose filters. Generally, only the Gaseous Effluent Vent System filters are contaminated and will contain much less than 1% by weight of UO_2F_2. HVAC filters, instrument air filters, air cooling filters from product take-off and blending systems, and standby generator air filters are not contaminated. HF-resistant HEPA filters are composed of fiberglass.

Filters associated with the HVAC System in the Centrifuge Assembly Building are used to remove dust and dirt from incoming air to ensure the cleanliness of the centrifuge assembly operation. When removed from the housing, the filter elements are wrapped in plastic to prevent the loss of particulate matter. These filter elements are not contaminated with radioactive or hazardous materials so disposal occurs with other industrial trash.

Filters used in the Gaseous Effluent Vent Systems, and Centrifuge Test and Post Mortem Facilities Exhaust Filtration System are used to remove HF and trace uranium compounds from the exhaust air stream. When the filters become loaded with particulate matter, they are removed from the housings and wrapped in plastic bags to prevent the spread of radioactive contamination. Due to the hazard of airborne contamination, either portable ventilation equipment or respiratory protection equipment is used during filter handling to prevent the inhalation of material by plant personnel. The filters are taken to the Solid Waste Collection Room in the TSB where they are sampled to determine the quantity of ^{235}U present. The exterior of the bag is monitored for contamination; the package is properly marked and placed in storage. The filter elements are sent to a CVRF for processing and shipped to a low-level radioactive waste disposal facility.

Air filters from the non-contaminated HVAC systems, Compressed Air System and the Diesel Generators are handled as industrial waste.

3.12.2.1.2.6 Scrap Metal

Metallic wastes are generated during routine and abnormal maintenance operations. The metal may be clean, contaminated with radioactive material or hazardous material. Radioactive contamination of scrap metal is always in the form of surface contamination caused by uranium compounds adhering to the metal or accumulating in cracks and crevices. No process in this facility results in activation of any metal materials.

Clean scrap metal is collected in bins located outside the TSB. This material is transported by contract carrier to a local scrap metal vendor for disposal/recycling. Items collected outside of Restricted Areas are disposed of as industrial scrap metal unless there is reason to suspect they contain hazardous material.

Scrap metal is monitored for contamination before it leaves the site. Metal found to be contaminated is either decontaminated or disposed of as radioactive waste. When feasible, decontamination is the preferred method.

Decontamination is performed in situ for large items and in the Decontamination Workshop for regular items used in performing maintenance. Decontamination of large items should not be required until the end of plant life. Items that are not suitable for decontamination are inspected to determine the quantity of uranium present, packaged, labeled, and shipped either to a CVRF or a radioactive waste disposal facility.

Metallic items containing hazardous materials are collected at the location of the hazardous material. The items are wrapped to contain the material and taken to the Solid Waste Collection Room.

The items are then cleaned onsite if practical. If onsite cleaning cannot be performed then the items are sent to a hazardous waste processing facility for offsite treatment or disposal.

3.12.2.1.2.7 Laboratory Waste

Small quantities of dry solid hazardous wastes are generated in laboratory activities, including small amounts of unused chemicals and materials with residual hazardous compounds. These materials are collected, sampled, and stored in the Solid Waste Collection Room.

Precautions are taken when collecting, packaging, and storing these wastes to prevent accidental reactions. These materials are shipped to a hazardous waste processing facility where the wastes will be prepared for disposal.

Some of the hazardous laboratory waste may be radioactively contaminated. This waste is collected, labeled, stored, and recorded as mixed waste. This material is shipped to a licensed facility qualified to process mixed waste for ultimate disposal.

3.12.2.1.2.8 Evaporator

Treated aqueous effluent is evaporated in an evaporator. Evaporation produces a chemically decontaminated gaseous effluent. The concentrate, composed of residual impurities, is periodically drained and constitutes a low volume liquid effluent that is removed, analyzed, processed, and disposed of.

3.12.2.1.2.9 Depleted UF_6

The enrichment process yields depleted UF_6 streams with assays of up to 0.4 $^{w}/_{o}$ ^{235}U. The approximate quantity and generation rate for depleted UF_6 is 15,270 MT (16,832 tons) per year. This equates to approximately 1,222 depleted uranium tails cylinders of UF_6 per year. The depleted uranium tails cylinders will be temporarily stored onsite before transfer to a processing facility for subsequent reuse or disposal. The depleted uranium tails cylinders are stored in the outdoor storage areas known as the Full Tails Cylinder Storage Pads.

