3.0 Affected Environment

3.1 Air Quality

3.1.1 Climate and Meteorology

The climate for the Salt Creek region is classified as a continental semi-arid cool steppe area. The summers are short and warm, while the winters are long and cold. The average monthly temperature in Midwest ranges from 23.7˚F in January to 72.0˚F in July. The average daily temperature for the Powder River Basin to the north of the project area ranges between 5–10˚F for a low and 30-35˚F as a high in mid-winter, and an average daily temperature of 55–60˚F for a low and 80-85˚F as a high in the summer. The region's frost-free period occurs between late May and early September. Refer to Section 3.1.1 of the Phase I EA for additional information related to the climate and meteorology described for the Salt Creek area (BLM 2003a).

3.1.2 Ambient Air Quality

The ambient air quality in the project area and the region is generally good, and the region encompassing Salt Creek Oil Field is classified as "attainment" with respect to Ambient Standards established by the Wyoming Air Quality Standards and Regulations (WAQS&R) and National Ambient Air Quality Standards (NAAQS). State and federal ambient air quality standards listed in Table 3-1 set upper limits for concentrations of designated "criteria" air pollutants for public accessible areas. "Criteria pollutants" include: inhalable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), and ozone or ozone precursors (volatile organic compounds [VOCs]). The State of Wyoming also has established ambient air quality standards for hydrogen sulfide (H_2S), which is prevalent in very low ambient concentrations throughout Salt Creek Oil Field.

Existing sources of emissions of criteria pollutants in the project area and region include:

- Oil and gas production and processing operations; e.g., engine-driven compressors, pumps and generators, gas processing, dehydration units; other stationary fuel fired sources: PM_{10}/$PM_{2.5}$, NOx, SO_2, CO, VOCs, and H_2S.
- Dust (PM_{10}) from traffic on unpaved roads, sand application on paved roads during the winter, construction activities, and windblown deposition.
- Combustion emissions from mobile sources (gasoline and diesel vehicles): PM_{10}/$PM_{2.5}$, NOx, SO_2, CO, and VOCs.
- Fugitive emissions (equipment leaks) from process equipment: H_2S and VOCs.
- Mining (primarily coal in Campbell county): PM_{10}.
- Coal-fired power plants.
- Regional transport of pollutants from areas upwind of the project area.

No air quality monitoring stations exist in or near Salt Creek Oil Field and no ambient air quality data specific to the project area are available. However, Argonne National Laboratory compiled and reviewed ambient air quality data measured throughout northeastern Wyoming and southeastern Montana (Argonne 2002), in support of the Powder River Basin (PRB) Oil and Gas Project, which encompasses all or parts of Johnson, Campbell, and Sheridan counties adjacent to northeast Natrona County and Salt Creek Oil Field. Background concentrations of regulated pollutants compiled for northeast Wyoming (Argonne 2002) are provided in Table 3-1.

As discussed in Section 3.2.1 of the Phase I EA (BLM 2003a), ambient concentrations of H_2S in the project area have been demonstrated to be negligible and the WDEQ has not required H_2S monitoring since 2000.

Table 3-1 Ambient Air Quality Standards and Published Background Concentrations of Regulated Air Pollutants in Northeast Wyoming

Pollutant	Averaging Time	Wyoming Ambient Air Standards (μg/m^3)	NAAQS (μg/m^3)	Assumed Background Concentrations (μg/m^3)
PM_{10}	Annual	50	50	30
	24-Hour	150	150	105
$PM_{2.5}$	Annual	15	15	8
	24-Hour	65	65	20
NO_x	Annual	100 (0.05 ppmv)	100	11
SO_2	Annual	60 (0.02 ppmv)	80	16
	24-Hour	260 (0.1 ppmv)	365	89
	3-Hour	1,300 (0.5 ppmv)	1,300	325
CO	8-Hour	10,000 (9 ppmv)	10,000	6,600
	1-Hour	40,000 (35 ppmv)	40,000	15,000
Ozone	8-Hour	157 (0.08 ppmv)	157	-

Source: Argonne 2002

3.1.3 Carbon Dioxide Seeps

As discussed in Section 2.1.3, small CO_2 seeps have surfaced in a confined area of the NE ¼ of Section 14 in the Phase I area. These surface seeps are composed of liquids (i.e., water and crude oil), CO_2, and lesser concentrations of H_2S. The seep phenomenon was not anticipated and was not examined in the Phase I or Phase II EAs (BLM 2003a, 2004a).

CO_2 is not a regulated pollutant, but it is a greenhouse gas and an asphyxiant in high concentrations. If present in confined spaces or areas of low and confining features, such as natural draws, gullies, or ditches, concentrations of CO_2 could increase to potentially hazardous levels in some circumstances (Cameron-Cole 2005a).

Concentrations of H_2S measured in current seeps have not exceeded the ambient standards (Cameron-Cole 2005a). The Cameron-Cole study did not quantify concentrations of VOCs emitted and dispersed from the selected seeps. In response, substantial resources and technologies have been implemented to assess surface impacts from the active seeps and to identify the source and path of CO_2 from the subsurface to the surface, as described in the following sections.

Data from a representative sample of surface seeps were collected to determine the input parameter ranges and distributions for an air dispersion modeling analyses (Cameron-Cole 2005a). Six seeps were studied, in addition to measurements of gas concentrations that were taken in one draw downgradient of several active seeps.

Field measurements collected during the study included:

- Location of selected representative seep locations (latitude/longitude) using Global Positioning System (GPS).
- Measurements of physical characteristics of selected seeps:
    - Approximate size (radius) of surface disturbances.
    - Gas flow rate in cubic feet per minute (cfm).
- Sampling and analysis of CO_2 and H_2S concentrations from seep discharge points.
- Perimeter monitoring (real-time) of ambient ground-level gas concentrations (i.e., CO_2, H_2S, and oxygen [O_2]).
- On-site ambient and meteorological data (e.g., temperature, relative humidity).
- Monitoring (real-time) of ground-level gas concentrations (CO_2, H_2S, and O_2) at the base of a drainage.
    - Multiple active seeps located in a draw upslope of monitoring stations.

Field measurements showed the highest CO_2 and H_2S concentrations occurred during nighttime conditions, when both ambient temperatures and wind speeds were low. The maximum reported CO_2 concentration at ground level near one of the sampled seeps was approximately 24,500 parts per million dry volume basis (ppmvd) (Cameron-Cole 2005a).

Specifically, field measurements taken at the base of the drainage up to approximately 500 feet downgradient of several small seeps reported maximum measured CO_2 concentrations of 25,000 ppmvd (Cameron-Cole 2005a, Figure 4). It should be noted that the large number of CO_2 data points falling precisely at the 25,000 ppmvd scale on the time series scatter plot of measured CO_2 concentration (Cameron-Cole 2005a, Figure 4) infers that the range of the instrument may have been exceeded and that the actual downdraw CO_2 concentrations may have exceeded 25,000 ppmvd during some periods during the test.

Based on the field measurement data, Cameron-Cole performed air dispersion modeling designed to determine the critical parameters leading to high ground-level CO_2 concentrations and to predict the dispersion of dense gas concentrations over distances from the seep. The dispersion modeling results confirmed the results of the air monitoring, in that the highest ground-level CO_2 concentrations occurred during calm, stable conditions, and that the highest concentrations were predicted to occur close to the release point, with concentrations decreasing with increasing distance from the release. The modeling results also indicated that concentrations decrease significantly between ground level and the breathing zone (5 feet [1.5 meters] above ground), as would be expected with a heavier-than-air release under calm conditions. It should be noted, however, that the modeling results should be interpreted while

considering the limitations of the model used. The greatest limitation is that the model assumes that the underlying terrain is flat, so it cannot predict relative build-up of concentration in ground depressions or any channeling effects due to gullies or ravines.

3.2 Geology

The topography of Salt Creek Oil Field is characterized by dissected, rolling upland plains with low to moderate relief (badlands, broad valleys, deep eroded gullies, and isolated hills). Elevations in the project area range from 4,750 to 5,150 feet. Refer to Section 3.1.2.1 of the Phase I EA (BLM 2003a) for a detailed description of the topography of the Salt Creek area.

Salt Creek Oil Field is located within the transitional zone between the Powder River Basin to the northeast and the Casper Arch to the southwest. The structural framework is the result of the Late Mesozoic Laramide Orogeny. Site geology ranges from the Cody Formation, which forms all outcrops throughout the project area, and the Frontier Formation, which includes the petroleum reservoir rocks of Salt Creek Oil Field. Hydrocarbons are produced from 11 individual units of the Frontier, particularly from the Wall Creek 2 (WC2) formation. A more detailed description of project area geology, including a representative well log that illustrates the relationship among different geologic strata, can be found in the Phase I EA (BLM 2003a, Figure 11).

3.2.1 Source and Path of CO_2 Migration to Surface

The integrity of the WC2 reservoir is well documented. The reservoir initially contained a gas cap with reservoir pressures exceeding 1,000 pounds per square inch gauge (psig). The integrity of the producing formation(s) is not suspect. Field studies show the source of the CO_2 seeping to the surface is from wells of poor integrity, where CO_2 migrates to the surface via existing localized geological structures (e.g., faults, fractures).

The following actions help define the model for CO_2 seeps:

- Historical Well File Research
  - Undocumented well locations
  - Well integrity evaluations
- Temperature Logging
- Noise Logging
- Fluid Tracer Logging
- Gas Tracer Logging
- Surface Geology Study
- Subsurface Geology Study
  - Passive Seismic Survey
  - Active Seismic Survey

Extensive studies of surface and subsurface geology are currently underway, not only in the localized area of the seeps, but the entire field, including the Phases III/IV area.

3.2.2 Well Location and Evaluation of Well Integrity

There are observed gaps in well spacing where there may be undocumented wells, including locations in and around populated areas. For example, in an array of regularly spaced wells, there are areas where a well is not evident where expected, based on historical well locations. Howell has undertaken efforts to locate undocumented wellbores that may exist throughout the field using:

- Magnetic detection techniques (aerial and surface)
- Radon, methane, and CO_2 detection (spectroscopy)
- Well file research

Howell has reviewed historical documentation and Cement Bond Logs (CBLs) to identify wells in need of repair. Wells with documented CBLs may not be re-worked, but many wells, including injection/production wells, and plugged and abandoned wells with damaged or inferior cement jobs or plugs have been re-worked or re-plugged. In some circumstances, new casing strings have been run.

3.2.3 Well Work Practices and Reliability

The reliability of well integrity (e.g., elimination of leaks) from well work has and is expected to continue to improve through advancements in practices/techniques for re-completing existing wells (e.g., squeeze cementing) and for wells to be plugged and abandoned. Howell anticipates that additional reliability also would be realized from deployment of improved well completion tools (e.g., packers). Packers are downhole tools used in well completions to isolate the annulus from the production casing, enabling controlled production, injection, or well treatment. A typical packer assembly incorporates a means of securing the packer against the casing or liner wall and a means of creating a reliable hydraulic seal to isolate the annulus, typically by means of an expandable elastomeric element. Through experience gained during development of Phase I and early Phase II, Howell has substantially improved well work practices resulting in improved reliability with respect to well integrity.

3.3 Water Resources

3.3.1 Surface Water

3.3.1.1 Flow

The project area is located within the Salt Creek drainage. Salt Creek flows in a northerly direction from headwaters in the Pine Ridge south of the project area. It flows approximately 50 miles to its confluence with the Powder River near Sussex, Wyoming. Total drainage area is 759 square miles. Among the principal tributaries to Salt Creek are Castle Creek, Meadow Creek, and Teapot Creek. All the tributaries to Salt Creek are ephemeral or intermittent except where produced water discharges from oil and gas extraction activities provide permanent flows (lower Teapot Creek, lower Castle Creek, and Meadow Creek). Salt Creek itself originally was an intermittent stream (WDEQ 2002). However, for over 80 years it has received produced

water discharges from Salt Creek Oil Field, Naval Petroleum Reserve No. 3 Field (Teapot Dome), and several smaller oil fields. Particularly since the introduction of extensive waterflooding in the early 1970s Salt Creek has been a perennial stream, seldom dropping below approximately 13 cubic feet per second (cfs).

Current stream flows in Salt Creek vary from 13 cfs to well over 2000 cfs during storm events. Annual average flow (including storm events) for the period of record (1976-1993) was 44 cfs, although minimum monthly means (i.e., not including unusual storm events) range from less than 10 cfs (January and September) to about 18 cfs (June). Seasonality is damped by the presence of approximately 13 cfs of year-round flow from the combined produced water discharges in the basin. The minimum flows in Salt Creek, therefore, consist almost entirely of produced water (RETEC 2004).

