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BIG SANDY

Energy Project

Environmental Impact Statement

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Western Area Power Administration
DOE/EIS-0315

Issuance Date: June 2001

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TITLE: **BIG SANDY ENERGY PROJECT ENVIRONMENTAL IMPACT STATEMENT**

Draft (X) Final ( )

EIS NUMBERS: BLM/AZ/PL-01/004
DOE/EIS-0315

LEAD AGENCIES: U.S. Department of Energy, Western Area Power Administration
U.S. Department of the Interior, Bureau of Land Management

COOPERATING AGENCIES: Arizona Department of Transportation
Arizona Department of Water Resources
Arizona Game and Fish Department
Hualapai Tribe
Mohave County (through the Planning and Zoning Department)
U.S. Department of the Interior, Fish and Wildlife Service

ABSTRACT

Caithness Big Sandy LLC (Caithness) proposes to construct and operate a 720-megawatt (MW) natural gas-fired, combined-cycle power plant and ancillary facilities on private land about 4 miles southeast of Wikieup, in the southeastern portion of Mohave County, Arizona. The power plant would be interconnected to the regional electric transmission grid through an existing 500-kilovolt (kV) transmission line owned and operated by the Western Area Power Administration (Western) and others which passes through the power plant site. The plant would be a "merchant plant", which means that it would not be owned by a utility. There is currently no long-term commitment or obligation by any utility to purchase the capacity and energy generated by the power plant. Caithness has applied to interconnect its proposed power plant with the existing Mead-Phoenix Project 500-kV transmission line. Construction of segments of the access road, natural gas pipeline, and water pipelines and electric and control lines would require a grant of right-of-way across Federal lands administered by the Bureau of Land Management (BLM). Water necessary for power plant and agricultural operations would be provided from wells drilled on private land in the vicinity of the proposed power plant site. The proposed access road to the power plant and well field would extend eastward to the proposed power plant site from U.S. Highway 93, crossing approximately 2 miles of public and private lands. The high-pressure natural gas pipeline would extend approximately 39 miles across private and public lands to the site from existing pipelines owned by several natural gas suppliers located along the Interstate 40 corridor. Agricultural development would occur on private lands adjacent to the access road immediately southwest of the proposed power plant site. The EIS describes existing environmental conditions as well as potential direct, indirect, and cumulative effects of the proposed action. BLM will be deciding whether or not whether or not to authorize rights-of-way on public lands administered by the BLM for portions of the proposed natural gas pipeline, access road, water pipelines and electric and control lines. Western will be deciding whether or not to execute an agreement with Caithness for interconnection with the Mead-Phoenix Project.

Comments on this Draft EIS should be sent only to Western Area Power Administration at the address below and must be postmarked no later than ***August 6, 2001***.

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LIST OF ACRONYMS

Acronym	Definition
°C	degrees Celsius
°F	degrees Fahrenheit
$\mu g/m^3$	Microgram(s) per cubic meter
AAAQG	Arizona Ambient Air Quality Guidelines
ACEC	Area of Critical Environmental Concern
ac-ft	acre-foot (feet)
ac-ft/yr	acre-foot (feet) per year
ACHP	Advisory Council on Historic Places
ADA	Arizona Department of Agriculture
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AGFD	Arizona Game and Fish Department
APP	Aquifer Protection Permit
AQRV	air quality related values
ARPA	Archaeological Resources Protection Act
ASLD	Arizona State Land Department
AUM	animal unit month
AWQS	aquifer water quality standards
BA	Biological Assessment
BACT	best available control technology
BADCT	best available demonstrated control technology
BLM	U.S. Bureau of Land Management
BMPs	best management practices
BO	Biological Opinion
BTU	British Thermal Unit(s)
Caithness	Caithness Big Sandy, L.L.C. (project proponent)
CATEF	California Air Toxics Emission Factors
CEQ	Council on Environmental Quality
cfm	cubic feet per minute
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm/sec	centimeters per second
CO	carbon monoxide
CO_2	carbon dioxide
COE	U.S. Army Corps of Engineers
CT	combustion turbine
CTQ	Community Tolerance Quotient
dB	decibel
dBA	A-weighted decibel
DOE	U.S. Department of Energy
DSWR	Western Area Power Administration Desert Southwest Regional Office
EIS	environmental impact statement
ELF-EMF	extremely-low-frequency electric and magnetic field
EMF	electric and magnetic field

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Acronym	Definition
EPA	U.S. Environmental Protection Agency
EPC	Engineering, Procurement and Construction
EPT	Ephemeroptera, Plecoptera, and Trichoptera taxa
ESA	Endangered Species Act of 1973
EWG	exempt wholesale generator
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map (FEMA)
FLAG	Federal Land Manager's Air Quality Related Values Workgroup
FLPMA	Federal Land Policy and Management Act
FMCPG	Ford Motor Company Proving Grounds
FPA	Federal Power Act
gpd	gallons(s) per day
gpd/ft	gallon(s) per day per foot
gpm	gallon(s) per minute
Greystone	Greystone Consultants (consultant to project proponent)
GIS	geographic information system
HAP	hazardous air pollutant
HBI	Modified Hilsenhoff Biotic Index
HDPE	high-density polyethylene
HMMSPC Plan	Hazardous Materials Management and Spill Prevention and Countermeasure Plan
HRSG	heat recovery steam generator
HSMS	Health and Safety Management System
Hz	hertz
I-40	Interstate 40
ISC3	Industrial Source Complex 3rd Version Short-Term Gaussian-plume model
IWAQM	Interagency Workgroup on Air Quality Modeling
JHA/THA	job/task hazard analysis
km	kilometer(s)
KOP	key observation point
kV	kilovolt(s)
kWh	kilowatt-hour
lbs/hr	pounds per hour
LCRS	leak collection and removal system
Ldn	Average Day-Night Noise Level
LDRS	leak detection and removal system
Leq	equivalent sound level
LOS	level of service
MAP	Mitigation Action Plan
MCEDA	Mohave County Economic Development Authority
MEC	Mohave Electric Cooperative
mg/L	milligram(s) per liter
MLA	Mineral Leasing Act
MMCF	million cubic feet
MMI	Modified Mercalli Intensity scale
MSL	mean sea level
MUTCD	U.S. Department of Transportation Manual on Uniform Traffic Control Devices
MW	megawatt(s)

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Acronym	Definition
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
National Register	National Register of Historic Places
NEIS	National Earthquake Information Center
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NIEHS	National Institutes of Environmental Health Sciences
NO	nitrogen monoxide
NO_2	nitrogen dioxide
NO_X	nitrogen oxide
NOA	Notice of Availability
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NSPS	New Source Performance Standards
O_3	ozone
OHV	off-highway vehicle
OPGW	optical ground wire
PA	Programmatic Agreement
Pb	lead
PCB	polychlorinated biphenyls
PM_{10}	particulates with an aerodynamic diameter less than or equal to 10 microns (1×10^{-6} m)
ppm	part(s) per million
ppmvd	part(s) per million, by volume corrected to 15 percent oxygen and dry gas conditions
ppmw	parts per million by weight
PSD	prevention of significant deterioration
psi	pound(s) per square inch
PVC	polyvinyl chloride
RAPID	Research and Public Information Dissemination Program
RCRA	Resource Conservation and Recovery Act
RDA	Rural Development Area
RMP	Resource Management Plan
ROD	Record of Decision
ROMP	Reclamation Operation Maintenance Plan
RV	recreational vehicle
SARA	Superfund Amendments and Reauthorization Act
SCADA	Supervisory Control and Data Aquisition
SCR	selective catalytic reduction
SDA	Suburban Development Area
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasures

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Acronym	Definition
SRP	Salt River Project
STG	steam turbine generator
SWPPP	Stormwater Pollution Prevention Plan
T15N, R12W	Township 15 North, Range 12 West
TDS	total dissolved solids
tpy	ton(s) per year
TSP	total suspended particulate
UBC	Uniform Building Code
UDA	Urban Development Area
URS	URS Corporation
US 93	U.S. Highway 93
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
V	volt(s)
VOC	volatile organic compound
VRM	Visual Resource Management
Western	Western Area Power Administration

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Summary

BIG SANDY
Energy Project
Environmental Impact Statement

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SUMMARY

INTRODUCTION TO THE PROJECT

Caithness Big Sandy, L.L.C. (Caithness) has proposed to construct, operate, and maintain the Big Sandy Energy Project, a baseload 720-megawatt (MW) power plant and ancillary facilities (Figure S-1). This Proposed Action includes the following components:

- power plant and associated facilities and operations, including the plant cooling system, waste management operations, lighting, and fire protection and other safety systems
- 500-kilovolt (kV) substation, with associated transmission line modifications and communications facilities
- water supply system consisting of deep groundwater wells and associated pipelines
- natural gas supply pipeline and interconnection facilities
- development of land for agricultural purposes
- actions to reduce or prevent environmental impacts

The United States electric utility industry currently is in transition from a highly regulated industry to one where market forces develop and shape decisions in the generation, transmission, and purchase of energy. Making wholesale and retail power markets more competitive is consistent with congressional policy reflected in the Energy Policy Act of 1992.

As an independent power producer, Caithness proposes to construct a merchant power plant, meaning the plant would not be owned by a utility or by a utility affiliate, nor would it be supported by a long-term power purchase agreement with a utility. Caithness would instead sell power to customers and the spot market, and all economic costs would be borne by Caithness. The Mohave County Economic Development Authority (MCEDA), working with Caithness, proposes limited agricultural development (about 107 acres) in conjunction with the development of the power plant.

To market the generated electrical energy, Caithness has applied to the Western Area Power Administration (Western) for an interconnection with the existing Mead-Phoenix Project 500-kilovolt (kV) transmission line, which provides access to the regional transmission grid. Caithness also has applied for authorization to build portions of the natural gas pipeline, water supply pipeline system, and electric and control lines across public lands administered by the Bureau of Land Management (BLM).

PURPOSE AND NEED

For Caithness, the purpose and need for the proposed Project includes the following:

- Generate and consistently deliver competitively priced electrical energy, to short- and mid-term electric energy markets in the western United States in response to market demands, using available capacity of the Mead-Phoenix Project 500--kV transmission line.
- Construct and operate a power plant on private land, in compliance with:
  (1) applicable laws and regulations;
  (2) industry standards for reliability; and
  (3) Caithness' corporate environmental objectives to generate power with minimal impact on the environment.
- Support MCEDA's objective for economic development in the Big Sandy Valley by providing land adjacent to the proposed facility, and water for agricultural purposes.

MCEDA's purpose and need for the proposed Project is as follows:

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- Generate economic benefits, encourage economic development, and support the agricultural sector in the Big Sandy Valley of Mohave County.

For Western, the purpose and need for the Project is as follows:

- Respond to Caithness' request to interconnect the proposed power plant to the existing Mead-Phoenix Project 500-kV transmission line to meet the intent of Federal policy to provide open access for unused available transmission capacity to wholesale electrical generators, such as Caithness, while maintaining reliability of service to existing customers.

For BLM the purpose and need for the Project is as follows:

- Respond to Caithness' request for rights-of-way across public lands, ensure that natural gas pipelines constructed on public lands are safe and reliable, and ensure reclamation of public lands that would be disturbed.

THE NATIONAL ENVIRONMENTAL POLICY ACT PROCESS

The National Environmental Policy Act (NEPA) of 1969 requires that an environmental impact statement (EIS) be prepared for any Federal actions significantly affecting the human environment. Since the proposed power plant would interconnect with the transmission system managed by Western and the proposed water and gas pipelines would cross public lands managed by BLM, the proposed Project constitutes a Federal action for NEPA purposes. This EIS has been prepared in accordance with Federal regulations implementing NEPA, which are codified at Title 40, Code of Federal Regulations (CFR), Parts 1500-1508 and 10 CFR 1021.

The major steps in the EIS process are described below.

Notice of Intent (NOI) – The EIS process began with publication of a NOI in the *Federal Register* on April 18, 2000 (*Federal Register* Vol. 65, No. 75). The NOI announced Western's and BLM's intention to prepare an EIS and hold a public scoping meeting concerning the Project.

Scoping Period – The purpose of scoping was to identify public and agency issues, and alternatives to be considered in the EIS. The scoping process included notifying the general public, and Federal, state, local, and tribal agencies of the Proposed Action. BLM and Western held a public information and scoping meeting on May 3, 2000 in Wikieup, Arizona.

Draft EIS – This document is the Draft EIS. A Notice of Availability (NOA) was published in the *Federal Register*.

EIS PROCESS

Notice of Intent
▼
Scoping Period
▼
Draft EIS
▼
Comment Period and Public Hearings
▼
Final EIS
▼
Record of Decision
▼
Mitigation Action Plan

Comment Period and Public Hearings – The public and agencies may review and comment on the Draft EIS during a comment period. BLM and Western will hold a public workshop to provide interested parties an opportunity to ask questions about the Draft EIS analysis and hold a public hearing to receive comments.

Final EIS – The purpose of the Final EIS is for BLM and Western to assess, consider, and respond to public and agency comments received on the Draft EIS. BLM and Western will encourage public review of the Final EIS after it is published.

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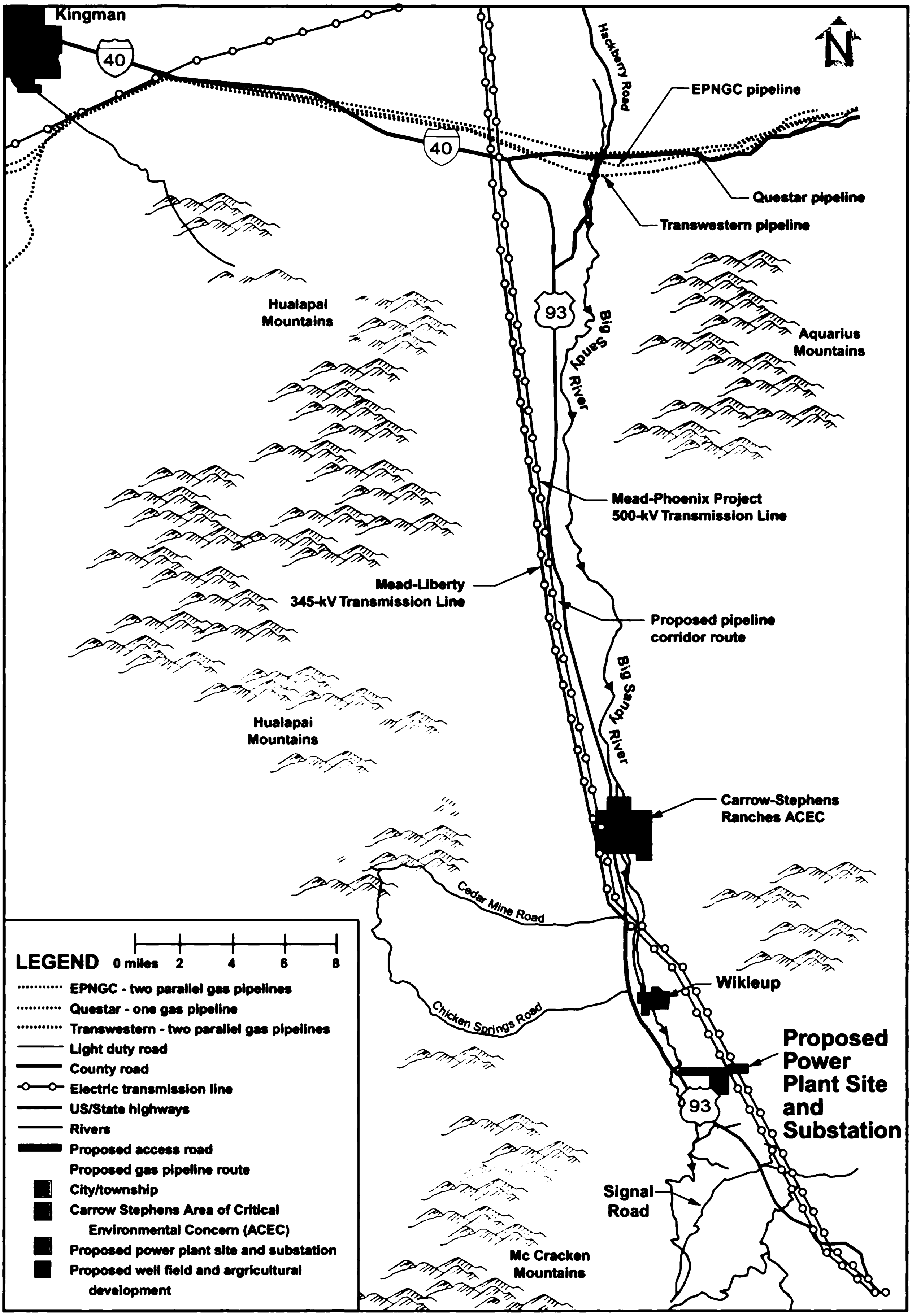

Power Plant Location with Major Project Components

Big Sandy Energy Project EIS

Figure S-1

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Records of Decision (RODs) – BLM and Western each will publish independent RODs after a NOA of the FEIS is published in the *Federal Register*. BLM and Western will explain the factors taken into consideration in making their decisions and the RODs will identify the environmentally preferred alternative. BLM and Western will encourage public review of the RODs.

Mitigation Action Plan (MAP) – After the RODs are published, Western will prepare a MAP that will address mitigation commitments expressed in its ROD.

The BLM Kingman Field Office and Western are serving as co-lead agencies for the EIS. Construction and operation of the proposed Project would require compliance with a number of other Federal, state, and local regulations and would require specific permits and approvals.

The following agencies have jurisdiction, special expertise, or interests in some of these regulatory requirements and are participating in the EIS process as cooperating agencies:

- Arizona Department of Water Resources
- Arizona Game and Fish Department
- Arizona Department of Transportation
- Mohave County (through the Planning and Zoning Department)
- Hualapai Tribe
- U.S. Fish and Wildlife Service

THE PROPOSED ACTION AND ALTERNATIVES

Power Plant

The proposed power plant, substation, and associated facilities would be built on private property in Section 5, Township 15 North, Range 12 West (T15N, R12W) (Figure S-2). The proposed power plant site is about 4 miles southeast of Wikieup, and about 2 miles east of where U.S. Highway 93 (US 93) crosses the Big Sandy River. A new road to provide access to the proposed power plant site and for other landowners east of US 93 is proposed by Mohave County. This road, along with a small section of private road, would provide access to the proposed power plant and well field.

The proposed power plant and associated facilities would occupy about 33 acres of a 120-acre site. The power plant would be built in two phases. Phase 1 would be a 500-MW natural gas-fired, combined-cycle power plant, composed of two combustion turbine generators, one steam turbine generator, and two heat recovery steam generators (HRSG) and exhaust stacks. Phase 2 would be constructed within 18 months of the startup of Phase 1, and would include one single-shaft combustion turbine/steam turbine generator, and one HRSG and exhaust stack.

The proposed power plant would be equipped with a selective catalytic reduction system as necessary to meet U.S. Environmental Protection Agency (EPA) and Arizona Department of Environmental Quality (ADEQ) air standards. Ancillary equipment for the balance of the power plant systems would include cooling towers, administration (control room) and support buildings, a communication system, water systems, fire systems, transformers, switching gear, and other facilities. Wet cooling towers would provide cooling for the steam generation cycle and turbine inlet air. Cooling water would be supplied from Project groundwater wells, and wastewater from the cooling system would be directed to one of two evaporation ponds.

Most of the solid waste generated during both construction and operation of the proposed power plant and associated facilities would be non-hazardous wastes typical of those generated by other human activities.

Several special or potentially hazardous wastes would be generated from routine operations. These would include waste lubricating oils (12 tons per year [tpy]) and associated used oil filters, spent solvents (12 tpy), empty drums

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(100 per year), and spent selective catalytic reduction catalyst (24 tpy). These would be recycled or disposed of in an approved and permitted commercial disposal facility in accordance with applicable requirements.

Sanitary wastes would be directed to a septic system and drain field constructed for the proposed power plant. Process water would be used in boilers and for cooling and cleaning purposes. Process wastewater would be recycled to the maximum extent feasible. Wastewater that could no longer be recycled would be evaporated. No discharge of process wastewater is proposed. The proposed power plant would be designed and operated as a zero discharge facility.

Wastewater storage/evaporation ponds would receive discharged process wastewater, cooling tower blowdown water, and stormwater runoff from the proposed power plant site and substation. The ponds would be designed to meet permitting requirements of ADEQ and the Arizona Department of Water Resources (ADWR).

Lighting at the power plant would be limited to areas required for safety. Lighting would be directed downward and shielded in accordance with the Mohave County Night-Sky Ordinance. Highly directional, high-pressure sodium vapor fixtures would be used.

A microwave communication tower about 20 feet tall would be built with a microwave antenna aimed toward the existing communication link on Aubrey Peak or Wikieup. This system would be used to deliver signals from control centers and other remote locations, report operating status, and provide voice communication from dispatchers to power plant operators and maintenance personnel.

Numerous safety features would be included in the power plant design. Fire protection would be supplied by the use of diesel-driven emergency fire pumps, in accordance with National Fire Protection Association (NFPA) guidelines. Fire detection and extinguishing devices would be installed at key points throughout the proposed power plant.

Construction materials that would be purchased from commercially available sources include concrete (15,600 cubic yards), sand (4,400 cubic yards), aggregate (8,900 cubic yards), backfill gravel (18,000 cubic yards), and rebar (1,092 tons). A special train would be needed to deliver some major plant components, including three combustion turbines, four generators, and two steam turbines, from the Port of Houston, Texas to Kingman, Arizona. In Kingman, the equipment would be offloaded to oversized transport vehicles, and be delivered to the Project site via Interstate 40 (I-40) and US 93.

Construction of Phase 1 is estimated to require about 20 months, and is scheduled to begin in the third quarter of 2001. An average of about 350 workers would be employed with a maximum of about 650. Phase 2 would require a similar schedule but a smaller average work force of about 240.

Substation and Electrical Equipment

The substation, which would connect the proposed power plant and immediately adjacent Mead-Phoenix Project 500-kV transmission line, would cover about 12 acres just west of the power plant. Western would design, construct, own, and operate the proposed substation. Two new steel lattice structures would be built to provide a tie between the Mead-Phoenix Project 500-kV transmission line and the new substation. The substation would include transformers, circuit breakers, switches, and bus works arranged to perform electrical functions, minimize safety risk, and accommodate operation and maintenance. Electronic controls and monitoring equipment for the power system would be housed in a building within the proposed substation. A chain-link fence would provide security for the substation.

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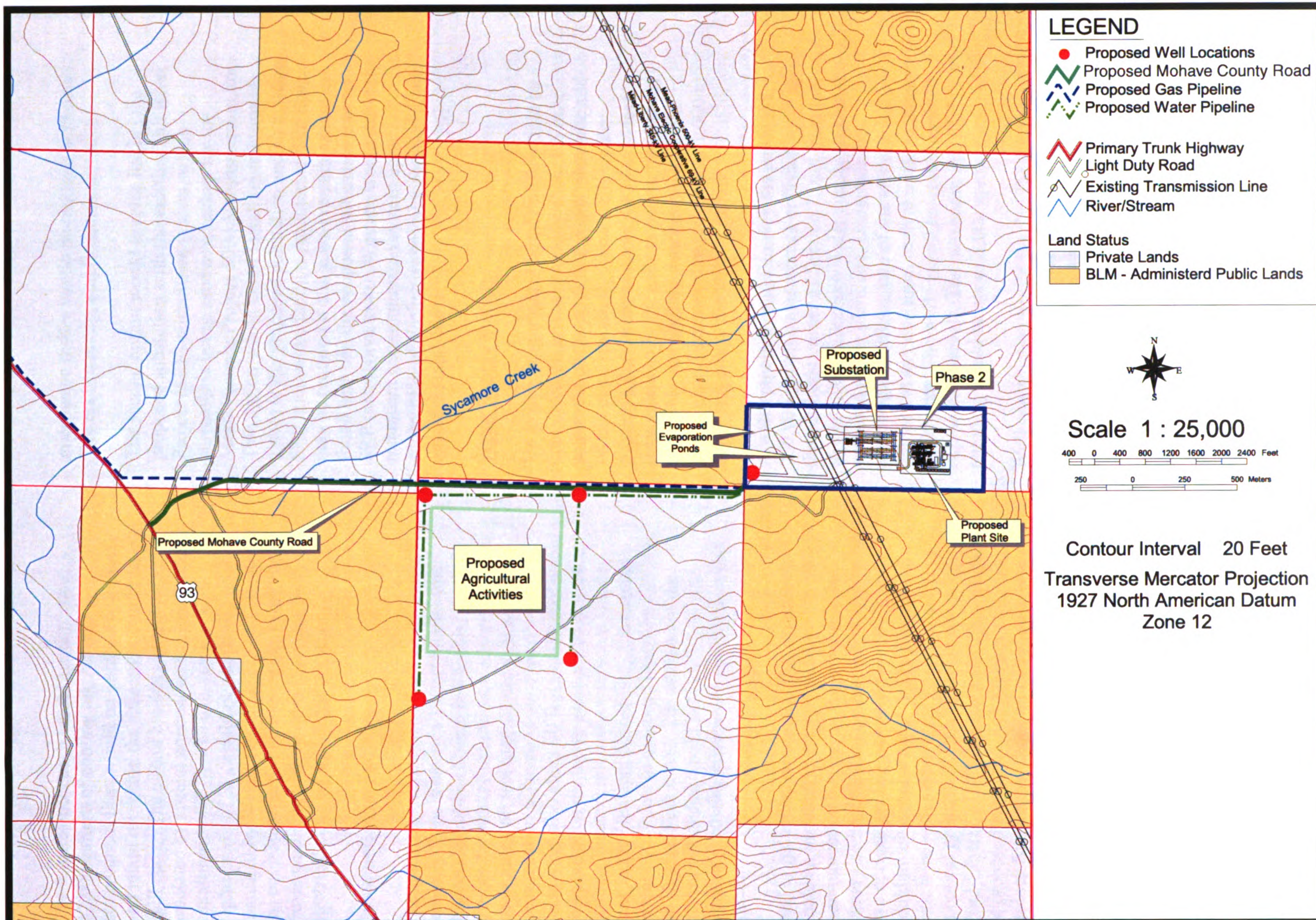

Proposed Power Plant and Well Field
Big Sandy Energy Project EIS

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The transformers each would contain about 12,000 gallons of cooling oil. An oil containment liner would be installed to collect and retain oil within the substation should an oil spill occur. The circuit breakers would be insulated by special nonconducting gas (sulfur hexafluoride [SF_6]). The use, storage, and replacement of SF_6 would be monitored and managed by Western to minimize any releases to the environment. Small amounts of hydraulic fluids would be used to open and close the electrical contacts within the breakers.

Communication Facilities

The substation equipment would be operated remotely from Western's Desert Southwest Region Operations Center in Phoenix. To provide for remote operation, a communications tower about 60 feet high would be built within the substation adjacent to the control house. A microwave dish about 10 feet in diameter would be installed on the tower and pointed toward an existing Western microwave tower at Hayden Peak in the Hualapai Mountains. A microwave dish about 10 feet in diameter would be added to the Hayden Peak tower. The addition of the microwave dishes would provide a link with Western's existing microwave communications system.

Dual or redundant communication facilities would be installed to provide backup communication system, in the event that the primary communication system is interrupted. Two options are being considered. One option would involve replacing an existing overhead static wire with a fiber optic line, referred to as an optical ground wire (OPGW), on the existing Mead-Liberty 345-kV transmission line between the proposed substation and Western's existing Peacock Substation, about 46 miles north of the proposed power plant site. From Peacock Substation, there is a fiber optic path to Western's Phoenix Substation in Phoenix. A microwave link also would need to be developed between Phoenix Substation and Perkins Substation at the southern end of the Mead-Phoenix Project 500-kV transmission line via an existing Western microwave facility at Towers Mountain (in the Bradshaw Mountains). New microwave dishes would be required at Phoenix, Towers Mountain, and Perkins substations.

The second option would involve linking the proposed substation with the existing Salt River Project (SRP) microwave system, which currently is being used as a backup for the Mead-Phoenix Project 500-kV transmission line. This option would entail installing microwave dishes at the proposed substation and an existing SRP microwave facility. An intermediate tower may be required if a microwave path cannot be found between the proposed substation and an SRP microwave tower. Western would select the redundant communication system upon completion of further technical, operational, and environmental study.

Water Supply System

Up to five groundwater supply wells would be completed on private property about 0.5 mile southwest of the proposed power plant site and on the plant site itself. These wells would provide a maximum of about 4,850 acre-feet (equivalent to 3,000 gallons per minute [gpm]) of potable and cooling water annually to the power plant from a deep aquifer about 1,000 to 1,500 feet below the ground surface.

A water pipeline would convey the water to a 250,000-gallon water storage or "head" tank in the northeast corner of Section 7, and from there to a 600,000-gallon raw water supply tank on the proposed power plant site. Under normal operating conditions, two of the wells would be pumped at any one time, each at a rate of about 1,200 gpm. The wells would be cycled at about two-week intervals. The maximum rate of pumping would be about 5,000 gpm.

Well construction would involve the clearing of about 4 acres for each well pad. Drilling would occur 24 hours per day, and completion of each well would be expected within a 45- to 60-day period.

Natural Gas Supply Pipeline

A buried, high-pressure natural gas pipeline would be constructed to supply natural gas to the

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proposed power plant. The line would connect to one or more existing natural gas transmission lines located about 39 miles north of the proposed power plant site near I-40.

The pipeline would be 16 to 20 inches in diameter, and be buried at least 3 feet. At full capacity, the pipeline would deliver about 106.4 million cubic feet (MMCF) of gas per day, which is equivalent to 3,246 MMCF per month, or 38,960 MMCF per year.

Construction of the line typically would require a 50-foot right-of-way in a 90-foot-wide disturbance corridor, but a specific proposed alignment or alternative alignments have not been identified at this stage of planning. Instead, broader corridors that allow adjustments to be made in the final engineered alignment of the pipeline have been identified. This would allow constraints discovered during pre-construction surveys and right-of-way negotiations to be accommodated.

Thirteen corridor segments have been identified. The proposed route uses six corridor segments (R1-C1-T3-C3-T4-R5), which follow a combination of existing road and transmission line corridors (Figure S-3). The proposed pipeline would begin at the points of connection with one or more of the three potential gas supply pipelines near I-40, and proceed along corridor segment R1, heading south in the 100- to 150-foot-wide right-of-way of Hackberry Road, a Mohave County road. There is an existing underpass where Hackberry Road connects with I-40 that the pipeline would follow. This corridor segment is about 3.9 miles long and passes through relatively undeveloped private and state-owned lands.

The proposed pipeline would then follow corridor segment C1 to the west and then southwest until intersecting the existing transmission line corridor. This corridor segment crosses both private and state-owned lands and is about 2.8 miles long.

The proposed route then follows corridor segment T3, which parallels the existing transmission lines south for about 8.5 miles to the beginning of corridor segment C3. This corridor crosses both private and state-owned lands.

Corridor segment C3 is a crossover segment located where the transmission line and US 93 corridors overlap. The corridor segment is about 1.9 miles long and crosses private and state-owned lands.

The proposed route then continues southeast along the transmission line route (corridor segment T4). This corridor segment is about 13.8 miles long, terminating at the intersection of the transmission line rights-of-way and US 93. This segment extends along the western boundary of the Carrow-Stephens Ranches Area of Critical Environmental Concern (ACEC). This corridor segment crosses private, BLM-managed public, and state-owned lands.

From this point, the proposed route follows corridor segment R5 along US 93 south to the proposed Mohave County access road leading to the proposed power plant site. This corridor segment is about 8.5 miles long and varies in width from 150 feet wide along the proposed access road, to 1,800 feet wide along certain portions of US 93.

An alternative generally following US 93 was evaluated as the Alternative R gas pipeline corridor (corridor segments R1-R2-R3-R4-R5), as was an alternative generally following the Mead-Phoenix Project 500-kV transmission line, referred to as the Alternative T gas pipeline corridor (corridor segments T1-T2-T3-T4-T5).

Pipeline construction would take about 75 days to complete. Trenching, installation of the pipe, and closing of the trench at any one point along the route would take about three to five days. The crossing of the Big Sandy River is the most sensitive construction area, and the pipe may be installed beneath the riverbed either by open trenching or directional boring. Construction within the river and other washes would be performed in accordance with permits issued by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act.

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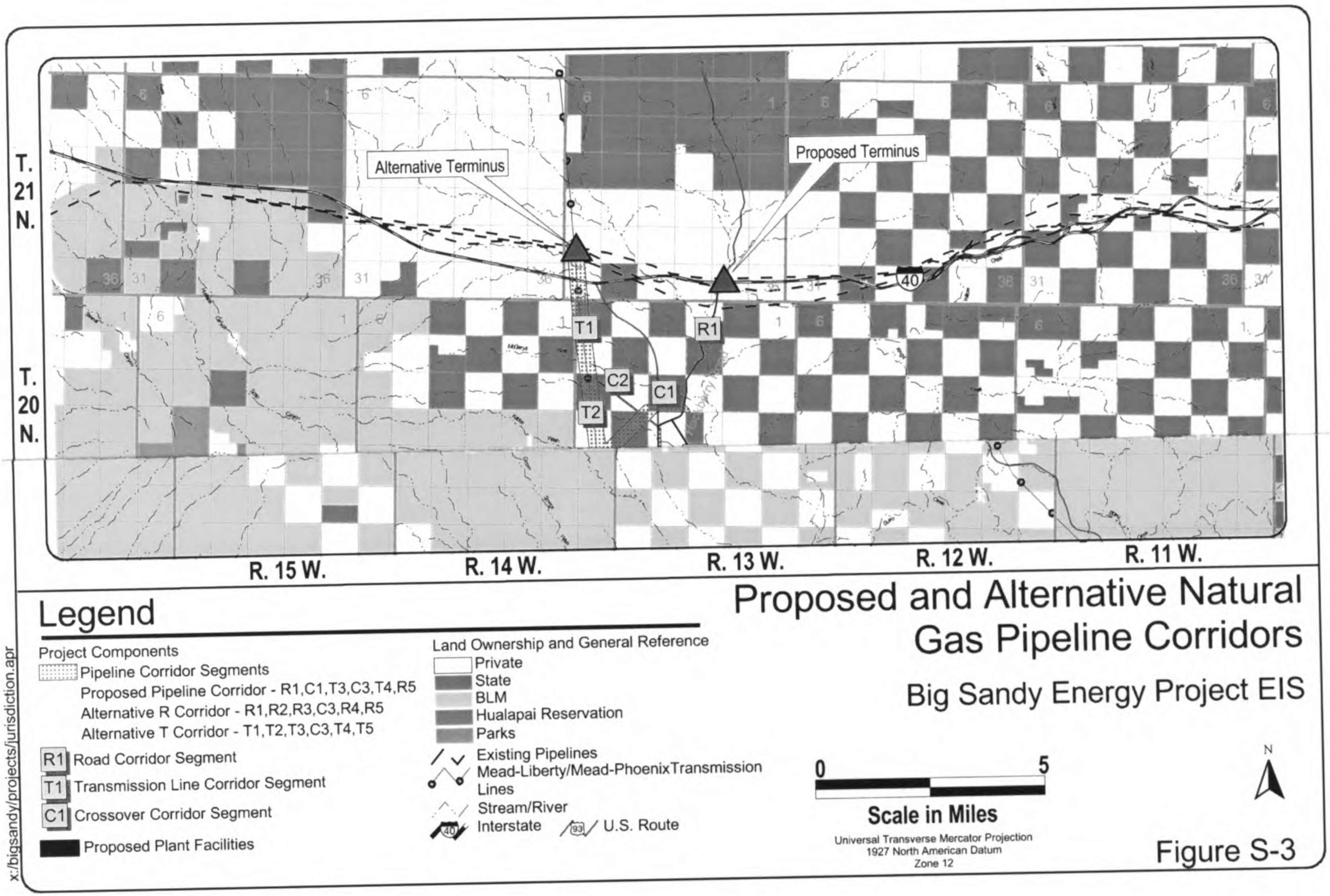

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Agricultural Development

The Proposed Action would involve supplying selected lands and water to MCEDA for agricultural use. Agricultural development would occur on about 107 acres located in the vicinity of the well field. Water for agricultural use would be raw groundwater provided from the same water wells that would supply water for the proposed power plant. A maximum of 400 gpm (650 acre-feet per year) of water, subtracted from the Project's maximum use of 4,850 acre-feet per year (3,000 gpm), would be made available for agricultural use in this area.

Agricultural products would be mainly forage crops or fruit or nut orchards. These crops are likely to require 2 to 6 acre-feet of water per acre per year. Agricultural fertilizers, pesticides, and herbicides would be applied as needed for specific agricultural operations. Application rates would follow manufacturers' instructions and all pesticides would be EPA-registered and approved for use on the specific crops grown. Standard agricultural practices to minimize erosion and runoff of applied chemicals and soil would be employed.

Actions to Reduce or Prevent Environmental Impact

The Proposed Action incorporates numerous measures to avoid or reduce environmental impacts, including the following:

- dust control measures
- erosion and sedimentation reduction measures
- groundwater monitoring plan
- shallow groundwater and river water flow augmentation
- stormwater pollution prevention plan and surface water diversion structures
- compensation for predicted impacts on the flow of Cofer Hot Spring
- actions to minimize impacts on grazing
- actions to reduce visual impacts
- reclamation plans
- pre-construction biological surveys, Sonoran desert tortoise impact reduction measures, and construction scheduling to avoid wildlife impacts
- implementation of a programmatic agreement to reduce impacts on cultural resources
- spill prevention control and countermeasure plan
- noise reduction measures

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The proposed Project is situated in the Big Sandy River Valley, a thinly populated desert region of eastern Mohave County. Ranching and limited farming are the major economic activities in the area. The valley is drained by the Big Sandy River, which has perennial flows and rare wetland and riparian habitat in certain locations. The major highway between the Phoenix and Las Vegas, Nevada metropolitan areas, US 93, passes through the valley. The Mead-Liberty 230-kVand Mead-Phoenix Project 500-kV transmission lines also pass through the valley, connecting the Phoenix metropolitan area with electrical substations near the hydroelectric power plant at Hoover Dam. The following aspects of the natural and cultural environment in the area are addressed in this Draft EIS:

- Air Resources
- Geology/Paleontology
- Soils

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- Groundwater
- Surface Water
- Floodplains
- Land Use and Access
- Grazing Management
- Recreation, Wilderness, and Visual Resources
- Areas of Critical Environmental Concern
- Vegetation
- Wetlands, Riparian Areas, and Waters of the United States
- Fisheries and Wildlife
- Threatened, Endangered, Proposed, Candidate, and Other Special Status Species
- Cultural Resources
- Socioeconomics and Environmental Justice
- Public Safety and Services
- Noise

Major Environmental Issues

Agency and public scoping defined the following major issues:

- Short-term and long-term effects of groundwater use for power plant operations, including effects on future water supplies in the Wikieup area and stream flows in the Big Sandy River.
- Direct and indirect effects on fish and wildlife resources and habitats, including the endangered southwestern willow flycatcher and wetland and riparian habitats.
- Direct and indirect effects on the community and values of Wikieup from construction activity, air emissions, future land use changes, landscape changes, noise, and taxation changes.
- Direct and indirect effects on water quality and use in the Project area, including any effects from the proposed pipeline construction.
- Effects on cultural resources and traditional cultural values of Native Americans.
- Effects on existing land uses from the pipeline construction.
- Federal agency fulfillment of Indian Trust responsibilities.

Major Conclusions

The assessment of impacts in this Draft EIS is summarized in Table S-1 at the end of this summary. Because numerous measures have been incorporated into the Proposed Action to eliminate or reduce environmental impacts, no significant impacts are projected for most of the resources considered. Additional potential mitigation measures are also identified in this Draft EIS. The major conclusions about significant impacts that potentially could occur are summarized in the following paragraphs.

Water Issues

No significant impacts on surface water are projected, and the only significant groundwater impact would be the reduction in flow to Cofer Hot Spring.

A deep aquifer has been identified as the source of water for the proposed power plant. Exploratory drilling and groundwater modeling indicate that this aquifer is relatively isolated from a middle aquifer, as well as the shallow aquifer that is the source of virtually all groundwater used in the valley today.

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Groundwater modeling conducted for this Draft EIS predicted that without flow augmentation, water levels in the shallow groundwater could drop by less than 1 foot, and surface water could be reduced. However, the Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project.

Groundwater pumping is likely to affect flows from Cofer Hot Spring. Caithness has agreed in concept to compensate the private owner of this spring; however, the loss of the spring flow would be a significant impact, per the significance criteria established for this Draft EIS.

Construction is projected to impact about 13 acres of Big Sandy River and ephemeral stream channels and washes. Measures to reduce the impacts of this disturbance in those jurisdictional waters would be implemented.

Fisheries and Wildlife, Including Threatened and Endangered Species and Wetland or Riparian Habitats

The Project may adversely impact riparian habitat and the endangered southwestern willow flycatcher, as well as other sensitive wildlife and plant species.

Installation of the pipeline by trenching across the Big Sandy River within corridor segment R5 would remove riparian vegetation, which represents habitat loss for the endangered southwestern willow flycatcher and provides opportunity for increase in brood parasitism by cowbirds. Installation of the pipeline by directional drilling would reduce impacts. Consultation with the U.S. Fish and Wildlife Service in compliance with Section 7 of the Endangered Species Act are ongoing to determine if significant impacts would occur, and to identify potential measures to avoid or reduce impacts on listed endangered, threatened, or proposed species

There also is the potential for significant impacts on birds if the Migratory Bird Treaty Act is violated due to bird deaths or loss of nests.

Most wetland and riparian habitats would be avoided or, if disturbed, the resulting impacts would be mitigated. However, the loss of the wetland associated with Cofer Hot Spring would be a significant impact.

Cultural Resources

The Hualapai Tribe considers impacts of the Project on their traditional cultural landscape within the Big Sandy Valley and impacts on archaeological sites reflecting their heritage to be a significant impact. Documenting aspects of traditional Hualapai culture for a tribal educational program could reduce those impacts, but even with implementation of mitigation, residual impacts would be considered significant. Although some archaeological and historical sites would be adversely affected by construction activities, data recovery studies would compensate adequately for the impacts on the informational values of those resources.

The Hualapai Tribe considers the Big Sandy Valley to be an integral part of their aboriginal territory and an important traditional cultural landscape. Early ethnographic studies documented that the Hualapais occupied at least four villages in the Big Sandy River Valley during the 1880s. Although the specific locations of these villages have not been identified, the Tribe concludes that the intrusion of the proposed Project into the Big Sandy Valley would adversely affect the traditional cultural landscape that the valley represents for the Tribe.

The Tribe also considers archaeological sites that reflect the occupation of the area by the Hualapai and their ancestors to be traditional cultural places. Construction of the power plant would destroy part of one archaeological site,

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and other sites may be disturbed or destroyed by construction of the natural gas pipeline and other features of the Project. The Hualapai Tribe considers any disturbance of archaeological sites reflecting traditional occupation to be a significant adverse effect.

The Tribe has been involved in conducting cultural resource surveys and developing a programmatic agreement that would specify procedures for other pre-construction surveys and implementation of mitigation measures in compliance with Section 106 of the National Historic Preservation Act. No impacts to three parcels of Hualapai Reservation land in the upper Big Sandy River Valley are projected.

The proposed pipeline corridor would avoid direct impacts on the historic Carrow and Stephens ranches, which the BLM manages as an ACEC. Measures to mitigate impacts on other archaeological and historical sites would be developed and implemented in accordance with the Section 106 programmatic agreement and are expected to reduce residual impacts on the informational values of those resources to less than significant levels.

Indian Trust Assets

BLM and Western will continue to have discussions with the Hualapai Tribe about actions needed to protect tribal rights.

Federally recognized Indian tribes are domestic dependent nations, and the Federal government is obligated to protect tribal interests, a duty that is referred to as trust responsibility. This trust doctrine is defined through treaties, laws, executive orders, judicial decisions, and agreements. Indian trust responsibility commonly is thought of as encompassing the following three areas:

1. protection of trust land, assets, and resources
2. protection of tribal sovereignty and self-government
3. provision of services

The technical studies conducted for this Draft EIS concluded that there would be no significant impacts on Hualapai trust lands, assets, and resources. However, the Hualapai Tribal Council remains unconvinced by the technical models and is reluctant to support the Project.

Sovereignty and self-government for the Hualapai Tribe have been promoted by arranging for the Tribe to fully participate, within a government-to-government relationship, as a cooperating agency in the preparation of this EIS. The provision of services to Indian tribes typically is the role of agencies such as Bureau of Indian Affairs and Indian Health Service.

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
Air Resources	**Power Plant** • Power plant operation would result in the release of various pollutants, but there would be no significant impacts from the operation with implementation of the pollution control measures and devices included in the Proposed Action. The analysis indicates no exceedances of any National Ambient Air Quality Standards or maximum allowable Prevention of Significant Deterioration increments; no exceedances of thresholds in the Arizona Ambient Air Quality Guidelines for hazardous air pollutants; no unacceptable or discernable impairment to visibility in nearby Class I, selected Class II, or Hualapai tribal lands; and no unacceptable levels of nitrogen or sulfur in areas where AQRVs were required to be reviewed. **All Elements** • Construction activities in all locations would result in release of particulates and exhaust gases, but effects would be short term and would occur over a small area at one given time, resulting in a minor level of impact. • Dust control measures included in the Proposed Action would help limit impacts to less than significant levels. Conclusion: No significant impacts are expected with implementation of proposed actions to reduce or prevent adverse impacts.	Same as Proposed Action Conclusion: Same as Proposed Action	Same as Proposed Action Conclusion: Same as Proposed Action	No impacts
Geology/ Paleontology	**All Elements – Geology** • There would be no significant impacts on areas	**Geology** – Same as Proposed Action	**Geology**-Same as Proposed Action	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	of regional geological importance (none is present). • There would be no impacts on substantial known potential mineral resource development areas (none is present). • No impacts are expected on existing mining operations. There would be an insignificant loss of a small portion of the valley's sand and gravel resources. • No substantial increase in impacts from earthquakes would be expected as long as structures comply with appropriate standard procedures. • No substantial increase in magnitude of mass movements would occur since cut and fill areas would be engineered to ensure stability. • Groundwater withdrawal would not result in land subsidence because it would be isolated to a volcanic aquifer and should not result in sediment compaction and/or significant drop in levels in overlying aquifers.			
	All Elements – Paleontology No impact would be expected as long as mitigation is included during construction to identify and protect previously unidentified fossil localities. <u>Conclusion</u>: No significant impacts are expected with implementation of proposed actions to reduce or prevent adverse impacts, with the addition of mitigation to protect unidentified fossil localities during construction.	**Paleontology**-Same as Proposed Action	**Paleontology**-No impacts would be expected as long as additional surveys are conducted should the eastern portion of corridor segment T5 be selected for the final alignment, and the same provisions as listed under the Proposed Action are followed.	

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
Soils	**All Elements** • Any proposed ground disturbance would result in disruption of soils and potential soil erosion, compaction, reduced productivity, and/or loss of topsoil. The Proposed Action would involve disturbance of about 621 acres of land surface, of which 229 acres would be permanently disturbed. Implementation of the proposed reclamation plans and erosion control measures, plus other measures such as limiting grading and access road building, and use of the directional drilling option, would reduce impacts to less than significant levels. • With implementation of the proposed Stormwater Pollution Prevention Plan and provisions for surface water diversion at the power plant site, no significant impacts would result from stormwater runoff. • There would be no significant adverse impacts associated with the installation of the optical ground wire, since the ground disturbance at the pulling and tensioning sites would be minimal, on areas already disturbed, and subject to reclamation and erosion control measures. **Pipeline** • The potential for significant impacts exists where highly erodible soils coincide with steep slopes (greater than 20 percent). These locations would be avoided during siting of the final alignment and/or be adequately mitigated, such that impacts would be reduced to less than significant levels. (There are four such areas	Same as Proposed Action, except that areas of steep slope plus erodible soils could more easily be avoided.	Same as Proposed Action; contains some areas along corridor segments T2, T3, and C1 where it may be difficult to avoid areas of steep slopes and erodible soils. This route also may cross exposures of soils that uniquely support the Arizona cliffrose. Mitigation includes measures to avoid impacts on this plant species.	The 26 acres of soil disturbed for construction of the production and monitoring wells used during testing and associated well pads and access roads would remain.

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	located in corridor segments R1, C3, T4, and the T2-T3-C1 interchange. The area in the intersection of corridor segments T2, C1, and T3 would be the most difficult to avoid, since it appears to extend across the entire corridor.) Conclusion: No significant impacts are expected with implementation of proposed actions to reduce or prevent adverse impacts.			
Groundwater	**Power Plant and Associated Facilities** ***Groundwater Quantity*** • Groundwater modeling conducted for this Draft EIS predicted that without flow augmentation, water levels in the shallow groundwater could drop by less than 1 foot, and surface water could be reduced. However, the Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project. • There likely would be a reduction and eventual elimination of water discharged from Cofer Hot Spring. The Proposed Action includes measures to provide compensation to the landowner; however, the loss of the spring would be considered a significant impact.	Same as Proposed Action	Same as Proposed Action	The groundwater production and monitoring wells used to identify and test the lower aquifer would remain.

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Groundwater Quality • No significant impacts from the Proposed Action are expected, given the construction of the evaporation ponds and lack of other sources of groundwater contamination associated with the proposed Project. **Pipeline and Communication Facilities** • No impacts on groundwater quality or quantity would be expected from these Project elements. Conclusion: The loss of Cofer Hot Spring would be a significant adverse impact. With the implementation of the actions proposed to reduce or prevent adverse impacts and other mitigation, no other significant impacts would be expected.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Surface Water	**Power Plant and Associated Facilities** ***Surface Water Flows*** • Groundwater modeling conducted for this Draft EIS predicted that without flow augmentation, water levels in the shallow groundwater could drop by less than 1 foot, and surface water could be reduced. However, the Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project.	Same as Proposed Action	Same as Proposed Action	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Surface Water Quality • The power plant would be a zero discharge facility with no significant impacts on surface water quality. Onsite stormwater generation would be collected and routed to lined evaporation ponds. Offsite stormwater would be routed around the facility and returned to natural drainages using standard erosion control structures. • Agricultural activities should not have a significant impact on surface water quality of the Big Sandy River basin or downstream watercourses. The agricultural area would be operated in a fashion that minimizes the potential for runoff of irrigation water, applied chemicals, and fine-grained soils to surface waters. ***Surface Water Rights*** • Owners of surface water rights along the Big Sandy River downstream of Granite Gorge would not be impacted because no reduction in surface water flow is predicted. **Pipeline and Access Road** • Construction of the pipeline and access road across washes or the Big Sandy River likely would cause a temporary, minor, less than significant impact on surface water quality, including increased sedimentation and turbidity with implementation of proposed construction practices and erosion and sedimentation control measures. Special procedures are included in the			

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Proposed Action to minimize impacts of the pipeline crossing caused by trenching on the Big Sandy River. Directional drilling under the Big Sandy River would further minimize or eliminate these water quality impacts. Conclusion: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts and mitigation.			
Floodplains	**Power Plant and Associated Facilities** • Since the proposed power plant and associated facilities are located outside the 100-and 500-year floodplain zone, no impacts are predicted. Culverts installed along the proposed access road would allow for adequate flows under the road; no significant impacts on floodplains are predicted. • Impacts to floodplains along the optical ground wire route would be eliminated because the area needed for pulling/tensioning sites is small and floodplains could be avoided. **Pipeline** • The pipeline would cross numerous 100-year floodplains; actual total would depend on final alignment selected within corridor. Temporary disturbance of these floodplains and downstream areas would occur during pipeline installation. With the implementation of proposed erosion and sedimentation control measures, impacts would be reduced to minor, insignificant levels. • If the directional drilling option were selected	**All Elements**-Same as Proposed Action; possibly would have more floodplain crossings.	**All Elements**-Same as Proposed Action; possibly would have fewer floodplain crossings; directional drilling under the Big Sandy River would not be an option.	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	for crossing the Big Sandy River, adverse impacts would be further minimized or eliminated. Conclusion: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action without the directional drilling option	
Land Use and Access	**Power Plant and Associated Facilities** • No significant adverse land use impacts would be expected, since there would be conformance with existing zoning, County land use plans, and County transportation planning, and no impacts are expected on residences or businesses. **Pipeline** • The proposed pipeline would generally follow existing utility corridor and road rights-of-way. Several residences and businesses are located along these routes, especially fronting the road rights-of-way. Any potential conflict with existing residences or businesses could be avoided by adjusting the final alignment within the proposed corridor to avoid these uses or by providing compensation. Also, potential impacts to the Carrow-Stephens ACEC could be avoided. Construction adjacent to any residence or business is completed within three to five workdays, and impacts would not be considered significant. **Communication Facilities** • Primary communication facilities would be	Similar to Proposed Action, but with possibly more potential conflict with use of roads being used or followed. Also, there is more potential for conflict with residences and use of the ACEC along Segment R4 and less space to make adjustments within Segments R2 and R3.	Similar to Proposed Action, but with possibly more difficult access and installation along Segment T5, due to rugged topography. However, there would be fewer residences and businesses to avoid and there would be no potential conflicts with road use during construction.	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	located within the plant site and on existing facilities, causing no adverse impacts to land uses. The optical ground wire option, if installed, would occur within existing right-of-way and on existing transmission line structures, and involve only short-term and limited disturbance; therefore, no adverse impacts to land use would be expected. Conclusion: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts.	Conclusion: Same as Proposed Action but with slightly higher potential for conflicts with existing residences and businesses near roadways	Conclusion: Same as Proposed Action, but with slightly less potential for conflicts with residences and businesses primarily due to use of Segment T5	
Grazing Management	**Power Plant and Associated Facilities** • To avoid significant impacts from the loss of flow from Cofer Hot Spring, the Proposed Action would provide compensation by replacing the lost stock water using shallow well water. • Land available for grazing would be permanently reduced by the forage available for grazing by about one cow and calf for four months. This is a small reduction in forage availability (about 1 percent) and does not constitute a significant impact on livestock production. • The Proposed Action includes measures to maintain all range improvements, thereby avoiding significant impacts from loss or damage to these improvements.	**All Elements** Similar to Proposed Action, except that pipeline construction would permanently disturb 47 acres.	**All Elements** Similar to Proposed Action, except that pipeline construction would permanently disturb 45 acres.	The 26 acres of grazing lands already disturbed for construction of the production and monitoring wells constructed for testing the groundwater aquifers, and the well pads, and well access roads would remain disturbed.

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Pipeline • Actions included in Proposed Action would ensure that any range improvement facilities would be maintained during pipeline construction. • Livestock production on land crossed by the pipeline would not be significantly impacted by construction activities because only 48 acres would be permanently disturbed, and the reseeding done per the proposed reclamation plans would restore forage production on other disturbed land. • No significant land disturbance would be expected on BLM grazing allotments along the pipeline during construction. Conclusion: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Recreation, Wilderness, and Visual Resources	**All Elements** • Impacts on recreation resources and wildernesses would be low and less than significant over the life of the Project, since there would be a relatively small increase in population and no discernible impacts to visibility in wilderness areas included in the analysis. • Permanent effects on visual resources would be noticeable to co-dominant for the power plant, due to the surface disturbance, introduction of additional industrial facilities into foothill landscapes, intermittent water vapor plumes, and night lighting. Impacts would be low to	Same as Proposed Action, but with more impacts on viewers (residents and travelers) along roads during pipeline construction.	Same as Proposed Action, but with more impacts on viewers along the path of transmission lines during pipeline construction.	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	moderate and less than significant after the application of measures to reduce impacts and due to the presence of a BLM-designated utility corridor. **Pipeline** • The pipeline would result in low to moderate impacts, since it would generally follow existing rights-of-way with roads and transmission lines, which would reduce the effect of the intrusion of the pipeline into the landscape. Also, application of reclamation measures would reduce the visual contrast of the pipeline with the surroundings. Short-term impacts would result from the visibility of equipment and dust related to the construction process, especially in view of populated areas. These impacts would be reduced by dust control measures included in the Proposed Action and would be moderate and less than significant. <u>Conclusion</u>: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts			
Areas of Critical Environmental Concern	**Carrow-Stephens Ranches Area of Critical Environmental Concern (ACEC)** ***Pipeline (Corridor Segment T4)*** • An alignment within the corridor to avoid the ACEC would reduce impacts to less than significant. An alignment within the ACEC would require the removal of native plants, which is not consistent with BLM Prescription 10 and would result in a significant impact.	Corridor segment R4 crosses the ACEC where the ACEC cannot be avoided. If the pipeline is not placed within the US 93 right-of-way, significant impacts would occur because of the proximity of the pipeline	Same as Proposed Action	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Communication Facilities • An optical ground wire installation pad may be required within the ACEC. One pad may result a small amount of land disturbance within an existing transmission line right-of-way, away from vegetation, and Section 106 protection provisions would apply, thus limiting impacts to low and less than significant levels. **Three Rivers Riparian ACEC** ***Power Plant and Associated Facilities*** • Groundwater modeling conducted for this Draft EIS predicted that without flow augmentation, water levels in the shallow groundwater could drop by less than 1 foot, and surface water could be reduced. However, the Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project.	to historic buildings, the cemetery, and inconsistency with the BLM objectives for the ACEC. Any direct impact on graves would be a significant impact. Also, the removal of vegetation within the ACEC would be a significant impact, even with reclamation.		
	Conclusion: No significant impacts would occur with mitigation consisting of avoiding the Carrow-Stephens Ranches ACEC.	Conclusion: At Carrow-Stephens ACEC, significant impact would occur due to removal of native plants, and potential for other significant impacts	Conclusion: Same as Proposed Action	

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
		exists. For Three Rivers Riparian ACEC, same as Proposed Action.		
Vegetation	**Power Plant and Associated Facilities** • Construction and operation of the plant and associated facilities would result in the permanent loss of 181 acres of Sonoran desert scrub, previously disturbed by livestock grazing, which would not be a significant impact on a regional level. Loss of xeroriparian vegetation in drainages could result in significant impact, but losses would be replaced through revegetation and reclamation efforts defined in reclamation plan(s). In all areas, measures in the proposed reclamation plan would reduce loss of state-protected plants and may promote re-vegetation of temporary disturbed areas. • Sites for installation of the optical ground wire (5 acres) would be temporarily disturbed and reclaimed per proposed reclamation plans, which would minimize adverse impacts. **Pipeline** • Construction would result in disturbance of approximately 406 acres, of which 48 acres would remain permanently disturbed due to need for access over pipeline. • Disturbance of vegetation and xeroriparian vegetation along pipeline would be primarily temporary and would not result in significant impacts, as long as reclamation plans are successful.	Similar to Proposed Action. Pipeline would involve disturbance of approximately 393 acres, of which 47 acres would remain permanently disturbed. As with Proposed Action, most disturbances would be temporary and would not result in significant impacts, as long as reclamation plans are successful and no permanent loss of xeroriparian vegetation would occur.	Similar to Proposed Action. Pipeline would involve disturbance of approximately 418 acres, of which 45 acres would remain permanently disturbed. As with Proposed Action, most disturbances would be temporary and would not result in significant impacts, as long as reclamation plans are successful and no permanent loss of xeroriparian vegetation would occur.	The loss of vegetation (Sonoran desertscrub) from construction of the production and monitoring well pads and access roads would remain.

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Conclusion: No significant impacts are expected with the implementation of proposed actions and mitigation to reduce or prevent adverse impacts.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Wetlands, Riparian Areas, and Waters of the United States	**Power Plant and Associated Facilities** ***Wetlands and Riparian Areas*** • The layout of the Proposed Action would avoid direct impacts to the wetland on the plant site, and implementation of erosion control measures included in the Proposed Action would keep indirect impacts to a low, insignificant level. No long-term impacts are expected. • The reduction in flow to Cofer Hot Spring would dry up a small wetland in that area, resulting in a significant impact. • The Proposed Action contains measures designed to prevent changes to the wetland/marsh upstream of Granite Gorge in the Big Sandy River. ***Waters of the United States*** • The combined direct impact on waters of the United States from the proposed power plant and associated facilities would be a loss of approximately 5 acres. There would be no impacts on waters associated with the optical ground wire installation or microwave dish installation. No indirect impacts to downstream waters would be expected with the implementation of the surface water diversions, and erosion and sedimentation control measures included in the Proposed Action.	Same as Proposed Action, except with approximately 11 acres of direct impact (loss) on waters of the United States for the pipeline route	Same as Proposed Action, except with approximately 6 acres of direct impacts (loss) on waters of the United States	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Pipeline ***Wetlands and Riparian Areas*** • If trenching is used to cross the Big Sandy River wetland and riparian area, there would be temporary impacts on about 1.4 acres of wetland and riparian vegetation. Proposed erosion and sedimentation control and reclamation measures included in the Proposed Action would reduce impacts to less than significant levels. If the directional drilling option is used, then no impacts would be expected. ***Waters of the United States*** • Construction of the proposed pipeline would result in approximately 8 acres of direct impacts on waters of the United States. Impacts would be on "functions" of these waters discussed in other sections of this Draft EIS. Conclusion: Significant impacts would occur because of the loss of the Cofer Hot Spring wetland. Otherwise, impacts to wetlands would be less than significant, with the implementation of proposed actions to reduce or prevent adverse impacts and mitigation.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Fisheries and Wildlife	**All Elements** • Construction and operation activities would result in loss of habitat and some direct mortality of wildlife. The following significant impacts may occur: 1. The loss of one active zone-tailed hawk, common black hawk, ferruginous hawk, Swainson's hawk, or golden eagle nest, or	Same as Proposed Action	Same as Proposed Action, except there would be no or limited short-term impact to aquatic habitat in the Big Sandy from pipeline construction, since the river has no perennial	The 26 acres of wildlife habitat already disturbed for construction of the production and monitoring wells constructed for testing the groundwater aquifers would remain.

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	loss of two or more nests of any other raptor species, which would be significant. Preconstruction surveys and the additional mitigation of working around nests and fledging periods would help to reduce the likelihood of theses losses. 2. Mitigation, including habitat management practices to limit bird and other wildlife use of the ponds, use of fences around the ponds, and monitoring programs for waterfowl use and water chemistry would help reduce the potential impacts of wildlife exposure to toxic levels of contaminants in the evaporation ponds to less than significant; 3. Mortality of migratory birds using the evaporation ponds as a result of collision with the nearby transmission lines or from the chemicals used on the agricultural area would be reduced by the implementation of measures to exclude birds from the ponds and/or increase visibility of the transmission lines. However, incidental loss of any migratory bird without a permit would be significant. 4. Preconstruction surveys would help identify migratory bird nests, eggs, or nestlings. However, incidental loss of any migratory bird without a permit would be significant. • Additional adverse (but less than significant) impacts that would be expected include direct mortality of fossorial mammals and reptiles from construction activities; mortality of small		flow at the Alternative T crossing area.	

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	mammals and reptiles that would fall into the pipeline trench or attempt to cross the access road; interruption of breeding or foraging activities of birds and other mammals in proximity to construction activities; interruption of movement of large mammals during construction hours; substrate disturbance and turbidity on fish and other aquatic communities from construction near or in the Big Sandy River; permanent loss of breeding and foraging areas for species that use Arizona Upland vegetation; and long-term loss of habitat • There would be no impacts expected on aquatic species from groundwater withdrawal, and no loss of habitat for riparian species near the plant site would be expected. After reclamation is conducted in all temporarily disturbed areas, there should be no long-term impacts on aquatic resources. <u>Conclusion</u>: Significant impacts could occur only due to violation of the Migratory Bird Treaty Act, stemming from the accidental collision of birds with transmission lines or disruptional loss of nests.	<u>Conclusion</u>: Same as Proposed Action	<u>Conclusion</u>: Same as Proposed Action	
Threatened, Endangered, Proposed, and Other Special Status Species	**All Elements** ***Southwestern Willow Flycatcher*** • No direct or indirect impacts at plant site would occur. Groundwater modeling conducted for this Draft EIS predicted that without flow augmentation, water levels in the shallow groundwater could drop by less than 1 foot, and surface water could be reduced. However, the Proposed Action contains measures designed to	Same as Proposed Action	Similar to Proposed Action, except that this alternative does not cross the Big Sandy River in an area of perennial water with associated riparian habitat; therefore, there would be no impacts from	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project. Therefore, no impacts on southwestern willow flycatcher habitat from groundwater pumping is expected. Impacts would occur along corridor segment R5 if trenching is used for crossing the Big Sandy River, due to removal of riparian vegetation (a direct habitat loss and an opportunity for increase in brood parasitism by cowbirds). ***Bald Eagle*** • The Proposed Action is unlikely to result in any impacts because of the lack of roosting sites and the eagle's known tolerance to noise. Adverse impacts that could occur in the unlikely event that eagles feed on any waterfowl contaminated by ingesting toxic compounds from the evaporation ponds and /or collision with the transmission line near the ponds would be reduced by measures to avoid waterfowl use of the ponds and pond toxicity. ***Yuma Clapper Rail*** • No impacts would be expected.		construction on southwestern willow flycatcher, and there would be fewer adverse impacts expected on amphibians and fish.	

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Arizona Cliffrose • No impacts would occur, since the Proposed Action would not affect any known population and surveys would be required prior to construction to detect and avoid any identified populations. ***Other Special Status Species – Bats, Birds, Reptiles, Amphibians Fish, Plants*** • With pre-construction surveys, anticipated daytime construction, avoidance of sensitive areas by making adjustments in the pipeline route, and implementing the planned reclamation and wildlife protection measures contained in the Proposed Action, there may be minor adverse or short-term impacts, but no significant impacts would occur. Conclusion: Impacts could occur to the southwestern willow flycatcher because of riparian habitat loss at the Big Sandy River crossing that cannot be avoided or eliminated. Impacts also could occur from bald eagle collisions with transmission lines. The final determination of impact significance will be made through consultation with U.S. Fish and Wildlife Service and the completion of a Biological Assessment, which will be incorporated into the Final EIS. Impacts on sensitive species would be below the level of significance.	Conclusion: Same as Proposed Action	Conclusion: Similar to Proposed Action except that there would be no potential for southwestern willow flycatcher – no significant impacts would be expected.	
Cultural Resources	**Power Plant and Associated Facilities** • Construction activities would destroy part of one archeological site; adverse effects to informational values can be adequately	Same as Proposed Action	Same as Proposed Action	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	mitigated by data recovery studies pursuant to the Section 106 programmatic agreement. • Intrusion of the plant into the traditional cultural landscape of the Hualapai Tribe would be a significant impact. Even with implementation of mitigation measures, significant impacts would remain. **Pipeline** • Potential exists for adverse impacts on archeological and historical sites located within the corridor, depending on the alignment selected. Section 106 programmatic agreement surveys and avoidance or mitigation measures would be implemented along the final alignment. These measures would adequately mitigate impacts on informational values, but the Hualapai Tribe would consider residual impacts on the traditional Hualapai cultural landscape and archaeological sites to be significant. **Communication Facilities** • Construction activities associated with the primary or redundant communication systems are not expected to result in adverse effects, but would be reviewed and treated in accordance with the Section 106 programmatic agreement. <u>Conclusion</u>: Potential impacts are expected to be "adverse" per NHPA regulations, and the disruption to the traditional cultural setting of the Big Sandy Valley represents a significant impact. Impacts on	<u>Conclusion</u>: Same as Proposed Action	<u>Conclusion</u>: Same as Proposed Action	

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	informational values can be adequately mitigated through implementation of treatment measures in accordance with a Section 106 programmatic agreement. Although mitigation measures will reduce the level of impacts on the traditional Hualapai cultural landscape and related archaeological sites, residual impacts would be considered significant.			
Socioeconomics and Environmental Justice	***Population*** • Temporary population increases would occur with construction of the Project, the pipeline, and the access road. A permanent population increase is expected for the operation of the plant, which would be noticeable, but would not be significant or disruptive to the community. • Changes to quality of life in Wikieup would be temporary and not substantial or significant. • Construction and operation of Project including the agricultural development, would increase short-term and long-term employment in Mohave County, a beneficial impact. Since a natural gas connection in Wikieup is uncertain and not under the control of this Project, no impacts can be predicted. ***Quality of Life*** – Adverse impacts would be temporary and not significant. ***Employment*** – The Project would increase short-term and long-term employment in Mohave county, a beneficial but not significant impact; there may be increases in worker salaries and wages.	Same as Proposed Action	Same as Proposed Action	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Taxes – Taxes paid by the Project would be a beneficial impact on the community, but real estate taxes on houses may increase if housing prices increase. ***Education*** – Construction of the plant would not cause adverse effects on the Mohave County schools since construction workers would most likely not bring families for the duration of the construction period. ***Housing*** – There would be a temporary demand for housing, but no significant impacts would be expected. ***Health Care, Fire Protection, Law Enforcement*** – No significant impacts would be expected, since the plant would supply its own fire and security services and adequate health care exists in the area. ***Low Income and Minority Populations*** – A disproportionate environmental justice impact would not occur because the region is rural and sparsely populated with scattered residences. Conclusion: No significant impacts expected with the implementation of proposed actions to reduce or prevent adverse impacts.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Public Safety and Services	**Power Plant and Associated Facilities** ***Electric and Magnetic Fields (EMF)*** • No additional adverse impacts would occur. The proposed interconnection, substation, and power plant would create EMF within some areas that	***EMF*** Same as Proposed Action	***EMF*** Same as Proposed Action	No impacts

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	are not currently subjected to fields. The proposed new transmission line connection segments would generate EMF at the same strengths of the Mead-Phoenix Project 500-kV transmission line. The Proposed Action would not lead to increase in EMF exposures because the line is in a location generally inaccessible to the public.			
	Safety Issues • Short-term minor traffic increases on US 93 and I-40 would occur due to plant construction. Traffic increases would be noticeable during plant construction and operation. The increases would not be significant and would not result in downgrading the Level of Service for either I-40 or US 93. • Oversized loads would require an oversize load permit. Strict compliance with all provisions of the permit and close coordination with ADOT and provision of turnouts would ensure that significant traffic impacts would not occur.	***Safety Issues*** Effects on traffic are similar to the Proposed Action but potentially more disruptive, since it includes use of Segment R3 and R4, which are also used for equipment deliveries and by commuters.	***Safety Issues*** Effects on traffic are less than Proposed Action, or Alternative R as Alternative T pipeline construction would take place parallel to a transmission line and not in close proximity to US 93. Other safety issues are the same as the Proposed Action.	
	All Elements • Proper measures would be taken to ensure public health and safety as well as worker safety in both the construction and operation of the plant and pipeline. • No additional demands for county public services would result from the construction and operation of the plant or pipeline because the Proposed Action would include all necessary utilities, including fire, security, water,			

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TABLE S-1
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	wastewater disposal, and emergency medical care. **Pipeline** • The Proposed Action includes routine maintenance, aerial pipeline patrols, and leak inspection, which would reduce or eliminate potential impacts related to safety. Conclusion: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts.	Conclusion: Same as Proposed Action.	Conclusion: Same as Proposed Action.	
Noise	**Power Plant** • During plant operations, sound levels at closest residence would be approximately 54dBA Ldn, and no significant impacts would be expected. **All Elements** • Construction activities would result in temporary increases in noise levels in vicinity of construction activity. **Pipeline** • Sensitive receptors along the proposed pipeline (residences, businesses) would experience short-term and temporary noise from construction during weekday daylight hours, although these impacts are not expected to be significant. Conclusion: No significant impacts expected with the implementation of actions proposed to reduce or prevent adverse impacts.	**All Elements** Similar to Proposed Action, but includes more sensitive receptors along corridor segments R3 and R4; would also impact Carrow-Stephens ACEC users. Conclusion: Same as Proposed Action.	**All Elements** Similar to Proposed Action, but with more residences along corridor segment T5 along river and along US 93. Conclusion: Same as Proposed Action.	No impacts

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Chapter 1
Introduction

BIG SANDY
Energy Project
Environmental Impact Statement

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1.0 INTRODUCTION

1.1 INTRODUCTION TO THE PROPOSED ACTION

Caithness Big Sandy, L.L.C. (Caithness) proposes to construct the Big Sandy Energy Project, a 720-megawatt (MW) natural gas-fired electricity generating facility, on private lands near Wikieup, Arizona. The Project would be a merchant plant – meaning it would not be owned by a utility or by a utility affiliate selling power to its utility, nor would it be supported by a long-term power purchase agreement with a utility. Caithness could instead sell power to customers and the spot market. Power purchases by customers would be voluntary and all economic costs would be borne by Caithness.

A detailed description of the Proposed Action (Project) is provided in Section 2.2, and the location of the proposed power plant is shown on Figure 2.2 within that section. The Proposed Action includes the following components:

- power plant and associated facilities, including the plant cooling system
- 500-kilovolt (kV) substation, with associated transmission line modifications and communications systems
- water supply system consisting of deep groundwater wells and associate pipelines
- new county access road
- natural gas supply pipeline and interconnection facilities
- development of land for agricultural purposes
- actions to reduce or prevent environmental impacts

The proposed power plant and associated facilities would be built on private property owned by Caithness in Section 5, Township 15 North, Range 12 West (T15N, R12W) about 4 miles southeast of Wikieup, and about 2 miles east of where U.S. Highway 93 (US 93) crosses the Big Sandy River. The groundwater supply wells, which would provide a maximum of 4,850 acre-feet of potable and cooling water annually to the Project from a deep aquifer (more than 1,000 feet below the ground surface), would be completed nearby on private property located in the western half of Section 7, (T15N, R12W). Land and water would be supplied to the Mohave County Economic Development Authority (MCEDA) for agricultural use on private land in Section 7, (T15N, R12W). A buried natural gas pipeline would bring high-pressure natural gas to the power plant for the gas-fired turbines from at least one of the three existing natural gas transmission lines located about 39 miles north of the proposed power plant site near Interstate 40 (I-40). The gas pipeline would be constructed generally from I-40 south along Hackberry Road,the Mead-Phoenix Project 500-kV transmission line, and US 93 to the proposed power plant site. Two alternative corridors within which the pipeline also could be constructed are presented.

Caithness, a private energy development and operating company, has applied to the Western Area Power Administration (Western) for interconnection with the existing Mead-Phoenix Project 500-kV transmission line. Western is a participant (with others) in this transmission line project and is responsible for certain maintenance and operation activities. Caithness also has applied for authorization to build portions of the natural gas pipeline and the permanent access road, water pipeline system, and electrical and control lines to water wells across public lands administered by the Bureau of Land Management (BLM).

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1.2 READER'S GUIDE TO THIS DOCUMENT AND THE EIS PROCESS

The National Environmental Policy Act (NEPA) of 1969 requires that an environmental impact statement (EIS) be prepared for any Federal actions that may significantly affect the human environment. Since the proposed power plant would interconnect with the transmission system managed by Western and the proposed water and gas pipelines would cross public lands managed by BLM, the proposed Project constitutes a Federal action for NEPA purposes. BLM guidelines (NEPA Handbook H-1790-1) require proposed actions that may affect public lands or resources under BLM jurisdiction be reviewed for NEPA compliance. Equivalent U.S. Department of Energy (DOE) NEPA regulations and guidance documents are located on DOE's website at http://tis.eh.doe.gov/nepa/. This section describes ways to find information in, and related to, this document and provides an overview of the EIS process.

1.2.1 Reader's Guide

Desired information can be located in the following ways:

- review the Table of Contents to find the page numbers for broad subjects of interest
- use the index in the back of the document to locate particular subjects and the pages on which they are found

Much of the organization of this Draft EIS is dictated by Federal regulations implementing NEPA; these regulations are codified at Title 40 Code of Federal Regulations (CFR) Parts 1500-1508 (40 CFR 1500-1508) and, for Western, 10 CFR 1021. This Draft EIS contains the following major section headings and information:

Section 1.0, Introduction – presents the underlying purpose and need to which BLM and Western are responding, and lists the permits and approvals required for construction and operation of the Proposed Action.

Section 2.0, Description of the Proposed Action and Alternatives – presents details of the Proposed Action and alternatives, describes alternatives considered but eliminated from further consideration, and presents a comparative summary of the impacts of the Proposed Action and alternatives. Measures incorporated into the Proposed Action to reduce or prevent environmental impacts also are described.

Section 3.0, Affected Environment and Environmental Consequences – contains a description of existing environmental conditions, analyses of potential impacts from the Proposed Action and alternatives, and presents mitigation measures to reduce or eliminate environmental effects and/or enhancement measures not incorporated into the Proposed Action.

Section 4.0, Cumulative Impacts – presents the incremental impacts of the Proposed Action when added to other past, present, and reasonably foreseeable future actions.

Section 5.0, Other Required Considerations – describes any irreversible and irretrievable commitments of resources which would occur if the Proposed Action were implemented, and the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. Existing Indian trust assets are described, and impacts on these resources are summarized.

Section 6.0, Consultation and Coordination – describes the EIS scoping process and other past and planned agency consultation and public involvement activities. A list of agencies, organizations, and individuals to whom this Draft EIS were sent also is presented.

Section 7.0, List of Preparers and Contributors – presents the names and qualifications of the persons responsible for preparing this Draft EIS.

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Section 8.0, References – provides full citation information for all references cited within the document. Most cited documents are reasonably available from other sources and many of the cited documents are available for public review at public reading room(s) (refer to Section 6.4 for exact location(s)).

Section 9.0, Glossary – provides an alphabetized list of definitions of terms used in this Draft EIS.

Section 10.0, Index – provides an alphabetized list of subjects addressed in this Draft EIS and the pages on which they are located.

Appendices – include additional documents that substantiate analysis or provide other information directly relevant to the EIS.

The following additional features have been incorporated into this document to aid the reader:

- a list of the many abbreviations and acronyms used is included in the front of the document
- lists of tables and figures within the document are included after the Table of Contents; graphical presentation of information has been maximized to the extent practical
- occasional "sidebars" of boxed text provide additional explanatory or background information

1.2.2 EIS Process

The process for preparing an EIS is determined by the Federal regulations implementing NEPA. The major steps in the EIS process are described below.

Notice of Intent (NOI) – The EIS process began when BLM and Western issued a NOI on April 6, 2000; it was published in the *Federal Register* on April 18, 2000. The NOI announced Western's and BLM's intention to prepare an EIS and hold a public scoping meeting on May 3, 2000 concerning the Project proposed by Caithness.

Scoping Period – The purpose of scoping is to identify public and agency issues, and possible alternatives to be considered in the EIS. The scoping process included notifying the general public, and Federal, state, local, and tribal agencies of the Proposed Action. BLM and Western held a public information and scoping meeting on May 3, 2000 in Wikieup, Arizona. The scoping period, its results, and additional agency and public participation are described in Section 6.0.

Draft EIS – This document is the Draft EIS. This Draft EIS provides a description of the Proposed Action, considers public and agency comments received during the public scoping process, assesses the potential impacts, and identifies potential measures to mitigate those impacts. A Notice of Availability (NOA) for the Draft EIS was published in the *Federal Register*.

Comment Period and Public Hearings – The public and agencies may review and comment on the Draft EIS during a 45-day comment period. BLM and Western will hold a public workshop to provide interested parties an opportunity to ask questions about the Draft EIS analysis and Western will hold a public hearing to receive comments; these are further described in Section 6.0.

Final EIS – The purpose of the Final EIS is for BLM and Western to assess, consider, and respond to public and agency comments received on the DEIS. A NOA will be published in the *Federal Register* when the Final EIS is available. BLM and Western will encourage public review of the Final EIS for 30 days after it is published.

Records of Decision (RODs) – BLM and Western each will publish independent RODs. BLM and Western each will explain the factors taken into consideration in making its decisions. BLM and Western will encourage public review of the RODs. Western will take no action on its

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decision until its ROD is made available to the public.

Mitigation Action Plan (MAP) – After its ROD is published, Western will prepare a MAP that will address mitigation commitments expressed in its ROD. BLM's ROD will contain similar information.

EIS PROCESS

Notice of Intent
▼
Scoping Period
▼
Draft EIS
▼
Comment Period and Public Hearings
▼
Final EIS
▼
Record of Decision
▼
Mitigation Action Plan

1.3 AGENCY ROLES AND RELATIONSHIPS

This section presents roles and responsibilities of both lead and cooperating government agencies in this EIS process. Some relationships between the EIS process and agency policies, plans, and programs also are described and background information is presented to help the reader understand these roles and relationships.

1.3.1 Lead Agencies

Lead agencies are those preparing or having taken primary responsibility for preparing the EIS. Lead agencies for this Draft EIS are BLM and Western.

1.3.1.1 Western Area Power Administration

An interconnection with the existing Mead-Phoenix Project 500-kV transmission line has been requested for the Proposed Action. As a result, Western must comply with NEPA and has agreed to be a co-lead agency for this Draft EIS process. In addition, Western is the lead agency for purposes of Section 106 of the National Historic Preservation Act, and applicable regulations codified at 36 CFR 800.

The electric industry currently is in transition from a highly regulated industry to one where market forces develop and shape decisions in the generation, transmission, and purchase of energy. Making wholesale and retail power markets more competitive is consistent with congressional policy reflected in the Energy Policy Act of 1992. In particular, the authority of the Federal Energy Regulatory Commission (FERC) is expanded in Section 211 of the Federal Power Act (FPA) to require transmission services be provided upon application. The FPA also created a new category of power producers called exempt wholesale generators (EWGs). Open access to non-discriminatory transmission services is essential to competitive power markets, and is similarly essential to EWGs. Access to available transmission capacity allows EWGs to provide electrical energy to the marketplace. Experience has shown that in an open market, the price to electricity is very elastic. Competition can drive the price down; however, the price can be high during periods of peak demand.

In Arizona, 20 power plants currently are in the development stages, with a combined generation capacity of approximately 17,000 MW. Most of these are being proposed as merchant plants, meaning that they will operate without long-term power contracts for the purpose of selling power on the wholesale electric market to the highest bidder. Some of this capacity is needed to meet growing peak power demands in Arizona. According to an article in the *Arizona Republic* (Jarman 2000), by 2002, the state's peak power demand will exceed the existing capacity by 6,000 MW and by 2008, by 8,500 MW.

On April 7, 1995, FERC issued a Notice of Proposed Rulemaking for Open Access Transmission Service, published at 60 *Federal Register* 17662. The proposed rulemaking was

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addressed in an EIS (FERC/EIS-0096) issued in April 1996. The proposed rule addressed in the Final EIS requires all public utilities owning or controlling interstate transmission facilities to offer non-discriminatory open access transmission services. That is, a utility must offer to provide third parties, to the maximum extent possible, with transmission service that the utility could provide itself on its system. FERC's goal was to encourage lower electricity rates by facilitating the development of competitive wholesale electric power markets through the prevention of unduly discriminatory practices in the provision of transmission services. The final rulemaking was promulgated as FERC Order Nos. 888 and 888-A on April 24, 1996, and March 4, 1997, respectively.

Western was established on December 21, 1977, pursuant to Section 302 of the U.S. Department of Energy (DOE) Organization Act, Public Law 95-91. Historically, Western, by law, marketed Federal power resources predominately to public utilities. Although Western is not specifically subject to the requirements of the FERC Final Order Nos. 888 and 888-A, the DOE has issued a Power Marketing Administration Open Access Transmission Policy that supports the intent of the FERC's Notice of Proposed Rulemaking for Open Access Transmission, which does apply to Western. To comply with FERC Orders 888 and 888A, Western published in the *Federal Register* on January 6, 1998 its Notice of Final Open Access Transmission Service Tariff (Tariff).

Under the Tariff, Western offers transmission service for the use of available transmission capacity in excess of the capacity Western requires for the delivery of long-term firm capacity and energy to current contractual electric service customers of the Federal government. Under the Tariff, Western will provide firm and non-firm point-to-point transmission service and network integration transmission service to the extent that Western has available transmission capability. Western will also perform the necessary studies or assessments for evaluating requests for transmission service as set forth in the Tariff. Any facility construction or interconnection necessary to provide transmission service will be subject to Western's General Requirements for Interconnection, which are available upon request. Since Western's rates are developed by region under separate public processes pursuant to applicable Federal laws and regulations, the rates and charges for specific services provided under the Tariff are determined from the appropriate regional rate schedules.

Western's Desert Southwest Regional Office (DSWR) manages transmission facilities in the states of Arizona, California, and Nevada. DSWR manages a control area operations center through its DSWR office located in Phoenix, Arizona. The DSWR transmission facilities are interconnected with transmission facilities of several non-Federal entities. For this Project, applicable rates of the Mead-Phoenix Project 500-kV transmission line will be used. Through Western's interconnections with the neighboring transmission systems that have filed open access transmission tariffs pursuant to Order No. 888, an EWG located along the Mead-Phoenix Project 500-kV transmission line would have access to markets throughout the western United States.

Environmental impacts anticipated to be created by construction and operation of the Mead-Phoenix Project 50-kV transmission line were described in the following documents:

- Environmental Analysis of the Changes to the Proposed Mead-Phoenix Transmission Project (Western 1989)

- Mead Phoenix $\pm$500-kV DC Transmission Line Project Final EIS (DOE 1983)

1.3.1.2 Bureau of Land Management

The *Kingman Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement* (BLM 1993, adopted in 1995) guides the management of public lands within the regions of influence of the Proposed Action. Public lands in this area are rich in wildlife, archaeological, scenic,

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recreational, mineral, and forage values. BLM's mission is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations. BLM planning regulations (43 CFR 1600) equate land use planning with problem solving and issue resolution.

With the passage of the Federal Land Policy and Management Act (FLPMA) in 1976, the BLM was directed to manage rights-of-way. As defined in 43 CFR 2880 and 2880, a right-of-way grant is required to use a specific piece of public land for certain projects, including roads, pipelines, transmission lines, and communication sites. Titles I and II of the Mineral Leasing Act (MLA) of 1920 are the authorities for granting, amending, and renewing right-of-way through Federal land for oil and gas pipelines. The regulations covering processing and monitoring of right-of-way issued under the MLA are in 43 CFR 2883.

The goals of the BLM right-of-way program are as follows:

- coordinate the actions of individuals, government, and business
- promote the sharing of rights-of-way
- protect the quality of land resources
- prevent unnecessary environmental damage to lands and resources
- protect the holder's investments in improvements on the right-of-way

The Proposed Action would require rights-of-way for a permanent access road, natural gas pipeline, water pipeline system, and electrical and control lines on public lands managed by BLM. As stated in BLM NEPA Handbook H-1790-1, "All internally or externally proposed actions on or affecting public lands or resources under BLM jurisdiction must be reviewed for NEPA compliance." As a result, BLM has agreed to be a co-lead agency for the EIS process.

1.3.2 Federal Cooperating Agencies

Consistent with Federal regulations implementing NEPA (40 CFR 1501.5, 1501.6, 1508.5, and 1508.16), the lead agencies (BLM and Western) are responsible for establishing liaison with all Federal, state, local, and tribal agencies that have jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed action and for requesting its participation as a cooperating agency on an EIS, as appropriate.

The following agencies with jurisdiction, special expertise, or interest in the Proposed Action have agreed to participate in the EIS process as cooperating agencies:

- Arizona Department of Water Resources (ADWR)
- Arizona Game and Fish Department (AGFD)
- Arizona Department of Transportation (ADOT)
- Mohave County (through the Planning and Zoning Department)
- Hualapai Tribe
- U.S. Fish and Wildlife Service (USFWS)

The roles and responsibilities of these respective agencies with respect to the EIS process are described in the following paragraphs.

1.3.2.1 Arizona Department of Water Resources

ADWR does not require any permits or approvals associated with the proposed Project. However, because the proposed Project could result in potential impacts on local water resources, and because of its special expertise, ADWR has been involved in providing hydrogeological information and data used to evaluate environmental impacts associated with

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the Proposed Action. In addition, ADWR is involved in reviewing interim reports produced as part of the EIS process. Also, an ADWR representative is on the Arizona Power Plant/Transmission Line Siting Committee, to which Caithness has submitted an Application for a Certificate of Environmental Compatibility.

1.3.2.2 Arizona Game and Fish Department

In accordance with the U.S. Fish and Wildlife Coordination Act and Arizona Revised Statutes (ARS) 17-102 and 17-231, AGFD is designated as an authority for fish and wildlife management in the state of Arizona. Although AGFD has no permitting or approval system, AGFD has been consulted regarding measures to minimize disturbance of riparian habitat and wildlife crossings and corridors occurring as part of the Proposed Action.

1.3.2.3 Arizona Department of Transportation

A right-of-way permit is required from ADOT for access upon US 93 and for natural gas pipeline right-of-way along state roads. In addition, Crossing Permits are required for pipeline crossings of Federal and state highways.

ADOT has been implementing planned improvements to US 93 in the vicinity of the Proposed Action. Documents describing these improvements and their environmental impacts include the following:

- Draft Environmental Assessment for U.S. 93 Concept Design Study – Wikieup to Interstate 40 (ADOT 2000)
- Draft Environmental Assessment: Wickenburg – Kingman Highway Segment 2: Santa Maria River – Wikieup Project STP 035-1 (ADOT 1995).
- Design Concept Report Big Sandy Bridge in Mohave County (Cannon & Associates, Inc. 1990).

In addition to its review and approval responsibility related to right-of-way permits, ADOT has provided information on cultural resources in the Project area.

1.3.2.4 Mohave County Planning and Zoning Department

Mohave County zoning regulations require that power plants proposed for private lands be constructed and operated on lands zoned for industrial use. Because the 120-acre property on which the proposed power plant would be located is an area previously designated as an agricultural-residential/36-acre minimum lot size zone, rezoning the property to a heavy manufacturing zone designation was required. In addition, an amendment to the land use designation of the 120-acre property from a rural development area to an urban development area, heavy industrial in the Mohave County General Plan was required.

The requests for rezoning and amendment to the Mohave County General Plan were presented by MCEDA representing Caithness at a special meeting of the Mohave County Board of Supervisors on April 17, 2000. As stated in Resolution Nos. 2000-149 and 2000-150, the Mohave County Planning and Zoning Commission recommended approval for a rezone subject to 11 conditions, and approval for an amendment to the General Plan subject to 6 conditions. The rezone request and amendment request were approved by the Board of Supervisors on April 17, 2000.

As stipulated in Resolution Nos. 2000-149 and 2000-150, the following conditions would be met prior to power plant construction and/or operation:

- Legal access with a road and utility right-of-way would be dedicated to Mohave County on behalf of the public.
- A Hydrology Report would be submitted to Mohave County demonstrating that the water supply is adequate for the proposed Project.

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- A site plan would be completed in accordance with Section 27.P (Site Plan Requirements).

- Appropriate zoning, building, environmental, and floodplain permits would be obtained prior to construction.

In addition, an excavation/grading permit would be obtained from the Mohave County Planning and Zoning Department for road construction and a permit to "Build in Roadway" would be obtained from the Mohave County Public Works Department for access road construction.

1.3.2.5 Hualapai Tribe

The Hualapai Tribe requested to participate as a cooperating agency due to its interest in the natural and cultural resources of the Big Sandy Valley. Three parcels of tribal land are located in the upper Big Sandy Valley, approximately 18 miles north of the proposed power plant site, and the entire valley is within the tribe's traditional cultural territory. The tribe's role as a cooperating agency involves identifying specific tribal concerns, providing information, and reviewing studies prepared in support of this Draft EIS.

Federally recognized Indian tribes are domestic dependent nations, and the relationship between the Federal government and those tribes is characterized as one of guardian to ward. In that guardian role, the Federal government is obligated to protect tribal interests, a duty that is referred to as trust responsibility. This trust doctrine is defined through treaties, laws, executive orders, judicial decisions, and agreements.

Indian trust responsibility commonly is thought of as encompassing the following three areas:

1. protection of trust land, assets, and resources

2. protection of tribal sovereignty and self-government

3. provision of services

The Hualapai Department of Cultural Resources also conducted an ethnographic study to address potential impacts on places of traditional cultural concern. In addition, a tribal member participated in the cultural resource survey conducted to support this document.

1.3.2.6 U.S. Fish and Wildlife Service

Section 7 of the Endangered Species Act of 1973 requires that Federal agencies consult with the USFWS regarding the potential adverse effects of proposed actions on listed threatened and/or endangered species or their listed habitats. As required by the Endangered Species Act a Biological Assessment will be prepared by BLM and Western and submitted to USFWS because the Project may have an adverse effect on one or more species listed under the Act.

The Section 7 process is described in more detail in Section 3.14. If BLM and Western determine that the Proposed Action likely could affect a threatened or endangered species, and the USFWS concurs, formal consultation will be initiated with the USFWS. USFWS will review the information provided by BLM and Western and will issue a Biological Opinion.

The USFWS has provided technical expertise and information related to threatened and endangered species that potentially could be adversely affected by the Proposed Action, particularly the southwestern willow flycatcher, an endangered bird species found along the Big Sandy River west of the proposed power plant site. This information has been used in compiling the Affected Environment and Environmental Consequences section of this Draft EIS.

1.4 PURPOSE AND NEED

Federal regulations implementing NEPA state:

> "The statement [the EIS] shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." (40 CFR 1502.13)

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The purpose and need for the Proposed Action are described below in terms of each of the proponents and lead Federal agencies involved in this Project.

1.4.1 Underlying Needs for the Proposed Action

1.4.1.1 Proponents' Needs for Proposed Action

The proponents' (Caithness and MCEDA) underlying needs for the proposed Project are detailed below.

Caithness seeks to accomplish the following:

- Generate and consistently deliver competitively priced electrical energy, to short- and mid-term electric energy markets in the western United States in response to market demands, using available capacity of the Mead-Phoenix Project 500-kV transmission line.