The Full Tails Cylinder Storage Pads consist of outdoor storage areas with concrete saddles on which the cylinders rest. A mobile transporter transfers cylinders from the Blending, Sampling and Preparation Building to the Full Tails Cylinder Storage Pads. Depleted uranium tails cylinder transport between the Separations Building modules and the storage area is discussed in the Integrated Safety Analysis Summary Section 3.4.11.2, Cylinder Transport within the Facility. Refer to Section 4.13.3, Waste Disposal Plan, for information regarding the EREF depleted UF_6 management practices and the disposition plan for depleted uranium tails cylinders.

The potential environmental impacts from direct radiation exposure from the depleted uranium tails cylinders are described in Section 4.12.2.1.3, Direct Radiation Impacts. For the purposes of the dose calculation in that section, the Full Tails Cylinder Storage Pads have a capacity of 33,638 containers. A detailed discussion on the environmental impacts associated with the storage and ultimate disposal of depleted uranium tails cylinders is provided in Section, 4.13.3, Waste Disposal Plan.

3.12.2.2 Construction Wastes

Efforts are made to minimize the environmental impact of construction. Erosion, sedimentation, dust, smoke, noise, unsightly landscape, and waste disposal are controlled to practical levels and permissible limits, where such limits are specified by regulatory authorities. In the absence of such regulations, the EREF will ensure that construction proceeds in an efficient and expeditious manner, remaining mindful of the need to minimize environmental impacts.

Wastes generated during site preparation and construction will be varied, depending on the activities in progress. The bulk of the wastes will consist of non-hazardous materials such as packing materials, paper, and scrap lumber. These types of wastes will be transported off site to an approved landfill. It is estimated there will be an average of 6,116 m^3 (8,000 yd^3) (non-compacted) per year of this type of waste. A recycling program will be implemented during construction to recover recyclable materials such as metals, paper, etc. Most scrap structural steel, piping, sheet metal, etc., could be recycled or directly placed in an offsite landfill.

Hazardous wastes that may be generated during construction have been identified and annual quantities estimated as shown below. Any such wastes that are generated will be handled by approved methods and shipped off site to approved disposal sites.

Paint, solvents, thinners, organics - 11,360 L (3,000 gal)

Petroleum products, oils, lubricants - 11,360 L (3,000 gal)

Sulfuric acid (battery) - 379 L (100 gal)

Adhesives, resins, sealers, caulking - 910 kg (2,000 lbs)

Lead (batteries) - 91 kg (200 lbs)

Pesticides - 379 L (100 gal)

Management and disposal of all wastes from the EREF site is performed by a staff professionally trained to properly identify, store and ship wastes; audit vendors; direct and conduct spill cleanup; interface with state agencies; maintain inventories and provide annual reports.

A Spill Prevention, Control and Countermeasure (SPCC) Plan is implemented during construction to minimize both the possibility of spills of hazardous substances, and to minimize the environmental impact of actual spills. The SPCC Plan ensures prompt and appropriate remediation of spills. Spills during construction are more likely to occur around vehicle maintenance and fueling operations, storage tanks, painting operations and warehouses. The SPCC plan identifies sources, locations and quantities of potential spills and provides appropriate response measures. The plan will identify individuals and their responsibilities for implementation of the plan and provide for prompt notifications of state and local authorities, when required.

3.12.3 Effluent and Solid Waste Quantities

Quantities of radioactive and non-radioactive wastes and effluent are described in this section. The information includes quantities and average uranium concentrations. Portions of the waste considered hazardous or mixed are identified.

The State of Idaho has adopted the US EPA hazardous waste regulations governing the generation, handling, storage, transportation, and disposal of hazardous materials. The EPA regulations are in Title 40 of the Code of Federal Regulations (CFR), Parts 124, 260 through 266, 268, 270, 273 and 279 ((CFR, 2008ii), (CFR, 2008t), (CFR, 2008jj), (CFR, 2008kk), (CFR, 2008ll), (CFR, 2008mm)). The state's regulations are found in the Idaho Administrative Procedures Act 58.01.05: Rules and Standards for Hazardous Waste (IDAPA, 2008f). The EREF will comply with both the EPA and State of Idaho regulations.