Salt Creek contributes significant water volumes to the Powder River, ranging from 10 to 30% of total flow during spring, when the Powder River carries large volumes of snowmelt from the Bighorn Mountains, to an average of 50% of the total flow from July through September. During low flow periods, Salt Creek may contribute up to 95% of the flow in the downstream reaches of the Powder River, providing critical minimum flow in the river (RETEC 2004).

On an annual basis, Salt Creek is estimated to contribute from 27,000 acre-feet (in dry years) to 45,000 acre-feet (in wet years) to the Powder River (RETEC 2004). Of this contribution, an estimated 45% is produced water in dry years and 20% in wet years. Salt Creek produced water discharges from all sources, therefore, provide a significant contribution to Salt Creek water resources.

3.3.1.2 Water Quality

Salt Creek is classified as a Class 2C stream by the WDEQ. Class 2C waters maintain beneficial uses for propagation of non-game fish, agriculture, wildlife, industrial, and recreation. It does not support game fish or human consumption use.

The Phase I EA (BLM 2003a) presented a detailed overview of water quality issues associated with produced water discharges to Salt Creek. Since that time, additional studies have occurred in Salt Creek that provide further detailed information and are summarized below.

A review of water quality issues in Salt Creek (RETEC 2004) for a Use Attainability Analysis (UAA) in support of a petition for a site-specific Water Quality Criterion (WQC) for chlorides concluded that all beneficial uses are being met under current conditions. Salt Creek is on the State 303(d) list for impaired waters because chloride levels exceed the chronic WQC of 230 mg/L. The UAA cited above concluded that the ambient chloride concentrations resulting from produced water discharges, which typically result in chloride concentrations around 1000 mg/L and occasionally reach 1,500 mg/L, did not cause impairment or loss of beneficial uses. The UAA, therefore, has recommended a site-specific WQC for chlorides of 1,600 mg/L for Salt Creek, and 984 mg/L for the reach of Powder River below the confluence. The WDEQ is proposing to establish this site-specific water quality criteria for chlorides in Salt Creek.

The UAA also evaluated other potential water quality concerns and noted no significant concerns related to other pollutants resulting from produced water discharges. However, the UAA noted

that the "natural" water quality of Salt Creek is frequently elevated in sulfates and other dissolved solids, as well as elevated suspended sediment loads due to the erodible soils in the area.

Produced water discharges to Salt Creek occur from 21 Wyoming Pollution Discharge Elimination System (WYPDES) permits issued to seven producers: APC/Howell (Salt Creek Field, Meadow Creek Field, and Sussex Field), U.S. Department of Energy (Teapot Dome Field), Manx Petroleum, Chapman Oil, Sage Petroleum, Natural Gas Processing, and WyOil and Mining. Over 75% of the total produced water in Salt Creek results from Howell's Salt Creek Oil Field, with another 20% from the Department of Energy's Teapot Dome Field. The remaining producers collectively account for a few percent of the total volume (RETEC 2004).

Eight active WYPDES permits are held by Howell in Salt Creek Oil Field. Two of these permits (LACT 4 and LACT 5) are currently influenced by CO_2 EOR for Phases I and II. Table 38 of the Phase I EA (BLM 2003a) shows the discharge volumes for each of the LACTs. The interim numeric discharge limitations outlined by the WYPDES permits are to be applied as final limits by 2006 and are listed in Table 3-2. Note, however, that the chloride limitation is subject to revision following the establishment of the site-specific WQC for chloride. Selenium also has been monitored in the discharges and reported in the Discharge Monitoring Reports (DMR), although no effluent limit has been set.

Table 3-2 Interim and Final Effluent Limits for Howell LACT Discharges[1]

Parameter	Units	Discharge Limitation (Daily Maximum)
Oil and Grease	mg/L	10 (interim and final)
Specific Conductance	µS/cm	7,500 (interim and final)
Total Radium	pCi/L	60 (interim and final)
Chloride	mg/L	230 (Note: this limit is not in force at this time)
pH	Units	Within 6.5 – 8.5 (interim and final)

[1]Interim limits applicable at this time. Final limits applicable from 2006.

Review of historic discharge data, collected prior to the injection of any CO_2 at Salt Creek Oil Field, indicates that exceedances of the effluent limits have not occurred since 1998 for oil and grease (13.3 mg/L, LACT 11A, July 1998) and 2002 for specific conductivity (7,660 µS/cm and 7,683 µS/cm, LACT 11A, February and August 2002, respectively). As discussed in the UAA (RETEC 2004), the proposed chloride effluent limit is exceeded in most discharges, and has prompted the petition for a site-specific standard for chlorides in Salt Creek based on the observation that aquatic life uses are not impaired at ambient levels and the contribution of the produced water provides beneficial effects on water quality, quantity, and aquatic habitat.

A recent inspection of Howell discharges by WDEQ discovered exceedances of the effluent limit for TDS (5,000 mg/L) in the discharges from LACTs 4, 5, and 10. LACTs 4 and 5 are associated with ongoing Phases I and II EOR. LACT 10 is not currently associated with the CO_2 EOR project. While the WYPDES permits contain an effluent limit for TDS, Howell is not required to routinely analyze its discharges for this parameter. A review of data from other sources indicates that the TDS concentration may have exceeded the effluent limit prior to the start of CO_2 injection. Howell/Anadarko recently met with WDEQ to discuss the TDS issue, and

Howell has several options for addressing this compliance issue, including: (1) request that WDEQ establish a higher, site-specific TDS effluent limit; (2) inject or treat the higher TDS discharges; (3) consolidate separate discharges to lower the mixed TDS concentration to below the effluent limit. Ultimately WDEQ will require Howell to take appropriate measures to protect Salt Creek water quality.

3.3.2 Groundwater

The Phases III/IV Project area is located within the Non-Glaciated Central region that occupies a large area in the eastern and northeastern parts of the state. Hydraulic interconnection and flow paths between hydrogeologic units are not well understood. Generally, the groundwater system can be divided into an upper topographically controlled system from the ground surface down to 200 feet, and a lower system between 200 and 1,200 feet that has a general northward flow. Water-bearing characteristics of the aquifer system in Natrona County are discussed in more detail in Section 3.1.4.2 of the Phase I EA (BLM 2003a).

The majority of groundwater development in the project area is from deep Tertiary and Paleozoic aquifers because of the better quality and higher yield than the shallow alluvial aquifers. Since 1995, there has been a decline in the fresh groundwater withdrawal due to declining regional population and less use by industry, mining, and irrigation. Populated areas within the study area, including Midwest, Edgerton, and Gas Plant Camp, receive their water from the Casper Regional Water System, which is located in the Platte River Basin outside of the Phases III/IV study area. The Casper Regional Water System derives its water primarily from groundwater wells located along the Platte River basin in the winter and supplements that supply with treated water from the Platte River in the summer. Water from this system is delivered to the project area via pipeline.

In general, the quality of water in the alluvial aquifers within the project area is not potable, but may be suitable for livestock and marginally suitable for irrigation and/or industrial use. The quality of water in Tertiary units in the project area is variable and has different uses. The concentration of manganese in the Wasatch-Fort Union aquifer system is relatively high and the level of sulfates can exceed the Environmental Protection Agency's (EPA's) standard for drinking water. The Lance-Fox Hills aquifer system has total dissolved solids at less than 3,000 mg/L in some areas but has elevated sodium and bicarbonate levels that make this water generally unsuitable for irrigation. The Lower Hydrologic Unit composed of the Madison Limestone and Tensleep Sandstone often are used for public water supplies in the region, although in some areas the water quality from these aquifers may not be suitable for drinking and domestic use. Data available for the Madison Limestone and Tensleep Sandstone in the project area indicate that waters from these aquifers are not suitable for drinking in the areas where these wells were sampled.

3.4 Human Health & Safety and Ecological Risks

3.4.1 Human Health and Safety Risk

The Salt Creek Phases III/IV Project is located within an active oil field. The risks associated with surface and injection/production facilities are well understood and manageable (Damen et al. 2003). The area is open to the public, and public roadways are present throughout the area.

Visitors and the residents of the towns of Midwest and Edgerton, therefore, have access to public lands within Salt Creek Oil Field, with some restrictions for specific areas, such as drilling sites, treatment facilities, and other extraction-related activities. Potential risks to human health and safety associated with these normal activities, including the possible releases of CO_2 or H_2S or occurrences of industrial accidents, are potentially present under current conditions. Area residents and visitors are typically aware of and accustomed to these industrial risks, and the level of health and safety risk is generally accepted. Industrial management of CO_2 is a well-established process in many industries, and specific risks associated with CO_2 are well understood. Such risks are managed by consistent application of standard safety systems and procedures (Benson 2002).

The town of Midwest is located within the Phase IV Project Area. Although in the past there have been oil extraction activities within the town, and active pumps are presently located close to the residential and commercial areas, there is currently no oil or gas extraction occurring inside the town boundary.

The town of Edgerton is located to the east of the Phase IV project area. In addition, two facilities occur outside of these towns, including the Edgerton Rodeo Grounds located northeast of Edgerton and the Midwest Golf Club located within the Phase IV Project area between Midwest and Edgerton.

3.4.2 Ecological Risk

The Phases III/IV Project area forms part of an operating oil field, which has been active for 116 years. The historic and ongoing oil extraction activities have resulted in changes to the natural communities occurring within the Salt Creek Basin and the plant and animal species associated with these communities. The incremental habitat modifications have resulted in a lower habitat value for area wildlife and native plant communities, although some species have habituated to the increased habitat fragmentation, surface disturbance, and human-related activities in Salt Creek Oil Field and more specifically near the Phases III/IV Project area. Natural resources are discussed further in Sections 3.7, 3.8, 3.9, and 3.10.

3.5 Soils and Reclamation

Comprehensive county-wide information was available from the Natural Resources Conservation Service (NRCS) soil survey for Natrona County (NRCS 1997). In addition, the Phase I EA (BLM 2003a) provides detailed site-specific information for the overall project area.

Soils in the project region are distributed according to primary differences in parent material (both residual and depositional), elevation, effective moisture, and topographic slope and position. Soils in the project region have developed from residual material and alluvium in a climatic regime characterized by cold winters, warm summers, and low to moderate precipitation. Precipitation is generally derived from spring snowmelt and summer thunderstorms, which are often high intensity, short duration events.

Upland soils are derived from residual interbedded shales and sandstones, as well as stream alluvium or colluvial material. Valley or bottomland soils have developed in unconsolidated stream sediments. The soils are generally low in organic matter and are alkaline and saline-

sodic. The saline-sodic nature of the existing soil resource is discussed, in part, in Section 3.2.2 of the Phase I EA (BLM 2003a). General taxonomic classes of soils present in the project area include: Usteric and Ustic Natrargids, Typic and Ustic Torriorthents, Ustic Haplargids, and Ustic Torrifluvents. Overall textural families primarily are fine or clayey but also include fine-loamy, loamy, and coarse loamy. Textures within a given soil profile may vary, as well. Slopes range from nearly level to moderately steep with the deeper soil profiles found in less sloping to flat terrain. Rangeland livestock grazing, wildlife habitat, and oil drilling activities are the dominant historical land uses on these soils.

The Salt Creek drainage historically has been designated an Area of Critical Environmental Concern (ACEC), based in part on the erosion severity in portions of the watershed (Section 3.1.3.5, Phase I EA). No soil map unit within the Phases III/IV project area is listed as sensitive for wind or water erosion by the BLM.

Eight map units are found within the Phases III/IV area, as summarized in Table 3-3 by the NRCS soil complexes, including one for open water. Approximately 63% of the area consists of series that belong to fine or clayey textural families. Slightly over 42% of the map units contain potential issues with saline and/or sodic soils.

Refer to Section 3.1.3.2, Major Soil Types, in the Phase I EA (BLM 2003a) for a complete and detailed description of the soil map units listed above.