- Construct and operate a power plant on private land, in compliance with:
(1) applicable laws and regulations;
(2) industry standards for reliability; and
(3) Caithness' corporate environmental objectives to generate power with minimal impact on the environment.

- Support MCEDA's objective for economic development in the Big Sandy Valley by providing land adjacent to the proposed facility and water from the proposed power plant for agricultural purposes.

MCEDA seeks to accomplish the following:

- Generate economic benefits, encourage economic development, and support the agricultural sector in the Big Sandy Valley of Mohave County.

1.4.1.2 Agencies' Needs for the Proposed Action

The underlying needs for the lead Federal agencies (BLM and Western) regarding the proposed Project are detailed below.

BLM seeks to accomplish the following:

- Respond to Caithness's request for rights-of-way across lands managed by the BLM to the proposed power plant site for portions of an access road, a natural gas pipeline, water supply pipeline, and electrical and control lines.

Western seeks to accomplish the following:

- Respond to Caithness's request to provide interconnection of the proposed power plant to the existing Mead-Phoenix Project 500-kV transmission line.

1.4.2 Purpose for the Proposed Action

Caithness' purpose is to construct a 720-MW power plant to generate and sell new, competitively priced electrical energy and capacity in the western United States market, using the Mead-Phoenix Project 500-kV transmission line and associated transmission capacity.

MCEDA's purpose is to further the economic development of the Big Sandy Valley and support agriculture there in partnership with Caithness.

BLM's purposes are to ensure that natural gas pipelines constructed on public lands are safe and reliable and ensure reclamation of public lands that would be disturbed.

Western's purpose is to meet the intent of the requirements of FERC Order No. 888 in providing transmission service to Caithness consistent with statutory obligations without degrading reliability or service to existing customers.

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1.5 PERMITS AND APPROVALS REQUIRED

Construction and operation of the proposed Project would require compliance with a number of Federal, state, and local regulations and would require specific permits and permissions.

Table 1-1 summarizes the environmental regulatory requirements for the proposed Project.

TABLE 1-1
BIG SANDY ENERGY PROJECT
ENVIRONMENTAL REGULATORY REQUIREMENTS

Authorizing Agency	Law or Regulation	Type of Permit/ Approval/Action/Constraint
Western Area Power Administration (Western) and Bureau of Land Management (BLM)	National Environmental Policy Act of 1969 (NEPA) and Implementing Regulations (40 CFR 1500-1508)	• Record of Decision by Western for transmission line interconnection • Record of Decision by BLM for rights-of-way across public lands administered by BLM
	National Historic Preservation Act (NHPA) of 1966 as amended	• Cultural Resources Data Recovery Plan • Native American Consultations
	Archaeologic Resources Protection Act (ARPA) of 1979	• Cultural Resources mitigation • Native American Consultations
	Native American Graves Protection and Repatriation Act (NAGPRA)	• Protection of remains and funerary objects • Native American Consultations
	Executive Order 11988	• Floodplain management
	Executive Order 11990	• Protection of wetlands
	Executive Order 12898	• Environmental Justice in minority populations and lower income populations
	Executive Order 13007	• Protection of Indian sacred sites and their religious practices
	Executive Order 13186	• Protection of migratory birds
	Endangered Species Act	• Biological Assessment and consultation with USFWS
BLM	Federal Land Policy and Management Act (FLPMA)	• Right-of-Way Grants for access road, water and natural gas pipeline, and electrical and control lines crossing of public lands administered by the BLM
Western	Compliance with Floodplain/ Wetlands Environmental Review Requirements (10 CFR 1022)	• Statement of findings
U.S. Army Corps of Engineers (COE)	Clean Water Act	• Section 404 Permit authorization for pipelines and access road
U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act	• Section 7 Consultation (Biological Opinion)
	Migratory Bird Treaty Act	• Depredation permits

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TABLE 1-1 BIG SANDY ENERGY PROJECT ENVIRONMENTAL REGULATORY REQUIREMENTS		
Authorizing Agency	**Law or Regulation**	**Type of Permit/ Approval/Action/Constraint**
U.S. Environmental Protection Agency (EPA)	Clean Water Act	• Stormwater Discharge Permits for construction and operation at power plant site. • National Pollutant Discharge Elimination System (NPDES) Permit
Arizona Corporation Commission	Arizona Revised Statutes	• Certificate of Environmental Compatibility for siting of power plant
Arizona Department of Environmental Quality (ADEQ)	Clean Water Act	• Aquifer Protection Permit (APP) for construction and operation of the evaporation ponds • Stormwater Discharge Permits for construction and operation at power plant site • Spill Prevention Control and Countermeasure Plans for construction and operation • Section 401 Certification • NPDES Permit
	Clean Air Act	• Air Quality Permits to Construct and Operate (PSD and Title V) for emissions of regulated pollutants from plant
		• Fugitive Dust Permit
	Arizona Ambient Air Quality Guidelines	• Toxic Air Pollutants Standards for emissions of formaldehyde
	Superfund Amendments and Reauthorization Act (SARA) Title III	• Community Right-to-Know Reporting
	Resource Conservation and Recovery Act (RCRA)	• Hazardous waste and hazardous materials storage and handling permits
Arizona Game and Fish Department	U.S. Fish and Wildlife Coordination Act	• Coordination with USFWS/BLM/ Western/COE
Arizona State Historic Preservation Office	National Historic Preservation Act (NHPA)	• Permits on state-owned lands • Cultural Resources consultation with Western, BLM, and COE
	Archaeologic Resources Protection Act (ARPA) of 1979	• Cultural Resources Data Recovery Plan • Native American Consultations
	Native American Graves Protection and Repatriation Act (NAGPRA)	• Protection of remains and funerary objects • Native American Consultations

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TABLE 1-1
BIG SANDY ENERGY PROJECT
ENVIRONMENTAL REGULATORY REQUIREMENTS

Authorizing Agency	Law or Regulation	Type of Permit/ Approval/Action/Constraint
Arizona State Lands Department	State Statutes	• Right-of-way Permit for portions of pipeline crossing state lands
Arizona Department of Transportation (ADOT)	State Statutes	• Crossing Permit for pipeline crossings of Federal and state highways • Permit for use of right-of-way
Arizona Department of Agriculture	Native Plant Law	• Salvage or Removal Permit. • Notice of clearing on private lands, salvage on state lands
Mohave County	County Ordinances	• Zoning Permit • Septic/Sewage Package Permit • Building Permit • Excavation Permit (pipeline) • Grading Permit • Amendment to Mohave County General Plan • Night-sky Ordinance

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Chapter 2
Description of the Proposed Action and Alternatives

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2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter presents the following information:

- Description of the Proposed Action
- Actions incorporated into the Proposed Action to reduce or prevent environmental impacts
- Description of alternatives, including alternative gas pipeline routes and the No-Action alternative
- Alternatives considered but eliminated from further analysis
- Comparative summary of environmental impacts

Council on Environmental Quality (CEQ) regulations (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508) require that the Bureau of Land Management (BLM) and Western Area Power Administration (Western) use the review process established by the National Environmental Policy Act (NEPA) as amended to evaluate not only the Proposed Action, but also to identify and review reasonable alternatives to the Proposed Action, as well as a "No-Action" Alternative. The No-Action Alternative means the proposed Project would not take place. The No-Action Alternative provides an environmental baseline against which impacts of the Proposed Action and alternatives can be compared. CEQ (1981) states that reasonable alternatives include those that are practical or feasible from a common sense, technical, and economic standpoint. CEQ requires this document to identify those alternatives that have been eliminated from further analysis, and briefly discuss the reasons why they have been eliminated (40 CFR 1502.14(a)).

The BLM and Western decision-makers must consider all the alternatives discussed in this document. This comprehensive review ensures that environmental information is available to public officials and citizens before decisions are made and before actions are taken. BLM and Western will identify the preferred alternative in the final environmental impact statement (EIS), after considering public and agency comments on this document.

2.2 DESCRIPTION OF THE PROPOSED ACTION

The Proposed Action is to construct, operate, and maintain a baseload 720-megawatt (MW) natural gas-fired, combined-cycle power plant and ancillary facilities, as described further in this section. The proposed power plant would interconnect with the regional electric transmission grid through an existing 500-kilovolt (kV) transmission line.

The Proposed Action would be located in the southeastern portion of Mohave County, Arizona, in the Big Sandy Valley (Figures 2-1 and 2-2). The primary components of the Proposed Action include the following:

- power plant and associated facilities and operations, including the plant cooling system, waste management operations, lighting, and fire protection and other safety systems
- 500-kV substation, with associated transmission line modifications and communications facilities
- water supply system consisting of deep groundwater wells and associated pipelines
- new county access road
- natural gas supply pipeline and interconnection facilities

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- development of land for agricultural purposes
- actions to reduce or prevent environmental impacts

The proposed power plant and substation would be located on private land about 4 miles southeast of Wikieup, Arizona. Water necessary for power plant and agricultural operations would be provided from wells drilled on private land in the vicinity of the proposed power plant site. The access road to the power plant and well field would extend eastward to the proposed power plant site from U.S. Highway 93 (US 93), crossing about 2.3 miles of public and private lands. The high-pressure natural gas pipeline would extend about 39 miles across private and Federal and state public lands to the site from existing pipelines owned by several natural gas suppliers located along the Interstate 40 (I-40) corridor. Agricultural development would occur on private land adjacent to the access road immediately southwest of the proposed power plant site. Figure 2-2 shows the general location of the proposed power plant and most of the major Project components in the area.

The following sections describe each of the primary components of the Proposed Action in more detail.

3.1.1 Power Plant and Associated Facilities

The proposed power plant and associated evaporation ponds would occupy about 33 acres of a 120-acre site located on private land in the southwest quarter of Section 5, Township 15 North, Range 12 West (T15N, R12W). The power plant would be built in two phases. Phase 1 would be a 500-MW natural gas-fired, combined-cycle power plant, composed of the following:

- two combustion turbine generator sets and auxiliaries
- one steam turbine generator set and auxiliaries
- two triple-pressure heat recovery steam generators (HRSGs) and exhaust stacks, each equipped with a selective catalytic reduction (SCR) system as necessary for the exhaust gases to meet U.S. Environmental Protection Agency (EPA) and Arizona Department of Environmental Quality (ADEQ) air standards
- ancillary equipment for the balance of the power plant systems including cooling towers, administration (control room) and support buildings, a communication system, water systems, fire systems, transformers, switching gear, and other facilities

Construction of Phase 2, which is expected to commence within 18 months following completion of Phase 1, would add the following, for a total of 720 MW:

- one single-shaft combustion turbine/steam turbine generator set and auxiliaries
- one triple-pressure HRSG and exhaust stack equipped with an SCR system as necessary to meet EPA and ADEQ air standards
- ancillary equipment for the balance of the plant systems including cooling towers, water systems, fire systems, a transformer, switching gear, and other facilities

Specifics of the proposed power plant and associated facilities are subject to change during final design and construction. However, no environmental impacts beyond those assessed in this document are anticipated. If future changes to the design of the proposed power plant that constitute a Federal action create the potential for impacts not assessed in this EIS, BLM and Western would conduct additional environmental reviews pursuant to NEPA.

2.2.1.1 Process Description

The proposed combined-cycle operation uses a combination of a combustion turbine and steam turbine to generate electricity. The electrical generation process converts the heat energy

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Project Location Ma
Big Sandy Energy Project EI
Figure 2-

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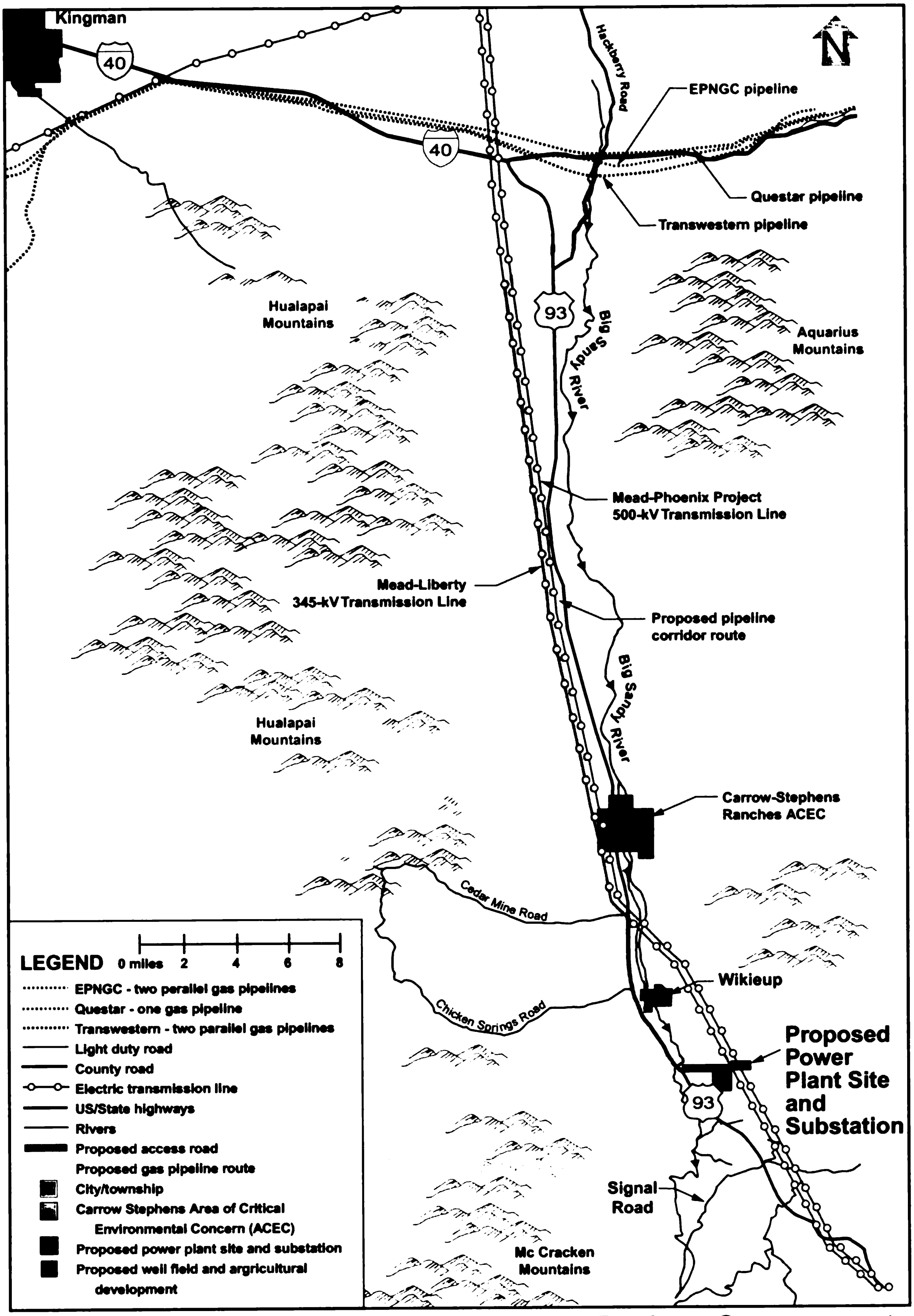

Power Plant Location with Major Project Components

Big Sandy Energy Project EIS

Figure 2-2

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available from the natural gas to mechanical energy, then to electrical energy. Inputs to the system would include natural gas and cooling water. Outputs would include heat, electrical energy, and combustion byproducts. Combustion byproducts primarily would be water and carbon dioxide (CO_2). Some air pollutants also would be emitted (primarily nitrogen oxide [NO_X], carbon monoxide [CO], and particulates). A simplified process diagram (Figure 2-3) is provided to indicate the major processes that would be involved with the production of electrical power at the proposed power plant.

As shown on Figure 2-3, natural gas would be burned in combustion turbines, which are connected to electrical generators that produce electricity. Each combustion turbine then would exhaust hot gas to an HRSG, which is a boiler specifically designed to recover heat from the gas. Steam generated in the boiler would be routed to a steam turbine to produce additional electricity. Each HRSG would include a section containing a catalyst to reduce air pollutants present in the combusted gas. The HRSG would remove some heat and pollutants in the gas, and the residual heat and air pollutants would be exhausted through a stack about 130 feet tall. The stack would contain equipment to monitor air emissions. Wet cooling towers would provide cooling for the steam generation cycle and turbine inlet air. Cooling make-up water would be supplied from Project groundwater wells, and wastewater from the cooling system would be directed to one of two evaporation ponds.

Figures 2-4a, b, and c are Project site diagrams that show locations of the various components of the proposed power plant, and proposed location of the substation and evaporation ponds. The combustion turbines and steam turbines are sited in close proximity to one another to maximize the use of shared infrastructure and minimize system losses. The combustion turbines, HRSGs, steam turbines, and supporting generation equipment are referred to throughout this environmental impact statement (EIS) collectively as the proposed power plant. The proposed power plant would cover about 15 acres and would contain the turbines, generators, HRSGs, stacks, administration building (control room), maintenance building/workshop, warehouse, storage, cooling towers, and parking for the operating staff. Several buildings and/or enclosures would contain the mechanical and electrical equipment. The size of these buildings would vary with the final layout and design. An artist's rendering of Phase 1 of the proposed power plant is shown on Figure 2-5. Figures 2-6 and 2-7 provide cross-sectional views of the proposed power plant layout for Phase 1; Phase 2 would involve the addition of more of the same equipment.

The following sections describe the proposed power plant and associated facilities in more detail. Refer to Figures 2-4a, b, and c; and Figure 2-7 for details on locations of the features discussed. Construction-related information for the proposed power plant is contained in Section 2.2.7.

2.2.1.2 Combustion Turbines and Generators

A combustion turbine is similar to a jet engine. In general, air is compressed and then heated by the fuel combustion. Energy is recovered as the high-pressure, high-temperature gas expands through and turns the turbine. This energy is used to turn the air compressor and a generator, producing electrical energy. Two 170-MW combustion turbines would be constructed as part of Phase 1. Each combustion turbine would use advanced combustion technology to minimize pollutant emissions, and would be housed in a metal building to protect the unit from the elements and provide noise reduction.

The air intake system would be mounted above each combustion turbine to provide filtered air to the combustion turbine compressor. The intake system would be equipped with a multistage, static filter system to clean particulates from the air. Silencers would be installed to reduce the potential for noise from the combustion turbine compressor inlet. The system would be provided with access for inspection and maintenance. An inlet air evaporative cooling system using water as the cooling medium would be provided to enhance combustion turbine performance at high local ambient air temperatures. Indirect cooling

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would be provided for the stator winding and direct cooling would be provided for the rotor winding.

A combined-cycle unit using both the steam turbine and combustion turbine to power one electrical generator rated at 220 MW would be added under Phase 2. The combustion turbine would be similar to the first two and would be rated at 160 MW.

2.2.1.3 Heat Recovery Steam Generators and Air Pollution Control Equipment

The high-temperature (about 1,000 degrees Fahrenheit) combustion turbine exhaust gas would be directed through its HRSG, for combined-cycle operation. This HRSG system would use the heat available in the exhaust gas to produce steam for the steam turbine.

Duct burners would be located in the transition section between each combustion turbine exhaust and the HRSG. Duct burners are natural gas burners that would add about 45 million British Thermal Units (BTU) per hour of heat to each HRSG. This additional heat energy would increase plant electrical output up to an additional 9 MW for each HRSG. The duct burners would be used during periods of peak energy demand to maximize the plant's electrical output.

The reduction in combustion turbine gas temperature in the HRSG would allow the use of advanced SCR systems to minimize concentrations of CO and NO_X. The SCR system would control emissions, as needed, to satisfy air quality standards. NO_X would be controlled in the exhaust gas during normal operations to a maximum of 2.5 parts per million volume, dry (ppmvd), corrected to 15 percent oxygen and dry gas conditions. The CO would be controlled during normal operation to a maximum emission rate from the turbine of 5 ppmvd. CO emissions would increase to 8 ppmvd during duct firing. The exhaust gas would be discharged through an integral exhaust stack about 130 feet in height.

The catalyst planned for NO_x control requires the addition of ammonia to the system. Aqueous ammonia is planned for this Project. About 10 part per million (ppm) of aqueous ammonia would be expected to exit the system unreacted. In addition, some formaldehyde and other gases would be released as a result of the natural gas combustion process.

Additional details on air pollutant emissions expected from operation of the proposed power plant are provided in Section 3.1, Air Resources.

2.2.1.4 Steam Turbines, Generators, and Condensers

Two steam turbines are proposed, one with Phase 1 and one with Phase 2. The initial steam turbine would power a generator rated at about 160 MW with a water-cooled condenser. The steam turbine would be fitted with stop and control valves for the high-pressure steam admission. The steam turbine and condensers would be factory-assembled and shipped in modules for field erection. The proposed design and size of the steam turbine would provide for incremental output during peak operations.

After powering the steam turbine, the exhaust steam would be condensed to water using a closed system condenser, which would transfer the heat to water circulated through a cooling tower.

Under Phase 2, the proposed steam turbine would drive the same shaft as the gas turbine also proposed to be installed during Phase 2. Together, the steam and gas turbines would power an enclosed air-cooled generator rated at 220 MW. After powering the steam turbine, the exhaust steam would be condensed, as described above.

2.2.1.5 Plant Cooling System

The Proposed Action would include two separate cooling systems. The first would be the cooling system installed at the inlet of the turbine that would use evaporation of water to cool incoming air. This would increase the air

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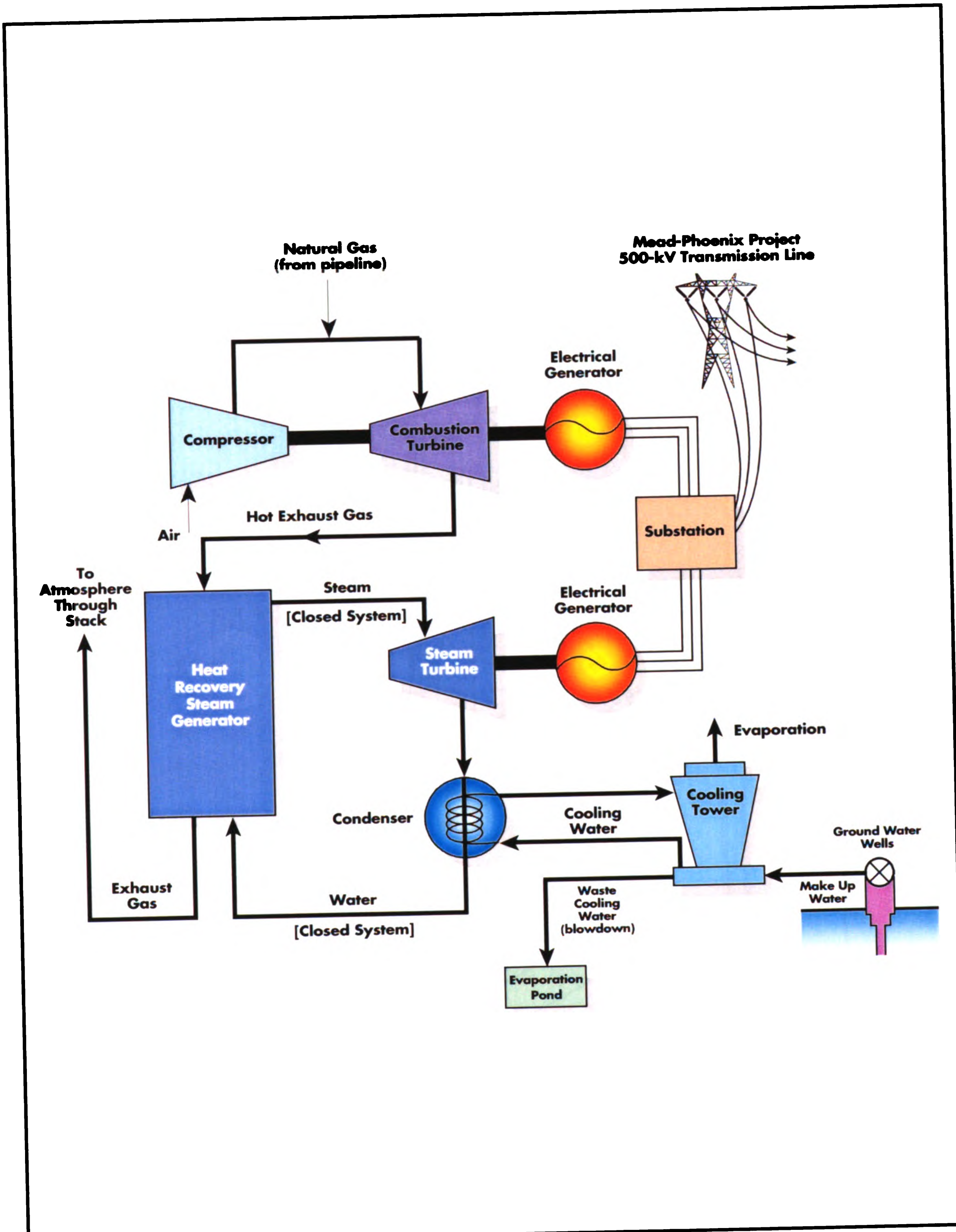

Process Description

Big Sandy Energy Project EIS

Figure 2-3

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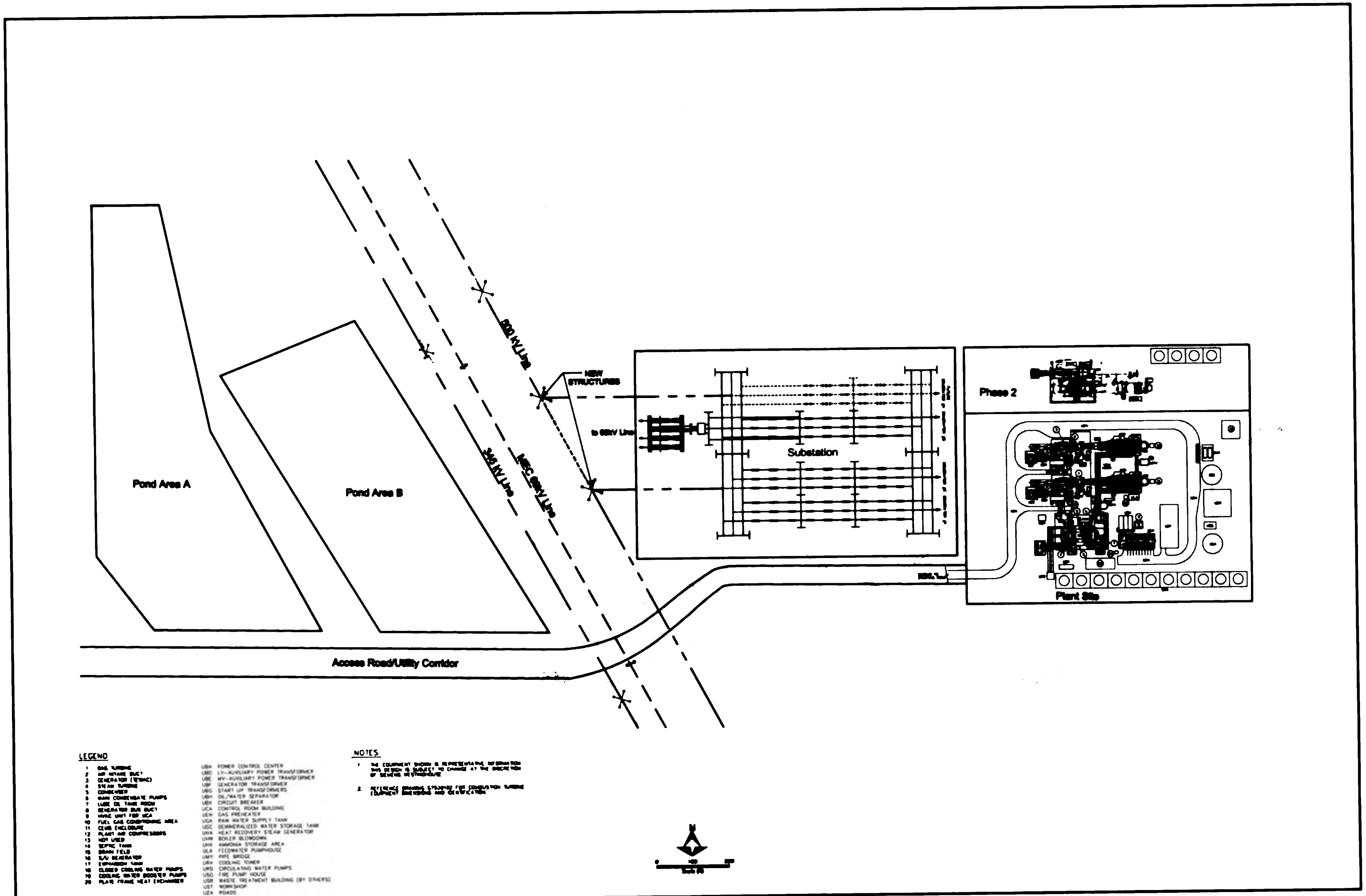

Project Site Diagram
Big Sandy Energy Project EIS
Figure 2-4a

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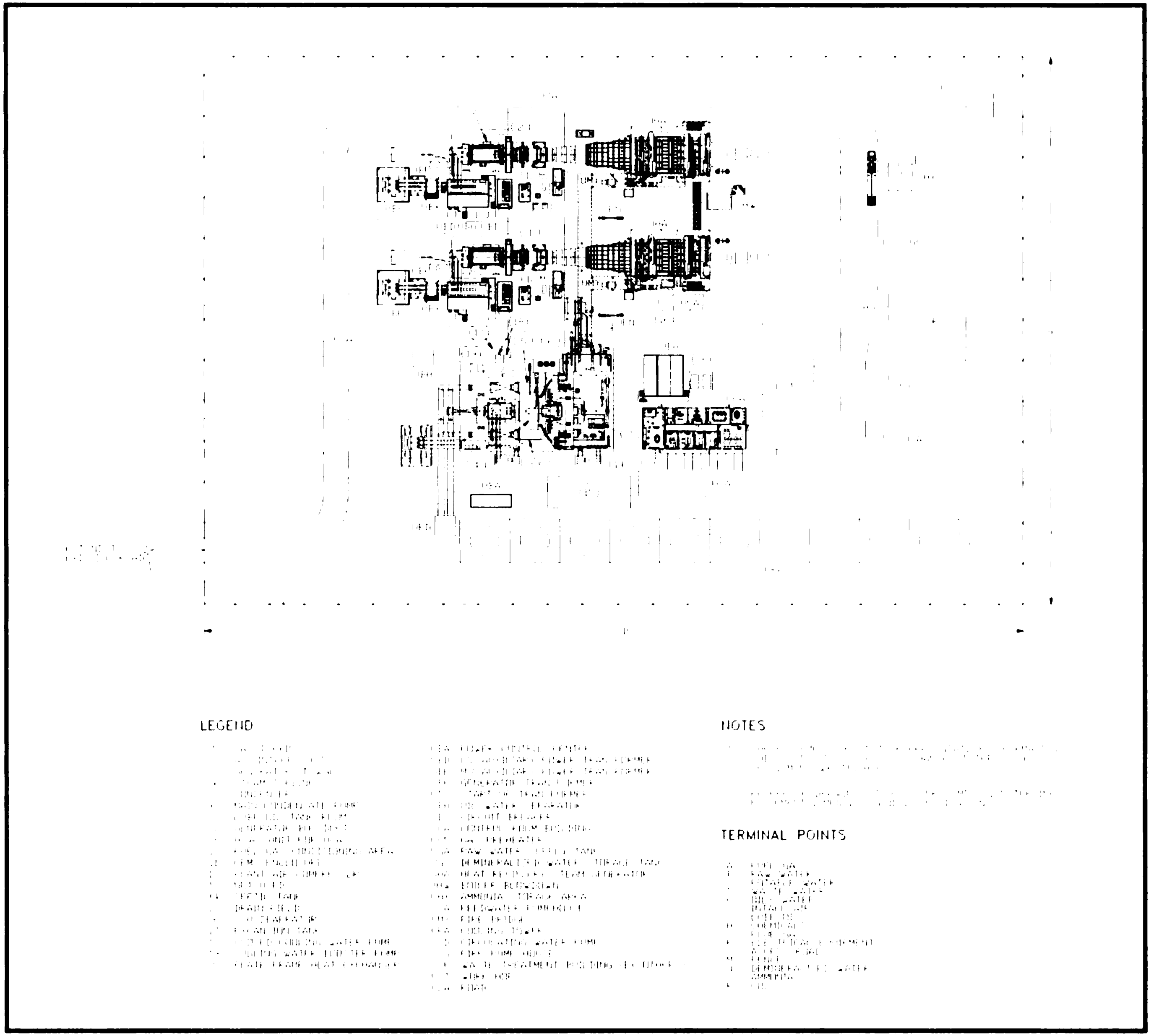

Phase 1 General Plant Site Arrangement

Big Sandy Energy Project EIS

Figure 2-4b

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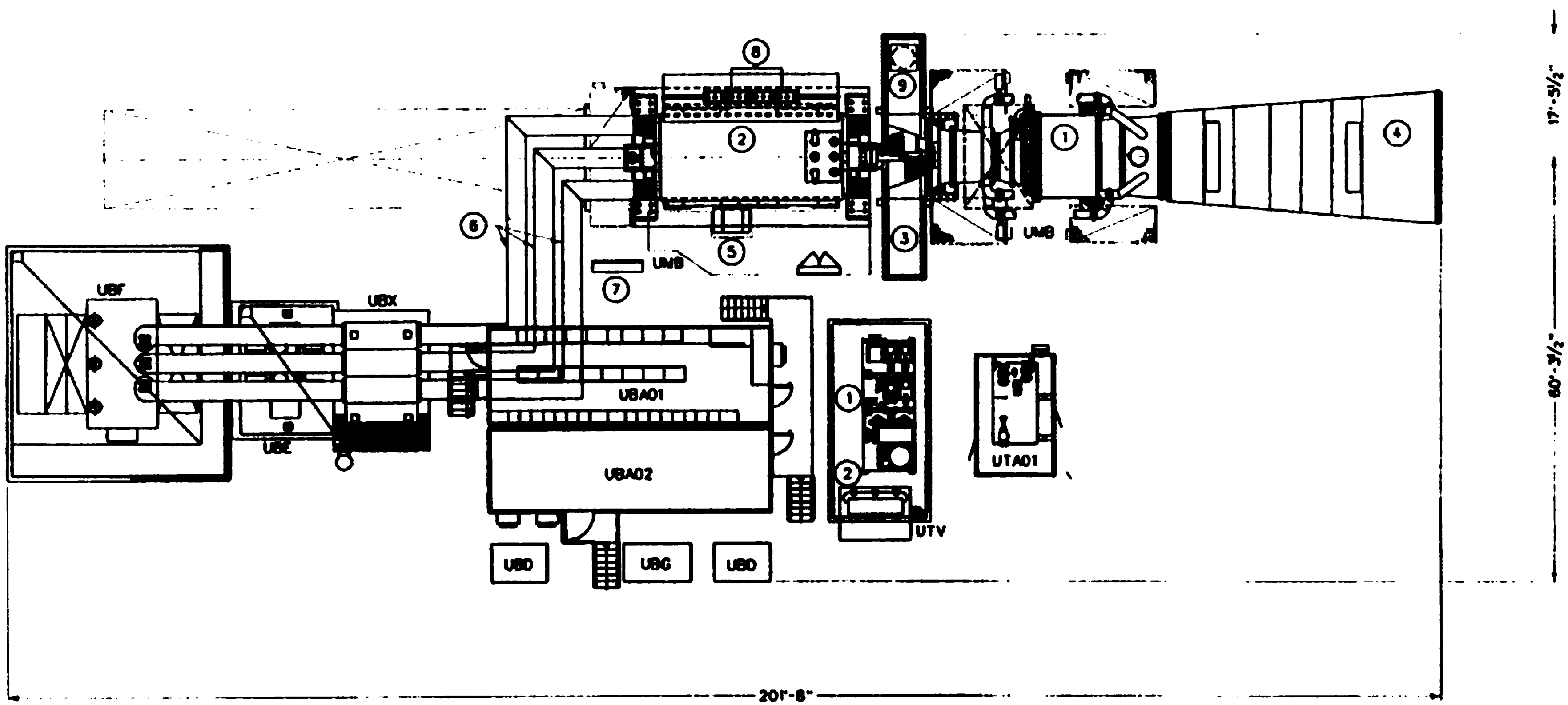

LEGEND

UMB GAS TURBINE HOUSE
1. GAS TURBINE V84.3A
2. GENERATOR TLRI 108/46-36
3. AIR INTAKE DUCT
4. DIFFUSER
5. NEUTRAL CUBICLE
6. BUS DUCT
7. MOTOR CONTROL CENTER
8. BLADE CLEANING SKID
9. DEHUMIDIFIER
UTA01 MECHANICAL CONTAINER *1

UTV LUBE OIL ENCLOSURE
1. LUBE OIL TANK
2. PLATE FRAME HEAT EXCHANGER
UBA01 & 02 POWER CONTROL CENTER
UBE AUXILIARY TRANSFORMER
UBF GENERATOR TRANSFORMER
UBD LOW VOLTAGE TRANSFORMER
UBG START UP TRANSFORMER
UBX GENERATOR BREAKER

NOTES

1. THE EQUIPMENT SHOWN IS REPRESENTATIVE INFORMATION. THIS DESIGN IS SUBJECT TO CHANGE AT THE DISCRETION OF SIEMENS WESTINGHOUSE.
2. ALL DIMENSIONS SHOWN ARE IN FEET AND INCHES.

Phase 2 General Plant Site Arrangement

Big Sandy Energy Project EIS

Figure 2-4c

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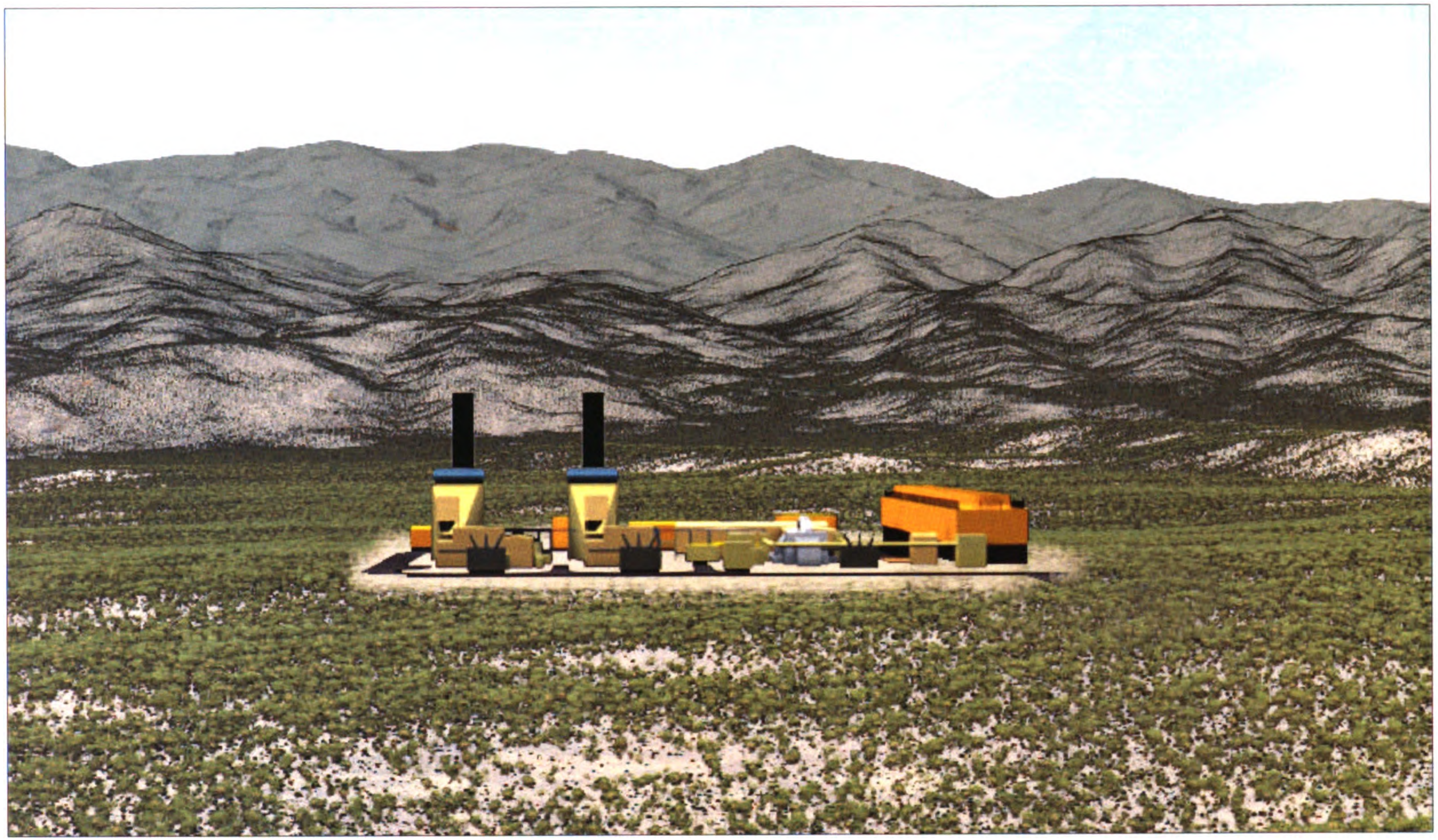

VIEW FROM WEST LOOKING EAST

891/bigsand-views2.dwg

Artist's Rendering of Power Plant
Big Sandy Energy Project EIS
Figure 2-5

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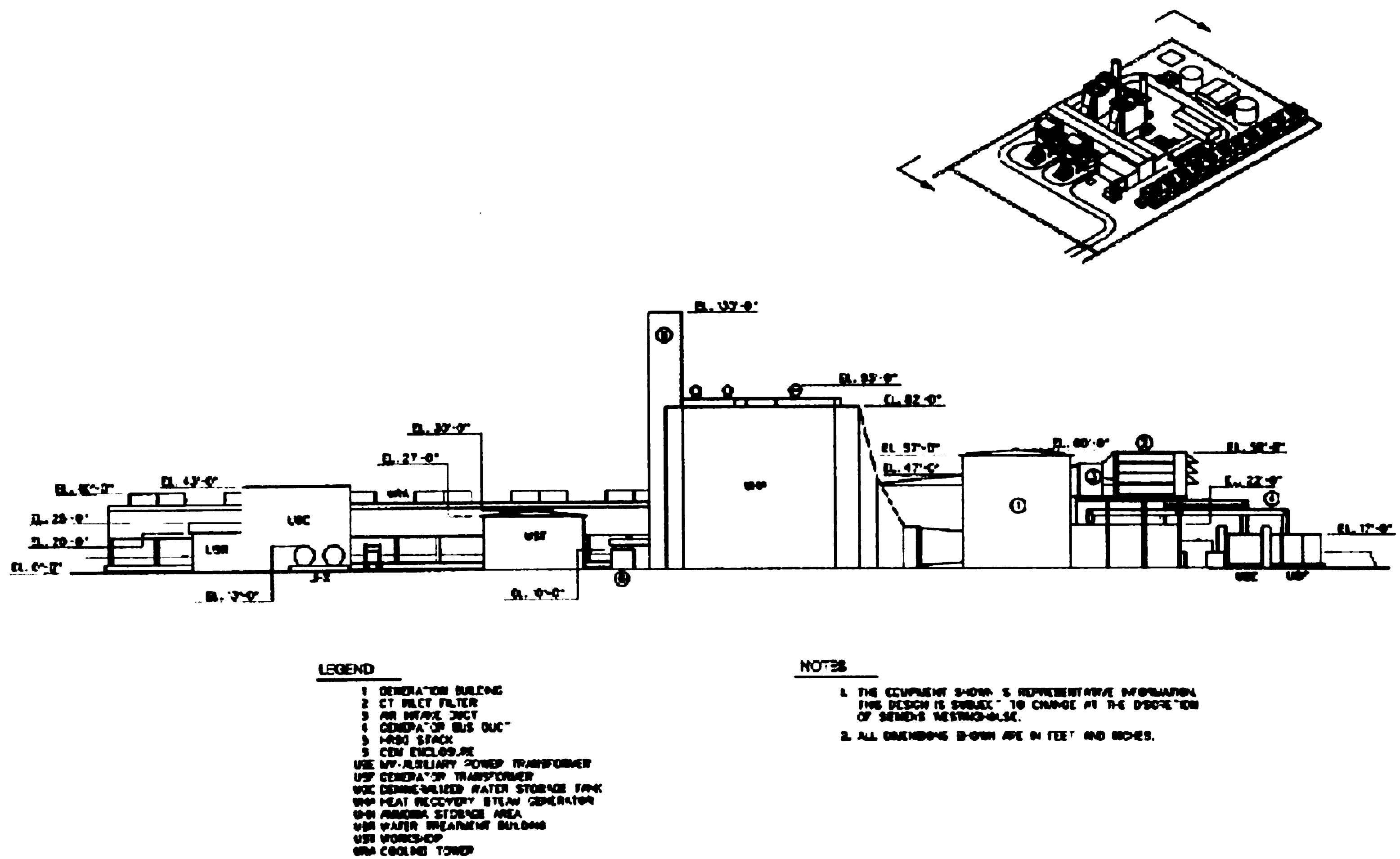

Phase 1 Power Plant Cross Section – Elevation 1

Big Sandy Energy Project EIS

Figure 2-6

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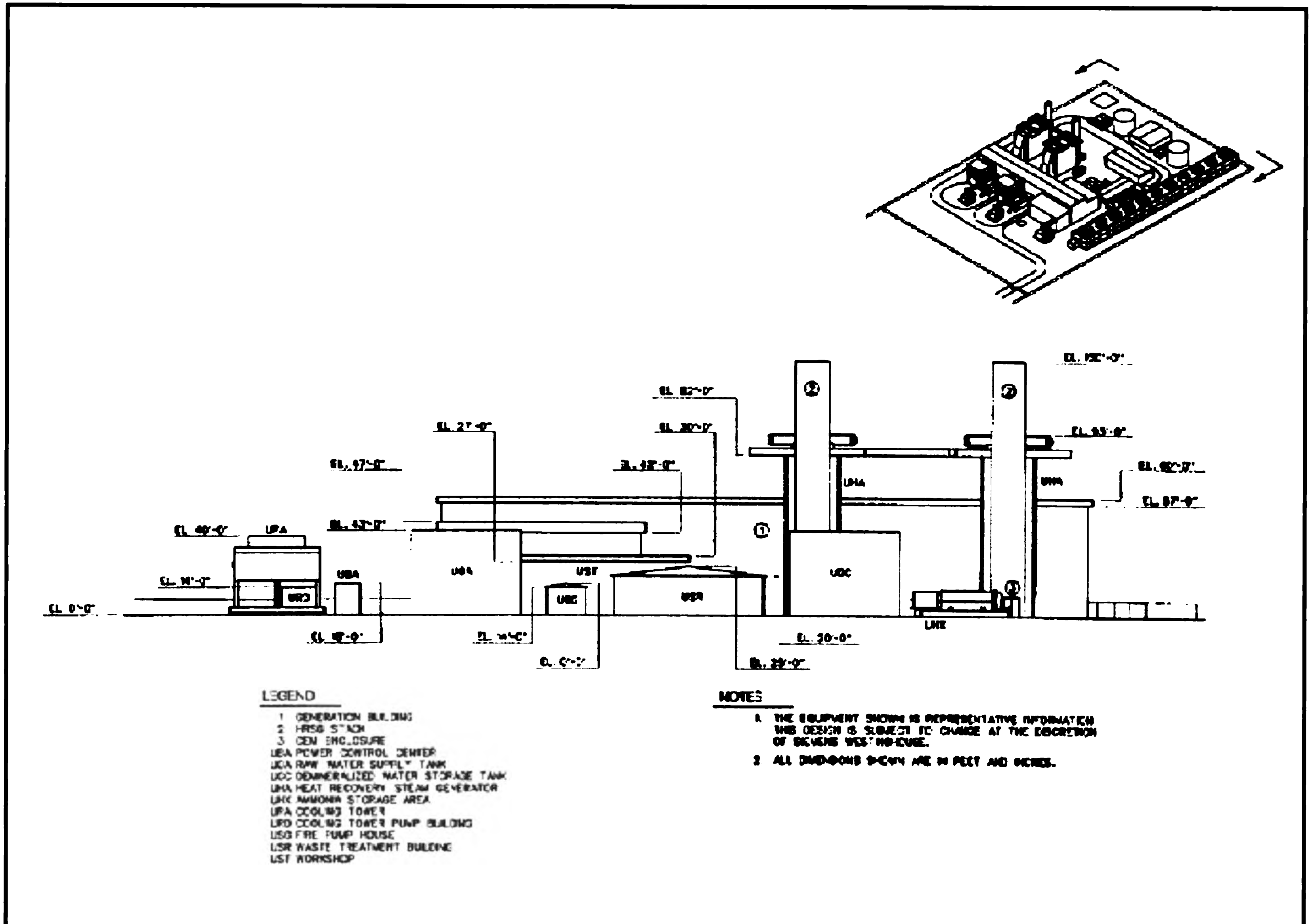

Phase 1 Power Plant Cross Section – Elevation 2

Big Sandy Energy Project EIS

Figure 2-7

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density, allowing the combustion turbine to generate additional energy.

The second cooling system would consist of an 11-cell wet cooling tower installed during Phase 1 that would evaporatively cool the water that has passed through the steam condenser to condense the low-pressure steam to water. An additional four-cell cooling tower would be installed as part of Phase 2. The cooling tower for the steam cycle built during Phase 1 would cycle water at the rate of about 219,000 gallons per minute (gpm). The smaller cooling tower added as part of Phase 2 would recycle about 82,125 gpm. About 2,400 gpm of water would be evaporated or lost as water droplets (drift) from the cooling towers during full load operation of the 720-MW (Phase 1 and Phase 2) power plant. Make-up water for the cooling towers would be provided from the groundwater supply wells. The water in the cooling tower would be cycled through the cooling system up to 12 times. To keep the dissolved solids concentration from going too high, a slip stream of cooling water would be discharged to the evaporation ponds (refer to Section 2.2.1.6) and make-up water would be added. Water for cooling needs would be treated with sodium hypochlorite (bleach) to control algal fouling. Less than 0.2 ppm of residual chlorine would be expected at the cooling water cycle outlet.

2.2.1.6 Waste Management

Solid and Hazardous Waste/Materials

Most of the solid waste generated during both construction and operation of the proposed power plant and associated facilities would be non-hazardous wastes typical of those generated by other human activities, such as used rags, empty parts containers, and office waste. About 50 tons per year (tpy) of general solid waste (rubbish) would be expected from routine operations.

Solid waste would be temporarily stored at the proposed power plant site in containers provided by a commercial waste handling facility. These materials would be collected and transported by a licensed hauler to an approved disposal facility authorized to accept this type of waste. All waste collection and disposal would be performed in accordance with regulatory requirements (Resource Conservation and Recovery Act [RCRA]) and applicable health and safety standards.

Several special or potentially hazardous wastes would be generated from routine operations. These include waste lubricating oils (12 tpy) and associated used oil filters, spent solvents (12 tpy), 100 empty drums per year, and spent SCR catalyst (24 tpy). Used oil, spent solvents, used oil filters and empty drums would be recycled by a licensed contract recycling company. Spent SCR catalyst would be returned to the supplier to be recycled or disposed of as a hazardous waste in an approved and permitted landfill.

Other hazardous wastes generated would include chemical cleaning wastes (such as alkaline and acid cleaning solutions used during pre-operational chemical cleaning of the HRSGs), acid cleaning solutions used for chemical cleaning of the HRSGs after the units are put into service, and turbine wash and HRSG fireside wash waters. These would be classified as characteristically hazardous because of their typically high metal concentrations. They would be stored temporarily on site in portable tanks and would be disposed of in accordance with applicable regulatory requirements (RCRA). About 120 tpy of these cleaning/flushing waste solutions could be expected from routine operations.

Hazardous materials, including solvents, acid, and oil, would be stored and used during construction and operation of the proposed power plant and associated facilities. Table 2-1 lists the various chemicals that likely would be used at the proposed power plant or other facilities. All materials would be stored, handled, and used in accordance with applicable regulations and standards (RCRA), and workers would be properly trained in hazardous materials identification and handling.

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TABLE 2-1
CHEMICALS STORED AT THE PROPOSED POWER PLANT SITE

	Chemical Name*	CAS Number	Maximum Quantity On-Site
Aqueous Ammonia (19 to 30% solution)	Ammonium Hydroxide	1336-21-6	10,000 gallons
NALCO 356	Cyclohexylamine (20 to 40%) Morpholine (5 to 10%)	108-91-8	2,000 gallons
TRIACT 1800	Cyclohexylamine (10 to 20%)	108-91-8	2,000 gallons
Ammonia Refrigerant (R717)	Anhydrous Ammonia	7664-41-7	14,000 gallons
Sulfuric Acid	Sulfuric Acid (93%)	7664-93-0	6,000 gallons
Aluminum Sulfate	Aluminum Sulfate	10043-01-3	Variable
Bleach	Sodium Hypochlorite (10%)	7681-52-9	6,000 gallons
Sodium Hydroxide	Sodium Hydroxide (50%)	1310-73-2	6,000 gallons
Disodium Phosphate	Di-Sodium Phosphate	7558-79-4	500 pounds
Trisodium Phosphate	Tri-Sodium Phosphate	760-54-9	500 pounds
Ammonium Bifluoride	Ammonium Bifluoride	N/A	200 pounds
Sodium Carbonate	Sodium Carbonate	N/A	500 pounds
Hydrochloric Acid	Hydrochloric Acid (30%)	7647-01-0	10,000 gallons
Citric Acid	Hydroxy-propoinic-tricarbonxylic Acid	77-7279	500 gallons
STABREX ST70	Sodium Hydroxide (1 to 5% solution)	1310-73-9	2,000 gallons
NALCO 7280	Polyacrylic Acid (20 to 40% solution) Other Proprietary Chemicals	N/A	250 gallons
ELIMIN-OX	Carbohydrazide Amino Compounds	497-18-7	2,000 gallons
NALCO 7408	Sodium Bisulfite (40 to 70% solution)	7631-90-5	250 gallons
NALCO 22106	Sodium Polyacrylate Aryl Sulfonate	N/A	2,000 gallons
NALCO 7213	Tetrasodium ethylenedia-minetetraacetate (10 to 20% solution) Sodium Polyacrylate	64-02-8	2,000 gallons
Mineral Insulating Oil[1]	Oil	N/A	25,000 to 40,000 gallons
Lubrication Oil	Oil	N/A	12,000 gallons
Hydraulic Oil	Oil	N/A	600 gallons
No. 2 Diesel	Oil	N/A	500 gallons
Various Cleaning Detergents	Various	N/A	100 gallons
Laboratory Reagents (Liquids and Solids)	Various	N/A	Small Quantities

* Provides the most toxic chemical used in the solution or formulation
[1] The majority of the mineral insulating oil would be stored at the substation.

Bulk chemicals used at the proposed power plant would be stored in storage tanks, and other chemicals would be stored in returnable delivery containers. Chemical storage and chemical feed areas would be designed to contain leaks and spills. Berms and drain piping design would allow a full-tank capacity spill without overflowing the berms. For multiple tanks located within the same bermed area, the capacity of the largest single tank would determine the volume of the bermed area and drain piping. Drains from the chemical storage and feed areas would be directed to a neutralization area for neutralization, if necessary. Drain piping for volatile chemicals would be equipped with traps and isolated from other drains to eliminate noxious or toxic vapors. After neutralization, water collected from the chemical storage areas would be directed to the cooling tower basin whenever possible. Locations of chemicals and lube oils expected to be used at the proposed power plant are noted on Figures 2-4b and c.

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Aqueous ammonia would be used in the SCR system. The aqueous ammonia would be stored in tanks within a containment basin. Ammonia vapor detection equipment would be installed to detect escaping ammonia and activate alarms and the automatic vapor suppression features.

Potential discharges from areas containing or using hazardous materials, and the best management practices that would be used to ensure discharges do not occur or are contained, are discussed in the *Big Sandy Stormwater Pollution Prevention Plan*, which is included as Appendix A.

Wastewater/Stormwater

Sanitary wastes would be directed to a septic system and drain field constructed for the proposed power plant; the location within the proposed power plant site is noted on Figure 2-4b. Process water would be used in boilers and for cooling and cleaning purposes. Process wastewater would be recycled to the maximum extent feasible, and wastewater that could no longer be recycled would be evaporated. No discharge of process wastewater is proposed, and the proposed power plant would be designed and operated as a zero discharge facility. Process wastewater would be treated using an advanced wastewater treatment system, which would return relatively clean water to the process and send a concentrated brine waste stream to an evaporation pond.

Floor drains would discharge to an oil/water separator, where oily wastes would be removed and the water sent to the process wastewater treatment system. A licensed contractor would collect and recycle or dispose of these oily wastes.

Stormwater from the power plant site surface runoff also would be discharged to the evaporation ponds. Section 2.2.8.4 provides a summary of the stormwater management features of the Proposed Action.

Evaporation Ponds

Two wastewater storage/evaporation ponds would be constructed west of the proposed power plant and substation (refer to Figure 2-4a). The two ponds would be bisected by a small drainage channel. Together, the ponds would occupy a total of 18 acres. Each pond would be fenced with four-strand barbed wire. The ponds would receive discharged process wastewater, cooling tower blowdown water, and stormwater runoff from the proposed power plant site and substation. The ponds would require a permit from ADEQ for aquifer protection, and would meet the design requirements of ADEQ and the Arizona Department of Water Resources (ADWR).

Each pond would be provided with two liners. A leak detection and leachate collection system would be installed between the liners. The outer (bottom) liner would consist of 12 inches of clay or an alternative material with a hydraulic conductivity of 1×10^{-6} centimeters per second (cm/sec) or less. Above the leak detection system, an inner (top) liner would be constructed with a 60 mil high-density polyethylene (HDPE) geomembrane. The HDPE would be textured on both sides to increase frictional resistance to slippage of cover material.

The interior bottom of each pond above the inner liner would be covered with a 12-inch-thick layer of prepared cover material to prevent wind uplifting, mechanical damage, and other types of potential damage to the inner liner.

Interior slopes of the ponds on top of the inner liner would be covered with a 12-inch-thick layer of prepared cover material, a layer of 10-ounce sewn polypropylene geotextile, and a minimum of a 9-inch-thick layer of riprap with an average size of 6 inches. The size of the riprap might be increased to accommodate surface waves in the pond. Exterior slopes of the dike surrounding each pond would be covered with a 6-inch layer of gravel or crushed rock for wind and rainwater protection.

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Each pond would be provided with an independent leak detection and removal system (LDRS) between the inner and outer liners. An HDPE geonet with a minimum thickness of 150 mils would be installed between the liners to collect leakage through the inner liner and carry the liquids to a drainage trench located in the center bottom of each cell. The drainage trench would be rock-filled and constructed with a minimum of a 6-inch-diameter perforated HDPE pipe. A geotextile cushion layer would be placed around the rock to prevent punctures of the geomembrane liner.

Each pond would have a rock-filled collection sump constructed within the LDRS. This collection sump would have a minimum depth of 30 inches. A perforated HDPE sump pipe would be installed inside of each sump. Each sump pipe would extend up the side slope of the cell to a concrete access area. A horizontal sump pump would be installed inside each sump pipe to pump out leakage and return it back into the pond. Each pump would have a local mounted controller with instrumentation. Each pump would be sized to remove twice the maximum leakage resulting from one 100-millimeter-diameter hole per acre with the pond at its maximum water level.

The pond influent system would be designed so that each pond could operate independently should a shutdown of a pond for maintenance be required. Discharge into each pond would be via pipes installed over the top of the dike and into each pond.

The calculated volume of stormwater retention required at the proposed power plant site and substation would be 7.44 acre-feet (324,086 cubic feet). This amount of storage was determined using information and calculation procedures in accordance with the ADEQ guidelines and procedures for stormwater detention/retention, which predicted a 100-year, 24-hour storm event (refer to Section 2.2.8.4). This amount was added to the amount of process wastewater expected in order to properly size the evaporation ponds.

2.2.1.7 Plant Auxiliaries

Lighting

Lights would be necessary to safely operate the facility at night. Lighting would be limited to areas required for safety in and around the proposed power plant and substation; no lighting is proposed for the area around the evaporation ponds. Lighting would be shielded from public view where and when possible. Lighting would be directed downward and shielded in accordance with the Mohave County Night Sky Ordinance. Highly directional, high-pressure sodium vapor fixtures would be used.

Communication Facilities

A microwave communication tower and antenna would be constructed on the proposed power plant site to deliver signals from control centers and other remote locations, and to report operating status. This network also would provide voice communication from dispatchers to power plant operators and maintenance personnel. Microwave communications require an unobstructed "line of sight" between antennas. A communications tower about 6 meters (20 feet) high would be constructed at the proposed power plant site, with a microwave antenna aimed toward an existing communication link on Aubrey Peak or in Wikieup.

Grounding and Cathodic Protection

The Proposed Action would include a grounding system that would be designed and installed in accordance with applicable industry standards.

The proposed power plant's electrical system would be susceptible to ground faults, lightning, and switching surges that could result in high voltage, creating a hazard to site personnel and electrical equipment. The grounding system would minimize these risks by shunting over-voltage phenomena to ground in a manner that would reduce exposure of personnel or equipment to excessive voltage, current, or temperature. Industry standards and guidelines

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for grounding of generation equipment and substations would be followed.

The grounding grid would be a network of bare copper conductors, laid out in an orthogonal pattern. The conductor size, spacing of conductors, and depth of burial would be determined by design based upon a number of factors, including soil characteristics and maximum ground fault and lightning intensity. Ground rods might be driven deeper into the earth and bonded to the grid, if necessary, to obtain adequate contact with the earth. There would be risers from the grid to the surface, where grounding wires to equipment and structures would be connected.

Cathodic protection systems would be provided, to control the corrosion of underground metal piping. Cathodic protection would include protective covering of pipes, as well as sacrificial anode systems. Depending upon the corrosion potential and the site soils, either passive or impressed current cathodic protection would be provided.

Fire Protection

Fire protection would be supplied by the use of diesel-driven emergency fire pumps, in accordance with National Fire Protection Association (NFPA) guidelines. Fire detection devices would be installed at key points throughout the proposed power plant. These would include smoke detectors, flame detectors, and temperature detectors, as appropriate.

Fixed fire suppression systems would be installed at determined fire risk areas, such as the turbine lubrication oil equipment and cooling towers. The power plant fire suppression water loop also would supply water to a vapor suppression system at the aqueous ammonia storage tank area. Sprinkler systems also would be installed in the control/administration building and fire pump building, as required by NFPA and local code requirements. The combustion turbine generator units would be protected by a deluge spray mist-type fire protection system.

Hand-held fire extinguishers and hand cart extinguishers of the appropriate size and rating would be located in accordance with NFPA 10, Standard for Portable Fire Extinguishers, throughout the facility.

Safety Systems

Several safety features would be integrated into the power plant design, including the following:

- Emergency power for control and protection systems for the combustion turbines would be supplied from redundant direct current systems within the respective combustion turbine. Power for control and protection systems for the boilers, steam turbine, and balance of plant would be supplied from a redundant direct current system (batteries) not associated with the combustion turbines.

- All electrical systems would be grounded to reduce the potential for electrical shock.

- All high-pressure steam systems would be routinely tested and inspected to ensure adequate reliability and safe operation.

- All structures would be designed and constructed to comply with Uniform Building Code (UBC) Seismic Zone 2b practices.

- Safety showers and eyewashes would be provided adjacent to, or in the area of, all chemical storage and use areas. Hose connections would be provided near the chemical storage and feed areas to flush spills and leaks to the neutralization facility. Power plant personnel would use state-approved personal protective equipment during chemical spill containment and cleanup activities. Personnel would be properly trained in the handling of these chemicals and instructed in the procedures to follow in case of a chemical spill or accidental release. Adequate supplies of absorbent material would be stored on site for spill cleanup.

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- Electric equipment insulating materials would be specified to be free of polychlorinated biphenyls (PCBs).

- Hazardous wastes generated during construction would be handled, controlled, and disposed of by the contractor in accordance with standard industry practices and appropriate regulations.

- A 6-foot-high chain-link fence would be installed around the perimeter of the proposed power plant site and around individual water well heads. A four-strand barbed wire fence would be installed around the evaporation ponds. A cattle guard and gate would be installed where the access road enters the plant, and the gate would remain closed during normal operating hours.

2.2.1.8 Operational Noise

A typical combined-cycle power plant generating 720-MW of power has a characteristic noise level of 75 A-weighted decibels (dBA) at 400 feet from the main facilities. Much of this noise originates from the turbines and cooling towers, but operational noise can occur from a variety of sources and activities at the plant. Section 3.1.8 provides more detail on noise levels that could be expected at various distances from the proposed power plant boundary.

2.2.2 Transmission System Modifications

2.2.2.1 Substation and Electrical Equipment

The substation would provide the interconnection between the proposed power plant and the Mead-Phoenix Project 500-kV transmission line. The proposed electrical substation for the high-voltage transmission interconnection would cover about 12 acres and would be located between the proposed power plant and the existing Mead-Phoenix Project 500-kV transmission line. The transmission line crosses the proposed power plant site, eliminating the need for new electrical transmission lines to connect the proposed power plant to the regional grid. Western would design, construct, maintain, and operate the proposed substation. Figure 2-4a shows the location of the substation, and Figure 2-8 provides a photograph of a typical substation. A substation contains several different kinds of equipment arranged to carry out electrical functions, minimize safety risk, and accommodate operation and maintenance. The discussion below describes the equipment that would be installed in the proposed substation.

Transformers

Three 3-phase 500/16-kV transformers would be installed during the first phase of the proposed Project to step-up the voltage from the proposed power plant. Electricity produced by the steam turbine generators and the combustion turbine generators would be transformed to 500-kV for delivery over the transmission system. Each generator would be connected to the high-voltage substation via generator leads, conductor support structures, and a generator step-up transformer. Also, one 3-phase 69/16-kV transformer for interconnecting with the existing Mohave Electric Cooperative (MEC) 69-kV transmission line would be used for construction power and station service. One 3-phase 16/12.47-kV transformer would be installed for serving water supply pump loads. A 500/69-kV transformer may be installed to strengthen the tie with the local 69-kV system. For Phase 2 of the proposed Project, one additional 3-phase 500/16-kV generator step-up transformer would be installed.

The step-up transformers each would contain about 45 cubic meters (12,000 gallons) of cooling oil. An oil containment liner would be installed to collect and retain oil within the substation should an oil spill occur, in accordance with a Spill Prevention, Control and Countermeasures (SPCC) Plan. Only newly purchased electrical equipment certified as PCB-free would be installed.

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Photo of Typical Substation
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Figure 2-8

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Power Circuit Breakers

Breakers automatically interrupt power flow on a transmission line at the time of an electrical fault. Depending upon the final design, eight or nine breakers would be provided in the substation to connect the proposed power plant to the Mead-Phoenix Project 500-kV transmission line. The type of breaker planned for the proposed substation, called a gas breaker, would be insulated by special nonconducting gas (sulfur hexafluoride [SF_6]). Small amounts of hydraulic fluids would be used to open and close the electrical contacts within the breaker.

SF_6 is a greenhouse gas. The use, storage, and replacement of SF_6 would be monitored and managed by Western to minimize any releases to the environment. SF_6 gas in substation circuit breakers would be contained within sealed units. Equipment as delivered from the manufacturer would be required to be factory-tested and certified not to leak. After installation, the equipment would be scanned for detection of leaks, and repairs made as appropriate. During use, the equipment would be monitored by periodic substation inspections for indications of leakage. During servicing, SF_6 gas would be evacuated using sealed gas containment equipment, thereby remaining totally contained.

Switches

Switches are devices used to mechanically disconnect or isolate equipment. Switches would be located on both sides of circuit breakers.

Buswork, Bus Pedestals

Power moves within a substation and between breakers and other equipment on bundled aluminum conductors, which are elevated by bus poles and towers called bus pedestals. Buswork within the proposed substation would transport the entire plant's power output to the Mead-Phoenix Project 500-kV transmission line. Bus pedestals would be grounded in accordance with the National Electrical Safety Code (NESC).

Substation Fence

A chain-link fence with standard barbed wire on top would provide security for the substation. Adequate space would be provided inside the fence to maneuver construction and maintenance vehicles. The fencing would be grounded in accordance with the NESC.

Substation Rock Surfacing

A 6-inch layer of rock and binder material selected for its insulating properties would be placed on the ground within the proposed substation to help protect operation and maintenance personnel from electrical danger in the event of electrical failures.

Control House

Electric/electronic controls and monitoring equipment for the power system would be housed in a building within the proposed substation. Control houses would be heated and air-conditioned to provide a controlled environment for equipment. Electrical service would be provided by a station-service transformer that would provide 208/120-volt (V) service to the control house.

2.2.2.2 Transmission Interconnection

The proposed substation would be located east of the Mead-Phoenix Project 500-kV transmission line between two existing transmission line structures. Western proposes to install two new turning dead-end structures to provide a tie with the new substation. Each turning structure would be a steel-lattice self supporting tower or three new single-pole structures, and provide for turns of 90 degrees or greater into the new substation. It is envisioned that the new structures would be located within the existing Mead-Phoenix Project 500-kV transmission line right-of-way in the span between the two existing structures west of the proposed substation. However, depending on outage requirements, it may be necessary to erect the structures adjacent to, and east of, the existing right-of-way to reduce outage time

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during installation, or install temporary wood-pole structures to bypass the substation until the proposed power plant is ready for interconnection.

Prior to placing the substation in service, the existing Mead-Phoenix Project conductors in the span west of the substation would be cut and attached to the new turning structures. New conductors would be installed from the new turning structures to A-frame tubular steel take-off structures, and between the take-off structures and bus tubing within the substation. Typical dead-end turning structures are shown on Figure 2-9. The locations of the new dead-end structures are indicated on Figure 2-4a.

2.2.2.3 Communication Facilities

Primary Communication System

Substation equipment would be operated remotely from the Western Desert Southwest Region Operations Center in Phoenix through a Supervisory Control and Data Acquisition (SCADA) system. The system would communicate with the control house of the proposed substation through links with an existing microwave system. To provide the links, Western would install a communications tower within the proposed substation adjacent to the control house. The height of the tower would be determined during the design phase of the communication tower, but is expected to be less than 60 feet high. A microwave dish about 10 feet in diameter would be installed on the tower and pointed towards an existing Western microwave tower at Hayden Peak in the Hualapai Mountains. A microwave dish about 10 feet in diameter would be added to the Hayden Peak tower. The addition of the microwave dishes would provide a link with Western's existing microwave communications system.

Dual/Redundant Communication System

A redundant communication system also would be installed. The redundant system would be designed to provide a backup communication system in the event that the primary communication system is interrupted. There are two options for installing the redundant communication system. The first option would include the following two actions:

1. Replacing an existing overhead static wire with an optical ground wire (OPGW) on the existing Mead-Liberty 345-kV transmission line between the proposed substation and Western's existing Peacock Substation. From the Peacock Substation, there is a fiber optic path to Western's Phoenix Substation in Phoenix. The Peacock Substation is about 46 miles north of the proposed substation.

2. Adding a microwave link between Western's Phoenix Substation and Perkins Substation via an existing Western microwave facility at Towers Mountain (located at latitude 34 degrees, 14', 06", longitude 112 degrees, 21', 59"). New microwave dishes would be required at Phoenix, Towers Mountain, and Perkins.

The second option would involve linking the proposed substation with the existing Salt River Project (SRP) microwave system, which currently is being used as a backup for the Mead-Phoenix Project 500-kV transmission line. This option would entail installing microwave dishes at the proposed substation and an existing SRP microwave facility. An intermediate tower may be required if a microwave path cannot be found between the proposed substation and an SRP microwave tower. Western would select the redundant communication system upon completion of further communications study.

Regeneration stations would not be required for the installation of OPGW. Western would own the OPGW, electronics equipment used by Western, and the ancillary facilities. The Project would not change the size of the right-of-way or the way in which the transmission line is maintained. No new road construction would be required. New ground disturbance during construction would be limited to pulling and tensioning sites along the Mead-Liberty 345-kV transmission line, trenching between the

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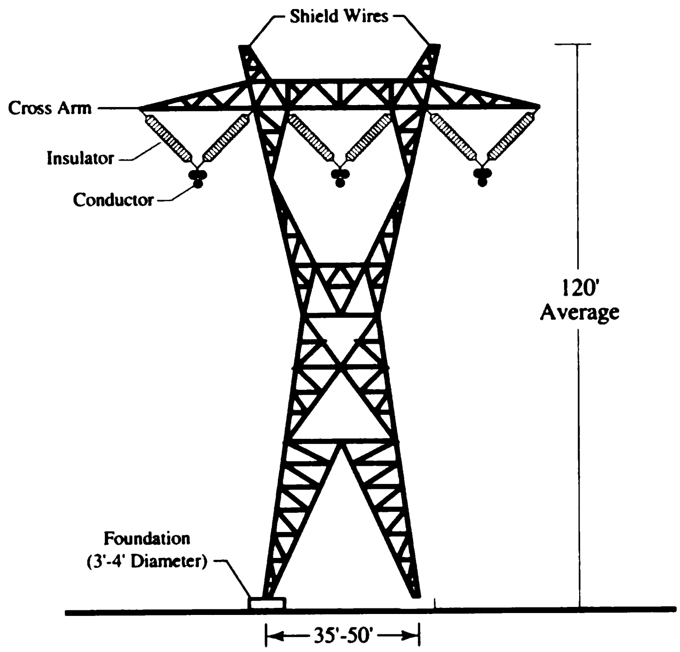
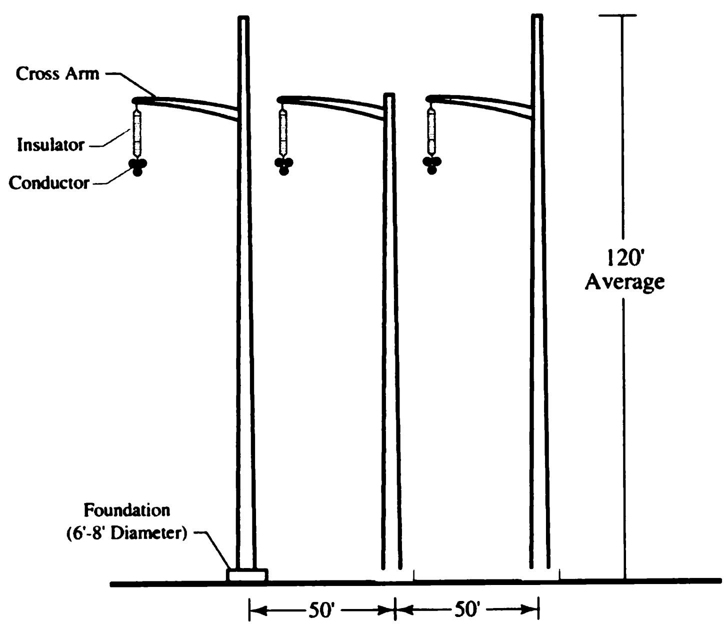
Self-supporting Steel-lattice



Self-supporting Tubular Steel



Note: Dimensions are approximate
Drawings are not to scale

Dead-end Turning Structure
Big Sandy Energy Project EIS
Figure 2-9

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substation and a transmission structure on the Mead-Liberty 345-kV transmission line, west of the proposed substation, and OPGW spool storage and handling areas. It is anticipated that all pulling and tensioning sites would be within the existing transmission line right-of-way. Each pulling and tensioning site would temporarily disturb an area about 120 by 120 feet or 0.33 acre. The sites would be located in previously disturbed areas to the extent feasible within the existing right-of-way. The number of pulling and tensioning sites would depend on the lengths of OPGW procured for the installation. Typically, the cable lengths average about 3 miles in length. Therefore, with a length of about 46 miles, 15 sites would be needed, involving the temporary disturbance of about 5 acres of existing right-of-way.

The OPGW would be composed of not more than 48 dielectric fibers (which do not conduct electricity) encased in a metal jacket that protects the fibers and serves the purpose of the static line it would replace. The fibers with their protective coatings, including the metal jacket, would create a cable about 1 inch in diameter. The cable would not emit any additional noise, or electric or magnetic fields. The OPGW would be attached at or near the top of each electrical transmission line structure above the electrical conductors. The OPGW would not be used for commercial purposes.

2.2.3 Water Supply System

The water supply system for the Project water requirements would consist of up to five groundwater wells, pumps, a water storage tank, and associated piping. Groundwater from a deep aquifer in the Big Sandy Valley is the planned source of water for the Project. Raw water would be provided from up to five groundwater wells drilled and completed to a depth of about 1,500 feet. Up to four of these would be on private land in Section 7, and one well that already has been drilled as a test production well is in the southwest corner of Section 5 adjacent to the proposed power plant site. A water pipeline (either aboveground or buried within the access road right-of-way) would direct the water to the proposed power plant and agricultural area. Where the pipeline would parallel the power plant access road, it would be buried within the road right-of-way. Figure 2-10 shows the proposed location of the wells and water pipelines, plus other plant utilities.

Under normal operating conditions, two of the wells would be pumped at any one time, each at a rate of about 1,200 gpm. The wells would be cycled at about two-week intervals. The maximum pumping rate would be about 5,000 gpm, which would utilize up to all five of the wells. The maximum annual consumption of water would be about 4,850 acre-feet (equivalent to 3,000 gpm). Approximately 81 percent of the water extracted would be used for cooling within the cooling towers themselves and 2 percent of the water would be conveyed to the evaporation ponds. Of the remaining 17 percent, approximately 13 percent would be used for the proposed agricultural activities, and 4 percent would be used for plant personnel and evaporative losses.

The electrical groundwater pumps would be powered from the proposed power plant via an underground 4,160-V electrical circuit. That line, and a control line, would be buried in or immediately adjacent to the well access roads.

An aboveground pipeline from each well would be constructed to a 250,000-gallon water storage or "head" tank to be located on the northeast well pad site in Section 7 (Figure 2-10). A single underground line would convey water from this tank to the 600,000-gallon raw water supply tank on the proposed power plant site near the administration (control room) building. Some of the wells also would be able to provide water directly to the proposed agricultural activities discussed in Section 2.2.6 through either aboveground or buried pipelines that would be placed within the access road right-of-way.

Demineralized water for power plant requirements would be generated from the well water using a reverse-osmosis system, followed by a mixed-bed demineralizer unit. The output of this unit would go to one demineralized water

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storage tank with a capacity of about 600,000 gallons, located on the proposed power plant site near the raw water tank. It then would be distributed to the various users within the proposed power plant and associated facilities.

2.2.4 Access Road

Access to the proposed power plant site, groundwater well field, and other properties in the vicinity would be principally provided by about 2.3 miles of a new Mohave County road. The road would begin at the Cholla Canyon Ranch Road intersection with US 93, cross Sycamore Creek, and end at the proposed power plant. The portion of the access road from the southwest corner of Section 5 to the proposed power plant would be a private road.

The Mohave County road would be constructed within a 150-foot-wide county road and utility easement adjacent to the section lines between Sections 1 and 12, T15N, R13W and Sections 6 and 7, T15N, R12W. The Mohave County road right-of-way would not be fenced. The private road would be posted to reduce unauthorized access to private lands.

The area needed for construction would be a 90-foot wide path for a total disturbed area of 21 acres. The width of the permanent roadbed would be 26 feet wide. The road would include a concrete box culvert at the Sycamore Creek crossing and seven pipe culverts at smaller drainages. The concrete box culvert across Sycamore Creek would be constructed of 10 individual boxes, each having a cross-section of 12 feet wide by 8 feet high and each will be 58 feet long as the creek flows. The boxes would be constructed side by side and extend 120 feet across the Sycamore Creek streambed. The culvert would provide an 8-foot clearance above the streambed and an apron with riprap would be provided at grade on the downstream side of the culvert. The box culvert and road would be designed to handle a 100-year storm event.

Figure 2-11 shows the proposed location of the access road and associated land jurisdiction. The road would cross about 700 feet of BLM-managed public land at the junction with US 93 and a small portion of BLM-managed land at the southwest corner of Section 5.

2.2.5 Natural Gas Supply Pipeline

A new 16- to 20-inch diameter high-pressure underground natural gas supply pipeline would bring natural gas to the proposed power plant from one or more of three interstate natural gas transmission pipelines located about 39 miles north of the proposed power plant site, immediately north and south of I-40. The proposed natural gas supply pipeline would have a nominal 50-foot-wide right-of-way and request authorization for construction disturbance within a nominal 100-foot-wide area. The pipeline would be constructed, owned, and operated by either the Project proponent (Caithness) or another entity. Figure 2-12 depicts the location of the proposed and alternative pipeline corridors evaluated in this Draft EIS.

This Draft EIS uses a corridor concept to locate and analyze alternative pipeline routes. Rather than identifying a specific alignment for the pipeline right-of-way, the routes follow broader corridors that allow adjustments to be made in the final engineered alignment of the pipeline, so that constraints identified during pre-construction surveys and right-of-way negotiations can be accommodated. Use of corridors rather than a specific alignment in this EIS provides the flexibility to make adjustments for these circumstances.

To the extent feasible, the pipeline would be located within a corridor such that permanent displacement of an existing use, such as a residence or business, is avoided. Compensation for use of lands would be determined through mutually agreeable business negotiations or, to the extent applicable, a court of law under a condemnation action. If the pipeline owner does not have the power of eminent domain, it would not be able to initiate a condemnation action and no use of the land would occur unless the proponent obtained the consent of the landowner.

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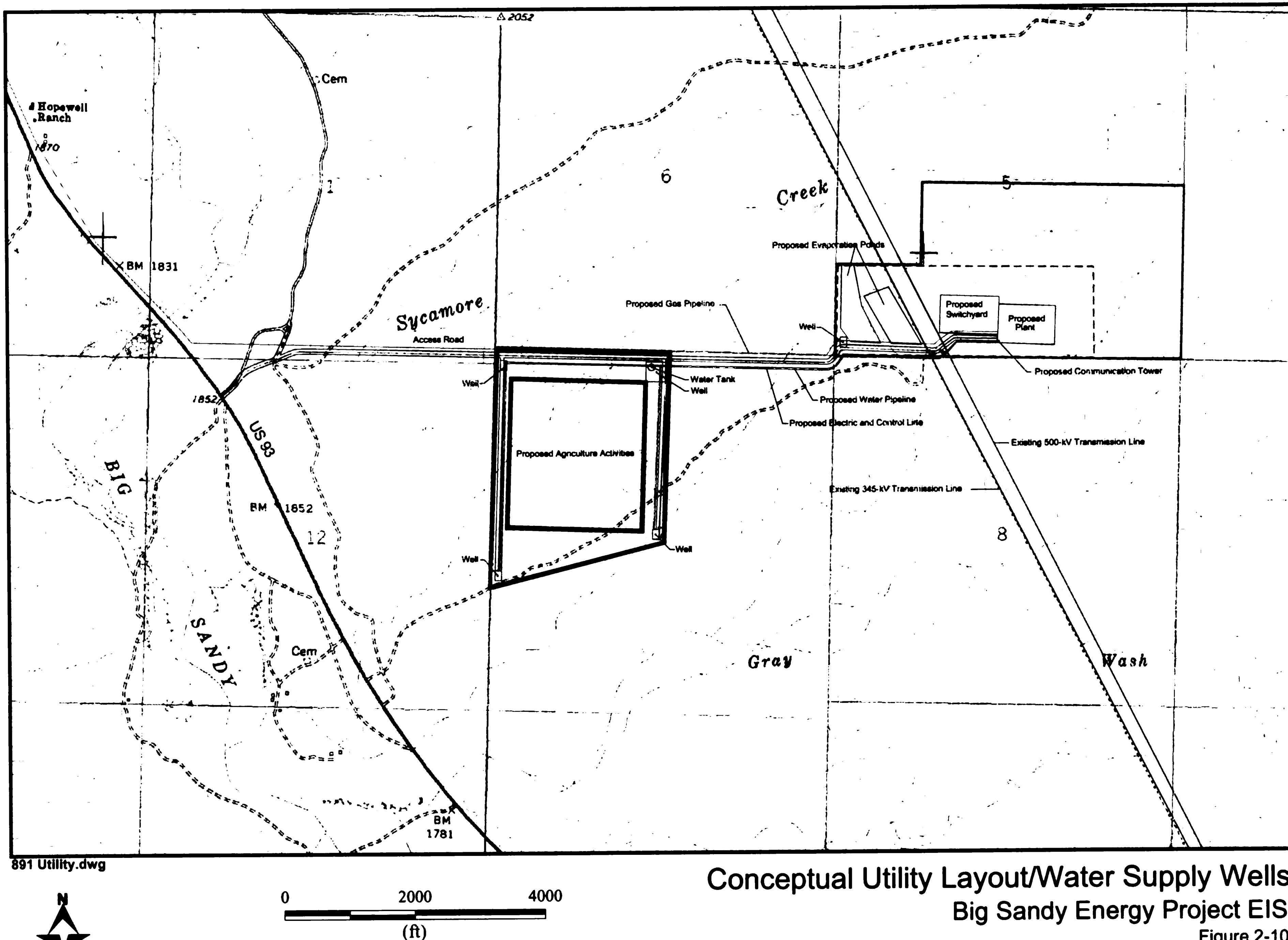

Conceptual Utility Layout/Water Supply Wells
Big Sandy Energy Project EIS
Figure 2-10

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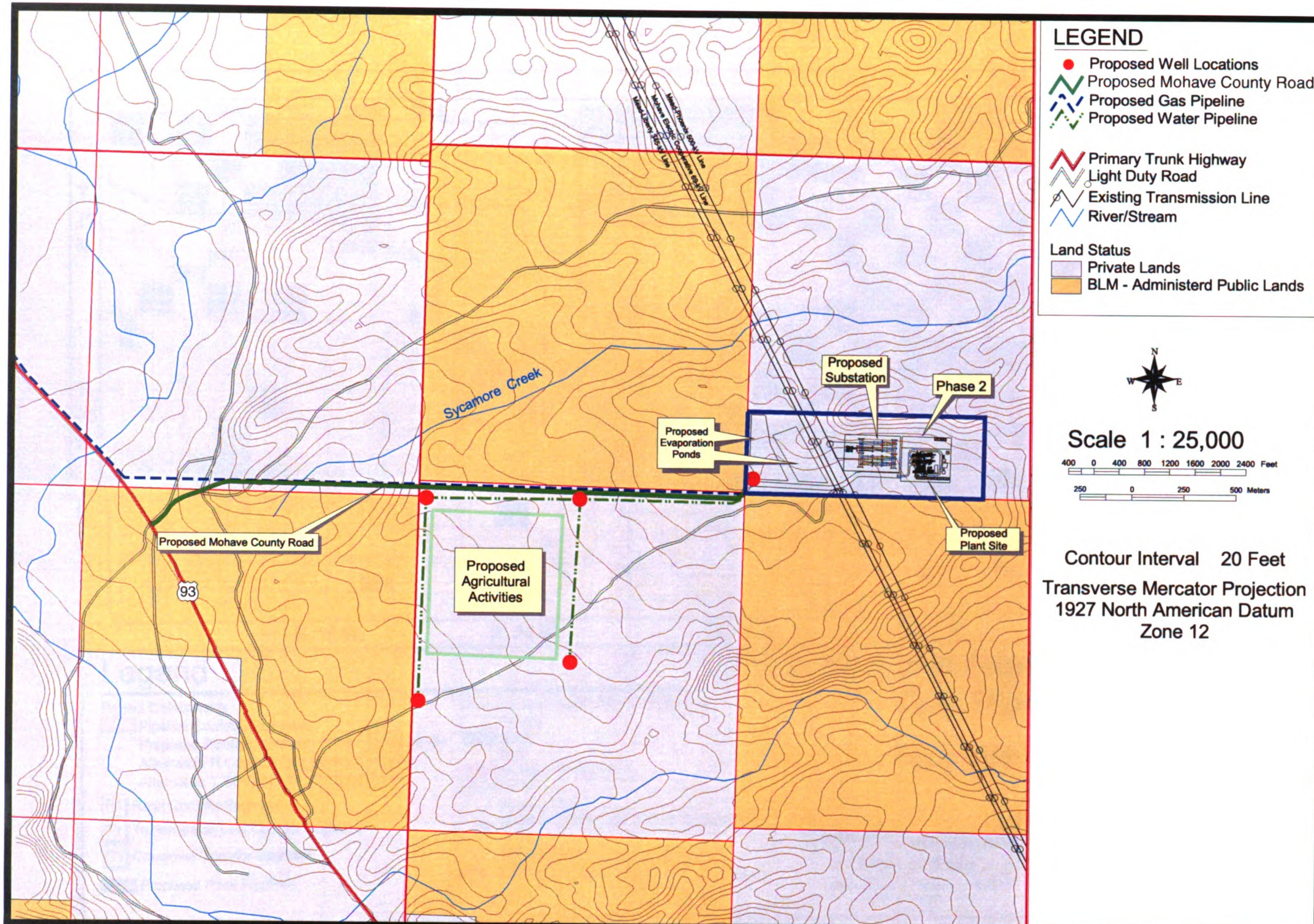

Proposed Access Road

Big Sandy Energy Project EIS

Figure 2-11

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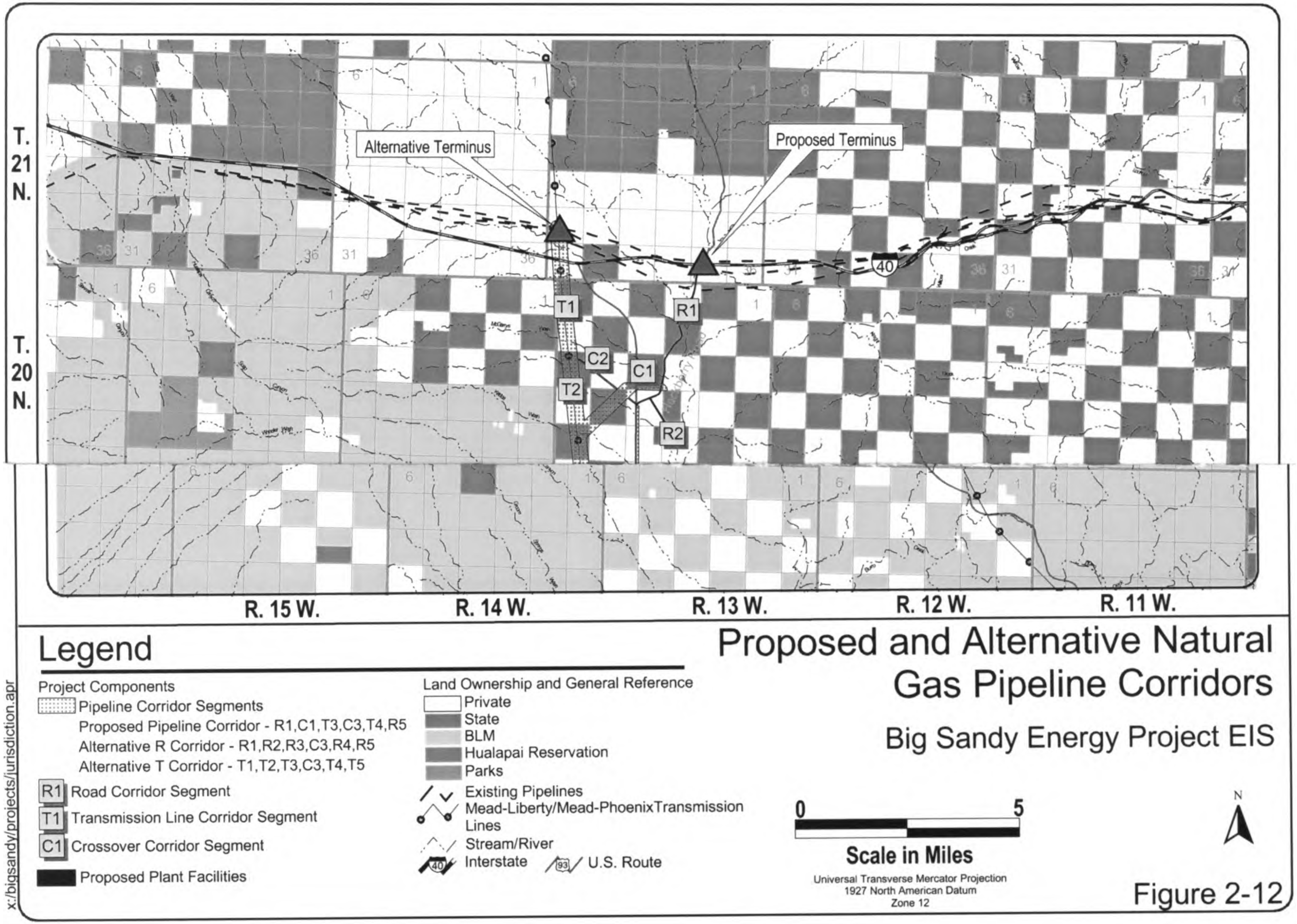

Proposed and Alternative Natural Gas Pipeline Corridors

Big Sandy Energy Project EIS

Figure 2-12

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Natural Gas Pipeline Terminology

Proposed and alternative corridors were developed by delineating areas within which the pipeline could be sited. The corridors were broken down into links or corridor segments, based on where the corridors interconnected, to facilitate the analysis. The final pipeline alignment could fall anywhere within the corridors. The following terminology will be used in the description of the pipeline alternatives:

- **Route** – the full length of either a pipeline alignment or pipeline corridor segments that allow the pipeline to be built from the start point to the end point (from near existing gas pipelines near I-40 to proposed power plant)
- **Alignment** – the specific location for the pipeline (that is, it will be built "here")
- **Corridor** – the more general area within which the pipeline would be built
- **Corridor Segments** – sections of pipeline corridor which, when pieced together, could define a pipeline route; sometimes referred to as "links." Segments are described in detail in Table 2-2.