The first two tables for this section address wastes: Table 3.12-1, Estimated Annual Radiological and Mixed Wastes, and Table 3.12-2, Estimated Annual Non-Radiological Wastes. The next two tables address effluents: Table 3.12-3, Estimated Annual Gaseous Effluent, and Table 3.12-4, Estimated Annual Liquid Effluent.

Each system at the EREF was analyzed to determine the quantities of wastes and effluents generated during operation. These values were analyzed and a waste disposal path was developed for each. AREVA Enrichment Services considered the facility site, facility operation, applicable operating experience, applicable regulations, and the existing U.S. waste processing/disposal infrastructure in developing the paths. The Liquid Waste Collection and Treatment System and the Solid Waste Collection System were designed in accordance with these considerations.

Applicable experience was derived from existing enrichment facilities. The majority of the wastes and effluents from an enrichment facility are from auxiliary systems and activities and not from the enrichment process itself. Waste and effluent quantities of specific individual activities instead of scaled site values were used in the development of EREF estimates. An example is the EREF laboratory waste and effluent estimate. This estimate was developed by determining which analyses would be performed at the EREF, and using operating experience to perform that analysis and determine the resulting expected wastes and effluents. The cumulative waste and effluent values were then compiled.

The proposed EREF site will use site well water supplies. No laundering of protective clothing is performed in the plant. The EREF does not perform any interior cylinder washing activities. Thus, the generation of significant quantities of uranic wastewater is precluded.

3.12.4 Resources and Materials Used, Consumed or Stored During Construction and Operation

Typical construction commodities are used, consumed, or stored at the site during the construction phase. Construction commodities are typically used immediately after being brought to the site. Some materials are stored for a short duration until they are used or installed. Table 3.12-5, Commodities Used, Consumed or Stored at the Eagle Rock Enrichment Facility During Construction, summarizes the resources and materials used during the 3-year period of site preparation and major building construction.

Tables 3.12-1, Estimated Annual Radiological and Mixed Wastes, 3.12-2, Estimated Annual Non-Radiological Wastes, and 3.12-3, Estimated Annual Gaseous Effluent, provide listings of materials and resources that are expected to be used, consumed, or stored on site during plant operation. The resources and materials provided in Table 3.12-6, Commodities Used, Consumed, Or Stored at the Eagle Rock Enrichment Facility During Operation, are also expected to be used, consumed, or stored on an annual basis at the EREF during operation.

3.12.5 External Effluent Monitoring Data

A search for external effluent monitoring data was carried out for the existing Urenco enrichment plants because these facilities are similar to the proposed EREF. There is no externally collected effluent monitoring data for the Almelo facility.

However, the Scottish Environment Protection Agency performs environmental monitoring in the vicinity of the Capenhurst site. The Capenhurst site comprises Urenco's enrichment plant and another facility operated under the auspices of the Nuclear Decommissioning Authority (CEFAS, 2007). Therefore, monitoring results for the Capenhurst site reflect the impacts of the combined operations of both facilities.

The annual reported doses over the years 1998 through 2006 (the last year for which a report is publicly available) were less than 0.005 mSv (0.5 mrem) for both the aquatic and terrestrial food pathways combined.

3.12.6 Internal Effluent Monitoring Data

Urenco annually publishes Health, Safety and Environment Reports as well as Sustainability Reports. These reports are publicly available and present effluent monitoring data produced internally by Urenco.

These reports summarize the radioactive gaseous and liquid effluents released from the site as well as solid wastes produced at Capenhurst. The data presented in the Urenco reports is for the entire Capenhurst site. While the EREF is similar to certain facilities and operations at the Capenhurst site, there are facilities on the Capenhurst site that are different in design from the EREF. In addition, there are other site activities that may release uranium but are not related to enrichment plant operations. There is insufficient publicly available data to allow this data to be used for comparison purposes with the EREF.

3.12.7 Packaging, Shipment, and Quantities of Radioactive, Mixed, and Non-Radiological Wastes

The intended package type for all radioactive, mixed, and hazardous wastes is a 55 gallon drum meeting the general package design requirements of 49 CFR 173.410 (CFR, 2008hh),General design requirements." All shipments are planned to be by truck. Typical truck loads are expected to be between 60 and 160 drums per shipment, depending on such variables as weight and dose rate. For drums containing solid radioactive waste materials, surface dose rates are estimated at 0.80 μSv/hr (0.080 mrem/hr).