Table 3-3 Phases III/IV Soil Units and Complexes

Map Unit No.	Description	Acreage	Percent
112	Arvada-Absted-Slickspots complex, 0 to 6% slopes	901.43	41.6
125	Blackdraw-Lolite-Gullied Land complex, 3 to 20% slopes	228.9	10.6
134	Bowbac-Taluce-Terro complex, 6 to 20% slopes	443.5	20.5
140	Cadoma-Renohill-Samday clay loams, 3 to 12% slopes	201.1	9.3
195	Haverdad-Clarkelen complex, saline, 0 to 3% slopes	238.9	11.0
214	Lolite-Rock outcrop complex, 10 to 40% slopes	34.2	1.6
275	Shingle-Taluce-Rock Outcrop complex, 10 to 40% slopes	115.0	5.3
313	Water	3.0	0.1
	Totals	**2166**	**100.00**

Source: NRCS 1997

3.6 Wetlands

Jurisdictional wetlands and other waters of the U.S. are limited in extent in the Phases III/IV development areas and are restricted to the Salt Creek drainage and Howell's WYPDES discharge channel that empties into Salt Creek. There also is a small wetland area created by Amoco (former operator), which is located adjacent to the discharge channel near its confluence with Salt Creek. Wetlands along the discharge channel and in the created wetland area are

dominated by stands of saltmarsh bulrush (*Bolboschoenus maritimus*). Along the discharge channel, saltmarsh bulrush is restricted to narrow stands immediately adjacent to perennial flow in the drainage. The created wetland area is a small, dry pond that was formerly fed water by the discharge channel. At the time of the July 2005 field survey, it was a dry mudflat dominated by saltmarsh bulrush in the central portions and by inland saltgrass (*Distichlis stricta*) around the periphery. There are no wetlands at the proposed substation and compressor station sites or along the power line corridors. The only wetlands crossed by the compressor station CO_2 trunk line occur along Salt Creek.

Streamside wetlands along Salt Creek are represented by two distinct communities. The lowest streamside terraces, immediately adjacent to surface water in the creek, are dominated by a mix of chairmaker's rush (*Schoenoplectus pungens*) and foxtail barley (*Critesion jubatum*) with occasional stands of sedge (*Carex* sp.) and alkali cordgrass (*Spartina gracilis*). These wetlands correspond to the streamside marsh and riparian grassland types discussed under Riparian Communities in Section 3.7.2.

A transitional wetland community, dominated by salt cedar (*Tamarix chinensis*), inland saltgrass, and poverty sumpweed (*Iva axillaris*) is supported on the next level terrace above the active stream channel, with salt cedar forming relative dense stands in some areas. The uppermost terrace along the stream channel does not support wetlands. The dominant species on this terrace are black greasewood (*Sarcobatus vermiculatus*), silver sagebrush (*Seriphidium canum*), and upland grass and weedy species such as cheatgrass (*Anisantha tectorum*), smooth brome (*Bromopsis inermis*), and clasping peppergrass (*Lepidium perfoliatum*), none of which is classified as a hydrophytic species.

Other drainages within the Phases III/IV Project area and within the power line/CO_2 trunk line corridors are ephemeral, and vegetation species supported within them are dominated almost entirely by upland (non-hydrophytic) species such as big sagebrush (*Seriphidium tridentatum*), silver sagebrush, rubber rabbitbrush (*Chrysothamnus nauseosus*), black greasewood, western wheatgrass (*Pascopyrum smithii*), summer cypress or kochia (*Bassia sieversiana*), yellow sweetclover (*Melilotus officinalis*), Russian knapweed (*Acroptilon repens*), and clasping peppergrass. Further, none of these ephemeral drainages exhibit a defined bed or bank or other distinguishing characteristics that would require their classification as other waters of the U.S.

3.7 Vegetation and Weeds

3.7.1 Vegetation

This section provides a summary of the vegetation resources applicable to the Phases III/IV Project area, as well as the proposed substation and compressor station sites and related power line and CO_2 trunk line corridors. More detailed descriptions of vegetation communities are provided in the Phase I EA (BLM 2003a). Over the past 116 years, much of the project area has been disturbed by oil and gas exploration and development. Many roads cross the project area, and numerous wells (both active and abandoned) have been established in grid patterns throughout the upland areas. Some shoreline degradation occurs along streamside habitats of Salt Creek. The vegetation within the project area consists of a variety of grassland and shrubland types that have developed in response to amounts of available moisture, soil salt

concentrations, and past disturbances. Available moisture ranges from sub-irrigated conditions along the Salt Creek drainage to dry upland shale badlands and grasslands that have developed on shallow sandy soils. Shale and mudstone bedrock outcrops tend to be very saline, and as these upland areas weather, they produce fine-textured sediments that tend to be somewhat less saline. These deposits collect as alluvial fans on upland depositional areas and as fine-grained clayey deposits on stream terraces and in stream channels.

Landscape units within the project area and the surrounding region were mapped in the Phase I EA (BLM 2003a) using a supervised vegetation classification system applied to Landsat 7 imagery (Phase I EA, Appendix 8). The regional map (see Figure 34, Phase I EA) portrays eight vegetation types as well as other landscape units including rivers and streams, commercial/industrial sites, residential areas, major roads, and agricultural areas. In general, the vegetation within the Phases III/IV Project area and adjacent sites can be classified into three general types: riparian communities, lowland communities, and upland communities. The areal extent of all mapped units is provided in Table 3-4.

3.7.2 Riparian Communities

As discussed in Section 3.6, riparian plant communities are supported only along the channel and low floodplain terraces of Salt Creek. The riparian communities consist of the following.

- Open water areas
- Streamside marshes
- Riparian grasslands
- Riparian tall shrublands.

Open water areas consist of the shallow, flowing water of Salt Creek. There are a few emergent wetland plants including bulrushes *(Schoenoplectus sp.)* and a species of naiad *(Najas quadalupensis)*. Stonewort *(Chara sp.)*, a submerged macrophytic algal species, commonly grows in the stream channel. The streamside marsh community corresponds to the lowest streamside terrace wetlands described in Section 3.6. The streamside marsh type typically occurs as a narrow band of wetland vegetation immediately adjacent to the stream channel. In most situations, this zone is less than 10 feet wide. Soil conditions are completely saturated, and

Table 3-4 Areal Extent of Vegetation Communities and Landscape Units Within the Region and Phases III/IV Project Area

	Areal Extent within the Region (Regional Map)		Areal Extent for the Phases III/IV Project	
	Hectares	Acres	Hectares	Acres
Rivers/Steams	632	1561	26	63
Ponds	40	100	0	0
Riparian Forest	1031	2547	0	0
Lowland Shrubland	2635	6509	85	210
Riparian Communities	920	2272	0	0
Upland Forest	303	748	0	0
Upland Shrubland	22975	56748	150	370

Table 3-4 Areal Extent of Vegetation Communities and Landscape Units Within the Region and Phases III/IV Project Area

Upland Grassland	50971	125897	476	1176
Saltbush Badlands	15501	38289	39	96
Barren/Sparsely Vegetated Areas	110	272	11	28
Commercial/Industrial	28	70	9	23
Residential	75	186	42	104
Major Roads	882	2177	45	111
Agriculture	1773	4379	0	0
Total	**97877**	**241755**	**883**	**2182**

Source: Phase I EA (BLM 2003a)

under flood stages, this vegetation type is underwater. The major species in this type is chairmaker's rush. Total vegetation cover is variable depending primarily on the erosive effects of floodwaters. Riparian grasslands are supported as narrow bands of vegetation in sub-irrigated zones located above and parallel to the Salt Creek stream channel. These grasslands grow on terraces above the streamside marsh community but below the drier transitional salt cedar and inland saltgrass wetland areas higher on the floodplain. The major species in riparian grasslands include slender wheatgrass *(Elymus trachycaulus)*, alkali cordgrass, western wheatgrass, and inland saltgrass. Other common, but less dominant species include chairmaker's rush, poverty sumpweed, Russian knapweed, meadow barley *(Critesion brachyantherum)*, and foxtail barley. The riparian tall shrubland type is supported on topographically similar sites that support riparian grassland as well as on somewhat more elevated sites. The understory is similar to riparian grassland, but riparian tall shrubland differs and is characterized by a dominance of salt cedar in the shrub overstory. Along the upper portions of the Salt Creek floodplain, salt cedar grows in linear stands parallel the stream course probably reflecting high water levels of past flood events. Section 3.3.1.1.1 in the Phase I EA (BLM 2003a) provides more detailed riparian community descriptions.

3.7.2.1 Lowland Communities

As the distance from stream channels increases, the land surface rises gently to higher stream terraces and quickly dries out at the surface. Water is still available at depth, but these higher terraces are not sub-irrigated. These upper terraces are characterized by shrublands dominated by black greasewood and silver sagebrush. In many places along Salt Creek, these two shrub types are relatively separate and distinct, but in some places the two dominant species form mixed stands. Black greasewood is commonly found as the dominant on saline soils, especially on floodplain sites where the water table is within the range of the rooting depth for this species. Silver sagebrush shrublands occur on floodplain terraces that are somewhat less saline than the sites dominated by black greasewood.

Some of the upper terraces have low shrub densities, probably the result of past industrial disturbances. Depending on the degree of past disturbance, sites may be dominated by perennial grasses like western wheatgrass or needle-and-thread grass (*Hesperostipa comata*) under conditions of limited disturbance, or by cheatgrass and other annual weeds such as kochia and

clasping peppergrass on sites with greater amounts of disturbance. More detailed descriptions of lowland plant communities are provided in Section 3.3.1.1.2 of the Phase I EA (BLM 2003a).

3.7.2.2 Upland Communities

The vegetation in upland areas throughout the project area is somewhat variable depending on the character of the underlying bedrock formations. Within the project area, much of the upland vegetation has developed on bedrock marine shale, or on alluvial and colluvial materials developed from shale deposits. The bedrock formations tend to support plant communities dominated by Gardner's saltbush (*Atriplex gardneri*), while the alluvial and colluvial materials tend to support mixed shrublands dominated by black greasewood, silver sagebrush, western wheatgrass, and variety of other species.

The saltbush badlands are characterized by sparse vegetation cover with most of the cover attributed to Gardner's saltbush. Relatively few other species can tolerate the high clay content and saline conditions of the saltbush badlands areas. The upland shrubland type occurs in areas that tend to be covered by alluvial or colluvial sediments derived from the shale outcrops in the project area. These substrates appear to be less saline than the bedrock outcrops themselves. Species composition and cover values in the mixed shrubland type are similar to that observed in the greasewood shrubland and silver sagebrush shrubland vegetation types (see Section 3.7.2.1). Upland grasslands in the project area tend to be dominated by western wheatgrass and a variety of annual grasses and forbs including cheatgrass, soft brome (*Bromus mollis*), flixweed (*Descurainia sophia*), tumble mustard (*Sysymbrium altissimum*), yellow sweetclover (*Melilotus officinalis*), and clasping peppergrass. Section 3.3.1.1.3 in the Phase I EA (BLM 2003a) provides more detailed descriptions of the upland communities.

3.7.3 Weeds

In Section 3.3.1.1.4 of the Phase I EA, five species of noxious weeds were identified for the overall project area. These species include the following, as described.

1. Russian knapweed (*Acroptilon repens)*commonly occurs in the riparian grassland type and also in the upper stream terrace communities. This introduced, perennial species readily becomes established on disturbed areas and spreads both by seed and by adventitious shoots from roots growing to a depth of up to 8 feet.

2. Canada thistle (*Breea arvense*) tends to occur in bottomland communities where moisture is more abundant as compared to upland areas. It also was observed along Salt Creek in limited areas. This species spreads by seed and vegetatively.

3. Bull thistle (*Cirsium vulgare*), an introduced biennial reproduces by seed, and is highly competitive. It typically occurs along roadsides and in similar disturbed areas.

4. Halogeton (*Halogeton glomeratus*) is an annual weed from Eurasia that is well adapted to alkaline soils and a semi-arid climate. This species readily invades disturbed or over-grazed areas. It occurs in riparian grasslands, saltbush badlands and disturbed areas. This species is a problem because of its toxicity to livestock, especially sheep. It was observed to a limited extent during the July 2005 surveys.

5. Scotch thistle (*Onopardum acanthium*) occurs in the greasewood shrubland type and in other disturbed areas. This large, introduced biennial thistle is an aggressive species that has become more widespread throughout the Rocky Mountain region over the past 10 years.

Other problem weed species noted in the Phases III/IV Project area during the July 2005 field survey were summer cypress (*Bassia sieversiana)* and Russian thistle (*Salsola australis*), which were observed along roadsides and in disturbed areas.

While none of the above listed species occurs as overall dominants within the project area, they all pose potential management problems for reclaimed areas. Annual weed species, such as summer cypress and Russian thistle, commonly occur as dominant species in localized areas during the first growing season following seeding. Mowing can be used to control these species. Once perennial grasses become established as a result of revegetation efforts, annual weed species usually begin to decline in numbers as a part of the overall revegetation plant community. Perennial weed species that occur on reclaimed areas are typically more persistent following revegetation and usually need to be controlled through the use of herbicides.

As part of a cooperative and integrated effort among Howell, the BLM, the local lessee, and Natrona County Weed and Pest (NCW&P), the NCW&P prepared a Noxious Weed Management Plan (NWMP) (Appendix B) to provide a comprehensive approach to control the spread of noxious weeds and other invasive species in Salt Creek Oil Field. The NWMP (BLM 2004) identified eight known plant species of Wyoming that are designated as noxious weeds and occurring within the Salt Creek project area boundaries. These species are listed and discussed below.