This EIS analyzes the effects of construction and operation of the natural gas pipeline, including required construction staging areas and a nominal 90-foot-wide area of disturbance along the route, within each corridor segment. However, once detailed pre-construction surveys are complete and any site-specific issues are resolved, the final alignment of the pipeline within the corridor segments will be selected and approved by the agencies.

As can be seen on Figure 2-12, both the proposed and alternative pipeline corridors consist of various combinations of 13 individual corridor segments, ranging in width from 100 feet (within road rights-of-way) to nearly 1 mile (to provide additional room to avoid sensitive resources and topographic obstacles). These segments have been assigned alphanumeric designations. The five corridor segments following existing or proposed roads (Hackberry Road, US 93, and the new Mohave County access road) have been labeled R1 through R5 ("R" for "road"). The five corridor segments following the Mead-Liberty 345-kV and Mead-Phoenix Project 500-kV transmission lines have been labeled T1 through T5 ("T" for "transmission"). Three corridor segments that provide for potential crossover between the road and transmission line corridors have been labeled C1 through C3 ("C" for "crossover"). Detailed descriptions of the 13 segments are provided in Table 2-2, and Table 2-3 summarizes the length (in miles) associated with each segment.

The Proposed Action (proposed route) for the gas pipeline follows the following sequence of corridor segments:

R1 - C1 - T3 - C3 - T4 - R5

The following describes the general path of the proposed route; refer to Table 2-3 for additional detail on the location and width of each corridor segment.

The proposed pipeline would begin at the points of connection with one or more of the three potential gas transmission pipelines, in Section 3, T20N, R13W and/or Section 35, T21N, R13W. From this connection, the pipeline would proceed along corridor segment R1, heading south in the 100 to 150-foot-wide right-of-way of Hackberry Road, a Mohave County road. There is an existing underpass where Hackberry Road goes under I-40 that the pipeline would follow. This corridor segment is about 3.9 miles long and passes through relatively undeveloped private and state-owned lands.

The proposed pipeline would then follow corridor segment C1, which begins at the intersection of Hackberry Road and the southeast corner of Section 16, T21N, R13W. The corridor segment heads to the west, crossing US 93 on a path that avoids the planned traffic interchange at the junction of Hackberry Road and US 93. It then turns southwest and increases in width to 2,000 feet until intersecting the transmission line corridor at the junction of segments T2 and T3. This corridor segment

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TABLE 2-2 CORRIDOR SEGMENT DESCRIPTIONS	
Segment	**Description**
Road Segments	
R1	This corridor segment begins at the northernmost potential supply pipeline (Questar) located in T21N, R13W and heads south along Hackberry Road, crossing under I-40. This segment encompasses the Mohave County Hackberry Road right-of-way, which varies between 100 and 150 feet wide. The corridor segment is approximately 3.9 miles long and passes through relatively undeveloped, privately owned and State Trust land. This corridor segment ends at the intersection of Hackberry Road and the southeast corner of Section 16, T21N, R13W, where it intersects with corridor segment C1.
R2	This corridor segment begins at the southern end of corridor segment R1, and encompasses the Hackberry Road right-of-way to its junction with US 93. The corridor segment, which is approximately 0.8 mile long, passes through privately owned lands.
R3	This corridor segment begins at the southern end of corridor segment R2, and follows along the eastern edge of the US 93 right-of-way south until US 93 and the transmission line corridors overlap near the boundary of Sections 4 and 5, T18N, R13W. This corridor is 400 feet wide, immediately adjacent to the eastern edge of the US 93 right-of-way. The corridor segment is about 9.3 miles long, and crosses primarily privately owned land, although there is a small amount of State Trust land near the southern end of the corridor segment.
R4	This corridor segment begins in Section 16, T18N, R13W, just south of corridor segment C3, which is the crossover segment that encompasses the overlap between the road and transmission line corridors in T18N, R13W. Segment R4 continues south along US 93 just east of the US 93 right-of-way to the intersection with the transmission line corridor in T16N, R13W, a distance of about 13.7 miles. The corridor primarily crosses public land managed by the BLM and privately owned land, but also a small area of State Trust land. This corridor segment generally is 400 feet wide, although there are the following two areas of variation: Within the public land designated as the Carrow-Stephens Area of Critical Environmental Concern (ACEC) (in Sections 21 and 28, T16.5N, R13W), the corridor also includes the 200-foot-wide US 93 right-of-way. This variation allows the pipeline to be installed within the highway right-of-way to minimize impacts to historic features within the ACEC. [The Arizona Department of Transportation (ADOT) eventually plans to relocate US 93 approximately 2 miles to the west in conjunction with upgrading the highway to a four-lane roadway.] For a distance of 1.5 miles south of Gunsight Canyon (in Section 28, T16.5N, R13W), the corridor width increases to 1,500 feet immediately along the eastern edge of the US 93 right-of-way to accommodate the planned realignment of US 93 to the east of the existing roadway in this area.
R5	This corridor segment begins at the southern end of corridor segment R4 and follows along US 93 south to the proposed Mohave County access road where it turns east to follow the access road to the plant site. The length of this corridor is about 8.5 miles. The corridor segment crosses privately owned and BLM-managed lands. The corridor segment varies from 150 feet wide to 1,800 feet wide, as described below. From the beginning of the corridor segment, extending about 1.25 miles to the south, the corridor is expanded to 1,000 feet west and 600 feet east of the US 93 right-of-way, and includes the 200-foot US 93 wide right-of-way itself. This corridor expansion is intended to avoid conflicts with the proposed expansion of US 93 and adjacent topographic features. From the point that the 1,800-foot wide corridor ends, south through Wikieup to the plant access road, the corridor is 600 feet wide, immediately adjacent to the eastern edge of the US 93 right-of-way, and also includes the 200-foot-wide US 93 right-of-way, providing an opportunity to avoid existing features east of the ADOT right-of-way and the proposed expansion of US 93. The access road corridor encompasses the proposed Mohave County 150-foot-wide road right-of-way. In addition, the westernmost 1,500 feet of the corridor is expanded to 750 feet north of the access road right-of-way to accommodate the transition of the pipeline from US 93 to the access road.

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TABLE 2-2 CORRIDOR SEGMENT DESCRIPTIONS	
Segment	**Description**
Transmission Line Segments	
T1	This corridor segment begins north of I-40 at the northernmost potential supply pipeline in Section 30, T21N, R13W, and extends south about 3.7 miles to Old Highway 93 in Section 18, T20N, R13W. This corridor segment extends 1,000 feet west and east of the 150-foot-wide right-of-way for the Mead-Liberty 345-kV transmission line and 1,000 feet west of the adjacent 175-foot-wide right-of-way for the Mead-Phoenix 500-kV transmission line and includes both rights-of-way, for a total corridor width of 2,325 feet. This corridor segments crosses private and State Trust land.
T2	This corridor segment begins at the southern end of corridor segment T1 and follows along the same transmission line rights-of-way for a length of about 2.1 miles into Section 30, T20N, R13W. This corridor segment, which is the same width as Segment T1, crosses private and State Trust land.
T3	This corridor begins at the southern end of corridor segment T2 and follows the same transmission line rights-of-way south for about 8.5 miles to Section 5, T18N, R13W where corridor segment C3 begins. This corridor segment has the same width as corridor segments T1 and T2, and crosses private and State Trust land.
T4	This corridor segment begins in Section 16, T18N, R13W, just south of corridor segment C3. This corridor segment is about 13.8 miles long, terminating at the intersection of the transmission line rights-of-way and US 93. Like corridor segments T1, T2, and T3, this corridor segment is 2,325 feet wide except that this corridor segment increases to a width of 4,000 feet west of the transmission line rights-of-way for a distance of approximately 4.0 miles from the northern boundary of Section 34, T17N, R13W, south to the boundary between T16.5N and T16N. This expansion allows for complete avoidance of the Carrow-Stephens Ranches ACEC and rugged topography. This corridor segment crosses privately owned, BLM-managed public, and State Trust lands.
T5	This corridor segment begins at the southern end of corridor segment T4 and extends southeast about 7.8 miles to the plant site. This corridor segment is also 2,325 feet wide and follows the transmission line rights-of-way except to accommodate a perpendicular crossing of the Big Sandy River, where the corridor segment leaves the transmission lines rights-of-way to become a 3,000-foot wide corridor centered on the northern and eastern boundary of Section 10, T16N, R13W.
Crossover Segments	
C1	This crossover corridor segment begins at the intersection of Hackberry Road and the southeast corner of Section 16, T21N, R13W. This corridor segment extends to the west, encompassing 1000 feet across the southern end of this section and crossing US 93 on a route that avoids the planned traffic interchange at the junction of US 93 and Hackberry Road. From the southwest corner of Section 16 the corridor increases to 2000 feet in width and turns southwest, crossing straight through the southwest corner of Section 20 until intersecting the transmission line corridor at the junction of corridor segments T2 and T3. This corridor segment, which is about 2.8 miles long, crosses private and State Trust land.
C2	This corridor segment encompasses Mohave County's 100-foot-wide right-of-way for Old Highway 93 between the transmission line and US 93 corridors. This segment, which is about 2.3 miles long, crosses private and State Trust land.
C3	This corridor segment is located where the transmission line and US 93 corridors overlap in T18N, R13W. The eastern boundary of this corridor segment is 400 feet east of the existing US 93 right-of-way and the western boundary is 1,000 feet west of the Mead-Liberty 345-kV transmission line right-of-way. This crossover corridor segment is about 1.9 miles long and crosses private and State Trust land.

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TABLE 2-3 LENGTH OF LINKS FOR BIG SANDY ENERGY PROJECT	
Corridor Segment	**Miles**
C1	2.8
C2	2.3
C3	1.3
R1	3.9
R2	0.8
R3	9.3
R4	13.7
R5	8.5
T1	3.7
T2	2.1
T3	8.5
T4	13.8
T5	7.8
Totals	78.9
Road Corridor	
R1	3.9
R2	0.8
R3	9.3
C3	1.9
R4	13.7
R5	8.5
Totals	38.1
Transmission Line Corridor	
T1	3.7
T2	2.1
T3	8.5
C3	1.9
T4	13.8
T5	7.8
Totals	37.6
Proposed Corridor	
R1	3.9
C1	2.8
T3	8.5
C3	1.9
T4	13.8
R5	8.5
Totals	39.3

crosses both private and state-owned lands and is about 2.8 miles long.

The proposed route then follows corridor segment T3, which parallels the existing transmission lines south for about 8.5 miles to the beginning of segment C3 in Section 5, T18N, R13W. This corridor segment is 2,325 feet wide, encompassing both transmission line rights-of-way and 1,000-foot-wide buffers on either side. It crosses both private and state-owned lands.

Corridor segment C3 is a crossover segment located where the transmission line and US 93 corridors overlap in Section 5, T18N, R13W. The corridor segment is about 1.9 miles long and crosses private and state-owned lands. The corridor here extends from 1,000 feet west of the Mead-Liberty 345-kV transmission line to 400 feet east of the US 93 right-of-way.

The proposed route then follows corridor segment T4, continuing southeast along the transmission line route. This corridor segment is about 13.8 miles long, terminating at the intersection of the transmission line rights-of-way and US 93. This segment is 2,325 feet wide except in one location, where it extends to a width of 4,000 feet along the western boundary of the Carrow-Stephens Ranches Area of Critical Environmental Concern (ACEC). This corridor segment crosses private, BLM-managed public, and state-owned lands.

From this point, the proposed route follows corridor segment R5, which follows along US 93 south to the proposed access road leading to the proposed power plant site. The county's right-of-way would cross Sections 1, 5, and 7, T15N,R12W, and enter the proposed power plant site over the section corners of Sections 5, 6, 7, and 8, T15N, R12W. This corridor segment is about 8.5 miles long and varies in width from 150 feet wide along the proposed access road, to 1,800 feet wide along certain portions of US 93.

Gas metering interconnect facilities would be installed at the northern terminus of the pipeline, at its tie into the Questar Southern Trails located north of I-40, and/or to the El Paso Natural Gas and/or Transwestern gas transmission pipelines located south of I-40. These facilities would consist of isolation valves, control valves, metering equipment, and filter separators. This equipment would be located within new 100- by 100-foot fenced and graveled sites, adjacent to Hackberry Road. Construction disturbance may be as large as 150 by 150 feet. Each metering

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facility would be enclosed within a small building on each site. In addition, a small communication tower (about 15 feet high) would be included within each fenced site. Electric power service would be provided to each metering site from existing electric distribution lines available within 100 feet of the site. Access to each pipeline meter interconnect facility would be from Hackberry Road.

At the southern terminus of the pipeline, a gas metering facility would be installed at the proposed power plant. This facility would consist of isolation valves, metering equipment, a filter separator, and pressure reduction and control valves used to feed gas to the turbines. The metering facility would be installed within the proposed power plant site.

At full capacity, the proposed power plant would use, and the gas pipeline would deliver, about 106.4 million cubic feet (MMCF) of gas per day, which is equivalent to 3,246 MMCF per month, or 38,960 MMCF per year. The potential exists to tap this pipeline and thereby supply gas to the Wikieup area (refer to Section 2.4.6, Wikieup Gas Tap).

Inspection of the pipeline would be accomplished by the pipeline owner and operator in accordance with U. S. Department of Transportation regulations, Parts 192.105, 106, and 107. The pipeline would be patrolled by air every six months. Routine inspection also would be conducted annually using vehicles that can drive directly over the pipeline (two-track access, resulting in, at worst, a 10-foot-wide pathway over the pipeline that would remain permanently disturbed). Areas not accessible by the vehicles (steep terrain, Big Sandy River, within the ACEC) would be inspected by foot. If leaks are encountered, they would be isolated, exposed, and repaired in accordance with industry practices. If excavation is needed to replace a section of pipe, the landowner or land manager would be notified and reclamation procedures would be followed as outlined in Appendix B.

2.2.6 Agricultural Development

In addition to the activities directly related to the electrical generation process, the Proposed Action would involve supplying selected lands and water to the Mohave County Economic Development Authority (MCEDA) for agricultural use. Agricultural development would occur on about 107 acres, located about 1 mile southwest of the proposed power plant site in the northwest quarter of Section 7, T15N, R12W. Water for agricultural use would be well water (i.e., non-process water provided from the same water wells that would supply water for the proposed power plant). A maximum of 400 gpm (650 acre-feet per year) of water would be made available for agricultural use in this area. This amount of water would be provided if the crops produced required this much water and would be subtracted from the proposed water budget of 4,850 acre-feet per year for all Proposed Action (power plant and agricultural) uses. This proposed agricultural use of both land and water would continue even after plant closure.

Agricultural activities are proposed to include mainly forage crops or fruit/nut orchards. The following are potential crops that are being considered for the area, with their respective irrigation requirements:

Crop	Water Requirement (per acre)
Bermuda grass	5 to 6 acre-feet per year
Alfalfa	6 acre-feet per year
Small Grains	2 to 3 acre-feet per year
Vegetables (High Value)	2 to 3 acre-feet per year
Pecan Nuts	4 to 5 acre-feet per year
Olives	4 to 5 acre-feet per year

Source: Grumbles 2001

Areas within this 107 acres with significant gullying, rilling, or lack of topsoil due to slope or other factors would not be used for crop production. Soils also would be tested to

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determine if high quantities of gypsum, lime, or other minerals resulting in high pH would limit productivity and treated if necessary.

Agricultural fertilizers and pesticides, including herbicides, would be applied as applicable for the specific agricultural operations. Specific fertilizer, pesticide/herbicide and other chemical requirements and application rates would depend on the type of crops grown. Application rates would follow manufacturers' instructions and all pesticides would be EPA-registered and approved for use on the specific crops grown. Standard agricultural practices to minimize erosion and runoff of applied chemicals and soil would be employed. Depending on the crop, these would include tilling with the contour, avoiding major washes in the area, establishing a buffer area between tilled areas and drainages, and establishing tail water areas for irrigation water to be collected and infiltrated. Table 2-4 lists those pesticides, herbicides, or other chemicals that could be expected to be used, based on the type of crops anticipated to be grown on the designated agricultural area.

2.2.7 Project Construction

The following sections describe the construction activities that would be completed under the Proposed Action associated with the proposed power plant and substation, water supply system, proposed access road, and proposed natural gas supply pipeline. Table 2-5 summarizes the ground disturbance acreage for each of these areas and some associated facilities, plus the agricultural area. Each section below provides more detail about the activities that would occur within the acreages listed.

Equipment used for construction activities would include temporary power supply generators, dozers, backhoes, graders, trenchers, air compressors, light and heavy trucks, and cranes. Cranes would range in capacity from 20 tons to 225 tons. Heights would range from about 80 feet to 250 feet. All equipment would generate noise of varying levels and at different times, but would be expected to average about 85 dBA at 50 feet.

2.2.7.1 Power Plant Construction

The proposed power plant and associated facilities would be constructed by a primary contractor that would perform the Engineering, Procurement and Construction (EPC) activities for the project. The EPC contractor would undertake final plant design, equipment procurement, and construction all under contract to Caithness.

The proposed site includes adequate area for construction parking, work trailers, storage, and lay-down areas. The primary access during construction would be from US 93 along the proposed access road.

As previously noted, the power plant is proposed to be constructed in two phases: Phase 1, consisting of a baseload 500 MW, natural gas-fired, combined-cycle generating facility and 500-kV substation; and Phase 2, consisting of a 220-MW single-shaft combined-cycle generator. The construction phasing for Phase 1 is expected to begin in during the third quarter of 2001 and be completed within 20 months, as follows:

Site Preparation, Access Road, and Water Supply System	Months 1 through 6
Foundations	Months 4 through 12
Building Erection	Months 8 through 12
Mechanical Installation	Months 10 through 14
Electrical Installation	Months 10 through 14
Gas Pipeline Construction	Months 8 through 14
Commissioning and Startup	Months 14 through 20

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Table 2-4 PESTICIDES/HERBICIDES AND OTHER CHEMICALS THAT MIGHT BE USED ON THE PROPOSED AGRICULTURAL AREA	
2,4-D	Mancozeb
Abamectin	Mepiquat Chloride
Acephate	Metalaxyl
Benefin	Methomyl
Benlate 50 WP	Methyl Parathion
Benomyl	Permethrin
Bensulide	Pounce 3.2EC
Bifenthrin	Princep Caliber 90
Bromoxynil	Promamide
Chlorothalonil	Prometryn
Chlorpyrifos	Pyritiodac-Sodium
Cygon 400	Rodent bait
Cypermethrin	Roundup
Cytokinin	Rovral
DCPA	Sevin 805
Disulfoton	Sodium Chlorate
Endosulfan	Spinosad
Fenvalerate	Sulfur
Fluazifop	Supracide 2EC
Goal 1.6E	Supreme Oil
Goal 2XL	Surflan 4AS
Guthion 50W	Thiodicarb
Imidacloprid	Tribufos
Karmex DF	Trifluralin
Kocide	Vinclozolin
Lambdacyhalothrin	

Construction is anticipated to occur in one 10-hour shift per day, 5 days per week, during daylight hours.

Construction of Phase 2 is expected to commence within 18 months following completion of Phase 1, with a similar schedule for those applicable components of this phase.

Specific plans or proposed measures for desert tortoise protection, fugitive dust control, erosion and sedimentation control, site reclamation, stormwater runoff control, and biological/cultural resources protection that would be implemented as part of the construction process are presented in Section 2.2.8.

Cut/Fill Activities

A total of about 800,000 cubic yards of soil is assumed for cut/fill for the proposed power plant and substation site combined. The cut/fill activities would be balanced over the proposed power plant and substation sites, such that soil would not need to be imported or exported. Areas of substantial cut or fill would be engineered to ensure stability. Areas of clayey or expansive soils would either be avoided or properly engineered to ensure that structures are stable.

Construction Auxiliaries

Construction water required would be approximately 300 gpm. This rate would be variable based on the activities scheduled at the site at the time. The water would be used primarily for earthworks such as compaction. The water would be required during the anticipated 20-month construction timeframe. Water for construction would be supplied from the production well located in the southwest corner of Section 5.

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TABLE 2-5 SUMMARY OF GROUND DISTURBANCE ACTIVITIES PROPOSED ACTION			
Activity	Acres of Permanent Disturbance	Acres of Temporary Disturbance*	Total Acres Disturbed
Proposed Power Plant and Immediate Site Facilities			
Power Plant	15	0	15
Power Plant Lay Down Area	0	3	3
Substation	12	0	12
Substation Cut/Fill	0	7	7
Transmission Line Turning Structures	0	1	1
Evaporation Ponds	18	0	18
SUBTOTAL	**45**	**11**	**56**
Well Pad Sites	10	10	20
Well Pad Access Roads	6	0	6
Plant Access Road (2.3 miles)	13	8	21
Agricultural Activities	107	0	107
OPGW Installation (15 pulling and tensioning sites)	0	5	5
SUBTOTAL	**136**	**23**	**159**
Proposed Pipeline Route: R1-C1-T3-C3-T4-R5			
Construction Right-of-Way	48	351	399
Additional Work Spaces	0	7	7
SUBTOTAL	**48**	**358**	**406**
TOTAL	**229**	**393**	**621**
*These areas would be disturbed only during construction.			

Electricity required for construction would be supplied by a portable diesel-powered generator (up to 1 MW) to be located on the proposed power plant site, and/or from the existing MEC 69-kV electrical line located adjacent to the Mead-Phoenix Project 500-kV transmission line

Construction Materials Available Locally

A concrete batch plant would be located on the proposed power plant site as required for construction. The batch plant would be supplied by the selected contractor and would be required to comply with all state and Federal regulations and permit requirements. The following summarizes the estimated amounts of various construction materials that would be purchased from commercially available sources and trucked to the site:

Concrete	15,600 cubic yards
Sand	4,400 cubic yards
Aggregate	8,900 cubic yards
Backfill Gravel	18,000 cubic yards
Rebar	1,092 tons

Transport of Heavy Plant Components

Heavy equipment would be delivered using US 93. All oversized transportation would be coordinated with the Arizona Department of Transportation (ADOT) and would be accomplished in accordance with ADOT's

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guidelines and recommendations. Turnouts at various locations along US 93 would be used, so that traffic would be able to bypass oversize loads using the highway shoulder or other previously disturbed areas at the edge of the road. The location of these turnouts would be subject to ADOT approval.

The major plant components (three combustion turbines, four generators, and two steam turbines) would be delivered using a dedicated rail (special train) from the Port of Houston, Texas to Kingman, Arizona. In Kingman, the equipment would be offloaded to oversized transport vehicles, and continue to the Project site via I-40, US 93, and the proposed power plant access road.

2.2.7.2 Substation Construction

All substation construction would be performed by Western, which would maintain and operate the substation. Except for grading, a separate contract would be issued by Western for the installation of the substation equipment.

Construction of the substation would involve the following activities:

- placing and compacting structural fill to serve as a foundation for equipment
- installing foundations for electrical equipment, buswork pedestals, control building, and transmission structures
- installing oil drains
- installing fences and gates
- hauling and laying gravel within the yard
- installing electrical equipment

Transformers that would be used are very heavy and must be transported using oversized vehicles, using the same access and procedures as described above under "Transport of Heavy Plant Components."

Surface Runoff and Erosion Control

During construction, surface water diversion ditches would be installed, and specific erosion control measures implemented. Sections 2.2.8.5 and 2.2.8.6 provide more information on the proposed measures that would be taken to prevent erosion and sedimentation.

Construction Wastes

Waste generated during construction of the proposed power plant would include waste steel, copper, and aluminum; wood transport boxes; polyvinyl chloride (PVC) cables; piping; and incidental plastics. About 300 tons of total waste would be generated from construction activities.

2.2.7.3 Water Supply Wells

Well construction would involve the clearing of about 4 acres for each well pad and associated access roads. Drilling would occur 24 hours per day, and well completion would be expected within a 45- to 60-day period. Following drilling, an electrical pump would be installed and pipelines connected. Each well site would be reclaimed with native vegetation to the greatest extent possible, and each non-reclaimed final well site would cover about 2 acres.

The water pipeline would be buried within the right-of-way of the access roads about 3 feet deep using standard trench and fill techniques. An insulated 4,160-V electrical cable and controls cable would be buried in the right-of-way of the proposed power plant and well site access roads to provide electrical power and control signals to the well pumps from the proposed power plant.

2.2.7.4 Access Road

The proposed road to access the power plant site would be about 2.3 miles long, beginning at US 93 and running east to the proposed power plant site along section boundaries. The road would be designed and constructed in accordance with Mohave County standards. The design and staking of the road would be conducted under

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the direction of a licensed, professional engineer. Road construction would be monitored by a qualified professional engineer or qualified inspector.

Construction equipment and techniques to be employed by the contractors selected for road construction would be standard for the industry (crown-and-ditch method). No special or additional grade or base thickness would be required. A typical roadway cross-section with width specifications is presented on Figure 2-13.

The road would be constructed by first blading or grading the area of construction, which already has been bladed to provide an unpaved access to the east. The road base would consist of an aggregate base on compacted natural earth. Road surfacing would consist of an asphaltic concrete pavement, creating a final paved road about 26 feet wide. Pipe culverts would be used where needed at drainage or wash crossings, with riprap used to control erosion. A larger concrete box culvert would be installed at the Sycamore Creek crossing. About 21 acres would be disturbed by clearing and grubbing to construct the road and culverts.

Heavy equipment and support vehicles would be required (i.e., bulldozer, grader, track hoe, front end loader, and heavy- and light-duty trucks). Clearing of vegetation and blading of soil materials would be limited to areas of construction; bladed vegetation and topsoil materials would be windrowed for future redistribution during interim and final reclamation. The road would be constructed with appropriate, adequate drainage and erosion control features/structures (i.e., cut and fill slope and drainage ditch stabilization, relief and drainage culverts, and riprap).

2.2.7.5 Natural Gas Pipeline

Pipeline construction activities generally would be limited to a 90-foot-wide area of disturbance within the selected pipeline right-of-way, plus several additional areas of disturbance needed for various work areas along the route. Where the pipeline parallels the proposed power plant access road, the disturbed area would be reduced to 40-foot-wide. A 50-foot width would be disturbed in wetland and riparian areas; however, a 90-foot width was used to calculate areas of disturbance, since the exact lengths of wetland crossings are not known at this time. Table 2-5 summarizes the ground disturbance (total, permanent, and temporary) expected from proposed pipeline construction.

The pipeline would consist of high-strength, 16- to 20-inch-diameter steel pipe with a minimum wall thickness of 0.281 inch. Heavy wall pipe may be used at road crossings, river crossings, through the community of Wikieup, and wherever required for loadings such as vehicular traffic crossing the pipeline. Generally, pipe sections would be welded together, externally coated with fusion-bonded epoxy for corrosion and cathodic protection, as required, placed in a trench, and buried with a minimum 3 feet of cover. Pipeline construction would take about 75 days to complete; however, construction activities at any one point along the route would last about three to five days. Construction is anticipated to occur in one 10-hour shift per day, 5 days per week, during daylight hours. Construction may occur outside of this period, but would not be conducted outside of this period at the Big Sandy River crossing due to the presence of night-roosting bats.

Construction of the gas pipeline would maintain the integrity of all existing fences, water pipelines, and other existing range improvements.

General Construction Procedures

The pipeline would be designed and constructed in accordance with "Part 192 – Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards" (49 CFR 192). Installation within the US 93 corridor would conform to requirements of ADOT's "Guide for Accommodating Utilities on Highway Rights-Of-Way." In addition, the U.S. Department of Transportation Federal Highway Administration "Manual on Uniform Traffic Control Devices" (MUTCD) would be followed for all work within or adjacent to the US 93 or I-40 corridor.

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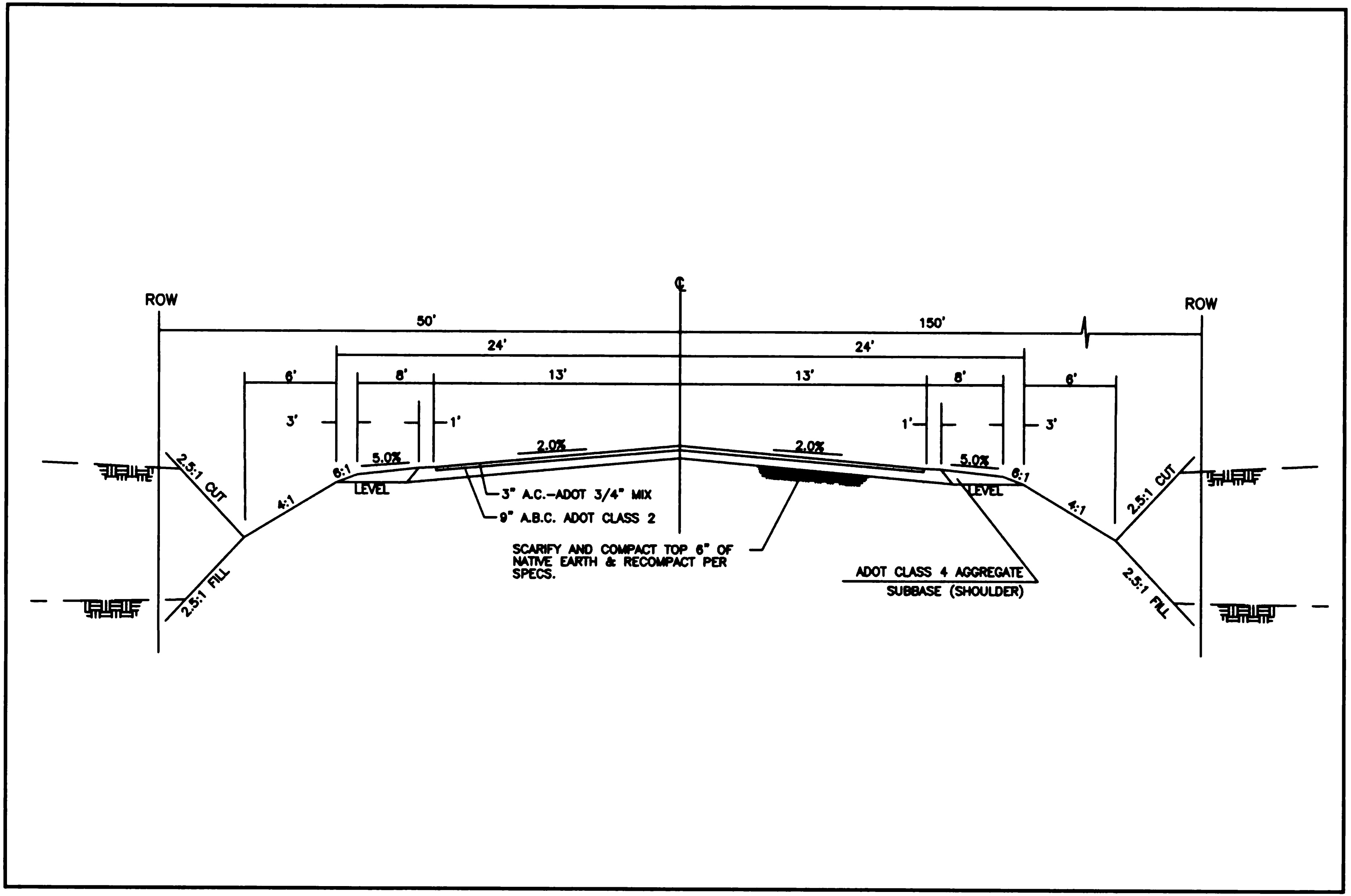

Mohave County Road Cross Section
Big Sandy Energy Project EIS
Figure 2-13

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Wherever the pipeline route would parallel or lie within portions of an existing Mohave County road (Hackberry Road) and US 93, the pipeline owner would consult with these agencies regarding future highway development plans to ensure that the pipeline would not interfere with any planned road expansion, relocation, or reconstruction plans.

As the pipeline generally would be routed through rural countryside, cross-country pipeline construction methods would be used for installation. A typical cross-country pipeline construction sequence is shown on Figure 2-14. An additional specialized construction crew would be required to install the pipeline where it would cross the Big Sandy River.

Prior to the start of construction, the pipeline owner would complete engineering surveys of the right-of-way centerline and extra work areas, and finalize right-of-way easement or lease agreements. Surveys would be conducted using existing roads wherever possible to avoid cross-country motorized travel. Other pipeline or utility operators would be notified through the Arizona Blue Stakes system to locate lines or pipes along the pipeline corridor, and line crossing stipulations obtained from these operators.

The first phase of construction would involve staking the pipeline centerline, construction right-of-way, and temporary work areas, which also would serve as temporary nursery and staging areas for final reclamation activities. Temporary gates would be installed at each fence crossing. For any work within the highway corridor, barricades, signage, and signals would be placed as required by ADOT. The right-of-way then would be cleared of vegetation and brush, and graded only where necessary to create a level work surface. No permanent access road along the pipeline would be constructed. Vehicles would make the maximum use of existing access and only two-track maintenance pathways along the route would be allowed.

Clearing of BLM-managed public lands would be preceded by the salvage of native plant specimens. Grading would be limited to slopes and topography that require leveling to allow safe operation of pipeline construction equipment. Any debris generated would be removed by the construction contractor in conformance with applicable Federal, state, and local regulations.

The pipeline construction company would follow the Federal Energy Regulatory Commission's (FERC) "Upland Erosion Control, Revegetation, and Maintenance Plan" for the management of excavated soils, slope stabilization, and right-of-way restoration and rehabilitation. A Reclamation Operation Maintenance Plan that addresses plant salvage, reclamation, and revegetation, would be followed for BLM-managed lands, and a Reclamation Plan for State and Private Lands would be followed for private and state-owned lands (refer to Section 2.2.8.9 and Appendix B).

In addition, specific ADOT restoration requirements would be adopted for final site reclamation if the pipeline would intrude on ADOT right-of-way. The pipeline company also would implement the following general procedures, as well as additional procedures that might be required by the BLM or the Arizona State Land Department or local soil conservation authorities, for site-specific soil and slope stabilization issues:

- Topsoil would be stripped and piled along the trench for future reclamation use or as requested by landowners during easement negotiations.

- Where topsoil has been stripped, trench spoil would be maintained separate from topsoil.

- The trench would be dug deep enough to allow for at least 3 feet of cover in standard soil conditions to meet minimum 49 CFR 192 safety standards. Within ADOT and Mohave County road corridors, the trench would be dug to allow for a minimum of 5 feet of cover over the buried pipeline, in compliance with the ADOT requirements.

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- In exceptional cases, boring may be used where trenching is not possible due to topographic constraints (e.g., steep slopes).

After trenching, individual sections (40- to 80-foot lengths) of pipe would be hauled to the construction site and laid adjacent to the trench along the right-of-way (pipe stringing). After trenching and pipe stringing, individual sections of pipe would be bent as necessary to fit the contours of the trench. Pipe ends then would be aligned and welded together and the completed pipe placed on temporary supports along the edge of the trench. All welds then would be visually and radiographically inspected and repaired if necessary. The welds would be field-coated to protect the pipeline against corrosion. Coating the welded joints would complete the external coating of the pipeline. The entire pipeline coating would be inspected by an electronic device to locate and allow for repair of defects in the external coating.

The pipe would be lowered into the trench by sideboom tractors and the trench backfilled with the previously excavated soil using a padding machine, bladed equipment, or backhoes. The right-of-way would be regraded to its approximate pre-construction contour, except for a slight crown of soil to compensate for the natural compaction of the backfill that would occur after placement.

After installation, the pipeline would be hydrostatically tested to verify the integrity of the completed steel pipeline system. In accordance with 49 CFR 192 regulations, the hydrostatic test pressure would range from 1.1 to 1.5 times the pipeline's maximum operating pressure. To accomplish this integrity testing, the pipeline would be hydrostatically tested in sections, at locations to be determined based upon elevation change. An estimated one million gallons of water would be used to fill about half of the completed pipeline for testing, and then transferred for subsequent testing. Water for hydrostatic testing would be obtained from the Project well field. After testing, the water would be returned to the proposed power plant site for disposal, or disposed of at each test site by discharging to a dewatering structure. Once the test sections are determined, appropriate discharge permits would be obtained.

Concurrent with hydrostatic testing, the work areas would be final graded and restored. Reclamation would follow the appropriate plans (Appendix B). Topsoil would be returned to its original horizon and rock would be scattered randomly over the surface. Land contours would be restored as near to original as practical in all areas. In non-agricultural areas, permanent erosion control berms (waterbars or slope breakers) would be installed on slopes as appropriate. The ground surface would be prepared for seeding, and planted with a native seed mixture based upon consultation with land management agencies, local conservation authorities, and respective landowners. In agricultural lands, any existing terraces or swales would be restored and seeded. Annual croplands would not be seeded unless requested by the landowner. Surplus construction material and debris would be removed and disposed of in appropriate facilities, and private property, such as fences, gates, and driveways would be restored to a condition equal to or better than the preconstruction condition.

After hydrostatic testing, the pipeline would be dried, and block valves, taps, and meter interconnect facilities would be installed. The pipeline then would be purged and packed with natural gas for service.

Pipeline Construction at Wetland/River/ Stream Crossings

The proposed pipeline would need to cross the Big Sandy River and an associated wetland, and other ephemeral dry washes or drainages. The pipeline company would adopt FERC's "Wetland and Water Body Construction and Mitigation Procedures" (FERC procedures) for construction work in these locations.

Standard cross-country construction techniques (as described above) would be used to cross all dry ephemeral channels and non-wetland areas. For any drainage that contains water at the time

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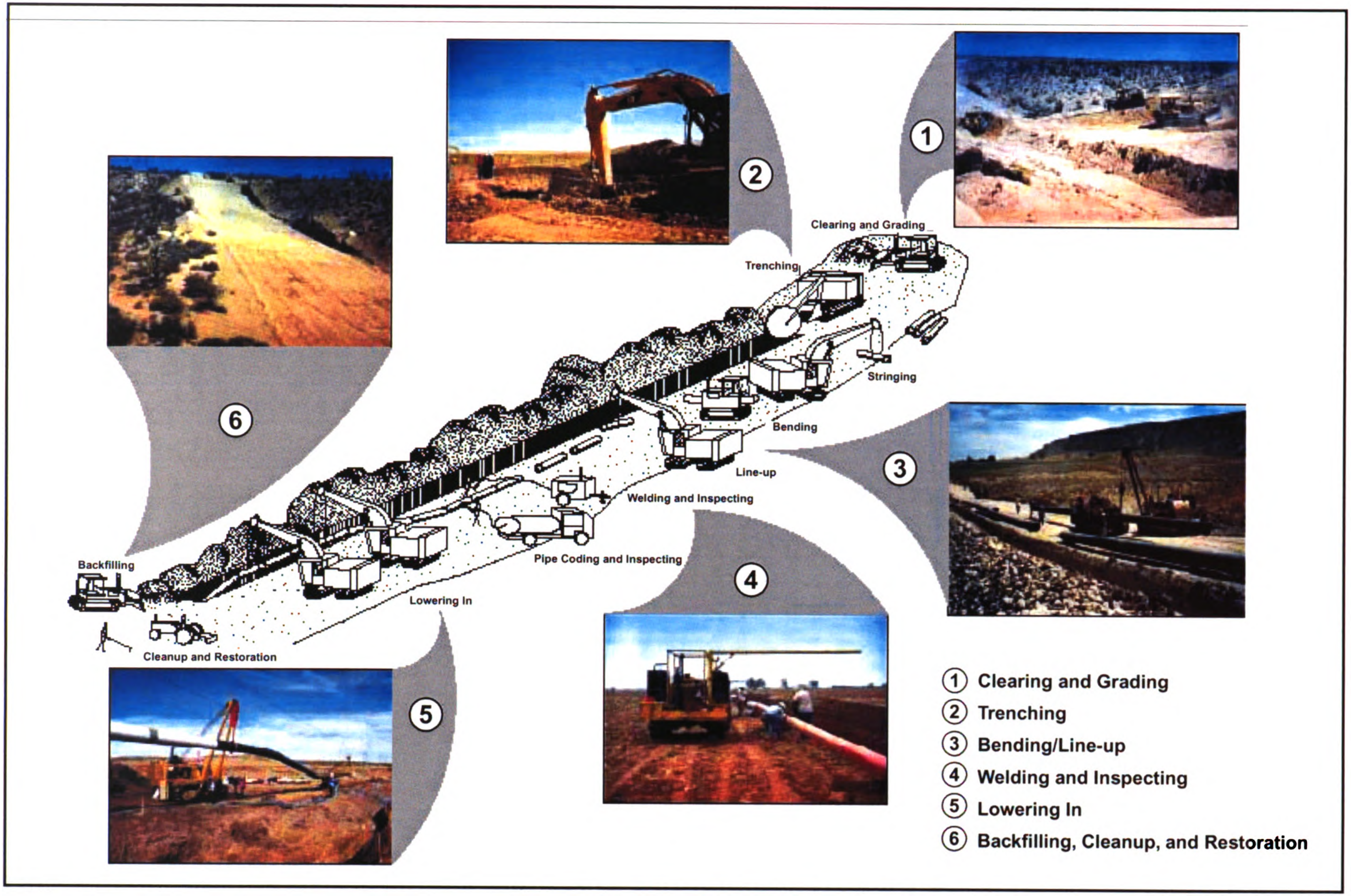

Pipeline Construction Sequence
Big Sandy Energy Project EIS
Figure 2-14

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of crossing, open-cut crossings would be accomplished by using conventional bucket-type excavation equipment operating from the banks or from within the waterbody. Open-cut crossings typically would require temporary work space on both sides of the crossing. The excavation, pipeline installation, and backfilling across the water body and banks would be completed as quickly as possible. The pipeline construction company would obtain permits from the U.S. Army Corps of Engineers (COE) as required for crossing of dry washes and drainages subject to COE jurisdiction.

As one option for crossing the Big Sandy River, Caithness has proposed to directionally drill the pipeline under the river. If the option of directional drilling is used, the work areas would be configured as follows:

- two 150-foot by 200-foot pads for drilling equipment, mud tracks, and mud shakers, one on each side of the river, set back away from the Big Sandy River riparian area
- one 75-foot by 1,700-foot area for pipe string layout north of, and set back from, the Big Sandy River riparian area

The estimated depth of the directional drilling is 20 to 30 feet below the bed of the Big Sandy River, and the boring is expected to be about 1,300 feet long.

As a second option, installation of the pipeline across the Big Sandy River could be accomplished by open-cut methods, due to the very narrow width of the flowing waterway crossing and associated wetlands and riparian vegetation. The crossing installation would be completed during time of low flow and would be performed in accordance with the COE Section 404 permit and FERC Procedures. Pipeline construction staging, welding, and installation activities at the Big Sandy River crossing would require additional work areas, with an additional space of 100 feet (width) by 300 feet (length) required on each side of the crossing. Also, pipeline anchoring and construction methods to prevent flotation during flooding may be required.

Storage of hazardous materials, chemicals, fuels, and lubricating oils would be prohibited within 100 feet of wetland boundaries.

Limited and temporary access through the wetland would be required to complete the trenching. Construction equipment operating within wetlands would be limited to that needed to dig the trench, install the pipe, backfill the trench, and restore the right-of-way. All other construction equipment would use access roads on upland areas to the maximum extent practicable. No permanent access roads would be constructed in the wetland.

Sediment filter devices would be installed at the base of the slope leading to a wetland. If there is no slope, sediment filter devices would be installed as necessary to prevent spoil from flowing off the right-of-way into the wetland or to prevent sediment from flowing from the adjacent upland into the wetland.

During clearing, woody riparian/wetland vegetation would be cut at ground level and the cut material removed from the wetland, leaving the root systems intact. In most areas, removal of stumps and roots would be limited to the area directly over the trench. This would promote more rapid regeneration of woody wetland vegetation. To facilitate revegetation of wetlands, the top foot of soil would be stripped from over the trench, except in areas with standing water or saturated soils.The Project proponent would use several additional measures at the Big Sandy River crossing to minimize environmental impacts. These are addressed in Section 2.2.8. The dry-ditch technique would be used to limit disturbance in the stream channel and protect water quality of the flowing water.

The pipeline construction company would develop and implement a Hazardous Materials Management and Spill Prevention and Countermeasure Plan (HMMSPC Plan), including more detailed information on the use

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of hazardous materials and handling of hazardous materials encountered during construction activities.

Blasting

It is not expected that bedrock would be encountered during trenching operations; however, if bedrock is encountered and mechanical ripping is not feasible, blasting might be required. If blasting is required, applicable Federal, state, and local stipulations would be followed, and necessary permits and authorizations would be obtained. The pipeline company would take measures to prevent damage to property and livestock during blasting operations, including the use of blasting mats. Owners of nearby buildings would be notified.

The pipeline construction company would coordinate any blasting operations adjacent to public highways with ADOT, and would comply with ADOT guidelines regarding blasting operations. Federal blasting regulations are administered by the U.S. Bureau of Alcohol, Tobacco, and Firearms (27 CFR 55), and U.S. Department of Labor, Occupational Safety and Health Administration (29 CFR 1910.109-1926.914).

Road and Highway Crossing

Construction of the 16- to 20-inch pipeline to the Questar pipeline would require crossing of I-40. I-40 would be crossed by installing the pipeline within the Mohave County Hackberry Road right-of-way and through the ADOT I-40 underpass for Hackberry Road. Specific ADOT or Mohave County requirements would be followed for the pipeline installation at the highway underpass. Temporary extra work areas would be required at each end of the highway crossing location.

Existing smaller (county) roads and various private or public access roads would be crossed by trenching (open-cut crossing). Open-cut crossings typically would be completed within three to five days, and alternate vehicular routes would be provided for traffic during pipeline construction. After pipe installation and backfilling, the roadway would be restored to near original conditions.

Electric Power Transmission Line Crossing

The 16- to 20-inch pipeline would cross the existing electric transmission line corridor (Mead-Liberty 345-kV and Mead-Phoenix Project 500-kV overhead lines) north of Wikieup and at the entrance to the proposed power plant. Cathodic protection devices would be installed at these locations as required.

Extra Work Areas

Based upon preliminary site inspections, additional work areas would be required for construction of the pipeline. The exact locations of these are not known at this time, but they generally would be small areas (about 100 by 100 feet to 100 by 300 feet in size), totaling about 7 acres.

2.2.7.6 Optical Ground Wire Installation

Equipment, OPGW, and other construction material would be acquired from various vendors and stockpiled along the route at sites owned by Western or its contractor. During the construction phase, the contractor would obtain material from these sites.

The OPGW would be constructed in spreads consisting of equipment and crews handling various phases of construction for a given line segment. The equipment used in the construction would include a tensioner and cable puller. These vehicles are large, 10-wheel trucks designed for heavy loads. Tensioners also may be mounted on a trailer.

The process of replacing the existing overhead static wire with the OPGW would be accomplished by first mounting a traveler or pulley on each structure near the place where existing wire attaches to the structure. Next, the existing static wire would be released from its attachment to the structure and placed into the traveler and cut at one end. The OPGW then

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would be tied to the end of the old static line and pulled through the travelers, removing the static line and installing the OPGW in one motion. Linemen would remove the new OPGW from the travelers and attach them to the structures. For the 46-mile length, about 15 pulling and tensioning sites would be needed, resulting in about 5 acres of temporary disturbance.

Flagging and Staking of Right-of-way

All activities associated with the construction, operation, and maintenance of the right-of-way would be conducted within the authorized limits of the temporary and permanent disturbance. For the area west of the proposed substation, trenching would displace 18 inches of soil for the length of the trench. The length of the trench would be about 500 feet.

Sensitive areas as identified by the specialist (e.g., biologist, archaeologist) would be clearly marked for avoidance before any construction or surface-disturbing activities begin.

Temporary Construction Areas

Two to four temporary staging areas for equipment and materials storage, each about 100 by 100 feet in size, would be required. These marshaling yards would be located on previously disturbed land, avoiding wetlands and other environmentally sensitive areas.

Clearing and Grading of the Right-of-way

Portions of the existing access roads to the transmission line structures on the Mead-Liberty 345-kV transmission line may require improvement to accommodate cable trucks or construction vehicles. Improvements would be limited to blading the existing alignment in those areas necessary.

No construction or routine maintenance activities would be performed during periods when the soil is too wet to adequately support construction equipment. If equipment creates ruts in excess of 6 inches deep, the soil shall be deemed too wet to adequately support construction equipment.

The width of the disturbance zone along the route would be minimized to the extent practicable. Construction vehicles would be excluded from traveling or turning around in undisturbed areas outside the right-of-way, except for reasons of safety. Disturbance of vegetated areas would be avoided where possible. In those areas where the disturbance is necessary, sensitive and protected species, steep slopes, and floodplains would be avoided.

Access

New road construction is not anticipated. Construction-related traffic would be restricted to existing routes approved by the authorized specialist assigned by Western to monitor biological or cultural resources during construction.

Fences and Range Improvements and Existing Land Uses

All existing improvements would be protected. If damage occurs it would be repaired immediately to the satisfaction of the owner or land manager.

Western would protect all public survey monuments found within or adjacent to the right-of-way. Survey monuments include but are not limited to General Land Office and BLM Cadastral Survey Corners; reference corners; witness points; U.S. Coastal and Geodetic benchmarks and triangulation stations; military control monuments; and recognizable civil (both public and private) survey monuments. If any of the above are obliterated or disturbed, Western would report the incident, in writing, to the BLM Field Office Manager and the respective installing authority, if known. Where BLM or General Land Office right-of-way monuments or references are obliterated during operations, Western would secure the service of a registered land surveyor or a staff cadastral surveyor to restore the disturbed monument according to procedures found in the latest edition of the

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manual of surveying instructions for the survey of the public lands of the United States. Western would record such survey in the appropriate county and send a copy to the authorized specialist.

Work Force

Each construction spread would require 15 to 20 workers including foremen, equipment operators, general laborers, and environmental monitors and construction inspectors. Each spread would require three to five pieces of equipment and support vehicles.

Construction workers would not be permitted to camp on public lands while participating in construction activities. Construction camps would not be necessary. The 15 to 20 workers would move along the route as the OPGW is installed and find local lodging in Wikieup or Kingman.

Safety

The following measures would be undertaken to ensure the health and safety of agency personnel, contractors, and the general public:

- The existing transmission lines would be de-energized.
- Applicable Western construction and safety standards would be followed.
- Traffic control procedures at road crossings, as approved by ADOT, would be implemented.

Hazardous/Toxic Materials

No hazardous material would be generated by the actions required for the operation and maintenance of the OPGW. To minimize the impact of hazardous materials used during construction activities (fuels and lubricating oils), all equipment would be inspected regularly for leaks. Any leaks detected would be promptly corrected. Fueling operation would be conducted at commercial filling stations or fuel farms.

Maintenance and Operation

Supervisors and field personnel would monitor and control the system by driving throughout the Project area inspecting facilities and checking equipment. Periodic reconnaissance of the right-of-way would not change with the addition of the OPGW and would continue to be conducted twice a year by driving the entire route on the existing roads or by helicopter. Improvements and repairs would be conducted as necessary. Maintenance procedures for the right-of-way would remain unchanged with the addition of the OPGW. Once the proposed facilities are in place and functioning, they would remain in continuous operation.

2.2.8 Actions to Reduce or Prevent Environmental Impact

The Proposed Action includes actions or plans that would be implemented to reduce or prevent environmental impacts. Each of these actions or plans is summarized below, and has been committed to by Caithness, MCEDA, and Western, as applicable.

2.2.8.1 Dust Control Measures

Fugitive dust sources that would be anticipated during construction of the Proposed Action include ground-disturbing site work such as clearing, excavation, bulk material storage and handling, grading, and labor and material transport. During construction of the Project pipeline, dust would be generated by ground-disturbing activities as well as equipment travel on paved and unpaved roads.

Construction and Excavation Activities

For the duration of construction activities, actively disturbed areas would be stabilized through the use of wet suppression as required to meet offsite visible dust limits. Surfactants may be used to aid in wet suppression, thereby reducing the volume of water required to effectively treat the site. Disturbed areas of the site, including storage piles, not being actively used for a period of seven calendar days or

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longer, would be stabilized as appropriate to minimize dust emissions. Active stabilization may not be required if soil moisture or natural crusting is sufficient to limit visible dust emissions.

Control of Dust from Handling and Storage of Bulk Materials

Bulk materials stored on site would be actively wetted during unloading as needed to minimize visible dust emissions off site. It is anticipated that the majority of the material would be used on site upon arrival. Should bulk materials require onsite storage for an extended period of time, the application of active wet suppression or the installation of a porous wind fence (a.k.a., windscreens) would be used as necessary to minimize fugitive dust generation.

Paved and Unpaved Travel Surfaces

Traffic passing from unpaved surfaces to paved roadways would create both mud and dirt deposits on the road and blowing dust from passing vehicles. Onsite equipment tire washing would be implemented as necessary to mitigate this potential source of fugitive dust.

Particulate emissions occur whenever a vehicle travels across an unpaved surface. Many of the heavily traveled unpaved surfaces such as onsite access roads, parking lots, and laydown areas would be covered with gravel and watered as necessary to minimize dust generation.

Onsite fugitive dust emissions would be limited by reducing vehicle speeds, and a combination of active and passive dust suppression measures. Mitigation practices would include the following:

- Where practicable, onsite employee parking, construction offices, and equipment and material laydown areas would be located near the main entrance to minimize onsite vehicle traffic.
- Onsite access roads, parking lots, and laydown areas would be maintained with a gravel cover to the maximum extent practical.
- Traffic off of maintained onsite access roads would be restricted and a posted speed limit of 15 miles per hour would be enforced to minimize emissions from unpaved road segments.
- Unpaved road segments would be watered at least once daily when precipitation has not occurred. Additional watering of unpaved surfaces may be undertaken whenever it is necessary to prevent visible dust emissions off site.

2.2.8.2 Erosion and Sedimentation Control Measures

Caithness would prepare and implement a final Erosion and Sedimentation Control Plan. The measures described below would be included in this plan.

Big Sandy River Crossing

The following measures would be taken at the Big Sandy River crossing before and during construction of the pipeline if the Big Sandy River is crossed by trenching:

- Limit width of disturbance to the minimum necessary during construction.
- In disturbed areas outside of the trench, cut vegetation at ground surface rather than removal of root systems, where possible.
- Install water diversion flume (dry-ditch technique) or diversion pump across the portion of the channel to be trenched. Use sandbags to direct surface flow into flume or pump and protect sides of flume or pump exit.
- Segregate topsoil (i.e., soil removed from river channel and adjacent upland area) so that trench is filled with original material in its proper location. This material would be stored adjacent to the channel area while the pipe is being installed.

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- Install water pump to relocate sub-surface water in the trench to water filtration structure in upland area.

- Install sediment barriers (sandbags, silt fence, or hay bales) immediately down gradient of the trenching along banks, riparian zones, and stockpile areas.

- Allow no construction traffic across riparian area.

- Use equipment mats to minimize impacts on soils and vegetation along right-of-way.

- Implement appropriate preventative and mitigative measures in accordance with the SPCC plan.

The following measures would be taken at the Big Sandy River crossing after construction of the pipeline if the Big Sandy River is crossed by trenching:

- Restore river channel and channel banks to preconstruction contours.

- Install trench breakers at the base of slopes near river channel.

- Apply seed to banks and riparian zone and cover with erosion control matting. Seeding should take place within a week from completion of construction.

- Application of a minimal amount of fertilizer on the banks may be implemented once seedlings have appeared.

- Leave sediment barriers and erosion control matting in place on banks and adjacent riparian zone until revegetation is successful.

- Check Big Sandy River crossing after substantial storm events within the first year after completion of installation across the river to ensure that unusual erosion has not occurred in the construction area. Maintain erosion control measures as necessary.

General Erosion and Sedimentation Control Methods

The following measures would be taken at all locations as applicable:

Standard measures and best management practices as discussed in the Stormwater Pollution Prevention Plan (Appendix A) and reclamation plans (Appendix B), including use of erosion control fabric, diversion ditches, ditch stabilization, sediment barriers such as silt fences and hay bales, sediment filtering devices in areas leading to wetlands, erosion control berms (water bars) on slopes, riprap, and revegetation.

2.2.8.3 Groundwater Monitoring Plan

The principal objective of groundwater monitoring would be to assess the extent to which observed water level drawdowns correlate with model-predicted drawdowns, and to use this information to determine the amount of water to be added, and the timing of this water augmentation.

Potential impacts to the upper aquifer are of primary concern. Because groundwater levels in the upper aquifer tend to fluctuate in response to groundwater pumping and flow in the Big Sandy River, it is not feasible to discern impacts on groundwater levels in the upper aquifer through direct measurement. Groundwater levels would be measured in upper aquifer wells as part of the monitoring program to record the daily and seasonal fluctuations in the upper aquifer in response to groundwater pumping in the upper aquifer, flows in the Big Sandy River, and climatic cycles. However, the groundwater level data obtained from the upper aquifer would not be used to assess whether upper aquifer groundwater levels are being impacted by groundwater pumping in the lower aquifer.

As an alternative to direct monitoring of groundwater levels in the upper aquifer to assess impacts, groundwater levels would be monitored in the lower and middle aquifers to assess the extent to which observed groundwater levels in

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those two aquifers correlate with groundwater levels predicted by the groundwater flow model. In this way, the groundwater monitoring data from the lower and middle aquifers would be used as an early warning of potential impacts on groundwater levels in the upper aquifer.

The results of the groundwater flow model define a range of predicted reduction in flow from the middle aquifer to the upper aquifer as a result of the Proposed Action. If the observed groundwater level drawdowns in the lower and middle aquifers are within the model-predicted range of drawdowns, then the observed data would be used to determine the amount of water to be added, and the timing of water augmentation. If the observed groundwater level drawdowns in the lower and middle aquifers are outside of the model-predicted range of drawdowns, then the observed water level data would be used to re-calibrate the model prior to determining the amount of water to be added and the timing of this augmentation.

Groundwater level measurements would be collected from five existing wells in the vicinity of the proposed power plant. One well (OW-2) would be used to monitor the lower aquifer, one well (OWMA-2) would be used to monitor the middle aquifer, and three wells (OW-1, OW-8, and Banegas) would be used to monitor the upper aquifer. In addition, there is a recognized need for a second middle aquifer monitor well between the production wellfield and the marsh. This second middle aquifer monitor well would be installed and equipped for water level monitoring prior to initiating groundwater pumping for the Proposed Action. The location of the new middle aquifer monitor well would be selected based on consensus between Caithness and BLM.

Groundwater level measurements would be collected from the lower and middle aquifer monitor wells (OW2, OWMA2, and the new middle aquifer monitor well) at a frequency of once per day. Based on the rates of drawdown observed during the long-term aquifer test, it is anticipated that more frequent measurements would not be necessary. Groundwater level measurements would be collected from the upper aquifer monitor wells (OW-1, OW-8, and Banegas) four times per day to monitor anticipated diurnal fluctuations in groundwater levels.

Groundwater level measurements would be collected from the middle and upper aquifer monitor wells using either an electric sounder or an electronic pressure transducer. Because the lower aquifer monitor well is under artesian pressure, groundwater level measurements in that well (OW-2) would be collected using a pressure transducer. Groundwater levels obtained using an electric sounder would be measured to an accuracy of 0.01 foot. Groundwater levels obtained using a pressure transducer would be measured to 0.01 psi, or about 0.01 foot.

2.2.8.4 Stormwater Pollution Prevention Plan/Surface Water Diversion Structures

A Stormwater Pollution Prevention Plan (Appendix A) would be followed to minimize impacts from surface water runoff and erosion. Under this plan, surface water diversion structures would be installed at the proposed power plant and substation site to drain surface water runoff from on-site graveled and impermeable surface areas, including areas that would be used for future phases of facility construction. Runoff (clean water) from the areas above the proposed power plant site would be diverted around the plant site.

The average annual precipitation measured at the Wikieup National Climatic Data Center Station is 10.0 inches. According to Western U.S. Precipitation Frequency Maps, published by the National Oceanic and Atmospheric Administration (1973), the 10-year, 24-hour storm event at the proposed plant site is 2.6 inches, and the 100-year, 24-hour storm event is 4.2 inches. The Best Available Demonstrated Control Technology Guidance Document for the Surface Impoundment Category at Industrial Facilities (ADEQ 1996) requires that surface water diversions have a

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design capacity capable of withstanding a 100-year, 24-hour storm event to protect impoundment structures from runoff.

Four ditches (designated A1, A2, A3, and A4) would receive flows from the proposed substation, power plant site, and Phase 2 areas. Ditch A3 also would receive overland flow from a small portion of the watershed to the east and north of the Phase 2 area. Flows from these sites would peak at about 84.08 cubic feet per second (cfs), and would be diverted to Evaporation Pond B. Flows from these sites would contribute a run-off volume of 7.44 acre-feet to Pond B from a 100-year, 24-hour storm event (Figure 2 - 15).

An offsite stormwater ditch (Ditch B1) would be located at the northern boundary of the proposed substation and the area containing facilities constructed under Phase 2 of the Proposed Action, and would receive overland flow from a slope on the north side of the ditch. Ditch B2, on the western boundary of the substation, would receive water from Ditch B1 and a small area west of the ditch. A culvert about 300 feet long would carry water from Ditches B1 and B2 under the access road and empty into the existing drainage south of the road. The culvert would need to be at least 96 inches in diameter to carry peak flows of 45.63 cfs. A retention basin would be constructed at this location to provide capacity for excess water during storm events. An erosion control structure would be installed at the outlet to dissipate energy. Table 2-6 summarizes the ditch designs required for offsite surface runoff and onsite stormwater runoff from a 100-year, 24-hour storm event.

Ditches C1, C2, and C3 would divert water from a temporary construction laydown area to the east of the proposed power plant site and Phase 2 areas to an unnamed drainage southeast of the proposed power plant site. A peak run-off of 6.16 cfs would drain from this area. Best management practices such as the use of energy dissipaters and silt fence/straw bale structures would be used to control sedimentation from this area.

The plan also would address erosion control and site stabilization. The main power plant area would be covered with asphalt, concrete, or rock. Portions of the proposed power plant's perimeter and interior would be reclaimed or landscaped with native vegetation to provide some erosion control and soil stability in localized areas.

2.2.8.5 Flow Augmentation and Monitoring

Groundwater monitoring data would be compiled and evaluated quarterly, and reported to BLM annually. Emphasis would be placed on evaluation of the monitoring data from the middle aquifer wells (OWMA-2 and the new middle aquifer monitor well), because groundwater levels in the middle aquifer are more directly connected to groundwater levels in the upper aquifer.

At the end of each quarter, the groundwater level measurements from each well would be appended to the groundwater level database for that well and an updated water level hydrograph prepared. For the lower and middle aquifer hydrographs, the model-predicted groundwater level data would be superimposed on the observed data to allow model-predicted and observed drawdowns to be compared.

If the observed groundwater level drawdowns in the lower and middle aquifers are within the model-predicted range of drawdowns for the two aquifers, then the observed data would be used to determine the amount of water to be added, and the timing of water augmentation , based on the model-predicted range of flow reductions. If the observed groundwater level drawdowns in the lower and middle aquifers are outside of the model-predicted range of drawdowns for the two aquifers, then the observed water level data would be used by Caithness, in cooperation with BLM, to re-calibrate the groundwater flow model. The re-calibrated model would then be used to determine the amount of water to be added.

As noted above, the results of the groundwater model indicate that the potential reduction in

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TABLE 2-6 BIG SANDY PROPOSED POWER PLANT SITE DITCH DESIGNS FOR 100-YEAR, 24-HOUR STORM EVENT						
Ditch	Discharge	Shape	Slope	Depth*	Width*	Type
On-site						
A1	43.48	Triangular	1.3	2.31	11.55	Riprap
A2	35.08	Triangular	0.4	2.61	13.06	Riprap
A3	44.78	Triangular	0.4	2.83	14.17	Riprap
A4	84.08	Triangular	7.8	6.60	8.01	Concrete
Off-site						
B1	38.20	Triangular	4.4	1.10	5.50	Riprap
B2	45.63	Triangular	0.4	2.85	14.26	Riprap
C1	3.61	Triangular	1.9	1.04	5.18	Riprap
C2	5.81	Triangular	2.9	0.70	3.49	Riprap
C3	6.16	Triangular	3.3	0.70	3.52	Riprap

* - with freeboard of 0.3 feet.

flow from the middle aquifer to the upper aquifer as a result of the proposed action may range from 0.5 percent (159 gpm or 256 ac-ft/yr) to 1 percent (350 gpm or 564 ac-ft/yr). The model results also indicate that the area of greatest potential flow reduction is at the marsh, located near the southern boundary of the basin above Granite Gorge, and that addition of water at the marsh would avoid these flow reductions. Water could effectively be conveyed to the marsh via the Big Sandy River. Accordingly, Caithness has proposed that any augmentation water be directed into the Big Sandy River between the US 93 bridge crossing of the Big Sandy River and the marsh. Required augmentation would be provided at least one year in advance of the projected flow reduction (as determined by monitoring and the groundwater model).

The two sources of augmentation water are (1) a portion of the 4,850 ac-ft/yr maximum withdrawal of groundwater from the lower aquifer, and (2) conversion of existing surface water irrigation rights to stream flow rights in the Big Sandy River.

Groundwater from the lower aquifer would be supplied by constructing a pipeline from the groundwater production wellfield or the power plant and diverting a portion of the groundwater from the production wellfield or water from the proposed power plant water treatment system to the river.

Surface water also could be supplied by converting surface irrigation rights at Banegas Ranch and/or others to instream flow rights.

2.2.8.6 Actions to Compensate for Predicted Impacts on Cofer Hot Spring

Cofer Hot Spring is privately owned, and is used by the owner for grazing and other uses. Hydrologic analysis of the Big Sandy Energy Project has indicated that a reduction of flow from Cofer Hot Spring is projected due to the drawdown of the lower aquifer from pumping the water supply for the proposed project. The lower aquifer has been determined to be the source for Cofer Hot Spring. The landowner will use existing shallow wells near the spring to replace water in the spring used for grazing. One of the wells would be pumped to a stock tank or water trough to provide water for the Hot Spring Grazing Allotment.

The Project proponent has agreed in concept with the landowner to provide a well to access water from the lower aquifer to replace any water lost from reduction in spring flow.

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2.2.8.7 Actions to Minimize Impacts on Grazing

Range improvements that are removed or disturbed during construction of the proposed project would be repaired or replaced immediately following construction. A survey would be completed prior to construction of the natural gas pipeline and other facilities where range improvements are present to identify existing range improvements that would be impacted during construction. The pre-construction survey would be coordinated with BLM personnel to ensure all range improvements are taken into consideration. An action plan that identifies the duration, timing, and methods to reduce temporary impacts on range improvements would be developed so the function of range improvements is ensured during construction. In areas where permanent access is required to maintain or inspect the natural gas pipeline, cattle guards or gates would be installed to ensure the integrity of fencing systems.

2.2.8.8 Actions to Reduce Visual Impacts

The following actions would be taken to minimize visual impacts associated with the Proposed Action:

- All structures, exhaust stacks, buildings, tanks, and other features associated with the proposed power plant site and aboveground portions of the pipeline would be surface-treated (dulled or painted with desert tones) to reduce visible glare and visual contrast with the surrounding landscape.

- Areas of surface disturbance (e.g., proposed power plant site, pipeline, roads, well sites, and other areas) would be revegetated to be consistent with the surrounding landscape to reduce visual contrast. This primarily would occur along the perimeter of the proposed power plant site and not the interior, as well as along the pipeline and access road edges.

- Areas of surface disturbance (e.g., proposed power plant site, pipeline, roads, well sites, and other areas) would be contoured to closely match the surrounding landscape to reduce visual contrast and allow for revegetation. This primarily would occur along the perimeter of the proposed power plant site and not the interior, as well as along the pipeline and access road edges.

- Lighting for the proposed power plant and substation would be limited to areas required by regulation, operation, and safety. Wherever practical, provisional lighting control devices (i.e., motion detectors and emergency switches) would be installed to reduce the amount of lighting visible at the proposed power plant site during times of normal operation, and lights would be located at the lowest points on the power plant which still would provide for the intended use and reduce overall visibility of lights.

- Lighting devices would be an amber (high-pressure sodium) or red color where needed to avoid the intensity associated with white lights. Lights would have directive or shielding devices to reduce uplighting and offsite glare.

2.2.8.9 Reclamation Plans

The proponent has developed two different reclamation plans for the proposed Project: the Reclamation Operation Maintenance Plan (ROMP) for BLM-Managed Public Lands, which would be followed on public lands managed by BLM and the Reclamation Plan for State and Private Lands, which would be used on private and state-owned lands. Complete copies of these plans are included as Appendix B.

Primary provisions in the ROMP include the following:

- pre-construction surveys to identify native plants and areas of environmental concern (refer to Section 2.2.8.10)

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- salvage of native plants listed on the Arizona Department of Agriculture List of Protected Native Plants (1999). The number of plants (per species) to be salvaged would be determined based on transplant spacing criteria as described in the plan.
- stockpiling and reuse of topsoil
- storage of salvaged plants in temporary nurseries located in work areas or other disturbed areas
- use of erosion control measures such as sediment barriers, water bars, mulching, riprap, and erosion control fabric
- reseeding of the recontoured right-of-way, using mainly broadcast seeding methods and
- a BLM-approved native seed mix, followed by transplanting of salvaged plants
- watering for about nine months after transplantation, with a follow-up inspection after one year
- use of two-track maintenance pathways along the pipeline right-of-way (no permanent access road construction)

The Reclamation Plan for State and Private Lands includes the same provisions as the ROMP, except that ADOT would identify which plants would be salvaged and use them in its highway reclamation projects, instead transplanting them on site. Disturbed areas would be similarly reseeded and a one year inspection conducted, but no watering schedule is specified.

For construction on any lands, a contractor would be selected to perform all reclamation activities for disturbed areas. This contractor would coordinate with appropriate Federal and state agencies, acquire all permits and approvals, prepare a detailed plan, and comply with the approved plan and all other applicable reclamation requirements.

2.2.8.10 Pre-construction Biological Surveys and Impact Reduction Measures

Pre-construction biological surveys would be conducted for special status plants and certain wildlife species or groups. Detailed field surveys would be conducted prior to construction to identify habitats of special status plants, including the endangered Arizona cliffrose. If special status plant habitat cannot be avoided, surveys would be conducted to identify any populations or individuals. Surveys for populations and/or individuals would be conducted during the species' flowering period, if appropriate. The Arizona cliffrose has a flowering period between April and June. Details on the proposed surveys are included in Appendix C.

Wildlife pre-construction surveys would be performed prior to ground-disturbing activities, with the precise timing of surveys dependent on the target species and the specific construction activity. Currently, pre-construction surveys are proposed for the Sonoran desert tortoise and breeding raptors. Details on the proposed surveys are included in Appendix C.

Caithness would restrict all ground-disturbing activities in the Big Sandy River riparian zone, including a 150-foot buffer on each side, to months outside the peak breeding season (mid-June through mid-August) for the southwestern willow flycatcher.

Caithness would implement numerous measures in areas designated as Category III desert tortoise habitat to reduce or minimize impact. Surface-disturbing activities would be minimized along the proposed pipeline corridor. Access to roads not needed after construction would be restricted, and the roads would be scarified. Access roads scheduled for upgrading in desert tortoise habitat would not be widened, if possible, nor would berms be disturbed during grading. New permanent access roads would not be created in desert tortoise habitat except where

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the right-of-way is not adjacent to an existing right-of-way or road. Stockpile areas in desert tortoise habitat would be placed either in less valuable habitat, or minimized in size.

2.2.8.11 Cultural Resources Protection Measures

Cultural resources would be protected in accordance with the provisions of a Programmatic Agreement (PA) prepared in compliance with Section 106 of the National Historic Preservation Act (Western 2001). The PA defines procedures for additional pre-construction surveys to inventory cultural resources within areas of potential effect as they are identified. Any inventoried cultural resources would be evaluated and treated in consultation with the parties participating in the PA, which include Western, BLM, Hualapai Tribe, Arizona State Historic Preservation Office, Arizona State Museum, Arizona State Land Department, COE and Caithness.

2.2.8.12 Spill Prevention Control and Countermeasure Plan

An SPCC plan would be developed as design information is finalized. This plan would address specific methods and standards to ensure safe storage of chemicals and petroleum products at the proposed power plant site. An HMMSPC Plan would be developed by the pipeline company and implemented during construction. The plans would contain information on how to safely handle, store, and dispose of hazardous materials, as well as procedures to follow in case of a release.

2.2.8.13 Noise Reduction Measures

Noise reduction measures would be included in the design of the turbines and the turbine housing. The air intake system would include silencers to reduce noise from the combustion turbine compressor inlet. The turbines would be contained within an insulated shell to further reduce noise levels.

Construction other than water well drilling would be anticipated to occur in one 10-hour shift per day 5-days per week, thereby reducing the potential for noise on nights and weekends. Construction equipment would be required to have operable mufflers wherever possible.

2.3 DESCRIPTION OF ALTERNATIVES

2.3.1 Alternative Pipeline Routes

Two alternatives were identified for routing the natural gas pipeline. The first would make use of the existing BLM utility corridor that overlays the Mead-Phoenix Project 500-kV and Mead-Liberty 345-kV transmission line corridors. Although Western's polices do not allow the parallel location of the pipeline within these transmission line rights-of-way, this recognized utility corridor provides a viable route from the supply pipeline connection to the proposed power plant, and the transmission lines can be closely paralleled. Also, a second alternative route that generally follows road rights-of-way was identified. This alternative would follow Hackberry Road, US 93, and the new Mohave County access road leading to the proposed power plant site.

As with the proposed pipeline, these alternative corridors consist of combined corridor segments. The five corridor segments following the transmission lines are designated T1 through T5, while the segments following roads are designated R1 through R5. Both alternatives make use of corridor segment C3 where the transmission line corridor overlaps the US 93 corridor. Figure 2-12 depicts the locations of the alternative pipeline routes and their respective corridor segments, and Table 2-2 provides a detailed description of each of the segments. Sections 2.3.1.1 and 2.3.1.2 below describe the location and features of each alternative pipeline route in more detail.

Similar to the proposed gas pipeline, an interconnection facility would be installed at each interconnection point at the northern end of the pipeline. This facility would consist of isolation valves, control valves, metering

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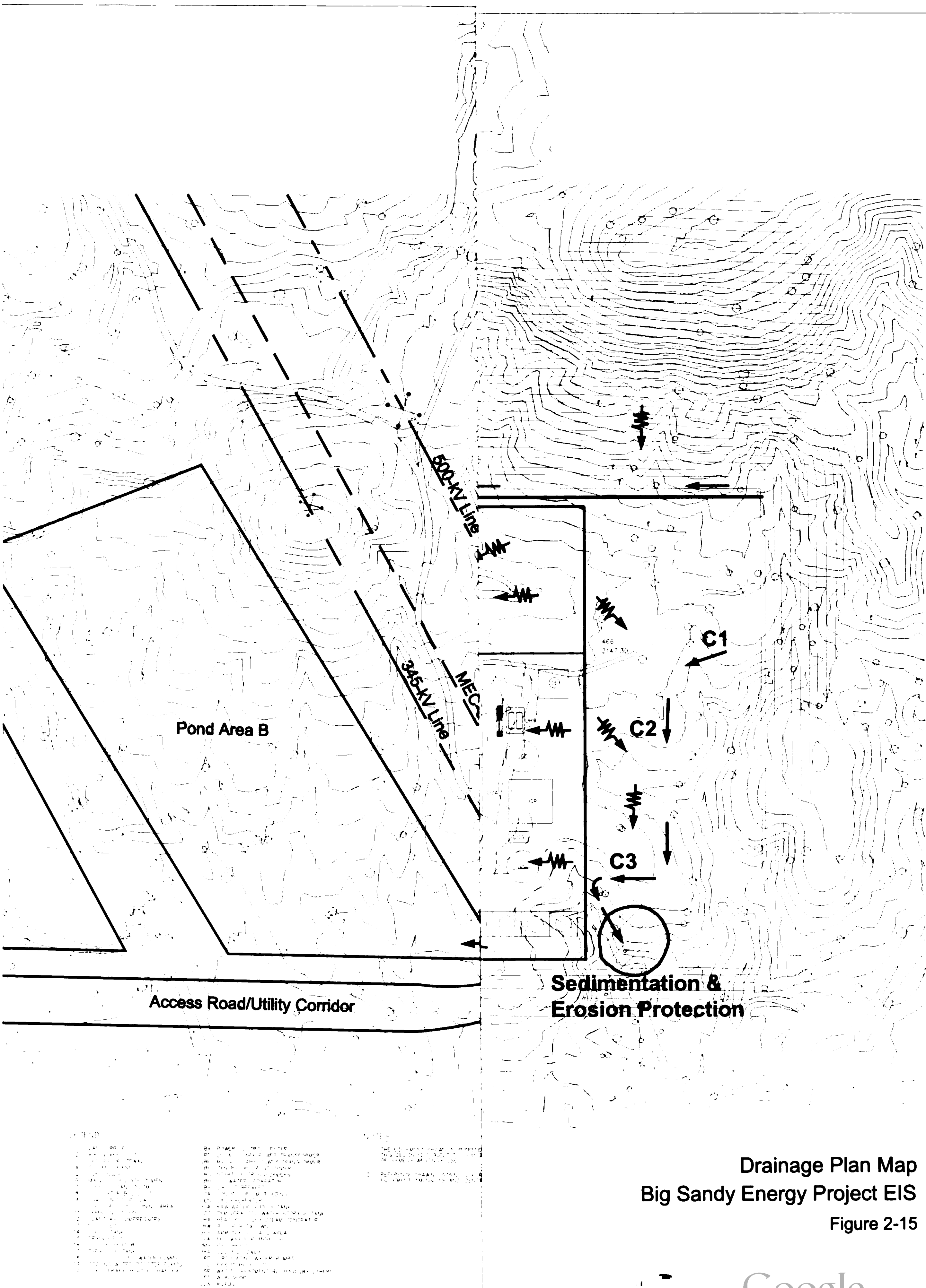

Drainage Plan Map
Big Sandy Energy Project EIS
Figure 2-15

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equipment, and a filter separator. The equipment would be enclosed within small buildings. This equipment and buildings would be located within new approximately 100-foot by 100-foot fenced and graveled yard. In addition, a small communication tower (about 15 feet high) would be included within the fenced yard. Electric power service would be supplied from a nearby existing distribution line. Access to the interconnection facility would be from existing roads. Additional yards would be needed if connections were made to more than one of the interstate pipelines.

A gas metering facility would be installed at the southern end of the pipeline within the proposed power plant site. This facility would consist of isolation valves, metering equipment, a filter separator, and pressure reduction and control valves used to feed gas to the turbines. A fuel gas preheater also would be installed to increase the efficiency of the proposed power plant.

2.3.1.1 Alternative R Gas Pipeline Corridor

The Alternative R (Road) gas pipeline corridor, would consist of the following corridor segments:

R1 – R2 – R3 – C3 – R4 – R5

Corridor segment R1 begins at the northernmost potential supply pipeline and heads south after crossing under I-40. This segment and corridor segment R2 encompass the Hackberry Road right-of-way, which varies from 100 to 150 feet wide. Corridor segment R1 passes through both private and state-owned land, while corridor segment R2 crosses private land only. Corridor segment R1 is 3.9 miles long and segment R2 is 0.8 miles long.

Corridor segment R3 begins where Hackberry Road intersects with US 93 and continues south, following the US 93 alignment. The corridor width is 400 feet, immediately adjacent to the eastern edge of the US 93 right-of-way. This segment is about 9.3 miles long and crosses primarily private lands.

Corridor segment C3 is the same connecting segment included in the Alternative T gas pipeline corridor, and is described above.

Corridor segment R4 continues south along US 93 just east of the US 93 right-of-way to the intersection with the Alternative T gas pipeline corridor, a distance of about 13.7 miles. This segment crosses private, BLM-managed public, and state-owned lands and has a width of 400 feet except within the Carrow-Stephens Ranches ACEC, where it also includes the 200-foot wide US 93 right-of-way; and along US 93 south of Gunsight Canyon, where it increases to a width of 1,500 feet to accommodate the planned realignment of US 93.

From this point, the Alternative R gas pipeline corridor follows corridor segment R5, which follows along US 93 south to the proposed access road leading to the proposed power plant site. The access road right-of-way would cross Sections 1, 5, and 7, T15N, R12W, and enter the proposed power plant site over the section corners of Sections 5, 6, 7, and 8, T15N, R12W. This corridor segment is about 8.5 miles long and varies in width from 200 feet wide along the proposed access road to 1,800 feet wide along part of US 93.

2.3.1.2 Alternative T Gas Pipeline Corridor

The Alternative T (Transmission Line) Gas Pipeline Corridor, would consist of the following corridor segments:

T1 – T2 – T3 – C3 – T4 – T5

The northern end of this alternative route would begin with corridor segment T1. The exact starting location would depend on which interstate pipeline or pipelines are selected for the gas supply, but would begin about 1 mile northwest of the interchange of US 93 and I-40. All three potential source natural gas pipelines are located north of I-40 at this location; therefore, the pipeline would be installed by boring underneath I-40. Corridor segment T1 extends south about 3.7 miles to Old Highway 93 in Section 18, T20N, R13W (also the

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intersection with corridor segment C2). The corridor has a width of 2,235 feet and crosses private and state-owned lands.

This route continues along corridor segment T2, following the existing transmission lines for about 2.1 miles to the intersection with corridor segment C1 in Section 30, T20N, R13W. Corridor segment T2 is also 2,235 feet wide and crosses private and state-owned lands.

The route continues with corridor segment T3, heading south parallel to the transmission lines, for a distance of 8.5 miles. This corridor segment is also 2,325 feet wide, crossing both private and state-owned lands. It intersects with corridor segment C3, which is located where the transmission line and US 93 corridors overlap. This segment's eastern boundary is 400 feet east of the US 93 right-of-way and the western boundary is 1,000 feet west of the Mead-Liberty 345-kV transmission line right-of-way. The segment is about 1.9 miles long and crosses private and state-owned lands.

This alternative route continues with corridor segment T4, which follows the transmission line rights-of-way to their intersection with US 93. Corridor segment T4 is 2,325 feet wide except along the western border of the Carrow-Stephens Ranches ACEC, where it expands to 4,000 feet. This segment is 13.8 miles long and crosses private, BLM-managed public, and state-owned lands.

The final corridor segment for the Alternative T gas pipeline corridor is T5, which begins at the southern end of corridor segment T4 and extends southeast about 7.8 miles to the proposed power plant site. This segment is 2,325 feet wide except where it veers from the transmission line rights-of-way to cross the Big Sandy River perpendicularly; the corridor expands to 3,000 feet wide for this crossing. This segment crosses private and BLM-managed lands.

2.3.1.3 Crossover Segment C2

Although not a part of any alternative route, corridor segment C2 is included in environmental planning and analysis because it could be considered during final right-of-way acquisition as a connecting link between the Alternative T and R gas pipeline corridors. It encompasses the Mohave County 150-foot-wide right-of-way of Old Highway 93 and is about 2.3 miles long, crossing private and state-owned lands. Mohave County has agreed that the pipeline could be placed within the existing road right-of-way to minimize impacts.

2.3.1.4 Construction of the Alternative Pipelines

Construction and maintenance within either alternative corridor would use methods similar to those described for the Proposed Action (refer to Section 2.2.7.4). Any applicable actions to reduce or prevent environmental impact (Section 2.2.8) also would be implemented. Requirements for temporary workspace are expected to be similar to those of the Proposed Action. Wherever possible, existing roads would be upgraded as needed and used for pipeline construction and maintenance access. The new area of disturbance for construction of either route would be 90 feet wide within the pipeline right-of-way, with additional work areas totaling 7 acres. Tables 2-7 and 2-8 summarize the areas of disturbance associated with both alternative corridors, including a breakout of total, permanent, and temporary disturbance.

Although the two alternatives differ in where they would cross the Big Sandy River, similar construction and environmental protection measures would be used. The Alternative T gas pipeline corridor would cross the river perpendicularly, where the river is typically dry, so that trenching would be used. Pipeline anchoring and construction methods to prevent flotation during flooding would be required across the entire 0.5-mile width of the crossing.

2.3.2 No-Action Alternative

No action would mean that BLM would not approve the requested right-of-way for the gas pipeline, the access road, the water pipeline and other related facilities for the proposed power

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TABLE 2-7 SUMMARY OF GROUND DISTURBANCE ACTIVITIES ALTERNATIVE R GAS PIPELINE CORRIDOR			
Activity	Acres of Permanent Disturbance	Acres of Temporary Disturbance*	Total Acres Disturbed
Proposed Power Plant and Immediate Site Facilities			
Power Plant	15	0	15
Power Plant Lay Down Area	0	3	3
Substation	12	0	12
Substation Cut/Fill	0	7	7
Transmission Line Turning Structures	0	1	1
Evaporation Ponds	18	0	18
SUBTOTAL	**45**	**11**	**56**
Well Pad Sites	10	10	20
Well Pad Access Roads	6	0	6
Plant Access Road (2.3 miles)	13	8	21
Agricultural Activities	107	0	107
OPGW Installation (15 pulling and tensioning sites)	0	5	5
SUBTOTAL	**136**	**23**	**159**
Proposed Pipeline Route: R1-R2-R3-C3-R4-R5			
Construction Right-of-Way	47	339	386
Additional Work Spaces	0	7	7
SUBTOTAL	**47**	**346**	**393**
TOTAL	**228**	**380**	**608**

*These areas would be disturbed only during construction.

plant site, and Western would not approve the interconnection request. In effect, the Project would not be built as proposed.

For the No-Action Alternative, there would not be any power plant developed at the proposed site. This includes the principal associated facilities including the substation and modifications to the Mead-Phoenix Project 500-kV transmission line for the interconnection. The natural gas pipeline would not be built, and no opportunity would be created for natural gas supply in the Wikieup area. Those project features already constructed on private lands, such as groundwater well PW2, the groundwater monitoring wells, and the associated well pads and well access roads, would remain.

Table 2-9 at the end of this chapter summarizes the environmental consequences associated with each alternative by resource.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

Possible alternatives were identified primarily through the scoping process. Following notification that an EIS would be prepared, the public and Federal, state, and local agencies were given the opportunity to provide comments on the proposed Project. An evaluation of these comments resulted in the identification of possible alternatives to the Proposed Action.

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TABLE 2-8 SUMMARY OF GROUND DISTURBANCE ACTIVITIES ALTERNATIVE T GAS PIPELINE CORRIDOR			
Activity	**Acres of Permanent Disturbance**	**Acres of Temporary Disturbance***	**Total Acres Disturbed**
Proposed Power Plant and Immediate Site Facilities			
Power Plant	15	0	15
Power Plant Lay Down Area	0	3	3
Substation	12	0	12
Substation Cut/Fill	0	7	7
Transmission Line Turning Structures	0	1	1
Evaporation Ponds	18	0	18
SUBTOTAL	**45**	**11**	**56**
Well Pad Sites	10	10	20
Well Pad Access Roads	6	0	6
Plant Access Road (2.3 miles)	13	8	21
Agricultural Activities	107	0	107
OPGW Installation (15 pulling and tensioning sites)	0	5	5
SUBTOTAL	**136**	**23**	**159**
Proposed Pipeline Route: T1-T2-T3-C3-T4-T5			
Construction Right-of-Way	45	366	411
Additional Work Spaces	0	7	7
SUBTOTAL	**45**	**373**	**418**
TOTAL	**226**	**407**	**633**

*These areas would be disturbed only during construction.

In addition to the scoping process, the lead agencies and environmental specialists reviewed the Proposed Action, and possible alternatives were identified in cases where a potentially significant impact was anticipated. Alternatives were identified for the following Project components:

- power plant and evaporation pond sites
- power generation technology
- water sources
- water for agricultural use
- power plant cooling
- Wikieup gas tap

2.4.1 Power Plant and Evaporation Pond Sites

During the scoping process, an alternative power plant site was suggested near the I-40 corridor.

This site does not directly satisfy the purpose and need to support MCEDA's objective for economic development in the Big Sandy Valley. Also, it was important that the plant be located outside a 100-kilometer (62-mile) buffer zone around Grand Canyon National Park, to minimize air quality and visual impacts on the Park. This site fell within that zone, which begins about 8 miles north of Wikieup. Water availability in the northern portion of the Big

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Sandy groundwater basin was researched via standard literature reviews with the Arizona Geological Survey, ADWR, and U.S. Geological Survey. No information regarding the specifics of availability in this area was determined to exist.

Suggestions also were made to consider sites closer to Bullhead City or Lake Havasu City and use water from the Colorado River. However, sites in this area do not satisfy the purpose and need which includes efficient interconnection to the Mead-Phoenix Project 500-kV transmission line. In addition, water for industrial development is not practically available for allocation from the Colorado River.

The sites suggested as alternatives to the proposed power plant site were found to be lacking in available water resources, making them uneconomic to develop and inconsistent with the purpose and need for this Project.

Alternative sites for the evaporation ponds also were examined, primarily due to concern about the proximity of the proposed location of the ponds to the existing transmission lines, which could present a hazard to birds using the ponds during entry or takeoff. However, the ponds could not be relocated, due to the terrain and location of features such as drainages and roads. The land to the east of the proposed power plant site is at a higher elevation than the plant site itself and has very rugged terrain. This would make construction and containment more difficult and costly. It also would require that water be pumped uphill to the ponds. There also are land boundaries and facilities that must be accommodated or worked around. The proposed location of the west cell is bordered by a section line and a drainage. The east cell is bordered by a transmission line, a section line, an access road, and a drainage. All of these features limit the ability to make adjustments in the pond locations on the west side of the proposed power plant site.

2.4.2 Power Generation Technology

A key part of the purpose and need for this Project is the ability to consistently deliver competitively priced electrical energy. Energy sources that do not consistently deliver electrical energy do not meet the purpose and need of the Project.

2.4.2.1 Wind

Electrical power production using wind energy is dependent on the wind field encountered at the power plant site. Although wind generation is technically feasible, this location does not experience strong sustained winds, and is therefore not well-suited as a wind energy site. Even considering advances in energy storage technology, the proposed power plant site would not allow the Project to consistently deliver electrical power.

2.4.2.2 Solar

Electrical power production using solar energy is dependent on the solar energy received at the power plant site. This location receives strong solar energy during the daylight hours, especially during the summer. Although solar energy has been shown to be technically feasible, solar energy is not available during nighttime hours. Even considering advances in energy storage technology, this technology would not allow the Project to consistently deliver electrical power.

2.4.2.3 Other

Other energy sources capable of generating electrical energy (fuel cells, tidal power, geothermal) were not considered technically viable alternatives at this location.

2.4.3 Water Sources

Two alternative groundwater sources and one surface water source were considered for this Project, as follows:

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1. Surface water produced from the Colorado River

2. Groundwater produced from shallow wells from the Big Sandy River alluvial aquifer

3. "Joint" use of water from the Phelps Dodge Bagdad pipeline carrying shallow groundwater

Procurement of an allocation of Colorado River water for this Project is impracticable. Groundwater from the Big Sandy River alluvial aquifer is not viable due to concerns regarding existing water users and the need to protect riparian habitat downstream from the Project.

The design concept associated with the "joint" use of water from the Phelps Dodge water pipeline would be to use the water for "once-through" cooling. This process would require about 44,000 acre-feet per year in order to dissipate the amount of heat generated by the project (URS Technical Memorandum, May 7, 2001). This volume of water is not available from the Phelps Dodge water supply wells.

2.4.4 Water for Agricultural Use

The following two alternatives for providing water for agricultural use were considered:

- using cooling tower blowdown
- using stormwater runoff

If cooling tower blowdown were used, water would be recycled through the cooling tower a fewer number of times, in order to limit the concentration of dissolved solids to a level that could be used for irrigation. Calculations were performed to compare the amount of water that would be needed if this alternative were implemented. Results showed that this alternative would require the use of approximately 100 gpm more than the Proposed Action. In addition, the alternative would introduce the potential for cooling tower chemicals (e.g., algaecides) to be present in the irrigation water. For these reasons, an alternative that would use cooling tower blowdown for agricultural use was eliminated from further consideration.

The potential use of stormwater as irrigation water also was examined. This alternative was not carried forward for further consideration because it was not feasible to ensure that the water supply needed to sustain crops would be available at the time it was needed, since storms are sporadic and unpredictable. Storage capacity would be required, but it would not be possible to guarantee that the supply in storage would be sufficient to meet the agricultural needs. Also, this would involve additional environmental impacts related to construction of the storage and delivery system. For these reasons, this was not selected as an alternative.

2.4.5 Power Plant Cooling

Initial consideration was given to three conventional types of cooling technology for use at the Big Sandy Energy Project: wet cooling, dry cooling, and a hybrid cooling technology partially wet and dry. The potential impacts on the facility's ability to provide competitively priced electricity was a factor in considering the viability of these alternatives.

Under the Proposed Action, deep aquifer groundwater would be used as the water source for the wet-cooled facility. An average of about 3,200 acre-feet of groundwater (4,200 acre-feet maximum) is expected to be consumed annually for cooling and operational purposes.