At the Urenco Capenhurst Limited (UCL) site, the best measure of worker dose for waste handling activities is the dose received by the central material handling operators. At the UCL site, a shared central material handling facility provides waste processing services for the entire site. Since the site is jointly occupied by Urenco and the operations of the Nuclear Decommissioning Authority, the central material handling operators handle radioactive materials for both organizations. Therefore, portions of these operators' exposures are received from facilities that are not related to gas centrifuge enrichment operations. These operators also handle uranium cylinders.

At the UCL site, the highest reported central material handling operator dose during the period 1999-2003 was 2.81 mSv (281 mrem) and the highest mean dose during the same period was 2.07 mSv (207 mrem).

At Urenco's Almelo facility, workers receive < 1 mSv/yr (100 mrem/yr) processing, packaging, and shipping radioactive wastes associated with gas centrifuge enrichment operations. The Almelo exposure values for waste processing workers are typical of exposures expected at the EREF for workers processing, packaging, and shipping radioactive wastes.

3.12.8 Climate Change

3.12.8.1 Introduction

The principal greenhouse gases that enter the atmosphere due to natural processes and human activities are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and fluorinated gases. The relative contribution of these gases to global warming depends on their Global Warming Potential, i.e., their ability to trap heat relative to other gases. This potential is typically expressed in terms of Carbon Dioxide Equivalents (CDE) to account for the relative differences in their contribution to global warming (EPA, 2008j). As discussed below, the EREF will emit negligible amounts of greenhouses gases given its small carbon footprint. In addition, the enriched uranium produced, when converted to nuclear fuel will produce electricity that is essentially carbon free relative to traditional fossil fuels.

3.12.8.2 EREF Carbon Dioxide Equivalent Footprint

Greenhouse gases that may be attributed to EREF include indirect and direct emissions. Indirect emissions include those derived from the off-site generation of electricity required to operate the EREF and to a lesser extent from uranium mining. Direct emissions result from transportation associated with EREF construction and operations and testing of onsite emergency diesels.

In 2006, about 83% of the energy consumed in the U.S was produced from fossil fuels. An estimated $4.1x10^{12}$ kwh of electricity was generated in the U.S. and approximately $2.1x10^{9}$ MT ($2.3x10^{9}$ tons) of carbon dioxide emitted, or about $5.1x10^{-4}$ MT/kwh ($5.8x10^{-4}$ tons/kwh) (EIA, 2008a) (EIA, 2008b). Electrical production alone represented about 41% of CDE emitted from fossil fuels and 39% of total CDE emissions from all U.S. sources (EPA, 2008k). The operation of EREF will require approximately 60 MWe of electricity. This is equivalent to an annual consumption of $5.2x10^{8}$ kwh or about 0.0126% of the electricity generated in the U.S. On this basis the amount of indirect emissions of carbon dioxide from electrical use at the EREF would be approximately 273,607 MT (301,600 tons) annually or about 0.0126% percent of carbon dioxide emissions from U.S electrical production.

3.12.8.3 Carbon Dioxide Emission Avoided

While use of electricity at the EREF will indirectly result in emission of carbon dioxide and limited quantities of other pollutants, the enrichment of uranium and its use as a fuel in nuclear power plants will contribute measurably to the overall reduction in greenhouse gases and other air quality pollutants. A typical 1,000 MWe coal plant produces approximately $7.0x10^{6}$ MT ($7.8x10^{6}$ tons) of carbon dioxide annually, yet life cycle carbon dioxide emissions from a nuclear fueled power plant are estimated to be 1-2% of a comparable coal facility (WNA, 2008a). The World Nuclear Association estimates that every 22 MT (24.3 tons) of uranium (U) used avoids the emission of $1.0x10^{6}$ MT ($1.1x10^{6}$ tons) of carbon dioxide relative to coal (WNA, 2008a). EREF is expected to ship approximately 2,252 MT (2,482 tons) of UF_6 annually. The fuel load for a typical 1000 MWe nuclear power reactor requires about 35 MT (38.6 tons) of UF_6 (with 24 MT (26.5 tons) enriched U) equivalent to about $8.6x10^{9}$ kwh of electrical production (WNA, 2008b). As a result, the reduction in carbon dioxide emissions from EREF output will be substantial.