1. Russian knapweed is a perennial forb with a deep and spreading, black-sheathed root system. It occupies more acreage in the overall project than any other species, and should receive top priority due to its ubiquitous distribution in Salt Creek Oil Field and its ability to reproduce from the small root fragments resulting from cultivation and/or excavation. This species was the most common weed observed in the proposed Phases III/IV Project area in July 2005. It occurred most often in drainage bottoms and on stream terrace positions but could also be found in disturbed uplands typically exhibiting enhanced soil moisture regimes.

2. Salt cedar (*Tamarisk chirensis)* grows as a perennial, deciduous, large woody shrub or small tree. The main problem associated with this species is that each mature tree can draw from the water table, and transpire to the atmosphere, up to 200 gallons of water per day. It is ubiquitous along the Salt Creek channel in the project area.

3. Diffuse knapweed *(Acosta diffusa)* is a highly competitive, introduced, biennial plant that reproduces from seed. It can rapidly spread to form a dense monoculture enabling it to out-compete surrounding vegetation. This species was found along disturbed roadsides in limited portions of the project area. It was notably less common than Russian knapweed.

4. Spotted knapweed (*Acosta maculosa*) is similar to diffuse knapweed. Both plants are biennials, reproduce from prolific seed production, and are similar in appearance.

5. Scotch thistle is a biennial plant reproducing from seed. The plant can grow up to 8 feet tall in a large, multi stemmed stands. Each plant can produce up to 40,000 seeds that can remain viable for over 20 years in the soil. Large stands of scotch thistle are virtually impenetrable and these stands can exclude any wildlife or livestock from foraging in the area. Control is typically most successful when applied in the rosette stage. In July 2005, Scotch thistle was observed to be somewhat common within the Phases III/IV Project area boundaries in both multi-plant stands and as individual plants in widely spaced groupings over dispersed sites.

6. Leafy spurge (*Tithymalus esula*) is an extremely aggressive perennial from Asia with a deep root system, sometimes extending 17 feet into the soil. It reproduces from seed and by vegetative growth. Plants can spread by their roots at the rate of several feet per year. Leafy spurge not only out-competes surrounding vegetation for water and nutrients, but is allellopathic, capable of excluding the establishment of other plant species from the area surrounding it.

7. Field bindweed (*Convolvulus arvensis*) is a vine-like perennial from Europe that infests thousands of acres of land in North America. This plant reproduces from seed and spreading rootstock that can grow to a depth of 10 feet. It is a problem in croplands, borrow ditches, and waste areas. Mechanical control is ineffective as cultivation spreads the plant and mowing encourages growth. Chemical control can be effective if applied at the right time and is a persistent annual treatment until the infestation is controlled.

8. Canada thistle is a native of southeastern Eurasia. It is a colony-forming species that spreads from seed or deep root stocks and is difficult to control due to its ability to reproduce vegetatively.

In addition, summer cypress was commonly observed July 2005 along disturbed roadsides and in facility sites where revegetation had not been completed. Halogeton and Canada thistle also were observed onsite but appeared to be limited in extent.

3.8 Terrestrial Wildlife

Terrestrial wildlife resources commonly associated with the Salt Creek Basin and, more specifically, the proposed Phases III/IV Project are commensurate with the type of native habitat availability, relative carrying capacities of these habitats, and the degree of existing disturbance and activities from past development of Salt Creek Oil Field. As discussed in Section 3.7.1, vegetation occurring within and adjacent to the Phases III/IV Project can be classified into three general types, including upland communities, lowland communities, and riparian communities. The specific vegetation types and landscape units associated with these three communities comprise the primary habitats for terrestrial wildlife species in Salt Creek Oil Field; these types are delineated for the overall project area in Table 3-4. Of these vegetation types and communities associated with Phases III/IV, the riparian shrublands and adjacent riparian

grasslands (i.e., mesic habitats) occurring along Salt Creek provide some of the more valuable habitats for area wildlife, followed by the upland shrublands, grasslands, and rocky substrates. The wildlife species' diversity and abundance correlate directly with these habitat values, with the greatest number of animals typically associated with the riparian habitats and adjacent mesic grasslands. Historic oil exploration and development within Salt Creek Oil Field over the last 116 years has substantially modified the upland habitats and wildlife use by both resident and migratory species.

The following information is a summary of terrestrial wildlife resources expected to occur in and near the proposed Phases III/IV area, proposed Claim Jumper Switchyard, and associated power line corridors. More detailed information regarding wildlife resources associated with the entire Salt Creek Oil Field and surrounding region is presented in the Phase I EA (BLM 2003a).

Big game species that occur in the Phases III/IV Project area are limited to mule deer and pronghorn. Both are relatively common. No designated big game seasonal ranges (e.g., crucial winter range, fawning grounds) or key movement corridors intersect with the Phases III/IV boundaries or ancillary facilities (i.e., substation and power line ROWs). Mule deer occupy much of the upland habitats and also utilize the riparian corridor along Salt Creek. Browse for foraging and thermal protection in the winter (e.g., canopy cover or shallow canyons) are key to mule deer use and survival. Pronghorn are more closely associated with the upland grasslands and open, sagebrush steppe. Pronghorn behavior in Salt Creek Oil Field infers that some of the animals have habituated to increased human presence, noise, and habitat fragmentation associated with the ongoing oil extraction activity.

Two Wyoming Game and Fish Department (WGFD) big game herd units occur within the proposed project area, the North Natrona Mule Deer Herd Unit (#759) and North Natrona Pronghorn Antelope Herd Unit (#746). In accordance to the WGFD 2002 Job Completion Reports, mule deer within this herd unit are approximately 50% below objective. Factors cited as contributing to this decline are deteriorating habitat conditions due to an extended drought. The WGFD is currently evaluating altering the herd unit objective, as this herd has only been at or near objectives twice in the past 12 years. The North Natrona Pronghorn Antelope herd, on the other hand is, estimated to be approximately 16% above objective, although population simulations have fluctuated greatly over the past 12 years. However the perception of field personnel, landowners, and hunters is that the population has declined over the past 4 to 6 years.

Other representative mammals that occur in the Phases III/IV Project area include predators such as the coyote, bobcat, and red fox. These predators typically rely on medium- to small sized prey species, which include two cottontail rabbit species, white-tailed jackrabbit, deer mouse, other rodent species, and the black tailed prairie dog. Other than the prairie dog, which is discussed further in Section 3.10.2, these predator and prey species generally occupy the range of habitat types associated with Phases III/IV, extending from the upland rocky outcrops, shrublands, and open grasslands into the mesic interface between these upland areas and the Salt Creek drainage and the riparian corridor itself. Two mammals predominantly associated with the open water and riparian habitats along Salt Creek in the Phases III/IV area include muskrat and common raccoon. Since larger diameter trees and canopy cover are limited along this area of Salt Creek, beaver are limited, although muskrat occur in Salt Creek, as discussed in Section 3.9.

Resident and migratory bird species that occur or move through the project area are diverse, ranging from raptors, upland game birds, and passerines to waterfowl and other water birds. Generally, bird use is opportunistic in Salt Creek Oil Field, with individuals occupying areas that provide sufficient breeding, foraging, and roosting habitats. The overall number of birds, however, is expected to be lower in the field than in surrounding, undisturbed areas.

Raptors or birds or prey reported for the overall Salt Creek Oil Field include golden eagle, red tailed hawk, prairie falcon, American kestrel, great horned owl, burrowing owl, and northern harrier (Wildlife Consulting Services 2005a, 2005b). Other raptors that may occur in the project area would include the ferruginous hawk, Swainson's hawk, short-eared owl, barn owl, and turkey vulture. Two raptor surveys were conducted for Phases III and IV on April 18-19 and June 20-21, 2005, respectively (ENSR 2005a, 2005b). A third raptor survey was completed for the Salt Creek 3D Geophysical Project (Wildlife Consulting Services 2005a, 2005b). Table 3-5 summarizes the survey results applicable to the Phases III/IV area, and Figure 3-1 provides a general overview of these nest sites. The specific nest site locations have not been provided to protect the nests and their occupants. BLM surveys in spring of 2005 also documented a golden eagle nest site and a nearby smaller (tended) nest less than 0.25 mile north of the proposed Claim Jumper Switchyard in February 2005. These nest sites coincide with Nests #13 and #14, respectively, shown on Figure 3-1 and in Table 3-5 (Wildlife Consulting Services 2005a, 2005b).

The Phase I and Phase II EAs (BLM 2003a, 2004a) contain detailed information on other representative bird species documented for the project area, encompassing a number of passerines or songbirds and both waterfowl and water bird species associated with the Salt Creek drainage and adjacent riparian habitats.

Area amphibian and reptile species are typically associated with the different habitat types. Amphibians are limited to aquatic habitats, primarily along Salt Creek and its tributaries. Documented species include the Woodhouse's toad and chorus frog. Reptiles recorded include three species of snakes, including the wandering garter snake, bull snake, and prairie rattlesnake (BLM 2003a). Rattlesnakes and bull snakes tend to be wide ranging and may be found throughout the upland and riparian habitats. Garter snakes tend to be more prevalent in the riparian areas.

3.9 Aquatic Biology

The aquatic biology of the Salt Creek system is fully described in Section 3.3.2 of the Phase I EA (BLM 2003a). Additional information based on detailed analysis of aquatic biota, aquatic communities, and current conditions of the Salt Creek system also can be found in the Salt Creek UAA (RETEC 2004), and is briefly summarized here. Salt Creek maintains a diverse non-game fish community of nine species of primarily Cyprinid minnows, which collectively are tolerant ofthe periodic low flow, turbid, saline, and alkaline conditions in natural streams of the northern plains. A dam at the location of the former power plant several miles north of the project area is an effective fish migration barrier resulting in lower diversity in the project area upstream of the dam.

Table 3-5 Raptor Nest Locations Documented In and Near Proposed Action

Assigned Nest ID#[1]	Species	Approximate Location[2]	Nest Type and Substrate	Activity Status	Height Above Ground (ft)	Habitat	Comments	Sources
1 43	Unknown	Phase III area	Stick nest on cliff wall	Inactive	50	Sagebrush / Shortgrass Prairie	Nest in fair-poor condition.	Wildlife Consulting Services 2005a; ENSR 2005a
2 44	Red-tailed Hawk	Within 0.5-mile buffer north of Phase III	Stick nest on cliff wall	Active	50	Sagebrush / Shortgrass Prairie	3 adults present; female incubating; artificial nest platform near active cliff nest.	Wildlife Consulting Services 2005a; ENSR 2005a
3	Unknown	Within 0.5-mile buffer north of Phase III	Artificial Nest Structure (ANS)	Inactive	?	Sagebrush / Shortgrass Prairie	Active red-tailed hawk nest on cliff above ANS.	Wildlife Consulting Services 2005a; ENSR 2005a
45	Northern Harrier	Within 0.5-mile buffer north of Phase III	Not identified	Active	--	Riparian / Willow	Nest was not identified, but adult male observed; possible breeding territory.	ENSR 2005a
8 46	Red-tailed Hawk	Phase IV area	Stick nest on cliff wall	Active	40	Sagebrush / Shortgrass Prairie	2 adults present; female incubating in April; 1 nestling observed in June.	Wildlife Consulting Services 2005a; ENSR 2005b
9 47	Unknown	Phase IV area	Stick nest on cliff wall	Inactive	40	Sagebrush / Shortgrass Prairie		Wildlife Consulting Services 2005a; ENSR 2005b
48	Unknown	Within 0.5-mile of compressor station	Stick nest on top of hill	Inactive	0	Sagebrush / Shortgrass Prairie	Remnant nest; likely ferruginous hawk.	ENSR 2005b
49	Unknown	Within 0.5-mile of compressor station	Stick nest on top of hill	Inactive	0	Sagebrush / Shortgrass Prairie	Remnant nest; likely ferruginous hawk.	ENSR 2005b
11	Unknown	Within 0.5-mile of 34.5-kV distribution line	Stick nest on cliff/ledge	Inactive	?	Unknown		Wildlife Consulting Services 2005a
40	Northern harrier	Within 0.5-mile of 34.5-kV distribution line	?	Active	?	Unknown	Assuming ground nest or breeding adults present in riparian or willow habitats.	Wildlife Consulting Services 2005b
15	Unknown	Within 0.5-mile of 34.5-kV distribution line	Stick nest	Inactive	?	Badlands / bank		Wildlife Consulting Services 2005a

Table 3-5 Raptor Nest Locations Documented In and Near Proposed Action

Assigned Nest ID#[1]	Species	Approximate Location[2]	Nest Type and Substrate	Activity Status	Height Above Ground (ft)	Habitat	Comments	Sources
13	Red-tailed hawk/golden eagle	Approximately 150 yards north of substation and power line ROWs	Stick nest on ledge	Active; failed	25	Grassland / sagebrush	Signs of nest tending in February 2005, inferring golden eagle. Occupied by red-tailed hawk May 27; 1 egg observed June 3; nest abandoned.	Wildlife Consulting Services 2005a; BLM observations
14	Unknown	Approximately 150 yards north of substation and power line ROWs	Stick nest on ledge	Tended	20	Grassland / sagebrush	New nesting material observed in May/June 2005; nest site located ~40 feet south of nest #13.	Wildlife Consulting Services 2005a; BLM observations

[1]Assigned identification numbers correlate with Figure 3-2.