The wet cooling technology requires cooling towers, which would use both mechanical and evaporative cooling mechanisms to condense the process steam.

In comparison, the dry cooling technology would condense the process steam essentially using the same technology as an automobile radiator. This alternative would reduce water usage by about an average of 3,000 acre-feet per year (4,000 acre-feet per year maximum).

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A simple analysis prepared to consider the dry cooling alternative determined that, although technically feasible, dry cooling results in substantial additional cost and reduced plant output. Because the greatest reduction to the power plant output would occur during the hottest part of each day, which would coincide with the periods of greatest electrical demand, and (potentially) the greatest price per kilowatt hour, the overall economic impact of dry cooling was substantial. The capital and operating costs of dry cooling relative to wet cooling would represent an additional cost (including lost revenue) to Caithness of about $26 to $28 million over the life of the Project (URS Technical Memorandum, May 7, 2001). This makes this alternative not economically feasible and does not meet Caithness' need to provide competitively priced electrical energy.

Hybrid wet-dry cooling towers are commonly used in applications that require abatement of the condensed water plume. The plume abatement feature is normally used only where icing or fogging is a concern such as in colder climates with higher relative humidity typical of the northeastern United States or when a facility is located within extremely close proximity to a highway (i.e., less than 200 feet away). The annual difference in water usage for a hybrid cooling system would be about 600 acre-feet less than a wet cooling system. The initial cost of the hybrid wet-dry cooling system would result in an increase in capital expenditures of about $5 to $6 million, thereby increasing the cost of electricity to consumers. Although this possible alternative also would be technically feasible, plume abatement is not required at this site, and the alternative would not be cost-effective.

2.4.6 Wikieup Gas Tap

The possibility of adding a gas tap to the proposed gas pipeline at a location near Wikieup was raised during public scoping. This alternative was considered but eliminated from further analysis because the decision to do this lies with the local gas distribution company, not the pipeline owner and is not reasonably foreseeable. The local gas distribution company could evaluate the economics of providing such a tap and could approach the pipeline owner about adding such a gas tap in the future, if a decision is made by a gas distribution company to pursue this option.

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
Air Resources	**Power Plant** • Power plant operation would result in the release of various pollutants, but there would be no significant impacts from the operation with implementation of the pollution control measures and devices included in the Proposed Action. The analysis indicates no exceedances of any National Ambient Air Quality Standards or maximum allowable Prevention of Significant Deterioration increments; no exceedances of thresholds in the Arizona Ambient Air Quality Guidelines for hazardous air pollutants; no unacceptable or discernable impairment to visibility in nearby Class I, selected Class II, or Hualapai tribal lands; and no unacceptable levels of nitrogen or sulfur in areas where AQRVs were required to be reviewed. **All Elements** • Construction activities in all locations would result in release of particulates and exhaust gases, but effects would be short term and would occur over a small area at one given time, resulting in a minor level of impact. • Dust control measures included in the Proposed Action would help limit impacts to less than significant levels. Conclusion: No significant impacts are expected with implementation of proposed actions to reduce or prevent adverse impacts.	Same as Proposed Action Conclusion: Same as Proposed Action	Same as Proposed Action Conclusion: Same as Proposed Action	No impacts
Geology/	**All Elements – Geology**	**Geology** – Same as	**Geology**-Same as	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
Paleontology	• There would be no significant impacts on areas of regional geological importance (none is present). • There would be no impacts on substantial known potential mineral resource development areas (none is present). • No impacts are expected on existing mining operations. There would be an insignificant loss of a small portion of the valley's sand and gravel resources. • No substantial increase in impacts from earthquakes would be expected as long as structures comply with appropriate standard procedures. • No substantial increase in magnitude of mass movements would occur since cut and fill areas would be engineered to ensure stability. • Groundwater withdrawal would not result in land subsidence because it would be isolated to a volcanic aquifer and should not result in sediment compaction and/or significant drop in levels in overlying aquifers.	Proposed Action	Proposed Action	
	All Elements – Paleontology No impact would be expected as long as mitigation is included during construction to identify and protect previously unidentified fossil localities. Conclusion: No significant impacts are expected with implementation of proposed actions to reduce or prevent adverse impacts, with the addition of mitigation to protect unidentified fossil localities during construction.	**Paleontology**-Same as Proposed Action	**Paleontology**-No impacts would be expected as long as additional surveys are conducted should the eastern portion of corridor segment T5 be selected for the final alignment, and the same provisions as listed under the Proposed Action are followed.	

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
Soils	**All Elements** • Any proposed ground disturbance would result in disruption of soils and potential soil erosion, compaction, reduced productivity, and/or loss of topsoil. The Proposed Action would involve disturbance of about 621 acres of land surface, of which 229 acres would be permanently disturbed. Implementation of the proposed reclamation plans and erosion control measures, plus other measures such as limiting grading and access road building, and use of the directional drilling option, would reduce impacts to less than significant levels. • With implementation of the proposed Stormwater Pollution Prevention Plan and provisions for surface water diversion at the power plant site, no significant impacts would result from stormwater runoff. • There would be no significant adverse impacts associated with the installation of the optical ground wire, since the ground disturbance at the pulling and tensioning sites would be minimal, on areas already disturbed, and subject to reclamation and erosion control measures. **Pipeline** • The potential for significant impacts exists where highly erodible soils coincide with steep slopes (greater than 20 percent). These locations would be avoided during siting of the final alignment and/or be adequately mitigated, such that impacts would be reduced to less than significant levels. (There are four such areas located in corridor segments R1, C3, T4, and the	Same as Proposed Action, except that areas of steep slope plus erodible soils could more easily be avoided.	Same as Proposed Action; contains some areas along corridor segments T2, T3, and C1 where it may be difficult to avoid areas of steep slopes and erodible soils. This route also may cross exposures of soils that uniquely support the Arizona cliffrose. Mitigation includes measures to avoid impacts on this plant species.	The 26 acres of soil disturbed for construction of the production and monitoring wells used during testing and associated well pads and access roads would remain.

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	T2-T3-C1 interchange. The area in the intersection of corridor segments T2, C1, and T3 would be the most difficult to avoid, since it appears to extend across the entire corridor.) Conclusion: No significant impacts are expected with implementation of proposed actions to reduce or prevent adverse impacts.			
Groundwater	**Power Plant and Associated Facilities** ***Groundwater Quantity*** • Groundwater modeling conducted for this Draft EIS predicted that without flow augmentation, water levels in the shallow groundwater could drop by less than 1 foot, and surface water could be reduced. However, the Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project. • There likely would be a reduction and eventual elimination of water discharged from Cofer Hot Spring. The Proposed Action includes measures to provide compensation to the landowner; however, the loss of the spring would be considered a significant impact. ***Groundwater Quality*** • No significant impacts from the Proposed	Same as Proposed Action	Same as Proposed Action	The groundwater production and monitoring wells used to identify and test the lower aquifer would remain.

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Action are expected, given the construction of the evaporation ponds and lack of other sources of groundwater contamination associated with the proposed Project. **Pipeline and Communication Facilities** • No impacts on groundwater quality or quantity would be expected from these Project elements. Conclusion: The loss of Cofer Hot Spring would be a significant adverse impact. With the implementation of the actions proposed to reduce or prevent adverse impacts and other mitigation, no other significant impacts would be expected.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Surface Water	**Power Plant and Associated Facilities** ***Surface Water Flows*** • Groundwater modeling conducted for this Draft EIS predicted that without flow augmentation, water levels in the shallow groundwater could drop by less than 1 foot, and surface water could be reduced. However, the Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project. ***Surface Water Quality*** • The power plant would be a zero discharge facility with no significant impacts on surface	Same as Proposed Action	Same as Proposed Action	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	water quality. Onsite stormwater generation would be collected and routed to lined evaporation ponds. Offsite stormwater would be routed around the facility and returned to natural drainages using standard erosion control structures. • Agricultural activities should not have a significant impact on surface water quality of the Big Sandy River basin or downstream watercourses. The agricultural area would be operated in a fashion that minimizes the potential for runoff of irrigation water, applied chemicals, and fine-grained soils to surface waters. ***Surface Water Rights*** • Owners of surface water rights along the Big Sandy River downstream of Granite Gorge would not be impacted because no reduction in surface water flow is predicted. **Pipeline and Access Road** • Construction of the pipeline and access road across washes or the Big Sandy River likely would cause a temporary, minor, less than significant impact on surface water quality, including increased sedimentation and turbidity with implementation of proposed construction practices and erosion and sedimentation control measures. Special procedures are included in the Proposed Action to minimize impacts of the pipeline crossing caused by trenching on the Big Sandy River. Directional drilling under the Big Sandy River would further minimize or			

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	eliminate these water quality impacts. Conclusion: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts and mitigation.			
Floodplains	**Power Plant and Associated Facilities** • Since the proposed power plant and associated facilities are located outside the 100-and 500-year floodplain zone, no impacts are predicted. Culverts installed along the proposed access road would allow for adequate flows under the road; no significant impacts on floodplains are predicted. • Impacts to floodplains along the optical ground wire route would be eliminated because the area needed for pulling/tensioning sites is small and floodplains could be avoided. **Pipeline** • The pipeline would cross numerous 100-year floodplains; actual total would depend on final alignment selected within corridor. Temporary disturbance of these floodplains and downstream areas would occur during pipeline installation. With the implementation of proposed erosion and sedimentation control measures, impacts would be reduced to minor, insignificant levels. • If the directional drilling option were selected for crossing the Big Sandy River, adverse impacts would be further minimized or eliminated. Conclusion: No significant impacts are expected	**All Elements**-Same as Proposed Action; possibly would have more floodplain crossings. Conclusion: Same as Proposed Action	**All Elements**-Same as Proposed Action; possibly would have fewer floodplain crossings; directional drilling under the Big Sandy River would not be an option. Conclusion: Same as Proposed Action without	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	with the implementation of proposed actions to reduce or prevent adverse impacts.		the directional drilling option	
Land Use and Access	**Power Plant and Associated Facilities** • No significant adverse land use impacts would be expected, since there would be conformance with existing zoning, County land use plans, and County transportation planning, and no impacts are expected on residences or businesses. **Pipeline** • The proposed pipeline would generally follow existing utility corridor and road rights-of-way. Several residences and businesses are located along these routes, especially fronting the road rights-of-way. Any potential conflict with existing residences or businesses could be avoided by adjusting the final alignment within the proposed corridor to avoid these uses or by providing compensation. Also, potential impacts to the Carrow-Stephens ACEC could be avoided. Construction adjacent to any residence or business is completed within three to five workdays, and impacts would not be considered significant. **Communication Facilities** • Primary communication facilities would be located within the plant site and on existing facilities, causing no adverse impacts to land uses. The optical ground wire option, if installed, would occur within existing right-of-way and on existing transmission line structures, and involve only short-term and limited disturbance; therefore, no adverse impacts to	Similar to Proposed Action, but with possibly more potential conflict with use of roads being used or followed. Also, there is more potential for conflict with residences and use of the ACEC along Segment R4 and less space to make adjustments within Segments R2 and R3.	Similar to Proposed Action, but with possibly more difficult access and installation along Segment T5, due to rugged topography. However, there would be fewer residences and businesses to avoid and there would be no potential conflicts with road use during construction.	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	land use would be expected. <u>Conclusion</u>: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts.	<u>Conclusion</u>: Same as Proposed Action but with slightly higher potential for conflicts with existing residences and businesses near roadways	<u>Conclusion</u>: Same as Proposed Action, but with slightly less potential for conflicts with residences and businesses primarily due to use of Segment T5	
Grazing Management	**Power Plant and Associated Facilities** • To avoid significant impacts from the loss of flow from Cofer Hot Spring, the Proposed Action would provide compensation by replacing the lost stock water using shallow well water. • Land available for grazing would be permanently reduced by the forage available for grazing by about one cow and calf for four months. This is a small reduction in forage availability (about 1 percent) and does not constitute a significant impact on livestock production. • The Proposed Action includes measures to maintain all range improvements, thereby avoiding significant impacts from loss or damage to these improvements. **Pipeline** • Actions included in Proposed Action would ensure that any range improvement facilities would be maintained during pipeline construction. • Livestock production on land crossed by the pipeline would not be significantly impacted by construction activities because only 48 acres would be permanently disturbed, and the	**All Elements** Similar to Proposed Action, except that pipeline construction would permanently disturb 47 acres.	**All Elements** Similar to Proposed Action, except that pipeline construction would permanently disturb 45 acres.	The 26 acres of grazing lands already disturbed for construction of the production and monitoring wells constructed for testing the groundwater aquifers, and the well pads, and well access roads would remain disturbed.

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	reseeding done per the proposed reclamation plans would restore forage production on other disturbed land. • No significant land disturbance would be expected on BLM grazing allotments along the pipeline during construction. Conclusion: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Recreation, Wilderness, and Visual Resources	**All Elements** • Impacts on recreation resources and wildernesses would be low and less than significant over the life of the Project, since there would be a relatively small increase in population and no discernible impacts to visibility in wilderness areas included in the analysis. • Permanent effects on visual resources would be noticeable to co-dominant for the power plant, due to the surface disturbance, introduction of additional industrial facilities into foothill landscapes, intermittent water vapor plumes, and night lighting. Impacts would be low to moderate and less than significant after the application of measures to reduce impacts and due to the presence of a BLM-designated utility corridor. **Pipeline** • The pipeline would result in low to moderate impacts, since it would generally follow existing rights-of-way with roads and transmission lines, which would reduce the effect of the intrusion of	Same as Proposed Action, but with more impacts on viewers (residents and travelers) along roads during pipeline construction.	Same as Proposed Action, but with more impacts on viewers along the path of transmission lines during pipeline construction.	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	the pipeline into the landscape. Also, application of reclamation measures would reduce the visual contrast of the pipeline with the surroundings. Short-term impacts would result from the visibility of equipment and dust related to the construction process, especially in view of populated areas. These impacts would be reduced by dust control measures included in the Proposed Action and would be moderate and less than significant. Conclusion: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts			
Areas of Critical Environmental Concern	**Carrow-Stephens Ranches Area of Critical Environmental Concern (ACEC)** ***Pipeline (Corridor Segment T4)*** • An alignment within the corridor to avoid the ACEC would reduce impacts to less than significant. An alignment within the ACEC would require the removal of native plants, which is not consistent with BLM Prescription 10 and would result in a significant impact. ***Communication Facilities*** • An optical ground wire installation pad may be required within the ACEC. One pad may result a small amount of land disturbance within an existing transmission line right-of-way, away from vegetation, and Section 106 protection provisions would apply, thus limiting impacts to low and less than significant levels. **Three Rivers Riparian ACEC** ***Power Plant and Associated Facilities***	Corridor segment R4 crosses the ACEC where the ACEC cannot be avoided. If the pipeline is not placed within the US 93 right-of-way, significant impacts would occur because of the proximity of the pipeline to historic buildings, the cemetery, and inconsistency with the BLM objectives for the ACEC. Any direct impact on graves would be a significant impact. Also, the removal of vegetation within the ACEC would be a significant impact, even with reclamation.	Same as Proposed Action	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	• Groundwater modeling conducted for this Draft EIS predicted that without flow augmentation, water levels in the shallow groundwater could drop by less than 1 foot, and surface water could be reduced. However, the Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project. Conclusion: No significant impacts would occur with mitigation consisting of avoiding the Carrow-Stephens Ranches ACEC.	Conclusion: At Carrow-Stephens ACEC, significant impact would occur due to removal of native plants, and potential for other significant impacts exists. For Three Rivers Riparian ACEC, same as Proposed Action.	Conclusion: Same as Proposed Action	
Vegetation	**Power Plant and Associated Facilities** • Construction and operation of the plant and associated facilities would result in the permanent loss of 181 acres of Sonoran desert scrub, previously disturbed by livestock grazing, which would not be a significant impact on a regional level. Loss of xeroriparian vegetation in drainages could result in significant impact, but	Similar to Proposed Action. Pipeline would involve disturbance of approximately 393 acres, of which 47 acres would remain permanently disturbed. As with Proposed Action, most disturbances would be	Similar to Proposed Action. Pipeline would involve disturbance of approximately 418 acres, of which 45 acres would remain permanently disturbed. As with Proposed Action, most disturbances would be	The loss of vegetation (Sonoran desertscrub) from construction of the production and monitoring well pads and access roads would remain.

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	losses would be replaced through revegetation and reclamation efforts defined in reclamation plan(s). In all areas, measures in the proposed reclamation plan would reduce loss of state-protected plants and may promote re-vegetation of temporary disturbed areas. • Sites for installation of the optical ground wire (5 acres) would be temporarily disturbed and reclaimed per proposed reclamation plans, which would minimize adverse impacts. **Pipeline** • Construction would result in disturbance of approximately 406 acres, of which 48 acres would remain permanently disturbed due to need for access over pipeline. • Disturbance of vegetation and xeroriparian vegetation along pipeline would be primarily temporary and would not result in significant impacts, as long as reclamation plans are successful. Conclusion: No significant impacts are expected with the implementation of proposed actions and mitigation to reduce or prevent adverse impacts.	temporary and would not result in significant impacts, as long as reclamation plans are successful and no permanent loss of xeroriparian vegetation would occur. Conclusion: Same as Proposed Action	temporary and would not result in significant impacts, as long as reclamation plans are successful and no permanent loss of xeroriparian vegetation would occur. Conclusion: Same as Proposed Action	
Wetlands, Riparian Areas, and Waters of the United States	**Power Plant and Associated Facilities** ***Wetlands and Riparian Areas*** • The layout of the Proposed Action would avoid direct impacts to the wetland on the plant site, and implementation of erosion control measures included in the Proposed Action would keep indirect impacts to a low, insignificant level. No long-term impacts are expected. • The reduction in flow to Cofer Hot Spring	Same as Proposed Action, except with approximately 11 acres of direct impact (loss) on waters of the United States for the pipeline route	Same as Proposed Action, except with approximately 6 acres of direct impacts (loss) on waters of the United States	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	would dry up a small wetland in that area, resulting in a significant impact. • The Proposed Action contains measures designed to prevent changes to the wetland/marsh upstream of Granite Gorge in the Big Sandy River. ***Waters of the United States*** • The combined direct impact on waters of the United States from the proposed power plant and associated facilities would be a loss of approximately 5 acres. There would be no impacts on waters associated with the optical ground wire installation or microwave dish installation. No indirect impacts to downstream waters would be expected with the implementation of the surface water diversions, and erosion and sedimentation control measures included in the Proposed Action. **Pipeline** ***Wetlands and Riparian Areas*** • If trenching is used to cross the Big Sandy River wetland and riparian area, there would be temporary impacts on about 1.4 acres of wetland and riparian vegetation. Proposed erosion and sedimentation control and reclamation measures included in the Proposed Action would reduce impacts to less than significant levels. If the directional drilling option is used, then no impacts would be expected. ***Waters of the United States*** • Construction of the proposed pipeline would			

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	result in approximately 8 acres of direct impacts on waters of the United States. Impacts would be on "functions" of these waters discussed in other sections of this Draft EIS. Conclusion: Significant impacts would occur because of the loss of the Cofer Hot Spring wetland. Otherwise, impacts to wetlands would be less than significant, with the implementation of proposed actions to reduce or prevent adverse impacts and mitigation.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Fisheries and Wildlife	**All Elements** • Construction and operation activities would result in loss of habitat and some direct mortality of wildlife. The following significant impacts may occur: 1. The loss of one active zone-tailed hawk, common black hawk, ferruginous hawk, Swainson's hawk, or golden eagle nest, or loss of two or more nests of any other raptor species, which would be significant. Preconstruction surveys and the additional mitigation of working around nests and fledging periods would help to reduce the likelihood of theses losses. 2. Mitigation, including habitat management practices to limit bird and other wildlife use of the ponds, use of fences around the ponds, and monitoring programs for waterfowl use and water chemistry would help reduce the potential impacts of wildlife exposure to toxic levels of contaminants in the evaporation ponds to less than significant;	Same as Proposed Action	Same as Proposed Action, except there would be no or limited short-term impact to aquatic habitat in the Big Sandy from pipeline construction, since the river has no perennial flow at the Alternative T crossing area.	The 26 acres of wildlife habitat already disturbed for construction of the production and monitoring wells constructed for testing the groundwater aquifers would remain.

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	3. Mortality of migratory birds using the evaporation ponds as a result of collision with the nearby transmission lines or from the chemicals used on the agricultural area would be reduced by the implementation of measures to exclude birds from the ponds and/or increase visibility of the transmission lines. However, incidental loss of any migratory bird without a permit would be significant. 4. Preconstruction surveys would help identify migratory bird nests, eggs, or nestlings. However, incidental loss of any migratory bird without a permit would be significant. • Additional adverse (but less than significant) impacts that would be expected include direct mortality of fossorial mammals and reptiles from construction activities; mortality of small mammals and reptiles that would fall into the pipeline trench or attempt to cross the access road; interruption of breeding or foraging activities of birds and other mammals in proximity to construction activities; interruption of movement of large mammals during construction hours; substrate disturbance and turbidity on fish and other aquatic communities from construction near or in the Big Sandy River; permanent loss of breeding and foraging areas for species that use Arizona Upland vegetation; and long-term loss of habitat • There would be no impacts expected on aquatic species from groundwater withdrawal, and no loss of habitat for riparian species near the plant site would be expected. After reclamation is			

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	conducted in all temporarily disturbed areas, there should be no long-term impacts on aquatic resources. Conclusion: Significant impacts could occur only due to violation of the Migratory Bird Treaty Act, stemming from the accidental collision of birds with transmission lines or disruptional loss of nests.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Threatened, Endangered, Proposed, and Other Special Status Species	**All Elements** ***Southwestern Willow Flycatcher*** • No direct or indirect impacts at plant site would occur. Groundwater modeling conducted for this Draft EIS predicted that without flow augmentation, water levels in the shallow groundwater could drop by less than 1 foot, and surface water could be reduced. However, the Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project. Therefore, no impacts on southwestern willow flycatcher habitat from groundwater pumping is expected. Impacts would occur along corridor segment R5 if trenching is used for crossing the Big Sandy River, due to removal of riparian vegetation (a direct habitat loss and an opportunity for increase in brood parasitism by cowbirds).	Same as Proposed Action	Similar to Proposed Action, except that this alternative does not cross the Big Sandy River in an area of perennial water with associated riparian habitat; therefore, there would be no impacts from construction on southwestern willow flycatcher, and there would be fewer adverse impacts expected on amphibians and fish.	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Bald Eagle • The Proposed Action is unlikely to result in any impacts because of the lack of roosting sites and the eagle's known tolerance to noise. Adverse impacts that could occur in the unlikely event that eagles feed on any waterfowl contaminated by ingesting toxic compounds from the evaporation ponds and /or collision with the transmission line near the ponds would be reduced by measures to avoid waterfowl use of the ponds and pond toxicity. ***Yuma Clapper Rail*** • No impacts would be expected. ***Arizona Cliffrose*** • No impacts would occur, since the Proposed Action would not affect any known population and surveys would be required prior to construction to detect and avoid any identified populations. ***Other Special Status Species – Bats, Birds, Reptiles, Amphibians Fish, Plants*** • With pre-construction surveys, anticipated daytime construction, avoidance of sensitive areas by making adjustments in the pipeline route, and implementing the planned reclamation and wildlife protection measures contained in the Proposed Action, there may be minor adverse or short-term impacts, but no significant impacts would occur.	Conclusion: Same as	Conclusion: Similar to	

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SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Conclusion: Impacts could occur to the southwestern willow flycatcher because of riparian habitat loss at the Big Sandy River crossing that cannot be avoided or eliminated. Impacts also could occur from bald eagle collisions with transmission lines. The final determination of impact significance will be made through consultation with U.S. Fish and Wildlife Service and the completion of a Biological Assessment, which will be incorporated into the Final EIS. Impacts on sensitive species would be below the level of significance.	Proposed Action	Proposed Action except that there would be no potential for southwestern willow flycatcher – no significant impacts would be expected.	
Cultural Resources	**Power Plant and Associated Facilities** • Construction activities would destroy part of one archeological site; adverse effects to informational values can be adequately mitigated by data recovery studies pursuant to the Section 106 programmatic agreement. • Intrusion of the plant into the traditional cultural landscape of the Hualapai Tribe would be a significant impact. Even with implementation of mitigation measures, significant impacts would remain. **Pipeline** • Potential exists for adverse impacts on archeological and historical sites located within the corridor, depending on the alignment selected. Section 106 programmatic agreement surveys and avoidance or mitigation measures would be implemented along the final alignment. These measures would adequately mitigate impacts on informational values, but the Hualapai Tribe would consider residual impacts on the traditional Hualapai cultural	Same as Proposed Action	Same as Proposed Action	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	landscape and archaeological sites to be significant. **Communication Facilities** • Construction activities associated with the primary or redundant communication systems are not expected to result in adverse effects, but would be reviewed and treated in accordance with the Section 106 programmatic agreement. <u>Conclusion</u>: Potential impacts are expected to be "adverse" per NHPA regulations, and the disruption to the traditional cultural setting of the Big Sandy Valley represents a significant impact. Impacts on informational values can be adequately mitigated through implementation of treatment measures in accordance with a Section 106 programmatic agreement. Although mitigation measures will reduce the level of impacts on the traditional Hualapai cultural landscape and related archaeological sites, residual impacts would be considered significant.	<u>Conclusion</u>: Same as Proposed Action	<u>Conclusion</u>: Same as Proposed Action	
Socioeconomics and Environmental Justice	***Population*** • Temporary population increases would occur with construction of the Project, the pipeline, and the access road. A permanent population increase is expected for the operation of the plant, which would be noticeable, but would not be significant or disruptive to the community. • Changes to quality of life in Wikieup would be temporary and not substantial or significant. • Construction and operation of Project including the agricultural development, would increase short-term and long-term employment in	Same as Proposed Action	Same as Proposed Action	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	Mohave County, a beneficial impact. Since a natural gas connection in Wikieup is uncertain and not under the control of this Project, no impacts can be predicted. ***Quality of Life*** – Adverse impacts would be temporary and not significant. ***Employment*** – The Project would increase short-term and long-term employment in Mohave county, a beneficial but not significant impact; there may be increases in worker salaries and wages. ***Taxes*** – Taxes paid by the Project would be a beneficial impact on the community, but real estate taxes on houses may increase if housing prices increase. ***Education*** – Construction of the plant would not cause adverse effects on the Mohave County schools since construction workers would most likely not bring families for the duration of the construction period. ***Housing*** – There would be a temporary demand for housing, but no significant impacts would be expected. ***Health Care, Fire Protection, Law Enforcement*** – No significant impacts would be expected, since the plant would supply its own fire and security services and adequate health care exists in the area. ***Low Income and Minority Populations*** – A disproportionate environmental justice impact would			

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	not occur because the region is rural and sparsely populated with scattered residences. Conclusion: No significant impacts expected with the implementation of proposed actions to reduce or prevent adverse impacts.	Conclusion: Same as Proposed Action	Conclusion: Same as Proposed Action	
Public Safety and Services	**Power Plant and Associated Facilities** ***Electric and Magnetic Fields (EMF)*** • No additional adverse impacts would occur. The proposed interconnection, substation, and power plant would create EMF within some areas that are not currently subjected to fields. The proposed new transmission line connection segments would generate EMF at the same strengths of the Mead-Phoenix Project 500-kV transmission line. The Proposed Action would not lead to increase in EMF exposures because the line is in a location generally inaccessible to the public. ***Safety Issues*** • Short-term minor traffic increases on US 93 and I-40 would occur due to plant construction. Traffic increases would be noticeable during plant construction and operation. The increases would not be significant and would not result in downgrading the Level of Service for either I-40 or US 93. • Oversized loads would require an oversize load permit. Strict compliance with all provisions of the permit and close coordination with ADOT and provision of turnouts would ensure that significant traffic impacts would not occur.	***EMF*** Same as Proposed Action ***Safety Issues*** Effects on traffic are similar to the Proposed Action but potentially more disruptive, since it includes use of Segment R3 and R4, which are also used for equipment deliveries and by commuters.	***EMF*** Same as Proposed Action ***Safety Issues*** Effects on traffic are less than Proposed Action, or Alternative R as Alternative T pipeline construction would take place parallel to a transmission line and not in close proximity to US 93. Other safety issues are the same as the Proposed Action.	No impacts

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SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	All Elements • Proper measures would be taken to ensure public health and safety as well as worker safety in both the construction and operation of the plant and pipeline. • No additional demands for county public services would result from the construction and operation of the plant or pipeline because the Proposed Action would include all necessary utilities, including fire, security, water, wastewater disposal, and emergency medical care. **Pipeline** • The Proposed Action includes routine maintenance, aerial pipeline patrols, and leak inspection, which would reduce or eliminate potential impacts related to safety. Conclusion: No significant impacts are expected with the implementation of proposed actions to reduce or prevent adverse impacts.	Conclusion: Same as Proposed Action.	Conclusion: Same as Proposed Action.	
Noise	**Power Plant** • During plant operations, sound levels at closest residence would be approximately 54dBA Ldn, and no significant impacts would be expected. **All Elements** • Construction activities would result in temporary increases in noise levels in vicinity of construction activity. **Pipeline** • Sensitive receptors along the proposed pipeline	**All Elements** Similar to Proposed Action, but includes more sensitive receptors along corridor segments R3 and R4; would also impact Carrow-Stephens	**All Elements** Similar to Proposed Action, but with more residences along corridor segment T5 along river and along US 93.	No impacts

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TABLE 2-9
SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

Affected Environment	Proposed Action	Alternative R Gas Pipeline Corridor	Alternative T Gas Pipeline Corridor	No Action
	(residences, businesses) would experience short-term and temporary noise from construction during weekday daylight hours, although these impacts are not expected to be significant. Conclusion: No significant impacts expected with the implementation of actions proposed to reduce or prevent adverse impacts.	ACEC users. Conclusion: Same as Proposed Action.	Conclusion: Same as Proposed Action.	

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Chapter 3

Affected Environment and Environmental Consequences

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Energy Project

Environmental Impact Statement

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3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter is divided into the following resource topics:

- Air Resources
- Geology/Paleontology
- Soils
- Groundwater
- Surface Water
- Floodplains
- Land Use and Access
- Grazing Management
- Recreation, Wilderness, and Visual Resources
- Areas of Critical Environmental Concern
- Vegetation
- Wetlands, Riparian Areas, and Waters of the United States
- Fisheries and Wildlife
- Threatened, Endangered, Proposed, and Other Special Status Species
- Cultural Resources
- Socioeconomics and Environmental Justice
- Public Safety and Services
- Noise

The following sections are presented for each resource topic listed above:

Affected Environment – this section succinctly describes the environment of the areas to be affected by the Proposed Action or alternatives. Because resource topics are often interrelated, one section may refer to another. The Affected Environment section includes the following:

Region of Influence– is the area that the Proposed Action or alternatives may reasonably affect. Regions of influence are specific to each resource topic. Limits of regions of influence may be natural features (such as an aquifer boundary), political boundaries (such as Mohave County), or industry-accepted norms for the resource (such as 50 kilometers for one aspect of air quality).

Existing Conditions– characterizes the resource within the region of influence and provides a framework for understanding the effects described in the Environmental Consequences section; the amount of information presented is commensurate with the importance of the effects.

Environmental Consequences – This section objectively evaluates the Proposed Action and reasonable alternatives. It presents a scientific analysis of the direct and indirect environmental impacts and forms the analytic basis for the summary comparison of impacts presented in Section 2.0. Because resource topics are often interrelated, one section may refer to another. Potential impacts for Phases 1 and 2 of the Proposed Action are considered together. The Environmental Consequences section includes the following:

Identification of Issues – presents the issues analyzed, which were identified during the public scoping period for this environmental impact statement (EIS) (refer to Section 6.0), or

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by lead or cooperating agency personnel during preparation of this document.

Significance Criteria – indicate thresholds where adverse impacts become significant.

Impact Assessment Methods – briefly describes the manner or means used to accomplish the analysis of impacts.

Actions Incorporated Into the Proposed Action to Reduce or Prevent Environmental Impact – these are actions that Caithness has committed to implementing. Impacts have been assessed assuming these measures would be implemented if the Big Sandy Energy Project were implemented. Actions presented in this section are more fully described in Section 2.2.8.

Impact Assessment – presents the results of the analysis for various components of the Proposed Action and alternatives.

Mitigation – includes appropriate measures not already included in the Proposed Action. The Council on Environmental Quality (1981) states that mitigation measures must be considered even for impacts that would not be considered significant, and where it is feasible to develop them. Mitigation can include things such as: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

Significance criteria and impact assessment methods were developed in coordination and consultation with the cooperating agencies (refer to Section 1.3.2 for more information on cooperating agencies. Refer to Section 6.0 for more information on agency consultation and coordination).

Cumulative impacts are discussed in Section 4.0. A description of the Proposed Action and alternatives, including the proposed and alternative gas pipeline corridor segments, is presented in Section 2.0.

Types of Impacts

Direct Impacts

These are effects that are caused by the action and occur at the same time and place. Examples include the elimination of original land use due to the erection of a structure. Direct impacts may cause indirect impacts, such as ground disturbance resulting in resuspension of dust and decreased visibility.

Indirect Impacts

These are effects that are caused by the action but occur later in time or are farther removed in distance, but are still reasonably foreseeable. Indirect impacts may include related impacts to other resources such as air, water, and fish and wildlife.

Significant Impacts

Both direct and indirect impacts may be significant. "Significant" requires consideration of both the context and intensity of the impact. This means that an action must be analyzed in several contexts – such as the immediate vicinity, affected interests, and the locality. Both short-term and long-term effects are relevant. Intensity refers to the severity of impact. Direct and indirect impacts may be positive (beneficial) or negative (adverse). Compliance with regulatory standards is not necessarily an indication of the significance or severity of an environmental impact.

3.1 AIR RESOURCES

This section describes the affected environment and environmental consequences relative to air resources. The primary factors that determine the air quality of a region are the locations of air pollution sources, the type and magnitude of pollutant emissions, and the local meteorological

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conditions. A modeling study has been performed to support the assessment of air quality impacts related to the proposed Big Sandy Energy Project. This study takes into account these factors, and provides a prediction of the air impacts that would occur.

3.1.1 Affected Environment

The following sections describe the current environment regarding meteorology and air resources. The description of current conditions represents the baseline for the assessment of impacts and environmental consequences.

Clean Air Act

The Clean Air Act of 1970 (CAA) established ambient air quality standards intended to protect public health and welfare. These are referred to as the National Ambient Air Quality Standards (NAAQS). Areas with air quality cleaner than these standards were referred to as "attainment" areas. Areas with Air quality not meeting the NAAQS are referred to as nonattainment areas. Areas where the air quality was not clearly defined as either attainment or nonattainment were designated "unclassified."

In 1977, the CAA was amended, and provisions intended to prevent deterioration of air quality in relatively pristine areas of the country were established. These provisions, referred to as the Prevention of Significant Deterioration (PSD) rule, established Class I areas and Class II areas. This regulation establishes stringent increments to limit the deterioration of air quality. The increments are more stringent in Class I areas.

In 1990 additional amendments to the CAA encouraged EPA to establish particulate standards for fine particulates referred to as $PM_{2.5}$ or particulate matter smaller than 2.5 microns. At this time the standard for $PM_{2.5}$ has not been fully implemented, and is therefore not addressed in this analysis.

Class I areas. The CAA of 1977 established as mandatory Class I areas defined as national parks that exceeded 6,000 acres in size and were in existence on the date of enactment of the Clean Air Act Amendments of 1977. Other areas of the country can apply to be designated as Class I areas based on the need to prevent further deterioration of the existing air quality and several other factors.

Class II areas. The CAA of 1977 established all other areas of the country as Class II areas unless redesignated. The CAA provides the means for the following areas to be redesignated as Class I:

1. an area that exceeds 10,000 acres in size and is a national monument, a national primitive area, a national preserve, a national recreation area, a national wild and scenic river, national wildlife refuge, a national lakeshore or seashore, or

2. a national park or national wilderness area established after the date of enactment of this Act that exceeds 10,000 acres in size, or

3. lands within the exterior boundaries of reservations of Federally recognized Indian tribes.

3.1.1.1 Region of Influence

The region of influence for the Proposed Action and alternatives was established by simulating the dispersion of emitted pollutants to determine changes in ambient concentrations. The analysis also determined the visibility and soil deposition effects of such concentration changes in designated Class I and Class II areas. These factors were assessed in detail by computer simulations of the dispersion of the pollutants to be emitted from the proposed power plant.

Two region of influence boundaries were established for this Project. For NAAQS and air quality increment analyses, the region of influence boundary was set at 50 kilometers (km) (31 miles) beyond the farthest distance from the source where defined "significant" pollutant concentrations are predicted to occur. For example, if dispersion modeling predicts that particulate concentrations would be above the significant modeling level at 6 km (4 miles)

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from the proposed power plant site, then the region of influence for that pollutant would be 56 km (35 miles) in extent. For visibility and related impacts in Class I areas, the region of influence is set by Arizona Department of Environmental Quality (ADEQ) regulation at 100 km (62 miles). However, at the discretion of a Federal land-management agency, additional Class I areas beyond 100 km (62 miles) can be included in the region of influence. Based on precedents in this region, the Grand Canyon National Park and Sycamore Canyon Wilderness are included in the region of influence of this Project, even though both of these Class I areas are more than 100 km (62 miles) distant.

The air quality region of influence consists of low-elevation arid, Sonoran desert surrounded by desert mountain terrain, including portions of Mohave, La Paz, and Yavapai counties in the western portion of central Arizona. The mountain ranges defining the Big Sandy Valley would tend to contain the discernable air quality effects. In this valley, elevations in the vicinity of the Project range from about 1,700 feet above mean sea level (MSL) on the valley floor to peaks of more than 4,500 feet above MSL in the mountains to the east and west.

The proposed power plant would be situated near the eastern side of the Big Sandy Valley. Therefore, the influence on ambient air concentrations is likely to be greatest in the Aquarius Mountains to the east of the valley, and less in the more distant Hualapai Mountains to the west.

3.1.1.2 Existing Conditions

Meteorology

Temperatures in this region are typical of desert climate, ranging from lows of 30 to 45 degrees Fahrenheit (°F) during the winter, to highs of more than 100°F during the summer. Daily high temperatures of 90°F or greater occur approximately 40 to 50 percent of the year. During the summer months, maximum temperatures of 120°F or greater have been reported.

Precipitation in the area is sparse and occurs primarily during the monsoon season from July through early October. Large amounts of warm, moist air moving from the Gulf of Mexico can create heavy thunderstorms across Arizona. Surface winds during the monsoon season primarily originate from the south-southeast or the south-southwest. During other seasons, the prevailing wind directions are northwest–southeast, in general alignment with the valley itself. After the monsoon season, westerly winds prevail. Meteorological data collected from the proposed power plant site since March 2000 confirm a northerly and southerly wind pattern.

Atmospheric stability is another important factor of meteorology that determines air pollution concentrations. When the atmosphere is stable, emitted pollutants tend to remain within a few hundred feet of the surface (close to the emission sources), and begin to diffuse horizontally across the surface. When the atmosphere is unstable, air pollution is free to mix with the atmosphere, and can vertically rise 1,000 feet or more, and be carried away in the prevailing wind. Therefore, the depth of this "mixing" area is very important when considering the impacts of air pollution on the region of influence.

In the Big Sandy Valley, and nearly all the Arizona desert, atmospheric stability depends on the season. During the summer, the frequency of stable and unstable conditions of the atmosphere is relatively equal. The periods of instability are due to the monsoon rains that occur during the summer months. When temperatures fall as winter approaches, stability in the atmosphere becomes more frequent, as lower mid-latitude high pressure tends to be dominant over southern and central Arizona. These observations, confirmed by the onsite monitoring data, mean that air pollution is less likely to be dispersed during the fall and winter months than during the summer months. This then leads to generally higher ambient concentrations of air pollutants in the winter than during the summer.

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TABLE 3.1-1 NATIONAL PRIMARY AMBIENT AIR QUALITY STANDARDS (NAAQS) (40 CFR 50.4 – 50.9)		
Pollutant	**Averaging Time**	**Concentration ($\mu g/m^3$)**
Nitrogen Dioxide	Annual Average	100
Carbon Monoxide	1 hour	40,000
	8 hour	10,000
Suspended Particulate Matter (PM_{10})	24 hour	150
	Annual Arithmetic Mean	50
Sulfur Dioxide	3 hour	1300
	24 hour	365
	Annual Average	80
Ozone	1 hour	235
	8 hour	157

Existing Ambient Air Quality

The region of influence has been designated attainment/unclassified with respect to NAAQS. The NAAQS provide limits considered to be protective of public health and the environment. Six pollutants, referred to as criteria pollutants, are addressed by the NAAQS: fine particulates (PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), and lead (Pb). The five NAAQS that would be applicable to the Project are shown and described in greater detail in Table 3.1-1 and in Section 3.1.2.1.

Existing levels of PM_{10} can be expected to be well below the NAAQS, although no monitoring stations exist near the proposed power plant site. The definition of PM_{10} as a criteria pollutant was established by the Clean Air Act as particulates with an aerodynamic diameter less than or equal to 10 microns (10×10^{-6} meter). Sources of PM_{10} include stationary point sources such as fuel combustion and industrial processes, fugitive sources such as roadway dust from paved and unpaved roads, wind erosion from open land, and mobile sources, such as trucks and automobiles.

A substantial portion of particulate emissions from natural gas combustion sources are in the form of very fine particles having diameters below 2.5 microns, termed $PM_{2.5}$. These particles are emitted as soot (carbon) particles, or are formed by condensation of fine aerosols in the exhaust stream. The U.S. Environmental Protection Agency (EPA) has recently promulgated ambient air standards for this pollutant. At this time, states and permitting agencies are collecting information, such as long-term ambient air monitoring data for $PM_{2.5}$, to evaluate attainment status with respect to the new standards. Until such evaluations are complete and, if necessary, new regulations are developed, there is no applicable significance criteria that can be assigned to $PM_{2.5}$ emissions.

Existing levels of O_3 can be expected to be well below the NAAQS, although no monitoring stations exist near the proposed power plant site. O_3 is not emitted directly into the atmosphere, but rather is produced through a photo-chemical reaction involving volatile organic compounds (VOCs) and nitrogen oxides (NO_x), known as precursors. Because O_3 formation results from the mixing of precursors, O_3 is more of a regional concern than that associated with more localized sources of pollution such as PM_{10}. The primary sources of NO_x include motor vehicles, power plants, and industrial boilers. Sources of VOCs include gasoline and solvent use.

Existing levels of NO_2 can be expected to be well below the NAAQS, although no monitoring

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stations exist near the proposed power plant site. This is because primary sources of NO_x are typically larger stationary sources, such as fossil fuel-fired power plants, and mobile sources such as automobiles and trucks. Nitrogen oxides are emitted predominantly as nitrogen monoxide (NO) and NO_2 from fuel-fired sources, but NO is largely oxidized to NO_2 soon after entering the atmosphere. Consequently, NO_2 is the criteria pollutant for which the NAAQS has been established.

CO is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. The primary sources of CO are motor vehicles. Secondary sources include fossil fuel combustion sources, and agricultural and/or forest burning. CO is more of a localized pollutant due to its tendency to oxidize to carbon dioxide (CO_2) and disperse under normal conditions. However, during those periods when the air is stagnant, such as with a low-altitude inversion, concentrations of CO can increase. CO concentrations are usually highest during the winter months when inversions are more frequent.

SO_2 is formed during the combustion or thermal processing of sulfur-bearing materials, such as coal or sulfur ores. Sources that emit large quantities of sulfur, such as copper smelters, historically have been the largest contributors to ambient concentrations of SO_2 in Arizona. The closest smelter operation was formerly located at Bagdad, approximately 22 miles from the proposed power plant site, but it is no longer in operation. There are no large sources of SO_2 in the region of influence for the Project, and consequently, the existing ambient concentrations are expected to be very low.

The main sources of Pb emissions are from vehicles fueled with leaded gasoline operating in the area and/or metal smelters. Because no lead smelters and very few vehicles using leaded fuel operate in the Project area, levels of Pb in the region of influence are expected to be well below the NAAQS.

Ambient Air Monitoring Data

There has been no ambient air pollution measurement program in the immediately surrounding region. However, ambient air quality is generally assumed to be good, as there are no large air pollutant-emitting sources in this area.

PM_{10} data were collected at the proposed Project area from March 2000 to March 2001. These data show the PM_{10} maximum 24-hour value to be 56.9 micrograms per cubic meter ($\mu g/m^3$), and the annual average is 19.8 $\mu g/m^3$. These values represent the background concentrations for this area.

Since no other pollutant monitoring data are available and since there are no large stationary sources of NAAQS criteria pollutants in the area, ADEQ has followed accepted convention and defined the background concentrations to be used for ambient air impact analyses as equal to 20 percent of the NAAQS. For example, this equates to an annual-average value of 20 $\mu g/m^3$ for NO_2, a one-hour average value of 8,000 $\mu g/m^3$ for CO, and an eight-hour average value of 2,000 $\mu g/m^3$ for CO (Luchesse, personal communication, 2001).

3.1.2 Environmental Consequences

The majority of the impacts discussed in the following sections are related to the operation of the proposed power plant. Construction impacts are considered as well, including those that are temporary in nature. An important part of determining the environmental consequences of the Proposed Action stems from comparing the predicted emissions and their associated environmental impacts to the applicable Federal and state standards. Information for this section has been compiled from the *Big Sandy Energy 720 MW Natural Gas Fired Combined Cycle Power Plant Class I Permit Application* (Greystone 2001), which includes the *Big Sandy Energy Class I/II Air Quality Related Values CALPUFF Modeling Results Report.*

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3.1.2.1 Identification of Issues

Ambient Air Quality Standards

A key issue to be considered is whether the NAAQS would be met. For criteria pollutants, Arizona's ambient air quality standards are equivalent to the NAAQS. Table 3.1-1 presents the primary NAAQS for criteria air pollutants.

Hazardous Air Pollutants and Arizona Ambient Air Quality Guidelines

An issue raised during scoping was concern about the release of hazardous air pollutants (HAPs). The Arizona Department of Health Services (ADHS) has issued a list of guidelines (ADHS 1999) for ambient air concentrations for several hundred air contaminants. The Federally listed HAP compounds that may be released from the combustion turbines are also included in this Arizona listing. These Arizona Ambient Air Quality Guidelines (AAAQG) represent levels at which long-term exposure should not present a threat to human health.

The AAAQG do not have the regulatory weight of NAAQS. They are used by permitting agencies as indicators of the adequacy of a pollution abatement strategy. An example relative to this study is formaldehyde, which is released due to the incomplete combustion of fossil fuel, and cannot practically be controlled. The AAAQG levels for formaldehyde are as follows:

- 1-hour average = 20 $\mu g/m^3$
- 24-hour average = 12 $\mu g/m^3$
- Annual average = 0.08 $\mu g/m^3$

Other AAAQG-listed compounds would be released by the Project in smaller amounts than formaldehyde. Consequently, the detailed evaluation of formaldehyde impact is considered to be indicative of the maximum impact related to emission of air toxics.

Prevention of Significant Deterioration

Another issue is the prevention of unacceptable degradation in areas that have good or excellent air quality. Federal and state regulations that address this issue are collectively referred to as the prevention of significant deterioration (PSD) regulations. The proposed power plant, consisting of combined-cycle electric generation units, is termed a "Categorical Source" and the PSD regulations apply to such sources that have the potential to emit more than 100 tons per year of any criteria air pollutant.

The PSD regulations at the Federal and state levels define numerical values for "increments" that are maximum allowable increases in predicted ambient concentrations at any location. The regulations also define the predicted concentrations that trigger an ambient monitoring requirement for a given project.

TABLE 3.1-2
PSD AIR QUALITY SIGNIFICANCE LEVELS AND CLASS II INCREMENTS

Pollutant	Averaging Time	Class II Increment [a] ($\mu g/m^3$)
NO_2	Annual	25
CO	1 hour	NA
	8 hour	NA
PM_{10}	24 hour	30
	Annual	17
SO_2	3 hour	512
	24 hour	91
	Annual	20

a – Class II increments were applied as air quality significance criteria for the Project.

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For the Project, a refined analysis was performed using one year of onsite meteorological data. Both existing and permitted sources of pollutants within the region of influence were considered to evaluate the PSD Class I and Class II increments consumed by the Project in conjunction with the background pollutant sources. One year of onsite meteorological data were collected at the proposed power plant site and were used to conduct these analyses .

Sensitive Species, Soils, Flora and Fauna (Air Quality Related Values)

A critical issue to be considered for the Proposed Action is the potential effect of air pollutants on sensitive areas and ecological resources. This involves an assessment of Air Quality Related Values (AQRV) and cumulative effects (addressed in Section 4.0) in potentially affected Class I and Class II Areas, Wild and Scenic Rivers, and Hualapai tribal lands. In general, the assessment of these impacts is based on dispersion simulations that cover both short-range and long-range transport of NO_x, SO_2 and PM_{10}. Potential effects on terrestrial and aquatic ecosystems from acid deposition and visibility impairment are analyzed. The AQRV analysis required for PSD permitting of new major sources includes consideration of potential impacts on sensitive species, soils, flora, and fauna that are associated with the air emissions of a Proposed Action.

The Clean Air Act established Class I areas throughout the nation that are pristine resources to be afforded the greatest degree of air quality protection due to their special natural, scenic, recreational, or historic interest to the public. The Federal PSD regulations codified at 40 Code of Federal Regulations (CFR) Parts 52.21 address the protection of Class I areas. Federal and ADEQ permitting regulations require that an air quality analysis (including visibility analysis) be performed for each Class I area located within 100 km (62 miles) of a facility undergoing an installation or modification that exceeds PSD modeling significant ground-level concentrations. Additional Class I areas further than 100 km from a given project may be included in the AQRV analysis, at the discretion of the Federal land-management agencies in the region. Two Class I areas, the Grand Canyon National Park and the Sycamore Canyon Wilderness, were considered in the analysis presented here. These areas are more than 100 km (62 miles) distant from the proposed power plant site (Figure 3.1-1).

In addition to the Federal protection of Class I areas, it is the responsibility of the Federal land-management agencies to protect values of Class II wilderness areas that may be affected by changes in air quality. Federal land-management representatives have requested an AQRV-type assessment of Bureau of Land Management (BLM) wilderness areas within the region of influence, each of which has been designated as a Class II air quality area. These areas are shown on Figure 3.1-1. The Class I, Class II wilderness areas, and the Hualapai Reservation (Peach Springs) that potentially would be affected by the Proposed Action are listed in Table 3.1-3.

The Hualapai Tribe has requested that EPA consider redesignating its reservation lands as Class I. Because of this potential redesignation, this Draft EIS considers the potential air quality impacts at Peach Springs, which is located at the southern end of the reservation, nearest the proposed power plant site. In addition, three parcels of Hualapai tribal lands lie in the northern end of the Big Sandy Valley. These parcels, located near the confluence of Knight Creek and Trout Creek that forms the Big Sandy River, are approximately 18 miles north of the proposed power plant site and are categorized as Class II areas. Results from the visibility impact and deposition analyses were used to interpolate the potential effects on these lands.

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TABLE 3.1-3 CLASS I AND II AREAS POTENTIALLY AFFECTED BY THE BIG SANDY ENERGY PROJECT		
Area	**Designation and Federal Agency**	**Closest Distance from Big Sandy Energy Project (km)**
Grand Canyon	Class I National Park – National Park Service	120
Sycamore Canyon	Class I Wilderness – U.S. Forest Service	140
Peach Springs	Class II	90
Mount Nutt	Class II Wilderness – BLM	85
Warm Springs	Class II Wilderness – BLM	60
Wabayuma Peak	Class II Wilderness – BLM	45
Aubrey Peak	Class II Wilderness – BLM	35
Arrastra Mountain	Class II Wilderness – BLM	20
Swansea	Class II Wilderness – BLM	50
Rawhide Mountain	Class II Wilderness – BLM	50
Tres Alamos	Class II Wilderness – BLM	55
Upper Burro Creek	Class II Wilderness – BLM	15

Best Available Control Technology

In addition to the PSD requirements for modeling of impacts on ambient air quality and adherence to allowable increments, new major sources must apply best available control technology (BACT) for each pollutant for which the source is a major source (i.e., having greater than 100 tons per year of emissions). The combustion turbines, duct burners, and cooling towers for the Proposed Action are subject to BACT for NO_2, CO, and PM_{10}.

During the subsequent air permitting process, administered by ADEQ, the appropriate BACT for these Project sources would be determined by a formalized analysis. BACT determinations are conducted by ranking available technologies in descending order of control effectiveness, and then evaluating technical considerations, energy, environmental, and economic impacts associated with implementation.

Stationary gas turbines also are subject to Federal emission standards for NO_x and SO_2, known as New Source Performance Standards (NSPS) at 40 CFR 60, Subpart GG, that would apply to the Project. These standards also are adopted by reference by the state of Arizona. The NSPS emission rate standards are meant to reflect the least stringent level of acceptable BACT for PSD sources.

Section 2.0 of this Draft EIS and the *Big Sandy Energy 720 MW Natural Gas Fired Combined Cycle Power Plant Class I Permit Application* (Greystone 2001) provide a discussion of the specific technologies and emission levels that are expected to represent BACT for the Proposed Action. Implementation of these technologies is assumed in the impact analysis performed for this study. Consequently, the BACT requirements themselves are an issue of concern, but were not used to develop significance criteria for the impact analysis.

Global Warming

The use of combustion turbines to produce electricity results in emission of CO_2. Experts in the scientific community believe that the increased emissions of CO_2 are leading to a global temperature increase and could have an adverse effect on life on earth.

Construction Activities

The Proposed Action would involve two distinct construction activities that have potential for discernable impacts on air quality. The first is the construction of the pipeline that would

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supply natural gas to the facility, and the second would be the construction of the power plant itself, including associated facilities such as the access road and substation. During construction, temporary and localized increases in atmospheric concentrations of NO_x, CO, SO_2, VOCs, and PM_{10} would result from exhaust emissions of workers' vehicles, heavy construction vehicles, diesel generators, and other machinery and tools.

In addition, fugitive dust would result from excavation and earthwork.

3.1.2.2 Significance Criteria

Based on the issues discussed above, significance criteria were developed for use in the impact assessment. Impacts on air quality would be considered to be significant if the following were to occur:

- predicted emissions would result in an exceedance of any NAAQS, as listed in Table 3.1-1
- predicted emissions would result in an exceedance of an AAAQG
- predicted emissions would result in an exceedance of maximum allowable PSD increments for PM_{10}, NO_2, or SO_2, as listed in Table 3.1-2
- predicted air pollutant emissions would cause a change in visibility greater than 5 percent for any 24-hour period in a Class I area or Class II wilderness area within the region of influence
- CALPUFF model results indicated unacceptable levels of nitrogen or sulfur deposition in areas subject to AQRV

3.1.2.3 Impact Assessment Methods

In general, potential impacts of the Proposed Action on ambient air quality were assessed by first quantifying emissions from the primary sources (combustion turbines, duct burners, and cooling towers), using agency-accepted emission factors and vendor information as needed. These emission rates were then input to dispersion models, along with meteorological (met) data sets and topographic data, to predict ambient concentrations of pollutants. Models also were used to assess related visibility and depositional effects on sensitive areas. Results were compared to air quality standards or other guidelines, and impacts were assessed in accordance with the significance criteria.

The following sections describe the methods used to assess impacts in more detail. First, the methods used to estimate emissions are described, including emissions from the proposed power plant and construction at the proposed power plant site. Next, the modeling analyses used for the impact assessment related to NAAQS, AAAQGs, PSD increments, and AQRVs are described. Because the impact analysis for SO_2 showed concentrations below the significance threshold for further modeling analysis, the only required modeling for SO_2 was related to the visibility issues.

Additional technical details of these methods can be found in the *Big Sandy Energy 720 MW Natural Gas-Fired Combined Cycle Power Plant Class I Permit Application* (Greystone 2001).

Emission Estimates

<u>Unit Emission Estimates (Power Plant)</u>

Emissions were quantified for the combustion turbines, duct burners supplementing the heat input to the heat recovery steam generator (HRSG) units, and cooling tower using accepted methods such as emission factors from EPA Document AP-42 (EPA 1995, 5^{th} edition, with updates) and vendor information. It was assumed that the combustion turbines would operate at normal full load (between 75 and 100 percent of capacity) when not in startup or shutdown mode. Duct firing would be in operation only when the combustion turbine was

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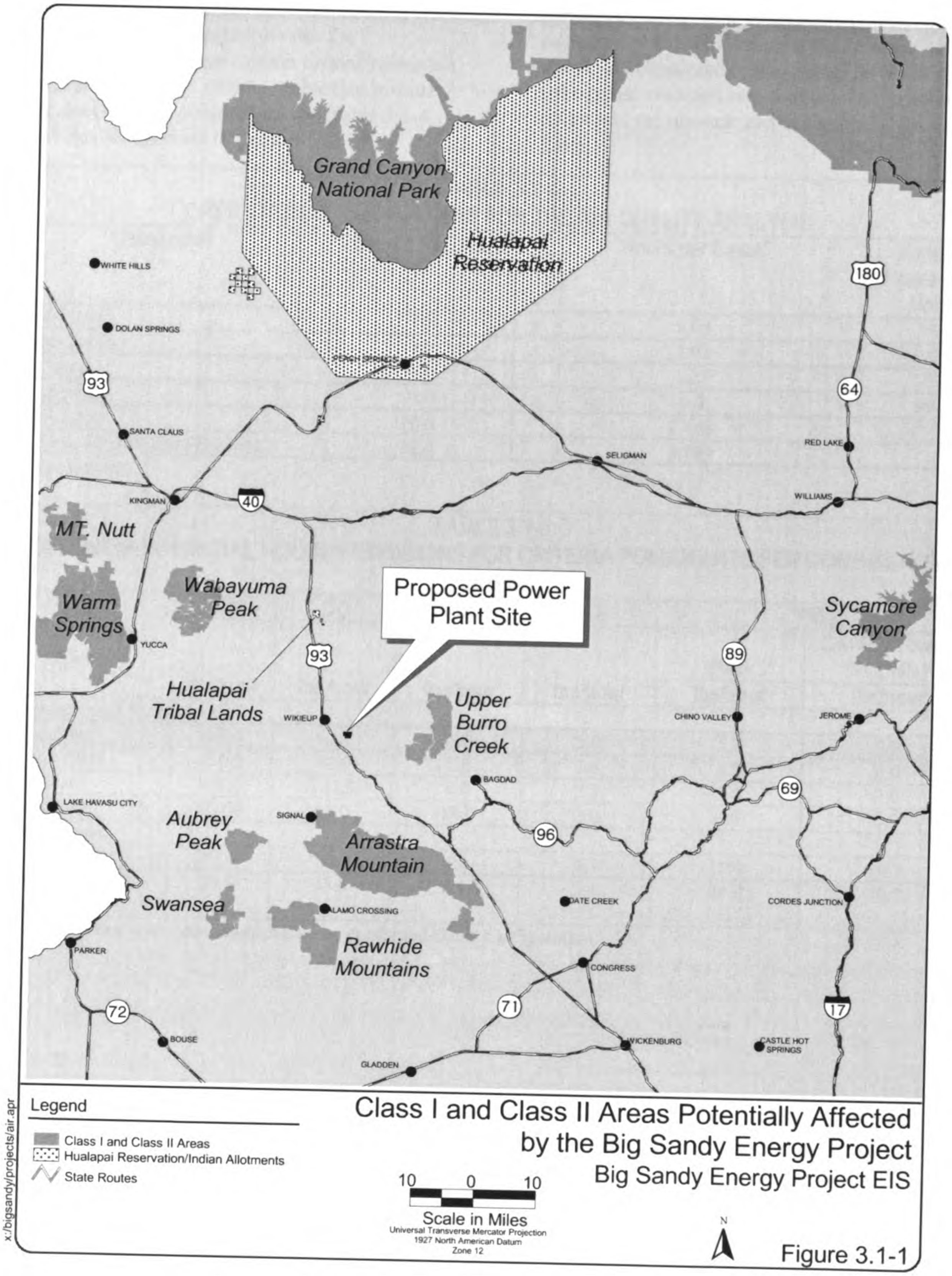

Class I and Class II Areas Potentially Affected by the Big Sandy Energy Project

Big Sandy Energy Project EIS

Figure 3.1-1

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operating at 100 percent load. The total annual emissions and maximum hourly emissions were based on different emission rates for startup/shutdown, combustion turbine operation only, and operation of the combustion turbine and duct burners simultaneously. Table 3.1-4 provides an estimate of the number of occurrences for each startup and shutdown parameter, along with the expected duration for each parameter, which would result in the maximum anticipated emissions. The resulting anticipated emission rate estimates for criteria pollutants are summarized in Tables 3.1-5 and 3.1-6.

TABLE 3.1-4
OPERATIONAL PARAMETERS FOR THE AIR QUALITY ANALYSIS

Parameter	Events Per Year		Hours per Event[1]		Annual Hours per Unit
Cold Starts	10	x	3.68	=	37
Warm Starts	15	x	2.02	=	101
Hot Starts	100	x	1.23	=	123
Shutdowns	160	x	0.5	=	80
100% Load	N/A		2,468		
100% Load with Duct Burners	N/A		3,890		

[1] – Per turbine

TABLE 3.1-5
MAXIMUM POTENTIAL HOURLY EMISSIONS FOR CRITERIA POLLUTANTS PER COMBUSTION TURBINE

Operational Parameter	NO_X	CO	VOC	SO_2	PM_{10}	
					Stack	Cooling Towers (11 Cells)[1]
	lbs/hour	lbs/hour	lbs/hour	lbs/hour	lbs/hour	lbs/hour
Startups and Shutdowns						
Cold Start	106.4	62.2	6.9	2.0	5.7	0.0
Warm Start	130.0	84.0	5.8	1.8	5.3	0.0
Hot Start	194.0	103.3	6.0	2.2	5.4	0.0
Shutdown	422.0	96.0	10.0	2.0	6.0	0.0
Operations						
100% Load	17.0	19.0	4.6	3.1	19.5	10.7
100% Load with Duct Firing	17.0	31.0	6.9	3.1	24.0	10.7

[1] Total cooling tower emissions based on combined-cycle configuration.

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TABLE 3.1-6 ANNUAL FACILITY EMISSIONS FOR CRITERIA POLLUTANTS FROM THREE COMBUSTION TURBINE UNITS						
	NO_X	CO	VOC	SO_2	PM_{10}	
					Stacks	Cooling Towers (11 Cells)
	tons/year	tons/year	tons/year	Tons/year	tons/year	tons/year
100% Load with Duct Firing	223.4	319.7	70.9	39.3	282.5	47.0
Startup/Shutdown Scenario	**270.4**	**298.0**	**59.4**	**29.3**	**215.1**	**34.0**
Maximum	**270.4**	**319.7**	**70.9**	**39.3**	**282.5**	**47.0**

The cooling tower emission rate for PM_{10} was estimated using the accepted method provided in EPA Document AP-42, Section 13.4 (EPA 1995). Drift aerosols are created from the circulation of water over the cooling tower internals, while mechanical draft air is drawn through the water cascade. The aerosols themselves can be PM_{10} emissions. Long-range transport analyses consider the solid particle formed when the water aerosol droplets evaporate. For this study, emissions of total aerosols were quantified and the potential PM_{10} fraction was characterized according to typical size distribution. The entrained droplets were estimated to have 8,000 parts per million by weight (ppmw) of dissolved solids, which then could be related to the mass PM_{10} emissions remaining after the water portion of the aerosol would evaporate.

Emissions of air toxics that are Federally listed HAPs or AAAQG compounds were calculated using gas-fired turbine emission factors. Of the range of values contained in the database, the maximum values were used in this analysis to provide conservative emission estimates. Table 3.1-7 summarizes the air toxics emission estimates.

Power Plant Construction Emission Estimates

Construction-phase air emissions are expected to be very small compared to regulatory thresholds typically used to determine whether further air quality impact analysis is necessary. During the 20-month construction period for the proposed power plant, gaseous emissions (NO_x, CO, SO_2, and PM_{10}) would be generated from heavy construction equipment such as graders, excavators, bulldozers, scrapers, tractors, water trucks, tractors, and air compressors. Additionally, fugitive PM_{10} would be generated from earth clearing and grading, and vehicular traffic on the site. Construction-related emissions would be short term, and would not be subject to air quality permitting.

Several agency-accepted particulate emission estimation models are available for facility construction activities. For this study, a very conservative estimate was obtained using a general emission factor from the EPA document AP-42, Volume I, Stationary Sources, Section 13.2.3. Uncontrolled emissions based on this factor are 1.2 tons/active acre/month of TSP. More detailed consideration of the construction emissions suggests that actual emissions must be far lower than indicated by the general factor.

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TABLE 3.1-7 MAXIMUM POTENTIAL EMISSIONS OF HAPs AND AAAQG COMPOUNDS						
Substance	CAS	CT Emissions Factor (lb/MMcf)	CT Emissions[1] (lb/hr)	Duct Burner Emission Factor (lb/MMcf)	Duct Burner Emissions[2] (lb/hr)	Annual Emissions (tons)
1,3-Butadiene[3]	106-99-0	1.33e-04	0.0018			0.01
Acetaldehyde[3]	75-07-0	2.909e-01	0.1716	1.468e-02	0.0041	0.77
Acrolein[3]	107-02-8	6.926e-02	0.0273			0.12
Benzene[3]	71-43-2	4.716e-02	0.0513	8.698e-03	0.0024	0.24
Formaldehyde[4]	50-00-0	4.479e-01	0.99	6.723e-01	0.1862	5.15
Naphthalene[3]	91-20-3	7.879e-03	0.0057			0.02
Propylene Oxide[3]	75-56-9	5.869e-02	0.1242			0.54
Toluene[3]	108-88-3	1.684e-01	0.5574			2.44
Xylene (Total)[3]	1330-20-7	6.262e-02	0.2745			1.2
Total HAPs						10.49

[1] – 3 turbines at 100% load
[2] – 3 duct burners
[3] - California Air Toxics Emission Factors (CATEF) database emission factors
[4] – turbine vendor emission factor

The proposed power plant and substation would involve disturbance of an approximately 38-acre area. The two evaporation ponds would be constructed on an additional 18 acres. Well construction would involve the disturbance of an approximate 10-acre area. The access road would involve the disturbance of an approximate 21-acre area. Combined, the total construction area to be disturbed was estimated to be 87 acres.

The PM_{10} emission rate that pertains to the impact assessment considers the actual level of activity at the site, the portion of TSP that is PM_{10}, and the effect of controls. For general construction emissions in desert soils, an accepted estimate is that about 36 percent of total particulate is sufficiently small in size to be PM_{10}. Furthermore, it was assumed that a maximum of 50 percent of the total facility area would be disturbed by activities on any given day. The application of water or chemical dust suppressants on exposed areas would reduce emissions by at least another 50 percent.

The resultant PM_{10} emissions considering these factors would be 11.25 pounds per hour (lbs/hr) from the power plant area, 5.33 lbs/hr from the evaporation ponds, 5.92 lbs/hr from the wells and 12.44 lbs/hr from the access road. During construction, off-road vehicles would generate gaseous exhaust emissions. Table 3.1-8 summarizes the total anticipated CO, NO_x, PM_{10}, SO_2, and PM_{10} emissions that would be generated during construction. Emission factors were obtained from EPA document AP-42, Volume II, Emission Factors for Mobile Sources (EPA 1995, 5th edition and updates). The total vehicle emissions per month were based on hourly use. Construction vehicles were assumed to operate 21 days per month and 10 hours per day or 210 hours per month. Trucks were assumed to operate at either 100 or 150 hours per month. The total annual emissions of 24.66 tons per year would be about 5 percent of annual Project emissions during operation.

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TABLE 3.1-8 EXHAUST EMISSIONS FROM CONSTRUCTION VEHICLES*										
	Criteria Pollutant Emissions									
	Operation	Carbon Monoxide		Nitrogen Oxides		Sulfur Dioxide		Particulates PM_{10}		
Vehicle Type	(hrs/mo)	lb/hr	tons/mo	lb/hr	tons/mo	lb/hr	tons/mo	lb/hr	tons/mo	
Light and Medium Truck (gasoline)[a,b]	150	0.331	0.025	0.056	0.004	0.025	0.002	0.058	0.004	
Heavy Truck (gasoline)[a,c]	100	0.730	0.037	0.098	0.005	0.005	0.0003	0.128	0.006	
Heavy Truck (off highway)	210	1.794	0.188	4.166	0.438	0.454	0.048	0.256	0.027	
Light Tractor (track type)	210	0.346	0.036	1.26	0.132	0.137	0.014	0.112	0.012	
Heavy Tractor (wheel type)	210	3.59	0.377	1.269	0.133	0.090	0.009	0.136	0.014	
Cranes	210	0.675	0.071	1.691	0.178	0.143	0.015	0.139	0.015	
Heavy Equipment (miscellaneous)[d]	210	0.675	0.071	1.691	0.178	0.143	0.015	0.139	0.015	
TOTAL	**1,300**	**8.141**	**0.805**	**10.231**	**1.068**	**0.992**	**0.089**	**0.782**	**0.093**	
Total Emissions: 2.055 Tons Per Month; 24.66 Tons Per Year										

* All vehicles are diesel-powered, except as noted.

[a] For gasoline-powered vehicles, emission rate (lbs/hr) is based on a gram per mile EPA emission factor and the speed shown under footnote [b] or [c].

[b] Assumes an average vehicle speed of 15 miles per hour.

[c] Assumes an average vehicle speed of 10 miles per hour.

[d] Includes trenches, pavers, and compact loaders.

Communication Facilities

Emissions were not quantified or modeled for microwave dish installations or the ground disturbance at pulling sites for the optical ground wire (OPGW) installation. This is because gaseous emissions from vehicles and equipment would be short term and small in magnitude for the short-term activities for the OPGW installation. Also, construction vehicles and machinery would be equipped with standard pollution-control devices to minimize emissions. Any one location would be affected for only three to five days for the OPGW, each of the 15 pulling sites would be about 3 miles apart and ground disturbance activities would last only 1 or 2 day(s) at each site. The slightly elevated NO_x and CO ambient levels associated with construction vehicles would cease after construction or installation activities cease. PM_{10} emissions, as fugitive dust, would result from soil disturbance during OPGW. However, dust would be controlled by watering or applying chemical stabilizers to the disturbed areas. After construction is complete, the disturbed areas would be revegetated to minimize long-term fugitive dust emissions.

Pipeline Emissions

Emissions from operation of the natural gas pipeline would be negligible. Construction of the natural gas pipeline would occur within one of three possible corridors. As described in Section 2.2, the three actions consist of a combination of several corridor segments of varying lengths using different rights-of-way. Table 3.1-9 lists each possible corridor segment along with the length of that corridor segment in miles. Table 3.1-9 further details the particulate emissions from pipeline construction activities of each individual corridor segment in tons of particulate per mile of construction.

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TABLE 3.1-9 PM$_{10}$EMISSIONS PER PIPELINE CORRIDOR SEGMENT[a]		
Corridor segment Number	Corridor segment Length (miles)	Total Particulate Per Segment[1] (tons)
R1	3.9	1.7
R2	0.8	0.2
R3	9.3	4.0
R4	13.7	5.9
R5	8.5	3.4
T1	3.7	1.6
T2	2.1	1.0
T3	8.5	3.7
T4	4.0	1.7
T5	7.8	3.4
C1	2.8	1.2
C2	2.3	1.0
C3	1.9	0.8

[1] Emission rates based on EPA AP-42, Volume I, Fifth Edition, Stationary Sources 13.2.3 Heavy Construction Operations

[a] Corridor segment length in miles times an approximate width of 90 feet was used to calculate the total acreage of each of the proposed segments.

Table 3.1-10 lists the total PM$_{10}$ emissions in tons for construction of each of the three gas pipeline corridors. Total PM$_{10}$ emissions would be 14.0 tons for the proposed gas pipeline corridor, 18.1 tons for the Alternative R gas pipeline corridor, and 13.3 tons for the Alternative T gas pipeline corridor.

TABLE 3.1-10 TOTAL PM$_{10}$EMISSIONS PER GAS PIPELINE CORRIDOR	
Pipeline Construction Corridor (segments)	Total PM$_{10}$Per Action (tons)
Proposed Gas Pipeline Corridor (R1+C1+T3+C3+T4+R5)	14.0
Alternative R Gas Pipeline Corridor (R1+R2+R3+C3+R4+R5)	18.1
Alternative T Gas Pipeline Corridor (T1+T2+T3+C3+T4+T5)	13.3
Additional workspace disturbance	0.37

For the purposes of evaluating particulate emissions from the construction of the proposed pipeline, it is assumed that the pipeline would travel one of three possible routes with the overall length of each possible action being nearly identical. It also is assumed that the soil along each of the three routes is of the same consistency. These assumptions are consistent with applying the emission factor listed in EPA AP-42 for particulate emissions from heavy construction. This emission factor, 1.2 tons per acre per month of activity, are conservatively high estimates that take into account several types of soils with varying moisture, silt, and particle size distributions within a given soil type.

The emission factor used to calculate particulate emissions is based on total suspended particulate (TSP). As is further discussed in this section an assumption was made that, of the 1.2 tons per acre/month of activity emission factor, 36 percent of the TSP is in the form of PM$_{10}$.

Emission rates were determined by calculating the number of acres in a mile and applying the emission factor above to yield a particulate emission per corridor segment mile.

Modeling Analyses

Ambient Impact Modeling Analysis for NAAQS and PSD Criteria Pollutants and AAAQG Pollutants

This section provides an overview of the procedures used in the NAAQS, PSD Increment, and AAAQG modeling analyses. For these assessments, the simulation model was used to determine maximum ground-level concentrations predicted for a grid of discrete receptors surrounding the proposed power plant site. There are two levels of modeling analysis typically used for PSD permitting and AQRV analyses: screening and refined dispersion modeling. A refined dispersion model requires more detailed source and meteorology data than a screening model, but is capable of providing more realistic estimates of a source impact. In

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this analysis, the findings are based on refined dispersion modeling using either the Industrial Source Complex 3rd Version Short-Term (ISC3) Gaussian-plume model, the ISC plume rise model enhancements (ISC Prime) model or the CALPUFF long-range transport model. Technical details of the air quality impact assessment are provided in the *Big Sandy Energy 720 MW Natural Gas Fired Combined Cycle Power Plant Class I Permit Application* (Greystone 2001), which includes the *Big Sandy Energy Class I/II Air Quality Related Values CALPUFF Modeling Results Report* (Caithness 2000).

The ISC3 (EPA Version 00101) and ISC Prime (Version dated 99020) models were used for refined dispersion analysis for the criteria and HAP impacts. The ISC3 model is a steady-state Gaussian plume model that allows for simulation of pollutant emission contributions from multiple sources. The ISC3 model was designed to specifically support the EPA regulatory modeling programs. The "Guideline on Air Quality Models" (EPA 1986, revised 1995) recommends the use of ISC3 for operating conditions such as those at the proposed power plant site (i.e., multiple sources, rural area, possible building downwash, and one-hour to annual averaging times). ISC Prime has updated physics routines to improve the representation of expected air concentrations.

Initially, a "screening" meteorology data set composed of combinations of wind speed, temperature, and stability class that represent worst-case dispersion conditions was used. This data set most conservatively estimates the ambient impact due to a source. Meteorological data collected on site in 2000 and 2001 were used in the final air impact analysis.

Individual point sources representing the generating unit combustion turbine and duct burner stacks, and the cooling tower, were input to the models. Receptors were placed beyond the Project boundary every 100 meters out to 3 km, then every 200 meters out to 10 km and every 1,000 meters out to 50 km.

Ambient Impact Modeling for AQRV Analysis

Visibility and acid deposition effects of the Proposed Action were evaluated on a regional basis. Changes in regional haze are caused by emissions of NO_x, SO_2, and particulates. These pollutants can be precursors of light-obscuring or refracting particles, such as sulfate and nitrate aerosols, throughout a given region. Regional visibility analyses use long-range transport dispersion models that can calculate sulfate and nitrate concentrations (or allow such concentrations to be derived from SO_2 and NO_x values). The predicted parameter corresponding to changes in visibility is the extinction coefficient, and this can be related to a quantitative relative change in visibility that could occur on the worst-case day.

The pollutants of primary concern for acid deposition impacts on terrestrial ecosystems are sulfur and nitrogen compounds and O_3. Because the Proposed Action would not be a major source of VOCs, the primary precursor of O_3, O_3 would not be expected cause discernable impacts.

The sensitivity of terrestrial ecosystems to sulfur and nitrogen compounds is expressed in their maximum allowable pollutant loading. Pollutant loading is expressed in kilograms of pollutant per hectare per year.

Potential effects on visibility and deposition in the Class I and Class II areas listed in Table 3.1-3 were assessed using the CALPUFF dispersion modeling system. The Interagency Workshop on Air Quality Modeling (IWAQM), in the *IWAQM Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (EPA 1998) has recommended that CALPUFF be adopted as the only acceptable model assessing pollutant impacts in distant Class I areas. The IWAQM Phase 2 document outlines the steps required in calculating regional visibility impairment. For this assessment, the CALPUFF model was used in screening mode, which allows a conservative evaluation of long-range transport effects using a single

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meteorological data set. Technical details of this air quality impact assessment are provided in the *Big Sandy Energy 720 MW Natural Gas Fired Combined Cycle Power Plant Class I Permit Application* (Greystone 2001), which includes the *Big Sandy Energy Class I/II Air Quality Related Values CALPUFF Modeling Results Report* (Caithness 2000).

3.1.2.4 Actions Incorporated into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse impacts on air resources.

Construction

Dust control measures would be implemented as described in Section 2.2.8.1.

The use of water and possibly surfactants to control fugitive dust on unpaved roads and during earthmoving operations would be implemented to control construction emissions by about 50 percent. Emissions also would be controlled by minimizing the number of vehicles operating at one time. Limiting vehicle speed on unpaved roads is another method that would be adopted to reduce particulate emissions.

Power Plant Operations

The sources of criteria pollutant emissions during proposed power plant operations include the combustion turbine exhaust stacks and wet cooling towers for both the steam turbine and inlet air cooling system condenser cooling water. BACT for these sources are required as part of the air permitting process. These measures include selective catalytic reduction to reduce NO_x emissions, and best combustion control practices to minimize emissions of VOCs, PM_{10}, and CO. PM_{10} emissions from the cooling towers would be minimized through the installation of high-efficiency drift eliminators with an efficiency of 0.005 percent of the circulating water rate.

Substation Operations

SF_6 gas in substation circuit breakers would be contained within the sealed units. Equipment as delivered from the manufacturer would be required to be factory tested and certified to not leak. After installation, the equipment would be scanned for detection of leaks, and repairs made as appropriate. During use, the equipment would be monitored by periodic substation inspections for indications of leakage. During servicing, SF_6 gas would be evacuated using sealed gas containment equipment.

3.1.2.5 Impact Assessment

Proposed Action

<u>NAAQS and PSD Increment Significance Criteria for Plant Operations</u>

This section presents a discussion of the predicted impacts associated with the Proposed Action, and how these impacts compare to significance criteria related to NAAQS and PSD increments. Predicted impacts are expressed as the maximum predicted ground-level concentrations derived from the modeling exercises described in the previous section. Note that the impacts were simulated using either screening meteorological conditions, or meteorological data for a full year collected at the proposed power plant site.

Table 3.1-11 compares the predicted maximum impacts to the PSD air quality increment concentrations and, when added to the applicable background concentration, the NAAQS and AAAQG. The results for CO indicate that the ambient CO impacts are well below all the NAAQS for 1-hour and 8-hour averaging times. Similarly, ambient air impacts for NO_x emissions are shown to be below annual-average NAAQS and increment criteria. Maximum ambient impacts for PM_{10}, are below 24-hour and annual averaging periods for NAAQS and PSD increments. Thus, there would be no significant impact for the criteria air pollutants.

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TABLE 3.1-11 COMPARISON OF PREDICTED MAXIMUM AIR QUALITY IMPACTS WITH SIGNIFICANCE CRITERIA FOR NAAQS, PSD INCREMENT, AND AAAQG[d]						
Pollutant	Averaging Period	Maximum Impact (μg/m[c])	Background Concentration (μg/m[c])	Percent of NAAQS or AAAQG (%)	Percent of Class II Increment (%)	Exceeds Project Significance Criteria?
NO_2	Annual [(b)]	2.78	20.0	22.8	17.8	No
CO	1 hour[(b)]	1,454	8,000	23.6	NA	No
	8 hour[(b)]	189.1	2,000	21.9	NA	No
PM_{10}	24 hour[(b)]	26.04	56.9	55.3	76.0	No
	Annual[(b)]	3.80	19.8	47.2	15.3	No
Formaldehyde[a]	1 hour[(c)]	5.5	NA	27.6 [(a)]	NA	No
	24 hour[(c)]	0.6	NA	5.0 [(a)]	NA	No
	Annual[(c)]	0.05	NA	64.2 [(a)]	NA	No

[a] – Formaldehyde values are AAAQG.
[b] – Quantified using refined (ISC3 Prime) model.
[c] – Quantified using refined (ISC3 Prime) model

The potential to emit calculations included in Table 3.1-6 show that the Proposed Action would not be a major source of SO_2 emissions. This is a typical finding for units using high-quality, low-sulfur natural gas. Although modeling of SO_2 would not be required for air permitting, it is included in this Draft EIS. Modeling for O_3 was not conducted. O_3 is not a pollutant that would be emitted from this facility and is typically considered an urban pollutant. O_3 is formed through a complex series of atmospheric reactions involving NO_X, ammonia, and VOCs combined with intense sunlight (ultraviolet light). Although the proposed power plant would emit NO_X, the emissions would be minimized, and the emissions of VOCs would be very small. Also, there are not a large amount of these pollutants emitted in the area. All of these facts indicate the potential for formation of a significant amount of O_3 is very unlikely.

NAAQS Significance Criteria for Construction

Due to the measures planned to prevent fugitive dust and the expected low vehicle emissions, the potential impacts resulting from construction activities at the Project site would occur only over a limited geographic area and only for a limited time. After the site preparation is complete, foundations have been constructed, and mitigation measures such as covering of traffic routes by gravel have been implemented, the actual impact of fugitive particulate emissions will be very low. Since these temporary emissions are not likely to exceed (applicable NAAQS), no significant impact is expected.

AAAQG Significance Criteria for Formaldehyde and other HAPS

For formaldehyde, the ambient impact analysis using the onsite meteorological data indicated that the maximum ground-level concentrations of formaldehyde would be below the AAAQGs, as shown in Table 3.1-7.

The impact of other air toxics can be evaluated by prorating the predicted impact for formaldehyde in proportion to the relative emission rates for these other compounds. The annual emission rate shown in Table 3.1-7 for each air toxic was used to estimate predicted impacts. The results of this calculation indicate the maximum impact for toxics other than formaldehyde are at least a factor of 10 less than the AAAQG thresholds. In most cases, the predicted impacts are several orders of

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magnitude below the AAAQG, and therefore, no significant impacts would occur.

NAAQS Significance Criteria for Pipeline Construction

Although pipeline construction total suspended particulate (TSP) emissions were calculated using conservative emission factors for each of the three alternative pipeline routes, modeling impact analysis was not conducted. Based on the calculated TSP emission rates for the pipeline construction, on average, emissions would be approximately 600 to 700 pounds of TSP over a two- or three-day period for 1 mile of construction. It is also assumed that 36 percent of TSP emissions are in the form of PM_{10} resulting in approximately 216 to 252 pounds of PM_{10}. These TSP and PM_{10} emissions would be further reduced by at least 50 percent through the application of a control method such as watering or other dust suppressing materials.

Because the pipeline construction TSP and PM_{10} emissions are transient and short term, and PM_{10} emissions would be reduced using the dust control measures discussed in Section 2.2.8.1, these emissions would not lead to a significant impact.

AQRV Analysis for Visibility and Acid Deposition

Potential visibility impacts and effects on AQRVs in the designated Class I and Class II wilderness areas within the region of influence were evaluated using methods recommended by the IWAQM in its *Phase 2 Summary Report* (IWAQM 1998), and those in the Draft Federal Land Manager's Air Quality Related Values Workgroup (FLAG) Draft Phase I October 1999 Report (FLAG 1999). The closest Class I area (Grand Canyon National Park) is 120 km from the proposed power plant site. Due to the distance from the region of influence to the Class I areas, the primary effect on visibility is due to potential increases in regional haze. Therefore, a regional haze analysis, using the IWAQM-recommended procedures, was conducted for each of the areas. In addition to the regional haze analysis, the increased potential for acid deposition of nitrogen and sulfur species was evaluated for each area. The effects on Hualapai tribal lands were derived by comparison with the modeled Class I and Class II areas surrounding the Big Sandy Valley.

According to the FLAG guidance document cited above, regional visibility impacts, as measured as change in the light extinction coefficient for an area, of less than 5 percent are deemed acceptable for purposes of air quality permitting.

Analyses using the CALPUFF model provided estimates of the visibility and acid deposition impacts in Class I areas, Class II wilderness areas, and Hualapai tribal lands. These results are summarized in Tables 3.1-12 through 3.1-15. Modeling was performed for a set of five years, to best assess the maximum impairment that could occur. As shown in the visibility results for Grand Canyon National Park and Sycamore Canyon Wilderness, the highest predicted visibility impairment is less than 5 percent. Within the accuracy of the model, this corresponds to no discernable change in visibility impact on the worst-case days, and would not be significant.

The BLM Class II wilderness areas and Hualapai tribal lands also would experience a maximum predicted change in the extinction coefficient visibility impairment of less than 5 percent. The highest value is 4.78 percent for 1994 simulated conditions at a ring of wilderness areas that lie between 45 to 60 km (30 to 42 miles) distant from the proposed power plant site (Warm Springs, Wabayuma Peak, Swansea, and Rawhide Mountains). Within the accuracy of the model, this corresponds to no discernable change in visibility impact on the worst-case days, and would not be significant.

The nature of deposition impacts are not readily translated from the predicted magnitude of nitrogen and sulfur deposition in a given area. Typically, the increased deposition due to a project is compared to baseline loading values that reflect the amount of naturally occurring soil and water deposition in an area. The underlying data on soil conditions (i.e., metallic

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TABLE 3.1-12 CLASS I VISIBILITY IMPACT RESULTS		
Modeled Year	Maximum 24-Hour Visibility Decrease at Grand Canyon National Park (%)	Maximum 24-Hour Visibility Decrease at Sycamore Canyon (%)
1993	2.54	2.44
1994	2.51	2.47
1995	3.25	2.98
1996	**3.40**	**3.20**
1997	**3.40**	**3.20**

Bold face entries indicate the year with highest predicted visibility impact.

TABLE 3.1-13 CLASS II AND HUALAPAI LANDS VISIBILITY IMPACT RESULTS				
	Maximum 24-Hour Visibility Decrease (%)			
Modeled Year	Mount Nutt Peach Springs (Hualapai Reservation)	Warm Springs Wabayuma Swansea Rawhide Mountains Tres Alamos	Aubrey Peak Hualapai Tribal Lands	Arrasta Mountains Upper Burro Creek
1993	2.88	3.15	2.23	1.06
1994	2.84	**4.78**	2.56	3.02
1995	2.97	4.11	**3.04**	**3.54**
1996	3.38	4.39	2.25	2.03
1997	**3.45**	4.26	2.57	2.72

Bold face entries indicate the year with highest predicted visibility impact.

TABLE 3.1-14 CLASS I DEPOSITION RESULTS				
	Maximum 24-Hour Acid Deposition (kilograms/hectare)			
Modeled Year	Maximum 24-Hour Deposition at Grand Canyon National Park (kilogram/hectare)		Maximum 24-Hour Deposition at Sycamore Canyon (kilogram/hectare)	
	Nitrogen	Sulfur	Nitrogen	Sulfur
1993	0.000424	0.0000366	0.000405	0.0000347
1994	0.000408	0.000030	0.000408	0.0000275
1995	**0.000495**	**0.0000431**	**0.000484**	**0.0000433**
1996	0.000374	0.0000277	0.000326	0.0000255
1997	0.000374	0.0000277	0.000326	0.0000255

Bold face entries indicate the year with highest predicted deposition impact.

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TABLE 3.1-15 BLM CLASS II WILDERNESS AND HUALAPAI LANDS DEPOSITION RESULTS								
	Maximum 24-Hour Acid Deposition (kilograms/hectare)							
Modeled Year	Mount Nutt Peach Springs (Hualapai Reservation)		Warm Springs Wabayuma Swansea Rawhide Mountains Tres Alamos		Aubrey Peak Hualapai Tribal Lands		Arrasta Mountains Upper Burro Creek	
	Nitrogen	Sulfur	Nitrogen	Sulfur	Nitrogen	Sulfur	Nitrogen	Sulfur
1993	**0.000823**	0.000060	0.000906	0.000077	0.000997	0.000119	0.00209	0.000282
1994	0.000615	0.000050	0.000794	0.000077	0.00127	0.000116	0.00191	0.00020
1995	0.000674	**0.000064**	0.00111	0.000111	0.00114	0.000150	**0.00323**	**0.000336**
1996	0.000669	0.000055	**0.00126**	**0.000121**	0.00109	0.000139	0.00151	0.000176
1997	0.000633	0.000051	0.00106	0.000095	**0.00176**	**0.000187**	0.00292	0.000288

Bold face entries indicate the year with highest predicted deposition impact.

cations) and other baseline levels for environmental parameters have not been developed for the area surrounding the proposed power plant site to allow such comparisons. However, the predicted deposition rates for the Project are small, in part because of the distance to the Class I areas. Consequently, the contribution to the sulfur and nitrogen loading resulting from long-range transport from the distant Project is very small compared to the natural processes that replenish the soil reservoirs of nitrogen and sulfur species, and not significant.

Global Warming Impact

The combustion turbines selected for the proposed Project are state-of-the-art natural gas combined-cycle technology that emphasize high fuel efficiency expressed by the "heat rate" of the combined-cycle generating process. They are the highest efficiency fossil fuel combustion power plants currently available in their class, and produce the least greenhouse gas per MW of electricity per BTU of fossil fuel consumed.

SF_6, a potent greenhouse gas, would be used in substation circuit breakers. The equipment is sealed and certified to not release SF_6 gas. At the time of servicing, SF_6 gas is evacuated using sealed gas containment equipment, thereby remaining totally contained.

Communication Facilities

OPGW installation activities would not be expected to have a significant impact on regional air quality due to the limited time frame and extremely small areal extent (500 to 1,000 linear feet) of construction activity.

The microwave dishes would be installed on existing towers and would have no impact on air quality.

Alternative R and T Gas Pipeline Corridors

The lengths of the Alternative R and T gas pipeline corridors are comparable to that for the Proposed Action, and these corridors do not run substantially closer to potentially sensitive receptors, Class I areas, or Class II areas. Therefore, there is no identifiable difference in the anticipated air quality impact between the Proposed Action and the alternative pipeline corridors.

No-Action Alternative

If the Proposed Action were not to occur there would be no impact on the existing air quality.

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3.1.2.6 Mitigation and Residual Impacts

No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts. No additional measures to mitigate significant impacts have been identified for air resources and there would be no residual significant impacts.

3.2 GEOLOGY/PALEONTOLOGY

This section describes the affected environment and environmental consequences as they apply to geological and paleontological resources in the vicinity of the Proposed Action.

3.2.1 Affected Environment

The following sections describe the current geological and paleontological environment. The description of current conditions represents the baseline for the assessment of impacts and environmental consequences.

3.2.1.1 Region of Influence

The region of influence for assessing impacts on geological and paleontological resources includes the proposed power plant site, well sites, access roads, rights-of-way where ground-disturbing activities could occur, agricultural areas, OPGW installation sites, the proposed or alternative pipeline corridors (R, T, or crossover segment C2), and the adjacent parcels of land.

3.2.1.2 Existing Conditions

The proposed power plant site is located within the southeastern portion of the Big Sandy groundwater basin, which is part of the Basin and Range physiographic province of northwestern Arizona. The Basin and Range physiographic province is characterized by fault block mountain ranges separated by aggraded desert plains (Figure 3.2-1).

The Big Sandy basin generally trends north-south and is bounded by the Hualapai and McCracken mountains to the west; Aquarius Cliffs and Aquarius Mountains to the east; and Cottonwood and Peacock mountains to the north. To the north, a divide in the Peacock Mountains separates the Big Sandy basin from the Hualapai valley to the west. To the south, a granitic gorge separates the Big Sandy basin from the Burro Creek drainage basin.

The proposed power plant site is located on a terrace approximately 2 miles east of the Big Sandy River. The elevation of the site ranges from 2,060 to 2,250 feet, and the ground surface generally slopes to the south at between 4 and 40 percent. The site is crossed by several ephemeral drainages that are tributaries to Gray Wash, which is a westerly flowing tributary to the Big Sandy River.