Direct emissions from the EREF are attributable largely to the transportation required to ship uranium cylinders and to a lesser extent to emissions from construction vehicles and the periodic testing of the emergency diesels. ER Section 4.6 describes these emissions and discusses them in the context of the national ambient air quality standards. The contribution of these pollutants to global warming is expected to be small.

TABLES

Table 3.12-1 Estimated Annual Radiological and Mixed Wastes (Page 1 of 1)

Waste Type	Radiological Waste Total Mass kg (lb)	Radiological Waste Uranium Content kg (lb)	Mixed Waste[2] Total Mass kg (lb)	Mixed Waste[2] Uranium Content kg (lb)
Activated Carbon	600 (1,323	50 (110)	–	–
Activated Alumina	4,320 (9,524)	4.4 (9.7)		
Perfluoropolyether Oil	2,054 (4,528)	10 (22)	–	–
Liquid Waste Treatment Sludge[6]	2,086 (4,599)	114 (251)[4]	–	–
Activated Sodium Fluoride[1]	–	–	–	–
Assorted Materials (paper, packing, clothing, wipes, etc.)	4,200 (9,262)	60 (132)	–	–
Ventilation Filters	92,196 (203,259)	11 (24)		
Non-Metallic Components	10,000 (22,050)	Trace[5]		
Miscellaneous Mixed Wastes (organic compounds)[2, 3]	–	–	100 (220)	4 (8.8)
Combustible Waste	7,000 (15,436)	Trace[5]	–	–
Scrap Metal	24,000 (52,920)	Trace[5]	–	–

1 No NaF wastes are produced on an annual basis. The Dump System NaF traps are not expected to saturate over the life of the plant.

2 A mixed waste is a radioactive waste containing listed or characteristic hazardous wastes as specified in 40 CFR 261, subparts C and D (CFR, 2008v).

3 Representative organic compounds consist of acetone, toluene, ethanol, and petroleum ether.

4 The value of 114 kg (251 lb) is composed of uranium in the citric acid and degreaser tanks, precipitated aqueous solutions, uranium in precipitated laboratory/miscellaneous effluents, and uranium in sludge from the citric acid and degreaser tanks.

5 Trace is defined as not detectable above naturally-occurring background concentrations.

6 Consists of sludge and evaporator concentrates.

Table 3.12-2 Estimated Annual Non-Radiological Wastes
(Page 1 of 1)

Waste	Annual Quantity
Spent Blasting Sand	249.5 kg (550 lbs)
Miscellaneous Combustible Waste	13,472 kg (29,700 lbs)
Cutting Machine Oils	90 L (23.8 gal)
Spent Degreasing Water (from clean workshop)	2 m^3 (528 gal)
Spent Demineralizer Water (from clean workshop)	400 L (106 gal)
Empty Spray Paint Cans*	40 each
Empty Cutting Oil Cans	40 each
Empty Propane Gas Cylinders*	10 each
Acetone*	54 L (14.3 gal)
Toluene*	4 L (1.0 gal)
Degreaser Solvent SS25*	4.8 L (1.3 gal)
Petroleum Ether*	20 L (5.3 gal)
Miscellaneous Scrap Metal	4,183 kg (9,221 lbs)
Motor Oils (for I. C. engines)	3,387 L (895 gal)
Oil Filters	250 each
Air Filters (vehicles)	50 each
Air Filters (building ventilation)	45,359 kg (100,000 lbs)
Hydrocarbon Sludge*	20 kg (44 lbs)
Methylene Chloride*	3,687 L (974 gal)

* Hazardous waste as defined in 40 CFR 261 (in part or whole) (CFR, 2008v)

Table 3.12-3 Estimated Annual Gaseous Effluent
(Page 1 of 1)