[2] Exact nest locations are not provided to protect the nest and its occupants.

Figure 3-1 Raptors 11x17

Aquatic animals such as muskrat are present in Salt Creek. A diverse benthic community is present, although higher diversity and abundance is found in the lower reaches of the creek (which are shallow, swift, and rocky) than in the reaches in the immediate Phases III/IV Project area, which are slower and deeper, with silty substrate. In summer this upper reach has abundant submerged macrophyte growth. Elevated temperatures in the reach near the discharge points result in ice-free conditions for much of the year.

The Salt Creek tributaries are ephemeral or intermittent water bodies, and generally lack permanent aquatic life. During flow periods, opportunistic species may use these streams, including fish such as the flathead chub (*Platygobio gracilis*), which specializes in spawning in small, ephemeral headwaters. In streams and draws receiving produced water discharges (such as lower Castle Creek) permanent aquatic life may be present, including aquatic insects and some benthic invertebrates.

In summary, current aquatic life in Salt Creek appears to be unimpaired and fairly diverse as noted in the Phase I EA and in the UAA. Continued existence of most if not all of this aquatic community is generally dependent on the perennial water provided by the produced water discharges.

3.10 Special Status Species

3.10.1 Plants

A total of eight plant species are considered to be of special interest within the proposed Phases III/IV Project area. These species include one endangered, two threatened, and five BLM sensitive species. Table 3-6, presents selected habitat characteristics for each of these species.

Colorado butterfly plant and Ute ladies'-tresses orchid are federally listed as threatened. These species are known to occur in extreme southeastern Wyoming. Blowout penstemon, federally listed as endangered, has been found in south-central Wyoming. None of these species is known to occur within Salt Creek Oil Field or surrounding areas, nor are they known to occur in Natrona County. No habitat suitable for these plant species was observed onsite during a July 2005 field reconnaissance survey. Wetland and adjacent upland transitional areas within the project area did not exhibit the suitable soil moisture regimes and appeared too saline to support the Colorado butterfly plant or the Ute ladies'-tresses orchid. Similarly, no sand dunes or blowout depressions were observed in the project area that could support blowout penstemon.

In addition to these federally threatened and endangered species, the BLM also maintains lists of sensitive plant species that are of particular interest because of their rarity. Of these listed species, five are known to occur in the Casper and Buffalo Field Office districts. These species include: Porter's sagebrush, Nelson's milkvetch, many-stemmed spider-flower, William's waferparsnip, and Laramie false sagebrush.

Nelson's milkvetch is the only species that may occur within the Phases III/IV Project area given its habitat requirements. It is known from several populations in Natrona County both east and west of Casper. However, none of the known populations occurs in the northeastern part of the county in the vicinity of Midwest and Edgerton. Appropriate habitat for this species includes

Table 3-6 Special Status Plant Species Summary

Species Name	Agency Listing[1]	Status[2]	Elevation Range (feet)	Habitat Characteristics/Comments	Habitat Observed in Project Area
Colorado butterfly plant *Guara neomexicana* ssp. *coloradensis*	USFWS	T	5,700 - 6,400	Subirrigated alluvial soils of drainage bottoms surrounded by mixed prairie, not known to occur in Natrona County	No
Blowout penstemon *Penstemon haydenii*	USFWS	E	NI[3]	Actively shifting sand dunes, blowout depressions; known from Ferris/Seminoe Mountains region; not known to occur in Natrona County.	No
Ute ladies'-tresses orchid *Spiranthes diluvialis*	USFWS	T	5,100 - 5,200	Moist streambanks, wet meadows, and abandoned stream channels; not known to occur in Natrona County.	No
Porter's sagebrush *Artemisia porteri*	BLM	S	5,300 - 6,500	Sparsely vegetated badlands of ashy or tufaceous mudstones and clay slopes; endemic to Wind River Basin, Fremont County.	No
Nelson's milkvetch *Astragalus nelsonianus*	BLM	S	5,200 – 7,600	Alkaline clay flats, shale bluffs and gullies, pebbly slopes, volcanic cinders in sparse vegetation.	Possible
Many-stemmed spider-flower *Cleome multicaulis*	BLM	S	5,900	Semi-moist, open, saline banks of shallow ponds and lakes with Baltic rush and bulrush.	No
William's waferparsnip *Cymopteris williamsii*	BLM	S	6,000-8,300	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; endemic to Bighorn Mountains.	No
Laramie false sagebrush *Sphaeromeria simplex*	BLM	S	7,500 – 8,600	Cushion plant communities on rocky limestone ridges and gentle slopes.	No

[1] USFWS = federally listed; BLM = sensitive species
[2] T = Federally listed as Threatened; E = federally listed as Endangered; S = BLM Sensitive species
[3] NI – No Information

Adapted from: Fertig 1994

alkaline clay flats, shale bluffs and gullies, pebbly slopes, volcanic cinders in sparse vegetation, and shadscale communities developing on marine shales. Marginal habitat occurs to a very limited extent within the Phases III/IV project area proper, but this species was not observed during the field reconnaissance. Habitat also may exist for this species across the shale bluffs located within or adjacent to the proposed power line ROWs and CO_2 trunk line, occurring outside the Phases III/IV boundaries.

No shallow ponds or lakes that would support the many-stemmed spider-flower are located within the project area. Porter's sagebrush and William's waferparsnip are both endemic to other areas in Wyoming, and no suitable habitat for these species was observed on site during the field reconnaissance. Laramie false sagebrush occurs at elevations higher than those within the project area. Further, no rocky limestone ridges suitable for supporting this species were observed within the project area boundaries.

3.10.2 Terrestrial Animals

The Phase I EA (BLM 2003a) outlined a number of special status species for the overall Salt Creek Basin. Subsequent site-specific field surveys were conducted in 2005 for both the Phases III and IV areas (ENSR 2005a, 2005b) and throughout Salt Creek Oil Field (Wildlife Consulting Services 2005a, 2005b, 2005c). Based on these data, the BLM initially identified 18 special status animal species for the proposed Phases III/IV EOR expansion project, encompassing 2 federally listed, 1 federal candidate, and 15 BLM sensitive species. Table 3-7 summaries these species, their associated status, habitats, potential to occur in the project area, and which species are analyzed in greater detail.

Of the two federally listed animal species identified for the project area, the bald eagle and black-footed ferret neither would likely occur in the proposed Phases III/IV Project area. The closest documented bald eagle winter roost is located along Pine Ridge, approximately 6 miles to the east of the project area. No suitable nesting, communal roost, or winter foraging areas for bald eagles occur in or near Phases III/IV or its ancillary facilities. Incidental bald eagle use of the Salt Creek corridor or nearby prairie dog colonies for foraging by individual eagles would be

expected to be sporadic and rare. The black-footed ferret is closely associated with active prairiedog colonies, their primary prey species. Although black-tailed prairie dogs have been documented in the project area, as discussed below, this area of Wyoming falls under the USFWS' black-footed ferret block clearance where no documentation of ferret presence or absence is currently required. Therefore, the black-footed ferret is not expected to occur in or near the project area.

Of the remaining 16 federal candidate or BLM sensitive animal species initially identified for the project area, 11 BLM sensitive species are analyzed in detail as part of this EA. Five species (boreal toad, northern leopard frog, American peregrine falcon, greater sage-grouse, and swift fox) were eliminated from detailed analysis, based on the lack of suitable habitat in the Proposed Action area or associated distribution and range information (see Table 3-7).

The two sensitive raptor species assessed for the Phases III/IV Project include the ferruginous hawk and western burrowing owl. Both species likely occur in and near the project area.

Table 3-7 Special Status Animal Species Examined for the Salt Creek Phases III/IV Project

Common Name	Scientific Name	Status[1]	Habitat Association and Distribution	Addressed in Detail in the EA	Potential to Occur in Project Area
Federally Listed Species					
Bald eagle	*Haliaeetus leucocephalus*	FT[2]	Typically breeds along reservoirs, lakes, and rivers, often using upland habitats for foraging. Winters near open water and in semideserts and grasslands, often associated with prairie dog colonies.	No	Low. No documented nests, communal winter roosts, or foraging areas in or near project area. Occasional individuals may move through the project area along Salt Creek and near active prairie dog colonies, but occurrence would be rare and sporadic.
Black-footed ferret	*Mustela nigripes*	FE	A prairie dog obligate, tied directly to prairie dog colonies. For black-tailed prairie dog, minimum colony size of 80 acres to support ferrets.	No	Low. However, project area falls under USFWS black-footed ferret block clearance; therefore, no presence/absence surveys are required. Additionally, existing prairie dog colonies are of insufficient size to support ferrets. The black-footed ferret is not expected to occur in or near the project area.
Federal Candidate Species					
Boreal toad	*Bufo boreas boreas*	C	Habitats include low elevation beaver ponds, reservoirs, streams, marshes, lake shores, potholes, wet meadows, and marshes, to high elevation ponds, fens, and tarns at or near tree line.	No	Low. Suitable habitat is limited to the Salt Creek drainage and isolated ponds and other open water areas. No drilling activities are proposed in or adjacent to these aquatic habitats.

Table 3-7 Special Status Animal Species Examined for the Salt Creek Phases III/IV Project

Common Name	Scientific Name	Status[1]	Habitat Association and Distribution	Addressed in Detail in the EA	Potential to Occur in Project Area
BLM Sensitive Species					
American peregrine falcon	*Falco peregrinus*	BLM	Typically breeds along high ridges and cliffs in foothills and mountainous areas. Eyries often located 400 feet or greater on cliff faces, overlooking rivers, lakes, wetlands, and wet meadows.	No	Low. No peregrine falcon nest sites have been documented. Habitat in project area and along Salt Creek is marginal for this species' foraging. Cliffs and rock outcrops are of limited height and not suitable for peregrine falcon nesting.
Ferruginous hawk	*Buteo regalis*	BLM	Occurs in open, semi-arid basin-prairies, foothills, badlands, and grasslands. Nest sites include trees, ledges, rock outcrops, and the ground on knolls or hills. Tree nests often occur on the pinyon-juniper woodland interface with sagebrush basins.	Yes	Moderate. Habitat is suitable for this species. Although no active ferruginous hawk nest sites were documented, two inactive nests sites (UNK-06-N and UNK-07-N) appear to be constructed by this species. Potential presence would be rare, but feasible.
Western burrowing owl	*Athene cunicularia hypugea*	BLM	Typically nests in open, grasslands, shrublands, and some woodland communities. Often occupies burrows of prairie dogs, ground squirrels, foxes, and badgers.	Yes	Moderate. Two active nest sites documented approximately 4 miles south of Phase IV area; individuals may breed in portions of the project area.

Table 3-7 Special Status Animal Species Examined for the Salt Creek Phases III/IV Project

Common Name	Scientific Name	Status[1]	Habitat Association and Distribution	Addressed in Detail in the EA	Potential to Occur in Project Area
BLM Sensitive Species					
Greater sage-grouse	*Centrocercus urophasianus*	BLM	A sagebrush obligate with lek sites typically located along ridges, open areas, and plateaus. Nesting habitat includes sagebrush with adequate canopy cover and shrub density. Brooding habitat includes wet meadows and mesic areas adjacent to riparian streams. Winter range requires adequate sagebrush cover and linkage corridors.	No	Low. Although sage-grouse occur in the project region, the sagebrush habitat located in and adjacent to the Phases III/IV area is limited in extent, canopy cover, and density to support breeding adults. Existing habitat fragmentation in the area also restricts grouse use and movement, particularly for breeding and wintering. The greater sage-grouse is not expected to occur in the immediate project area.
Sage thrasher	*Oreoscoptes montanus*	BLM	Breeds in sagebrush shrublands and occasionally in other shrublands or cholla grasslands. During migration and winter, occupies open agricultural areas, pastures, grasslands, shrublands, open riparian areas, and pinyon-juniper woodlands.	Yes	Documented. Species' presence and possible breeding recorded in or near the project area.
Brewer's sparrow	*Spizella breweri*	BLM	Breeds and forages primarily in sagebrush communities, but occasionally in other shrubland types. During migration, occupies woody, brushy, and weedy riparian, agricultural, and urban areas.	Yes	Documented. Species' presence and possible breeding recorded in or near the project area, in conjunction with sage thrasher records.