Geological Resources

The geology of the Big Sandy groundwater basin within the region of influence can be separated into the following seven units, from youngest to oldest:

- stream and floodplain deposits
- upper basin fill
- lower basin fill (includes the Big Sandy Formation, which constitutes the upper member of this unit)
- basaltic volcanic rocks
- volcanic rocks of Sycamore Creek
- arkosic gravels and conglomerate
- granitic gneiss

Detailed descriptions of these units, their thickness and extent, and their relationships, including geologic cross-sections, are provided in Caithness' water resources (Caithness 2000a)

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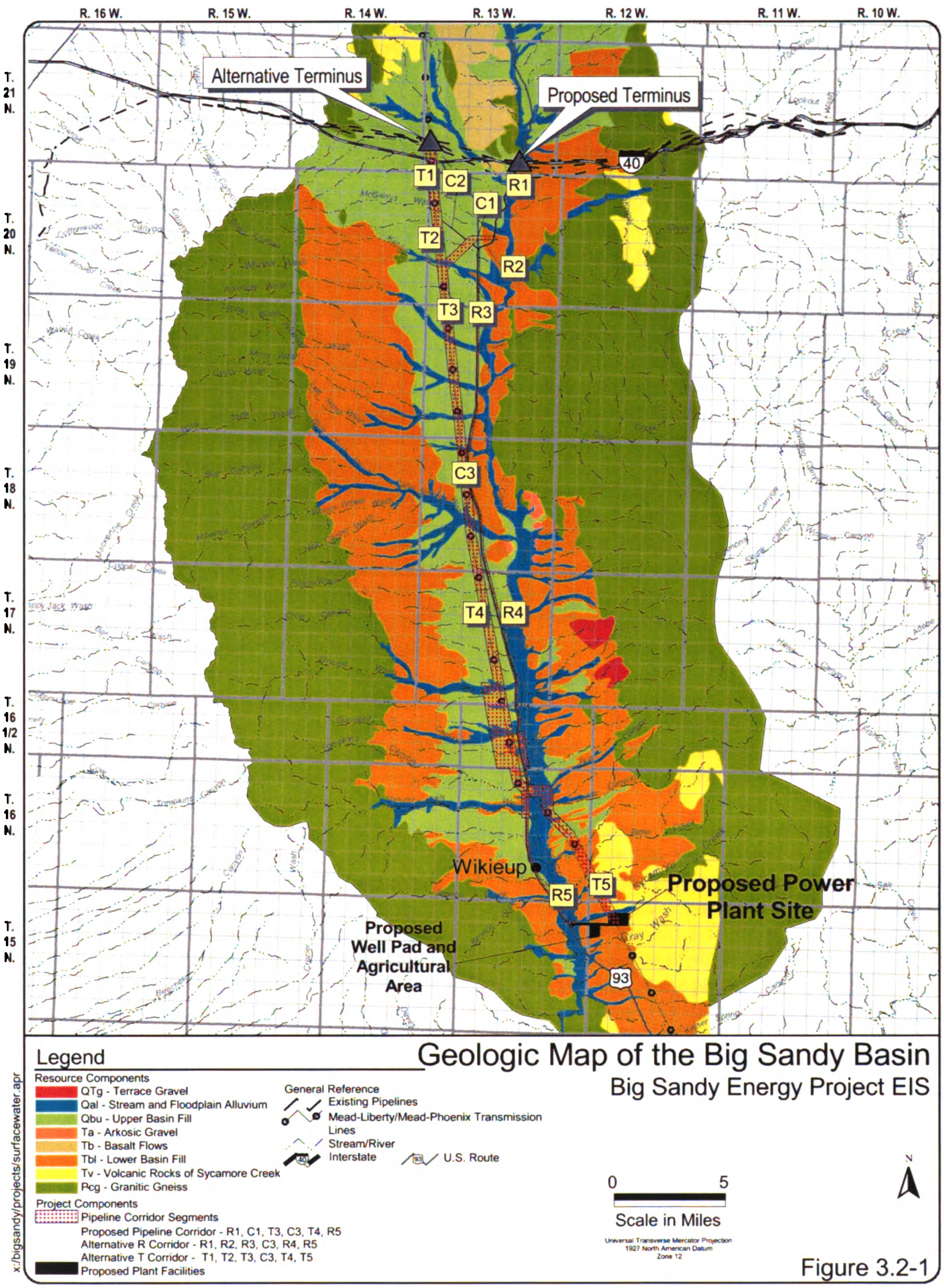

Geologic Map of the Big Sandy Basin
Big Sandy Energy Project EIS

Figure 3.2-1

and geology reports (Caithness 2000b); a previous water resources study of the Big Sandy area (Davidson 1973); the *Big Sandy Energy Project Groundwater Technical Report* (Appendix F); and in the Hydrogeologic Units and Model Development discussion in Section 3.4.

The proposed power plant site is situated on lower basin fill just west of the contact with the volcanic rocks of Sycamore Creek. The surface geology of the site consists of a minimum 30-foot-thick layer of silty sand to sandy clay material designated as partially cemented weathered volcanic ash or tuff that likely is derived from volcanic rocks that crop out upgradient of the site (Western Technologies, Inc. [Westech] 2000). These surface deposits likely are underlain by lacustrine clays, which represent the upper member of the lower basin fill unit.

Hard-rock mining for gold, silver, copper, and allied minerals historically has occurred in the Hualapai Mountains to the west and northwest of the proposed power plant site; however, most of these mines are inactive. Arizona Green Sands has an active mining operation in the southeast corner of Section 7, Township 15 North, Range 12 West (T15N, R12W) (Figure 3.2-2). This is a small surface mine that extracts a group of minerals known as zeolites from the surface clays, which are part of the exposed upper member of the lower basin fill. Numerous small sand and gravel operations exist along the Big Sandy River, which exploit the stream and floodplain deposits for construction of roads and other projects. There are no known significant coal, oil, or natural gas resources, or known potential mineral resource development areas of economic importance, within the region of influence.

Geologic Hazards

Potential geologic hazards that exist within the region of influence include earthquakes, mass movements (e.g., slope failures, slumps, rockfalls), expansive soils, and flash floods. The region of influence lies within seismic risk Zone +2, which is characterized as moderate risk.

A total of 13 earthquakes were reported to have occurred within Mohave County since 1891, with the greatest having a magnitude of approximately 5.75 on the Richter scale. The Richter scale is a common method of classifying earthquake severity, which uses a logarithmic measure of the maximum motions of the seismic waves as recorded by a seismograph. A search of the U.S. Geological Survey (USGS) National Earthquake Information Center (NEIC) database (1999) indicates that two significant earthquake events occurred within a 100-kilometer radius of the proposed power plant site. The largest event had a magnitude of 4.6 on the Richter scale.

The maximum impact that can be expected to occur at the proposed power plant site is moderate damage from an earthquake with an intensity of 7 (scale from 1 to 12) on the Modified Mercalli Intensity (MMI) scale. The MMI scale is the method used most often to classify earthquake intensity. The higher the number, the greater the associated ground-shaking intensity and/or damage. Earthquakes have varying intensities that generally decrease with increasing distance from the source (Bausch and Brumbaugh 1997).

The potential for mass movement is mainly restricted to the steep slopes along the northern margin of the proposed power plant site. In this area, there is a potential for rockfalls and slope failure. Figures 3.3-5, 3.3-6, and 3.3-7 in Section 3.3 show areas of slopes exceeding 20 percent in the vicinity of the proposed power plant site and proposed or alternative pipeline corridors (R, T, or crossover segment C2). Hazards from expansive soils exist in areas where proposed Project-related structures would be constructed on clayey soils, and particularly where these soils are hydrated due to poor drainage or the presence of springs/seeps (Westech 2000). Flash flood hazards exist within the washes that drain the site, with the highest potential to occur

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during the monsoon season between July and September.

Paleontological Resources

One of the geological units in the Big Sandy Valley is the Big Sandy Formation, which is a sequence of lake-deposited sediments interbedded with volcanic ash, marginal sandstone, and conglomerate. These deposits are exposed within an area of approximately 20 square miles. The deposits are up to 65 meters thick in the center of the basin, but thin to only a few meters at the basin margins.

Vertebrate fossils have been found at two localities within a 4- to 5-meter-thick horizon of the Big Sandy Formation. These fossils are of Late Miocene to Early Pliocene age (about 5 million years old). A number of research institutions have made collections from these quarries and recovered a diversity of land mammal and bird fossils. The avian fossils are characterized as the most significant pre-Pleistocene bird assemblage in North America.

The two studied fossil quarries at both of these localities are about 3 miles south of the proposed power plant site. The plant site, well field, new access road, plus the southern 6 to 7 miles of the proposed and alternative pipeline corridors (parts of corridor segments T4, T5, R4, and R5) and the route of OPGW installation are within areas where the Big Sandy Formation is exposed or buried at shallow depth. A field survey was conducted in these areas. Although the survey did not encompass the full width of the proposed and alternative pipeline corridors, the results can be interpolated to the entire width of the corridors with two exceptions. The eastern portions of corridor segment T5 at the crossings of Sycamore Creek and Bitter Creek would warrant additional survey if that corridor segment were selected for construction of the pipeline (Archer 2000).

The survey discovered previously unreported plant fossils in the form of root casts (probably of aquatic or semi-aquatic plants) and stromatolites (algal clumps) within the proposed power plant site. These fossils are indicative of a shallow, near-shore lake environment. Further study of the root casts and stromatolite fossils would not yield important information (Archer 2000).

The ancient lake that formed within the Big Sandy Valley apparently had little through-flow or was completely blocked from draining at times and became highly saline. The salty water was unlikely to have supported abundant life. The two known fossil localities apparently represent rare situations where mammals and birds either died near the edge of the lake and were quickly buried, or died along adjacent freshwater streams and their bones were washed into the lake. Potential lake inlets that might represent such rare situations have been noted north of the proposed power plant site and to the east of the Mead-Phoenix Project 500-kV transmission line along Sycamore Creek and Bitter Creek.

3.2.2 Environmental Consequences

The following sections outline the environmental issues related to geology and paleontology, significance criteria, and methodology and conclusions of the impact assessment. Also described are mitigation measures that could be implemented to prevent significant impacts on geological and/or paleontological resources.

3.2.2.1 Identification of Issues

The following is a list of issues that were identified as relating to geology and paleontology; these issues form the basis for the assessment of potential impacts:

- potential impacts on areas of regional geological importance
- potential impacts on paleontological resources (fossils) of scientific importance

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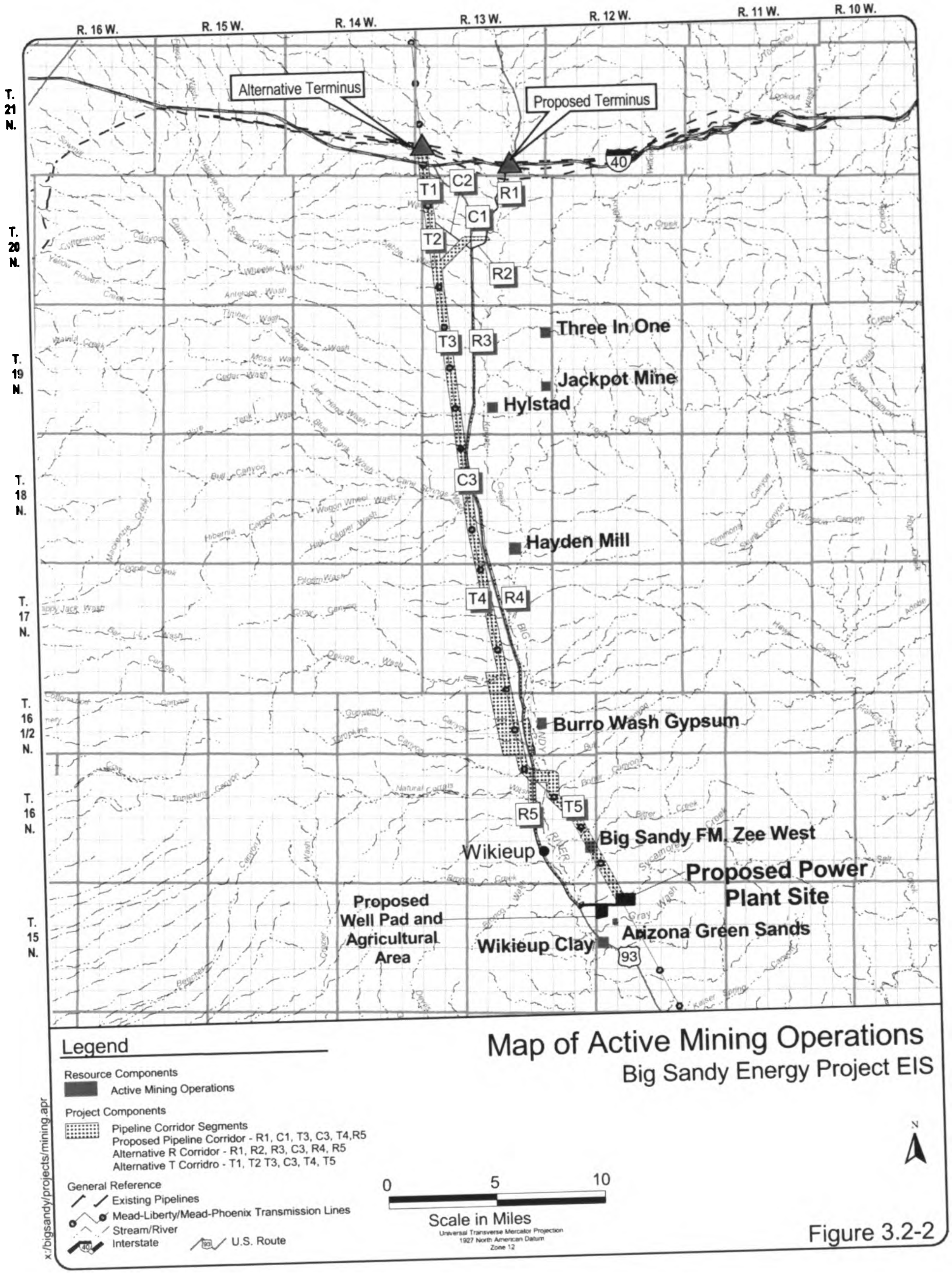

Map of Active Mining Operations
Big Sandy Energy Project EIS

Figure 3.2-2

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- potential impacts on mining operations or areas of potential mineral resource development of economic importance

- potential impacts on the influences of geologic hazards (e.g., slope failure)

- potential for land subsidence due to groundwater withdrawal

3.2.2.2 Significance Criteria

Listed below are the significance criteria established for the identified issues. Impacts would be considered significant if they would result in the following:

- destruction of or future inaccessibility to areas of regional geological importance

- destruction of or future inaccessibility to scientifically important paleontological resource areas

- destruction of or future inaccessibility to potential mineral resource development areas of economic importance

- adverse impacts on existing mining operations that could not be mitigated

- a substantial increase in the probability or magnitude of mass movements (e.g., slope failures, slumps, rockfalls) or impacts on lands or humans from earthquakes that could be attributed to the Proposed Action.

3.2.2.3 Impact Assessment Methods

In order to assess potential impacts on geological and paleontological resources within the region of influence, available information was compiled related to geological, paleontological, and mineral resources; and geologic hazards. All relevant reports prepared by Caithness and its consultants were reviewed in order to independently evaluate and verify the accuracy and comprehensiveness of information provided by Caithness, and, where necessary, supplement this information.

After data were compiled and reviewed, and the information provided was verified, potential direct and indirect impacts on geological and paleontological resources were assessed. Particular consideration was given to the identified issues, and the significance criteria described in Section 3.2.2.2 were used to assess whether significant impacts potentially could occur.

3.2.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse environmental impacts on geological resources:

- erosion control measures on slopes (waterbars, diversion ditches, riprap, revegetation)

- compliance with UBC Seismic Zone 2b construction practices.

3.2.2.5 Impact Assessment

Proposed Action

The assessment of impacts on geological and paleontological resources is described below in terms of the significance criteria outlined in Section 3.2.2.2.

<u>Geological Resources</u>

There are no areas of geological importance within the region of influence. Therefore, no areas of geological importance would be destroyed or made inaccessible by the Proposed Action.

There are no known potential mineral resource development areas of economic importance within the region of influence of the Proposed

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Action. Thus, the Proposed Action would not destroy nor make inaccessible any such areas.

The Proposed Action would not impact any existing mining operations. The active zeolite mine in the southeast corner of Section 7, T15N, R12W, would not be impacted by the Proposed Action, and only a very small portion of the valley's sand and gravel resources would be removed from potential development through construction of the proposed power plant, substation, and evaporation ponds. The potential economic impact of this is insignificant.

The Proposed Action would not cause a substantial increase in the probability or magnitude of mass movements. The Proposed Action requires that areas of substantial cut or fill be engineered to ensure stability, which is a common construction practice. No substantial increase in impacts on lands or humans would occur as a result of the Proposed Action because structures would comply with Uniform Building Code (UBC) Seismic Zone 2b construction practices.

There would be no potential for land subsidence as a result of groundwater withdrawal for the Proposed Action. Groundwater would be pumped solely from the volcanic aquifer, from a depth of approximately 1,000 to 1,500 feet below ground surface. The volcanic aquifer is confined, and relatively isolated from overlying aquifers. It has been estimated that groundwater levels in the volcanic aquifer may decline by as much as 85 feet as a result of groundwater pumping, and that groundwater levels in the overlying middle aquifer may decline by as much as 12 feet (refer to Section 3.4). Because the volcanic and middle aquifers are confined and have high confining pressures, these impacts would be expressed as a decrease in confining pressure. Since the aquifers would not be dewatered and become unconfined, subsidence would not occur. Furthermore, the volcanic and middle aquifers both consist of relatively incompressable materials. Pulling and tensioning sites for the OPGW would not impact any geologic resources. The sites would not impact any existing mining operations, or substantially increase the probability or magnitude of mass movements. Similarly, the installation of the microwave dishes on existing structures would have an insignificant effect on geologic resources.

Paleontological Resources

Although significant vertebrate fossils have been found within portions of the Big Sandy Formation, no significant fossils have been found or would be expected within the areas to be disturbed based on the surveys conducted. Pulling and tensioning sites for the installation of the OPGW may be located in areas not surveyed. If scientifically important paleontological resources were found there, their destruction as a result of the construction of the OPGW would be considered a significant impact. The microwave dishes would be installed on existing towers and would have no impact on paleontological resources.

Alternative R Gas Pipeline Corridor

Potential impacts resulting from the Alternative R gas pipeline corridor would be the same as those described for the Proposed Action.

Alternative T Gas Pipeline Corridor

Potential impacts resulting from the Alternative T gas pipeline corridor would be the same as those described for the Proposed Action except that the pipeline may be located in areas not surveyed. If scientifically important paleontological resources were found there, their destruction as a result of the construction of the transmission line would be considered a significant impact.

No-Action Alternative

Under the No-Action Alternative, the Project would not be constructed and there would be no change or disturbance of geological or

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paleontological resources within the Big Sandy Valley.

3.2.2.6 Mitigation and Residual Impacts

If adopted, the following measures would be implemented to avoid or reduce significant impacts:

- If unknown invertebrate fossils (or suspected invertebrate fossils) are encountered, construction activities in the immediate area would cease and a qualified paleontologist would be contacted. Construction activities would not re-commence until the area is cleared, or the area is avoided.

- If the eastern portion of corridor segment T5 more than 100 feet east of the Mead-Phoenix Project 500-kV transmission line right-of-way is selected for construction, a paleontological field survey would be conducted at the crossings of Sycamore Creek and Bitter Creek. If significant fossil localities are found in these areas, construction activities would not re-commence until the area is cleared, or the area avoided.

With the implementation of these measures, there would be no residual significant impacts.

3.3 SOILS

This section describes the affected environment and environmental consequences as they relate to soils in the vicinity of the Proposed Action.

3.3.1 Affected Environment

The following sections describe the various soils in the vicinity of the Proposed Action. The location and description of each soil type serves as a baseline for the assessment of environmental consequences, and assists in determining appropriate mitigation measures.

3.3.1.1 Region of Influence

The region of influence for assessing impacts on soils includes the power plant site and ancillary facilities, access roads, rights-of-way where ground-disturbing activities (e.g., water pipelines) could occur, the proposed gas pipeline corridor, the alternate gas pipeline corridors, and the areas of disturbance associated with the potential installation of the OPGW. The region of influence also is considered to be all surface areas that could be impacted by soil erosion.

3.3.1.2 Existing Conditions

Soils in the region of influence were surveyed and mapped by the Natural Resources Conservation Service (NRCS) in 1974. The survey is described by the NRCS as "tentative and subject to revision, correction, or completion," and has not yet been published. The soils survey data were compiled onto a map and described in the *Big Sandy Energy Project Soils Report* (Caithness 2000).

Figures 3.3-1 through 3.3-4 (taken from the above-named soils report) show 36 soil map units in the region of influence, based on the soils survey data provided by the NRCS. These figures also show locations of steep slopes (greater than 20 percent) and identify four areas along the corridors where steep slopes coincide with soil types that have severe or very severe erosion potential. Mapping of potential pulling and tensioning sites for the OPGW installation was not done, since these have not yet been located.

- The 36 soil map units presented on Figures 3.3-1 through 3.3-4 represent 25 soil types or associations, which are listed in Table 3.3-1 by soil name and associated map unit number(s). Table 3.3-1 includes the description, setting, and parent material of each soil type/association, range in slope, percentage rock fragments, permeability, runoff, depth, drainage, pH, water erosion hazard, wind erosion hazard, and shrink-

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swell potential. Table 3.3-1 also indicates whether each soil type falls within the footprint of the proposed power plant site and ancillary facilities, or within any of the pipeline corridor segments. Of the 36 soil map units, 25 are intersected by either the proposed power plant site and/or pipeline corridor segments.

- It should be noted that the 1974 soils survey was not completed in Township 21 North, in corridor segment T1, in the vicinity of I-40. For this area, the NRCS STATSCO database (NRCS 1998) was used to identify the two soil associations included at the end of the bulleted list (Romero-Rock Outcrop-Gila and Continental-Rillino-Gila). The other 23 entries are soil types.

In general, most of the soils within the Project area are classified as gravelly sandy loam derived from alluvium from mixed sources. The soils typically are alkaline, and the percentage of rock fragments is high. Slopes range from 1 to 70 percent. Most soils are deep and well drained, with slow to moderate permeability and slow to medium runoff. Water erosion hazard typically ranges from moderate to severe, whereas wind erosion hazard ranges from slight to moderately high. Shrink-swell potential is low for most soil types.

A preliminary geotechnical evaluation of the proposed power plant site was performed (Westech 2000). The geotechnical report includes detailed descriptions of subsurface soils to depths of 30 feet below ground surface. The report describes the soils at the proposed power plant site as severely corrosive to concrete, and recommends that Type V (or equivalent) sulfate-resistant cement be used.

Some soil types are known to uniquely support special status species. The only known threatened or endangered plant species that is dependent on a unique soil in the region of influence is the Arizona cliffrose, which grows only on Tertiary limestone lakebed deposits and is restricted to the nutrient-poor lakebed clays. There are two small deposits along corridor segment T5 and others may exist.

3.3.2 Environmental Consequences

The following sections outline the environmental issues related to soils, the significance criteria used in assessing impacts, and the methodology and conclusions of the impact assessment. Also described are measures that would be used to prevent significant impacts on soils.

3.3.2.1 Identification of Issues

The primary issues related to soils that form the basis for the assessment of potential impacts are as follows:

- potential impacts on soils from wind or water erosion
- potential impacts on soils that uniquely support special status plant species

3.3.2.2 Significance Criteria

The effects of the Proposed Action or alternatives would be considered significant if any of the following were to occur:

- proposed construction on areas of steep slopes (greater that 20 percent) that coincide with soils having a high or severe erosion potential, where mitigation cannot reduce impacts
- loss of soils that uniquely support threatened or endangered plant species
- alterations of stormwater runoff from the Proposed Action that could cause substantial soil erosion

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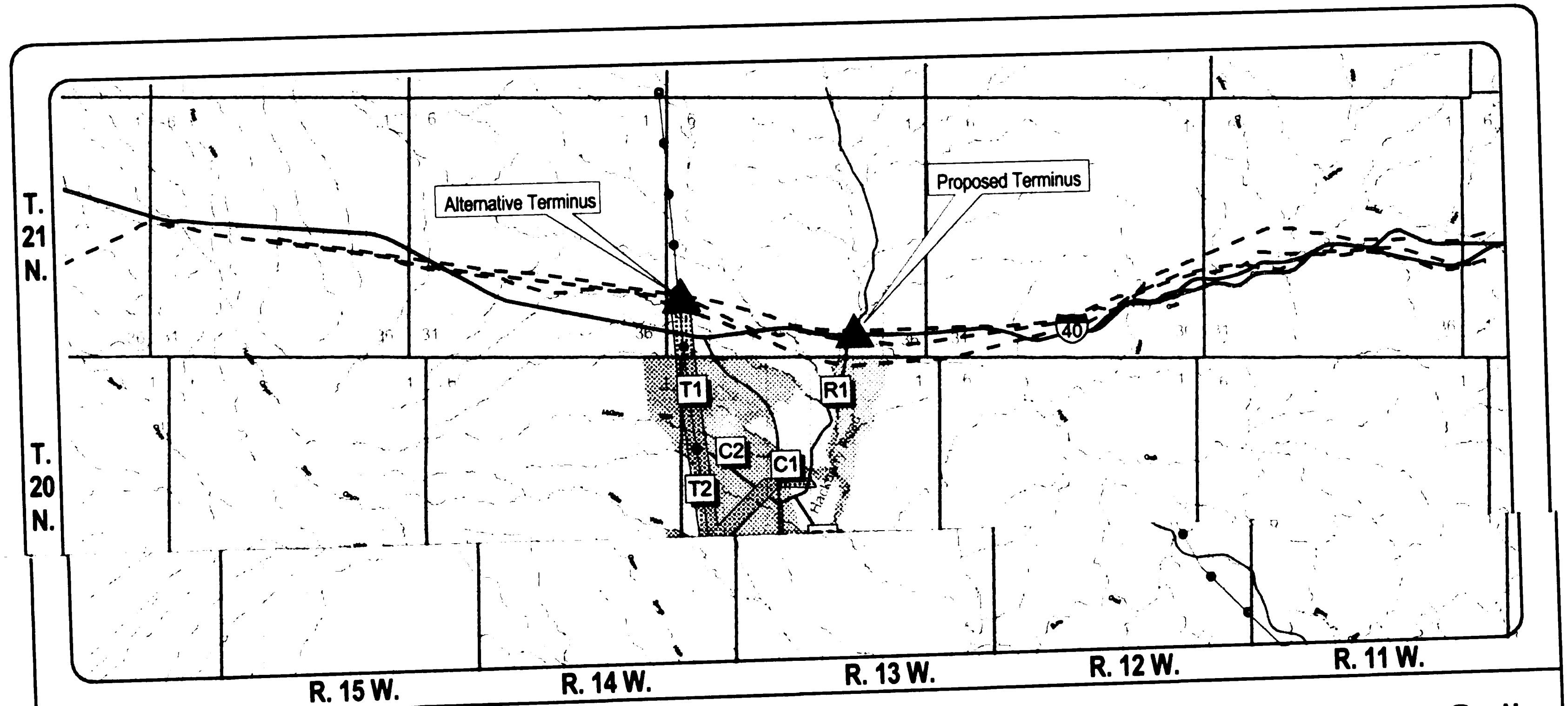

Legend

Soil Types are Indentified on the Individual Soil Panel Maps

Project Components
- Pipeline Corridor Segments
  - Proposed Pipeline Corridor - R1,C1,T3,C3,T4,R5
  - Alternative R Corridor - R1,R2,R3,C3,R4,R5
  - Alternative T Corridor - T1,T2,T3,C3,T4,T5
- Proposed Plant Facilities

General Reference
- Existing Pipelines
- Mead-Liberty/Mead-Phoenix Transmission Lines
- Stream/River
- Interstate
- U.S. Route

0 5

Scale in Miles

Universal Transverse Mercator Projection
1927 North American Datum
Zone 12

N

Soils Key Map

Big Sandy Energy Project EIS

Figure 3.3-1

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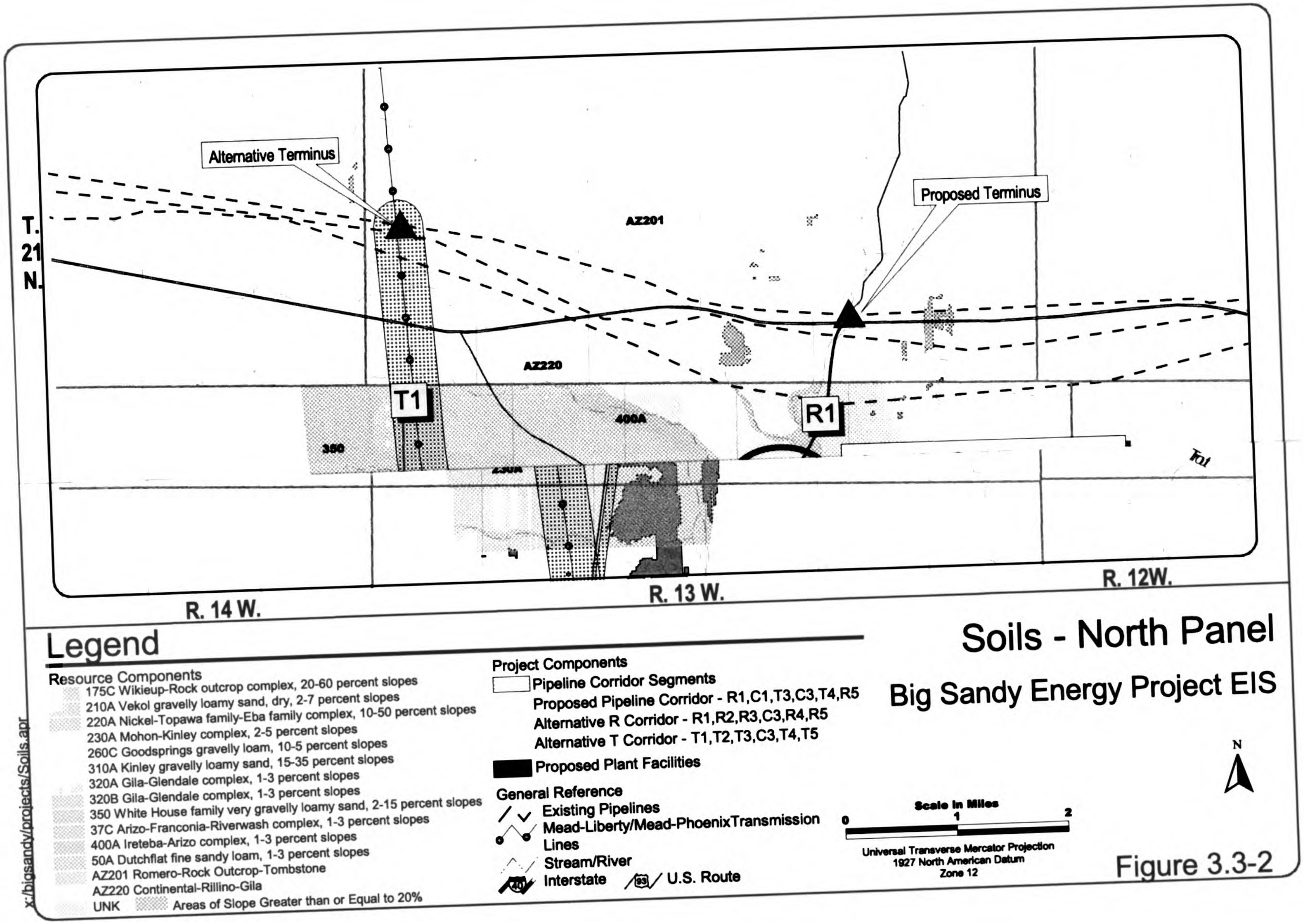

Soils - North Panel

Big Sandy Energy Project EIS

Figure 3.3-2

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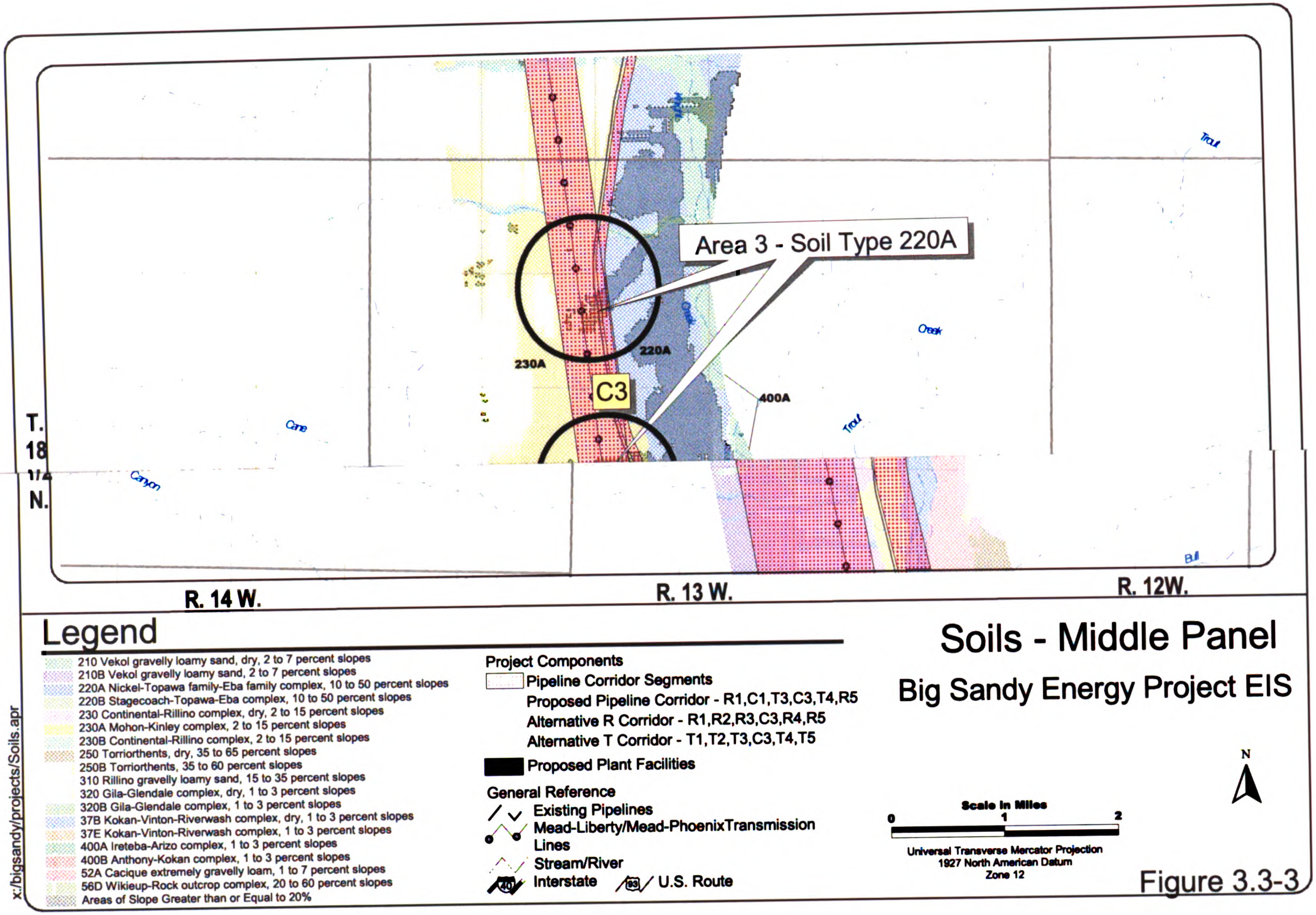

Area 3 - Soil Type 220A
C3
220A
230A
400A
Creek
Trail
Cane
Canyon
Bull
T. 18 1/4 N.
R. 14 W.
R. 13 W.
R. 12W.
Legend
210 Vekol gravelly loamy sand, dry, 2 to 7 percent slopes
210B Vekol gravelly loamy sand, 2 to 7 percent slopes
220A Nickel-Topawa family-Eba family complex, 10 to 50 percent slopes
220B Stagecoach-Topawa-Eba complex, 10 to 50 percent slopes
230 Continental-Rillino complex, dry, 2 to 15 percent slopes
230A Mohon-Kinley complex, 2 to 15 percent slopes
230B Continental-Rillino complex, 2 to 15 percent slopes
250 Torriorthents, dry, 35 to 65 percent slopes
250B Torriorthents, 35 to 60 percent slopes
310 Rillino gravelly loamy sand, 15 to 35 percent slopes
320 Gila-Glendale complex, dry, 1 to 3 percent slopes
320B Gila-Glendale complex, 1 to 3 percent slopes
37B Kokan-Vinton-Riverwash complex, dry, 1 to 3 percent slopes
37E Kokan-Vinton-Riverwash complex, 1 to 3 percent slopes
400A Ireteba-Arizo complex, 1 to 3 percent slopes
400B Anthony-Kokan complex, 1 to 3 percent slopes
52A Cacique extremely gravelly loam, 1 to 7 percent slopes
56D Wikieup-Rock outcrop complex, 20 to 60 percent slopes
Areas of Slope Greater than or Equal to 20%
Project Components
Pipeline Corridor Segments
Proposed Pipeline Corridor - R1,C1,T3,C3,T4,R5
Alternative R Corridor - R1,R2,R3,C3,R4,R5
Alternative T Corridor - T1,T2,T3,C3,T4,T5
Proposed Plant Facilities
General Reference
Existing Pipelines
Mead-Liberty/Mead-PhoenixTransmission Lines
Stream/River
Interstate
U.S. Route
Soils - Middle Panel
Big Sandy Energy Project EIS
N
Scale in Miles
0
1
2
Universal Transverse Mercator Projection
1927 North American Datum
Zone 12
Figure 3.3-3
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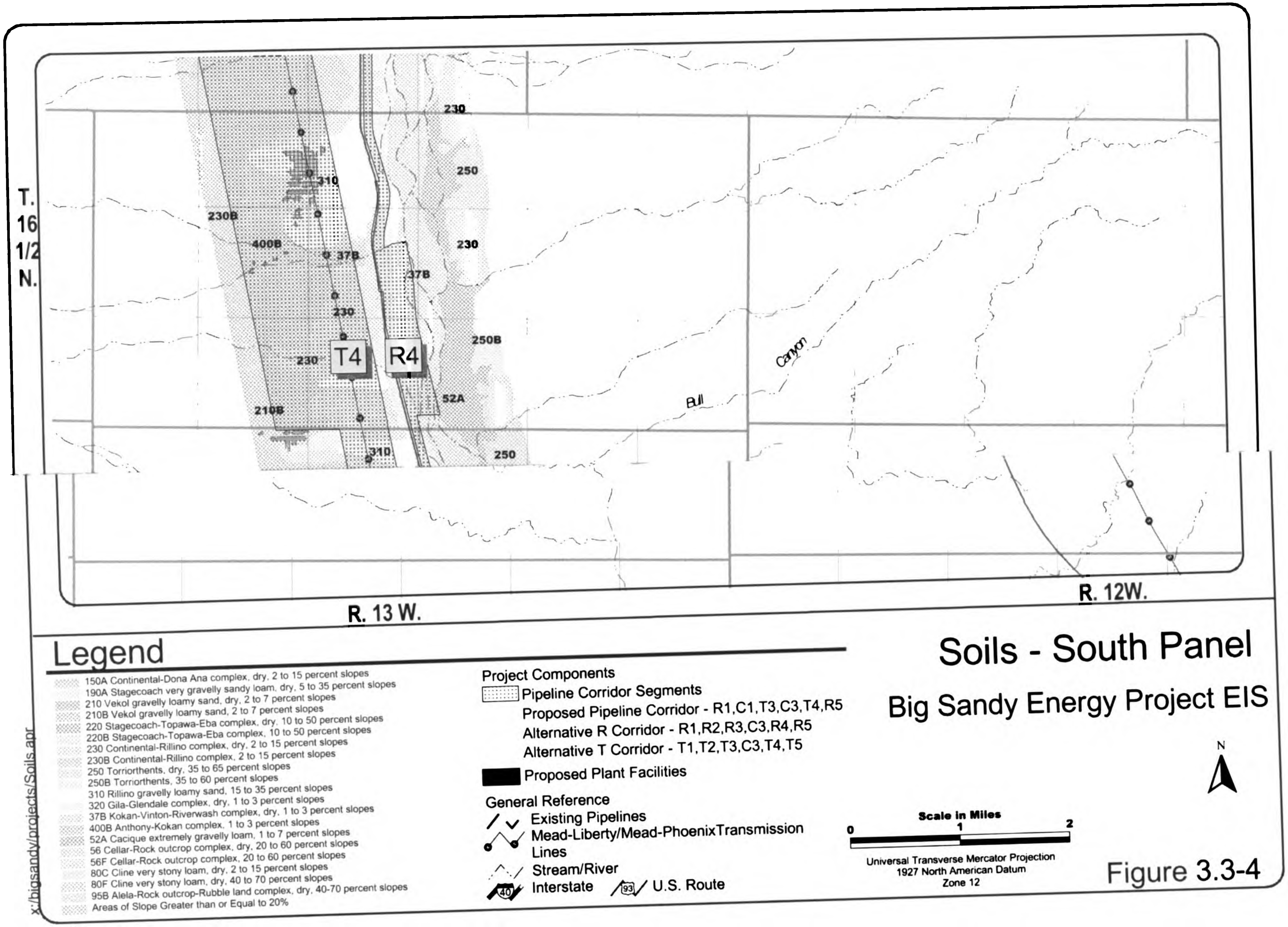

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Map Unit No.	Intersected by Pipeline or Plant Site	Soil Name	H	Water Erosion Hazard	Wind Erosion Hazard	Shrink-Swell Potential
150A	T5	Continental - Dona Ana Complex	acid to ly alkaline	moderate	slight	moderate to high
175C	--------	Wikieup-Rock Outcrop Complex	tly to iy alkaline	severe	slight	low
56D	--------					
190A	--------	Stagecoach	ɔ strongly lline	slight	slight	low
210	PS, R4, R5, T5	Vekol	ly alkaline	moderate	moderately high	high
210A	R3, T3					
210B	R4, T4					
220	R5	Stagecoach-Topawa-Eba Complex	ɔ strongly lline	severe	slight	low to high
220B	--------					
220A	C3, R3, T3	Nickel-Topawa Family-Eba Family Complex	ɔ strongly lline	severe to very severe	slight	low to high
230	R4, T4	Continental-Rillino Complex	acid to ly alkaline	moderate	slight	low
230B	R4, T4					
230A	C3, R3, R4, T3, T4	Mohon-Kinley Complex	ıtly to ly alkaline	moderate	slight to moderately high	low
250	T5	Torriorthents	-----	very severe	slight	variable
250B	--------					
260C	R1	Goodsprings	ıly to very alkaline	severe	slight	low
310	R4, T4	Rillino	ly alkaline	severe	moderately high	low
310A	C1, R1, R2, R3	Kinley	ıtly to ly alkaline	severe	moderately high	low
320	R4, R5, T5	Gila-Glendale Complex	to very alkaline	moderate to moderately high	moderate to moderately high	moderate
320A	--------					
320B	--------					
350	C1, R3, T1, T2, T3	White House Family Loamy Sand	ely acid to ly alkaline	slight to severe	slight to moderately high	high

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Map Unit No.	Intersected by Pipeline or Plant Site	Soil Name	H	Water Erosion Hazard	Wind Erosion Hazard	Shrink-Swell Potential
37B	R4, R5, T4, T5	Kokan-Vinton-Riverwash Complex	ͻ strongly aline	slight	moderately high	low
37E	R4, T4					
37C	T1	Arizo-Franconia-Riverwash Complex	ͻ strongly aline	slight	slight	low
400A	R1, R3, T3	Iretiba-Arizo Complex	ͻ strongly aline	slight	slight	low
400B	R4, T4	Anthony-Kokan Complex	ͻ strongly aline	slight	slight	low
50A	C1, C2, R2, R3, T1, T2	Dutchflat	ıtly to ly alkaline	slight	moderately high	moderate
52A	R5, T5	Cacique	ıtly to ly alkaline	moderate	slight	moderate
56	PS	Cellar-Rock Outcrop Complex	/ acid to ly alkaline	very severe	very slight	low
56F	--------					
80C	T5	Cline	alkaline	moderate	slight	low
80F	--------					
95B	--------	Akela-Rock Outcrop-Rubble Land Complex	-----	high	slight	low
AZ201	--------	Romero-Rock Outcrop-Tombstone Association	y acid to alkaline	moderate to high	low	--------
AZ220	R1, T1	Continental-Rillino-Gila Association	/ acid to ly alkaline	slight to moderate	slight to moderate	--------

PS = Proposed plant site
C1-C3, R1-R5, T1-T5 = Gas pipeline corridor segments

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3.3.2.3 Impact Assessment Methods

In order to assess the potential impacts on soils within the region of influence, soil survey maps and reports from available sources were compiled and reviewed, including all relevant reports prepared by Caithness and its consultants, as well as reports and maps prepared by the NRCS. The objective of this task was to independently evaluate and verify the accuracy and comprehensiveness of information provided by Caithness and supplement this information as needed. The data compilation and review resulted in the preparation of Figures 3.3-1 through 3.3.-4, and Table 3.3-1.

After data were compiled and reviewed, and information provided was verified, potential direct and indirect impacts on soils were assessed. Particular consideration was given to the identified issues described in Section 3.2.2.1, and the significance criteria described in Section 3.3.2.2 to assess whether significant impacts potentially could occur.

3.3.2.4 Actions to Reduce or Prevent Impacts Incorporated Into the Proposed Action

The Proposed Action includes the following measures to reduce or prevent adverse environmental impacts on soils:

- During design, the pipeline would be routed to avoid steep slopes, if at all possible. OPGW pulling and tensioning sites would be sited to avoid steep slopes.

- For segments of the pipeline corridor that cannot be altered to avoid steep slopes and erosive soils, soil loss would be minimized during revegetation through the use of erosion control measures such as mulching, water bars, silt fences, and staked hay bales. Section 2.2.8.5 describes the erosion control measures proposed in more detail.

- No permanent access would be built along the pipeline corridor, and steep washes would be inspected on foot.

- Grading would be done only where necessary.

- Local soil conservation specialists would be consulted to select the best seed mixes and best management practices (BMPs) for soils disturbed by the Proposed Action. The BLM Kingman Field Office will have the final approval on plant seed mixes on BLM-managed lands within the Project area.

- Soil loss from wind erosion during construction would be controlled through implementation of standard BMPs for controlling fugitive dust emissions, including wet suppression, limiting vehicle speeds, chemical suppression, physical suppression, and vegetative stabilization. The dust control measures included in the Proposed Action are listed in Section 2.2.8.1.

- The potential impacts of expansive soils would be minimized through avoidance or the use of special engineering and construction methods.

- If excessive percentages of rock fragments were encountered during pipeline construction, potential impacts would be reduced through the use of sand or other bedding material, which would assist in preventing damage to the pipeline.

- The potential impacts of corrosive soils would be avoided through the use of corrosion-resistant materials, such as Type V (or equivalent) sulfate-resistant materials.

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3.3.2.5 Impact Assessment

Proposed Action

Soil Erosion

The potential for soil loss through water and wind erosion is of primary concern. Many of the soils that would be impacted during construction are susceptible to water erosion and, to a lesser extent, wind erosion.

Soil erosion can occur wherever ground is disturbed. The Proposed Action (the power plant and associated facilities and the proposed pipeline) would involve the permanent or temporary disturbance of land. Erosion potential is dependent on several factors, including slope, vegetation cover, climate, and the physical and chemical characteristics of the soil. Increased soil erosion may occur when vegetation is removed during construction or in areas where the surface is disturbed by heavy equipment. Compaction of soils, loss of topsoil, and mixing of topsoils and subsoils may inhibit natural revegetation, which may cause increased soil erosion and further loss of soils after construction is complete. Increased water erosion may reduce the productivity of the soil as well as affect the water quality of streams by accelerated sediment loading. Loss of productivity of grazing land due to soil compaction and/or increased erosion may result from Project activities.

Steep slopes (exceeding 20 percent) were mapped in the vicinity of the power plant and along the pipeline corridors. No steep slopes occur in the footprint of the power plant and associated facilities, including the wells and access road. Steep slopes do exist along the pipeline corridors, as shown on Figures 3.3-2 through 3.3-4. Significant impacts could occur where these steep slope areas coincide with soils having high or severe erosion potential. Figures 3.3-2 through 3.3-4 identify four such areas of potentially significant impact within the pipeline corridors:

- Area 1 – in corridor segment R1
- Area 2 – at the intersection of corridor segments T2, T3, and C1
- Area 3 – in corridor segment C3
- Area 4 – in corridor segment T4 near the Carrow-Stephens Ranches ACEC

All four areas are located within the proposed pipeline corridor. Crossing Area 1 in corridor segment R1 would not result in significant impacts, since the pipeline alignment would fall within the already-graded Hackberry Road right-of-way. Area 2 may be difficult to avoid, since it extends almost the entire width of the corridor. Area 3 could be avoided if the final alignment is sited in the western portion of the corridor. Area 4 could be avoided with a route along the western side of the corridor, outside the Carrow-Stephens Ranches ACEC.

If the final alignment falls within these areas, the measures included in the Proposed Action to minimize soil loss in areas of steep slopes that cannot be avoided would reduce these impacts to less than significant.

Erosion also is of concern in the installation of the OPGW for the redundant communication system. However, selection of OPGW pulling and tensioning sites would avoid steep slopes and utilize already disturbed areas to the extent feasible along the Mead-Liberty 345-kV transmission line right-of-way, thus eliminating or minimizing adverse impacts to soils. The microwave dishes would be installed on existing towers and would have no impact on soils.

Trenching for the gas pipeline across the Big Sandy River would result in less than significant soil erosion. The directional drilling option for the crossing of Big Sandy River would result in less soil erosion than trenching.

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Expansive Soils

Expansive soils tend to swell and increase in volume in response to increase in moisture content. Conversely, some soils tend to develop swell pressures if their volume change is restricted.

Special engineering and construction methods or avoidance are proposed for expansive soils encountered during construction. The geotechnical report describes the soils in the vicinity of the spring near the proposed power plant as highly expansive and recommends that those soils be avoided during construction (Westech 2000). No adverse impact would be expected.

Rock Fragments

The percentages of rock fragments in each of the soil types are highly variable, but may range from less than 35 to more than 85 percent. Where the gas pipeline would be buried within soils with high rock fragment content, special construction methods would be employed to protect the pipeline from damage during and after construction. No adverse impact would be expected.

Corrosivity

Because sulfate-resistant cement would be used in areas with highly corrosive soils, no adverse impacts from corrosive soils would be expected.

Soils that Uniquely Support Threatened or Endangered Plant Species

The soil type that is known to uniquely support the Arizona cliffrose would not be affected by the Proposed Action. Therefore, no impacts related to this concern would be expected.

Alterations in Stormwater Runoff

There would be alterations to stormwater runoff from the construction activities that would occur in all locations. However, there are no areas of steep slopes in the proposed power plant area and very few steep areas along the proposed gas pipeline route or OPGW route. Also, environmental protection measures would be applied in all areas. Therefore, it is unlikely that substantial soil erosion would occur from stormwater diversions or changes in flow, and no significant impacts would be expected.

Alternative Gas Pipeline Corridors

Soil Erosion

Similar concerns with soil erosion would exist for the alternative gas pipeline corridors. There are areas of steep slopes located along both of these corridors, including the same four areas where steep slopes coincide with highly erodible soils as discussed under the Proposed Action (Figures 3.3-2 through 3.3-4). As discussed previously under the assessment of the Proposed Action, there may be alignments that can avoid these areas, except perhaps for Area 2, which extends across the corridor. Construction and operation of the alternative pipeline routes would include the same measures as described for the Proposed Action to reduce these impacts to below the level of significance.

Expansive Soils

Several of the soil types listed in Table 3.3-1 are described as having high, or low to high, shrink-swell potential, indicating that the soils are expansive. As with the Proposed Action, no adverse impacts from expansive soils encountered during pipeline construction would be expected.

Rock Fragments

As with the Proposed Action, no adverse impacts would be expected.

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Corrosivity

Because sulfate-resistant cement would be used in areas with highly corrosive soils, no adverse impacts from corrosive soils would be expected.

Soils that Uniquely Support Threatened or Endangered Plant Species

As with the Proposed Action, there would be no adverse impacts expected in the Alternative R gas pipeline corridor. The Alternative T gas pipeline corridor may cross exposures of the nutrient-poor calcareous soils that uniquely support the Arizona cliffrose. If these areas are not avoided, significant impacts may result.

Alterations in Stormwater Runoff

Alterations in stormwater runoff would be as described for the proposed pipeline, and no significant impacts would be expected.

No-Action Alternative

If the Proposed Action were not constructed there would be no impact on soils within the Big Sandy basin associated with the proposed Project. The groundwater production and monitoring wells and associated access roads and well pads completed on private land that were used to identify and test the lower aquifer would remain.

3.3.2.6 Mitigation and Residual Impacts

If adopted, the following measures would be implemented to avoid or reduce significant impacts:

- If corridor segment T5 is selected, the nutrient-poor calcareous soils derived from the Tertiary limestone lakebed deposits would be avoided.

If this measure is adopted, no residual impacts would remain.

3.4 GROUNDWATER

This section describes the affected environment and environmental consequences with regard to groundwater resources. Supporting information for this section is provided in Appendices D, E, and F.

3.4.1 Affected Environment

The following sections describe current groundwater conditions in the vicinity of the Proposed Action. The description of current conditions provides a baseline for the assessment of impacts and environmental consequences.

3.4.1.1 Region of Influence

The region of influence for assessing impacts on groundwater includes all aquifers within the southern portion of the Big Sandy groundwater basin that potentially could be impacted by groundwater pumping to supply the proposed Project, or by discharge of pollutants from the evaporation pond or any other activities related to the Proposed Action.

3.4.1.2 Existing Conditions

Hydrogeologic Setting

The proposed power plant site, ancillary facilities, and gas pipeline corridors are located within the Big Sandy basin, a north-south trending alluvial groundwater basin that covers an area of approximately 800 square miles (Figure 3.4-1). The Big Sandy basin is located within the Basin and Range structural and physiographic province, a region of the southwestern United States characterized by alluvial basins and fault block mountain ranges. The basin is bounded by the Hualapai Mountains on the west and southwest, the Aquarius Cliffs and Aquarius Mountains on the east, the Cottonwood Mountains on the northeast, and the Peacock Mountains on the northwest (Davidson 1973).

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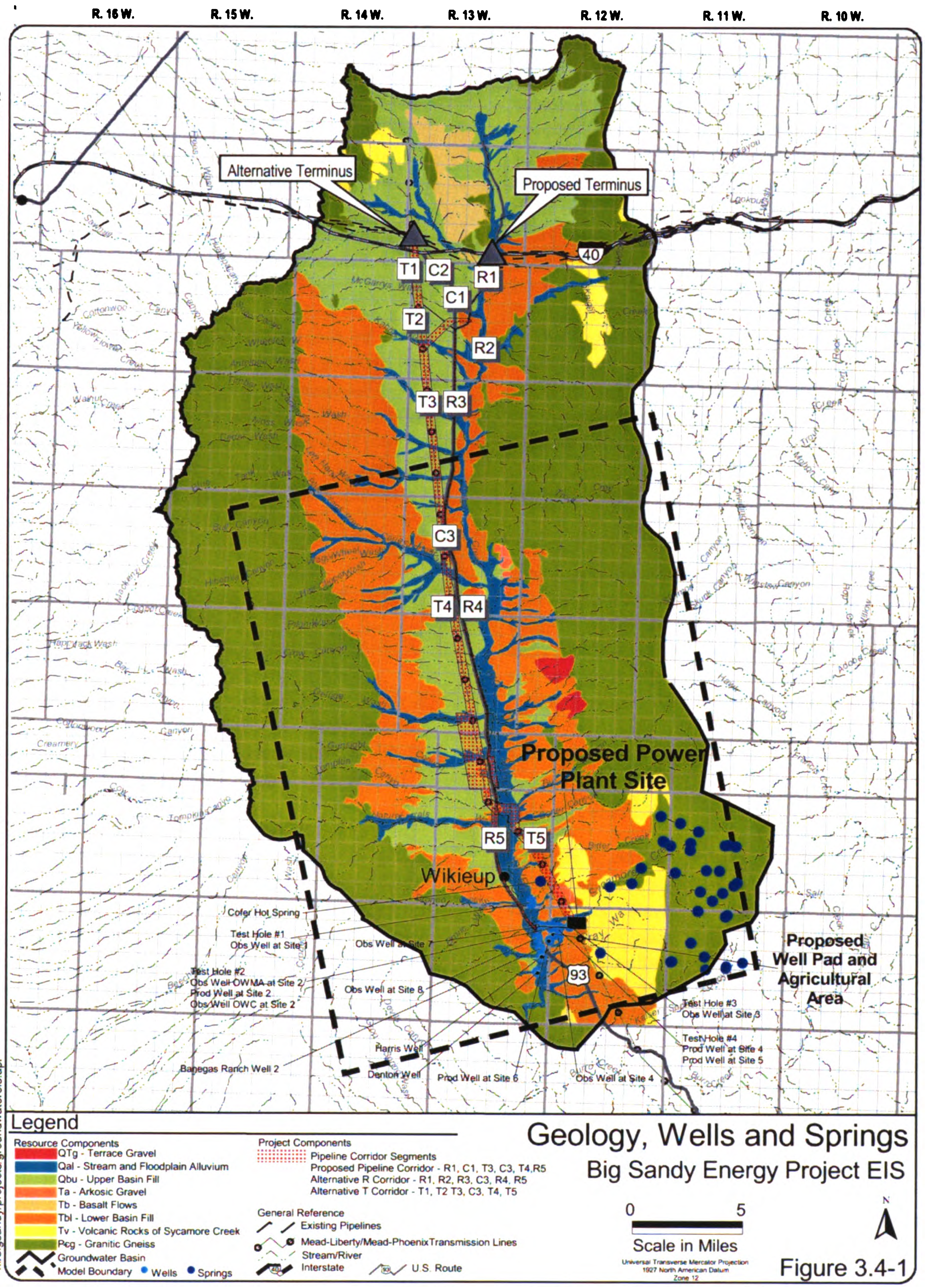

Geology, Wells and Springs
Big Sandy Energy Project EIS

Figure 3.4-1

The mountains that surround the basin are, for the most part, composed of Precambrian granitic and metamorphic rocks. These older, relatively impermeable rocks are overlain by Tertiary volcanic rocks in several locations in the northern part of the basin. Tertiary volcanic rocks crop out in the vicinity of the Aquarius Cliffs and form the southeastern boundary of the basin. These volcanic rocks are believed to represent the surface expression of the volcanic aquifer that would be developed to supply water for the proposed Project (refer to Figure 3.4-1).

The basin-fill sediments consist mainly of alluvial fan and lacustrine deposits, overlain by stream channel and floodplain deposits of the Big Sandy River (Davidson 1973). The basin-fill deposits have been generally subdivided into upper basin fill and lower basin fill, and are further defined in this section, for the southern portion of the basin, in the section titled Hydrogeologic Units.

Groundwater and Surface Water Flow

Groundwater within the Big Sandy basin originates as natural precipitation, which supplies water to the aquifer through recharge in stream channels and along the mountain fronts. A small amount of groundwater enters the basin as groundwater underflow from the Hackberry Sub-Area to the north (Remick 1981). Groundwater flows from the mountains toward the center of the basin, then south parallel to the Big Sandy River (Cady 1981; Davidson 1973; Figure 3.4-2). Depth to groundwater ranges from near ground surface along the lower reaches of the Big Sandy River, to more than 500 feet in the northern part of the basin (Cady 1981). Groundwater exits the basin as subflow in the Big Sandy River alluvium at Granite Gorge, approximately 4 miles south-southeast of the proposed power plant site.

North of Wikieup, the Big Sandy River is ephemeral, flowing only in response to direct precipitation; the river becomes perennial in the vicinity of Wikieup (refer to Figure 3.4-5). This phenomenon may be due to the presence of the lacustrine deposit, or "lakebed clay," which occurs only in the southernmost part of the basin (refer to the section titled "Hydrogeologic Units"). The lacustrine deposit, which functions as an aquitard, may force groundwater to the surface, where it provides base flow to the river. There is anecdotal evidence that perennial flow in the river disappears and becomes subflow in the alluvium south of Banegas Ranch. Perennial flow reappears at a marsh near the southern boundary of the basin, and continues south through Granite Gorge. The non-perennial reach of the Big Sandy River between Banegas Ranch and Granite Gorge has not been formally documented in the field, and may represent an intermittent reach, where the river flows during certain times of the year.

Water Budget

A water budget for the Big Sandy basin was developed to evaluate the relative significance of various sources of groundwater inflow and outflow under current conditions, and to assist in developing a conceptual model of the basin. The water budget is presented in detail in the *Big Sandy Energy Project Groundwater Technical Report* provided in Appendix F, and is summarized in Table 3.4-1.

Sources of Inflow

Sources of inflow (recharge) to the Big Sandy basin can be classified as either incidental recharge or natural recharge. Sources of incidental recharge to the Big Sandy basin include agricultural irrigation, livestock watering, and domestic use. Estimates of incidental recharge for these three sources were obtained from the *Big Sandy 1990 Water Use Report* (U.S. Geological Survey [USGS] 2000). The total estimated annual recharge from agricultural irrigation, livestock watering, and domestic use in 1990 was 112 acre-feet (ac-ft), or 0.4 percent of the total basin inflow. Natural recharge includes mountain front recharge, stream channel recharge, recharge from direct

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TABLE 3.4-1
WATER BUDGET

Water Budget Component	Annual Volume (ac-ft/yr)	Percent of Total Inflow/ Outflow	Source of Data/Comments
Inflow			
Incidental Recharge			Source: Big Sandy 1990 Water Use Report (USGS Web Site).
Agricultural Irrigation	22	0.1	Includes conveyance losses and infiltration.
Livestock Watering	45	0.2	Stock pond infiltration.
Domestic Use	45	0.2	Recharge primarily from septic systems.
Subtotal Incidental Recharge	112	0.4	
Natural Recharge	26,194	99.6	Calculated balance of inflow (assuming no change in storage).
Total Inflow	**26,306**	100.0	
Outflow			
Groundwater Pumpage			Source: Big Sandy 1990 Water Use Report (USGS Web Site).
Agricultural Irrigation	34	0.1	Estimated from electrical power company records.
Livestock Watering	123	0.5	Estimated from electrical power company records.
Domestic Use	101	0.4	Public pumpage from delivery records, private pumpage from gpcd
Mining	2,005	7.6	Phelps Dodge Bagdad Mine, based on mine production.
Subtotal Groundwater Pumpage	2,263	8.6	
Evapotranspiration	18,400	70.0	Davidson 1973, p. 36, based on 4 ft/yr x 4,600 acres (8,500 – 16,300 ac-ft/yr in southern half of basin, based on updated acreages and vegetation types).
Evaporation and Evapotranspiration at Marsh Near Denton Well	3,053	11.6	335 ac vegetation area (USGS Quad. Map)
Cofer Hot Spring Flow	290	1.1	Caithness (2000)
Consumptive Use of Surface Water for Irrigation	300	1.1	Based on the consumptive use and evaporative losses due to agricultural operations at Banegas Ranch.
Outflow at Granite Gorge	2,000	7.6	Outflow may range from 800 ac-ft/yr (Davidson 1973, p. 37) to 3,280 ac-ft/yr (BLM measurement at site B1, segment C, below Granite Gorge)
Total Outflow	**26,306**	100.0	
Change in Storage	**0**		No change in storage, based on analysis of long-term water level data.

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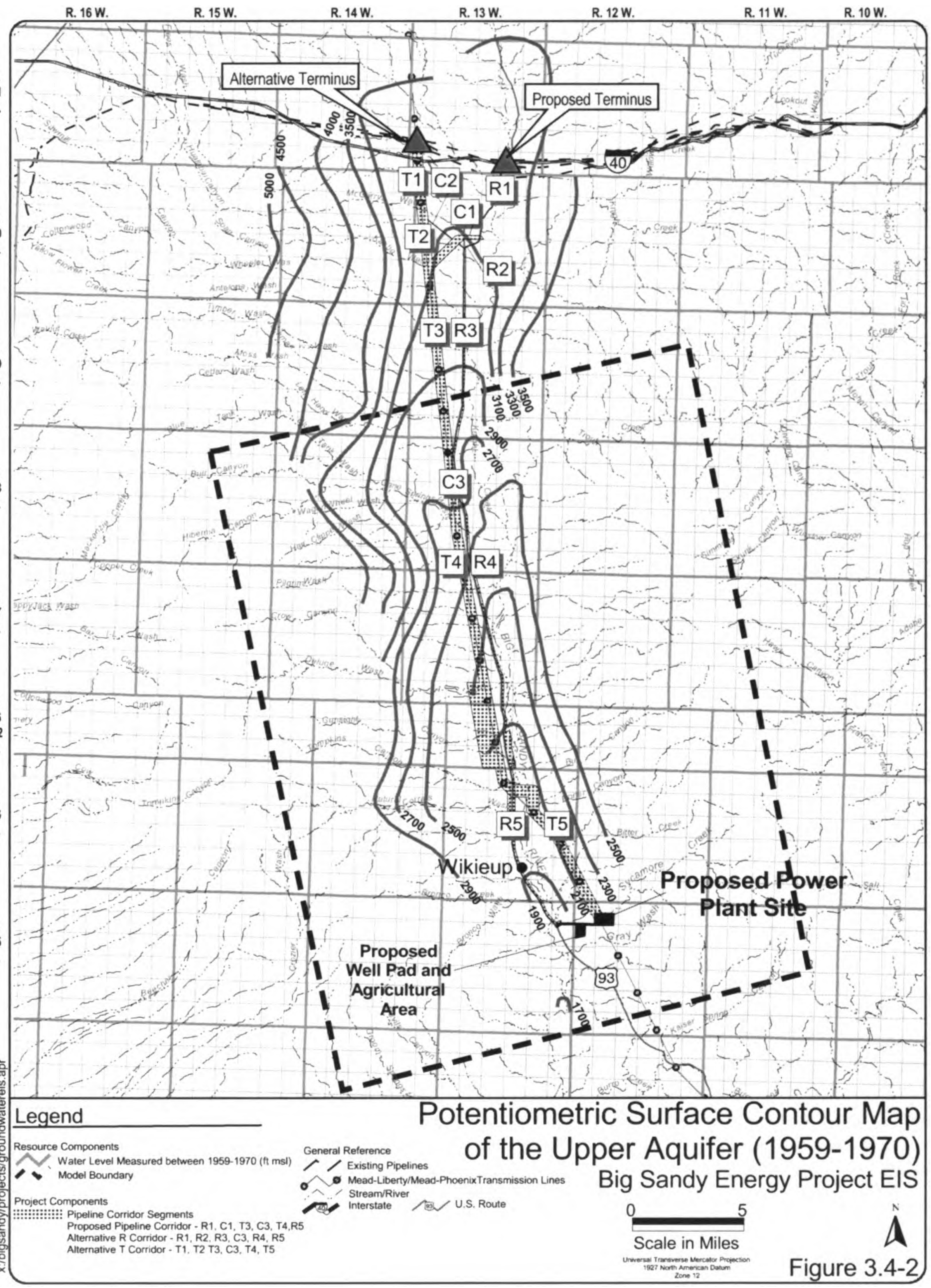

Potentiometric Surface Contour Map of the Upper Aquifer (1959-1970)

Big Sandy Energy Project EIS

Figure 3.4-2

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precipitation, and groundwater underflow from the Hackberry Sub-Area. Natural recharge is difficult to estimate due to the infeasibility of making direct measurements, and the wide range of estimates obtained using various analytical methods (Wilson et al. 1980). Because of this, natural recharge was not estimated using empirical methods, but rather was calculated to balance the water budget, assuming the basin is currently in steady state (inflow = outflow). The calculated value for natural recharge obtained using this approach is 26,194 ac-ft per year (ac-ft/yr), or 99.6 percent of total basin inflow.

Sources of Outflow

Sources of outflow (discharge) include groundwater pumpage, evapotranspiration, evaporation and evapotranspiration at the marsh south of Banegas Ranch, Cofer Hot Spring flow, consumptive use of surface water for irrigation, and outflow at Granite Gorge.

Groundwater pumpage includes pumping for agricultural irrigation, livestock watering, domestic use, and mining. Estimates of groundwater pumpage for these four sources were obtained from the *Big Sandy 1990 Water Use Report* (USGS 2000). The total estimated annual pumpage in 1990 was 2,263 ac-ft, or 8.6 percent of the total basin outflow. Most of the groundwater pumped (2,005 ac-ft) was used to supply water to the Phelps Dodge Bagdad Mine. All of the groundwater currently pumped in the basin is withdrawn from the upper aquifer (refer to the Hydrogeologic Units section below), or from shallow flow systems disconnected from the main valley groundwater flow, with most of the wells located in the floodplain of the Big Sandy River.

Evapotranspiration for this water budget refers solely to water use by riparian vegetation. Areas of dense riparian vegetation occur along the Big Sandy River, Deluge Wash, and Cane Springs Wash. The density of riparian vegetation is greatest along the Big Sandy River, particularly in the vicinity and south of Wikieup. The riparian vegetation is primarily a mix of mesquite and saltcedar, with small amounts of cottonwood.

Evapotranspiration estimates in the water budget developed by Davidson (1973) were updated by obtaining the total riparian acreage from a geographic information system (GIS) land use cover, and applying an average consumptive use factor based on the relative percentages of riparian plant types. The loss of water to evapotranspiration is estimated to be 18,400 ac-ft/yr (Davidson 1973, p. 36), or 70.0 percent of total basin outflow.

The marsh at the southern end of the basin, about 1 mile upstream from Granite Gorge, creates outflow from the basin through evaporation, evapotranspiration and surface flow to the downstream perennial reach of the Big Sandy River. The area of the marsh is estimated to be 335 acres based on the extent of vegetation shown on the USGS quadrangle of the area, then given an evaporation rate of about 95 inches/year (Trauger 1972) and a crop coefficient of 1.12 based on a 50/50 mixture of reed swamp and shallow standing water (FAO website 2001) the calculated outflow at the marsh is 3,053 ac-ft/y or 11.6 percent of the total basin outflow.

The amount of water discharged from Cofer Hot Spring was estimated to be 290 ac-ft/yr, or about 1.1 percent of the total basin outflow.

Surface water for agricultural irrigation is supplied to 53 acres of farmland on the Banegas Ranch from the perennial reach of the Big Sandy River through an upstream diversion structure. The land has been used to grow a 50:50 mixture of alfalfa and bermuda grass and fruit and nut trees. The annual consumptive use of surface water for irrigation at the ranch is estimated to be 300 ac-ft/yr, or 1.1 percent of the total basin outflow. Surface water diversions for other parcels of agricultural land in the basin have not been enumerated because their water consumption is minimal.

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The total volume of water that exits the basin as outflow at Granite Gorge includes groundwater underflow in the river alluvium and surface water flow in the Big Sandy River. The amount of groundwater leaving the Big Sandy basin as underflow at Granite Gorge was estimated by Davidson (1973) to be approximately 800 ac-ft/yr, assuming a hydraulic conductivity of 1,000 ft per day, a saturated cross-sectional area of 9,000 square ft, and a hydraulic gradient of 0.01 feet per foot (ft/ft). Perennial flow in the Big Sandy River at the northern end of Granite Gorge has not been measured. However, the BLM has measured flows in the river about 1 mile downstream of the northern end of the gorge. The average annual flow of the Big Sandy River, based on the BLM measurements, is 3,280 ac-ft/yr. These flow measurements may include storm flows as well as base flow.

The estimated range of outflow at Granite Gorge for the water budget, based on the Big Sandy flow measurements downstream of the gorge and the underflow estimates made by the USGS, was the average value of 2,000 ac-ft/yr , or about 7.6 percent of the basin outflow.

Water Budget Summary

The water budget for the Big Sandy basin is presented in Table 3.4-1. The water budget was balanced assuming that the basin currently is in steady state, and that there is no change in storage. This assumption is supported by water level data from six water level "index wells" measured by ADWR annually. The water level data from these wells, which originate from as early as 1944, show no long-term changes in water level elevations (ADWR 2000).

The principal observations that can be made based on the water budget are as follows:

- The largest source of inflow to the basin is natural recharge.
- The largest source of outflow from the basin is evapotranspiration.
- The water budget presented in this section is for current conditions, and is based on the assumption that the basin is in steady state. Groundwater pumping at the maximum rate to support the Proposed Action (3,000 gpm) would result in a groundwater overdraft of approximately 4,850 ac-ft/yr.

Hydrogeologic Units

Subsurface lithologic data obtained from groundwater exploration drilling on the Project site (Caithness 2000a, 2000b), and from earlier uranium exploration drilling by the U.S. Department of Energy (DOE) (Lease 1981), indicate that there are five hydrogeologic units in the southernmost part of the Big Sandy basin. In ascending order, these five units are as follows:

- arkosic gravel unit
- volcanic lower aquifer, which is confined by an overlying aquitard and is under a substantial amount of artesian pressure
- middle aquifer composed of conglomerate (lower basin fill) and which is also confined
- lacustrine deposit (also known as the "lakebed clay" portion of the lower basin fill) which serves as an aquitard to the middle aquifer
- upper aquifer (upper basin fill) which includes the recent alluvial deposits of the Big Sandy River

Detailed lithologic descriptions of these units are provided by the lithologic logs in the geology and water resources reports submitted by Caithness (2000a, 2000b).

Although almost all of the subsurface data are concentrated in the vicinity of the proposed power plant site, the areal extents of these units were extrapolated using subsurface lithologic data from six deep exploration wells logged by

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DOE (Lease 1981). Figure 3.4-3 shows the estimated areal extent of the lacustrine deposit and the volcanic lower aquifer. The spatial relationships among the five hydrogeologic units and the granitic bedrock are depicted on Figure 3.4-4, and are further depicted and discussed in the groundwater technical report in Appendix F (URS 2001).

The water-bearing portion of the upper aquifer forms a narrow band along the floodplain of the Big Sandy River and spans the entire length of the basin (refer to Figure 3.4-1). The lacustrine deposit crops out along the banks of the Big Sandy River in the southernmost part of the basin but disappears into the subsurface north of Wikieup, where it is thought to grade into coarser-grained basin-fill deposits (refer to Figure 3.4-1). The middle aquifer probably grades laterally into other units throughout the basin.

The areal extent and thickness of the lower aquifer are not known, although estimates of its extent and thickness have been made through evaluation of subsurface data. This volcanic unit is connected to the volcanic mass that composes the southern portion of the Aquarius Cliffs, which appears to be the source of the volcanic material and is restricted to the southernmost portion of the Big Sandy basin (refer to Figure 3.4-1). The arkosic gravel is also not well-defined due to a lack of subsurface data, but is believed to be present beneath most of the lower aquifer.

Groundwater Quality

Groundwater in the upper aquifer and spring water within the Big Sandy basin generally are of good chemical quality, based on data published by ADWR (Cady 1981). Although total dissolved solids (TDS) concentrations in water samples from wells and springs range from approximately 280 to as high as 1,800 milligrams per liter (mg/L), TDS concentrations in almost all wells in the basin are less than 500 mg/L.

Fluoride concentrations in water samples from upper aquifer wells and springs range from approximately 0.2 to 20.0 mg/L; however, most fluoride concentrations are less than the Arizona numeric aquifer water quality standard (AWQS) of 4.0 mg/L. With the exception of fluoride, there are no known chemical constituents present at concentrations above numeric AWQS (Cady 1981).

Groundwater analytical results from well OW4, completed in the lower aquifer, indicate a TDS concentration of 746 mg/L. Concentrations of all chemical constituents, with the exception of arsenic and fluoride, were below numeric AWQS (Caithness 2000b).

Proposed Groundwater Development

Caithness intends to supply water for the power plant and other uses by developing the groundwater resources of the volcanic lower aquifer. Until Caithness began exploring the development potential of this aquifer, its identity as a discrete aquifer had not been recognized and its groundwater production potential was unknown. As of this date, no production wells other than those developed by Caithness have been completed in the lower aquifer.

Caithness has installed one groundwater production well and three observation wells in the lower aquifer, one observation well in the middle aquifer, and three observation wells in the upper aquifer. Current plans call for the installation of three additional production wells in the lower aquifer to provide a maximum of 3,000 gallons per minute (gpm) (4,850 acre-feet per year) to supply the proposed power plant. Well locations in the vicinity of the proposed power plant site are shown on Figure 3.4-5 and are listed in Table 3.4-2.

- One lower aquifer production well completed to date (PW-2) has a shut-in pressure of 39 pounds per square inch (psi), which is equivalent to approximately 100 feet of pressure head.

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TABLE 3.4-2
WELLS IN THE VICINITY OF THE PROPOSED POWER PLANT SITE

Well ID	Well Site	Well Location	Well Type	Aquifer	Depth (ft)	Screened Interval (ft)	Casing Diameter (in)	Water Level (ft bgs)	Flow/ Pressure (gpm/psi)
Upper Aquifer Wells									
OW1	Site 1	(B-16-13) 36ccc	PZ	U	150	20 – 150	5	12	
OW7	Site 7	(B-15-13) 1ccc	PZ	U	190	20 – 190	3	Dry	
OW8	Site 8	(B-15-13) 12caa	PZ	U	150	90 – 150	5	64	
Banegas Well	---	(B-15-13) 13abc	PR	U	105	85 – 105		20	
Harris Well	---	(B-15-13) 13dbb	PR	U	<200	Unknown	8	40	
Denton Well	---	(B-15-13) 24bdd	PR	U	100	Unknown		42	
Salazar Well	---	**(B-16-13) 35dda**	PR	U					
Middle Aquifer Wells									
OWMA2	Site 2	(B-15-12) 7bbb	PZ	M	730	540 - 693	3	85	
Lower Aquifer Wells									
PW2	Site 2	(B-15-12) 7bbb	PR	L	1,500	1,120 - 1,488	20	Flowing	
OW2	Site 2	(B-15-12) 7bbb	PZ	L	1,600				
OW3	Site 3	(B-15-12) 5ccc	PZ	L	1,200	578 - 1,180	12	16	
OW4	Site 4	(B-15-12) 7bdd	PZ	L	1,500	1,070 - 1,500	3	Flowing	125/29
Lower Aquifer Wells (Planned)									
PW4	Site 4	(B-15-12) 7bdd	PR	L	1,600	1,400 - 1,600	20	Flowing	
PW5	Site 5	(B-15-12) 7baa	PR	L	1,500	1,100 - 1,500	20	Flowing	
PW6	Site 6	(B-15-12) 7ccc	PR	L	1,500	1,100 - 1,500	20	Flowing	
Exploration Test Holes									
Test Hole #1	Site 1	(B-16-13) 36cbc	EX	M	700	None	None	Plugged	
Test Hole #2	Site 2	(B-15-12) 7bbb	EX	L	1,155	None	None	Plugged	125/NA
Test Hole #3	Site 3	(B-15-12) 5ccc	EX	M	780	None	None	Plugged	
Test Hole #4	Site 4	(B-15-12) 7bdd	EX	M	1,200	None	None	Plugged	140/NA

U = Upper Aquifer PR = Production Well
M = Middle Aquifer PZ = Piezometer
L = Lower Aquifer EX = Exploration Test Hole
NF = Non-flowing Water Table

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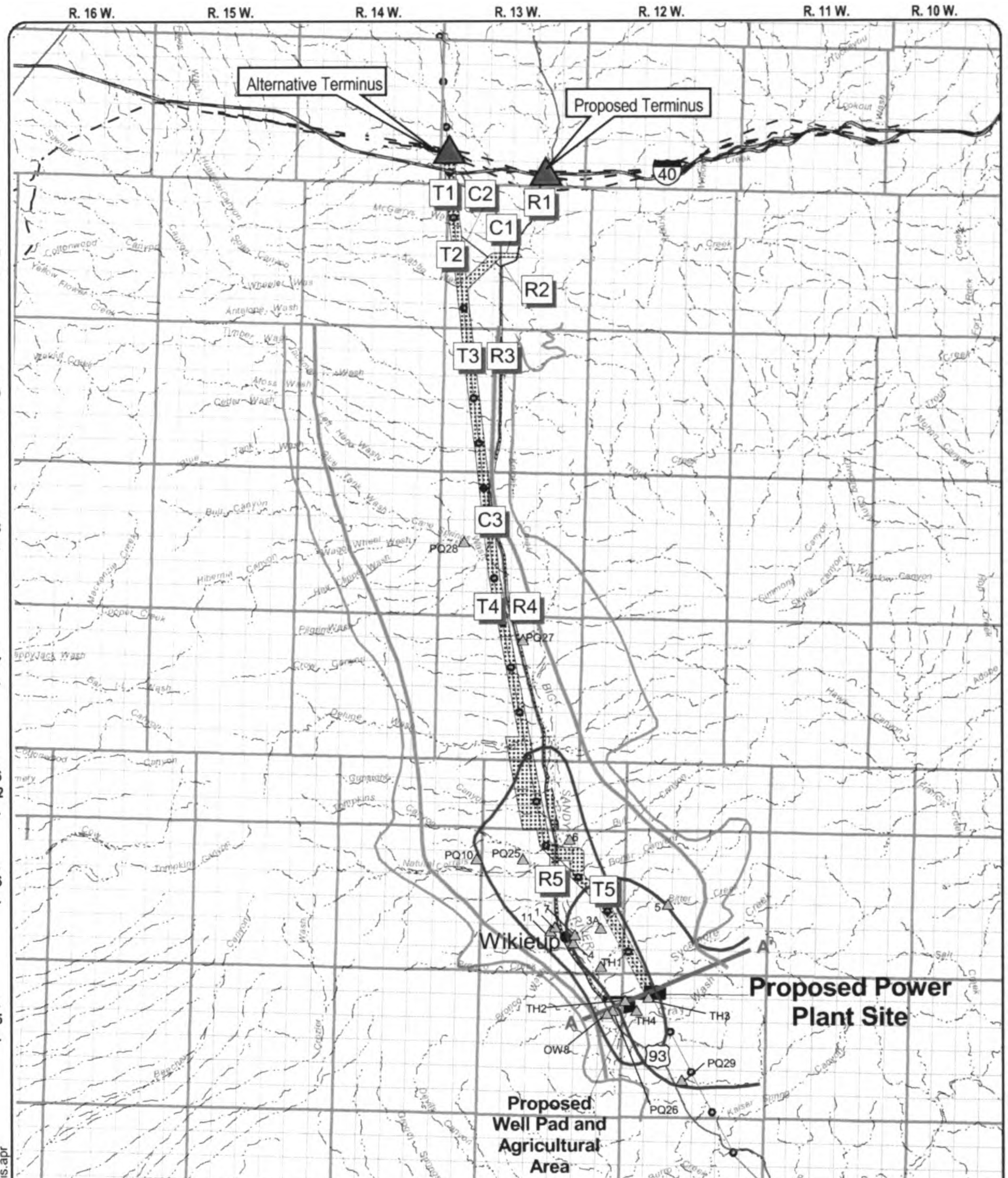

Legend

Resource Components
- A — A' Geologic Cross Section
- Boring
- Lakebed Clays
- Volcanic Aquifer
- Arkosic Gravels
- Model Boundary

Project Components
- Pipeline Corridor Segments
- Proposed Pipeline Corridor - R1, C1, T3, C3, T4,R5
- Alternative R Corridor - R1, R2, R3, C3, R4, R5
- Alternative T Corridor - T1, T2 T3, C3, T4, T5

General Reference
- Existing Pipelines
- Mead-Liberty/Mead-Phoenix Transmission Lines
- Stream/River
- Interstate
- U.S. Route

Extent of Geologic Units and Cross Section Locations

Big Sandy Energy Project EIS

0 — 5 Scale in Miles

Universal Transverse Mercator Projection
1927 North American Datum
Zone 12

N

Figure 3.4-3

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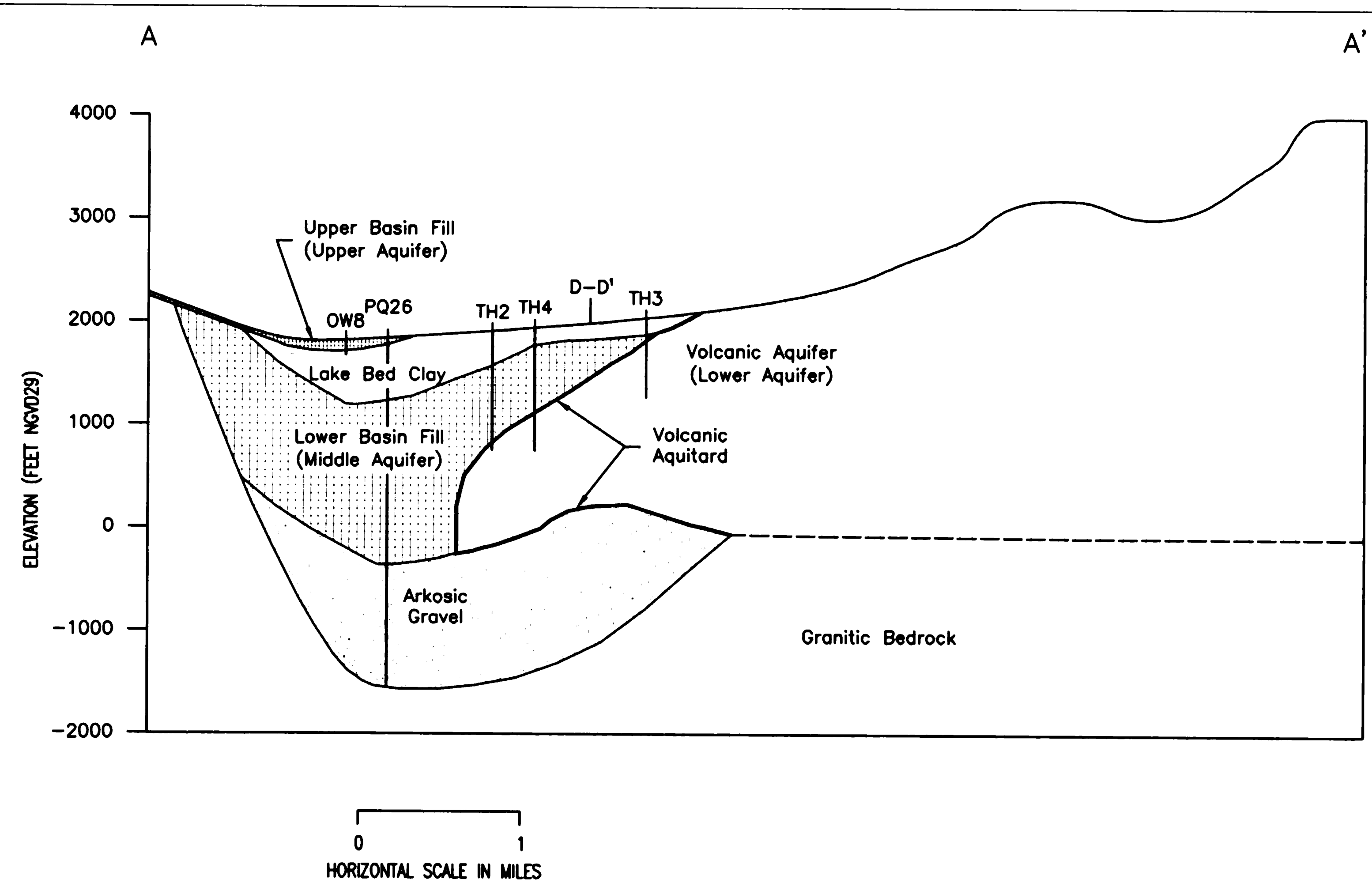

Geologic Cross Section
A - A'

Big Sandy Energy Project EIS

Figure 3.4-4

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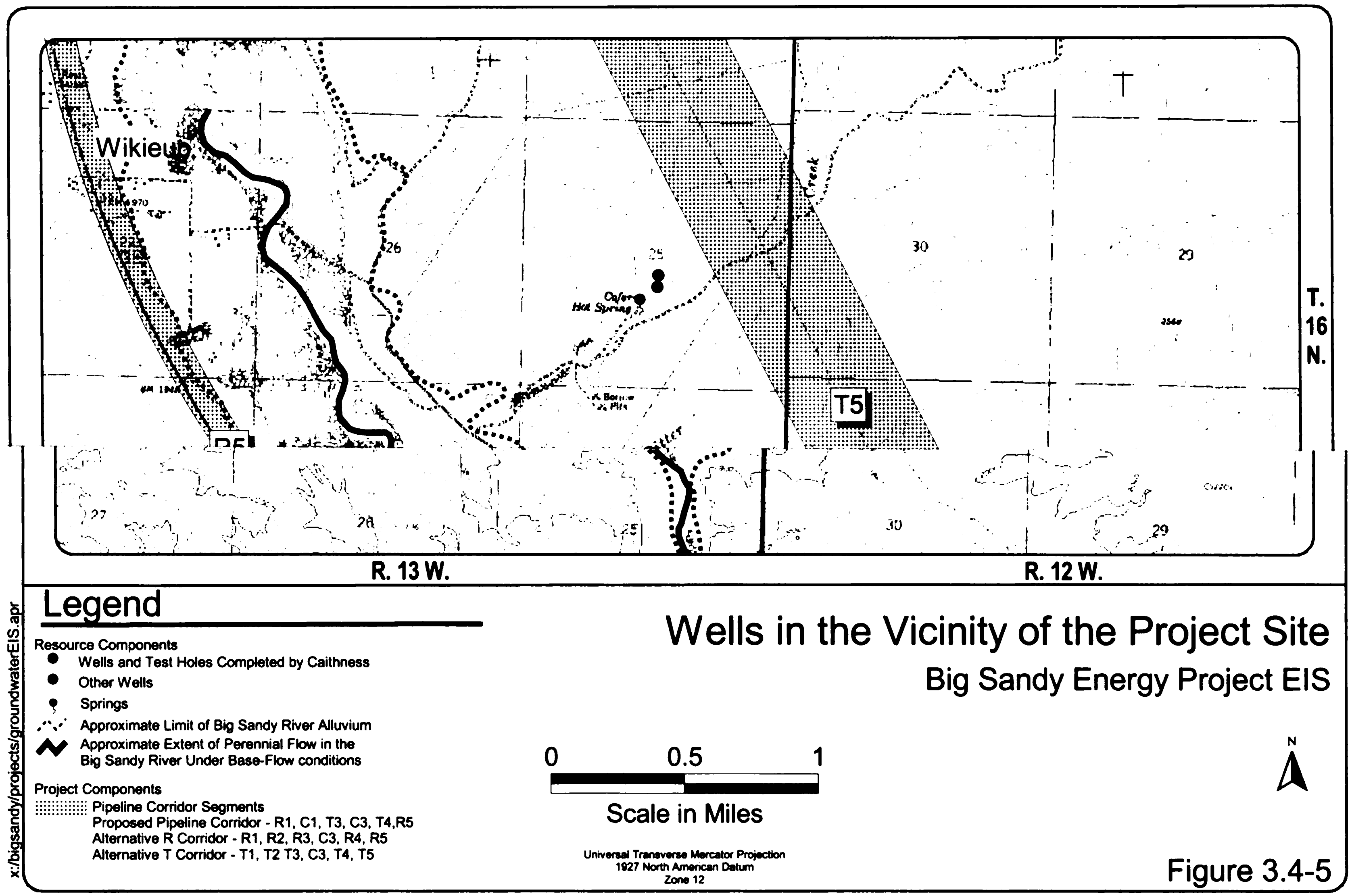

Wells in the Vicinity of the Project Site

Big Sandy Energy Project EIS

Figure 3.4-5

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The well flows artesian at 760 gpm, and is capable of producing groundwater at approximately 2,100 gpm. Available information suggests that the lower aquifer is at least 500 feet thick in the vicinity of the proposed power plant site (Caithness 2000) and has an estimated areal extent of 25 to 80 square miles (Appendix D).

3.4.2 Environmental Consequences

The following sections outline the environmental issues related to groundwater, significance criteria used to assess impacts, and methodology and conclusions of the impact assessment. Also described are various mitigation measures that may be considered if ongoing groundwater level monitoring indicates that groundwater pumping to supply the Project is significantly impacting groundwater levels in the upper aquifer, or the quantity of water discharged from springs.

3.4.2.1 Identification of Issues

The following is a list of identified issues that relate to groundwater. These identified issues form the basis for the assessment of potential impacts:

- Potential impacts on groundwater levels in the upper aquifer sufficient to impact users of groundwater in the upper aquifer.
- Potential impacts on groundwater levels in the upper aquifer sufficient to impact surface water flow in the Big Sandy River (also refer to Section 3.5).
- Potential impacts on the quantity of water discharged from springs and seeps.

Potential impacts on groundwater quality due to discharge of pollutants to the vadose zone from the evaporation pond or any other activities related to the Proposed Action.

3.4.2.2 Significance Criteria

Listed below are the significance criteria that have been established for the identified issues. Impacts would be considered significant if they would result in the following:

- Groundwater pumping of the lower aquifer to supply the Project would result in additional drawdown greater than 10 feet over any 5-year period in a neighboring well of record in the upper aquifer. The significance of 10 feet over 5 years is based on ADWR well spacing requirements.
- Groundwater pumping of the lower aquifer to supply the Project would result in any reduction of surface water flows in the Big Sandy River (also refer to Section 3.5, Surface Water).
- Groundwater pumping of the lower aquifer to supply the Project would result in any reduction in the quantity of water discharged from springs and seeps.
- Discharge of pollutants to the vadose zone from the evaporation pond or any other activities related to the Proposed Action would result in substantial degradation of groundwater quality.

3.4.2.3 Impact Assessment Methods

The impact assessment methods for this Project were developed by the Big Sandy EIS hydrology team (see inset). An effort was made to achieve consensus among the team members during the development of the impact assessment methods and at every ensuing stage of the Project.