Area	Quantity (yr^{-1})	Discharge Rate m^3/yr (SCF/yr) @STP
Gaseous Effluent Vent Systems	NA	2.6×10^8 (9.18×10^9)
HVAC Systems		
Radiological Areas	NA	1.93×10^9 (max) (6.8×10^{10})
Non-Radiological Areas	NA	2.2×10^9 (max) (7.8×10^{10})
Total Gaseous HVAC Discharge	NA	4.13×10^9 (max) (14.6×10^{10})
Constituents:	**Quantity (yr^{-1})**	
Helium	880 m^3 (31,080 ft^3) @STP	NA
Nitrogen	104 m^3 (STP) (3,672 ft^3)	NA
Ethanol	80 L (21.2 gal)	NA
Laboratory Compounds	Traces (HF)	NA
Argon	380 m^3 (13,418 ft^3) @STP	NA
Hydrogen Fluoride	<2.0 kg (<4.4 lb)	NA
Uranium	<20 g (<0.0441 lb)	NA
Methylene Chloride	1,220 L (322 gal)	NA
Thermal Waste:		
Summer Peak	55.2×10^9 J/hr (52.3×10^6 BTU/hr)	NA
Winter Peak	78×10^9 J/hr (74×10^6 BTU/hr)	NA

Table 3.12-4 Estimated Annual Liquid Effluent
(Page 1 of 1)

Effluent	Typical Annual Quantities	Typical Uranic Content
Contaminated Liquid Process Wastes:	**L (gal)**	**kg (lb)**
Laboratory Effluent/Floor Washings/Miscellaneous Condensates	46,280 (12,226)	32 (70.5)[1]
Degreaser Water	7,419 (1,960)	37 (81.6)[1]
Spent Citric Acid	5,440 (1,437)	44 (98)[1]
Total Effluent Discharged[2] to Atmosphere by Evaporation via Liquid Effluent System Evaporator:	59,100 (15,625)[2]	N/A [2]
Sanitary:	18,652,600 (4,927,500)	None
Stormwater Discharge:		
Gross Discharge[3]	420,090,000 (110,976,000)	None

1 Uranic quantities are before treatment. Volumes for degreaser water and spent citric acid include process tank sludge.

2 Total annual effluents to atmosphere by evaporation via liquid effluent system evaporator is approximately 59,100 L (15,625 gal) with total uranic input approximately 114 kg (251 lb). Effluents are treated to remove uranic content by precipitation, filtration, and evaporation and discharged to atmosphere. The anticipated atmospheric distillate release is expected to be < 0.0356 g/yr (1.26E-03 oz/yr) of total uranium. The EREF design precludes operational process discharges from the plant to surface or groundwater.

3 Maximum gross discharge is based on total mean annual precipitation falling on the developed portion of the site associated with the runoff to the Site Stormwater Detention Basin and the Cylinder Storage Pads Stormwater Retention Basins, neglecting infiltration into the site soil and evaporation.

Table 3.12-5 Commodities Used, Consumed, or Stored at the Eagle Rock Enrichment Facility During Construction

(Page 1 of 1)

Item Description	Quantity
Asphalt Paving	186,165 m^2 (222,652 yd^2)
Chain Link Fence	31,892 m (104,633 ft)
Concrete (including embedded items	198,341 m^3 (259,420 yd^3)
Concrete Paving (Sidewalks/Islands)	1,561 m^2 (1,867 yd^2)
Copper and Aluminum Wiring	619,133 m (2,031,275 ft)
Crushed Stone (roads and fencing)	313,174 m^2 (374,553 yd^2)
Electrical Conduit	272,461 m (893,900 ft)
Fence Gates	16 each
HVAC Units	150 each
Permanent Metal Structures	(1) Cylinder Receipt and Shipping Building
Piping (Carbon & Stainless Steel & Non-Metallic)	49,621 m (162,800 ft)
Roofing Materials	86,147 m^2 (927,279 ft^2)
Ductwork	1,133,981 kg (2,500,000 lbs)

Table 3.12-6 Commodities Used, Consumed, or Stored at the Eagle Rock Enrichment Facility During Operation

(Page 1 of 1)

Item	Quantity	Comments
Electrical Power	64 MVA	Separation Plant
Diesel Fuel	302,832 L (80,000 gal)	Periodic start tests and runs of standby diesel generators
Silicon Oil	100 L (26.4 gal)	–
Corrosion Inhibitor	None Expected	–
Growth Inhibitor	1,471 kg (3,244 lb)	Water systems biocide: consumed, not stored on site

FIGURES

Figure 3.12-1, Domestic Sanitary Sewage Treatment Plant, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390