Table 3-7 Special Status Animal Species Examined for the Salt Creek Phases III/IV Project

Common Name	Scientific Name	Status[1]	Habitat Association and Distribution	Addressed in Detail in the EA	Potential to Occur in Project Area
BLM Sensitive Species					
Sage sparrow	*Amphispiza belli*	BLM	Breeds in sagebrush shrublands; also occupies grasslands and other shrubland communities during migration.	Yes	Documented. Species' presence and possible breeding recorded in or near the project area; observations made in 1987 and 1989.
Loggerhead shrike	*Lanius ludovicianus*	BLM	Typically inhabits grasslands, semi-desert shrublands, agricultural areas, and riparian zones. Nests usually in isolated trees or large shrubs.	Yes	Moderate. This species could breed within suitable shrubland and riparian habitats in the project area.
Mountain plover	*Charadrius montanus*	BLM	Inhabits flat, shortgrass prairie often with surface disturbance, livestock grazing, and prairie dog colonies.	Yes	Moderate. Potentially suitable habitat has been delineated in and near the project area.
Black-tailed prairie dog	*Cynomys ludovicianus*	C	Forms colonies of varying size in shortgrass or mixed-grass prairie, digging complex burrow systems.	Yes	Documented. Colonies occur in and near the project area.
Swift fox	*Vulpes velox*	BLM	Typically occupies short-, mid-, and mixed-grass prairies with flat to gently rolling topography. Den sites provide good visual coverage of surrounding area and may coincide with prairie dog colonies.	No	Low. Project area occurs on the periphery of this species range and habitat is not optimal. Additionally, with the extent of historic activity in Salt Creek Oil Field, potential presence of breeding swift fox would be low.

Table 3-7 Special Status Animal Species Examined for the Salt Creek Phases III/IV Project					
Common Name	**Scientific Name**	**Status[1]**	**Habitat Association and Distribution**	**Addressed in Detail in the EA**	**Potential to Occur in Project Area**
BLM Sensitive Species					
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM	Inhabits dry, coniferous forests, juniper woodlands, deciduous forests, basins, desert shrublands, and grasslands. Roosts are critical to this species, typically requiring underground caverns (e.g., caves and abandoned mines) with stable temperatures and air supply. Roosting in rock outcrops and buildings would be individually dispersed.	Yes	Low. Unlike the myotis, this bat species requires very specific underground features and temperature regimes, particularly for hibernacula and maternity colonies. No communal roosts have been documented in project area, and occurrence would be expected to be low or sporadic.
Fringed myotis	*Myotis thysanodes*	BLM	Primarily inhabits coniferous forests, woodland-chaparral, and basin-prairie shrublands. Roosts include caves, abandoned mines, rock crevices, and buildings.	Yes	Low. This species could potentially occur in the project area; however, no known hibernacula, maternity colonies, or bachelor roosts. Potentially roost sites in rocky outcrops or structures would likely be dispersed.
Long-eared myotis	*Myotis evotis*	BLM	Inhabits basin-prairie and riparian shrublands, grasslands, barren areas, cliffs, and rock outcrops. Roosts primarily include structures (buildings and bridges) and occasionally in mines and caves.	Yes	Low. This species could potentially occur in the project area; however, no known hibernacula, maternity colonies, or bachelor roosts. Potentially roost sites in structures would be dispersed or sporadic.

Table 3-7 Special Status Animal Species Examined for the Salt Creek Phases III/IV Project

Common Name	Scientific Name	Status[1]	Habitat Association and Distribution	Addressed in Detail in the EA	Potential to Occur in Project Area
BLM Sensitive Species					
Northern leopard frog	*Rana pipiens*	BLM	Inhabits ponds, lakes, reservoirs, streams, irrigation ditches, and marshes.	No	Low. Suitable habitat is limited to the Salt Creek drainage and isolated ponds and other open water areas. No drilling activities are proposed in or adjacent to these aquatic habitats.

Sources: Fitzgerald et al. 1994; WGFD 2004; WyGISC 2002; Terres 1991; Andrews and Righter 1992; ENSR 2005a, 2005b; Wildlife Consulting Services 2005a, 2005b, 2005c; BLM 2005.

[1]Status:

FE = Federally listed as endangered
FT = Federally listed as threatened
FC = Federal candidate species
BLM = BLM Sensitive Species

[2]The bald eagle is proposed for delisting; the final decision is pending.

Although no active ferruginous hawk nests were documented during the 2005 field surveys in Phases III/IV (ENSR 2005a, 2005b) and Salt Creek Oil Field (Wildlife Consulting Services 2005a, 2005b), habitat in the area is suitable to support breeding and foraging birds. The appearance of two inactive nests sites (#48 and #49) documented June 2005 (Figure 3-1, Table 3-5, and Table 3-7) infer they may have been previously constructed by ferruginous hawks. Both were composed of large diameter sticks placed on the ground on the edge of a rock outcrop or cliff edge overlooking the basin below, which is classic nest construction for ferruginous hawks. The similarity of appearance and the close proximity of these two nests to each other also infer they could have been constructed by the same breeding pair as alternate nest sites within the same territory. However, both nest sites were not intact and age of initial construction could not be determined.

The burrowing owl has been documented nesting in the project region (Wildlife Consulting Services 2005a, 2005b). Three active burrowing owl nests were documented during these two field survey periods. One occurs approximately 2 miles north of the Phase III area; the other two nest sites are located in the Southern Unit, approximately 4 miles south of Phase IV (see Figure 3-1). No breeding burrowing owls were documented in or adjacent to the proposed Phases III/IV area or near the proposed Claim Jumper Switchyard, 230-kV transmission line ROWs, or 34.5-kV distribution line alignment.

Four BLM sensitive passerines or songbirds were identified for the proposed project, including the sage thrasher, Brewer's sparrow, sage sparrow, and loggerhead shrike. The sage thrasher, Brewer's sparrow, and sage sparrow are closely associated with sagebrush communities, particularly during the breeding season. All three of these bird species have been documented in the project region (BLM 2005) and may occur within suitable habitats in and near the Phases III/IV area. The loggerhead shrike typically occurs in more open grasslands and sagebrush steppe with scattered shrubs and small trees. It has been documented in the project region, specifically in greasewood communities (BLM 2005).

The mountain plover is closely associated with shortgrass prairie, disturbed areas, and prairie dog colonies. This bird species returns to Wyoming to breed between March and August. Surveys for potentially suitable habitat were conducted in and adjacent to the Phases III/IV Project area in 2005 (ENSR 2005a, 2005b; Wildlife Consulting Services 2005c). Suitable plover habitat relative to the Proposed Action and recorded during these surveys is shown on Figure 3-2.

Active black-tailed prairie dog colonies also were delineated during the 2005 field surveys in Phases III/IV and the surrounding areas (ENSR 2005a, 2005b; Wildlife Consulting Services 2005c). Table 3-8 lists the colonies recorded within 0.5 mile of the Proposed Action project components, which also are shown on Figure 3-3. No white-tailed prairie dogs occur in the area. A range of estimated colony size is provided in Table 3-8, based on the results from the two separate field programs completed for the project area (ENSR 2005a, 2005b; Wildlife Consulting Services 2005c).

Three bat species were identified for the proposed project area, including the Townsend's big-eared bat, fringed myotis, and long eared myotis. As summarized in Table 3-7, these bats can

occupy a variety of habitat types. However, particularly for the Townsend's big eared bat, underground features (e.g., mines, caves) and stable temperature regimes are critical for this bat species. No known winter hibernacula, maternity colonies, or bachelor roosts for either of these three bat species have been documented in or near the project area, and the potential for a feature of this nature would be low. Individual bats may day-roost under appropriate vegetative cover, in rocky crevices, and in buildings, but roosting would be anticipated to be sporadic and dispersed through the area.

Table 3-8 Black-tailed Prairie Dog Colonies Located In and Near Phases III/IV Area

Acres (Ranges[1])	Location	Density
205.8	Within 0.5 mile southeast of Phase IV	Unknown
43-53	Intersects corners of Phase III and Phase IV	High
36-53	Phase IV area	Moderate
22-28	Phase IV area	Moderate
15.89	Within 0.5 mile south of Phase IV	Moderate to High
2-3	Within 0.5 mile south of Phase IV	Moderate
1.4	Within 0.5 mile south of Phase IV	Unknown
1.1	Within 0.5 mile south of Phase IV	Unknown
1.09	Within 0.5 mile south of Phase IV	Low

[1]Ranges provided from two study sources; exact acreage recording from one source.
Sources: ENSR 2005a, 2005b; Wildlife Consulting Services 2005c.

3.10.3 Aquatic Species

A review of federal and state documentation conducted for the Salt Creek UAA (RETEC 2004) did not identify any special status aquatic species likely to be specifically present in Salt Creek or its tributaries. However, two species of fish are listed for the Powder River downstream of the confluence with Salt Creek. These species include the sturgeon chub, (*Macrhybopsis gelida*) listed as Native Species Status (NSS) Class 1 by the WGFD, although USFWS has issued a Resolved Taxon decision on April 12, 2001 denying a petition for to federally list this species (USFWS 2004). Class 1 species are of the highest conservation priority on the state sensitive species list due to possibility of extirpation from habitat loss. The second species is the shovelnose sturgeon (*Scapirhynchus platorhynchus*), also NSS Class 1, a big-river fish present in the Mississippi-Missouri drainage, which may inhabit the northernmost portion of Powder River. Neither of these species is present or expected to occur in the project area.

3.11 Cultural Resources

The Salt Creek Phase I EA (BLM 2003a) outlined a number of cultural resource inventories conducted in Salt Creek Oil Field that also have been confirmed by a recent Class I file search of the databases of the Wyoming Cultural Records Office and BLM Casper Field Office. In the project area, the earliest of these occurred in 1978 and included Class I, II, and III studies that do not meet current state and federal standards. Other studies conducted more recently were primarily related to oil field development and are mostly Class III (100% ground

Figure 3-2 Plovers 11x17

Figure 3-3 Prairie Dogs 11x17

coverage) surveys for pipelines, access roads, and well pads. The most comprehensive was a reinventory study of Salt Creek Oil Field that focused on prehistoric archaeological resources

(Berrigan 1990). In conjunction with the foregoing, Rosenberg (1988) wrote a detailed historical overview of the proposed Salt Creek Oil Field District where oil has been in relatively continuous production since the 1880s. In June of 2005, a Class III archaeological survey also was conducted within the north half of Salt Creek Oil Field for a 3D vibroseis geophysical project (Kail 2005). No new cultural resource sites were found. The study encompassed the entire Proposed Action, including the project's ancillary facilities. An environmental assessment for the project was completed prior to the Class III inventory (BLM 2005).

For over 100 years much of Salt Creek Oil Field has sustained surface disturbance that has removed the contextual integrity of existing cultural resources on or near the ground surface and, thus, future archaeological surveys in these areas were deemed unnecessary. This decision became official in 1988 when the BLM and State Historic Preservation Office (SHPO) entered into an agreement that delineated the boundaries of a Salt Creek Oil Field cultural resources exclusion zone (Figure 3-4). The Salt Creek Phase I EA references Berrigan (1990) for the exclusion boundaries and notes that Berrigan refers to the exclusion zone as "not inventoried" areas (BLM 2003a).

The Class I investigations for those portions of the study area associated with the proposed Phases III/IV project and located outside the exclusion zone have resulted in the identification of 13 prehistoric and 5 historic known cultural resource sites (Table 3-9). The Salt Creek Oil Field itself (48NA296) is officially eligible to the National Register of Historic Places

(NRHP) and has been nominated for consideration as a historic district. Rosenberg (1988) reports four former oil field camps associated with the development of Salt Creek Oil Field in the 1910s and 1920s are located within the current project study area. These camps were named Kittleson, Riverside Auxiliary 30, Skinnerville, and Sunnyside; however, apparently little material evidence of these camps remain (Rosenberg 1988). They appear not to have been evaluated separately from the proposed district and were not assigned individual Smithsonian site numbers. There is limited evidence in the SHPO records suggesting they may be part of the non-contiguous Teapot-Salt Creek District (48NA273). They are included on a map of the district that appears with a partial undated NRHP nomination form; however, SHPO records indicate that the NRHP status of this district is unknown. Of further note is the Edgerton Cemetery, also associated with oil field history, which is located in the Phase III area (Rosenberg 1988). Although cemeteries are not generally considered eligible to the NRHP, because the Edgerton Cemetery is within the nominated Salt Creek Oil Field District, Rosenberg (1988) recommended it be viewed as a contributing element. It also is noted that the route of the Salt Creek variant of the Bozeman Trail (48NA3024) traverses the study area, but no physical evidence of the trail has been identified and documented (Kail 2005). Lastly, it should be noted that 11 of the prehistoric sites remain unevaluated. Most have experienced severe levels of surface disturbance, but the recorders report that there is potential for subsurface remains at some of these sites.