The following tasks were performed to assess potential impacts on groundwater resources within the region of influence:

- Data Compilation and Evaluation – Available information was compiled and evaluated related to the hydrogeology and

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groundwater resources of the Big Sandy basin, with emphasis on the southern portion of the basin and the proposed groundwater production wellfield. This task included review of all relevant reports prepared by the proponent and its consultants. The objectives of this task were to independently evaluate and verify the accuracy and comprehensiveness of information provided by the proponent, and, where necessary, supplement this information. As part of this process, numerous meetings and conference calls were held among the various Project participants to discuss the ongoing data evaluation, field activities, and groundwater modeling.

- Aquifer Testing – An 11-day, constant-discharge aquifer test of one of the planned groundwater production wells (PW2) was performed by Caithness to obtain data on the hydraulic properties and sustainable yield of the lower aquifer, and to observe any impacts on groundwater levels in wells completed in the upper and middle aquifers. Aquifer test methods and preliminary results are described in the Caithness water resources report (Caithness 2000). Aquifer test data and results are discussed in detail in a subsequent report based on an independent review of the data (David Schafer & Associates 2000). A copy of this independent report is provided in Appendix D. Aquifer test methods and results are summarized in this section.

- Stable Isotope Sampling and Analysis – Twelve samples of groundwater and spring water were collected from various sources and analyzed for stable isotopes of oxygen and hydrogen. Stable isotope sampling and analysis methods and results are summarized in this section, and are described in detail in two URS technical memoranda provided in Appendix E (URS 2000a; 2000b).

Big Sandy EIS Hydrology Team

The Big Sandy EIS hydrology team was an ad hoc working group of hydrologists and other resource specialists that was assembled at the beginning of the Project at the direction of BLM and Western. The team consisted of representatives from the various cooperating agencies and their consultants, as well as from Caithness and its consultants. The team included participants from BLM, Western, USFWS, ADWR, the Hualapai Tribe, URS Corporation, David Schafer & Associates, Caithness, Greystone Consultants, and Manera, Inc.

The purpose of the hydrology team was to provide peer review of ongoing work by Caithness, and to develop a scope of work and provide peer review for the impact assessment. This process consisted of an initial team meeting in July 2000, during which the proposed impact assessment methods were developed, followed by numerous conference calls over the following eight months to review the progress at various stages.

The hydrology team initially Caithness' proposed plan for the 11-day aquifer test, then reviewed the aquifer test results and report. The team reviewed the approach proposed for isotope sampling and analysis, and the results of the study. The team also developed an overall approach for the development of the groundwater flow model, then reviewed the results of the model analysis throughout the modeling process. An effort was made to achieve consensus among the team members during the review of Caithness' scope of work, development of the impact assessment methods, and analysis of the data.

- Groundwater Modeling – A groundwater flow model of the southern portion of the Big Sandy basin was developed as part of the groundwater resources assessment. The purpose of the modeling effort was to create an understandable and technically sound groundwater flow model adequate for use in evaluating the long-term potential impact of the proposed Project on the groundwater and surface water resources of the Big Sandy basin. The USGS model MODFLOW, as embedded in Visual MODFLOW®, was used for the analysis. The groundwater flow

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model is described in detail in the groundwater technical report in Appendix F (URS 2001), and is summarized in this section. The results of the model analysis are presented as part of the impact assessment (Section 3.4.2.5).

- Impact Assessment – The groundwater modeling results were used to assess potential direct, indirect, and cumulative impacts on groundwater levels in the upper and middle aquifers, and on the quantity of water discharged from springs and seeps. The proposed evaporation ponds and other potentially discharging activities were reviewed to assess the potential impacts on groundwater quality. Particular consideration was given to the identified issues, and the significance criteria described in Section 3.4.2.2 were used to assess whether significant impacts potentially could occur.

Aquifer Testing

An 11-day, constant-discharge aquifer test was performed on production well PW2 to characterize the hydraulic properties of the aquifer, assess its suitability as a source of water for the proposed power plant, and evaluate the hydraulic connection between the lower, middle, and upper aquifers. The results of the test were used to assist in the development of the groundwater flow model. The test was designed and conducted by Caithness, with the concurrence of the EIS hydrology team.

A detailed description of the aquifer test, and an initial evaluation of the aquifer test data, were included in the Caithness water resources report (Caithness 2000b). A complete analysis of the data was performed by David Schafer & Associates and was presented in a subsequent report (David Schafer & Associates 2000; Appendix D).

Aquifer testing initially consisted of a step-drawdown test. The test was performed at four discrete pumping rates, beginning with the artesian flow rate of 760 gpm, and followed by increasing flow rates of 1,204, 1,800, and 2,100 gpm, respectively. Based on the results of the step-discharge test, a pumping rate of 2,000 gpm was selected for the constant-discharge test.

The constant-discharge aquifer test was initiated on September 11, 2000, and continued for approximately 11 days. The initial pumping rate of 2,000 gpm declined to about 1,950 gpm by the end of the test, for an average pumping rate of 1,960 gpm. After cessation of pumping, water level recovery was monitored for approximately 10 days.

Water levels were measured in the pumping well (PW2) and the three lower aquifer observation wells (OW2, OW3, and OW4). Water levels also were measured in the middle aquifer observation well (OWMA2), and five wells completed in the upper aquifer (OW1, OW7, OW8, Banegas, and Harris). Well locations are shown on Figure 3.4-5.

The results of the constant-discharge test are summarized as follows:

- The water level in the pumping well declined 150.2 feet during pumping, and recovered to within 95 percent of static conditions within the first few minutes of recovery.

- Total drawdowns in the three lower aquifer observation wells were similar, ranging from 7.3 feet in the nearest well (OW2) to 6.8 feet in the most distant well (OW3).

- All three lower aquifer observation wells recovered slowly during the recovery period, and never recovered to more than 85 percent of static conditions during the 10-day recovery period.

- No changes were measured in the water levels in the middle and upper aquifer

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observation wells in response to pumping of the lower aquifer during the test.

- There was a measurable decrease in the flow rate of Cofer Hot Spring during the test, indicating that this spring is hydraulically connected to the lower aquifer.

The following conclusions were drawn from the analysis of the constant-discharge aquifer test data (David Schafer & Associates 2000):

- The aquifer response to pumping exhibited the characteristics of both a porous medium and a fractured rock aquifer.
- The aquifer response was consistent with either a highly transmissive, porous medium, or a fractured aquifer with highly transmissive fractures and moderately transmissive blocks.
- Most of the pumping response reflected the effects of aquifer boundaries.
- The hydraulic response suggests an aquifer with an area of about 25 to 80 square miles.
- Linear drawdown response during pumping indicated that the cone of depression was fully developed throughout the extent of the aquifer.
- The data suggest that the lower aquifer is hydraulically separated from the middle and upper aquifers.
- The data suggest that if the arkosic gravel is laterally extensive, it is hydraulically separated from the lower aquifer.
- The aquifer test results are limited in that it was not feasible to run the test for a length of time sufficient to simulate operating conditions. In spite of this limitation, the aquifer test was critical in providing estimates of aquifer transmissivity and storativity for the groundwater flow model, confirming the extent of the volcanic aquifer, and refining the conceptual model of the southern portion of the Big Sandy basin.

Stable Isotope Sampling and Analysis

As part of the groundwater resource evaluation, samples of groundwater and spring water were collected from various sources and analyzed for stable isotopes of oxygen and hydrogen. The objectives of stable isotope sampling and analysis were to accomplish the following:

- assess the source(s) of recharge to the lower aquifer
- evaluate whether the upper, middle, and lower aquifers have distinct isotopic signatures, and are thus hydraulically disconnected

The stable isotopic composition of water (surface water or groundwater) depends on the characteristics of the water's source area and the effects of physical processes such as evaporation and mixing with other waters. If the aquifers in the Big Sandy basin (upper, middle, and lower) have different recharge sources and are hydraulically disconnected, it is conceivable that they would have different stable isotopic compositions. In addition, stable isotopes can be used to identify the recharge area for an aquifer. The information gained from stable isotope analysis was valuable to the assessment of impacts on groundwater resources because it contributed to the understanding of the basin hydrogeology and assisted in the development of the conceptual groundwater model.

Sample Locations

Groundwater samples were collected from five wells, including two upper aquifer wells (OW-7 and OW-8), one middle aquifer well (OWMA-2), and two lower aquifer wells (PW-2 and OW-4). Samples also were collected from Cofer Hot Spring, a seep along Sycamore Creek, three

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springs in the Aquarius Cliffs (Arrowweed, Deer, and Halo), and two springs in the Hualapai Mountains (Wild Cow and Chappo). Thus, a total of five groundwater samples and seven spring water samples were collected and analyzed for oxygen and hydrogen stable isotopes.

Results and Conclusions

Complete results of stable isotope sampling and analysis, including data and graphs, are presented in two technical memoranda provided in Appendix E (URS 2000a; 2000b).

The primary conclusions drawn from the analysis are as follows:

- The Aquarius Cliffs to the east of the proposed power plant site are likely the primary recharge source to the lower aquifer. This conclusion was made based on the similar stable isotopic compositions of the lower aquifer groundwater samples and the samples collected from springs located in the Aquarius Cliffs. This conclusion also was supported by the dissimilar isotopic compositions of the lower aquifer groundwater samples and those collected from springs located in the Hualapai Mountains.

- The upper, middle, and lower aquifers generally have distinguishable stable isotopic compositions. This suggests that they may have distinguishable recharge sources and supports conclusions made from test hole drilling and aquifer testing that the aquifers are hydraulically disconnected.

- The lower aquifer is the source for Cofer Hot Spring. This conclusion was made based on similar stable isotopic compositions of the lower aquifer groundwater samples and Cofer Hot Spring, and supports findings from aquifer testing.

Groundwater Modeling

A groundwater flow model of the southern portion of the Big Sandy basin was developed to provide a technically defensible tool for use in evaluating the long-term potential impacts of the Proposed Action on the groundwater and surface water resources of the Big Sandy basin. The groundwater flow model was based on the conceptual model of the area developed during the data evaluation, and was constructed using the USGS model MODFLOW, as embedded in Visual MODFLOW®.

The groundwater flow model was developed by URS with the concurrence of the EIS hydrology team. A detailed description of the model, including development, calibration, sensitivity analyses, and results of model simulations, is provided in the groundwater technical report in Appendix F (URS 2001). The groundwater model in summarized in this section.

Model Development

A three-dimensional, finite-difference groundwater flow model was constructed to represent the pumping and potentially impacted layers. The model domain encompasses the southern half of the Big Sandy basin as far south as Granite Gorge, and is defined on the east and west by the granite outcrops. The model domain extends from ground surface to the deepest part of the basin fill, 5,000 feet below ground surface.

The geology was simplified into the following seven-layer framework:

- upper basin fill (upper aquifer)

- lakebed clay (lacustrine deposit)

- lower basin fill (middle aquifer)

- aquitard above the volcanic aquifer

- volcanic (lower) aquifer

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- aquitard below the volcanic aquifer
- arkosic gravel

The layers all overlie essentially impermeable granitic bedrock.

The model domain and boundary conditions are shown on Figure 3.4-6. The model grid consists of 62 columns, 85 rows, and seven layers, and covers an area of about 466 square miles. Recharge is distributed along the mountain fronts, and as infiltration in the permeable volcanic outcrops of the Aquarius Cliffs (Figure 3.4-7). Evapotranspiration was distributed by vegetation type along the Big Sandy River, with an assumed extinction depth of 50 feet; the locations of the pumping wells are those proposed by Caithness (Figure 3.4-8). The model boundary conditions include the following:

- no-flow boundaries at the margins of the basin and either side of Granite Gorge
- constant-head boundary at the northern edge of the model representing inflow of recharge from the northern part of the valley
- wall boundary around the outside edge of the volcanic aquifer to maintain artesian pressures in the aquifer
- drain at Cofer Hot Spring representing connection via a fault to the volcanic aquifer
- general head boundary at the marsh near the Denton well representing evaporative losses to surface water and groundwater
- general head boundary at Granite Gorge representing subsurface outflow via the gorge.

The following three additional simplifying assumptions were used in the model analysis:

- An aquitard exists as a skin around the volcanic aquifer. This assumption is consistent with the aquitard and artesian heads observed in the wells, and with the results of the aquifer test which indicate that the volcanic aquifer is hydraulically isolated from the middle and upper aquifers.
- The volcanic aquifer was assumed to be a uniform porous medium. This assumption was tested by analyzing long-term pumping data using both a porous medium model and a block and fracture model. The results of the analyses were almost identical.
- A uniform pumping rate was applied at the four proposed pumping well locations.

Model Calibration

Model calibration typically consists of the following steps:

- specify calibration criteria and protocol
- modify model assumptions and/or uncertain input data to obtain a realistic simulation
- evaluate the model predictions versus observations
- examine "calibrated" model output and evaluate the results

Steady State Calibration

The model was first calibrated to steady state conditions, followed by transient calibration. Steady state calibration was achieved by varying the hydraulic conductivities of the hydrogeologic units within reported ranges, and varying the infiltration rates such that the sum of the recharge was equivalent to about 5 percent of the precipitation rate, in a set of more than 50 test calculations. The mean error between predicted and observed heads was used to assess each subsequent run, and the best calibrated run

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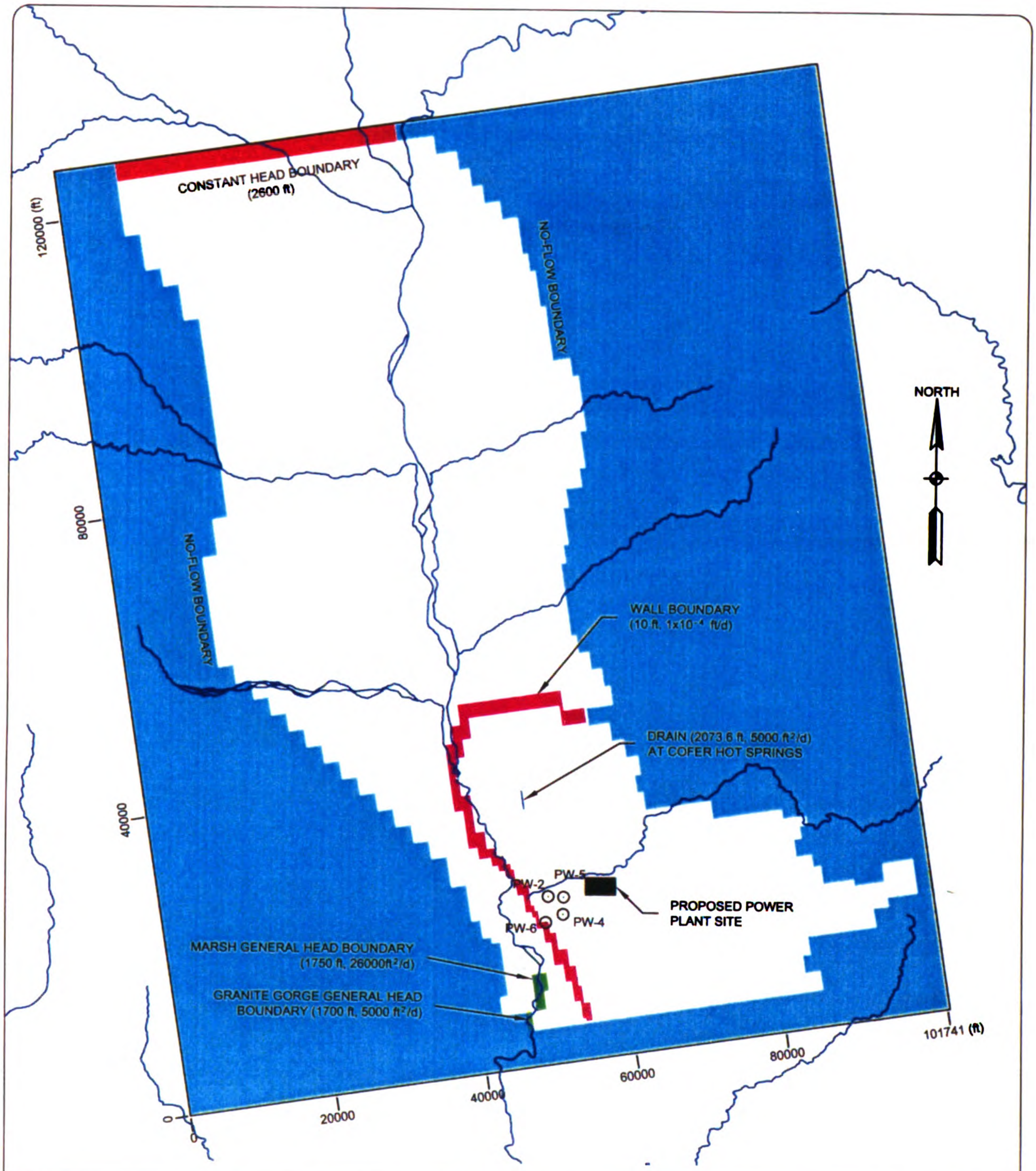

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Model Domain and Boundary Conditions

0 2 4
Scale in Miles

Big Sandy Energy Project EIS

Figure 3.4-6

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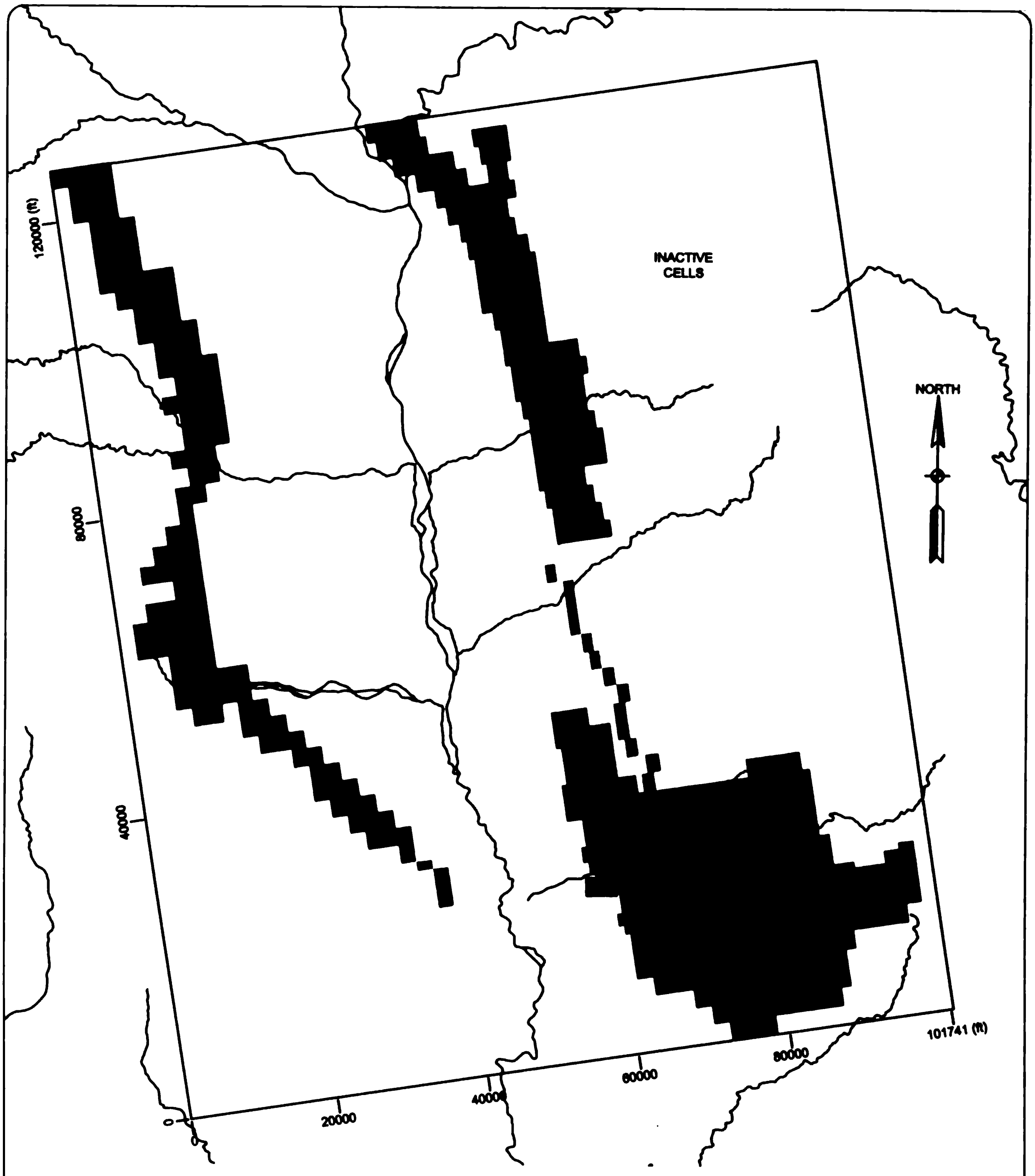

Legend

Recharge Rate

1.35 inches/year
(in Volcanic Aquifer Outcrop)

7.7 inches/year
(Mountain front recharge)

0 2 4
Scale in Miles

Distribution of Recharge

Big Sandy Energy Project EIS

Figure 3.4-7

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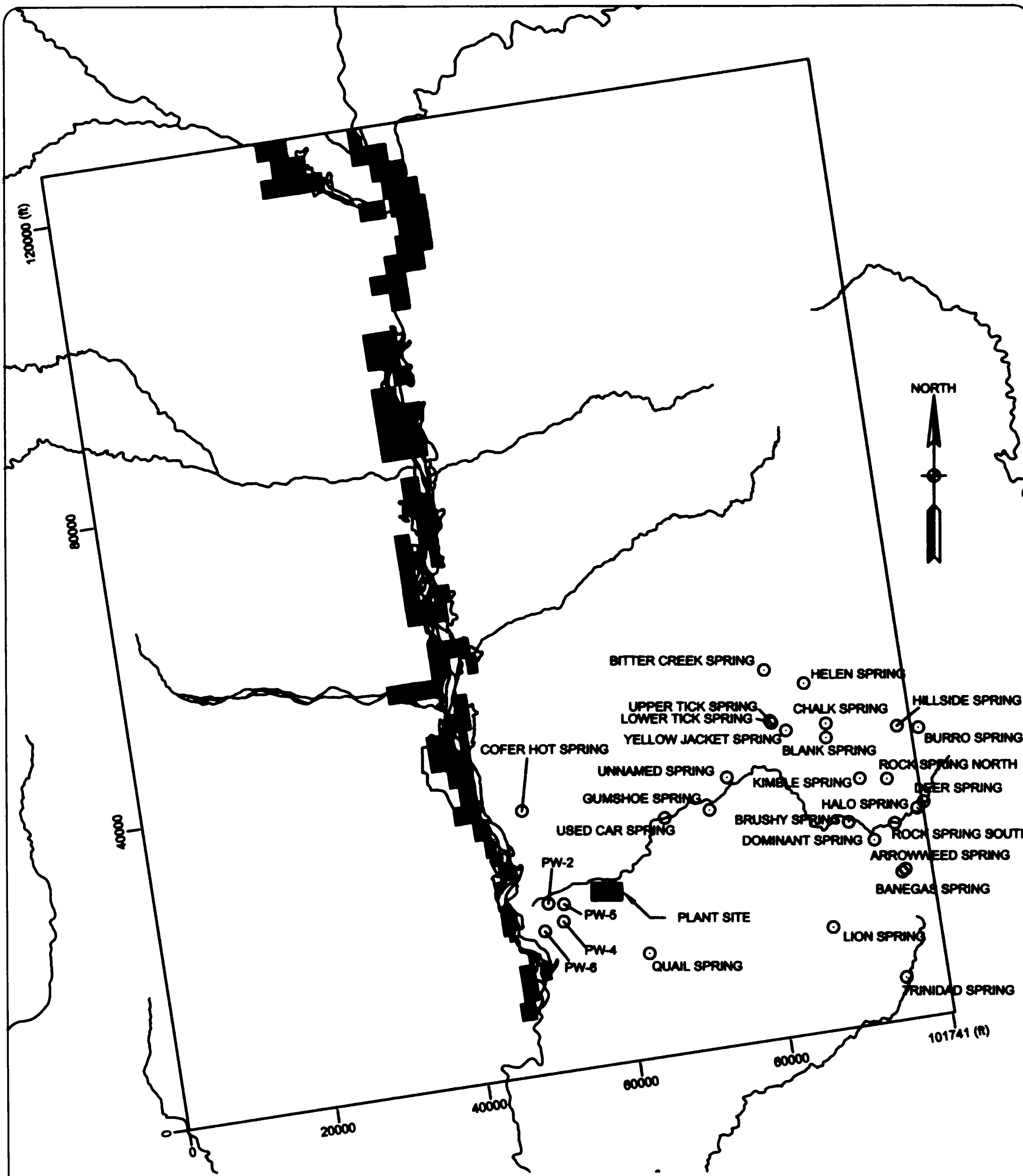

Legend

Evapotranspiration

Mesquite

Salt Cedar

Cottonwood

0 2 4

Scale in Miles

Distribution of Evapotranspiration, Springs, and Pumping Wells

Big Sandy Energy Project EIS

Figure 3.4-8

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was selected to be the model run that accomplished the following:

- minimized the mean error between predicted and observed heads
- matched reasonably well the expected flow rates through the Granite
- matched observed vertical hydraulic gradients between the three aquifers near the proposed power plant site
- satisfied the calibration criterion of normalized root mean square error less than 10 percent
- was well balanced and conserved mass

The steady state calibrated model yielded flow rates and head values that matched observed values reasonably well.

Transient Calibration

The transient calibration was performed using the data from the constant-discharge aquifer test. Due to the observed responses of the lower aquifer observation wells during the test, the following three methods of representing the lower aquifer were tested:

- uniform conductivity, confined aquifer
- uniform conductivity, confined/unconfined aquifer
- fracture and block model

A one-layer model subset of the Big Sandy model was used for the analysis. The seven-layer model was then applied to verify the conclusions. The results of the analysis indicated the following:

- The fracture and block model gives the best match to observed drawdowns at the wells distant from the pumping center.
- The drawdown at the pumping well is best matched by the confined/unconfined model, but not adequately matched by any model.

Based on these results, the uniform conductivity model was used in the basin model, and the fracture and block model was used in the single-layer model, to evaluate long-term pumping. The predicted drawdowns from the two models were nearly identical, suggesting that either approach could be used in the full-scale basin model. Since the uniform hydraulic conductivity model required fewer model cells without loss of accuracy, this approach was chosen for the remaining model runs.

Sensitivity Analyses

Sensitivity analyses were conducted to evaluate the following:

- if alternate conclusions about impacts could be drawn from an alternate, equally valid model
- which of the uncertain model parameters are the most sensitive
- the range of results considering uncertain parameters
- likely accuracy of model results

The following uncertain input parameters key to the analysis of impacts were identified in hydrology team meetings:

- aquitard hydraulic properties
- specific yield of the volcanic aquifer
- extent of the volcanic aquifer near Granite Gorge

In addition, three other parameters were tested that were found to affect predicted impacts:

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- The effect of assuming different lateral extents of the lakebed clay was assessed. It was found that reducing the lateral width of the lakebed clay in the model resulted in decreasing the predicted hydraulic gradient between the middle and upper aquifers, causing a mismatch with observed heads.

- The effect of different recharge rates into the volcanic aquifer (1.35 to 1.85 in/yr) was tested in conjunction with the aquitard hydraulic conductivity tests. It was found that recharge rates greater than 1.6 in/yr led to inaccurate hydraulic gradients between the volcanic and middle aquifers.

- The effect of a three-fold smaller assumed evaporation rate at the marsh was investigated. It was found that this change affected the relative flow rates through the marsh and gorge and the predicted drawdowns resulting from pumping.

The effect of assuming a larger extent of lakebed clay, including the entire area beneath the marsh, was tested. It was found that the predicted drawdowns and reductions in flow rates due to pumping were unchanged as a result.

The results of the sensitivity analyses indicated that extending the aquifer to Granite Gorge, and increasing the hydraulic conductivity of the aquitard to 1×10^{-4} feet per day, produced high error values and therefore were infeasible solutions. The remaining solutions consisted of varying the specific yield from 7 percent, to 11 percent (base case), to 15 percent, and varying the aquitard hydraulic conductivity from 4×10^{-5} ft/d (combined with a higher recharge rate, worst realistic case) to 1×10^{-6} ft/d. Running these five sensitivity cases to simulate the 11-day aquifer test produced drawdown values in the volcanic aquifer ranging from 7.2 to 7.5 feet, which correlate with the drawdowns observed during the test.

Pumping Analysis

Following calibration and sensitivity analyses, the model was used to predict potential impacts of 40 years of pumping at the maximum annual pumping rate of 3,000 gpm (4,850 ac-ft/yr).

Predicted Drawdowns for the Base Case

The results for the base case (specific yield = 11 percent) are shown on Figure 3.4-9 and on Figures 34 through 36 in Appendix F. The predicted drawdowns in the lower aquifer (Figure 34 in Appendix F) show an almost uniform drop in water levels of about 85 feet (refer ahead to Figure 3.4-11). In the middle aquifer (Figure 35 in Appendix F), a small zone of less than 4 feet of drawdown is predicted as a result of 40 years of pumping. This zone is centered above the pumping area and extends outward in areas where the lakebed clay thins. In the upper aquifer (Figure 36 in Appendix F), a small area of less than 0.5 foot of drawdown is predicted as a result of 40 years of pumping. This area is shown in detail on Figure 3.4-9. The predicted area of potential drawdown extends along the Big Sandy River from south of the US 93 bridge to Granite Gorge, and is greatest in the vicinity of the Denton well.

Predicted Drawdowns for the Worst Realistic Case

The case where aquitard hydraulic conductivity is 4×10^{-5} ft/d represents the worst realistic case for predicted impacts, because this case leads to the greatest predicted drawdowns in the middle and upper aquifers. Predicted drawdowns for this case are shown on Figure 3.4-10 and on Figures 37 through 39 in Appendix F. The predicted drawdowns in the lower aquifer (Figure 37 in Appendix F) show an almost uniform drop in water levels of about 85 feet. In the middle aquifer (Figure 38 in Appendix F), a small zone of approximately 12 ft of drawdown is predicted as a result of 40 years of pumping. This zone is centered above the pumping area and is greatest in the vicinity of Cofer Hot

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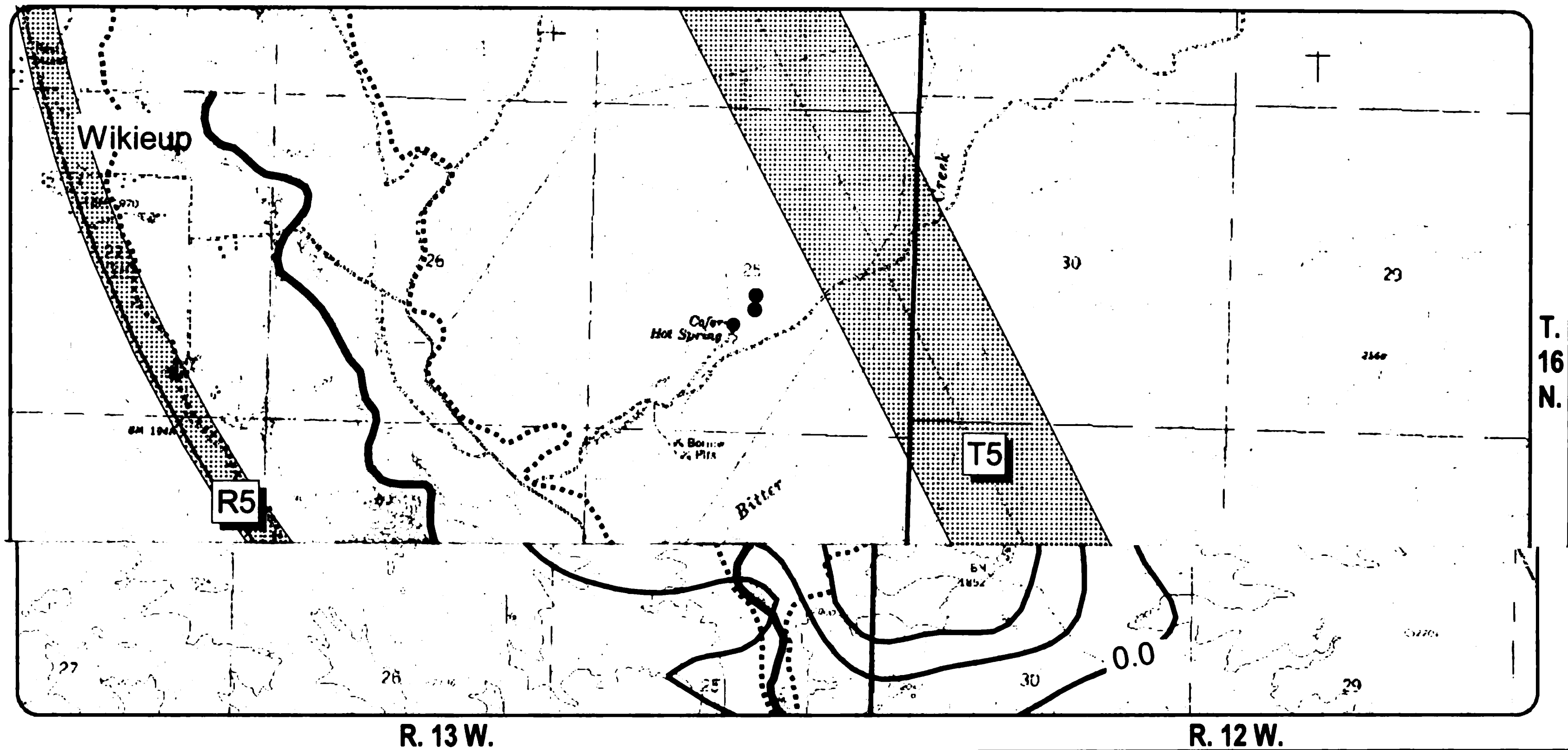

Legend

- Wells and Test Holes Completed by Caithness
- Other Wells
- Springs
- Approximate Limit of Big Sandy River Alluvium
- Predicted Drawdown in Feet
- Approximate Extent of Perennial Flow in the Big Sandy River Under Base-Flow conditions

Project Components
- Pipeline Corridor Segments
  - Proposed Pipeline Corridor - R1, C1, T3, C3, T4,R5
  - Alternative R Corridor - R1, R2, R3, C3, R4, R5
  - Alternative T Corridor - T1, T2 T3, C3, T4, T5

Predicted Drawdown in the Upper Aquifer After 40 Years of Pumping (Base Case)

Big Sandy Energy Project EIS

0 0.5 1

Scale in Miles

Universal Transverse Mercator Projection
1927 North American Datum
Zone 12

N

Figure 3.4-9

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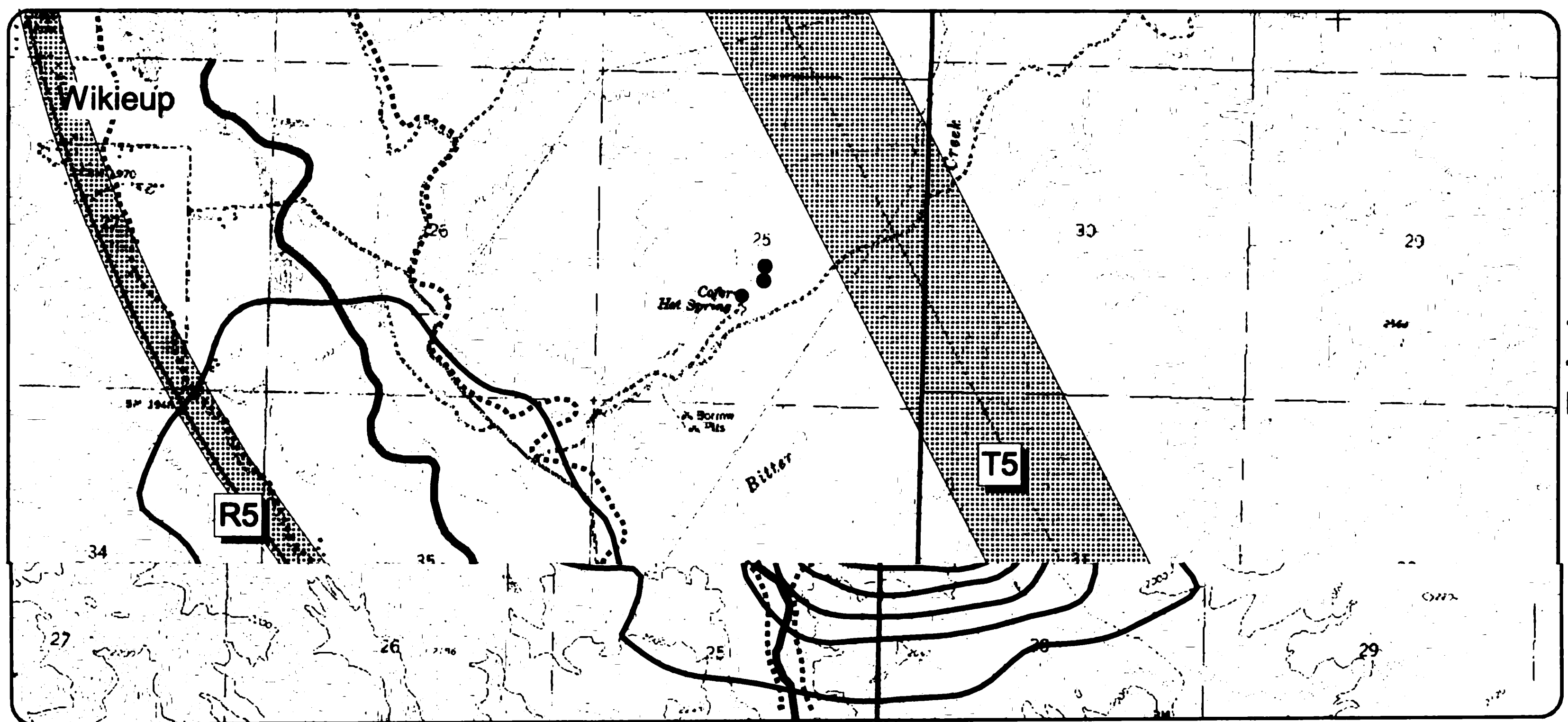

Predicted Drawdown in the Upper Aquifer After 40 Years of Pumping - Aquitard Hydraulic Conductivity of 4 x 10^{-5} ft/d (Worst Realistic Case)

Big Sandy Energy Project EIS

Figure 3.4-10

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Spring. In the upper aquifer (Figure 39 in Appendix F), an area of less than 1 foot of drawdown is predicted as a result of 40 years of pumping. This area is shown in detail on Figure 3.4-10. The predicted area of potential drawdown is more extensive than that predicted by the base case, and extends from south of Wikieup to Granite Gorge. The area extends along the Big Sandy River, with the area of greatest predicted drawdown (0.6 ft to less than 1 ft) extending from the vicinity of monitor well OW8 to Granite Gorge.

Predicted Drawdowns Versus Time

Predicted drawdowns versus time for the base and sensitivity cases are shown on Figures 3.4-11 through 3.4-13. The most sensitive parameters tested are specific yield and aquitard hydraulic conductivity. Under worst realistic case conditions (aquitard hydraulic conductivity $= 4 \times 10^{-5}$ ft/d) potential impacts of less than 1 ft of drawdown in the upper aquifer are predicted to occur as a result of 40 years of pumping. The lower aquifer is predicted to require approximately 130 years to recover to within 90 percent of static conditions.

Predicted Flow Rates Into the River Alluvium

The modeling results predict a reduction in groundwater flow from the middle aquifer to the upper aquifer as a result of 40 years of groundwater pumping. This reduction in flow is expressed as a reduction in outflow at Granite Gorge (Figure 3.4-14), a small decrease in evapotranspiration, and a relatively large reduction in evaporative losses at the marsh at the southern end of the basin.

Groundwater flow rates to the river alluvium were predicted for the base and sensitivity cases. It was predicted that drops in flows to the marsh, gorge and, to a small degree, to evapotranspiration outside the marsh, due to project pumping, would occur. The potential decrease in flows is predicted to occur gradually over the period of pumping. Both the response and recovery times were predicted to be very slow.

It was concluded from these results that:

- the base case and less-evaporative marsh cases bracket the data for outflows from the Big Sandy basin at the south end of the valley.
- alternate marsh scenarios predict a redistribution of flows between the gorge and the marsh, but do not significantly change the predicted overall decline in flow rates in the southern end of the valley
- for the realistic worst case, overall groundwater flow to the alluvium is predicted to decline by up to 1 percent (350 gpm or 564 ac-ft/yr).

The overall predicted drop in flow rates to the river alluvium comprise: drops in evapotranspiration, drops in flow to the marsh, and drops in outflow through the gorge. These predicted drops in flow vary from zero to a maximum after 40 years of pumping, as shown in Table 3-4.3.

<u>Conclusions</u>

Predicted water level drawdowns for the base case (specific yield = 11 percent) and worst realistic case (aquitard hydraulic conductivity = 4×10^{-5} ft/d) as a result of 40 years of pumping groundwater at the maximum proposed annual pumping rate of 3,000 gpm (4,850 ac-ft/yr) to support the Proposed Action are as follows:

- lower aquifer: 85 ft (both cases)
- middle aquifer: less than 4 ft (base case) to approximately 12 ft (worst realistic case)
- upper aquifer: less than 0.5 ft (base case) to less than 1 ft (worst realistic case)

The predicted area of potential drawdown in the upper aquifer under worst-realistic-case

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TABLE 3.4-3 PREDICTED DROP IN FLOW RATES TO THE RIVER ALLUVIUM OVER TIME				
Time Since Pumping Began (Years)	Predicted Drop in Flow Rate to River Alluvium			
	Base Case		Realistic Worst Case: Aquitard conductivity of $4x10^{-5}$ ft/d	
	(gpm)	(ac-ft/yr)	(gpm)	(ac-ft/yr)
0	0	0	0	0
10	32	52	60	97
20	72	116	145	234
30	112	181	230	371
40 (pumping stops)	155	250	317	511
50	168	271	350	564
60	170	274	365	589
70	166	268	371	598
80	161	260	371	598
90	155	250	371	598
100	151	244	371	598

conditions extends along the Big Sandy River from south of Wikieup to Granite Gorge. The area of greatest predicted drawdown (0.6 ft to less than 1 ft) extends from the vicinity of monitor well OW8 to Granite Gorge. The worst-realistic-case model predictions also indicate up to 1 percent (approximately 564 ac-ft/yr) reduction in groundwater flow from the middle aquifer to the upper aquifer This reduction in flow is expressed as a reduction in outflow at Granite Gorge, a small decrease in evapotranspiration, and a relatively large reduction in evaporative losses at the marsh at the southern end of the basin.

Model Limitations

The groundwater flow model is limited to the simulation of pumping in the volcanic aquifer and its effects on the water levels in the southern portion of the Big Sandy basin. Although conservative estimates have been tested in the model sensitivity analyses, unmapped geologic features could change the actual impacts. The assumptions used in the model have been discussed in the previous sections. The likely effects of the main assumptions on the predicted impacts due to pumping are summarized in the following sections.

Geology and Extent of Volcanic Aquifer

A different extent of volcanic aquifer than that modeled would result in a different distribution of projected impacts. A smaller aquifer extent would result in a greater impact on drawdowns in the volcanic aquifer, and less impact in the upper aquifer (due to less coverage by the lakebed clays). A larger aquifer extent than modeled would result in a lesser impact on drawdowns in the volcanic aquifer, and more impact in the upper aquifer (due to less coverage by the lakebed clays). Therefore, these two effects tend to offset one another since drawdowns in the volcanic aquifer are directly related to impacts in the middle and upper aquifers.

Specific Yield of Volcanic Aquifer

Greater or lesser specific yields in the volcanic aquifer than modeled would result in lesser or greater impacts in all three aquifers, respectively. The range of specific yields

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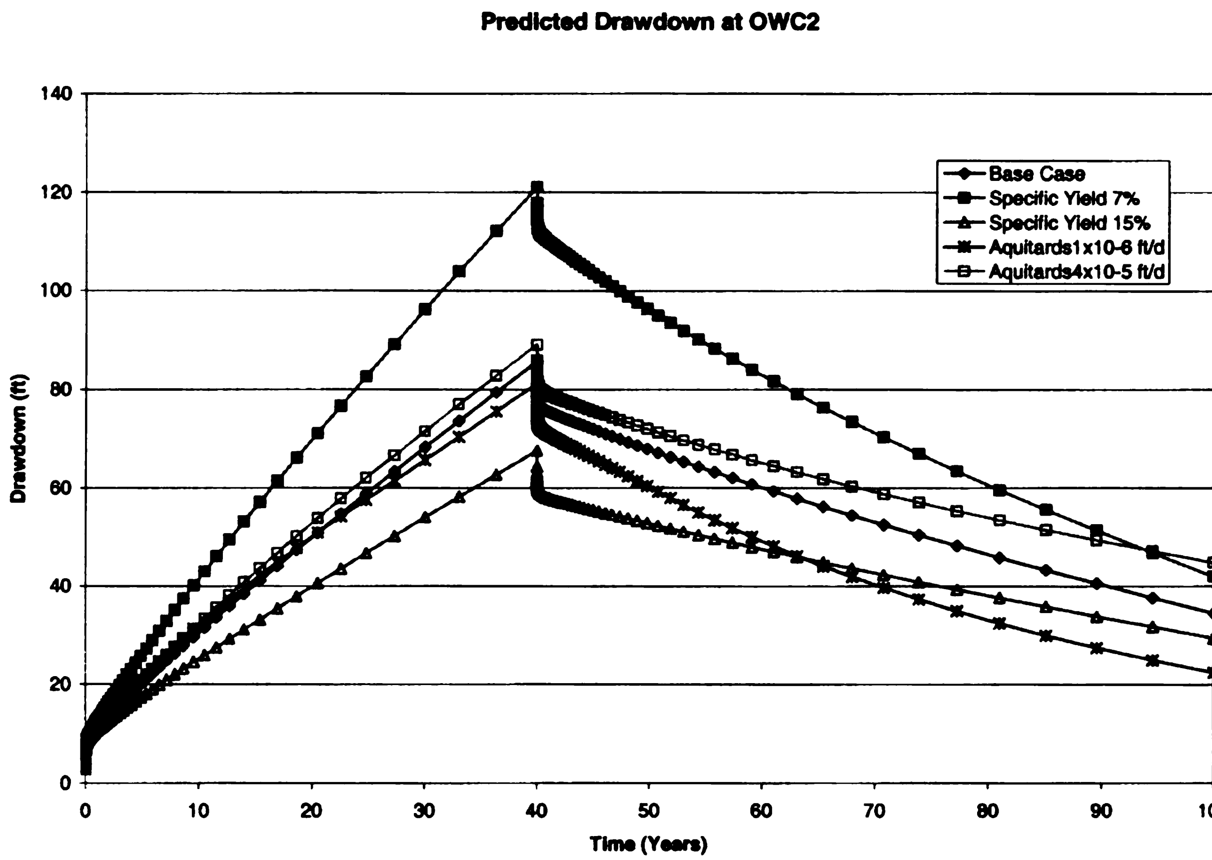

Predicted Drawdown versus Time
in the Volcanic Aquifer (OWC 2)

Big Sandy Energy Project EIS

Figure 3.4-11

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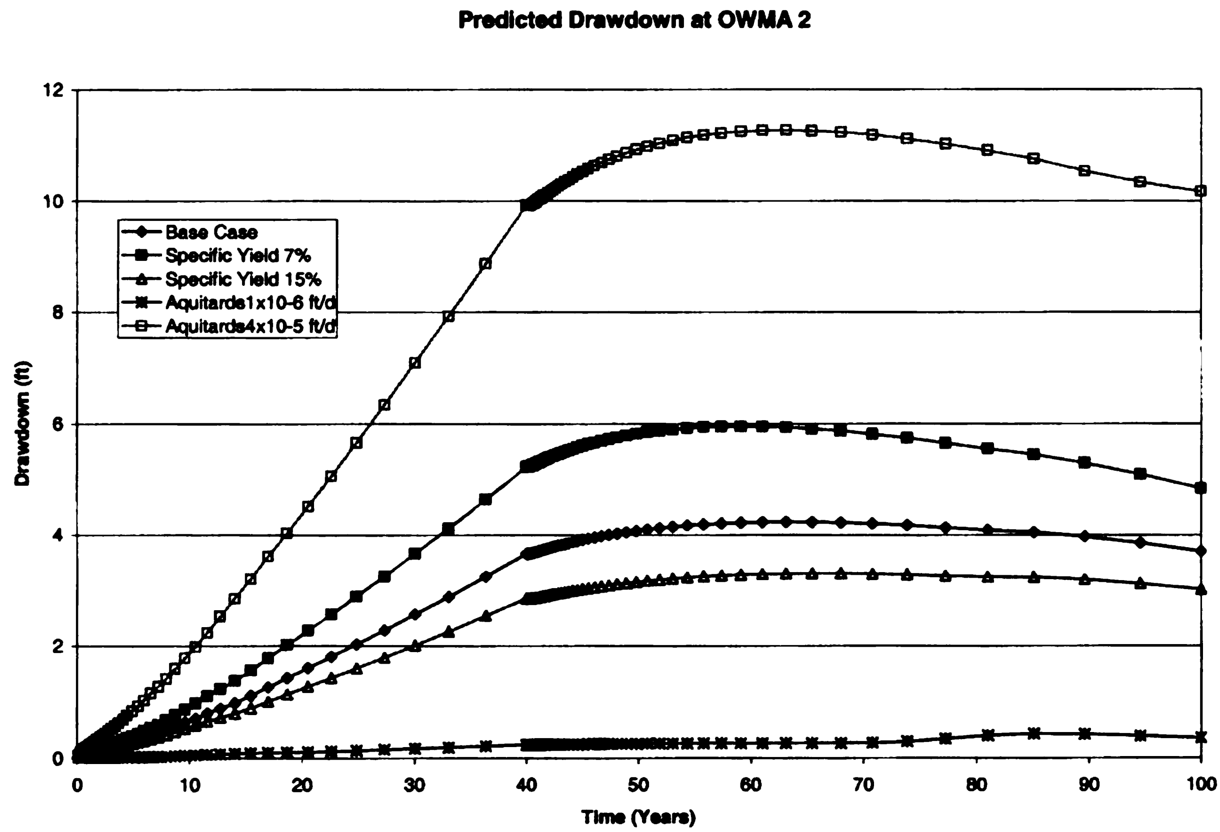

Predicted Drawdown versus Time
in the Middle Aquifer (OWMA 2)

Big Sandy Energy Project EIS

Figure 3.4-12

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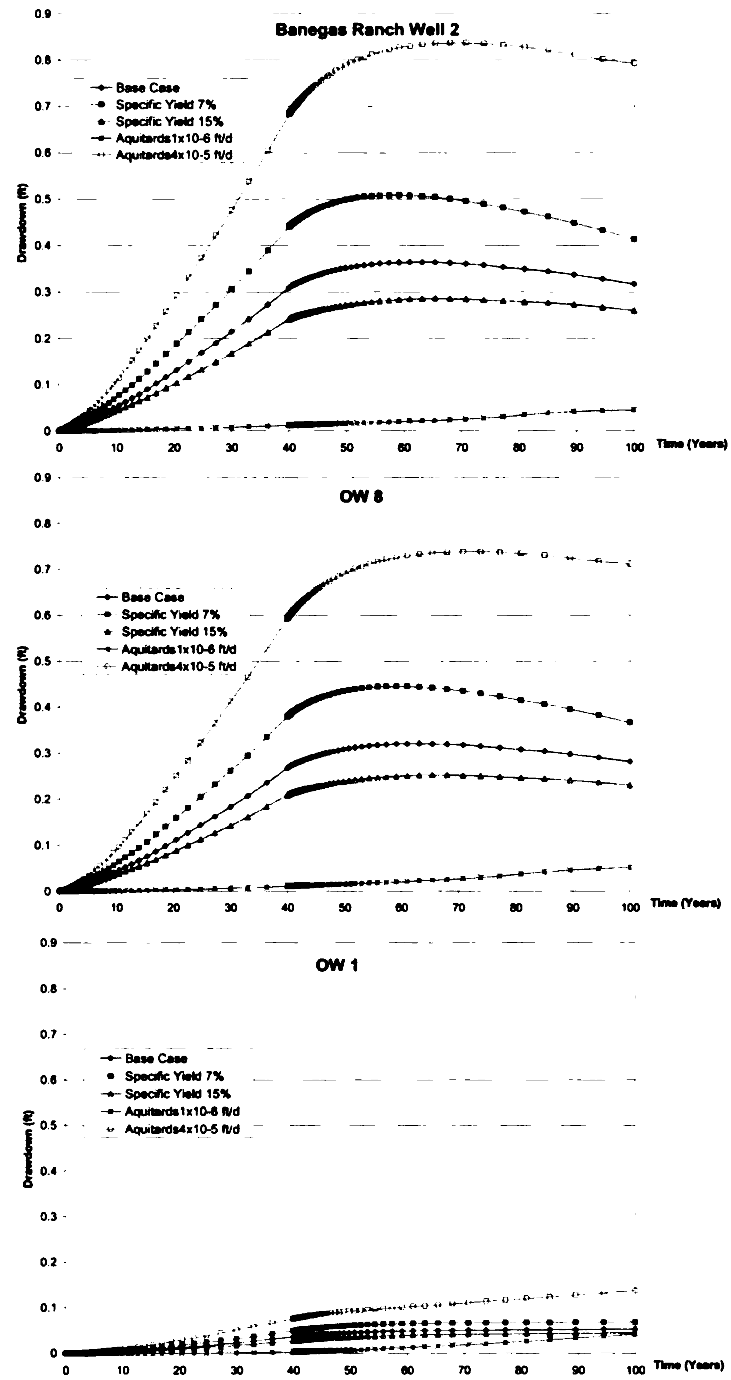

Predicted Drawdown versus Time
in the Upper Aquifer
(OW1, OW8 and Banegas Ranch Well 2)

Big Sandy Energy Project EIS

Figure 3.4-13

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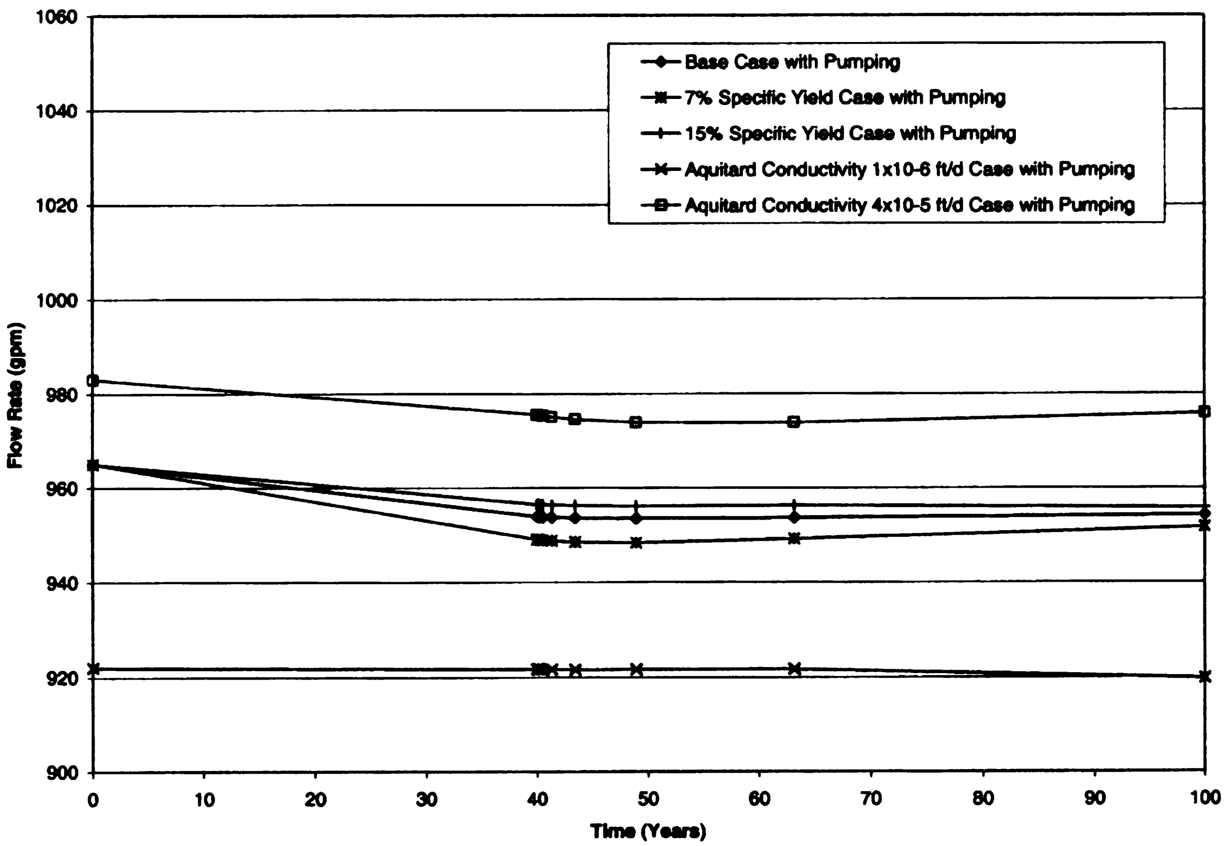

Predicted Granite Gorge Flow versus Time

Big Sandy Energy Project EIS

Figure 3.4-14

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presented in the literature, consistent with the observed volcanic aquifer hydraulic properties, was tested and found to affect predicted impacts due to Project pumping by a factor of 0.5 percent.

Hydraulic Conductivity of Volcanic Aquitards

Greater or lesser aquitard conductivities than those modeled would lead to greater or lesser impacts due to pumping, respectively. However, the aquitards confining the volcanic aquifer are known to be competent because of the 175-ft head drop observed across this interface. A range of aquitard conductivities was modeled and only a relatively narrow range of values produced predicted hydraulic heads and vertical gradients similar to those observed.

Recharge Rate into the Volcanic Aquifer

Greater or lesser recharge rates into the volcanic aquifer than those modeled would result in (1) a greater or lesser impact on the upper two aquifers, respectively, and (2) a lesser or greater impact on the volcanic aquifer than modeled, respectively. However, there is a realistic limit to the level of aquifer recharge that is likely to occur in this area of 12 in/yr precipitation. Recharge rates of two to three times the likely recharge rate were tested during sensitivity analyses.

Groundwater/Surface Water Interaction

The groundwater flow model is not capable of modeling the interaction between the groundwater and surface water flow in the Big Sandy River; therefore, the model was not used to predict any potential impacts on surface water flow from groundwater pumping.

Groundwater Flow to Marsh

The groundwater outflow at the marsh and through the Granite Gorge as underflow and/or streamflow are linked in that the basin water budget is balanced if changes in these two outflow components offset on another. At different times of the year the balance between these two components may vary, and also differ from that modeled. Both sets of outflows are modeled and reported separately. An alternate combination of outflows (less outflow from the marsh and more through Granite Gorge) was tested and is reported in Section 3.6 of the Groundwater Technical Report.

Summary

The model was tested with respect to observed current hydraulic heads in the three aquifers and observed responses during pumping. Many cases were rejected as being insufficiently accurate. A range of cases covering best-estimate and upper and lower limits for those parameters most sensitive to predicted impacts were evaluated. The model input data and assumptions that resulted in the best match to observed flows and heads were used to evaluate the likely effects of Project pumping.

3.4.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse impacts on groundwater.

Cofer Hot Spring

Cofer Hot Spring is privately owned, and is used by the owner for grazing and other uses. Caithness has agreed in concept to compensate for flow lost at Cofer Hot Spring, as described in Section 2.2.8.6, Actions to Compensate for Predicted Impacts on Cofer Hot Spring.

Groundwater Monitoring and Water Replacement Program

The groundwater model predicts a potential reduction in flow to the upper aquifer from the middle aquifer as a result of the Proposed Action. The potential reduction is predicted to

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range from approximately 0.5 percent (159 gpm or 256 ac-ft/yr) under base-case conditions to approximately 1 percent (350 gpm or 564 ac-ft/y) under worst-realistic-case conditions after 40 years of groundwater pumping (see "Pumping Analysis" in Section 3.4.2.3). This reduction in flow is expressed as a reduction in outflow at Granite Gorge, a small decrease in evapotranspiration, and a relatively large reduction in evaporative losses at the marsh at the southern end of the basin.

To prevent these potential adverse impacts, Caithness has agreed to monitor groundwater levels and to augment surface flows to prevent any impacts on the upper aquifer as a result of the Proposed Action.

Water Monitoring Approach

The principal objective of groundwater monitoring would be to assess the extent to which observed water level drawdowns correlate with model-predicted drawdowns, and to use this information to determine the amount of water to be added, and the timing of this water augmentation.

Potential impacts to the upper aquifer are of primary concern. Because groundwater levels in the upper aquifer tend to fluctuate in response to groundwater pumping and flow in the Big Sandy River, it is not feasible to discern impacts on groundwater levels in the upper aquifer through direct measurement. Groundwater levels would be measured in upper aquifer wells as part of the monitoring program to record the daily and seasonal fluctuations in the upper aquifer in response to groundwater pumping in the upper aquifer, flows in the Big Sandy River, and climatic cycles. However, the groundwater level data obtained from the upper aquifer would not be used to assess whether upper aquifer groundwater levels are being impacted by groundwater pumping in the lower aquifer.

As an alternative to direct monitoring of groundwater levels in the upper aquifer to assess impacts, groundwater levels would be monitored in the lower and middle aquifers to assess the extent to which observed groundwater levels in those two aquifers correlate with groundwater levels predicted by the groundwater flow model. In this way, the groundwater monitoring data from the lower and middle aquifers would be used as an early warning of potential impacts on groundwater levels in the upper aquifer.

The results of the groundwater flow model define a range of predicted reduction in flow from the middle aquifer to the upper aquifer as a result of the Proposed Action. If the observed groundwater level drawdowns in the lower and middle aquifers are within the model-predicted range of drawdowns, then the observed data would be used to determine the amount of water to be added, and the timing of water augmentation. If the observed groundwater level drawdowns in the lower and middle aquifers are outside of the model-predicted range of drawdowns, then the observed water level data would be used to re-calibrate the model prior to determining the amount of water to be added and the timing of this augmentation.

Wells to be Monitored

Groundwater level measurements would be collected from five existing wells in the vicinity of the proposed power plant. One well (OW-2) would be used to monitor the lower aquifer, one well (OWMA-2) would be used to monitor the middle aquifer, and three wells (OW-1, OW-8, and Banegas) would be used to monitor the upper aquifer. In addition, there is a recognized need for a second middle aquifer monitor well between the production wellfield and the marsh. This second middle aquifer monitor well would be installed and equipped for water level monitoring prior to initiating groundwater pumping for the Proposed Action. The location of the new middle aquifer monitor well would be selected based on consensus between Caithness and the applicable regulatory agencies.

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Monitoring Frequency and Accuracy

Groundwater level measurements would be collected from the lower and middle aquifer monitor wells (OW2, OWMA2, and the new middle aquifer monitor well) at a frequency of once per day. Based on the rates of drawdown observed during the long-term aquifer test, it is anticipated that more frequent measurements would not be necessary. Groundwater level measurements would be collected from the upper aquifer monitor wells (OW-1, OW-8, and Banegas) four times per day to monitor anticipated diurnal fluctuations in groundwater levels.

Groundwater level measurements would be collected from the middle and upper aquifer monitor wells using either an electric sounder or an electronic pressure transducer. Because the lower aquifer monitor well is under artesian pressure, groundwater level measurements in that well (OW-2) would be collected using a pressure transducer. Groundwater levels obtained using an electric sounder would be measured to an accuracy of 0.01 foot. Groundwater levels obtained using a pressure transducer would be measured to 0.01 psi, or about 0.01 foot.

Monitoring Data Evaluation

Groundwater monitoring data would be compiled and evaluated quarterly, and reported annually. Emphasis would be placed on evaluation of the monitoring data from the middle aquifer wells (OWMA-2 and the new middle aquifer monitor well), because groundwater levels in the middle aquifer are more directly connected to groundwater levels in the upper aquifer.

At the end of each quarter, the groundwater level measurements from each well would be appended to the groundwater level database for that well and an updated water level hydrograph prepared. For the lower and middle aquifer hydrographs, the model-predicted groundwater level data would be superimposed on the observed data to allow model-predicted and observed drawdowns to be compared.

If the observed groundwater level drawdowns in the lower and middle aquifers are within the model-predicted range of drawdowns for the two aquifers, then the observed data would be used to determine the amount of water to be added, and the timing of water augmentation, based on the model-predicted range of flow reductions. If the observed groundwater level drawdowns in the lower and middle aquifers are outside of the model-predicted range of drawdowns for the two aquifers, then the observed water level data would be used by Caithness to re-calibrate the groundwater flow model. The re-calibrated model would then be used to determine the amount of water to be added.

Water Replacement

As noted above, the results of the groundwater model indicate that the potential reduction in flow from the middle aquifer to the upper aquifer as a result of the proposed action may range from 0.5 percent (159 gpm or 256 ac-ft/yr) to 1 percent (350 gpm or 564 ac-ft/yr). The model results also indicate that the area of greatest potential flow reduction is at the marsh, located near the southern boundary of the basin above Granite Gorge, and that addition of water at the marsh would avoid these flow reductions. Water could effectively be conveyed to the marsh via the Big Sandy River. Accordingly, Caithness has proposed that any augmentation water be directed into the Big Sandy River between the US 93 bridge crossing of the Big Sandy River and the marsh. Required augmentation would be provided at least one year in advance of the projected flow reduction (as determined by monitoring and the groundwater model).

The two sources of augmentation water are (1) a portion of the 4,850 ac-ft/yr maximum withdrawal of groundwater from the lower aquifer, and (2) conversion of existing surface

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water irrigation rights to stream flow rights in the Big Sandy River.

Groundwater from the lower aquifer would be supplied by constructing a pipeline from the groundwater production wellfield or the power plant and diverting a portion of the groundwater from the production wellfield or water from the proposed power plant water treatment system to the river.

Surface water also could be supplied by converting surface irrigation rights at Banegas Ranch and/or others to instream flow rights.

3.4.2.5 Impact Assessment

Proposed Action

Groundwater Quantity

Implementation of the Proposed Action including the communication facilities, or either of the alternatives, would result in identical impacts to groundwater quantity, and these effects are not separately identified.

The Project would not likely have a significant impact on surface water flows in the Big Sandy River, either in the vicinity of the Project area or downstream in Granite Gorge or below. As discussed in Section 3.4.2.3, pumping of groundwater for the Project from the lower aquifer without the actions incorporated into the Proposed Action to reduce or prevent impacts resulted in a predicted reduction in flow to the upper aquifer from the middle aquifer.

The model showed a reduction in outflow at Granite Gorge, a decrease in evapotranspiration, and a reduction in evaporative losses at the marsh at the southern end of the basin. However, actions are incorporated into the Proposed Action which are designed to prevent these impacts. To evaluate the effectiveness of these actions, additional analyses were conducted using the base case of the groundwater model (refer to Appendix F). Based upon a series of runs, the model indicated that placement into the marsh of an amount of water equal to the amount of water not delivered from the middle aquifer to the upper aquifer would prevent the occurrence of the effects of the predicted flow reduction (reduction in the outflow at Granite Gorge, decrease in evapotranspiration, and reduction in evaporative losses at the marsh), either at the marsh or any other location. With this augmentation of water to the marsh, the drawdown of the upper aquifer groundwater contours displayed in Figures 3.49 and Figure 3.4-10 was predicted to not occur.

As discussed in Section 3.4.2.3 and Appendix F, even though the model has been constructed with conservative assumptions and estimates and has been subject to substantial review by the hydrologic team, it is still subject to certain limitations, and the predicted results are not absolute. However, the groundwater monitoring and flow augmentation program includes the ongoing collection of additional geologic and hydrologic information, which would be used to improve the model as appropriate over time. This, combined with the commitment in the Proposed Action to adjust the amount of water to be added to the marsh, would substantially compensate for the model limitations and uncertainties.

As proposed, the augmented water would be added to the Big Sandy River between the US93 bridge over the Big Sandy River and the marsh, and would be derived from either a portion of the 4,850 ac-ft/yr maximum withdrawal of groundwater from the lower aquifer or the conversion of existing surface water irrigation rights to instream flow rights in the Big Sandy River. Groundwater from the lower aquifer would be supplied by constructing a pipeline from the groundwater production wellfield or the power plant water treatment system and diverting a portion of the produced groundwater to the river. The required water would be provided at least one year in advance of the projected flow reduction, as determined by

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comparing the results of the groundwater monitoring to the groundwater model results.

Augmenting the flow of the Big Sandy River at any point between the US93 bridge over the Big Sandy River and the marsh is expected to be as effective as delivering the water directly to the marsh because the Big Sandy River would act as a direct conduit for water to the marsh. Any water lost through infiltration would enter the groundwater and have essentially the same effect as delivering the water directly to the marsh (and specifically the groundwater system on which it is dependent). Evaporative losses would be very small over the up to 3-mile flow in the river, and by delivering the quantity of water predicted by the model at least one year in advance, the quantity of water and water levels in the upper groundwater/surface water systems are predicted to never be reduced below those which would occur without the Proposed Action.

Delivering the required water to the marsh from the lower aquifer (produced from the maximum groundwater withdrawal rate of 4,850 ac-ft/yr) would ensure that "new" water was introduced into the upper groundwater system, and thus effectively prevent the predicted impacts from occurring. As a result, no significant impacts to the surface flow in the Big Sandy River would likely occur.

If the needed water comes from the conversion of existing surface water irrigation rights to instream flow rights in the Big Sandy River, this would result in the placement of "new" water into the Big Sandy River only if the water rights so converted were for current, existing consumptive uses of this water. (The transfer of water rights not currently used would only prevent the occurrence of future flow reductions associated with the use of these rights.) Since the Proposed Action does not propose the conversion only of water rights for existing consumptive uses, implementation of this option would likely still result in reduction of evapotranspiration from the marsh and surface water flows in the Big Sandy River through the gorge, which would be a significant impact.

The groundwater model predicts that without water augmentation, the flow reduction in the upper aquifer as a result of the production of the groundwater from the lower aquifer is slow to develop and continues long after the production of groundwater for the Project power plant stops. Augmentation of water to the marsh may reduce the time period over which augmentation would be required, although it would likely need to continue far into the future. Implementation of a mechanism to ensure the continued application of this water would be appropriate, regardless of the water source option selected. The Proposed Action includes a groundwater monitoring program that provides for compiling and reporting groundwater data; implementing additional groundwater modeling, if necessary; and comparing the monitored groundwater information and the results of the groundwater model to determine the annual quantity of water to be added to the marsh. Establishment of a reporting and review mechanism between Caithness and the applicable regulatory agencies would be appropriate.

The Proposed Action would not have a significant impact on groundwater users in the upper aquifer regardless of which options is selected to reduce the outflow at Granite Gorge, decrease evapotranspiration, and reduce evaporative losses at the marsh. This is because the results of the groundwater flow model, which indicated that groundwater pumping of the lower aquifer to supply the project would result in a realistic worst case drawdown of less than 1 foot in the upper aquifer over after 40-years of pumping even without the addition of water, is substantially less than the significance criterion of 10 feet over any 5-year period in the upper aquifer.

The Proposed Action likely would have a significant impact on the volume of water discharged from Cofer Hot Spring. The available

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information indicates that the source of Cofer Hot Spring is connected to the lower aquifer and its flow would be reduced, or possibly eliminated, by the pumping of groundwater for the Project from the lower aquifer. Caithness has agreed in concept to compensate the private owner of Cofer Hot Spring for this reduction in flow. However, because any reduction in the quantity of water discharged from a spring is considered significant, this reduction in the flow to Cofer Hot Spring would be significant.

No impacts are anticipated to the volume of water discharged from other springs in the area because none of these springs are hydraulically connected to the portions of the lower, middle or upper aquifers that would be drawn down by the project.

Groundwater Quality

The Proposed Action would not have a significant impact on groundwater quality. The evaporation pond will be constructed in accordance with ADEQ's prescriptive Best Available Demonstrated Control Technology (BADCT) criteria, which call for a double liner equipped with a leak collection and removal system (LCRS). Because of these design and construction requirements, it is not anticipated that discharge of pollutants to the vadose zone through the lower liner will result in exceedances of numeric AWQS in groundwater at the point of compliance.

There are anticipated to be no other on-site activities at the proposed power plant or along the proposed gas pipeline route that would cause a discharge of pollutants to the vadose zone sufficient to result in a significant degradation of groundwater quality.

No-Action Alternative

If the Proposed Action is not constructed there would be no impact on groundwater quantity or quality from the Project within the Big Sandy basin. The groundwater production and monitoring wells completed on private land which were used to identify and test the lower aquifer would remain.

3.4.2.6 Mitigation and Residual Impacts

If adopted, the following measure would be implemented to avoid significant impacts if the option to convert existing surface water irrigation rights to instream flow rights in the Big Sandy River is selected:

- To ensure that water sufficient to compensate for the predicted reduction in flow is delivered to the marsh, only the conversion, approved by ADWR, of existing surface water irrigation rights to instream flow rights in the Big Sandy River for current, existing consumptive uses of this water would be accepted as water to augment the flow of the Big Sandy River and the marsh.

With the implementation of this measure, significant impacts to surface water flow in the Big Sandy River would be avoided.

If adopted, the following measures would be implemented to minimize adverse impacts to surface water flow in the Big Sandy River not considered to be significant:

- Appropriate financial assurance mechanisms sufficient to fund those activities necessary to ensure application of the water required to augment the water flow to the Big Sandy River marsh, even after the production of groundwater for the Project power plant stops, would be required from Caithness.

- To ensure that the results of the monitoring program would be appropriately compiled and evaluated, an independent expert would annually analyze the collected monitoring data and prepare a report providing an assessment of the monitoring data, an evaluation of the groundwater model, and any required actions regarding the

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monitoring program, the groundwater model, the water augmentation program, and the appropriate quantity of water to be added in accordance with accepted professional standards. The report would be provided to Caithness and agencies with regulatory responsibility or appropriate expertise.

- Caithness and agencies with regulatory responsibility or appropriate expertise may provide comments regarding the report and required actions. The independent expert would revise the report and required actions as it deems appropriate. Caithness would implement those actions contained in the revised report.

3.5 SURFACE WATER

This section describes the affected environment and environmental consequences relative to surface water resources. "Waters of the United States" has a strictly defined regulatory meaning pursuant to the Clean Water Act. Most waters of the United States addressed in this Draft EIS are dry most of the year. Waters of the United States are discussed in Section 3.12.

3.5.1 Affected Environment

The following sections describe the current surface water environment. The description of current conditions represents the baseline for the assessment of impacts and environmental consequences.

3.5.1.1 Region of Influence

The region of influence for assessing impacts on surface water resources includes all areas of the Proposed Action, including gas pipeline corridors and communication facilities, the southern portion of the Big Sandy River basin, and all connected watercourses downstream of the Proposed Action subject to substantial adverse impacts. Potential impacts of the Proposed Action and alternatives are limited to the specific areas potentially impacted by wastewater and/or stormwater generation and gas pipeline construction.

3.5.1.2 Existing Conditions

The proposed power plant site is located in the southeastern portion of the Big Sandy River basin (Figure 3.5-1). The primary drainage and surface water resource in the basin is the Big Sandy River. The Big Sandy River flows from its headwaters, which originate east of Kingman, to the south and drains into Alamo Reservoir. Alamo Reservoir is located at the confluence of the Big Sandy and Santa Maria rivers, which form the Bill Williams River. The Bill Williams River joins the Colorado River at Parker, Arizona.

The proposed power plant site and substation are located between Sycamore Creek and Gray Wash, which are both westerly flowing tributaries to the Big Sandy River. The proposed power plant site is crossed by several southerly and southwesterly flowing ephemeral drainages that are tributaries to Gray Wash (Figure 3.5-2). These drainages flow only at certain times of the year when they receive water from precipitation events or snowmelt from the mountainous areas to the east.

The Big Sandy River basin occupies an area of approximately 2,732 square miles. The average annual precipitation in the Big Sandy River basin is approximately 10 inches per year (Davidson 1973), and the average evaporation rate is approximately 95 inches per year. The Big Sandy River north of Wikieup is generally ephemeral with isolated perennial reaches. South of Wikieup the river is generally perennial with isolated ephemeral reaches (refer to Section 3.4.1.2).

Four stream gaging stations have been operated by USGS along the Big Sandy River, including one along Cottonwood Wash north of Kingman, two along tributaries to the Big Sandy River near Kingman, and one along the Big Sandy River about 14 miles south of Wikieup (station

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number 09424450) (refer to Figure 3.5-2). All of these gaging stations were discontinued by 1979 with the exception of the gaging station south of Wikieup. This gaging station has been in operation since 1966 and both streamflow and water quality data are available. These data were used to establish a general baseline for surface water flow and quality in the Big Sandy River. However, this gaging station is located downstream of the confluence of the Big Sandy River and Burro Creek, a major tributary to the Big Sandy River, and is believed to be substantially influenced by the flows and water quality of Burro Creek. Therefore, data obtained from surface water sampling at this gaging station may not be entirely representative of flows or water quality in the Big Sandy River upstream of the confluence.

Between 1966 and 1999, annual peak streamflows in the Big Sandy River at the gaging station south of Wikieup have been recorded as high as 68,700 cubic feet per second (cfs) in 1993, and as low as 8.3 cfs in 1999. The average peak streamflow over this time period was approximately 12,950 cfs. Daily mean streamflow over the 35-year period typically averaged between 5 and 10 cfs, and rarely dropped below 3 cfs except during dry years (e.g., 1975 and 1990).

Water quality data for the Big Sandy River at the gaging station south of Wikieup are available from 1977 through 1979. A brief summary of these data are presented in Table 3.5-1. Based on these data, the river meets all primary Federal drinking water standards for the selected analytes with the exception of occasional exceedances for lead. Water quality in the Big Sandy River is highly variable and fluctuates with stream discharge. In general, water quality is better during periods of above average discharge and poorer during periods of low flow. For example, the concentration of total dissolved solids (TDS) was measured at 103 milligrams per liter (mg/L) during a streamflow event of 2,840 cfs versus 731 mg/L during a streamflow event of 3.1 cfs.

BLM has recently begun monitoring surface water flow in the perennial reach of the Big Sandy River in support of its Instream Flow Water Rights Application (No. 33-96348, filed on February 2, 1994). The monitoring location is about 1 mile downstream of the northern end of Granite Gorge (refer to Figure 3.5-2). The average annual flow of the Big Sandy River, based on these BLM measurements, is 3,280 ac-ft/yr.

Other surface water resources in the Big Sandy River basin include springs, seeps, and riparian areas. The most notable of these is Cofer Hot Spring, which is located northwest of Bitter Creek in the central part of Section 25, T16N, R13W (refer to Figure 3.5-2). This spring emanates from the same volcanic formation that makes up the aquifer proposed for development (refer to Section 3.4), and is hydraulically connected to the volcanic aquifer by faulting. The discharge from Cofer Hot Spring is variable and is reported to range from 20 to 180 gallons per minute (gpm). There are more than 20 other small springs and seeps in the Aquarius Mountains to the east of the proposed power plant site that have been identified and measured by the BLM. Based on BLM records, the combined discharge from these springs is less than 10 gpm. In addition, perennial riparian areas have been identified along Bull Canyon, Sycamore Creek, and Boner Canyon.

Communication Facilities

The proposed OPGW would follow the existing Mead-Liberty 345-kV transmission line between the proposed substation and Western's Peacock Substation, including a trench from the proposed substation to a nearby transmission structure. Surface water resources along the transmission line include the Big Sandy River, ephemeral Knight Creek, and numerous ephemeral tributaries that generally trend east to west or west to east and discharge to the Big Sandy River system. Notable tributaries crossed include Sycamore Creek, Bitter Creek, Boner Canyon, Cane Springs Wash, Wheeler Wash,

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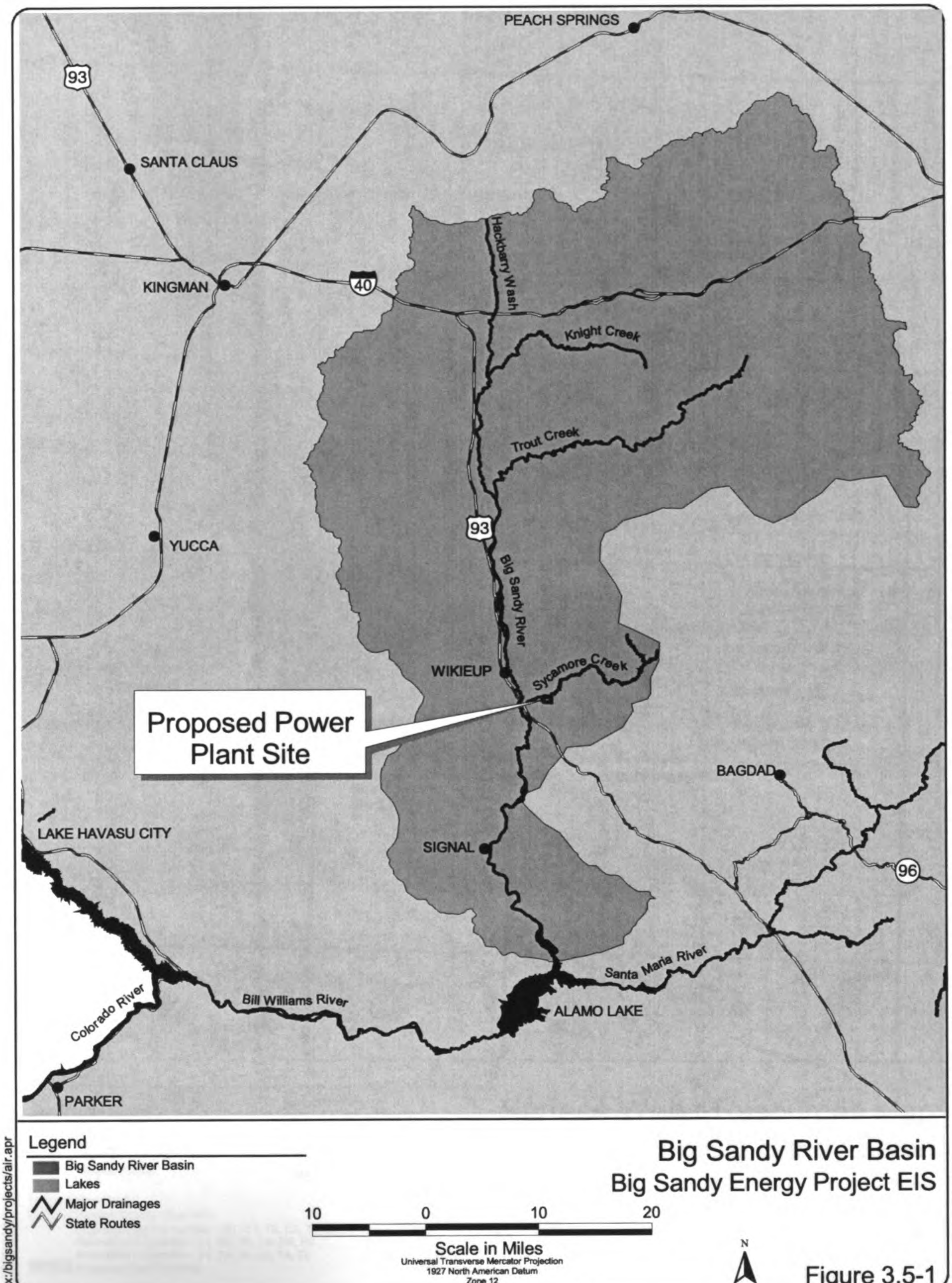

Big Sandy River Basin
Big Sandy Energy Project EIS

Figure 3.5-1

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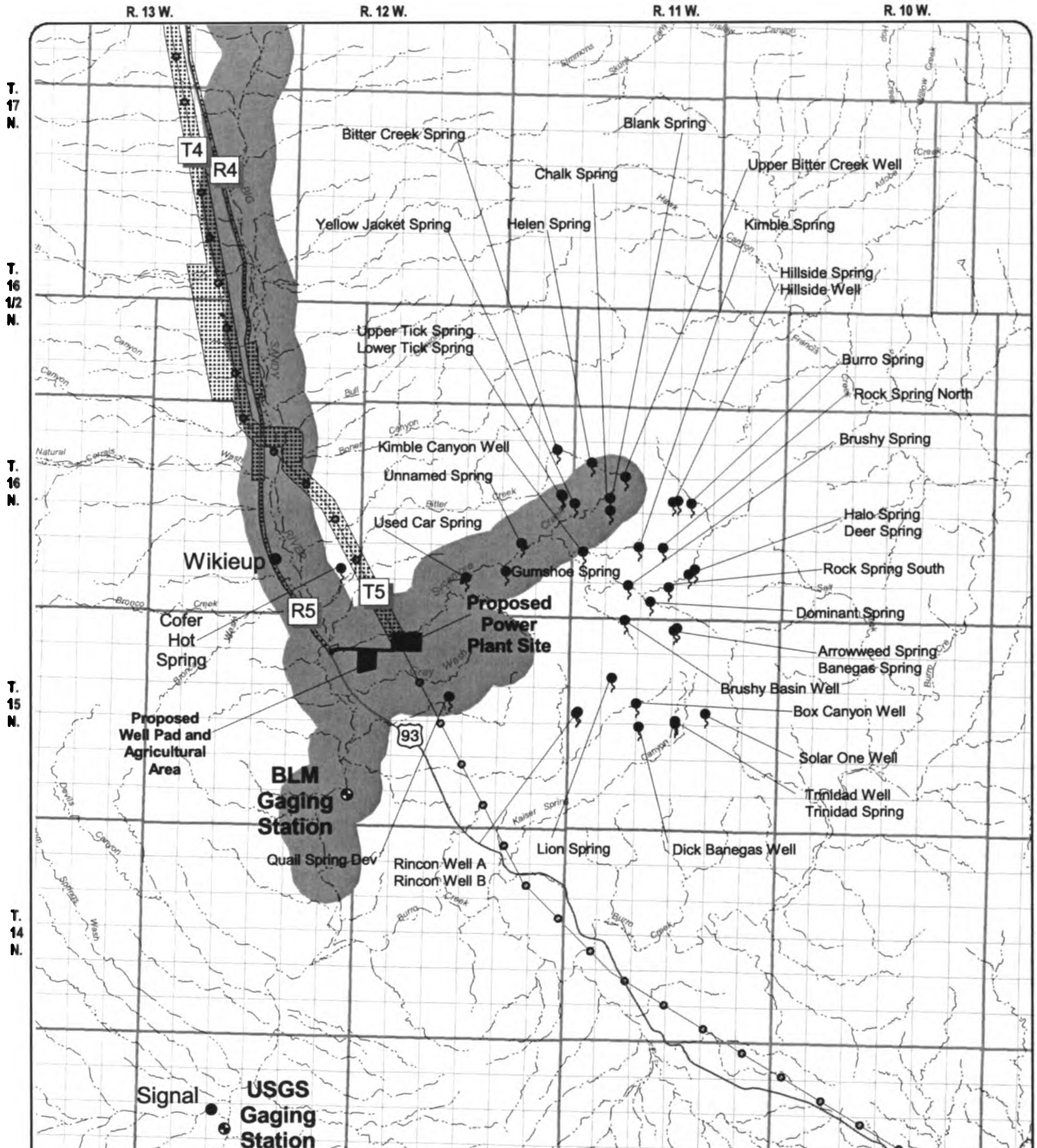

Legend

Resource Components
- Important Streams
- Springs
- Gaging Station

General Reference
- Existing Pipelines
- Mead-Liberty/Mead-Phoenix Transmission Lines
- Stream/River
- U.S. Route

Project Components
- Pipeline Corridor Segments
- Proposed Pipeline Corridor - R1, C1, T3, C3, T4, R5
- Alternative R Corridor - R1, R2, R3, C3, R4, R5
- Alternative T Corridor - T1, T2, T3, C3, T4, T5
- Proposed Plant Facilities

0 5

Scale in Miles

Universal Transverse Mercator Projection
1927 North American Datum
Zone 12

N

Surface Water Resources Map of the Big Sandy Basin

Big Sandy Energy Project EIS

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Figure 3.5-2

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TABLE 3.5-1 BIG SANDY RIVER GAGING STATION SOUTH OF WIKIEUP (09424450) WATER CHEMISTRY DATA						
Analyte	Federal Drinking Water Standard	Unit of Measure	Recorded Flow Rate (cfs)			
			Low	Medium	High	Extreme
			(<20)	(30-50)	(100-260)	(>1000)
As	50	µg/L	5-11	11-14	6-12	5
Ba	2,000	µg/L	40-300	40-400	20-200	100
Cd	5	µg/L	0-2	N/A	N/A	N/A
Cr	100	µg/L	20	N/A	20	40
Cu	1,300*	µg/L	0-7	3-7	3-9	5
Pb	15	µg/L	0-10	11-96	2-9	N/A
Hg	2	µg/L	0.1-0.5	N/A	0.1	0.1
NO_3	10	mg/L	0.71-4.8	N/A	2.3	9.7
Se	50	µg/L	0-1	1	1-6	1
SO_4	250*	mg/L	120-170	140-160	30-120	18
TDS	500*	mg/L	538-732	540-653	169-448	103
F	4	mg/L	1.3-1.5	1.1-1.4	0.4-0.9	0.5

*Indicates a Secondary Drinking Water standard.

and McGarrys Wash. Perennial riparian areas have been identified along certain reaches in the upper portions of Sycamore Creek and Boner Canyon.

Proposed Gas Pipeline Corridor

Surface water resources along the proposed gas pipeline corridor include the Big Sandy River, ephemeral Knight Creek, and numerous ephemeral tributaries that generally trend east to west or west to east and discharge to the Big Sandy River system. Notable tributaries crossed include Bronco Wash, Cane Springs Wash, Wheeler Wash, and McGarrys Wash.

Alternative R Gas Pipeline Corridor

Surface water resources along the Alternative R gas pipeline corridor include the Big Sandy River, ephemeral Knight Creek, and numerous ephemeral tributaries that generally trend east to west or west to east and discharge to the Big Sandy River system. Notable tributaries crossed include Bronco Wash, Cane Springs Wash, Wheeler Wash, and McGarrys Wash.

Alternative T Gas Pipeline Corridor

Surface water resources along the Alternative T gas pipeline corridor include the Big Sandy River, ephemeral Knight Creek, and numerous ephemeral tributaries that generally trend east to west or west to east and discharge to the Big Sandy River system. Notable tributaries crossed Sycamore Creek, Bitter Creek, Boner Canyon, Cane Springs Wash, Wheeler Wash, and McGarrys Wash. Perennial riparian areas havebeen identified along certain reaches in the upper portions of Sycamore Creek and Boner Canyon.

Crossover Corridor Segment C2

No surface water resources were identified along crossover corridor segment C2.

3.5.2 Environmental Consequences

The following sections outline the environmental issues related to surface water resources, significance criteria, and the methodology and conclusions of the impact

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assessment. Also described are mitigation measures that could be implemented to minimize impacts on surface water resources.

3.5.2.1 Identification of Issues

The following is a list of issues that were identified as relating to surface water; these issues form the basis for the assessment of potential impacts:

- potential impacts on surface water quality of the Big Sandy River, Alamo Reservoir, and Bill Williams River
- potential impacts on other surface water uses in the watershed
- potential impacts on surface water quality from wastewater discharges, stormwater discharges, secondary water uses, or crossings of the proposed or alternative gas pipeline corridors
- potential impacts of long-term groundwater withdrawal on surface water rights associated with springs and seeps
- potential direct and indirect impacts of long-term groundwater withdrawal on surface water resources
- potential impacts on the quantity of instream flow in the Big Sandy River and downstream surface water resources, including Alamo Reservoir and the Bill Williams River
- potential impacts on existing water rights on the Big Sandy River

3.5.2.2 Significance Criteria

Listed below are the significance criteria that have been established for the identified surface water issues. Impacts would be considered significant if the following were to occur:

- any reduction of flows in the Big Sandy River and/or downstream watercourses due to long-term groundwater withdrawal
- degradation of surface water quality in exceedance of state-established standards for designated uses of the Big Sandy River, Alamo Reservoir, or Bill Williams River, excluding background levels
- any uncompensated impact on existing surface water rights to springs and seeps, the Big Sandy River, and/or other watercourses

3.5.2.3 Impact Assessment Methods

In order to assess potential impacts on surface water resources within the region of influence, the first task involved reviewing the proposed agricultural water uses and locations as well as the proposed wastewater and stormwater discharge plans with respect to their potential impacts on surface water quantity and quality. Information collected and reviewed included the anticipated characteristics of wastewater discharge from generation areas. Also reviewed were actions included in the Proposed Action that would minimize impacts on surface waters, such as erosion and sedimentation control measures and Big Sandy River flow augmentation.

Where possible and appropriate, approximate impacts on surface water quality/quantity and surface water rights were estimated. Estimated impacts on surface water flows were based in part on results of groundwater modeling. Potential impacts on surface water quality/quantity were assessed by characterizing and quantifying discharge, and assessing how it may affect downstream surface water bodies.

The results of groundwater modeling were reviewed to assess whether surface water flows in the Big Sandy River and downstream watercourses could be impacted.

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If applicable, potential mitigation measures not already included in the Proposed Action were identified to prevent potential impacts on surface water quality, quantity, or rights.