Figure 3-4 Cultural 11x17

Table 3-9 Previously Recorded Cultural Resource Sites in the Phases III/IV Project Area

Site Number	Description	NRHP Status[1]	Comments
48NA231	Prehistoric; Hearth	-	Destroyed
48NA273	Historic Teapot-Salt Creek District	U	Non-contiguous boundaries, portions of which may or may not fall within the present project area.
48NA296	Historic; Salt Creek Oil Field	OE	Nominated to the NRHP as a historic district.
48NA1736	Prehistoric; Lithic Scatter and Features	U	Part of the Midwest Site Complex. Recorded and subjected to limited testing in 1988. Stratigraphic profiles suggest potential for subsurface archaeological remains.
48NA1737	Prehistoric; Lithic Scatter	U	Part of the Midwest Site Complex. In 1988 it was recorded and subjected to limited testing that produced negative results for subsurface materials.
48NA1739	Prehistoric; Lithic Scatter	U	Recorded in 1988, the site form notes that the surface assemblage is sparse and heavily disturbed. However, positive shovel tests suggest potential for subsurface cultural remains.
48NA1740	Prehistoric; Lithic Scatter	U	Part of the Edgerton Site Complex. Recorded in 1988, the surface assemblage is reported to be sparse and heavily disturbed. However, its proximity to other Edgerton sites suggests potential for subsurface cultural remains.
48NA1744	Prehistoric; Lithic Scatter	U	Part of the Edgerton Site Complex. Recorded in 1988, the surface assemblage is reported to be sparse and heavily disturbed. However, its proximity to other Edgerton sites suggests potential for subsurface cultural remains.
48NA1745	Prehistoric; Lithic Scatter	U	Part of the Edgerton Site Complex. Recorded in 1988, the surface assemblage is reported to be sparse and heavily disturbed. However, its proximity to other Edgerton sites suggests potential for subsurface cultural remains.

Table 3-9 Previously Recorded Cultural Resource Sites in the Phases III/IV Project Area

Site Number	Description	NRHP Status[1]	Comments
48NA1746	Prehistoric; Lithic Scatter	U	Part of the Midwest Site Complex. Recorded in 1988, the site form states that the surface assemblage is heavily disturbed, but suggests that undisturbed subsurface cultural remains may be present.
48NA1747	Prehistoric; Lithic Scatter	FNE	Recorded in 1988, the site appears to have been briefly occupied and thus there is minimal potential for subsurface remains.
48NA1748	Prehistoric; Lithic Scatter	U	Recorded in 1988, the site form reports that it has been adversely affected at the surface by oil field activities, but has the potential to yield subsurface cultural materials.
48NA1749	Prehistoric; Lithic Scatter	U	Recorded and subjected to limited testing in 1988, the site surface is heavily disturbed, but potential exists for the presence of subsurface cultural remains.
48NA1759	Prehistoric; Artifacts and Features	U	The site surface is heavily disturbed due to oil field activities. However, a partially buried stone feature suggests subsurface potential.
48NA3024	Historic; Bozeman Trail	U	The portion of the trail that traverses the project area is the westernmost Salt Creek route that is the first of several variants. The route is reported in the literature, but no physical evidence of the trail has been identified on the ground in this area by previous investigators.
48NA3072	Historic; Highway Bridge	-	Destroyed and replaced.
48NA3377	Historic; Building	ONE	Located in Edgerton.

[1]FNE=Field Not Eligible; OE=Officially Eligible; ONE=Officially Not Eligible; U=Unevaluated/Unknown

3.12 Range Management and Grazing Resources

The Proposed Action falls in portions of one BLM grazing allotment, the Davis Allotment (#10039). Although much of the surface in the Phases III/IV Project area is public, portions are leased by one lessee for livestock grazing. The total Davis Allotment has an estimated capacity of 5,160 animal unit months (AUMs), 3,044 of which are on public (BLM) lands. The 3,044 public AUMs on the Davis Allotment represent approximately two-thirds of the lessee's public AUMs on four allotments, and approximately one-third of the lessee's total public and private AUMs associated with the four allotments.

The number of acres required per AUM varies across the Phases III/IV area, depending on the forage productivity, which is largely a function of soil type and precipitation. The productivity was estimated based primarily on Ecological Site Description (ESD) and NRCS Soil Map Unit Description information. The Phases III/IV area is generally in transition between the 10- to 14-inch Northern Plains precipitation zone and the 10- to 14-inch High Plains SE precipitation zone (Jelden 2005; Bainter 2005).

Based on the soil series that comprise the NRCS map units and the carrying capacity values in the ESD for each respective soil series, the "high" and "low" values for acres per AUM were determined based on the anticipated mid-range production plant community. It was assumed that no site was in the Historic Climax Plant Community, which had the highest carrying capacity listed in each ESD, based on the level of historical disturbances in this area. In addition, no map unit was considered to be on the lowest end of the carrying capacity scale. A range was approximated based on the extent of acreage within a given soil map unit. A simple arithmetic average of the range was used to calculate the "Approximate Average Acres per AUM." The soil map unit acreage was divided by this approximate average to get the number of AUMs per Soil Map Unit. Carrying capacity (AUM/acre) was converted to acres per AUM for purposes of presentation in this section.

Table 3-10 lists the number of acres/AUM by soils series within soil map units found in the Phases III/IV area.

Table 3-10 Acres per AUM by Soil Series for the Phases III/IV Project Area

Map Unit #	Soil Series	Map Unit %	ESD	Acres/AUM	Average Acres/AUM	Weighted Acres/AUM by % of Map Unit
112	Arvada	35	Clayey	3.33-5.00	4.17	1.46
	Absted	30	Loamy	3.33-10.00	6.67	2.00
	Slickspots	15	N/A	N/A	0.00	0.00
	Inclusions:	20				
	Keyner		Loamy	3.33-10.00	6.67	
	Silhouette		Clayey	3.33-5.00	4.17	
	Cadoma		Clayey	3.33-5.00	4.17	
	Orella		Clayey	3.33-5.00	4.17	
	Inclusion Avg.				4.80	0.96
	Map Unit Total					**4.42**

Table 3-10 Acres per AUM by Soil Series for the Phases III/IV Project Area

Map Unit #	Soil Series	Map Unit %	ESD	Acres/AUM	Average Acres/AUM	Weighted Acres/AUM by % of Map Unit
125	Blackdraw	45	Saline Upland	6.67-20.00	14.01	6.30
	Lolite	20	Shale	8.33-20.00	14.17	2.83
	Gullied Land	20	N/A	N/A	0.00	0.00
	Inclusions:					
	Amodac		Loamy	3.33-10.00	6.67	
	Razsun		Clayey	3.33-5.00	4.17	
	Samday		Shale	8.33-20.00	14.17	
	Silhouette		Clayey	3.33-5.00	4.17	
	Inclusion Avg.				7.30	1.46
	Map Unit Total					**10.59**
134	Bowbac	40	Loamy	3.33-10.00	6.67	2.67
	Taluce	25	Shallow Sandy	5.88-10.00	7.94	2.65
	Terro	15	Sandy	3.03-5.00	4.02	0.60
	Inclusions:	20				
	Hiland		Loamy	3.33-10.00	6.67	
	Shallow Sodic		Clayey	3.33-5.00	4.17	
	Shallow Gravelly		Shallow Loamy	5.88-10.00	7.94	
	Rock Outcrop		N/A	N/A	0.00	
	Inclusion Avg.				4.70	0.94
	Map Unit Total					**6.86**
140	Cadoma	40	Clayey	3.33-5.00	4.17	1.67
	Renohill	25	Clayey	3.33-5.00	4.17	1.04
	Samday	25	Shale	8.33-20.00	14.17	3.54
	Inclusions:	10				
	Silhouette		Clayey	3.33-5.00	4.17	
	Gullied Land		N/A	N/A	0.00	
	Inclusion Avg.				2.09	0.21
	Map Unit Total					**6.46**
195	Haverdad	45	Saline Lowland	2.50-6.67	4.59	2.07
	Clarkelen	35	Saline Lowland	2.50-6.67	4.59	1.61
	Inclusions:	20				
	Draknab		Lowland	2.00-4.00	3.00	
	Petrie		Saline Upland	6.67-20.00	14.01	
	Aquic Ustifluvents		N/A	N/A	0.00	
	Inclusion Avg.				5.67	1.13
	Map Unit Total					**4.81**
275	Shingle	30	Shallow	5.88-10.00	7.94	2.38

Table 3-10 Acres per AUM by Soil Series for the Phases III/IV Project Area

Map Unit #	Soil Series	Map Unit %	ESD	Acres/AUM	Average Acres/AUM	Weighted Acres/AUM by % of Map Unit
			Loamy			
	Taluce	25	Shallow Sandy	5.88-10.00	7.94	1.99
	Rock Outcrop	25	N/A	N/A	0.00	0.00
	Inclusions:	25				
	Kishona		Loamy	3.33-10.00	6.67	
	Orella		Clayey	3.33-5.00	4.17	
	Theedle		Loamy	3.33-10.00	6.67	
	Worf		Shallow Sandy	5.88-10.00	7.94	
	Gateridge		Shallow Loamy	5.88-10.00	7.94	
	Taluce Variant		Shallow Sandy	5.88-10.00	7.94	
	Inclusion Avg.				6.89	1.72
	Map Unit Total					**6.09**

In the Phases III/IV project area, the number of acres required per AUM varies from 4.4 to 10.6, but averages approximately 5.4 acres per AUM (Table 3-11). At this stocking rate, previous disturbance of approximately 356 acres of the project area, due to more then 100 years of oil field development, has reduced the stocking capacity of the Davis Allotment by approximately 66 AUMs, which will continue until reclamation is accomplished.

Range improvements in the project area include pasture fences and stock reservoirs. Currently, cattle are fenced out of the LACT facilities, but individual wells are not fenced.

Table 3-11 Average Acres per AUM by Soil Map Unit for Phases III/IV Project

Soil Map Unit	Weighted Average (acres/AUM)	Soil Map Unit (acres)	Number of AUMs/Soil Map Unit
112	4.42	753	170
125	10.59	119	11
134	6.86	417	61
140	6.46	153	24
195	4.81	160	33
275	6.09	112	18
Totals		1714	317
Average	5.4		

3.13 Land Use

Most of the surface and the minerals in Salt Creek Oil Field are publicly owned and administered by the BLM. There are a few exceptions, including a section where the state owns both surface and mineral rights (T40N, R79W, S36) and several smaller areas where either the surface or both

the surface and minerals are privately owned. Midwest is privately owned and was developed as a company town, but subsequently sold to the residents. Surface rights in Edgerton are private, but the oil and gas rights are owned by the federal government and administered by the BLM. Within the Phases III/IV boundaries, there are two small areas with both surface and minerals privately owned (T40N, R79W, SW¼ S13 and T40N, R79W, E½ S25), and two with private surface ownership but federal mineral ownership (T40N, R79W, SE¼ S24 and T40N, R78W, SE¼ S19).

The current land use in the project area includes oil and gas production, wildlife habitat, domestic livestock grazing, and some recreation. Midwest and Edgerton are primarily residential with some supporting commercial activities.

Section 3.12, Range Management and Grazing Resources, details the BLM grazing allotment and livestock use for the Phases III/IV area. One party leases portions of Phases III/IV Project area for livestock grazing, with the 3,044 public AUMs on the Davis Allotment representing approximately two-thirds of the lessee's public AUMs on four allotments, and approximately one-third of his total public and private AUMs associated with the four allotments.

3.14 Socioeconomics

The Social Environment section addresses social and economic values in the vicinity of the project area, including population, employment, economic effects, and community resources such as housing, and community facilities and services. These topics have been described in greater detail in Section 3.4 of the Phase I EA (BLM 2003a). Factors that are particularly relevant to the Proposed Action (Phases III/IV EOR expansion) or that have changed notably since publication of the Phase I EA are discussed accordingly.

3.14.1 Population

The nearest communities to the Phases III/IV Project area are Midwest and Edgerton (see Figure 2-1). Both communities are now significantly smaller than they were when the Salt Creek Oil Field was at its peak in the first half of the 20th century. Both communities lost population from 1990 to 2000. Midwest, including the Gas Plant Camp, dropped from 636 people to 408 in that decade; Edgerton declined from 510 to just 169 residents (U.S. Census 1990 and 2000). Together they have lost half their combined populations; however, since 2000, they have experienced modest growth and the 2004 combined population was estimated at 600 people (U.S. Bureau of the Census 2005). Casper, the nearest city to the project area, had an estimated 2004 population of 51,240, which was almost exactly the same as its 1990 population after a slight drop in 2000 (U.S. Bureau of the Census 2005). Casper is located approximately 40 miles south of the project area. Casper, with its suburbs, and Midwest and Edgerton make up nearly 83 percent of the total Natrona County population, which was estimated at 69,010 for 2004 (U.S. Bureau of the Census 2005).

Demographically, Natrona County is generally similar to the state as a whole. The county's age profile is virtually the same as the state's with very slightly higher percentages of persons under 20 and over 65. Racially and ethnically, Natrona County is 96.1 percent white compared with 94.7 percent white for Wyoming. Both the county and the state have 0.9 percent blacks; Natrona

County has lower percentages of every other census tabulated race or ethnic category (WES 2005).

3.14.2 Employment and Income

Natrona County's non-agricultural employment increased to approximately 35,900 jobs in 2004 (Wyoming Department of Employment [WDOE] 2005a), an increase of 7.2 percent from the 33,500 jobs reported for 2002 (BLM 2003a). Natrona County has higher percentages of employment than the state in several sectors, including natural resources and mining (which includes oil and gas development), and manufacturing. Statewide, the percentages of government employment and leisure and hospitality services employment, in particular, are higher than the county's.

The labor force in Natrona County was estimated at 41,185 for April 2005, which would represent a 16.9 percent increase over the 2002 annual figure reported in the Phase I EA (BLM 2003a). Although the April 2005 figure is not directly comparable to the 2002 annual figure, it gives an indication of the growth that has occurred. The April 2005 unemployment rate was estimated at just 3.3 percent for Natrona County, compared with 3.8 percent for Wyoming and 4.9 percent for the U.S. (not seasonally adjusted) (WDOE 2005b). Updated labor force and unemployment estimates for Midwest and Edgerton are not available.

There are currently 69 Howell employees at the Salt Creek Oil Field, plus approximately 22 contractor personnel on long-term contracts. Operations at the oil field also utilize the services of 22 local contract companies for various purposes on an as-needed basis. Howell also employs 12 people at its Casper office. Nearly all of these workers reside in Midwest, Edgerton, or the Casper area.

The Department of Housing and Urban Development (HUD) estimated the 2005 median family income was higher for Natrona County ($55,900) than for Wyoming as a whole ($55,250) (WES 2005). These numbers aren't directly comparable to the "household" income cited in the Phase I EA (BLM 2003a), but they do indicate that incomes in the county are rising. Although data aren't available separately for Midwest and Edgerton, it is assumed, based on the disparity reported in the Phase I EA that the localized average income levels remain below the county level by as much as 15 to 20 percent.

3.14.3 Economy

As indicated in the Phase I EA (BLM 2003a), Natrona County's economy exhibits a significant degree of diversity. Oil and gas development and production are important to the county's economy, and are especially so in the Midwest-Edgerton area, which effectively originated because of Salt Creek Oil Field. The communities continue to rely on the oil field for their economic existence today. Salt Creek Oil Field is the largest producing field in Natrona County, producing 1,762,994 barrels of oil and 790,523 mcf of gas in 2004 (WOGCC 2005). Oil production from the field represented 55 percent of Natrona County's total and was 10 times the production of the second largest field in the county (WOGCC 2005; Hoffman 2004).

In addition to the jobs provided by oil and gas, the communities receive tax revenues from oil and gas severance taxes and from sales and use taxes generated by purchases in the oil fields and

spending by workers for goods. Oil and gas producers pay ad valorem taxes on equipment and production. They also pay royalties on production from state and federal leases at 16.67 percent and 12.5 percent, respectively. Half of the federal lease payments are passed on to the state.

The severance tax rate for oil and gas is 6.0 percent, of which 0.25 percent is distributed to counties and 0.75 percent is distributed to cities and towns, based on population. The remaining 5.0 percent is committed to various state funds and accounts. Tertiary projects are taxed at 4.0 percent rather than 6.0 percent. The Oil and Gas Conservation mill levy is now 0.02 percent, down from the 0.06 percent reported in the Phase I EA (WOGCC 2005). The average property tax rate in Natrona County is 7.95 percent; the assessment rate is 9.5 percent of fair market value, so the average tax is 0.76 percent of actual value per year (Wyoming Department of Revenue [WDOR] 2005).

Howell, as owner and operator of Salt Creek Oil Field, paid approximately $424,000 in 2004 severance taxes and $712,000 in ad valorem property taxes plus an unquantified amount of sales taxes on in-state purchases and use taxes on materials purchased elsewhere for use in Wyoming.

3.14.4 Infrastructure

The Phase I EA (BLM 2003a), quoting the 2000 census, reported 29,882 housing units in Natrona County in 2000, including 229 in Midwest and 122 in Edgerton. An additional 898 units received building permits from 2000 through 2004, 814 of which were single-family units and 84 of which were multi-family units (WES 2005). The number of new units, if any, in Midwest and Edgerton is not known, although 13 homes were reported to have been built in the 2 communities between 1990 and 2003 (BLM 2003a). At the time of the 2000 census, the rental vacancy rate in Natrona County was reported as 8.4 percent, which is fairly high. The rental vacancy rate in December 2004 had dropped to 2.8 percent, which would indicate a tight rental market (WES 2005). There are at least 29 motels in the Casper area, however, with approximately 2,000 rooms; several of these have weekly rates for longer stays (Casper, Wyoming Convention and Visitors Bureau [CCVB] 2005). There also are a half-dozen commercial campgrounds with approximately 200 spaces plus BLM and county park campgrounds (CCVB 2005).

The project area is served by the Natrona County School District, which has 5 senior high schools, 8 junior high and middle schools, 27 elementary schools, and 4 rural schools. Midwest Elementary School, with an enrollment of approximately 66 students, and Midwest Junior/Senior High School, enrolling 130 students, are both located in Midwest (Natrona County School District [NCSD] 2005).

The nearest full service medical facility to the project site is the Wyoming Medical Center, a 282-bed acute care regional medical center in Casper, 40 miles south of the project area. The center is a non-profit corporation. Physicians and midlevel practitioners in 45 different specialties provide care (3R Net 2005). First response emergency services are provided in the immediate project area by the all-volunteer (SCES). Several Howell personnel are qualified Emergency Medical Technicians and are volunteers with the organization.

SCES also provides fire protection in the Midwest-Edgerton area, with support from the professionally staffed Natrona County Fire Protection District. The Natrona County Sheriff's Department and one local officer in Midwest provide police protection to the area. Howell has an emergency response plan in place to provide guidance in the event of an emergency related to its operations. For additional information on emergency services, see the Phase I EA (BLM 2003a) and Section 2.1.1.1 of this EA.

Utility services for the project vicinity are provided by a combination of public and private entities. The Town of Midwest provides water service, obtaining water from the Central Wyoming Regional Water System, and sewer service. The water distribution system has a capacity of approximately 250 taps, 192 of which are currently in use. The sewage treatment system has two lagoon cells, but only one is in use and it operates below capacity. Natural gas, electricity, and communications services are provided by private entities. See the Phase I EA (BLM 2003a) for additional information.

3.14.5 Environmental Justice

Executive Order No. 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" (59 FR 7629), is "intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority communities and low-income communities access to public information on, and an opportunity for participation in, matters relating to human health and the environment." It requires each federal agency to achieve environmental justice as part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects, including social and economic effects, of its programs, policies, and activities on minority and low-income populations.

Environmental justice concerns are usually directly associated with impacts on the natural and physical environment, but these impacts are likely to be interrelated with social and economic impacts as well. EPA guidelines (CEQ 1997) for evaluating potential adverse environmental effects of projects require specific identification of minority populations when either: 1) a minority population exceeds 50 percent of the population of the affected area or 2) a minority population represents a meaningfully greater increment of the affected population than of the population of some other appropriate geographic unit, such as the State of Wyoming, as a whole. Neither of these situations was found to exist in either the project vicinity or Natrona County. Income levels in the Midwest-Edgerton area are lower on average than in other parts of Natrona County and Wyoming. It is not known, however, whether people living at or below the poverty level make up "meaningfully greater increment(s)" of the county or state populations.

3.15 Recreation

Recreation opportunities in the vicinity of Salt Creek Oil Field are discussed in greater detail in the Phase I EA (BLM 2003a). The oil field itself receives minor use for dispersed recreation such as wildlife viewing, hunting, and OHV travel. Two new (2001) reservoirs, Water Tank Reservoir and Petro Reservoir, are located about 5 miles south of Midwest. Initially fed by Salt Creek Oil Field discharge water, they are now fed by higher quality groundwater from the Madison formation. They are stocked with rainbow trout by the WGFD and have been attracting fishing activities, especially in drought years when other water features have been low or dry

(Conder 2005). There are no designated Wilderness Areas, Wild and Scenic Rivers, or Wilderness Study Areas in or near the project area.

3.16 Visual Resources

Initial oil production at Salt Creek Oil Field began in 1889 and, currently, the active wells in the SCLOU number approximately 754 production wells and 568 injection wells. The SCSU contains an additional 76 production wells and 75 injection wells. Salt Creek Oil Field, together with other fields in the vicinity, has been one of the most prominent visual features in northeast Natrona County for over 100 years. The oil field landscape is peppered with production well sites, pump jacks, production facilities, equipment storage areas, working rigs, power lines, unimproved roadways, and oil field traffic, all of which are part of the past, present, and foreseeable future visual environment of the area.

Many of the nearly 1,500 active wells and remnants of some inactive wells in Salt Creek Oil Field are visible in the foreground from highways State Route (SR) 259 and SR 387, and in the background from I-25/U.S. 87. They also are prominently visible from the residential and recreational areas in Midwest, Edgerton, and Gas Plant Camp. These highways and communities represent the visual observation points from which the landscape effects of the Proposed Action were evaluated.

Under the BLM's Visual Resource Management (VRM) System, public lands are normally evaluated for visual quality and sensitivity and, based on the results of the inventory, designated as one of four VRM classes with associated objectives for management of the visual environment under the umbrella of the RMP for the area (BLM 1986). The project area was excluded from this process because it is part of an ACEC with a separate management plan (BLM 1980) (Bennett 2005). Under the ACEC management plan, the visual resource objective for the project area is simply "to improve visual resources."

Upon final field closure in 30 to 40 years or more and full-field reclamation is ultimately achieved, the landscape of the former Salt Creek Oil Field will once again be primarily characterized by the dissected, rolling upland plains punctuated by badlands, broad valleys, deep eroded gullies, and isolated hills that characterized the landscape before oil was discovered in the late 1800s.

3.17 Noise

Noise levels in the vicinity of the Proposed Action have not been measured. Based on studies from other areas, it is expected that noise levels away from the industrial activity immediate to Salt Creek Oil Field would be quite low, influenced mainly by wind, insects, birds, and animals. The background noise in the area without these influences is likely in the range of 40 to 45 dBA (decibels, A-weighted) (EPA 1971). When the wind is blowing, the noise levels may be substantially higher. Noises from operations in the oil field include large diesel engines, compressors, heavy equipment operations, pipes clanking, and other industrial type noises. The nearest noise sensitive receptors are residences in Midwest and Edgerton and, perhaps, the schools in Midwest. At times, depending on the particular activity occurring in the oil field, the oil field noise sources may be within 200 to 300 feet of a sensitive receptor. These activities have been ongoing for over 100 years in Salt Creek Oil Field and many of the residents of Midwest

and Edgerton are employed in the oil field. Under these circumstances, it can be assumed that most residents are acclimated to the oil field noises and don't find them objectionable under most circumstances.

3.18 Transportation

Transportation access to the project area is almost exclusively highway oriented. The primary route is I-25/U.S.87, which runs north and south approximately 5 miles east of the project site. SR 387 connects to I-25 at exit 227 and passes through the project site before heading northeasterly toward Wright and Gillette. SR 259 runs south from Midwest, intersecting I-25 at exit 210. The three highways are paved and in generally good to excellent condition. There also is a network of county and BLM roads serving rural areas in the vicinity, none of which is paved. These roads are typically in poor to fair condition and are irregularly maintained, at best (BLM 2003a). Traffic counts for the state and federal highways are presented in the Phase I EA (BLM 2003a). The counts indicate levels of service (LOS) on the highways are currently at an "A" level, which means traffic flows freely with few restrictions, even at peak traffic periods.