3.5.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse environmental impacts on surface water:

- A groundwater and surface water monitoring plan would be implemented. The principal objective of groundwater monitoring would be to assess the extent to which observed water level drawdowns correlate with model-predicted drawdowns, and to use this information to determine the amount of water to be added, and the timing of this water augmentation. The groundwater and surface water monitoring plan is summarized in Sections 3.4.2.4.

- Two options have been included in the Proposed Action that would augment flows in the Big Sandy River to avoid reduction due to long-term groundwater withdrawal. These options are described in Section 3.4.2.4.

- The potential reduction or elimination of flow at Cofer Hot Spring would be mitigated by using existing shallow wells located near the spring to supply water for grazing. One of the wells would be pumped to a stock tank or water trough to provide water for the spring's grazing allotment. In addition, Caithness has agreed in concept with the landowner to provide a well to access water from the lower aquifer to replace any water for other uses lost from reduction in spring flow.

- The Stormwater Pollution Prevention Plan would be implemented and revised as needed (refer to Section 2.2.8.4 and Appendix A).

- Best management practices would be followed during construction in order to limit the temporary impacts of increased erosion, sedimentation, and/or turbidity in surface waters. These include measures such as silt fences, hay bales; water bars, and sediment barriers. More detail is provided in Section 2.2.8.2.

3.5.2.5 Impact Assessment

Proposed Action

The assessment of potential impacts on surface water resources is described below in terms of the significance criteria outlined in Section 3.5.2.2.

Surface Water Flows

The Project would not likely have a significant impact on surface water flows in the Big Sandy River, either in the vicinity of the Project area or downstream in Granite Gorge or below (refer to Section 3.4.2.5).

Groundwater modeling results suggest that, with the exception of Cofer Hot Spring, there would be no impact on springs, seeps, or riparian areas in the Aquarius Mountains because they are hydraulically disconnected from the lower (volcanic) aquifer (refer to Section3.4). Replacement of the lost Cofer Hot Spring water that had been used for grazing and other uses has been included in the Proposed Action (refer to Section 2.2.8.6). With this replacement, there would be no significant impacts.

Agricultural activities should not have any direct impact on surface water flows. However, the proposed quantity of groundwater to be produced for the Proposed Action includes irrigation water demands. Thus, agricultural activities could have an indirect impact on surface water flows in the Big Sandy River

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downstream of Granite Gorge due to long-term groundwater production for purposes including irrigation.

Neither the installation of the OPGW, construction of the gas pipeline in any location within the proposed corridor, nor the construction of the proposed access road would be likely to cause any significant impacts on surface water flows because these activities would be designed to not alter flows.

All stormwater within the proposed power plant site and substation boundaries would be captured and diverted to the evaporation ponds in accordance with the Stormwater Management Plan. This would remove 46 acres from the drainage basin of Grey Wash, which would not adversely affect surface water flows.

Surface Water Quality

The proposed power plant is designed to be a zero discharge facility. Practices would be implemented as follows: (1) onsite stormwater generation would be collected and routed to lined evaporation ponds (Caithness 2000a); (2) offsite stormwater discharges would be routed around the facility and returned to natural drainages using standard erosion control structures including a retention basin (Caithness 2000a); (3) a Stormwater Pollution Prevention Plan (SWPPP) has been developed to prevent onsite stormwater pollution and/or discharge from the proposed power plant site (Caithness 2000b and Appendix A.); (4) process wastes would be discharged to the evaporation ponds; (5) the evaporation ponds would be double-lined with leak detection; and (6) erosion and sedimentation control measures would be implemented. These practices should prevent all but incidental discharges. Thus, there would be no significant degradation of surface water quality in the Big Sandy River or downstream watercourses.

As part of the Proposed Action, Caithness has agreed to monitor groundwater levels and to augment surface flows to prevent any impacts on the upper aquifer as a result of the Proposed Action (refer to Section 3.4). A potential source of water for augmentation is groundwater from the lower aquifer, which would be piped from the groundwater production wellfield and added into the Big Sandy River between the US 93 bridge over the Big Sandy River and the marsh. Analytical results from two lower aquifer groundwater samples collected from the production wellfield show arsenic at concentrations of 80 and 141 μg/L, which exceed the Big Sandy River arsenic surface water quality standard of 50 μg/L. In addition, the temperature of the lower aquifer water was measured at 96 °F.

Caithness has proposed as part of the Proposed Action to discharge to the Big Sandy River only water that meets all applicable surface water quality standards. In addition, a National Pollutant Discharge Elimination System (NPDES) permit would be required to add water from the lower aquifer to the river. Surface water quality standards could be met by either treating the groundwater stream to surface water quality standards, or by using the treated water from the power plant water treatment system as the source of augmentation water. Other options may be available; therefore, there would be no significant impact on surface water quality.

There is a potential for erosion of the surrounding dike and sides of the evaporation ponds both from wind-generated wave action and from bank erosion of the wash that flows between the ponds. An impact on surface water quality could occur if erosion eventually caused one of the evaporation ponds to breach. However, wave action erosion should not occur because the evaporation ponds will be double-lined and covered with a 9-inch-thick layer or riprap; and the surrounding dike will be covered with a 6-inch layer of gravel or crushed rock to provide erosion protection.

As part of the Proposed Action, agricultural activities would be conducted on an

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approximately 107-acre site located in the northwest quarter of Section 7, T15N, R12W (Caithness 2000c). It is unlikely that agricultural activities would have a significant impact on surface water quality of the Big Sandy River basin or downstream watercourses. This is because the quantities and application rates of chemicals and water are typical for the desert southwest region of the United States and proposed crops. Also, the Proposed Action includes operating the agricultural area in a fashion that minimizes the potential for runoff of irrigation water, applied chemicals, and fine-grained soils to surface waters. There is a potential for offsite stormwater runoff to enter and flow over the agricultural area. Stormwater discharge from the agricultural area could carry irrigation water, low concentrations of residual applied chemicals, and silts and clays from the topsoil. Neither the construction of the gas pipeline in any location within the proposed corridor nor the construction of the proposed access road would be likely to cause any significant, long-term impact on surface water quality. The primary communication system would involve installing microwave dishes on existing towers and would have no impact on surface water quality. Construction of the pipeline or OPGW across washes and at crossings of the Big Sandy River may cause a minor, temporary impact on surface water quality, including some increase in sedimentation and turbidity. The Big Sandy River is perennial in this area, so it is likely that the river would be flowing during construction. However, these activities would be short-lived, and with the implementation of the best management practices included in the Proposed Action, impacts would not be considered significant. Caithness has included several erosion and sedimentation control measures in the Proposed Action (refer to Sections 2.2.8.2 and 2.2.8.4).

Domestic water supplies would not be impacted because they rely on groundwater instead of surface water.

Surface Water Rights

The surface water rights that potentially could be impacted are those pertaining to Cofer Hot Spring and the Big Sandy River downstream of Granite Gorge. Because there would be no reduction in flows in the Big Sandy River, no downstream surface water rights would be impacted (refer to Section 3.4.2.5).

It has been demonstrated through aquifer testing and numerical groundwater modeling that discharge from Cofer Hot Spring would be reduced, and possibly cease, as a result of groundwater withdrawal from the volcanic aquifer (refer to Section 3.4.2.3). Cofer Hot Spring is located on privately owned land. Discharges from the spring are used on site and do not flow off site. Caithness has agreed in concept with the landowner to provide compensation for impacts on the spring. This agreement is described in Section 2.2.8.6.

The assessment of springs and seeps conducted for the groundwater modeling suggests that no other known springs or seeps are hydraulically connected to the volcanic aquifer. Thus, it is not anticipated that any springs or seeps besides Cofer Hot Spring would be impacted. Refer to Section 3.4 for a further discussion of this topic. Because loss of flow at Cofer Hot Spring would be compensated, and because no other springs or seeps would be affected, impacts on surface water rights would not be considered significant.

Construction of the gas pipeline, along the proposed corridor or the access road, and installation of the OPGW and microwave dishes would not consume any water; therefore, these activities will not impact surface water rights. Agricultural irrigation would not impact surface water rights either since the estimated water demand for irrigation is included in the proposed groundwater consumption rate for the Proposed Action.

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Alternative R Gas Pipeline Corridor

The impacts of Alternative R would be the same as the Proposed Action.

Alternative T Gas Pipeline Corridor

Construction of the gas pipeline along the Alternative T gas pipeline corridor would result in crossing the Big Sandy River approximately 3 to 4 miles north of Wikieup. The Big Sandy River is ephemeral in this area, so it is likely that the river would be dry during pipeline installation. Thus, there would be little potential for surface water quality impacts to occur during construction. Some increase in sedimentation and turbidity could occur when the river later flows across the trenched area in response to a substantial precipitation event. This potential impact would be temporary, and it is likely that the river water would naturally have elevated turbidity due to entrainment of fines that collect on the surface of the channel during periods of no flow. Implementation of the best management practices contained in the Proposed Action would reduce the potential for impacts on surface water quality. Therefore, the impacts of this alternative would be less than significant.

No-Action Alternative

Under the No-Action Alternative, the Project would not be constructed and there would be no change to, or disturbance of, existing surface water resources within the Big Sandy Valley.

3.5.2.6 Mitigation and Residual Impacts

If adopted, the mitigation measure described in Section 3.4.2.5 regarding conversion of existing surface water irrigation rights to instream flow rights, would avoid significant impacts on surface water flow. With implementation of this measure, no residual significant impacts are expected.

If adopted, the following measure would be implemented to minimize adverse impacts not considered to be significant:

- The small wash between the evaporation ponds and evaporation pond dike would be designed and constructed to prevent substantial erosion and ensure the integrity of the pond.

3.6 FLOODPLAINS

This section describes the affected environment and environmental consequences relative to floodplains. This section complies with 10 CFR 1022, Floodplain/Wetlands Environmental Review Requirements. The Final EIS will contain a Statement of Findings explaining why the Proposed Action would be located in a floodplain and a list of alternatives considered, and describe steps that would be taken to minimize harm to or within any floodplain.

3.6.1 Affected Environment

The following sections describe the current floodplain conditions. The description of current conditions represents the baseline for the assessment of impacts and environmental consequences.

Areas of potential flooding (100-year and 500-year floodplains) as determined by the Federal Emergency Management Agency (FEMA) have been identified in the vicinity of the proposed Project and are presented on Figure 3.6-1.

The proposed power plant site, which is located mainly in the southwest quarter of Section 5, T15N, R12W, is situated in Zone C, which is defined by FEMA to include all areas of minimal flooding.

The proposed gas pipeline corridor crosses the Big Sandy River, minor tributaries, and several washes.

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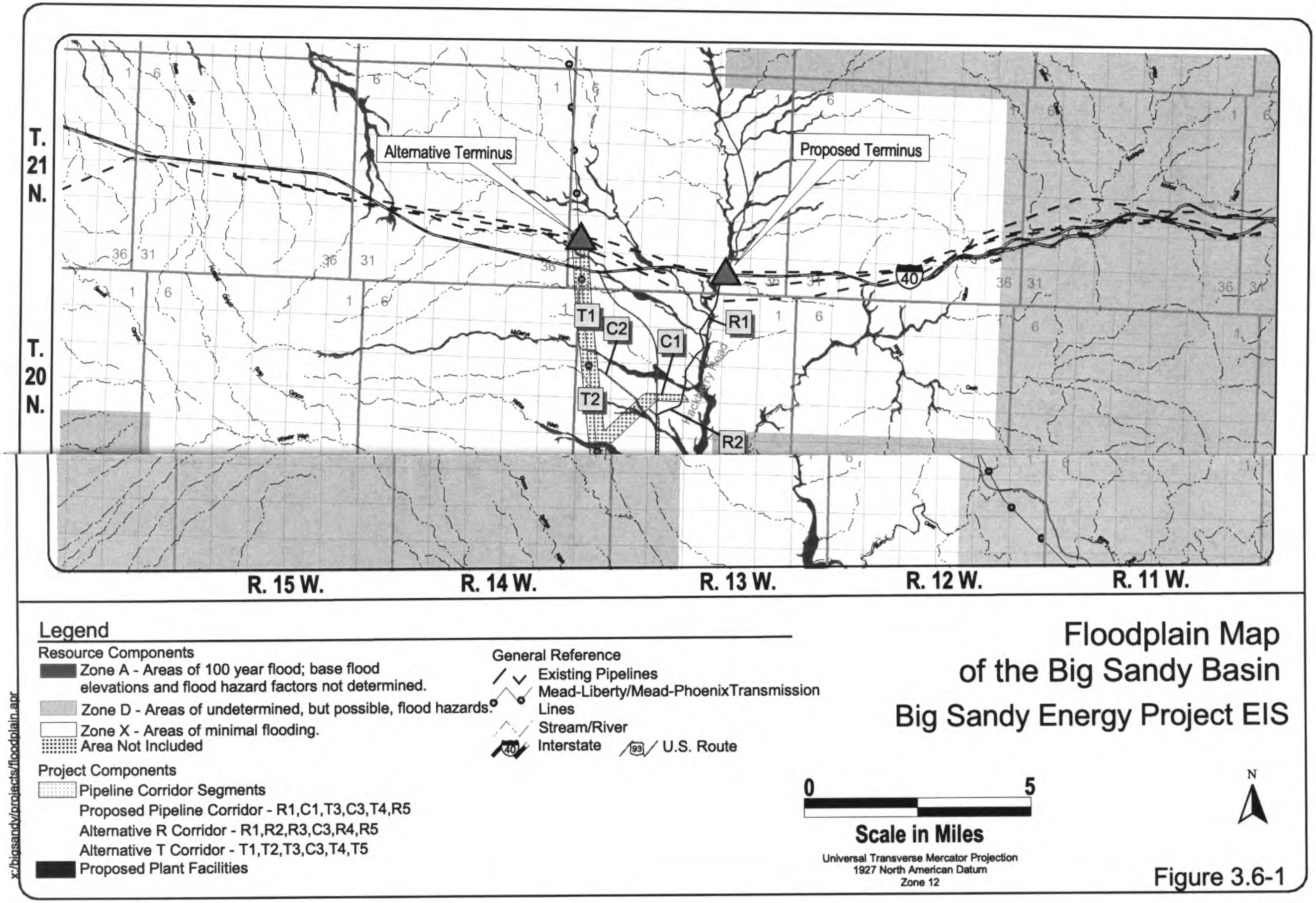

Floodplain Map of the Big Sandy Basin

Big Sandy Energy Project EIS

Figure 3.6-1

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The floodplains that would be crossed by the proposed pipeline corridor are classified as Zone A, which are areas of the 100-year flood; base flood elevations and flood hazard factors have not been determined. One tributary crossing in corridor segment R5 is classified as Zone A0, which is an area of 100-year shallow flooding where depths are between 1 and 3 feet; the average depth of inundation in this case is 2 feet, but no flood hazard factors have been determined. A list of the floodplains crossed by the proposed and alternative gas pipeline corridors is presented in Table 3.6-1.

3.6.1.1 Region of Influence

The region of influence for assessing impacts on floodplains and washes includes all facilities related to the Project. The Project parcels, well sites, access roads, pipeline corridors, and potential areas for the OPGW installation were evaluated to determine the level of possible floodplain disturbance.

3.6.1.2 Existing Conditions

Proposed Power Plant Site

The proposed power plant site is located in the southeastern portion of the Big Sandy groundwater basin, which occupies an area of approximately 800 square miles. The primary drainage and surface water resource in the basin is the Big Sandy River.

The proposed power plant site and substation are located between Sycamore Creek and Gray Wash, which are both westerly flowing tributaries to the Big Sandy River. The site is crossed by several southerly and southwesterly flowing ephemeral drainages that are tributaries to Gray Wash.

TABLE 3.6-1
FLOODPLAIN CROSSINGS BY THE PROPOSED AND ALTERNATIVE PIPELINE CORRIDORS

Proposed Route	Alternative R	Alternative T
Big Sandy River	Big Sandy River	Big Sandy River
Sycamore Creek	Sycamore Creek	Sycamore Creek
Bronco Creek	Bronco Creek	Bitter Creek
Tributary #1 (AO)	Tributary #1 (AO)	Tompkins Canyon Creek
Natural Corrals Wash	Natural Corrals Wash	Gunsight Canyon Creek
Tompkins Canyon Creek	Tompkins Canyon Creek	Deluge Wash
Gunsight Canyon Creek	Gunsight Canyon Creek	Cane Springs Wash
Deluge Wash	Deluge Wash	Moss Wash
Cane Springs Wash	Cane Springs Wash	Antelope Wash
Moss Wash	Moss Wash	Wheeler Wash
Antelope Wash	Antelope Wash	Kabba Wash
Wheeler Wash	Wheeler Wash	McGarrys Wash
Kabba Wash	Kabba Wash	10 Minor Tributaries
Bottleneck Wash	Bottleneck Wash	
McGarrys Wash	McGarrys Wash	
14 Minor Tributaries	29 Minor Tributaries	

Note: All floodplains crossed by the proposed and alternative gas pipeline corridors are classified as Zone A except Tributary #1, which is classified as Zone A0.

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The proposed power plant site and substation are located in an area of minimal flooding, outside of the 100-year and 500-year floodplain zones that extend from the Big Sandy River. The proposed gas pipeline corridor crosses the river west of the proposed power plant site and various extensions of the floodplain as the corridor runs north toward the intersection with the existing pipeline.

Proposed Gas Pipeline Corridor

Most of the segments that make up the proposed gas pipeline corridor intersect a floodplain. Only corridor segment C3, which also is included in the Alternative R and T gas pipeline corridors, is completely encompassed by Zone C and avoids any such crossings.

Corridor segment R5 crosses the Big Sandy River just west of the proposed power plant site along US 93. The crossing of Zone A0 is also located in corridor segment R5. All other crossings along the proposed gas pipeline corridor involve Zone A floodplains.

Alternative R Gas Pipeline Corridor

The Alternative R gas pipeline corridor crosses the same washes and creeks as the Proposed Action, but intersects many more minor tributaries. Corridor segment R4 is the main contributor to the additional crossings and overlaps approximately 8,000 feet of Zone A floodplain of the Big Sandy River in T16N, R13W. The remaining segments of this alternative have similar qualities to the Proposed Action. Corridor segment R2 is solely in Zone C, but the rest cross at least one floodplain in Zone A.

Alternative T Gas Pipeline Corridor

The Alternative T gas pipeline corridor has the fewest floodplain crossings of all the corridors presented. However, corridor segment T5 would cross approximately 0.5 mile of the Big Sandy floodplain. Zone A is the only floodplain that would be affected, as corridor segment R5 is excluded from this alternative. All the segments in the Alternative T gas pipeline corridor have similar intersections.

Crossover Segment C2

Crossover segment C2, which is not part of any of the corridors, does not intersect any flood zones.

3.6.2 <u>Environmental Consequences</u>

The construction of new facilities within floodplains or washes potentially could have an adverse impact on 100-year peak flow events. The extent of disturbance for this Project is examined in the following sections.

3.6.2.1 Identification of Issues

The issues identified are the potential adverse impacts on natural and floodplain values, as well as the potential adverse impacts on downstream lives and property.

3.6.2.2 Significance Criteria

The effects of the Proposed Action and alternatives would be considered significant if the following would occur:

- encroachment on a floodplain or alteration of a wash, watershed, or river or wash flow that would cause a rise in river or wash flow stage or increase in floodplain area downstream, such that the alteration would cause destruction of lives or property

- construction within or surrounding washes that would cause a substantial reduction in flood-carrying capacity

3.6.2.3 Impact Assessment Methods

Potential impacts on washes and floodplains were assessed based on intersections that would occur where the proposed Project would cross an existing wash or floodplain boundary. Factors including the number and location of

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intersections and the nature and size of facilities that intersect these features were evaluated.

The washes and floodplains were identified by plotting the proposed power plant site and the proposed and alternative gas pipeline corridors on FEMA Flood Insurance Rate Map (FIRM) panels. The proposed power plant site was found to be outside of any flood zone, but the access road and the proposed and alternative gas pipeline corridors cross several 100-year floodplains. Floodplain crossings associated with the proposed and alternative gas pipeline corridors were counted based on hypothetical assumed pipeline alignments along the centerlines of the corridors; these crossings are presented in Table 3.6-1. Any crossings not included in Table 3.6-1 that may occur due to selection of a final alignment would be evaluated as necessary during pre-construction surveys.

3.6.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse impacts on floodplains:

- The proposed county road that would connect the proposed power plant site to US 93 would include a box culvert at the Sycamore Creek crossing designed to handle a 100-year, 24-hour flood event.
- The Proposed Action includes numerous erosion and sedimentation control measures that would help to reduce downstream floodplain impacts. Section 2.2.8.2 includes a discussion of these measures.

3.6.2.5 Impact Assessment

Proposed Action

Since the proposed power plant site is located outside of the 100- and 500-year floodplain zones, no adverse impacts are expected in this area. All stormwater within the proposed power plant site and substation boundaries would be captured and diverted to the evaporation ponds in accordance with the Stormwater Management Plan. Stormwater in the washes upstream of the power plant, substation, and evaporation ponds would be collected and diverted in drainage channels around the facilities back into the same washes through appropriate erosion control and energy dissipation structures. Therefore, floodplains in Gray Wash and Sycamore Creek would not be adversely affected.

There are numerous crossings of floodplains by the proposed gas pipeline corridor. These areas would be disturbed only temporarily during construction because the pipeline would be placed underground. The pipeline would be buried at a depth of approximately 4 to 5 feet, which would eliminate the possibility of permanent floodplain disturbance. After the pipeline is in place, the excavated trench would be regraded to the approximate pre-construction contour. In effect, the original floodplain features and characteristics would remain unchanged. A Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (COE) would be required for the section of pipeline trenched through the Big Sandy River in corridor segment R5. Downstream effects would be minimal because this disturbance along the pipeline corridor would be temporary and because of the erosion/sedimentation control measures included in the Proposed Action.

The option to directionally drill the natural gas pipeline approximately 20 to 30 feet below the Big Sandy River instead of trenching and burying is included in the Proposed Action. The directional drilling option would minimize or eliminate impacts on floodplains and associated riparian areas during construction. In addition, this method could avoid the requirement of a permit from the COE pursuant to Section 404 of the Clean Water Act.

In corridor segment T4, where this corridor expands in the vicinity of the Carrow-Stephens Ranches Area of Critical Environmental Concern (ACEC) and near the Hackberry

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Road/US 93 intersection, floodplain crossings other than those listed in Table 3.6-1 would be encountered. Following pre-construction surveys, the final alignment would be located anywhere within the corridor. However, as mentioned before, all crossings would involve only temporary impacts.

The proposed county road would cross the Sycamore Creek floodplain. Because the box culvert under the road would be sized to handle the 100-year, 24-hour flood event, it would not cause a substantial reduction in flood-carrying capacity. Sycamore Creek would continue to flow through the box culvert and its downstream effects should remain the same.

The proposed agricultural activities and well sites would not affect any floodplains.

Any floodplains that occur along the route of the OPGW installation option would be easily avoided.

The microwave dishes would be installed on existing towers and would have no impact on floodplains.

Because there would be no alteration of flood-carrying capacity from the crossing of Sycamore Creek, and no permanent encroachment or alteration of a wash or river, and the resulting downstream effects would be negligible, the potential adverse impact on floodplains would not be significant.

Alternative R Gas Pipeline Corridor

The Alternative R gas pipeline corridor is similar to the Proposed Action. It crosses the same washes and streams, but intersects more tributaries. Corridor segment R4 potentially could affect the Big Sandy floodplain, but the impact would not be significant since there would not be substantial encroachment or alteration of flows or flood-carrying capacity.

As with the Proposed Action, there would be no alteration of the flood-carrying capacity of Sycamore Creek, and all crossings occurring along this alternative corridor would involve only temporary impacts. Thus, the potential for adverse impacts on floodplains would not be significant.

Alternative T Gas Pipeline Corridor

The Alternative T gas pipeline corridor would have similar impacts as the Proposed Action. This alternative would likely have fewer floodplains to cross; however, it would cross approximately 0.5 mile of the Big Sandy floodplain.

As with the Proposed Action, there would be no alteration of the flood-carrying capacity of Sycamore Creek, and all crossings occurring along this alternative corridor would involve only temporary impacts. Thus, the potential for adverse impacts on floodplains would not be significant.

Crossover Corridor Segment C2

Crossover segment C2 would have no adverse impacts on floodplains because it does not cross any flood zone.

No-Action Alternative

The Proposed Action would not be constructed under the No-Action Alternative. There would be no impacts on floodplains.

3.6.2.6 Mitigation and Residual Impacts

No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts and there would be no residual significant impacts.

If adopted, the following measure would be implemented to minimize adverse impacts not considered to be significant:

- Should substantial channel erosion occur in Sycamore Creek as a result of the

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installation of the box culvert that causes an impediment to wildlife movement, corrective actions, such as the placement of additional riprap or other means of restoring the channel grade sufficient to allow wildlife movement, would be taken.

3.7 LAND USE AND ACCESS

This section identifies and describes the jurisdiction and existing and planned land uses in the vicinity of the Proposed Action, as well as environmental consequences as they apply to land use and access.

Information was compiled from agency maps and planning documents, aerial photography, and previously conducted resource studies. Field investigations were conducted in August 2000 and April 2001 to verify existing land use conditions.

Land jurisdiction represents the administrative control maintained by the responsible Federal, state, Indian nation, or local agencies within the Project area. The jurisdiction does not necessarily dictate ownership. Jurisdictional boundaries were obtained from BLM and Arizona State Land Department (ASLD) maps and digital data. The main jurisdictions within the Project area include BLM, ASLD, Hualapai Tribe, and Mohave County. Private lands in the Project area are under the jurisdiction of Mohave County. Land jurisdiction and ownership for the power plant site, pipeline corridors, and surrounding areas are presented in Section 2.0 on Figure 2-12.

Existing land uses (regardless of jurisdiction or planned use) were determined from aerial photography and subsequent field visits. Planned land uses were assessed from appropriate planning documents; the plans applicable for land management in the area include the Kingman Area Resource Management Plan (BLM 1995) and Mohave County General Plan (1995) and Zoning Ordinance (2000). The approximate locations of residences and existing land uses are shown on Figure 3.7-1; planned land uses are shown on Figure 3.7-2.

In May 2001, the BLM Kingman Field Office completed the Cane Springs Land Exchange. This exchange brought additional lands in the region under the management responsibility of BLM. Twenty-eight sections of land in T18N and T19N; R13W and R14W just west of US 93 (Figure 3.7-3) were involved in this exchange. The Alternative T gas pipeline corridor crosses portions of two of these sections. Due to the timing of this land exchange agreement, and the limited effect this change in management responsibility has on the proposed Project, this Draft EIS was completed without further assessment of the lands involved in this exchange.

3.7.1 Affected Environment

The following sections describe the current land use and access conditions; this represents the baseline for assessment impacts.

3.7.1.1 Region of Influence

The region of influence for assessing construction, operation, and maintenance impacts on land uses includes all areas within 5 miles of the proposed power plant site, substation, access road, well pads, and agricultural area (all of these Project lands previously part of Banegas Ranch), and 1 mile on each side of the centerline of each alternative pipeline corridor. The Mead-Liberty 345-kV transmission line right-of-way, north of the alternative pipeline terminus, is also included for the potential installation of the redundant communication OPGW. In addition, lands owned by the Hualapai Tribe that are within the Big Sandy Valley have been included as a potentially sensitive land jurisdiction.

3.7.1.2 Existing Conditions

The Big Sandy Valley is surrounded by the Aquarius Mountains to the east, and McCracken and Hualapai Mountains to the west. The Big

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Sandy River and US 93 are oriented approximately north-south through the valley. Land uses throughout the valley include ranching, residential uses, and some commercial uses. The developed uses tend to be clustered along US 93 and near the community of Wikieup, which is located toward the south end of the valley. Lands 5 miles or less from the proposed power plant site are privately owned or managed by the BLM. Lands 1 mile from the proposed pipeline corridor are privately owned, Hualapai lands, public lands managed by the BLM, or state lands managed by ASLD (refer to Figure 2-12).

The general area surrounding the proposed power plant site, substation, agricultural uses, water wells, and associated facilities is located approximately 3.5 miles southeast of Wikieup in Sections 5 and 7, T15N, R12W. The terrain varies from flat areas, to rolling hills, to fairly mountainous and rocky terrain east of the proposed power plant site. There are small washes dissecting the area, as well as two large ephemeral streams, Sycamore Creek and Gray Wash. The proposed power plant site is located near one small spring and wetland area (refer to Section 3.12) with primarily native vegetation (refer to Section 3.11). Vegetation across the general area consists of native upland Sonoran Desert species of grasses, desert shrubs, and some cacti. The area is primarily open rangeland that is undeveloped and/or grazed by cattle and/or wild burros. There is a grazing allotment for use of public lands.

The general area shows evidence of some vehicle traffic; however, the disturbance appears predominantly limited to small areas (e.g., near well sites). There is one large bladed strip along the northern boundary of Section 7, which crosses through Sycamore Creek. This is the route of the proposed county road and currently is used for access from US 93 to the east.

The developed uses in the vicinity are limited to the Mead-Phoenix Project 500-kV transmission line, Phelps Dodge water pipeline, scattered water wells, a clay mining operation, two existing dirt roads [one through Sections 5 and 6 (T15N, R12W) and one through Section 7], and one residence that has several trailers associated with it. The residence is located approximately 0.5 mile southwest of the proposed power plant site, directly east of the proposed wells and agricultural area. The general area includes privately owned and BLM-managed lands. Plans for Mohave County and BLM-managed public lands do not indicate any proposed additional development near the proposed power plant site.

Communication Facilities

Land uses at Hayden Peak in the Hualapai Mountains include existing access roads and radio/microwave towers.

Land uses surrounding the Mead-Liberty 345-kV transmission line, where the OPGW option would be installed, are described under the pipeline corridor segments following the transmission lines. Lands north of the alternative pipeline terminus (Section 29, T21N, R14W) are privately-owned lands that typically include large-acreage remote ranches with a single residence and other structures associated with ranch uses (e.g., corrals, barns).

There are about three residences located near or adjacent to the Mead-Phoenix Project 500-kV or Mead-Liberty 345-kV rights-of-way. In addition to the privately owned lands, there are undeveloped lands managed by ASLD.

Natural Gas Pipeline Corridor

As described in Section 2.0, the corridor for the proposed natural gas pipeline would include corridor segments R1, C1, T3, C3, T4, and R5. The land uses associated with each corridor segment are described below, beginning closest to the plant site.

Corridor segment R5 follows the alignment of the proposed access road west to US 93, turns north and follows along the east side of the US 93 to the intersection of the highway and the Mead-Phoenix Project 500-kV transmission line.

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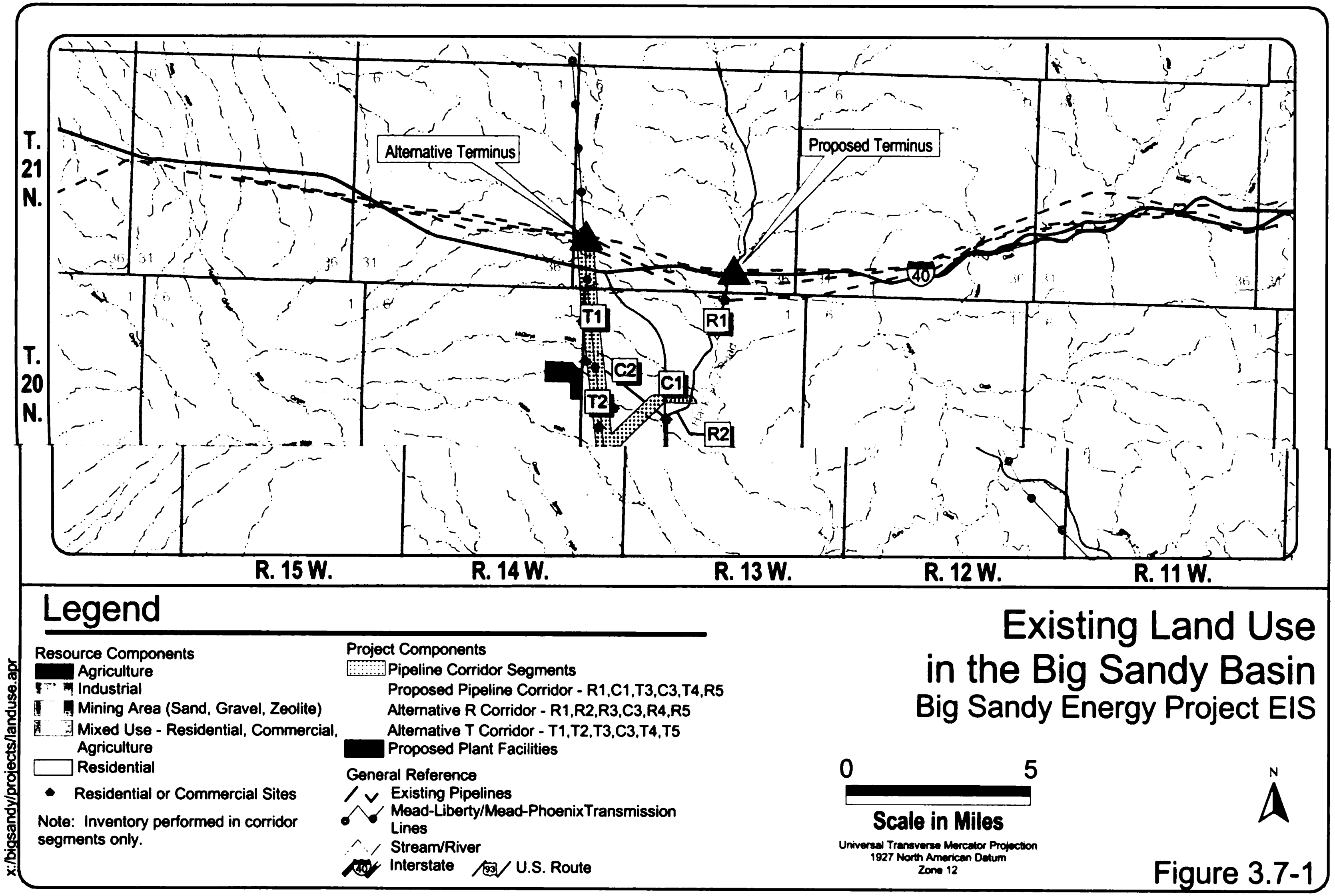

Existing Land Use in the Big Sandy Basin
Big Sandy Energy Project EIS

Figure 3.7-1

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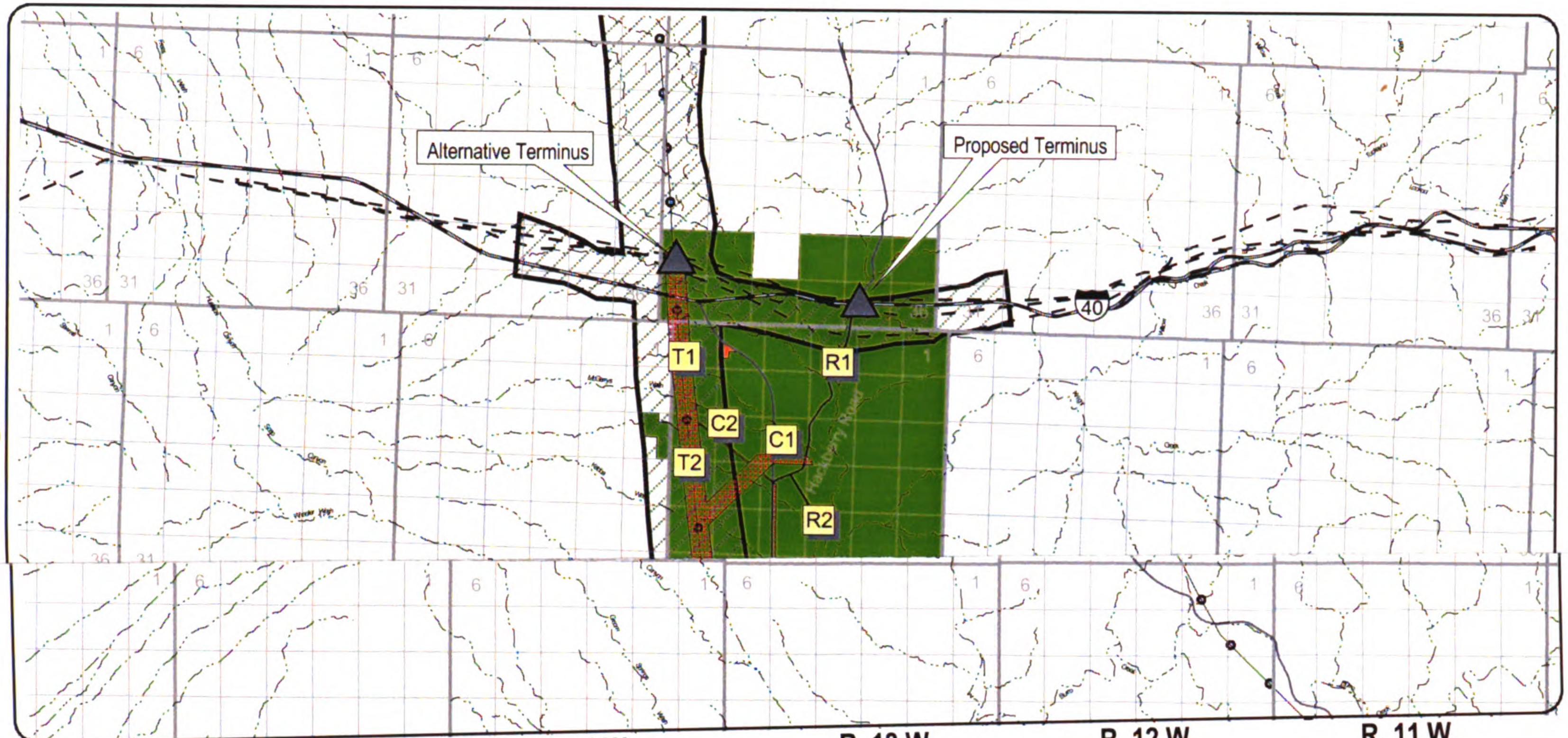

Legend

Resource Components
- BLM Utility Corridor
- Surbaban Development Area
- General
- Commercial
- Industrial

Project Components
- Pipeline Corridor Segments
- Proposed Pipeline Corridor - R1,C1,T3,C3,T4,R5
- Alternative R Corridor - R1,R2,R3,C3,R4,R5
- Alternative T Corridor - T1,T2,T3,C3,T4,T5
- Proposed Plant Facilities

General Reference
- Existing Pipelines
- Mead-Liberty/Mead-Phoenix Transmission Lines
- Stream/River
- Interstate
- U.S. Route

0 5

Scale in Miles

Universal Transverse Mercator Projection
1927 North American Datum
Zone 12

N

Planned Land Use in the Big Sandy Basin

Big Sandy Energy Project EIS

Figure 3.7-2

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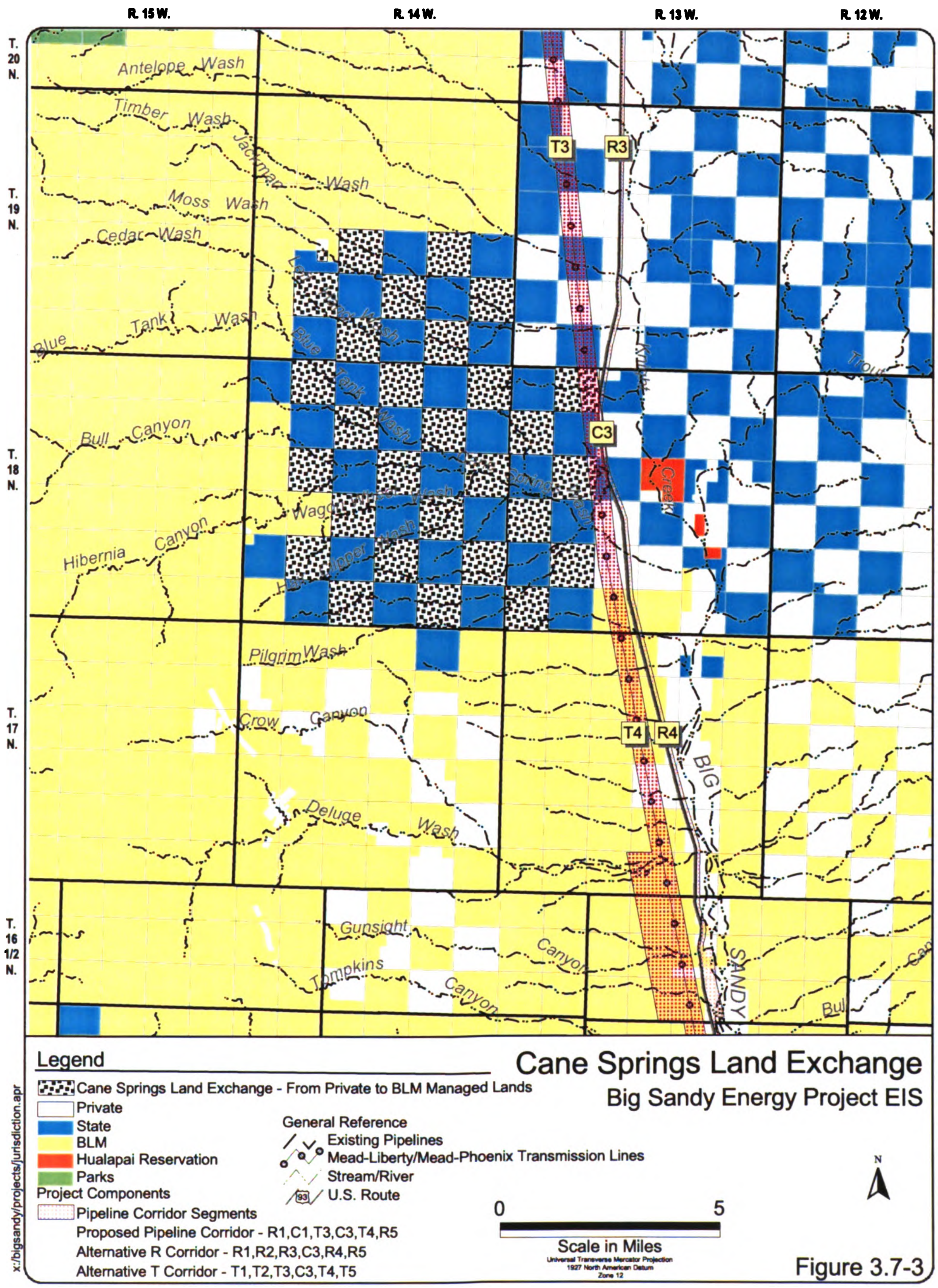

Figure 3.7-3

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This corridor segment crosses the Big Sandy River and travels through the community of Wikieup. Between the plant site and US 93, a large portion of the county road alignment within this corridor has been partially disturbed; much of the vegetation has been removed and vehicle travel along the proposed access road is apparent. The corridor crosses through Sycamore Creek, where vehicle disturbance is also apparent. Near US 93, there is an existing road (Cholla Canyon Ranch Road) which is the current access point from the highway into the general plant site area. North of Cholla Canyon Ranch Road, US 93 crosses over the Big Sandy River via a bridge.

The Big Sandy River area is relatively undeveloped with the exception of the highway crossing. ADOT plans to widen the highway through this area, which will include a second bridge to the west of the existing bridge. North of the Big Sandy bridge, there are four residences located in or near the corridor segment; however, the areas along US 93 remain relatively undisturbed south of the developed community of Wikieup. Through about two miles of Wikieup the land in the corridor tends to be partially to completely disturbed by development and ranching activities; there are up to 15 residences and up to 6 businesses, including a gas station and nursery/garden, located in or near the pipeline corridor. ADOT's proposed highway improvements would not expand the highway or its right-of-way east of US 93 through this area; rather there will be a by-pass road constructed to the west of Wikieup. About 0.25 mile north of Wikieup, there is a historical marker for the Big Sandy Valley located along the east side of the highway (Section 15, T16N, R13W). This corridor segment terminates where the Mead-Liberty 345-kV and Mead-Phoenix Project 500-kV transmission lines cross over US 93. Lands within corridor segment R5 are primarily privately owned, though some small land areas are managed by the BLM (i.e., at section corners along the proposed access road alignment).

Corridor segment T4 parallels each of the Mead-Liberty 345-kV and Mead-Phoenix Project 500-kV transmission lines through a BLM-designated 1-mile-wide utility corridor. As described in Section 2.0, this corridor segment includes a broader area to the west of the transmission lines, for a distance of about 4 miles, to provide an opportunity to avoid the Carrow-Stephens ACEC and existing topographic features. There is only one residence within this corridor, which is along US 93, just north of the Mead-Phoenix Project 500-kV line (on the west side); three additional residences are located on the east side of the highway, immediately north of the transmission lines (located in corridor segment T5). Despite these residences located along US 93, a majority of this corridor is undeveloped rangeland that is used for grazing. In addition, there is a primitive access road that generally follows topographic contours near the transmission line. This road was used for construction of the transmission line and is currently used for maintenance activities. The road is not maintained, but does provide limited access into the area. This corridor segment crosses privately owned lands and lands managed by the BLM and ASLD.

Similar to corridor segment T4, the land within corridor segment C3 includes relatively undeveloped areas used for grazing. This corridor includes US 93 along the east side, providing the opportunity for the pipeline to parallel the transmission lines or the highway. Roads in the corridor, including US 93, the transmission line access road, and several other small dirt roads, are the primary sources of disturbance. The unmaintained transmission line road generally follows the natural contours of the land. There are no residences located in this corridor segment. This corridor segment crosses privately owned lands and lands managed by ASLD.

Corridor segment T3 includes relatively undeveloped rangeland, though some residential development is present toward the north end of the segment. There are two residences, as well as a communication tower, located in Section

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30, T20N, R14W, just west of the transmission lines. These are the only developed uses, beyond the transmission lines and the transmission line access road, that are located in this corridor segment. Similar to the transmission line access road in other corridor segments, the road generally follows topographic contours. Corridor segment T3 includes privately owned lands and lands managed by ASLD.

Corridor segment C1 crosses undeveloped rangeland that is used for grazing. This corridor does not follow an existing linear feature and disturbance is limited to the existing nearby access provided by the transmission line access road, Old US 93, US 93, and Hackberry Road. The corridor crosses both Old US 93 and US 93. Old US 93 provides access to Windmill Ranch residences (40-acre parcel residential area) and Sierra Vista Estates (residential subdivision in Section 13, T20N, R14W). US 93 is a two lane highway maintained by ADOT. Roads are the only developed uses; no residences are located within this corridor segment. Corridor segment C1 primarily crosses lands managed by ASLD, though some section corners of privately-owned land are also present in the corridor (see Figure 2-12).

Corridor segment R1 parallels Hackberry Road, a dirt road maintained by Mohave County. The corridor crosses through relatively undeveloped rangeland that is used for grazing. Disturbance is limited to the existing roadway, side access roads, an abandoned mining area (Section 3, T20N, R13W), one residence, gas pipeline crossing areas and associated facilities, and the I-40 corridor. The single residence is located along the east side of Hackberry Road in Section 3, T20N, R13W. The corridor crosses two existing natural gas pipelines, one just south of the residence, the other crossing about 0.5 mile north of the residence. Just north of the second pipeline crossing, Hackberry Road crosses under I-40, at an existing highway underpass. This corridor segment terminates at a third natural gas pipeline immediately north of I-40. This pipeline corridor segment includes privately owned lands and lands managed by ASLD.

Alternative Gas Pipeline Corridors

The two alternative natural gas pipeline corridors follow road alignments completely (Alternative R) or along the transmission lines completely (Alternative T). The land uses associated with each corridor segment that have not been described under the proposed natural gas pipeline corridor are described below. Although none of the alternatives include corridor segment C2, a description of the existing land uses along this crossover segment is also included.

Alternative R Gas Pipeline Corridor

As described in Section 2.0, Alternative R gas pipeline corridor includes corridor segments R1, R2, R3, C3, R4, and R5. Corridor segments R1, C3, and R5 are described under the Proposed Action. The land uses associated with corridor segments R2, R3, and R4 are described below, beginning closest to the plant site.

Corridor segment R4 parallels US 93 and the Big Sandy River. The corridor includes areas east of, and adjacent to, the US 93 right-of-way. The land is relatively undeveloped and is primarily used for grazing, though there are some scattered residences associated with some of these ranch uses. The southern part of the corridor also crosses through the Carrow-Stephens Ranches ACEC (refer to Section 3.10). There are about eight residences located within the corridor along the east side of US 93; additional residences are present outside the width of the corridor to the east and along the west side of US 93. This corridor segment crosses privately owned lands and lands managed by the BLM.

The land uses present in the R3 corridor segment are very similar to those described for corridor segment R4. There are about four residences located within the corridor; additional residences are present outside the corridor and along the west side of US 93. This corridor segment crosses only privately owned lands.

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Corridor segment R2 follows along Hackberry Road, which is an unpaved public road maintained by Mohave County. The land in the area is undeveloped; there are no developed uses except one residence that is located outside the corridor. Lands within this corridor are privately owned and managed by ASLD.

Alternative T Gas Pipeline Corridor

As described in Section 2.0, the Alternative T gas pipeline corridor includes corridor segments T1, T2, T3, C3, T4, and T5. Corridor segments T3, C3, and T4 are described under the Proposed Action. The land uses associated with corridor segments T1, T2, and T5 are described below, beginning closest to the plant site.

Corridor segment T5 generally follows the Mead-Phoenix Project 500-kV and Mead-Liberty 345-kV transmission lines from the plant site to its intersection with US 93, except for the area where the corridor crosses the Big Sandy River. This corridor segment also crosses the buried Phelps Dodge water pipeline near the Big Sandy River. The lands through this corridor are mostly undeveloped and used for grazing, though some development is present near the Big Sandy River and where the corridor approaches US 93. Additionally, there is an unmaintained primitive access road that follows the transmission lines. There are about 10 residences located in this corridor (six along the river, four along US 93). Additionally, there are several non-residential structures located in the corridor along the boundary of Sections 10 and 11 (T16N, R13W). This corridor includes lands managed by the BLM and privately owned lands.

Corridor segment T2 is primarily undeveloped rangeland. There are some scattered residences located near the area, though they are completely outside the corridor. The corridor segment is intersected at its north end by Old US 93, a well-maintained dirt road. Additionally, the primitive transmission line road is located in and provides access to areas within this corridor.

This corridor segment crosses privately owned lands and lands managed by ASLD.

Land uses in corridor segment T1 are similar to those described for corridor segment T2; there are no residences located in this corridor segment. Corridor segment T1, however, includes the crossing of I-40 near its north end. The transmission lines cross over I-40; there is not an existing crossing under I-40 in this corridor segment. The corridor also intersects with three natural gas pipelines north of I-40. At the north end of the corridor, there is a large facility operated by El Paso Natural Gas located in Section 29, T21N, R14W, adjacent to the middle pipeline crossing. This corridor segment includes privately owned lands and lands managed by ASLD.

Crossover Segment C2

Corridor segment C2 follows Old US 93. This corridor is narrow, including only the road right-of-way. The land use near the road is generally grazing; there are a few scattered residences (on minimum 40-acre parcels). There are no developed uses, aside from the road itself, located within the corridor. This corridor segment crosses privately owned lands and public lands managed by the BLM.

Management Plans and Policies

Bureau of Land Management

The Kingman Area Resource Management Plan (RMP) guides management of BLM lands in the vicinity of the Project (1995). The Project would be located primarily in the General Management Area, meaning the lands are not subject to unusual demands requiring special management and typically are managed for multiple uses. Land use management prescriptions described in the RMP that are relevant to the proposed Project are for land use authorizations, or rights-of-way, utility corridors, and access issues. Portions of corridor segments R4 and T4 cross the Carrow-Stephens Ranches ACEC (refer to Section 3.10).

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BLM grants rights-of-way on a case-by-case basis, within existing rights-of-way whenever possible. In addition to the existing rights-of-way, BLM has designated utility corridors, which range from 1 to 2 miles in width, which are intended to prevent proliferation of utility systems across public lands and reduce potentially adverse impacts on sensitive resources. Existing utility corridors are designated along the Mead-Liberty 345-kV and Mead-Phoenix Project 500-kV transmission lines. These corridors are shown on Figure 3.7-2. Large utilities would be restricted to these corridors.

Access across and to public lands is specified as a management concern in the RMP. BLM has determined areas where access should be improved; none of these improvement areas are located in the Project area. Additionally, no specific policies or management guidelines regarding access have been established.

Mohave County

The Land Use Element of the Mohave County General Plan (1995) defines four planning area types for the unincorporated area: Rural Development Area (RDA), Suburban Development Area (SDA), Urban Development Area (UDA), and Outlying Communities. These planned uses are shown on Figure 3.7-2.

RDAs are intended to remain rural in nature with small neighborhood commercial uses serving local residential needs. No urban or suburban services or facilities are provided. SDAs are intended to provide opportunities for large-lot residential areas with non-residential uses (e.g., neighborhood commercial services) in appropriate locations. SDAs typically include facilities such as paved streets, septic systems, and public water supply. The plan indicates that there is an SDA planned for all of T20N, R13W and part of T21N, R13W. UDAs provide locations for more intense development, including residential uses on lots smaller than 1 acre and commercial and industrial uses. Urban service facilities and infrastructure are required in these areas and should be coordinated with land uses. Outlying Communities allow for small communities, such as Wikieup, to continue growing in their current patterns. Outlying Communities provide for residential uses at urban, suburban, or rural densities, as well as neighborhood commercial, public, recreational, or agricultural uses.

In addition to the Land Use Element, the General Plan includes a Public Infrastructure and Services Element and a Housing Element. These elements do not specify policies for utilities, such as a pipelines, other than that these facilities should be coordinated with planned land uses.

The Mohave County Zoning Ordinance (2000) regulates the specific uses permitted on individual properties. The primary zones within the Project area are "A-R" and "M-X." Zone "A-R" allows one residence per lot, agricultural uses, guest ranches, schools, churches, public buildings, playgrounds, greenhouses, and wireless communication towers. Zone "M-X" allows heavy manufacturing and industrial uses such as canneries, fertilizer plants, refineries, commercial feed lots, meat packing plants, and public and private utility power stations and commercial generating plants. Special use permits are required for uses not explicitly allowed in a zone.

3.7.2 Environmental Consequences

3.7.2.1 Identification of Issues

The following issues were identified during scoping and preparation of this Draft EIS:

- natural gas pipeline effects on private and public lands
- access road right-of-way and stream crossings and timing for completion
- effects on private parcel lots acquired for future residential development near the proposed power plant site and pipeline route

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3.7.2.2 Significance Criteria

The effects of the Proposed Action and alternatives would be considered significant if the following were to occur:

- any substantive inconsistencies with existing laws, ordinances, or regulations (BLM, state, or county)
- uncompensated permanent displacement of an existing residence or business by the proposed Project

3.7.2.3 Impact Assessment Methods

The assessment of impacts required an inventory of existing uses in areas where the Proposed Action and alternative pipeline corridors would be located, and where OPGW installation would occur. Data on planned future land uses were acquired from adopted plans from the BLM and Mohave County supplemented by personal communication with agency personnel. Additionally, the land use goals, objectives, policies, and management prescriptions stated in these plans were reviewed for potential conflicts with the proposed Project.

The anticipated physical impacts on land uses are based on the locations where Proposed Actions would occur. The sensitivity of nearby land uses within the region of influence also was considered if the proposed Project would be anticipated to interfere with the function of that land use. Duration of impact also was considered. Long-term impacts are considered those that would be permanent or those that would last beyond the construction period and short-term impacts are considered those associated with construction.

3.7.2.4 Actions Incorporated into the Proposed Action to Reduce or Prevent Impacts

Measures to reduce or eliminate land use and access impacts would be implemented as part of the Proposed Action, as follows:

- The proposed power plant site, substation, well heads, and evaporation ponds would be fenced to prevent conflicts with livestock and/or wild burros.
- The proposed access road serving the proposed power plant site would provide access to the nearby residence and existing clay mining operation south of the plant.
- The pipeline would be located parallel to existing rights-of-way to the extent feasible and practical.
- Easements and rights-of-way from appropriate owners/agencies would be acquired prior to Project construction.
- To the extent feasible, the pipeline would be located within the construction corridor so that permanent displacement of a residence or business would not occur.
- Following pipeline installation, the terrain of the construction corridor would be recontoured and revegetated based on input from respective landowners and land-management agencies and the final reclamation plans.
- Alternative vehicle routes would be provided when pipeline installation activities disturb existing access roads. Disturbance of access roads would be limited to three to five workdays, when possible.
- Access roads disturbed during pipeline installation would be restored to near original conditions.

3.7.2.5 Impact Assessment

Proposed Action

<u>Proposed Power Plant Site and Evaporation Ponds</u>

The proposed power plant, substation, one water production well, and the cooling water

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evaporation ponds would be located on a 120-acre, privately owned parcel within the unincorporated area of Mohave County in Section 5, T15N, R12W. The 120-acre site is primarily vacant of developed uses; the notable exceptions are the Mead-Phoenix Project 500-kV and Mead-Liberty 345-kV transmission lines, which cross through the western half of the site. Although cattle and/or wild burros graze the proposed power plant site, a fence would be constructed around the plant site and associated facilities to prohibit entry by livestock and wild burros.

The entire 120-acre parcel, located in unincorporated Mohave County, has been designated as a UDA through an amendment to the Mohave County General Plan (Board of Supervisors Resolution 2149, April 17, 2000). UDAs allow for industrial development (Mohave County 1995). The parcel also has been rezoned to "M-X" for heavy manufacturing (Board of Supervisors Resolution 2150, April 17, 2000). Zoning district "M-X" allows for utility power stations and commercial generating plants (Mohave County 2000). The surrounding privately owned lands, also within unincorporated Mohave County, are within the RDA and zoned "A-R" for agricultural and/or residential uses. Nearby BLM-managed lands are grazed under an existing allotment, used for utilities, provide recreation uses, and allow for access to public and private lands. Permitted uses on private and public lands would not change as a result of the proposed Project.

Development of the power plant, substation, and evaporation ponds would occur over approximately 20 months and would include disturbance of approximately 56 acres of privately owned land. The proposed power plant site is already designated and zoned for the proposed use and would not require additional authorization from Mohave County. Development at the proposed power plant site is consistent with county land use plans. No displacement of residences or businesses would be anticipated. Therefore, no significant adverse land use impacts would be anticipated at the proposed power plant site and evaporation ponds under the Proposed Action.

Access Road

The proposed access road to the power plant site would replace the existing access road to the site, which is a road that travels from southwest to northeast through Section 7. The road through the western half of Section 7 would become inaccessible, but the proposed access road would provide access to the existing residence in Section 7 and the mining operations to the south. The partial disturbance within the area of the proposed road alignment suggests that vehicles (potentially including off-highway vehicles [OHVs]) currently use the alignment for access; adjacent areas are used for grazing or are vacant. In Section 7, the road would cross the Phelps Dodge water pipeline alignment. No disturbance of the underground water pipeline would be anticipated. An additional road segment would be developed off the access road to the south through the center of Section 7 for a length of about ¾ mile to serve the proposed wells.

The proposed access road would be located primarily on privately owned lands in Sections 1 and 7. The road would cross through one section of BLM-managed land, Section 12. Additionally, the road would cross the two section corners of BLM-managed land at its end near the plant site (Sections 6 and 8, T15N, R12W). The proposed road would not conflict with BLM management guidelines. Mohave County would acquire ownership, easements, and/or right-of-way for the county portion of the road. Privately owned lands can be acquired through purchase or easements; BLM would require that the county apply for right-of-way on Sections 12 (if outside the existing right-of-way), 6, and 8. Development of the proposed road would occur on approximately 21 acres; 19 acres are private and 2 acres are managed by BLM. Thus, impacts of the access road on land use would not be significant.

Development of the access road would not conflict with goals and policies of the Mohave

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County General Plan, Transportation Element. The alignment of the access road would efficiently serve the plant site without adversely affecting surrounding land uses, consistent with Mohave County General Plan transportation goals and policies (Goals 51, 52; Policies 51.1, 52.1, 52.3). Thus, impacts of the proposed access road on land use would not be significant.

Pumping Wells, Agricultural Area, and Water Pipelines

Four water production wells, two observation wells, and more than 100 acres of agricultural activities are proposed for the eastern half of Section 7, T15N, R12W. The wells and pipeline routes would require disturbance of approximately 26 acres. Agricultural activities would occupy approximately 107 acres and would include crops such as Bermuda grass, alfalfa, small grains, vegetables, pecans, or olives. Water use for the agricultural activities would reach a maximum of 400 gallons per minute (650 acre-feet per year). This water would be part of the proposed water budget for all power plant uses (refer to Section 3.4). Development of the wells and agricultural activities would displace an existing dirt road, which currently provides access to the residence southwest of the plant site from US 93.

This half-section of privately owned land is located within the unincorporated area of Mohave County. The land lies within the RDA (Mohave County 1995) and is zoned "A-R." This zoning district allows for primarily agricultural uses and single-family residences. The well and agricultural area already are designated and zoned for the proposed use and would not require additional authorization from Mohave County. Therefore, development at the wells and agricultural uses are consistent with existing plans. The wells and agricultural activities would not displace residences or businesses. No significant adverse land use impacts would be anticipated due to development and operation of the wells and agricultural activities.

Communication Facilities

The primary communication facilities for the substation and power plant site would involve installing microwave dishes on existing microwave towers. Because these areas already have radio and microwave towers located in the vicinity and adequate access, no negative impacts on land uses would be anticipated from the primary communication facilities.

Activities for the construction and maintenance of Western's redundant communication facilities would include the installation of microwave dishes at Phoenix, Towers Mountain, and Perkins (Option 1), and/or at the Big Sandy Substation and an existing Salt River Project (SRP) microwave facility (Option 2). The land uses in these areas would not change, as these locations already have existing facilities similar to those proposed.

Option 1 would also require replacing the existing overhead ground wire on the Mead-Liberty 345-kV transmission line towers with an OPGW between the Big Sandy Substation and the Peacock Substation. As described for the alternative pipeline, land uses along the corridor are limited to ranching/grazing and some scattered residences. North of the Alternative T gas pipeline corridor along the Mead-Liberty 345-kV transmission line, land uses are primarily large acreage ranches.

It is anticipated that all pulling and tensioning sites would be within the existing transmission line rights-of-way; no residential areas would be disturbed. Maintenance activities would be similar to those of the existing transmission line. Because of the temporary and limited disturbance associated with these activities, and that the installation would occur within the existing right-of-way, no adverse impacts on land uses are anticipated.

Proposed Gas Pipeline Corridor

The proposed natural gas pipeline route would follow the proposed access road west to US 93

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(within a 200-foot-wide right-of-way), then turn north and follow along the east side of US 93. The pipeline would follow along US 93 for approximately 7 miles (in corridor segment R5) to the intersection of US 93 with the Mead-Phoenix Project 500-kV and Mead-Liberty 345-kV transmission lines. Despite the previous disturbance along the access road and US 93, installation of the pipeline in this corridor segment would alter terrain and vegetation that has remained intact along the eastern margins of the right-of-way.

Caithness has proposed to cross the Big Sandy River either by trenching or directional boring. Trenching would require disturbance to the riverbed and associated vegetation, while directional boring would not disturb the riverbed. The pipeline would pass near developed uses that are concentrated along US 93 in Wikieup. There are up to 15 residences and about 6 businesses (2 abandoned) within the corridor that would be potentially affected during pipeline construction due to their proximity to the existing highway right-of-way. Where necessary, the pipeline would be located within the existing right-of-way for US 93. Additionally, to the extent feasible, the pipeline would be located within the corridor such that the permanent relocation of residences or businesses, or impacts on the existing gas station or nursery, would not occur. However, if this could not be done, the resident or business would be compensated either through the process of eminent domain or by mutually agreeable business negotiations. Based on a 90-foot wide area of disturbance for the length of the corridor segment, about 84acres would be disturbed.

Corridor segments T4, C3, and T3 of the proposed pipeline corridor include very few developed uses, and are located entirely within the BLM-designated utility corridor. The few existing residences are located just north of the US 93 and transmission line crossing (corridor segments T4 and T5) and in Section 30, T20N, R14W, just west of the transmission lines (corridor segment T3); no residences are located in corridor segment C3. Corridor segment T4 is expanded to allow for avoidance of the Carrow-Stephens Ranches ACEC and nearby topographic features, which would require increased disturbance for installing the pipeline. The varying width of these corridor segments should provide adequate space to install the pipeline without requiring relocation of any residences or any potential impacts on the Carrow-Stephens ACEC.,Since the pipeline would be sited to avoid residences and the ACEC to the extent feasible, potentially significant impacts would be reduced. Impacts resulting from disturbance within the ACEC are discussed in Section 3.10. Based on a 90-foot wide disturbance area, about 150 acres, 20 acres, and 92 acres would be disturbed in corridor segments T4, C3, and T3, respectively.

Pipeline installation in corridor segment C1 would require temporary disturbance of approximately 30 acres of mostly undeveloped rangeland. About half of this corridor segment is located in the BLM-designated utility corridor associated with the transmission lines. The developed uses nearby are primarily roads that provide access to the area. The corridor segment would require crossing these roads (i.e., Old US 93, US 93) temporarily restricting access to some areas. No residential developments are located in this corridor segment.

Pipeline corridor segment R1 follows the north part of Hackberry Road. The corridor segment crosses two natural gas pipelines prior to passing under I-40 at an existing undercrossing. Just north of I-40, the corridor segment intersects a third natural gas pipeline (and terminates). Gas measurement interconnect facilities would be constructed within a new approximately 100- by 100-foot area at each of up to three pipeline interconnections (the southern terminus facilities would be within the proposed power plant site). The residence located near this corridor is on Hackberry Road and outside the road right-of-way. The southernmost pipeline is located just north of the residence and interconnection with that pipeline could require relocation of that residence. However, residents and businesses

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would be compensated either through the process of eminent domain or by mutually agreeable business negotiations, (refer to Section 2.2.5), thus impacts would not be significant. Access along Hackberry Road would be temporarily restricted during pipeline construction. Disturbance from pipeline installation would occur over about 35 acres (not including any additional work areas).

Installation of the pipeline is expected to occur over six months and temporarily disturb a 90-foot-wide area within the proposed pipeline corridor, except for a narrower 50-foot disturbance area along the plant access road and the crossing of the Big Sandy River. To the extent possible, terrain within the proposed corridor and in any additional work areas would be returned to natural contours following pipeline installation. Any removal of vegetation on BLM-managed land would be subject to the Reclamation Operation Maintenance Plan for BLM-Managed Public Lands (Appendix B) and would be consistent with Arizona Department of Agriculture native plant salvage regulations (refer to Section 3.11). A 10-foot wide two-track would be maintained along the pipeline route for inspection and maintenance purposes.

The pipeline would come within close proximity to developed uses in Wikieup and along US 93. However, the corridor allows for placement of the pipeline to avoid conflicts with these developed uses. Mohave County has not adopted any policies regarding the placement of natural gas pipelines near developed uses (Delmar 2001); therefore, the proposed pipeline would not conflict with local regulations for the placement of pipeline facilities. Additionally, the SDA located in T20N, R13W is not anticipated to be affected because the pipeline would be in place prior to the residential development of the area. Restrictions would, however, limit future development over the actual pipeline alignment.

The proposed pipeline corridor would cross about 19 miles of private lands, 11 miles of BLM-managed lands, and 9 miles of lands managed by the ASLD. The pipeline would be located predominantly within new rights-of-way. Rights-of-way would be acquired from landowners prior to pipeline installation. Rights-of-way on private lands would be acquired either through the process of eminent domain, if applicable, or by mutually agreeable business practices. ADOT, BLM and ASLD each would require that Caithness obtain a right-of-way for the natural gas pipeline. When within the ADOT right-of-way (i.e., potentially in Wikieup), pipeline installation would conform to the requirements of ADOT's *Guide for Accommodating Utilities on Highway Rights-of-Way*. The Mead-Phoenix Project 500-kV/Mead-Liberty 345-kV transmission lines are within a 1-mile-wide designated utility corridor (BLM 1993). Where Caithness proposes to cross the existing Mead-Phoenix and Mead-Liberty transmission line rights-of-way, the pipeline installation would conform with a license agreement issued by Western. Routing the pipeline along the transmission lines would result in the pipeline being primarily within the utility corridor (refer to Figure 3.7-2), which would be consistent with BLM planning criteria to evaluate existing right-of-way routes, and site utilities in locations that cause the least impacts on important resources (BLM 1993). Based on the 90-foot construction area, pipeline installation in the proposed corridor would disturb about 200 acres of private lands, 118 acres of BLM-managed lands, and 103 acres of lands managed by the ASLD.

Access roads to residences and businesses within the pipeline corridor would be crossed by trenching. Trenching activities in front of any specific business or residence would typically be completed within three to five workdays, and alternate vehicular routes would be provided. Roads would be restored to original conditions following pipeline installation. The U.S. Department of Transportation Federal Highway Administration *Manual on Uniform Traffic Control Devices* would be followed for all work within or adjacent to the US 93 or I-40 corridors. Although some delays may occur due to detours and/or the movement of construction equipment, access to businesses and residences would be

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maintained and no significant access impacts would be anticipated from pipeline construction under the Proposed Action. However, if this could not be done, the resident or business would be compensated either through the process of eminent domain or by mutually agreeable business negotiations.

Alternative Gas Pipeline Corridors

Impacts associated with each alternative pipeline corridor are described below by segment. Only corridor segments not previously discussed under the Proposed Action are included below.

Alternative R Gas Pipeline Corridor

The Alternative R gas pipeline corridor would cross about 30 miles of private lands, 5 miles of BLM-managed lands, and 3 miles of lands managed by the ASLD. If the pipeline were located such that a residence or business would be permanently displaced, construction of the pipeline would have the potential to create the same minor, insignificant impacts for businesses and residences as the Proposed Action.

Based on the 90-foot construction area, pipeline installation in the Alternative R gas pipeline corridor would disturb about 312 acres of private lands, 58 acres of BLM-managed lands, and 37 acres of lands managed by the ASLD. Corridor segment R4 crosses through Carrow-Stephens Ranches ACEC and includes about 9 residences. Due to the width of the corridor, the pipeline could be located so that no adverse impacts on the ACEC or displacement of residences would be anticipated. Corridor segments R3 and R2 parallel US 93 through relatively undisturbed rangeland. Developed uses include only 4 residences (all within R3), which would not likely be relocated because the pipeline corridor is wide enough to avoid displacement of the residences. The transition between these two corridor segments includes the US 93 and Hackberry Road intersection.

Residents and businesses would be compensated either through the process of eminent domain or by mutually agreeable business negotiations, (refer to Section 2.2.5), thus impacts would not be significant.

Alternative T Gas Pipeline Corridor

The Alternative T gas pipeline corridor would cross about 16 miles of private lands, 13 miles of BLM-managed lands, and 8 miles of lands managed by the ASLD. Regardless of the corridor, the pipeline would be located predominantly within new rights-of-way acquired in the same manner as the Proposed Action. Construction of the pipeline would have the potential to create the same minor, insignificant impacts for businesses and residences as the Proposed Action.

The Alternative T gas pipeline corridor would disturb about 173 acres of private lands, 149 acres of BLM-managed lands, and 91 acres of lands managed by the ASLD.

Corridor segment T5 begins at the proposed plant site and travels northwest parallel to the Mead-Liberty 345-kV and Mead-Phoenix Project 500-kV transmission lines. Although a primitive access road exists along the transmission lines, topography through this area is much more rugged than along US 93, potentially resulting in difficulties with access and pipeline installation. The corridor crosses the Big Sandy River perpendicularly to create as short of a crossing as possible. The corridor also would cross the Phelps Dodge water pipeline, and the pipeline installation would need to be coordinated to avoid impacts on this existing pipeline. The corridor includes six residences and several non-residential structures along the east side of the Big Sandy River, and three residences in Section 3 (T16N, R13W) east of US 93. The width of the corridor could allow for installation of the pipeline without displacement of the residential uses or other structures. Corridor segments T2 and T1 parallel the transmission lines north through mostly undisturbed rangeland. Developed uses within the corridor are limited to the transmission line and associated access road, Old US 93, and I-40

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(corridor segment T1). Installation of the pipeline would require crossing Old US 93, via trenching, and boring under I-40. No residences are located within the corridor; therefore no adverse impacts to residential uses would be anticipated. A large natural gas compressor station is present north of I-40 in Section 24, T21N, R13W. The width of corridor segment T1 could provide adequate space for installation of the pipeline without disturbing the existing compressor station.

Installation of the either alternative pipeline would be expected to occur over six months and temporarily disturb a 90-foot-wide area within the proposed pipeline corridor. To the extent possible, terrain within the proposed corridor and in any additional work areas would be returned to natural contours following pipeline installation. Any removal of vegetation on BLM-managed land would be subject to the Reclamation Operation Management Plan for BLM-Managed Lands (Appendix B) and would be consistent with Arizona Department of Agriculture native plant salvage regulations (refer to Section 3.11). A 10-foot wide two-track would be maintained along the pipeline route for inspection and maintenance purposes.

Though the pipeline would come within close proximity to developed uses in Wikieup and along US 93 (Alternative R gas pipeline corridor), and near the Big Sandy River (Alternative T gas pipeline corridor), any potential conflicts with these uses could be avoided by adjusting the pipeline alignment within the proposed corridor. Further, Mohave County has not adopted any policies regarding the placement of natural gas pipelines near developed uses (Delmar 2001). Therefore, if these adjustments are made, the proposed pipeline would not displace businesses or residences, nor would it conflict with local regulations for the placement of pipeline facilities. Additionally, the SDA located in T20N, R13W would not be significantly affected because the pipeline would be in place prior to the residential development of the area.

Restrictions would, however, limit future development over the actual pipeline alignment.

Residents and businesses would be compensated either through the process of eminent domain or by mutually agreeable business negotiations, (refer to Section 2.2.5), thus impacts would not be significant.

Crossover Segment C2

Crossover corridor segment C2 would be limited to the Old US 93 right-of-way. Pipeline installation through this area would require disturbing a maximum of about 25 acres of undeveloped rangeland. Disturbance would likely be less, however, because the existing road has disturbed part of the right-of-way. No residences are located within the road right-of-way; no residences would be displaced.

No-Action Alternative

The Project would not be developed under the No-Action Alternative. Under this alternative, no land disturbance would occur at the proposed power plant site, no agricultural development would take place in Section 7, and the access road and pipeline would not be constructed as part of the Project. The groundwater production and monitoring wells and associated access roads and well pads completed on private land that were used to identify and test the lower aquifer would remain.

3.7.2.6 Mitigation and Residual Impacts

If adopted, the following measures would be implemented to minimize adverse impacts not considered to be significant:

- To the extent possible, pulling stations for the OPGW would be excluded within 0.25 mile of residential development, to avoid temporary negative impacts to residences.

With the implementation of this measures, there would be no residual impacts.

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3.8 GRAZING MANAGEMENT

This section describes the affected environment as they apply to grazing management.

3.8.1 Affected Environment

The following sections describe the current grazing management; this represents the baseline for the assessment of impacts and environmental consequences.

3.8.1.1 Region of Influence

The region of influence for grazing management assessed in this section includes grazing allotments in the Big Sandy Valley potentially impacted by the proposed power plant and associated facilities and allotments affected by the natural gas pipeline or proposed OPGW installation.

Power Plant Site and Ancillary Facilities

Construction of the power plant, well field, and agricultural land is proposed on private land within the Gray Wash Allotment. The Groom Peak Allotment is located west of the Gray Wash Allotment and the Greenwood Peak Community Allotment is located south of the Gray Wash Allotment (Figure 3.8-1). Caithness has acquired some or all of the grazing privileges for these allotments through purchase of water rights that function as base property.

Grazing allotments in the region of influence that are present along the gas pipeline corridors and the installation of the OPGW are the Big Sandy, Cane Springs Wash, Diamond Joe, Francis Creek, Gray Wash, Groom Peak, Hibernia Peak B, Hot Springs, Little Cane, Sandy, and Wikieup allotments (refer to Figure 3.8-1).

3.8.1.2 Existing Conditions

The BLM classifies grazing allotments into different management categories depending on factors such as range condition, opportunity for positive economic return, and whether present management appears to be satisfactory.

All grazing allotments considered in this section currently are categorized as either Improve Management or Custodial Selective Management. The Improve Management category involves managing vegetation resources to improve currently unsatisfactory conditions. Custodial Management is a limited form of management where the potential for resource production is low and there is minimal potential for a positive return on public investment in range improvement facilities. Under Custodial Management, current resource conditions are maintained and investment in range improvements is limited.

Grazing preference is given to parties that own or control a "base property." In the BLM Kingman Field Office management area, the base property criterion is based either on ownership of land or livestock water rights. The base property for all allotments discussed here is water. Caithness owns the base water for the entire Groom Peak and Gray Wash allotments and the majority of the base water for the Greenwood Peak Community Allotment and therefore has grazing privileges on public lands within these allotments (Table 3.8-1). Caithness intends to transfer its grazing privileges to MCEDA via a base water lease. MCEDA is expected to use all Animal Unit Months (AUMs) permitted to Caithness. AUMs are units that measure the forage used by livestock, where one AUM is the forage required to feed one cow and calf for one month.

The Greenwood Peak Community Allotment extends from the Aquarius Mountains to the east, across the Big Sandy River and US 93, to the Hualapai Mountains to the west (refer to Figure 3.8-1). Land ownership includes public, Caithness/MCEDA, and other private land. Public land managed by the BLM constitutes 82 percent of the total land within this allotment. Pastures are not used in this allotment, and no fence separates this allotment from the Groom Peak Allotment to the north. Although the right-

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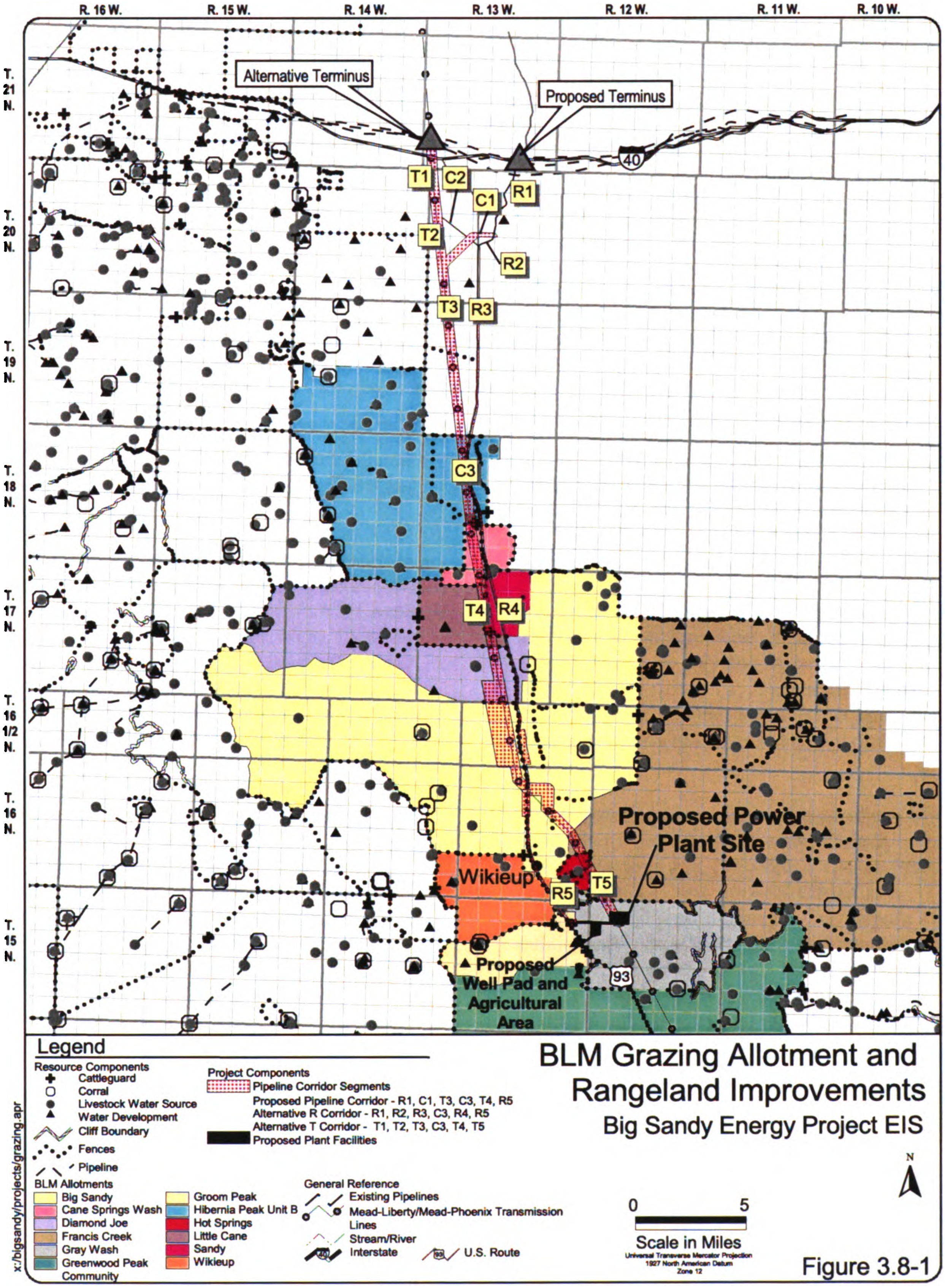

BLM Grazing Allotment and Rangeland Improvements

Big Sandy Energy Project EIS

Figure 3.8-1

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TABLE 3.8-1 GRAZING MANAGEMENT DATA							
Allotment[1]		Selective Management Category[2]	AUMs		Public Acres	Total Acres	Acres/AUM
No.	Name		Grazing Use	Suspended Use			
0038	Gray Wash	I	373	0	10,599	17,471	46.8
0040	Greenwood Peak Community	I	2,080	0	39,817	48,173	23.2
0041	Groom Peak	I	265	0	6,049	7,090	26.8

Source: BLM 2000

[1] BLM grazing allotments where Caithness has grazing privileges and that could be impacted during construction or operation of the proposed Project.

[2] I = Improve Management, C = Custodial Management

AUM = Animal Unit Month

of-way for US 93 is fenced, livestock can readily move under the highway through culverts and under bridges.

Other than the Big Sandy River, perennial water sources for livestock are primarily located in the portion of the allotment east of US 93. Livestock present in the western portion of the allotment obtain water primarily at the Big Sandy River. Water also is available perennially at springs located in the Hualapai Mountains, but it is most abundant during wet or cool weather.

The Groom Peak Allotment extends from the Big Sandy River west into the Hualapai Mountains (refer to Figure 3.8-1). Land ownership in the Groom Peak Allotment includes public, Caithness, and other private land. Public land managed by BLM constitutes 85 percent of the allotment. Livestock water sources include the Big Sandy River and springs in the western portion of this allotment. Two defunct windmills are located in the western portion of the allotment.

The Gray Wash Allotment extends from the Aquarius Mountains in the east to the eastern edge of the Groom Peak Allotment. Land ownership includes public, Caithness, and other private land. Public land managed by BLM constitutes 61 percent of this allotment. Livestock water sources for this allotment include two springs, two water troughs fed by the Phelps Dodge water line, and a windmill. Another defunct windmill is located on this allotment.

The Greenwood Peak Community, Groom Peak, and Gray Wash allotments are in the Improve Management category due in part to unsatisfactory riparian and upland ecological conditions. No grazing system (other than year-long use) traditionally has been used on these allotments.

The proposed and alternative gas pipeline corridors traverse the Big Sandy, Cane Springs Wash, Diamond Joe, Gray Wash, Groom Peak, Hibernia Peak B, Hot Springs, Little Cane, Sandy and Wikieup allotments. The acreage of public land controlled by the BLM ranges from 335 to 77,948 acres (Table 3.8-2). Five of the eight allotments are in the Custodial Management category and the other three are in the Improve Management category.

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TABLE 3.8-2 GRAZING MANAGEMENT DATA						
Allotment[1]		Selective Management Category[2]	AUMs[3]		No. Public Acres	Pipeline Alternative[4]
No.	Name		Grazing Use	Suspended Use		
0008	Big Sandy	I	6,084	1,901	64,913	P, T, R
0016	Cane Springs Wash	C	120	69	2,310	P, T, R
0028	Diamond Joe	I	1,404	917	16,223	P, T, R
0035	Francis Creek	I	9,750	0	77,948	T
0038	Gray Wash	I	373	0	10,599	P, T, R
0041	Groom Peak	I	265	0	6,049	P
0083	Hibernia Peak B	C	120	0	335	P, T, R
0046	Hot Springs	C	52	0	1,057	T
0087	Little Cane	C	372	0	5,542	P, T, R
0064	Sandy	C	60	138	1,524	P, T, R
0076	Wikieup	I	684	0	8,446	P, R

[1] BLM grazing allotments that could be impacted during construction of the natural gas pipeline
[2] I = Improve Management, C = Custodial Management
[3] AUM = Animal Unit Months
[4] P = Proposed Corridor, T = Transmission Line Corridor, R = Road Corridor
Source: BLM 2000

3.8.2 Environmental Consequences

3.8.2.1 Identification of Issues

Two main issues were identified during meetings with resource managers, consultants, Caithness, and MCEDA. Potential impacts from groundwater withdrawn for the operation of the Proposed Action must be analyzed to determine impacts on surface water availability to livestock. Impacts from construction of the natural gas pipeline should be analyzed to determine any impacts on range improvement facilities (e.g., fencing, water pipelines, stock tanks, and water troughs). Additionally, livestock production for the allotment where the power plant is proposed should be analyzed to determine impacts on the carrying capacity of this allotment. Impacts on grazing management also should be analyzed to determine if rangeland conditions could be impacted by this Project.

3.8.2.2 Significance Criteria

The effects of the Proposed Action and alternatives would be considered significant if the following were to occur:

- reduction in existing water availability for livestock use occurs that cannot be mitigated or compensated for
- impact on existing range improvement facilities occurs that cannot be mitigated or compensated for
- reduction in livestock production on land or grazing rights not owned by Caithness occurs that cannot be mitigated or compensated for
- decrease in the quality of rangeland conditions occurs that cannot be mitigated or compensated for

3.8.2.3 Impact Assessment Methods

Assessing the impacts on grazing management involved determining the level of impact on

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water resources, range improvement facilities, livestock production, or range condition during construction and operation of the Proposed Action. The level of impact was then compared to planned mitigation measures identified by Caithness. If the application of mitigation measures identified did not reduce impacts to levels below those described in the significance criteria, then impacts were assessed as significant.

3.8.2.4 Actions Included in the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce and prevent environmental impacts on grazing; details of the measures can be found in Sections 2.2.8.6 and 2.2.8.7:

- Pre-construction surveys would identify range improvements and an action plan to reduce temporary impacts would be developed.
- The integrity of all fences, water pipelines, and other existing range improvements would be maintained during construction of the proposed power plant, gas pipeline, and associated facilities; any improvements that are removed or disturbed would be replaced or repaired.
- Temporary gates would be used where openings are required in fences; cattle guards or gates would be installed where permanent access is required.
- Any reduction in water supply for grazing from Cofer Hot Spring would be replaced by an existing shallow well water supply.

3.8.2.5 Impact Assessment

Proposed Action

Power Plant Site and Ancillary Facilities

Pumping water to supply the proposed power plant is not expected to impact water flow in the Big Sandy River (refer to Section 3.5). Cofer Hot Spring, located approximately 2.5 miles northwest of the proposed power plant site, is expected to have reduced water flow resulting from the pumping of water for the proposed power plant (refer to Section 3.4). This spring has provided water to livestock that graze public lands in the Hot Springs Allotment. The Proposed Action includes the use of existing shallow wells near Cofer Hot Spring to replace water for grazing (refer to Section 2.2.8.6). Based on these actions, there would be no significant impact from reduction of water availability for livestock.

Caithness would install a cattle guard along the main access road to the proposed power plant site at the fence that separates the Gray Wash Allotment from the Groom Peak Allotment. This cattle guard would maintain separation of cattle grazing the Gray Wash Allotment from cattle grazing the Groom Peak or Greenwood Peak Community allotments; therefore, there would not be impacts on these allotments.

Land available for grazing within the Gray Wash Allotment would be reduced by construction of the Proposed Action. The total acreage that is expected to be permanently removed from grazing is 181 acres. On the Gray Wash Allotment 46.8 acres of land provides one AUM (Table 3.8-1). Removal of 181 acres from grazing equates to the loss of about 3.9 AUMs or approximately one cow and calf for four months. This small reduction (about 1 percent) in forage availability from construction of the proposed power plant and associated facilities would take place almost entirely on private lands owned by Caithness within the Gray Wash Allotment, and would not be significant.

Communication Facilities

Impacts associated with installation of the OPGW would be short term and limited to the already disturbed areas in the Mead-Phoenix Project 500-kV transmission line right-of-way. Impacts on grazing would be short term, and all range improvements would be maintained.

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Therefore, impacts associated with the OPGW would be minimal and not significant. The microwave dish installation on existing structures would have no impact on grazing.

Proposed Gas Pipeline Corridor

The proposed gas pipeline corridor crosses portions of the Big Sandy, Cane Springs Wash, Gray Wash, Diamond Joe, Groom Peak, Hibernia Peak B, Little Cane, Sandy and Wikieup allotments. The function of any range improvements encountered anywhere within the proposed gas pipeline corridor would be maintained. A list of existing range improvements located along the proposed and alternative gas pipeline corridors is provided in Table 3.8-3.

Impacts on grazing management are expected to be similar for all segments within the proposed gas pipeline corridor; therefore, individual links are not addressed separately.

Livestock production on allotments crossed by the proposed gas pipeline corridor is not expected to be impacted during construction of the pipeline. The proposed gas pipeline corridor is primarily east of the existing ADOT right-of-way for US 93, or along transmission lines. Pipeline construction could impact a total of 399 acres within this corridor; however, 351 acres would be reclaimed and forage production is expected to be restored on these lands. The permanent disturbance of 48 acres would not result in a reduction of livestock production and would not be significant.

Construction and operation of the Proposed Action are not expected to have significant impacts on the range condition of BLM grazing allotments. Temporary land disturbance at the proposed power plant site (10 acres) and within the proposed gas pipeline corridor (351 acres) would cover a relatively small area and would neither degrade nor improve range conditions significantly.

Alternative R Gas Pipeline Corridor

The Alternative R gas pipeline corridor crosses portions of the Big Sandy, Cane Springs Wash, Diamond Joe, Gray Wash, Hibernia Peak B, Little Cane, Sandy and Wikieup allotments (refer to Table 3.8-2). Impacts on range improvements for this alternative are not expected to be greatly different than for the proposed gas pipeline corridor. A list of existing range improvements located along alternative corridors for the gas pipeline is provided in Table 3.8-3. Impacts on grazing management are expected to be similar for all segments within the Alternative R gas pipeline corridor; therefore, individual corridor segments are not addressed separately.

Construction activities would have minimal effects on livestock production. The relatively small areas of range that would be impacted during construction would be reclaimed. Long-term effects on livestock production under this alternative are not expected to be different than for the Proposed Action since forage production is expected to be restored along this corridor and would not be significant.

Construction within the Alternative R gas pipeline corridor is not expected to have significant impacts on the range condition of BLM grazing allotments. Total land disturbance would be about 386 acres, but 339 acres would be reclaimed. Temporary impacts would neither degrade nor improve range conditions significantly.

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TABLE 3.8-3 GRAZING IMPROVEMENTS POTENTIALLY IMPACTED BY CONSTRUCTION OF THE PROPOSED POWER PLANT AND ASSOCIATED FACILITIES INCLUDING ALTERNATIVE GAS PIPELINE CORRIDORS		
Allotment	**Range Improvement**	**Location**
Gray Wash	Fence	North and west boundaries of allotment
Francis Creek	Fence	South boundary of allotment (T15N, R12W, Sec 30; T15N, R13W, Sec 35 and 36)
	Cofer-Green-Nogales Fence (No. 0189)	West boundary of allotment along alternative pipeline route (T15N, R13W, Sec 13, 23 and 24)
Sandy	Arizona-Copperville Cattle Guard #1 (No. 0384)	Mine Road access near southern border of allotment (T17N, R13W, Sec 15)
	Fence	South and west boundaries of allotment
Cane Springs Wash	Trout Creek Corrals (No. 0361)	Near southern boundary of allotment (T18N, R13W, Sec 34)
	Lakin and Peter – Gist Fence (No. 0649)	Central portion of allotment along proposed and alternative pipelines (T18N, R13W, Sec 28, 29, 32 and 33)
	Fence	South and north boundaries of allotment
Hot Springs	Fence	East and north boundaries of allotment along alternative pipeline
Diamond Joe	Fence	South and north boundaries of allotment along proposed and alternative pipeline routes
Big Sandy	Duncan and Boevers – Stephens Fence #2 (No. 0585)	Southern portion of allotment along the alternate pipeline (T16N, R13W, Sec 14)
	Cornwall South Line Fence (No. 0256)	Southern portion of allotment along the alternate pipeline route (T16N, R13W, Sec 11 and 12)
	Duncan and Boevers East Boundary Fence (No. 0150)	Near southern boundary of allotment along proposed pipeline (T16N, R13W, Sec 21 and 22)
	Byner Cattle Fence	Near southern boundary of allotment along proposed pipeline (T16N, R13W, Sec 22 and 23)
Little Cane	Cornwall – Crabtree Fence	East boundary of allotment along alternative pipeline route (T17N, R13W, Sec 3, 4, 9, 10, 15 and 16)
Cane Springs Ranch	Fence	South and north boundary of allotment

Alternative T Gas Pipeline Corridor

The Alternative T gas pipeline corridor crosses portions of the Big Sandy, Cane Springs Wash, Diamond Joe, Francis Creek, Gray Wash, Hibernia Peak B, Hot Springs, Little Cane, and Sandy allotments (refer to Table 3.8-2). Impacts on range improvements along this alternative corridor are not expected to be greatly different than for the Proposed Action. A list of existing range improvements located within alternative gas pipeline corridors is provided in Table 3.8-3. Impacts on grazing management are expected to be similar for all segments within the corridor; therefore, individual corridor segments are not addressed separately.

Livestock production on allotments crossed by the Alternative T gas pipeline corridor is not expected to be impacted during construction of the pipeline. The relatively small acreages of range that would be impacted during construction would be reclaimed. Livestock production under this alternative is not expected to be different than for the Proposed Action because forage production is expected to be restored within this corridor.

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Construction of the pipeline within the Alternative T gas pipeline corridor is not expected to have significant impacts on the range condition of BLM grazing allotments. Total land disturbance within this corridor would be about 411 acres, but 366 acres would be reclaimed. Temporary impacts would neither degrade nor improve range conditions significantly.

No-Action Alternative

Under the No-Action Alternative, no impacts on grazing resources are expected. The Project would not be constructed and associated facilities including the natural gas pipeline would not be constructed. The groundwater production and monitoring wells and associated access roads completed on private land that were used to identify and test the lower aquifer would remain.

3.8.2.6 Mitigation and Residual Impacts

No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts. As a result, no additional measures to mitigate significant impacts have been identified for grazing management and there would be no residual significant impacts.

3.9 RECREATION, WILDERNESS, AND VISUAL RESOURCES

This section identifies and describes the affected environment and environmental consequences as they apply to recreation, wilderness, and visual resources.

3.9.1 Recreation and Wilderness

The following sections describe the current recreation and wilderness environment; this represents the baseline for assessment of impacts and environmental consequences.

3.9.1.1 Affected Environment

Region of Influence

The region of influence for the inventory and assessment of potential significant impacts to recreation resources is the area within a 20-mile radius of Wikieup. For wilderness areas the region of influence is the area within 25 miles of the proposed power plant site. This would account for a substantial amount of recreation and wilderness resources, which are situated in all directions around the Wikieup area. Two special cases were included in the analysis to address potential recreation (visibility) impacts even though they were considered outside the region of influence. The special cases were the Grand Canyon National Park (approximately 80 miles north of the proposed power plant site) and Sycamore Canyon Wilderness (approximately 95 miles northeast of the proposed power plant site).

The evaluation of impacts on BLM-designated "suitable" wild and scenic rivers is not included in this Draft EIS since it was determined that the proposed Project would not affect resources within those sections of the Big Sandy River, Burro Creek, and Santa Maria River designated by BLM as "suitable" wild and scenic rivers. Therefore, the Project would not change the status as "suitable" for designation as a wild and scenic river. Refer to Section 3.5 for the analysis of potential effects on surface water including these rivers.

Existing Conditions

The region of influence offers diverse landscapes, views, historic resources, wildlife, and wilderness areas (three within the region of influence and nine total under the jurisdiction of the BLM Kingman Field Office). These elements combine to offer a wide range of recreation opportunities including camping, hiking, horseback riding, rockhounding, off-highway vehicle use, photography, and hunting. Visitors to the area can choose to take part in active or passive recreation opportunities,

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including undeveloped (primitive) activities or developed recreation facilities such as campgrounds and trails. The majority of recreation opportunities in the region occur outside the region of influence, such as along the Colorado River, Grand Canyon, and several wilderness areas. The Burro Creek Recreation Area is the closest and most widely used (moderate to high use depending upon season) recreation facility in the area. This facility is located approximately 12 miles to the south of Wikieup and consists of campgrounds, trailheads, picnic tables, and an interpretive garden, and serves as an access to Burro Creek.

Recreation opportunities immediately surrounding the Wikieup area primarily consist of hiking, hunting, wildlife viewing, horseback riding, and off-highway vehicle use. There are no special designated trails, nor use areas for these activities, and use volumes are relatively low. These activities primarily are oriented around existing access roads (such as along the Mead-Phoenix Project 500-kV transmission line route (corridor segment T5), washes, foothills, and the Big Sandy River (corridor segments T5, R5, and R4). Additionally, the Coyote Canyon Country Club (a golf course facility) is located along the east side of Wikieup (corridor segment R5). This facility provides free access to the golf course for residents of Wikieup and is a relatively low-use activity.

There are no defined recreation uses at the proposed power plant site since it is located on private land zoned for industrial use. The proposed and alternative gas pipeline corridor cross the Carrow-Stephens Ranches ACEC within the US 93 right-of-way (corridor segment R4) and a BLM-designated utility corridor (corridor segment T4). This ACEC contains historic resources from late nineteenth century farming and ranching activities. This ACEC has the potential for future recreational and educational development as stated in the *Kingman Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement* (BLM 1993). If the ACEC is developed in the future, visitor use volumes likely would be moderate. The remaining areas crossed by the gas pipeline alternatives have no defined recreation uses and consist primarily of dispersed low-use activities such as off-highway vehicle use, hiking, horseback riding, and hunting.

There are three wilderness areas within the region of influence. The Upper Burro Creek Wilderness is located approximately 10 miles to the east of the proposed power plant site, Arrasta Mountain Wilderness is located approximately 13 miles south of the proposed power plant site, and Aubrey Peak Wilderness is located approximately 20 miles to the southwest of the proposed power plant site. These wilderness areas are characterized by rugged, mountainous terrain with a diversity of plants, wildlife, and riparian habitat. This diversity creates outstanding scenic and recreational opportunities throughout the wilderness areas (BLM 1993). The wilderness areas are remote and access difficult, resulting in relatively low visitor use volumes. However, these users are afforded the opportunity to take advantage of solitude and natural conditions by participating in undeveloped recreation activities including hiking, backpacking, camping, horseback riding, and scenery and wildlife viewing.

The Grand Canyon National Park and Sycamore Canyon Wilderness are Class I areas of special national and/or regional value with respect to air quality (visibility). The Upper Burro Creek Wilderness, Arrasta Mountain Wilderness, and Aubrey Peak Wilderness are Class II areas (refer to Section 3.1 for additional details). Currently, these areas have good to excellent visibility overall, contributing to outstanding recreation opportunities (viewing landscape scenery). There are exceptions to this in the case of the Grand Canyon National Park, where there are days where visibility is reduced due to regional haze. Maintaining these high levels of visibility is a primary objective for management of the wilderness areas.

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3.9.1.2 Environmental Consequences

Identification of Issues

The issues identified for use in evaluating potential impacts on recreation and wilderness areas included the following:

- potential increase in the demand for undeveloped and developed recreation activities due to the increase in population
- changes to the air quality or visibility in adjacent wilderness areas and national parks including the Burro Creek Wilderness, Arrasta Mountain Wilderness, Aubrey Peak Wilderness, Grand Canyon National Park, and Sycamore Canyon Wilderness

Significance Criteria

The effects of the Proposed Action and alternatives would be considered significant if the following were to occur:

- increased demand for recreation activities (i.e., due to the influx of people during construction and operation of the proposed power plant) would exceed capacity for that activity in a given area such as a campground, wilderness, and/or trail
- predicted air pollutant emissions would cause a change in visibility greater than 5 percent for any 24-hour period in a Class I area or Class II wilderness area within the region of influence

Impact Assessment Methods

The methods used for determining potential impacts on recreation resources consisted of evaluating current demand for recreation as well as estimating future demand as a result of increased population from construction, operation, and maintenance of the proposed Project. If the future demand for recreation resources in the region of influence would not exceed existing capacities, then impacts on those resources would be low and less than significant. However, if future demand for recreation resources resulting from the Project would exceed capacity, impacts would be high and potentially significant, warranting mitigation measures. Additionally, evaluation of potential degradation of visibility for Class I areas and Class II wilderness areas (with respect to air quality) was derived from Section 3.1.

Actions Incorporated into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent impacts on recreation:

- The private road portion of the proposed access road (within Section 5) would be posted to reduce unauthorized access.

Impact Assessment

<u>Proposed Action</u>

The work force required to construct the Project would average 350 employees with a peak of 650 employees during Phase 1 and 240 employees with a peak of 430 employees during Phase II. Operation and maintenance of the proposed Project would require approximately 25 people (refer to Section 3.16).

The demand for recreation resources within the region of influence as a result of these workers would not exceed current capacity. This would hold true for both developed and undeveloped recreation areas including adjacent wilderness areas. Therefore, impacts on recreation resources and wilderness areas are expected to be low and less than significant over the life of the Project.

The improved roads (paved) leading to the proposed power plant site would make adjacent landscapes more accessible. However, off-highway vehicle use is not expected to increase dramatically, since the amount of potential users during and after construction would be low. Therefore, impacts would remain low. Also, the

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private road portion of the access road near the proposed power plant site would be posted to reduce unauthorized access to the Mead-Phoenix Project 500-kV transmission line access roads. Impacts would not be significant.

There would be no discernable change to visibility within Class I areas or Class II wilderness areas as a result of the Project's emissions. Details on the visibility analysis are in included in Section 3.1.

The proposed pipeline corridor would generally follow major rights-of-way including US 93 (corridor segment R5), the Mead-Phoenix Project transmission line (corridor segmentsT4, C3, and T3) and Hackberry Road (corridor segment C1 and R1). This would not change existing access or encourage off-highway vehicle use beyond what currently exists. Therefore, the proposed pipeline corridor would result in no impacts on recreation resources.

Communication Facilities

Installation of the OPGW would not have any substantial impact on recreation and wilderness resources. The addition of microwave dishes on existing towers would have an insignificant impact on recreation and wilderness resources.

Alternative R and T Gas Pipeline Corridors

The alternative pipeline corridors would have the same impacts on recreation and wilderness areas as the Proposed Action.

No-Action Alternative

There would be no impacts on recreation resources and wilderness areas associated with the No-Action Alternative.

Mitigation and Residual Impacts

No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts. No additional measures to mitigate adverse impacts have been identified for recreation and wilderness. There would be no residual significant impacts.

3.9.2 Visual Resources

The following sections describe the current visual resources; this assessment represents the baseline for the assessment of impacts and environmental consequences.

The visual resources inventory and assessment of potential impacts included the evaluation of landscape scenic quality, views from key observation points (KOPs), and BLM Visual Resource Management (VRM) Classes. The methods used for the visual resources study were based upon guidelines established by the BLM's 8400 series manual (Visual Resource Inventory and Contrast Rating System, 1986) and tailored to address specific issues related to the construction, operation, and maintenance of the proposed Project. Data were collected from several sources including previous environmental studies conducted for this Project, the *Kingman Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement* (BLM 1993), aerial photography, numerous maps, various environmental documents for other projects occurring in the vicinity, and field review.

3.9.2.1 Affected Environment

The following sections describe the current visual conditions. The description of current conditions represents the baseline for the assessment of impacts.

Region of Influence

The visual region of influence represents the landscapes within which construction, operation, and maintenance of the proposed Project potentially could result in significant impacts on visual resources. The visual region of influence was determined to be the area within a 5-mile radius of the proposed power plant site (Figure 3.9-1) and a 2-mile-wide area (1 mile on either

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side of the assumed centerline) for the proposed and alternative gas pipeline routes. The 5-mile radius was established to account for height and potential visibility of the plant HRSG stacks (130 feet high) and other vertical facilities at the plant site (e.g., tanks, transmission line structures), as well as vapor plumes emanating from the HRSG stacks and cooling towers. There are locations (e.g., higher elevations in the Hualapai and Aquarius mountains and the Carrow-Stephens Ranches ACEC) beyond these distances where the proposed power plant could be seen under ideal conditions (i.e., no intervening terrain or vegetation and clear visibility). However, at distances beyond 5 miles significant impacts are not expected (refer to Section 3.9.2.2).

The region of influence for the required communication facilities at Hayden Peak and the Phoenix and Perkins Substations would consist of the area within 2 miles of the facilities. Beyond 2 miles the proposed modifications would not be recognizable.

Existing Conditions

Scenic Quality

The region of influence falls within the Basin and Range Physiographic Province (Fennemen 1931). The Basin and Range landscape is characterized by isolated, roughly parallel, north-south trending mountain ranges separated by basins and/or drainages. The mountains can be steep-sloped with jagged ridgelines or smooth-sloped with rounded peaks. The higher elevation mountain slopes have a sparse to moderate cover of vegetation (e.g., juniper, piñon, globe mallow, barberry, banana yucca) due to the rocky outcrops and soils. The lower elevation mountain slopes have a sparse cover of Arizona Upland Sonoran Desertscrub vegetation (e.g., paloverde, mesquite, saguaro, ocotillo, cholla, yucca). The drainages are primarily ephemeral with a moderate to dense cover of xeroriparian vegetation (e.g., paloverde, mesquite, creosote, desert willow) along the edges of the channels. The vegetation in the drainages adds color and distinctly contrasts with the surrounding desert landscape. There is limited landscape diversity in the basins consisting mainly of flat to gently rolling terrain with sparse Arizona Upland Sonoran Desertscrub or Semi-Desert Grassland (e.g., bush muhly, black grama, creosote, snakeweed, yucca) vegetation types.

Distinctive landscapes in the region of influence include the Hualapai Mountains on the west, Aquarius Mountains on the east, and Big Sandy Valley in between the mountains.

> **_Scenic Quality_**
>
> Scenic quality is determined by evaluating the overall character and diversity of landform vegetation, water, color, and cultural or manmade features in a given landscape. Typically, more complex or diverse landscapes have higher scenic quality. The landscapes in the region of influence were assigned one of the following three scenic quality classifications based on these elements:
>
> **Class A** – landscapes of outstanding or distinctive diversity or interest
>
> **Class B** – landscapes of common or average diversity or interest
>
> **Class C** – landscapes of minimal diversity of interest.

There are five distinct scenic quality units located in the region of influence, including mountains, foothills, rivers/drainages, juniper plains, and desert scrub. The Hualapai Mountains (west of the proposed power plant site and along corridor segments R5, T4, C3, and T3) and Aquarius Mountains (east of the proposed power plant site along corridor segments T5, R4, C3, and R3) are Class A landscapes that dominate the setting due to their size and diversity of characteristics. These mountains are characterized by jagged ridgelines (3,500 to 7,000 feet) and dissected slopes leading into major drainages. There are little to no visible manmade modifications in the mountains with the exception of some minor

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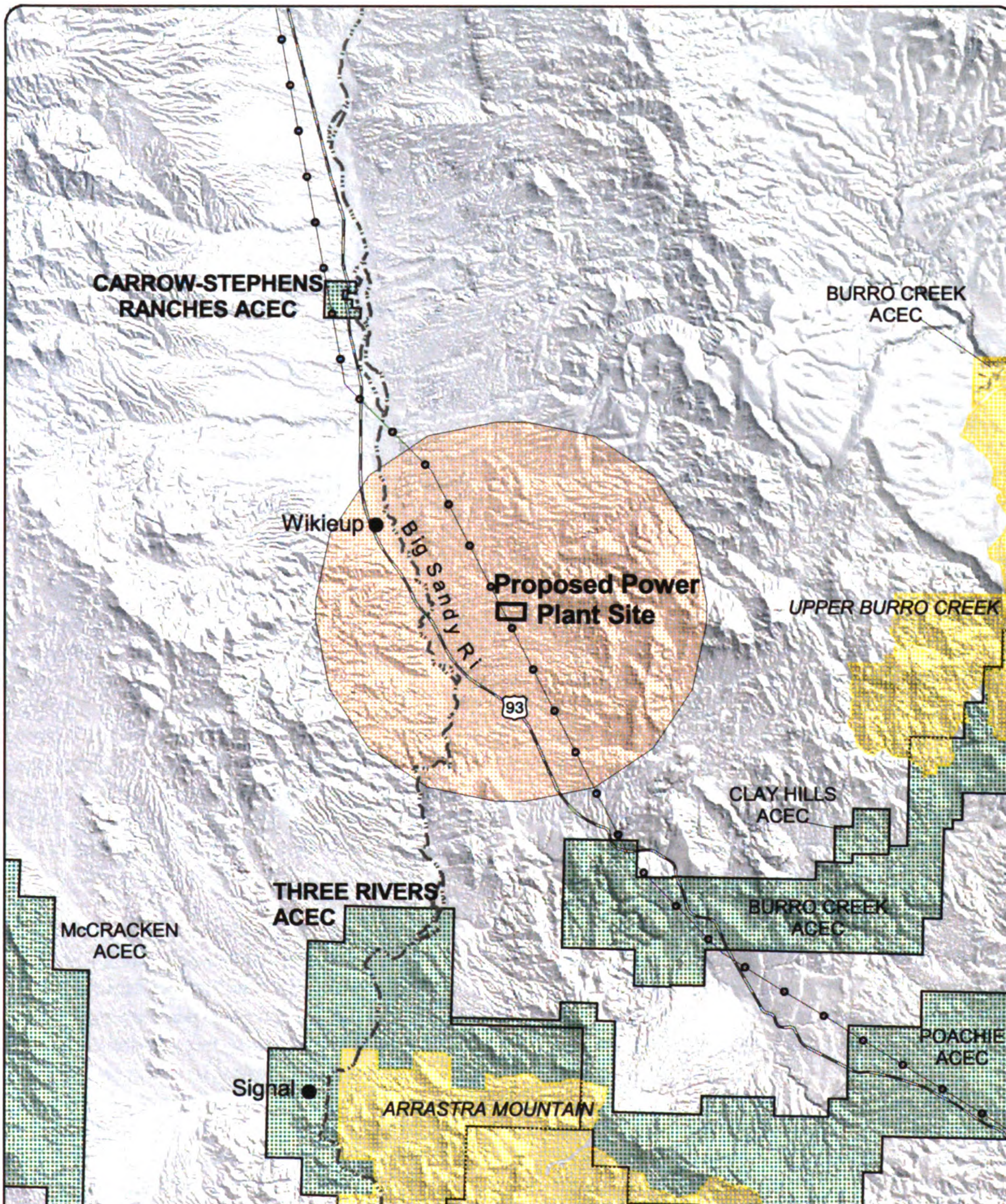

Legend

Resource Components
Five-mile Region of Influence (Plant Site)
Wilderness Areas
Areas of Critical Environmental Concern
Proposed Power Plant
General Reference
Mead-Liberty/Mead-Phoenix Transmission Lines
Interstate
U.S. Route

x:/bigsandy/projects/vis.apr

Region of Influence for Visual Resources

Big Sandy Energy Project EIS

0 5 10
Scale in Miles

Universal Transverse Mercator Projection
1927 North American Datum
Zone 12

N

Figure 3.9-1

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roads (e.g., Chicken Springs Road). Vegetation on the mountain slopes consists of a mixture of saguaro cactus, paloverde trees, ocotillo, prickly pear cactus, and creosote, which adds contrasting colors to the landscape.

The Big Sandy River (along or near corridor segments R5, T5, and R4) also is a Class A landscape and a unique feature within the region of influence. The moderate to dense xeroriparian and riparian vegetation along the river exhibits colors and textures that contrast with the surrounding desert landscape. These features make the river one of the most recognizable landscapes in the region of influence. The river extends from central portion of the region of influence through the southern portion. The river is north-south trending and parallels the east side of US 93 until it crosses under the highway west of the proposed power plant site.

The Class B foothills (along corridor segments R5, R4, R3, T5, T4, and T3) are an extension of the mountain landscapes with no distinctive ridgelines (2,000 to 3,500 feet) and smooth, rounded slopes. Vegetation is primarily Arizona Upland Sonoran Desertscrub and adds to the visual quality of these landscapes. Foothill areas occur near the proposed power plant site at the southern end of the region of influence and near the northern end of the Big Sandy River midway between Wikieup and I-40.

The Class B juniper plains (along corridor segments T2 and T1) occur near the northern end of the region of influence on the south side of I-40. This landscape is characterized by rolling to relatively flat grassland terrain. There is a moderate cover of juniper dispersed throughout the grasslands, which adds contrasting colors and textures to the landscape. Small drainages with areas of eroded slopes and exposed soils add to the visual quality of the area.

The majority of the landscape within the region of influence is Class C desert scrub (along corridor segments R5, R4, T4, C3, R3, T3, R2, R1, C2, and C1). These areas are characterized by relatively flat to rolling terrain with a low to moderate density cover of vegetation including creosote, cacti, and grasses. There are numerous small drainages cutting through the terrain adding slightly to the visual quality of this landscape. A unique feature found in this landscape is the Carrow-Stephens Ranches ACEC. This historic ranch setting is located approximately 7 miles north of Wikieup and is characterized by the presence of an 1880s two-story ranch house, a pioneer cemetery, and a 1930s Depression-era cannery. This site is indicative of the late nineteenth century farming and ranching lifestyle as stated in the *Kingman Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement* (BLM 1993). Management efforts emphasize maintaining and improving the "historic feel" or "sense of place" at the ranch.

Residential and commercial development occurs throughout Wikieup. This development occurs in a linear pattern along US 93. The residential areas consist of low-density, large-lot development with primarily native vegetation throughout the area (along corridor segments R5 and T5). The commercial areas are located immediately adjacent to US 93 and consist of restaurants, convenience stores/gas stations, gift shops, and machine/maintenance shops, as well as numerous signs and lights (along corridor segment R5). Development lacks definition in terms of architectural or planning themes. However, this lack of definition contributes to the unique character and "small town" feel in Wikieup. Dispersed residential development (e.g., single-family homes and small ranches) occurs in the region of influence outside of Wikieup.

There are numerous cultural and manmade modifications present in the region of influence. There is a BLM-designated utility corridor, which has 500-kV, 345-kV, and 69-kV transmission lines (along corridor segment T5, T4, C3, T3, T2, and T1) crossing the region of influence from the proposed power plant site to I-40. The transmission lines are a noticeable to dominant feature in the landscape depending on

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their location in the landscape (e.g., proximity, skylined, backdropped). Additional infrastructure in the area consists of the US 93 (along corridor segments R5, R4, C3, and R3) and several non-paved roads. The highway corridor runs the full length of the region of influence from north to south. This corridor is well traveled and is a distinct feature in the landscape. The non-paved roads include Chicken Springs Road (along corridor segment R5) and numerous unnamed roads throughout the region of influence. These roads provide access to many sites, allowing people to experience different levels of scenic quality. In some cases, the roads have left "scars" in the soil surface that contrast with the adjacent conditions allowing them to be visible from distant areas. In areas with scenic quality Class A and B landscapes, these roads can detract from the natural qualities and appeal of the landscape.

Additionally, the Hayden Peak and Phoenix and Perkins Substations have numerous modifications including large towers, buildings, transformers, electrical equipment, and fences present which are dominant features in the landscape.

Key Observation Points and Other Viewing Areas

KOPs are viewing locations that are representative of the most sensitive viewers that would view the proposed Project. The inventory of KOPs included the following three components:

- identification of KOPs
- viewer sensitivity
- Project visibility (seen areas and distance zones).

KOPs were identified based on review of available land use data, field review, public and agency review, and previous environmental studies in the region of influence. Additionally, a general inventory of other sensitive viewing areas was documented to account for distant viewers who see the Project facilities, but would not be significantly impacted.

Viewer sensitivity is a measure of the degree of concern for change in the visual character of a landscape. Viewer sensitivity is determined by evaluating type of use, user attitude, volume of use, influence of adjacent land use, and viewing duration. Two levels of sensitive views were evaluated for this Project—high and moderate. Low sensitivity views were not evaluated since they would not result in significant visual impacts.

Visibility reflects how the proposed Project would be seen and what distance it is from a particular KOP or viewing area. There were three distance zones defined within the region of influence, as follows:

- Foreground views: 0 to 1 mile
- Middleground views: 1 to 3 miles
- Background views: 3 to 5 miles (views beyond 5 miles are considered outside the zone of influence)

There were five KOPs identified for this Project (Figure 3.9-2). The following descriptions characterize the viewing conditions relative to the proposed Project for each of the KOPs. Two of these KOPs are outside the region of influence for the plant site, but are within the region of influence for the proposed and alternative pipeline corridors.

KOP #1 - Community of Wikieup (High Sensitivity)—Wikieup has the highest concentration of residential views within the region of influence. There would be background views (approximately 4 miles away) of the proposed power plant site from these residences.

Corridor segment R5 would be visible from this KOP since it would parallel US 93 bisecting Wikieup.

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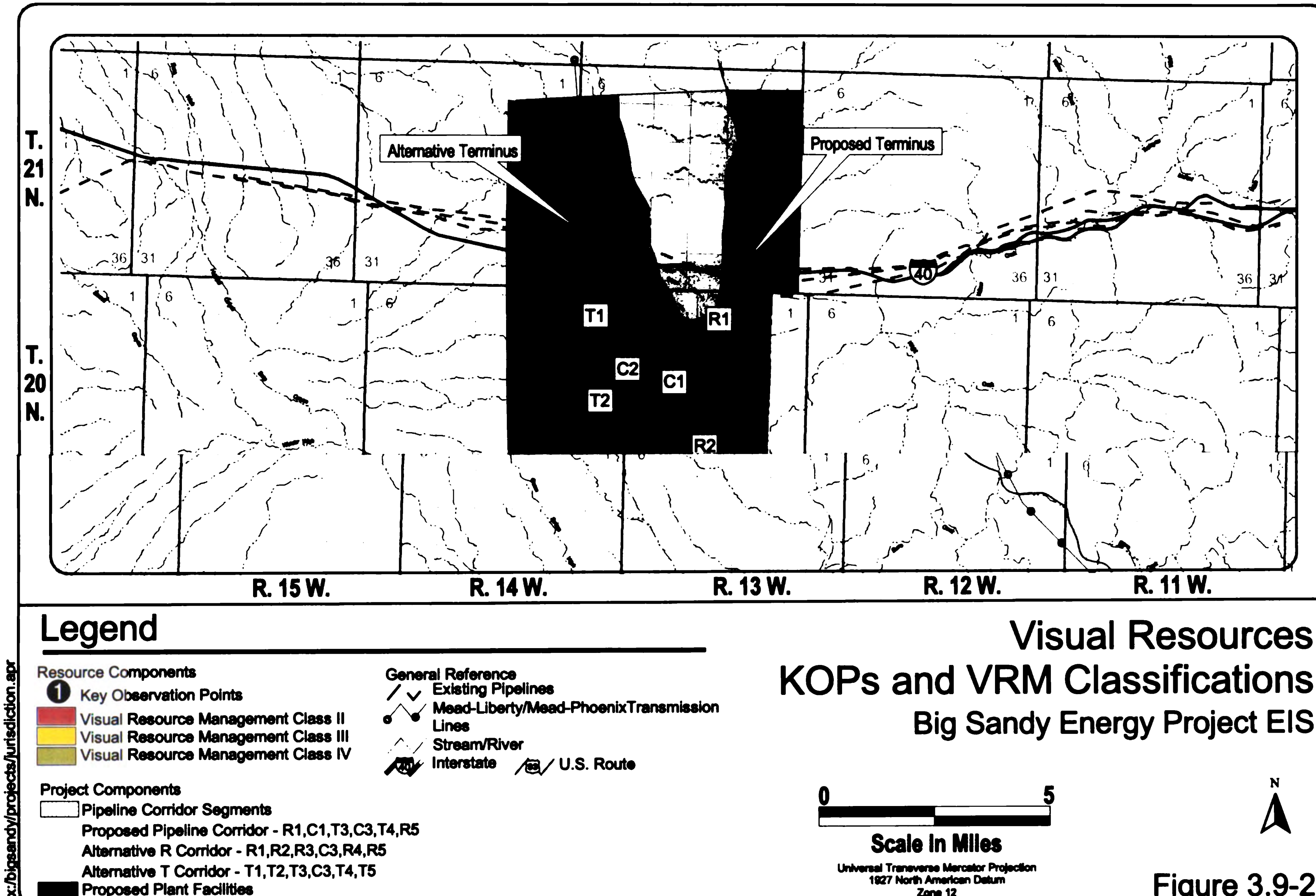

Visual Resources
KOPs and VRM Classifications
Big Sandy Energy Project EIS

Figure 3.9-2

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There would not be views from this KOP of corridor segment T5 due to distance and relatively low profile.

KOP #2 - Chicken Springs Road (Moderate Sensitivity)—This road is located on the northwest side of Wikieup. The road serves as an access from the Wikieup area to Dutch Flat on the west side of the Hualapai Mountains. This road has open panoramic views of the entire region of influence. The westernmost portions of the road increase in elevation providing unique viewing opportunities of the entire valley and surrounding mountain landscapes when traveling east. The proposed power plant site would be visible in the distant background (approximately 7 miles away) and is considered to be outside the 5-mile region of influence.

Corridor segment R5 would be visible in the foreground to middleground (approximately 0.25 to 2 miles away) from this KOP.

Corridor segment T5 along the Mead-Phoenix Project 500-kV transmission line route would not be visible from this KOP due to distance (approximately 2.5 to 6 miles away depending upon location on the road) and low profile.

KOP #3 - US 93 (High Sensitivity)—There are several locations along US 93 where the proposed power plant site would be visible in the background distance zone. A section of US 93 in the southern portion of the region of influence has been designated scenic by the ADOT Parkways, Historic, and Scenic Roads Advisory Committee (ADOT 1993). The first location where the power plant may be visible is within this designated scenic section of the highway along a hilltop approximately 3.5 miles south (background views) of the proposed power plant site. The second location is the section of US 93 near Wikieup where viewing conditions are the same as those described for KOP #1. The third section is located 5 miles north of Wikieup.

The proposed gas pipeline corridor and corridor segments R5, R4, and R3 would be visible (within approximately 150 feet) for the entire length of US 93. Corridor segments R1 and R2 would be visible where they parallel Hackberry Road.

Portions of the Alternative T gas pipeline corridor would be visible from two locations along US 93. The remaining areas would not be visible due to distance and low profile. Corridor segment T5would be visible where the corridor crosses US 93 approximately 2.5 miles south of the Carrow-Stephens Ranches ACEC. Corridor Segment C3 would be visible approximately 10 miles north of the Carrow-Stephens Ranches ACEC where the corridor would be within 0.25 mile along the west side of US 93. Corridor segment C1 would be visible from a location approximately 3.5 miles south of I 40 where the corridor crosses US 93.

KOP #4 - Carrow-Stephens Ranches ACEC (High Sensitivity)—The proposed power plant site would be viewed in the distant background (approximately 9 to 10 miles away) and is considered to be outside the 5-mile region of influence. There are very few viewers currently visiting the Carrow-Stephens Ranches ACEC. However, future plans for developing the ACEC as an "interpretive site" for cultural resources likely will increase the number of potential viewers.

Corridor segment T4) would be visible in the foreground where it crosses through the ACEC boundaries. Corridor segment R4 would be visible where it crosses through the southwest corner of the Carrow-Stephens Ranches ACEC.

KOP #5 - Nettie's Place Residence (High Sensitivity)—This residence is the closest viewer to the proposed power plant site (less than 1 mile). The existing transmission line corridor (consisting of 500-kV, 345-kV, and 69-kV transmission line structures) is partially visible crossing in front of the proposed power plant site.

Corridor segment R5 would be visible in the foreground where it would parallel the proposed access road leading to the proposed power plant

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site. Corridor segment T5 would not be visible from this KOP due to distance and low profile.

Other Viewing Areas—There are other locations with potential views of the proposed Project facilities, including Hackberry Road, I-40, several rural residences, and dispersed recreation areas. Corridor segment R1 would be visible in the foreground where it parallels Hackberry Road near the northern end of the region of influence. Hackberry Road is a low-use, non-paved road providing access to dispersed rural residences in the area. Views of corridor segment R1) and corridor segment T1 would be visible in the foreground where they intersect I-40.

There are middleground views (approximately 1.5 miles west) of the proposed power plant site from several rural residences. Additionally, there are middleground views (approximately 2.5 miles southwest) of the proposed power plant site from two residences. There are several dispersed rural residences near the central and northern portions of the region of influence along the proposed and alternative pipeline corridors. These residences have foreground to middleground views from less than 100 feet to more than 1 mile away.

Additionally, there are potential views from dispersed use recreation areas (undefined viewpoints) such as hunting or hiking areas along the Big Sandy River and in the adjacent mountains. Views from these areas are difficult to define and quantify. However, it is likely that use volume is low and views would be intermittent and short term.

Potentially, the region of influence, including the Wikieup area, may see future growth. However, no specific future plans for residential development, recreation, commercial development, and roads were identified. Therefore, this study does not attempt to characterize future viewing conditions.

BLM Visual Resource Management Guidelines

VRM Classes establish guidelines for determining the acceptable level of change to visual resources on BLM lands. Private, state, and county lands within the region of influence do not have formal guidelines for the management of visual resources. Although the VRM guidelines strictly apply only to BLM-managed public lands, to be consistent, the VRM classification guidelines were used for all lands within the region of influence. VRM classes in the region of influence were identified from the *Kingman Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement* (BLM 1993).

Visual Resource Management Classes

Visual Resource Management (VRM) Classes are determined by evaluating three components – scenic quality, visibility from sensitive viewpoints, and sensitivity of viewpoints. The following is a summary of the VRM Classes.

Class I – The objective of this class is to preserve the existing character of the landscape. Changes to the landscape character must be low and should not be evident.

Class II – The objective of this class is to retain the existing character of the landscape. Changes to the landscape character may attract slight attention, but should be subordinate to the visual setting.

Class III – The objective of this class is to partially retain the existing character of the landscape. Changes to the landscape character may begin to attract attention, but should not dominate the visual setting.

Class IV – The objective of this class is to allow for activities that modify the existing character of the landscape. Changes to the landscape character may attract attention and dominate the visual setting. However, these activities should minimize changes to the landscape where possible.

VRM Class II, III, and IV landscapes were identified in the region of influence. Class IV lands are predominant and consist of landscapes

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along the proposed gas pipeline corridor (corridor segments T4, C3, T3, C1, and R1); Alternative T gas pipeline corridor (corridor segments T4, C3, T3, T2, and T1); and Alternative R gas pipeline corridor (corridor segments R5, R4, R3, R2, and R1) located in areas of Class C scenic quality which are seen by a low to moderate number of sensitive viewers (primarily from US 93 and dispersed residences). These alternatives follow a BLM-designated utility corridor and US 93.

Class III landscapes occur near the eastern and southern boundaries of the region of influence surrounding the proposed power plant site. These landscapes consist of Class B scenic quality which is seen by a low to moderate number of sensitive viewers (primarily US 93 and dispersed residences). The Class III landscapes are found along the proposed gas pipeline corridor (corridor segment R5); Alternative T gas pipeline corridor (corridor segment T5); and Alternative R gas pipeline corridor (corridor segment R5).

Class II landscapes occur along the Big Sandy River from the southern to central portions of the region of influence. These landscapes consist of Class A scenic quality areas seen by a moderate to high number of sensitive viewers (primarily from US 93, Wikieup, and dispersed residences). The proposed and alternative gas pipeline routes cross the Class II Big Sandy River north and south of Wikieup. The Class II landscapes are found along the proposed gas pipeline corridor (corridor segment R5); Alternative T gas pipeline corridor (corridor segment T5); and Alternative R gas pipeline corridor (corridor segments R5 and R4).

The proposed power plant site is located on private land. Therefore, it is not specifically subject to BLM VRM guidelines. It is surrounded by Class III landscapes and the closest Class II landscapes are approximately 1 to 1.5 miles away.

3.9.2.2 Environmental Consequences

Identification of Issues

Impacts on visual resources resulting from the proposed Project would be both short term and long term. Issues relative to evaluating impacts on visual resources are listed below.

Short-term Issues:

- presence of construction vehicles and equipment (e.g., cranes, trucks, bulldozers, scaffolding)
- dust and emissions from construction equipment
- construction lighting

Long-term Issues:

- terrain and vegetation disturbance at the proposed power plant site (approximately 56 acres), as well as along the pipeline and access roads
- presence of aboveground facilities at the proposed power plant site including the following:
- combustion turbine generators (CTGs), approximately 60 feet high
- HRSG, approximately 93 feet high
- HRSG exhaust stacks, approximately 130 feet high
- steam turbine generator (STG), approximately 37 feet high
- cooling tower (CT), approximately 40 feet high
- water storage tanks, approximately 43 feet high

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- power plant substation and transmission line structures, approximately 35 to 125 feet high
  - presence of communication facilities including a 60 feet high communication tower and two 10 feet diameter microwave dishes
- presence of visible vapor plumes emanating from the HRSG exhaust stacks and CT cells
- night lighting for operations and maintenance

Significance Criteria

Impacts would be considered significant if the following were to occur:

- non-compliance with applicable agency VRM guidelines, including the following:
  - BLM Visual Resource Management Classifications
  - ADOT Parkways, Historic, and Scenic Roads Program
  - Mohave County "Night Sky Ordinance"
- a substantial degradation of the character or scenic quality of a landscape in terms of the form, line, color, and texture qualities that make the setting unique, identifiable, or establish a "sense of place" as a result of the proposed Project
- introduction of substantial dominant visual changes in the landscape that are seen by highly sensitive viewers (e.g., residences, recreation areas, scenic roads) including, but not limited to the following:
  - partial or full view blockage of surrounding viewsheds (e.g., ridgelines and riparian corridors) by the proposed facilities, where there currently are unobstructed views
  - skyline views of proposed facilities
  - substantial earthwork (cut and fill) that exposes visually contrasting soils or rock and does not repeat natural contours of the surrounding terrain

Impact Assessment Methods

The assessment of potential significant impacts on visual resources resulting from the Proposed Action was based on the evaluation of visual contrast as defined by the BLM's 8400 series manual (Visual Resource Inventory and Contrast Rating System, 1986).

Visual contrast is a measure of the perceptible level of change to landscape scenic quality and views from KOPs resulting from the proposed Project. Viewing variables affecting visual contrast include vegetation or terrain screening, atmospheric conditions, daytime vs. nighttime conditions, and visual absorption capability (VAC). VAC is defined as the extent to which the complexity of the landscape can absorb changes without affecting the overall visual character.

The BLM Visual Contrast Rating Worksheet (Form 8400-4) was used as the basis for establishing potential visual contrast levels. These worksheets were completed in the field and are available for review at the BLM Kingman Field Office. Additionally, visual simulations were prepared using photography and computer-generated three-dimensional models to assist in determining visual contrast levels.

There were four visual contrast (modification) levels established for this Project, as described below.

Not Noticeable—Changes in the landscape scenery or views that would not be evident (weak contrast) unless pointed out due to such factors as previous disturbance, distance, terrain and vegetation screening, dominance of adjacent landscape features, and visual absorption due to

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background terrain. Changes typically would be viewed in the background and would be unobstructed. However, middleground views may be included that are partially screened or foreground views that would be completely screened.

Noticeable—Changes in the landscape scenery or views that would be evident (weak/moderate contrast) but visually subordinate to the setting due to the factors described above. These changes may attract slight attention, but would not compete with adjacent landscape scenery or views. Changes typically would be viewed in the middleground or background and would be unobstructed. However, foreground views may be included that would be partially screened.

Co-dominant—Changes in the landscape scenery or views that would attract attention (moderate contrast) and begin to compete with adjacent landscape scenery or views. Changes typically would be viewed in the middleground and would be unobstructed or partially screened in the foreground.

Dominant—Changes in the landscape scenery or views that would become the focal point or most significant (strong contrast) feature in the setting. Changes typically would be viewed in the foreground, be unobstructed, and in extreme cases may be partially screened. Such changes often cause a lasting impression when viewed in the landscape.

The severity of impacts is determined by combining the landscape scenic quality classes and viewer sensitivity levels for KOPs determined in the inventory with the visual contrast/modification levels described above. Tables 3.9-1 and 3.9-2 summarize the impacts in terms of high, moderate, and low levels. The impact levels assume the application of mitigation measures that are part of the Proposed Action and presented in Section 2.2.8.8. Table 3.9-3 summarizes the compliance with BLM VRM Classifications.

Five visual simulations (3D computer models), one from each of the KOPs, were prepared to assist with the assessment of impacts to visual resources. The simulation prepared from KOP #1 - Community of Wikieup (refer to Figure 3.9.3) is the only one shown in this Draft EIS, since it represents a characteristic view of the proposed power plant seen by the general public. Simulations for the other KOPs illustrated limited views of the power plant due to short viewing duration, increased viewing distance, and screening from intervening terrain and vegetation.

Actions Incorporated into the Proposed Action to Reduce or Prevent Impacts

As described in Section 2.2.8.8, all lighting would be shielded and directed downward, in accordance with the Mohave "Night-Sky" Ordinance. In addition, the proposed power plant would be painted to blend with the natural background. All areas disturbed by construction would be reclaimed (landscape recontoured and rocks scattered randomly and planted with native vegetation, which would help ensure that the proposed Project facilities blend with the surrounding area.

Impact Assessment

Proposed Action

Proposed Power Plant Site

Long-term impacts would begin after construction of the proposed power plant and remain over the life of the Project. Modifications would be noticeable to co-dominant primarily due to surface disturbance and the introduction of additional industrial facilities (turbines, exhaust stacks, CTs, water tanks, substation, and evaporation ponds) into scenic quality Class B foothill landscapes at the proposed power plant site. Impacts would be moderate and less than significant after the application of actions to reduce impacts and due to the presence of a BLM-designated utility corridor, which has 500-kV, 345-kV, and 69-kV transmission lines

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TABLE 3.9-1 SCENIC QUALITY IMPACT LEVELS			
Visual Contrast or Modification Levels	**Scenic Quality Class**		
	Class A	***Class B***	***Class C***
Not Noticeable	Moderate	Low	Low
Noticeable	Moderate	Moderate	Low
Co-dominant	High	Moderate	Low
Dominant	High	High	Moderate

TABLE 3.9-2 KOP (VIEWER) IMPACT LEVELS			
Visual Contrast or Modification Levels	**Viewer Sensitivity**		
	High	***Moderate***	***Low***
Not Noticeable	Low	Low	Low
Noticeable	Moderate	Moderate	Low
Co-dominant	High	Moderate	Low
Dominant	High	High	Moderate

TABLE 3.9-3 COMPLIANCE WITH BLM VRM CLASSIFICATIONS				
Visual Contrast or Modification Levels	**VRM Class**			
	Class I*	***Class II***	***Class III***	***Class IV***
Not Noticeable	Yes	Yes	Yes	Yes
Noticeable	No	Yes	Yes	Yes
Co-dominant	No	No	Yes /No**	Yes
Dominant	No	No	No	Yes/No**

* There are no VRM Class I landscapes in the region of influence

** Compliance may depend upon implementation of mitigation measures to reduce visual contrast

bisecting the proposed power plant site and evaporation ponds.

The proposed power plant would be a noticeable feature in the landscape as viewed from KOP #1 - Community of Wikieup (approximately 3.5 to 4 miles away). Impacts on these views would be moderate to low, since they are partially screened by vegetation, terrain, and occasionally surrounding development. A simulation of the view of the proposed power plant from KOP #1 is included as Figure 3.9-3. The Aquarius Mountains to the east are the dominant feature in the landscape when viewed from this KOP. The Big Sandy River in the foreground (approximately 0.25 mile away) is a secondary feature that attracts viewer attention from this KOP. Additionally, the Hualapai Mountains to the west are a dominant feature in the landscape, which may draw attention away from views of the proposed power plant. At this distance, the proposed power plant would tend to be absorbed into the landscape. Visible water vapor plumes would contribute to the visibility of the proposed power plant from this KOP and likely would be a co-dominant feature when they occur. Lighting also would contribute to the noticeability of the proposed power plant during nighttime hours; however, impacts would be reduced to low levels because of the measures proposed as part of the Proposed Action (refer to Section 2.2.8.8). Based on the significance criteria, these impacts would not be significant.

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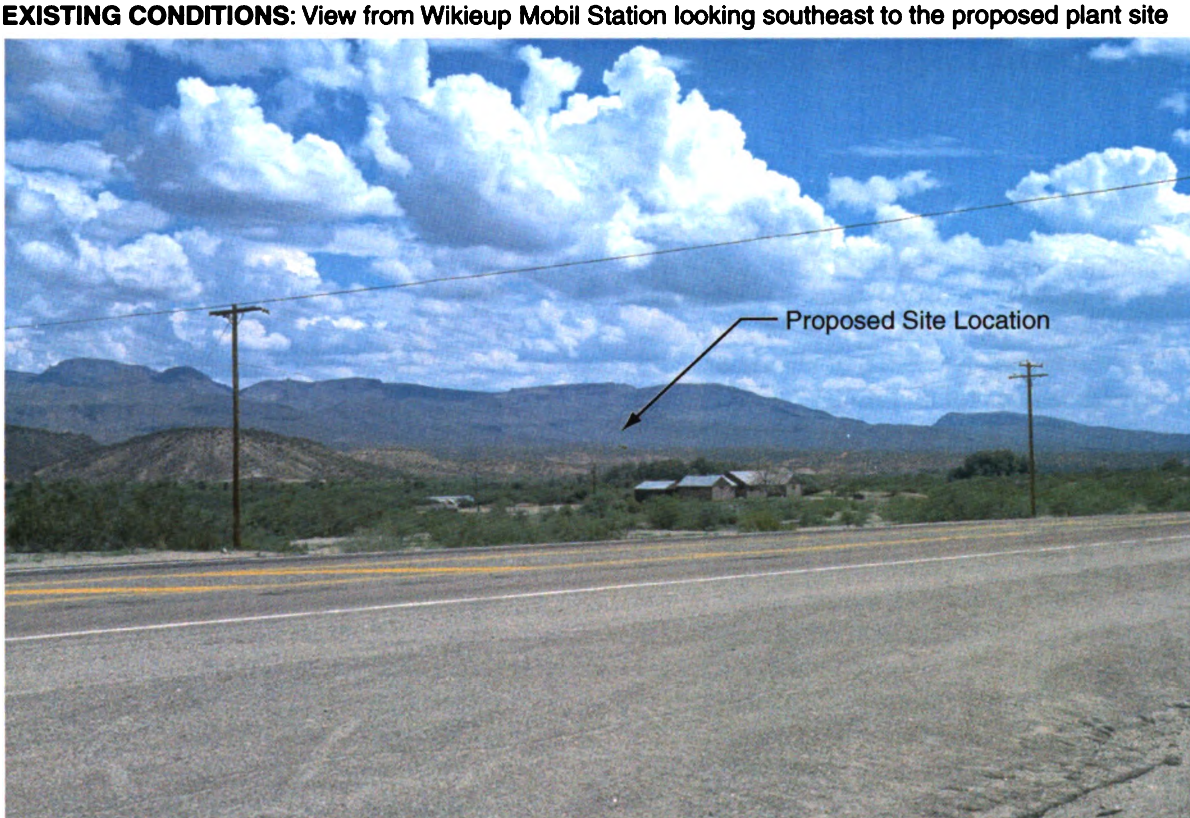
EXISTING CONDITIONS: View from Wikieup Mobil Station looking southeast to the proposed plant site



SIMULATION

Photographic Simulation
Big Sandy Energy Project EIS

Figure 3.9-3

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The proposed power plant would be a noticeable to not noticeable feature in the landscape when viewed from KOP #2 - Chicken Springs Road (approximately 7 miles away). This is primarily because the proposed power plant site is located at a relatively long distance and is partially to fully screened due to intervening terrain and vegetation from this KOP, as well as being absorbed by background terrain. Additionally, the Big Sandy River, Hualapai Mountains, and Aquarius Mountains are the dominant features visible in the landscape from this KOP. The most noticeable features would be the presence of water vapor plumes during the day and light during nighttime hours. Visible night lighting would be reduced to low levels since they would be shielded and directed away from viewers. Based on the significance criteria, impacts on this KOP would be low and less than significant.

KOP #3 - US 93 has several viewing locations where the proposed power plant and access road would be not noticeable to noticeable primarily due to intervening terrain and vegetation, as well the dominance of the surrounding mountain landscapes. The proposed power plant would not be noticeable along the stretch of highway west of the proposed power plant site where views are oriented primarily north and south away from the site. However, the access road would be noticeable since it is located immediately adjacent to the highway. The most noticeable location is the designated scenic section of the highway south of the proposed power plant site where northbound views (relatively short duration) are oriented directly toward the proposed power plant site (approximately 3.5 miles away). The upper portions of the HRSG and exhaust stacks, along with the cut slope created by the earthwork at the power plant site, would be the most visible features from this KOP. However, the power plant and cut slope would tend to be absorbed into the landscape since the plant facilities would be surface treated to match colors in the surrounding environment and after the cut slope has been revegetated.

The second location along US 93 where the proposed power plant would be most noticeable is north of Wikieup where southbound views are partially directed toward the proposed power plant site in similar conditions described above. Similar to other viewing areas, night lighting and water vapor plumes would be the most visible features associated with the proposed power plant. Impacts for this KOP would be moderate along the scenic portion of the highway and low for the remaining sections after the application of measures. Based on the significance criteria, impacts along US 93 would not be considered significant.

KOP #4 - Carrow-Stephens Ranches ACEC is approximately 9 to 10 miles away from the proposed power plant site and views would range from not noticeable during daytime hours to potentially noticeable during nighttime hours. Impacts on views would be low primarily due to distance, orientation, and absorption from background terrain. Another potentially noticeable feature of the proposed power plant from this KOP would be the water vapor plumes. However, occurrence of the plumes would be relatively infrequent. Based on the significance criteria, impacts would be less than significant.

The highest visual impacts would occur at KOP #5 – Nettie's Place Residence. Impacts on these views would be moderate due to the proximity (less than 1 mile) of the KOP to the proposed plant site. The most noticeable feature would be the cut slope created by the earthwork at the plant site (including the evaporation ponds) since it is the highest point where modifications to the landscape occur. The cut slope would be visible primarily during the first several years after construction, until vegetation of the disturbed area establishes itself. Foreground screening from intervening vegetation and terrain would reduce the overall visual contrast of the proposed power plant from this KOP from co-dominant to noticeable. The impacts would be less than significant, since the proposed power plant would partially blend with background terrain when painted with earth tones consistent with the surrounding landscape.

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Water vapor plumes emanating from the CT cells and HRSG exhaust stacks would be occasionally visible from KOP #5 during daylight hours. These plumes would occur only under certain atmospheric conditions (i.e., primarily during winter when cold temperatures and high humidity are common), with the CT plumes visible more frequently than the HRSG plumes. Plumes that are 164 feet high are expected to occur less than 5 percent of hours during the course of a year and plumes that are greater than 230 feet high would be expected to occur less than 3 percent of yearly hours. The plumes would appear as a medium-density white/gray cloud rising above the proposed power plant site and would occur primarily at night during winter months. The plumes would partially block views of the Aquarius Mountains from KOP #5. When visible, the plumes would be co-dominant to dominant depending upon their height above ground and duration of time visible. Impacts resulting from the plumes would be high to moderate. However, the plumes only would be visible a small percentage of daytime hours, and therefore would result in less than significant impacts.

There currently are no lights visible to the east of KOP #5. Therefore, lighting would be co-dominant (partially screened) and contribute to impacts during the nighttime. Impacts would be reduced to moderate levels by implementation of shielding and directive devices. Based on the significance criteria, impacts from night lighting would be less than significant.

Impacts on other viewing areas described in the affected environment section would be low and insignificant primarily due to limited visibility of the proposed power plant site. Additionally, measures included in Section 2.2.8.8 (i.e., surface treated facilities, revegetation of disturbed areas, and shielding devices on lights) would reduce visual contrast with the surrounding landscape.

The proposed power plant site is located on private land (zoned industrial) and therefore does not have established visual resource management guidelines. The proposed power plant and associated facilities would comply with all applicable agency visual resource management guidelines including BLM VRM classifications, ADOT's Parkways, Historic, and Scenic Roads Program; and Mohave County's "Night Sky" Ordinance, and therefore would not result in a significant impact.

Short-term impacts resulting from the construction of the proposed power plant primarily would result from the visibility of equipment and dust related to the construction process. Additionally, lighting present during nighttime hours would contribute to short-term impacts. These impacts would occur primarily to KOP #5 - Nettie's Place Residence and would range from moderate to low depending upon the size and type of equipment (e.g., high cranes, scaffolding, earth moving equipment). These short-term impacts would be less than significant.

Communication Facilities

Visible modifications and impact levels for the proposed communication towers (approximately 60 feet high) and microwave dishes would be the same as previously described for the proposed power plant site.

Modification levels for the installation of microwave dishes would range from noticeable from views within 0.25 mile to not noticeable to views from beyond 0.25 mile. Impacts would be low and insignificant primarily due to the presence of numerous existing towers, buildings, and microwave dishes. Impacts would be the same for facilities at the Phoenix and Perkins Substation sites.

Replacing the existing overhead static wire with an OPGW on the existing 345-kV transmission line would not be noticeable since it would appear nearly identical. Based on the significance criteria, therefore, impacts would be low and insignificant.

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Proposed Gas Pipeline Corridor

Long-term impacts would begin after the construction of the gas pipeline along the proposed route. The proposed gas pipeline route follows existing right-of-way along the Mead-Phoenix Project 500-kV transmission line route and Hackberry Road. The modifications resulting from the proposed gas pipeline corridor would range from noticeable in areas where existing right-of-way disturbance is evident to not noticeable where existing disturbance is prevalent. Low to moderate impacts would occur where the proposed pipeline corridor crosses scenic quality Class B foothill landscapes west of the proposed power plant site (corridor segment R5) and juniper plains south of I-40 (corridor segment T3). The remainder of the proposed pipeline corridor would cross Class C desert scrub landscapes (corridor segments T4, C3, C1, and R1) resulting in low impacts. Based on the significance criteria, impacts on scenic quality would be less than significant.

Modification levels would range from not noticeable to noticeable and impacts on KOPs and other viewing areas would be low where the corridor is adjacent to previously disturbed right-of-way. Modification levels would be noticeable to co-dominant and impacts on KOPs and other viewing areas would be moderate where the corridor would diverge beyond 1/8 of a mile from previously disturbed right-of-way.

The most visible portion of the proposed gas pipeline corridor would be where it crosses US 93 and to residences located near its intersection with the Big Sandy River (corridor segments R5 and T4). Modification levels here would be noticeable and impacts would be moderate to viewers traveling in both directions along the highway as well as the residences. Contrasting rocks or soil in the disturbed area may contribute to this impact. The application of reclamation and other measures proposed as part of the Proposed Action would reduce visual contrast of the pipeline with the surrounding landscape. Based on the significance criteria, impacts on KOPs and other viewing areas would be less than significant.

The proposed gas pipeline corridor would be in compliance with BLM Class II, III, and IV landscapes. This is primarily due to its location adjacent to existing right-of-way and the implementation of the measures described in Section 2.2.8.8.

Short-term impacts resulting from the construction of the pipeline primarily would result from the visibility of equipment and dust related to the construction process from KOPs #1 - Community of Wikieup, #3 - US 93, and #5 – Nettie's Place Residence. The equipment (e.g., backhoes, bulldozers, trucks) and dust could temporarily block views to distant mountain landscapes. These short-term impacts would be moderate and, based on the significance criteria, they would be less than significant.

Alternative R Gas Pipeline Corridor

Long-term impacts would begin after the construction of the gas pipeline along the Alternative R gas pipeline corridor. Modification levels would range from not noticeable to noticeable and impacts on scenic quality would be low where the corridor is adjacent to previously disturbed right-of-way. Modification levels would be noticeable to co-dominant and impacts on scenic quality would be moderate where the corridor would diverge beyond 1/8 of a mile from previously disturbed right-of-way.

The Alternative R gas pipeline corridor would cross (corridor segment R5) or be adjacent to (corridor segment R4) the scenic quality Class A Big Sandy River near the middle of the region of influence resulting in moderate to low impacts. Moderate to low impacts would occur where the Alternative R gas pipeline corridor crosses scenic quality Class B foothill landscapes west of the proposed power plant site along the proposed access road (corridor segment R5). The remainder of the Alternative R gas pipeline corridor would cross Class C desert scrub

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landscapes (corridor segment R4, C3, R3, R2, and R1) throughout the middle of the region of influence and result in low impacts on scenic quality. Based on the significance criteria, impacts on scenic quality would be less than significant.

Modification levels would range from not noticeable to noticeable and impacts on KOPs and other viewing areas would be low where the corridor is adjacent to previously disturbed right-of-way. Modification levels would be noticeable to co-dominant and impacts on KOPs and other viewing areas would be moderate where the corridor would diverge beyond 1/8 of a mile from previously disturbed right-of-way.

The Alternative R gas pipeline corridor would be visible for the entire length of US 93 (corridor segment R5, R4, C3, and R3) and Hackberry Road (corridor segment R2 and R1). Modification levels here would be noticeable and impacts would be moderate to viewers traveling in both directions along the roadways. Contrasting rocks or soil in the disturbed area may contribute to this impact. Revegetation of disturbed areas would reduce visual contrast of the pipeline with the surrounding landscape. Impacts to KOPs and other viewing areas would be less than significant.

The Alternative R gas pipeline corridor would be in compliance with BLM Class II (corridor segments R5 and R4), Class III (corridor segment R5), and Class IV (corridor segments R5, R4, C3, R3. R2, and R1) landscapes. This is primarily due to its location adjacent to previously disturbed right-of-way.

Alternative T Gas Pipeline Corridor

Long-term impacts would begin after the construction of the gas pipeline along the Alternative T gas pipeline corridor. The Alternative T gas pipeline corridor follows existing right-of-way along the Mead-Phoenix Project 500-kV transmission line route. Modification levels would range from not noticeable to noticeable and impacts on scenic quality would be low where the corridor is adjacent to previously disturbed right-of-way. Modification levels would be noticeable to co-dominant and impacts on scenic quality would be moderate where the corridor would diverge beyond 1/8 of a mile from previously disturbed right-of-way.

The Alternative T gas pipeline corridor would cross the scenic quality Class A Big Sandy River (corridor segment T5) near the southern end of the region of influence, resulting in moderate impacts. Low to moderate impacts would occur where the alternative pipeline route crosses scenic quality Class B foothill landscapes northwest of the proposed power plant site (corridor segment T5) and juniper plains south of I-40 (corridor segments T3, T2, and T1). The remainder of the proposed pipeline corridor would cross Class C desert scrub landscapes (corridor segments T4, C3, C1, and R1), which would result in low impacts. Based on the significance criteria, impacts on scenic quality would be less than significant.

Modification levels would range from not noticeable to noticeable and impacts on KOPs and other viewing areas would be low where the corridor is adjacent to previously disturbed right-of-way. Modification levels would be noticeable to co-dominant and impacts on KOPs and other viewing areas would be moderate where the corridor would diverge beyond 1/8 of a mile from previously disturbed right-of-way along the Mead-Phoenix Project 500-kV transmission line.

The most visible portion of the Alternative T gas pipeline corridor would be where it crosses US 93 and to residences located near its intersection with the Big Sandy River (corridor segments T5 and T4). Modification levels here would be noticeable and impacts would be moderate to viewers traveling in both directions along the highway as well as the residences. Contrasting rocks or soil in the disturbed area may contribute to this impact.The application of reclamation and other measures proposed as part of the Proposed Action would reduce visual

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contrast of the pipeline with the surrounding landscape. Impacts on KOPs and other viewing areas would be less than significant.

The Alternative T gas pipeline corridor would be in compliance with BLM Class II (corridor segment T5), III (corridor segment T5), and IV (corridor segments T4, C3, T3, T2, and T1) landscapes. This is primarily due to its location adjacent to existing rights-of-way and after implementation of measures described in Section 2.2.8.8.

Short-term impacts resulting from the construction of the pipeline primarily would result from the visibility of equipment and dust related to the construction process from KOPs #1 - Community of Wikieup, #3 - US 93, and #5 - Nettie's Place Residence. The equipment (e.g., backhoes, bulldozers, trucks) and dust could temporarily would block views to distant mountain landscapes. These short-term impacts would be moderate and less than significant.

Crossover Segment C2

Corridor segment C2 follows the old US 93 alignment. The scenic quality is Class C desert scrub landscapes and would result in low impacts. Views of this corridor would be limited to the point where it intersects with US 93. Modifications would be noticeable when viewed from a small section US 93 and not noticeable for the remainder of the corridor where there are no sensitive viewers. Impacts to views from US 93 would be low primarily because of the short duration of view and minimal scenic quality of the landscape. Impacts from this corridor would be less than significant.

No-Action Alternative

There would be no impacts on visual resources associated with the No-Action Alternative. The groundwater production and monitoring wells, access roads, and well pads, that were completed on private land and used to identify and test the lower aquifer, would remain.

Mitigation and Residual Impacts

No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts. There would be no residual significant impacts.

If adopted, the following measures would be implemented to minimize adverse impacts not considered to be significant:

- As necessary to blend with the surrounding weathered rock, the high cut slope north of the proposed power plant site would be coated with penetrating rock stain.
- As necessary to blend with the surrounding weathered rock and soil, larger rocks left on the surface of areas disturbed for the pipeline construction would be coated with penetrating rock stain.

3.10 AREAS OF CRITICAL ENVIRONMENTAL CONCERN

The Federal Land Policy and Management Act directs BLM to manage public lands for multiple purposes. However, BLM has the authority to designate and more restrictively manage some lands to protect some resources such as special status plants and animals, cultural values, scenic values, and wildlife and riparian resources. The *Kingman Area Resource Management Plan* (BLM 1993) defined 12 ACECs for such special management (Figure 3.10-1). Because of their locations, the proposed Big Sandy Energy Project is not projected to have any potential effects on 10 of these 12 ACECs. The Carrow-Stephens Ranches ACEC and the Three Rivers Riparian ACEC were identified as subject to potential impacts and are addressed in this section.

3.10.1 Affected Environment

3.10.1.1 Region of Influence

The region of influence for assessing construction and operation impacts includes the area within the boundaries of the Carrow-

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Stephens Ranches and Three Rivers Riparian ACEC. Corridor segment T4, which is a component of the Proposed Action and the Alternative T gas pipeline corridor, crosses the Carrow-Stephens Ranches ACEC, as does corridor segment R4 of the Alternative R gas pipeline corridor. Also, the OPGW option for the substation dual/redundant communication system would cross this ACEC within the right-of-way for the Mead-Liberty 345-kV transmission line. The Three Rivers Riparian ACEC begins about 8.5 miles south of the Project area and extends about 16 to 17 miles south to where the confluence of the Big Sandy River and Santa Maria River form the Bill Williams River. This ACEC was addressed to evaluate whether the pumping of groundwater for the Big Sandy Energy Project could affect the ACEC by reducing surface water flows in the Big Sandy River or could affect the water quality of the Big Sandy River.

3.10.1.2 Existing Conditions

Carrow-Stephens Ranches ACEC

The Carrow-Stephens Ranches ACEC encompasses 542 acres of public land on the west side of the Big Sandy River about 5 to 6 miles north of Wikieup. US 93 and the Mead-Liberty 345-kV and Mead-Phoenix Project 500-kV transmission lines cross the ACEC (refer to Figure 3.10-1).

This ACEC was designated primarily to protect the historical residences, outbuildings, and other features of the Joseph Carrow and Ray Stephens ranches, but also includes parts of the Carrow-Stephens Wildlife Movement Corridor (BLM 1995). The potential for other aboriginal archaeological sites and Miocene-Early Pliocene fossils also was recognized when the ACEC was designated. A recent survey for the planned upgrading of US 93 discovered four previously unrecorded archaeological sites within the ACEC. These include three scatters of historic trash that may relate to the historic ranches, and a small scatter of pieces of broken aboriginal pottery and flaked stone artifacts. About one-third of the ACEC has yet to be intensively inventoried for cultural resources, but paleontological studies indicate that the ACEC is north of the Big Sandy Formation and therefore has little potential for significant fossils (refer to Section 3.2).

The features of the Carrow Ranch complex include the main house (a two-story adobe built in 1890-91), family cemetery, ruins of a dugout structure, barn, garage, outbuilding, outhouse, corrals, irrigation ditches, road, 1930s cannery shed, and earth-sheltered storage cache (Figure 3.10-2). The foundations of a school also may be present but have not been located. The features at the Ray Stephens Ranch include the main house (adobe building constructed in 1935), five storage sheds, and small orchard. Pieces of wagons and other farming equipment and other artifacts are scattered across both of the ranch complexes.

The Carrow family moved onto their ranch in 1882. Crops had been grown at this location adjacent to two springs since at least 1873. The family lived at the ranch for two decades and Joe Carrow became known as one of the most successful farmers in Mohave County.

Two of the Carrow children died in the 1890s and were buried in a family cemetery. At least one other individual, an unidentified Hualapai Indian who apparently worked on the ranch, is buried at the cemetery (Colby et al. 1993:26).

William Stephens settled on a ranch north of the Carrow place in 1894. In 1922 Stephens acquired the Carrow land and combined the ranches. In the 1930s, one of his sons, Ray, built the house south of the Carrow ranch that is now within the ACEC.

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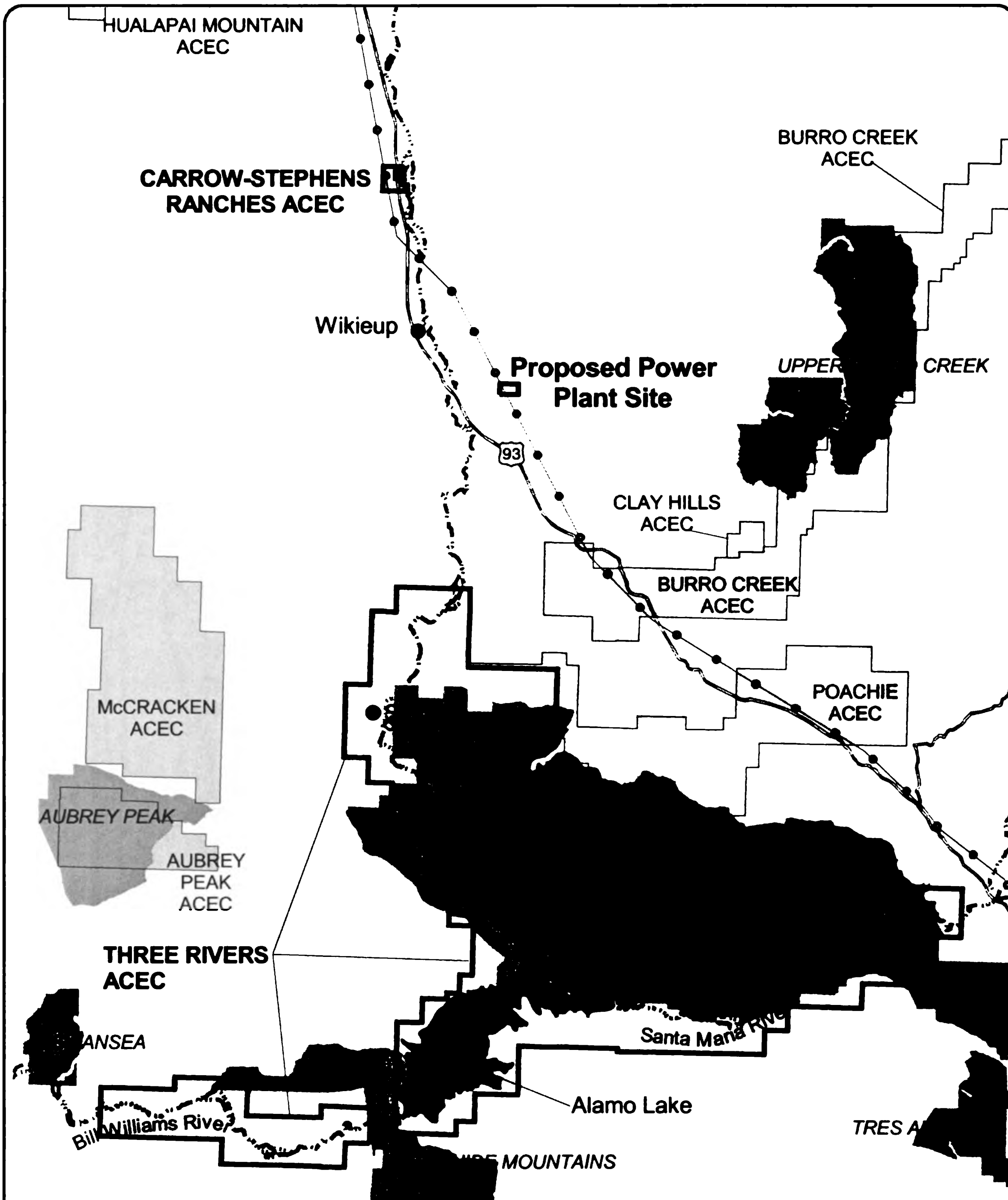

Legend
- Wilderness Areas
- Areas of Critical Environmental Concern
- Mead-Liberty/Mead-Phoenix Transmission Lines
- State Route

Areas of Critical Environmental Concern

Big Sandy Energy Project EIS

5 0 5 10
Scale in Miles

Universal Transverse Mercator Projection
1927 North American Datum
Zone 12

Figure 3.10-1

x:/bigsandy/projects/acec.apr

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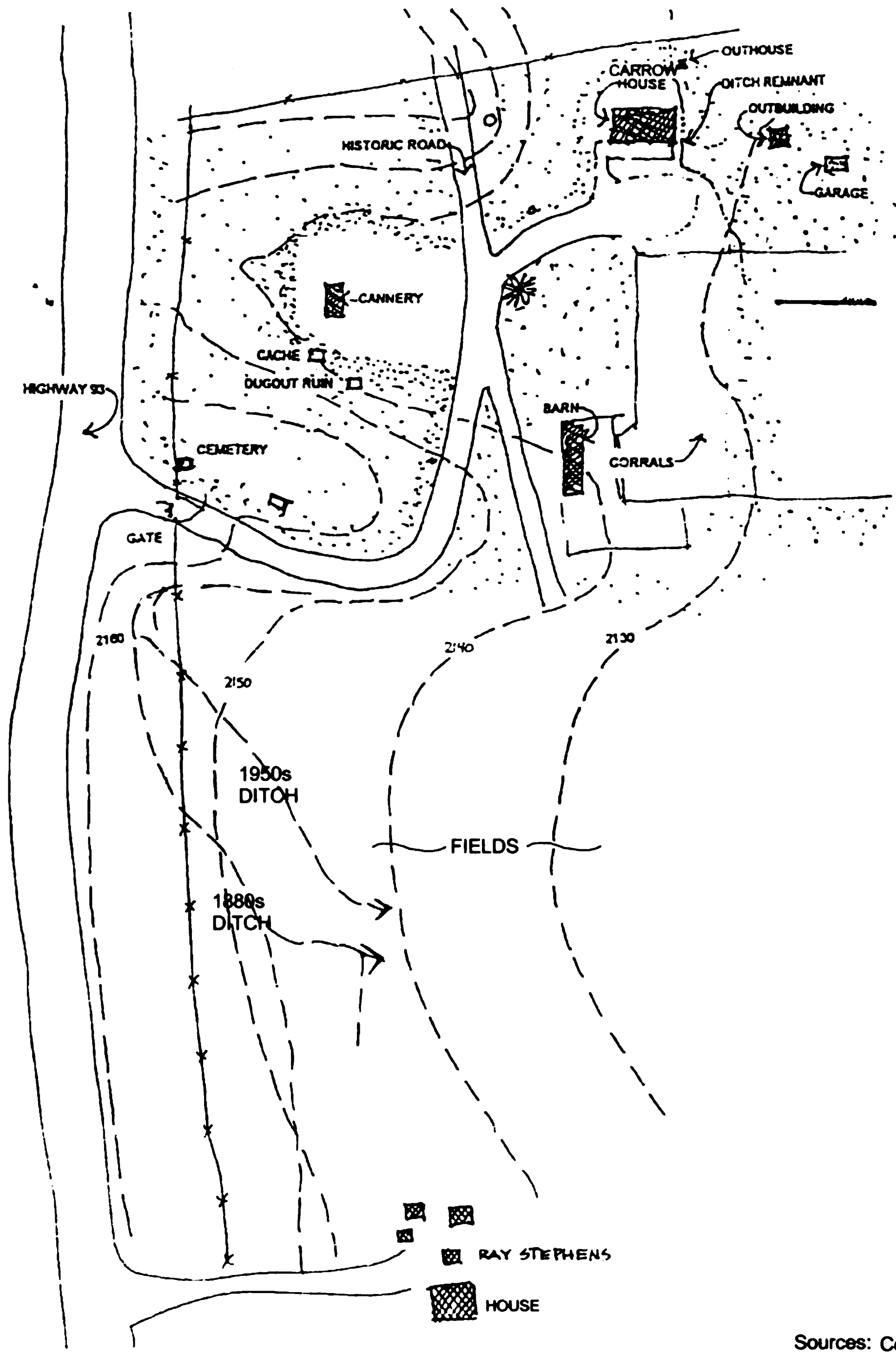

Sources: Colby and others 1993
Wright 1993

Carrow-Stephens Ranches ACEC

Big Sandy Energy Project EIS

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Figure 3.10-2

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The cannery shed and storage cache are remnants of the Big Sandy Cooperative Canning and Marketing Association. These facilities were developed with assistance of a New Deal self-help program during the Great Depression. The canning of locally grown fruits, vegetables, and beef began in 1936 and continued for several years.

The Carrow-Stephens Ranches ACEC stands as a monument to the first generation of ranchers in the Big Sandy Valley, and BLM objectives for this ACEC focus on public interpretation, education, and recreation. The National Park Service completed an assessment of the site conditions in 1993 (Colby et al. 1993), and BLM has programmed additional funds to stabilize the Carrow ranch house. BLM is seeking additional funds and partners for development of the site for recreational and educational opportunities. Within the next 5 to 10 years, the Arizona Department of Transportation (ADOT) plans to upgrade US 93 within the ACEC, but would reroute the highway about 1,200 feet west of the existing alignment to reduce impacts on the historic ranches within the ACEC.

Three Rivers Riparian ACEC

The Three Rivers Riparian ACEC covers 32,043 acres. The ACEC boundaries encompass the riparian zones where the Big Sandy River and Santa Maria River join to create the Bill Williams River and upland areas that surround this confluence. Alamo Dam, built across the upper Bill Williams River, creates Alamo Lake within this ACEC (refer to Figure 3.10-1).

The northern, eastern, and western boundaries of this ACEC are located along the Big Sandy River, Santa Maria River, and Bill Williams River, respectively. The northern boundary is north of Burro Creek, in T14N, R13W; the eastern boundary is in T12N, R9W; and the western boundary is in T9N, R15W. The boundaries of this ACEC abut the Arrastra Mountain Wilderness and the Rawhide Mountains Wilderness.

This ACEC was designated to protect riparian habitat because these habitats are limited and have been degraded throughout the Southwest. The riparian areas along the Big Sandy, Santa Maria, and Bill Williams rivers provide habitat for birds, fish, wildlife, and insects—some of which are threatened or endangered, State-listed, or BLM sensitive species (refer to Section 3.14). In addition to its importance for wildlife, the ACEC includes valuable scenic and recreational resources. Scenic resources include the riparian vegetation and diversity of terrain. The free-flowing stream provides opportunities for water-based recreation, and BLM has proposed portions of the Big Sandy River within the ACEC for inclusion in the Wild and Scenic River system.

3.10.2 <u>Environmental Consequences</u>

3.10.2.1 Identification of Issues

The following issues were identified during the scoping and preparation of this Draft EIS:

- potential effects of the Project on goals and objectives for the Carrow-Stephens Ranches ACEC and Three Rivers Riparian ACEC
- potential effects on archaeological and historical resources in the Carrow-Stephens Ranches ACEC
- potential effects on riparian areas in the Three Rivers Riparian ACEC as a result of any reduction in surface water flows
- potential effects on water quality in the Three Rivers Riparian ACEC due to spills or stormwater or wastewater discharges

3.10.2.2 Significance Criteria

Any Project effects on the Carrow-Stephens Ranches ACEC and Three Rivers Riparian ACEC that are inconsistent with the BLM Kingman Area RMP goals, objectives, and management prescriptions for these ACECs would be considered significant.

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3.10.2.3 Impact Assessment Methods

The assessment of impacts relied heavily on the cultural resource studies (refer to Section 3.15) and hydrological analyses (refer to Sections 3.4 and 3.5) conducted for this Draft EIS. Goals, objectives, and management prescriptions for the Carrow-Stevens Ranches ACEC and Three Rivers Riparian ACEC (BLM 1995) were reviewed for potential conflicts with the Proposed Action. In addition, for the Carrow-Stevens Ranches ACEC, maps of the proposed and alternative pipeline corridors and descriptions of the pipeline construction and maintenance activities were compared with previously prepared maps of the Carrow and Stephens ranches. Cultural resource specialists also visited that site.

3.10.2.4 Actions Incorporated into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse environmental impacts on ACECs:

- Disturbed areas would be revegetated in accordance with the Reclamation Operation Maintenance Plan for BLM-Managed Lands (refer to Section 2.2.8.9 and Appendix B) to minimize impacts on and promote revegetation of native plants. The plan includes salvage and transplanting of selected species. Quarterly visual inspections and annual leak detection inspections of the pipeline would be conducted on foot and no roadway would be maintained along the pipeline through the ACEC.

- A detailed evaluation of any effects to the Carrow-Stephens Ranches ACEC from construction of a natural gas pipeline or installation of an OPGW would be conducted in accordance with the terms of the Programmatic Agreement developed for the Project in compliance with Section 106 of the National Historic Preservation Act. This agreement defines a consultation process for avoiding or mitigating any identified adverse effects on significant cultural resources (refer to Section 2.2.8.11,).

- The Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flow in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project.

3.10.2.5 Impact Assessment

Proposed Action

<u>Carrow-Stephens Ranches ACEC</u>

The Kingman Area Resource Management Plan defined 5 objectives and 13 management prescriptions for the Carrow-Stephens Ranches ACEC. One objective and two management prescriptions are relevant for the impact analysis. Objective 1 stipulates that surface disturbance be minimized. Prescription 8 stipulates that within the US 93 corridor, new rights-of-way are to be confined to the area west of the highway. The Resource Management Plan subsequently was amended to eliminate this prescription and BLM now considers any proposed new rights-of-way on a case-by-case basis. Prescription 10 stipulates that native plants not be removed from the ACEC.

The Proposed Action would involve the installation of a 16- to 20-inch-diameter pipeline within corridor segment T4, which includes the western portions of the Carrow-Stephens Ranches ACEC. Typically, corridor segment T4 extends 1,000 feet to the east and west of the existing rights-of-way for the transmission lines. However, the corridor is expanded to 4,000 feet west in the vicinity of the Carrow-Stephens

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Ranches ACEC to accommodate design of a specific alignment that would avoid any encroachment into this ACEC (Figure 3.10-3).

Cultural resource surveys of the portion of corridor segment T4 that overlaps with the ACEC are limited to the right-of-way and access road for the Mead-Phoenix Project 500-kV transmission line and the western edge of the proposed realignment corridor for US 93. No archaeological or historical sites have been found by these surveys. This suggests a low probability for archaeological and historical sites in the remainder of the ACEC, but much of corridor segment T4 within the ACEC remains unsurveyed. Location of the pipeline in this western portion of the ACEC would be consistent with the BLM objective of minimizing impacts on the historic ranches in the ACEC, but construction would involve removal of native plants, which would not be consistent with BLM Prescription 10 and therefore would be a significant impact. An alignment within the corridor that completely avoids the ACEC would have no impacts on the ACEC.

Three Rivers Riparian ACEC

The Kingman Area Resource Management Plan defined 8 objectives and 21 management prescriptions for the Three Rivers ACEC. One objective and one management prescription are relevant to the assessment of impacts of the Proposed Action. Objective 3 is to obtain minimum instream flow to support aquatic and riparian habitat values. Prescription 19 states that the riparian area condition evaluation inventory and monitoring must be continued.

The Proposed Action would not directly disturb any area within the boundaries of the Three Rivers Riparian ACEC.

The Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flow in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project. Therefore, no impact on the instream flows, aquatic resources, or riparian conditions of the ACEC are anticipated.

The analysis of spills and stormwater and wastewater discharges concluded that the proposed use of best management practices would avoid significant impacts on the quality of surface water and groundwater (refer to Sections 3.4.2.5 and 3.5.2.5). Therefore the Proposed Action would have no significant impacts on the quality of surface water and groundwater within the Three Rivers Riparian ACEC.

Alternative R Gas Pipeline Corridor

Carrow-Stephens Ranches ACEC

The impacts of this alternative on the Carrow-Stephens Ranches ACEC would not differ from the Proposed Action except that the Alternative R gas pipeline route would use corridor segment R4 through the ACEC. Corridor segment R4 is widened through the ACEC to include the 200-foot-wide US 93 right-of-way, as well as the typical corridor width extending 400 feet to the east of the highway right-of-way. This corridor modification is intended to accommodate installation of the pipeline in the US 93 right-of-way to avoid impacts to other parts of the ACEC. ADOT plans to eventually relocate this segment of US 93 up to 1,200 feet to the west to move the highway farther from the historic ranches, and therefore is amenable to this strategy. The corridor also is widened to 1500 feet east of the US 93 right-of-way south of Gunsight Canyon. This modification is intended to accommodate the proposed realignment of US 93 east of the current roadway in the southeastern part of the ACEC.

Almost all of the portion of corridor segment R4 corridor that overlaps the ACEC has been inventoried for cultural resources. Other than the Carrow and Stephens Ranches, the only other

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recorded resource is a segment of the Hillside to Kingman Highway, which was built in 1924. This road has been evaluated as eligible for the National Register of Historic Places for it potential to yield important information. This historic road is on the west side of US 93 through the ACEC. Installation of the pipeline on the west side of US 93 is likely to damage segments of this road.

The historical ranch buildings and other features that are the focus of BLM's public interpretation planning are all located east of US 93 (refer to Figure 3.10-2). Construction of the pipeline east of the right-of-way through the clusters of buildings and other features at the Carrow Ranch and Stephens Ranch would be counter to BLM objectives for the ACEC and therefore a significant impact.

The existing US 93 roadway is centered within the right-of-way, and installation of the pipeline within the right-of-way would temporarily disturb most of the area between the shoulder of the highway and the edge of the right-of-way. There are segments of an unlined irrigation ditch within the US 93 right-of-way. This ditch was cleaned, repaired, and used to irrigate fields of the Carrow-Stephens Ranches into the 1970s (Stephens, personal communication, 2001), but the alignment may date from the 1880s. Installation of the pipeline within the right-of-way is likely to damage as much as 200 to 300 feet of the ditch. A culvert beneath the highway crosses the ditch at this location. Although highway construction has compromised the historical integrity of the ditch, additional disturbance is likely to be considered an adverse effect as defined by regulations implementing the National Historic Preservation Act.

The family cemetery at the Carrow Ranch is the most sensitive resource subject to potential direct construction impacts. The cemetery is on a ridge that extends into the right-of-way. The three recognizable graves in the cemetery are just east of the right-of-way fence. Any direct construction impacts on the graves in the cemetery would be a significant impact.

The construction and maintenance of US 93 has not disturbed the entire right-of-way, so installation of the pipeline would alter terrain and vegetation that has remained intact along the margins of the highway right-of-way. After the pipeline is installed, the disturbed areas would be graded to blend with adjacent topography.

There would be no aboveground pipeline facilities within the ACEC to introduce visual intrusions, but the terrain and vegetation disturbed by construction would leave an unnatural scar that would take several years to recover to a more natural condition. Requirements to inspect and maintain the pipeline in a safe condition do not allow large vegetation to grow above the pipeline. Therefore, the disturbed and unnatural vegetation pattern above the pipeline is likely to be a long-term effect noticeable from the historic Carrow Ranch complex. This alteration of vegetation would be relatively minor compared to the disturbances introduced by US 93 but removal of native vegetation is counter to Prescription 10 and therefore a significant impact. The pipeline also may hinder the restoration of the current US 93 alignment to more natural contours if it is abandoned.

Three Rivers Riparian ACEC

As with the Proposed Action, the Alternative R gas pipeline corridor would not directly disturb any area within the boundaries of the Three Rivers Riparian ACEC, and would have no significant impacts on the quality or quantity of surface water and groundwater within this ACEC.

Alternative T Gas Pipeline Corridor

Carrow-Stephens Ranches ACEC

The Alternative T gas pipeline corridor would use the same corridor segment T4 as the Proposed Action. As discussed above, construction of the pipeline within the portion of the corridor that overlaps the ACEC would involve removal of native plants, which is not

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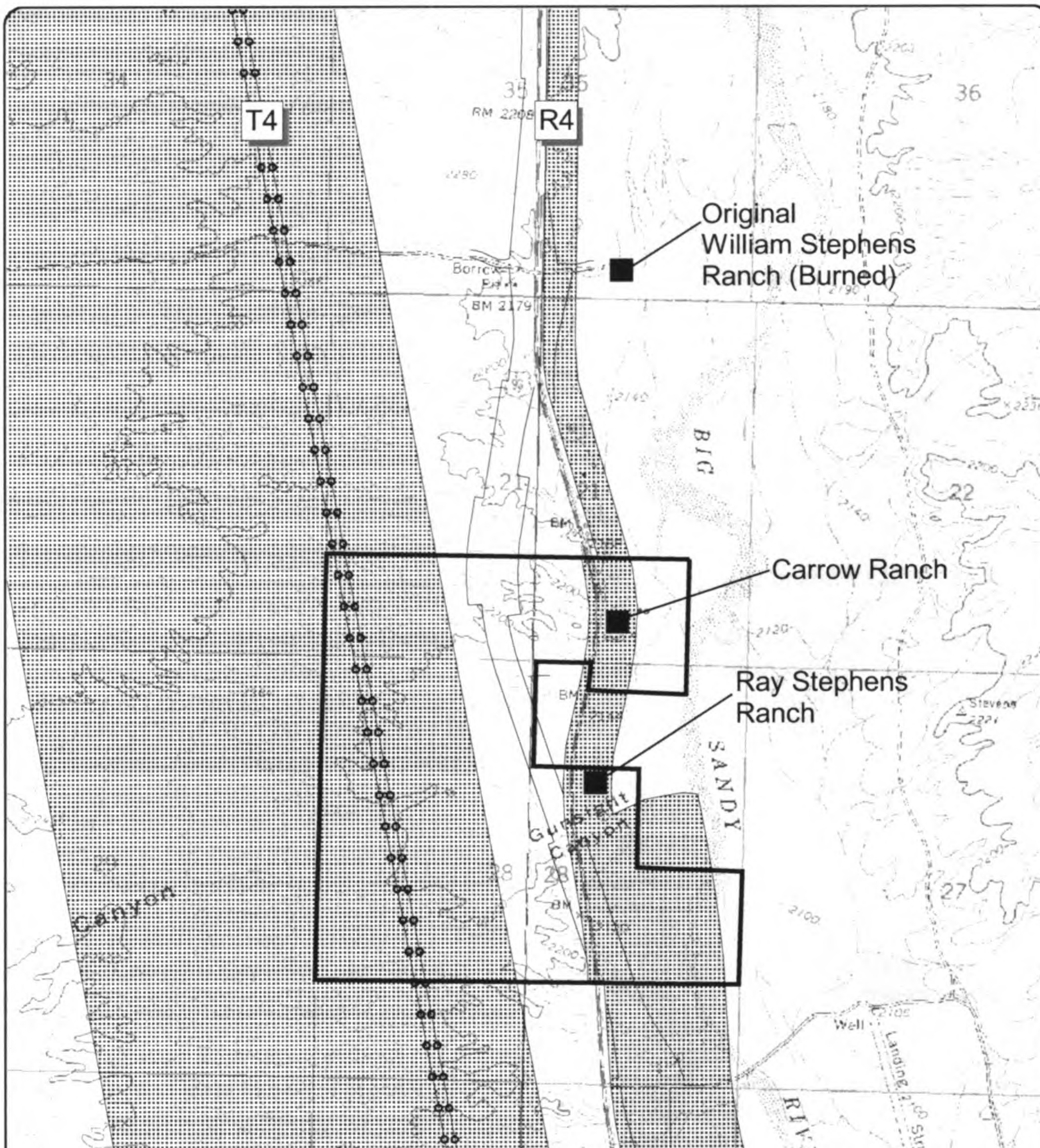

Relation of Natural Gas Pipeline Corridors to Carrow-Stephens Ranches ACEC

Big Sandy Energy Project EIS

Figure 3.10-3

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consistent with BLM Prescription 10 and therefore would be a significant impact. This wide corridor segment is intended to accommodate an alignment that would completely avoid the Carrow-Stephens Ranches ACEC and have no impacts on the ACEC.

Three Rivers Riparian ACEC

As with the Proposed Action, the Alternative T gas pipeline corridor would not directly disturb any area within the boundaries of the Three Rivers Riparian ACEC, and would have no significant impacts on the quality or quantity of surface water and groundwater within this ACEC.

Communication Facilities

Carrow-Stephens Ranches ACEC

One option for the alternative substation dual/redundant communications system would involve installation of an OPGW as a replacement of one of the static wires on the existing Mead-Liberty 345-kV transmission line. This line passes through the Carrow-Stephens Ranches ACEC about 0.5 mile or more to the west of the historic ranches. Installation of the fiber optic line is not expected to require any new roads, but heavy trucks require pads about every three miles to pull and tension the OPGW. These pads involve disturbance of only a fraction of an acre. No more than one pad, at most, would be within the ACEC and it would be sited to avoid vegetation.

The right-of-way for the Mead-Liberty line has not been surveyed for cultural resources, but intensive survey for the adjacent Mead-Phoenix Project 500-kV transmission line and access roads identified no archaeological or historical sites within the boundaries of the Carrow-Stephens Ranches ACEC. These survey results indicate that significant archaeological or historical sites are unlikely to be present in areas that would be affected by the OPGW installation. Therefore, installation of the OPGW is unlikely to significantly impact the ACEC, but additional intensive survey would be required to confirm that conclusion.

Three Rivers Riparian ACEC

The use of either of the options for the alternative dual/redundant communications systems for the substation would have no effect on the Three Rivers Riparian ACEC.

No-Action Alternative

The Big Sandy Energy Project would not be developed under the No-Action Alternative. Therefore, the natural gas pipeline and the OPGW would not be built and would have no effect on the Carrow-Stephens Ranches ACEC. No impacts on the Three Rivers Riparian ACEC would be expected.

3.10.2.6 Mitigation and Residual Impacts

If adopted, one of the following measures would be implemented to avoid or reduce significant impacts if the Proposed Action or corridor segment T4 is selected for construction:

- To avoid any effects on the Carrow-Stephens Ranches ACEC, the gas pipeline route in corridor segment T4 would not be constructed within the boundaries of this ACEC.

With the implementation of this measure, there would be no residual significant impacts.

- To minimize terrain disturbance within the Carrow-Stephens Ranches ACEC, the design of the specific alignment would be developed and implemented in close coordination with BLM and ADOT.

Even with implementation of this measure, significant impacts would remain.

If adopted, the following measures would be implemented to avoid or reduce significant impacts if alternative pipeline corridor segment R4 is selected for construction:

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- The pipeline would be installed so that it would not hinder restoration of US 93 through this ACEC to a more natural topography.

- To minimize impacts on the Carrow-Stephens wildlife movement corridor, additional reclamation efforts, such as replanting removed trees and succulents and revegetating with native seeds, woud be undertaken.

- The pipeline would be designed to avoid impacts on the family cemetery immediately adjacent to US 93.

- Disturbance of the historic irrigation ditch within the US 93 right-of-way would be minimized and any construction damage would be repaired.

- Even with the implementation of these measures, significant impacts would remain if corridor segment R4 is selected.

3.11 VEGETATION

This section describes the affected environment and environmental consequences related to vegetation. Special status species are discussed in Section 3.14. Vegetation within wetlands and riparian areas are described in Section 3.12.

3.11.1 Affected Environment

The following sections describe the current vegetative communities; this provides a baseline for the assessment of impacts and environmental consequences.

3.11.1.1 Region of Influence

The region of influence for the analysis of impacts to vegetation consists of an area 0.5 mile around the proposed power plant site and associated facilities, within the proposed and alternative gas pipeline corridors, and along the route of the OPGW installation.

3.11.1.2 Existing Conditions

The vegetation within the region of influence consists of elements that are characteristic of the Arizona Upland Subdivision of the Sonoran Desert, Mohave desertscrub, Semidesert Grassland, and Great Basin conifer woodland. Most of the region of influence has also been mapped as semi-desert grassland (Brown and Lowe 1980). The vegetative communities appear highly ecotonal; that is, they exhibit characteristics of the four major non-riparian biotic communities listed above. Semi-desert grassland areas dominate, but contain many plant species that are characteristic of Mohave and Sonoran desertscrub. Similarly, areas where Sonoran desertscrub elements dominate (e.g. near Wikieup), there are species present that are characteristic of Mohave desertscrub (e.g., Joshua tree). To the northwest, near Interstate 40, where Great Basin Conifer woodlands dominated by juniper occur, there are also elements of Mohave desertscrub, Sonoran desertscrub, and semi-desert grassland interspersed with the woodland elements. The limits of a particular vegetation community are determined to some extent by climate (e.g., minimum seasonal temperatures, minimum seasonal precipitation). Local factors such as elevation, soil type, slope exposure, cold air drainages, and soil porosity interact with climate to dictate local and regional distribution of vegetation.

Overall, the vegetation within the region of influence is a complex mix of species that represent several biotic communities of northwestern Arizona. None of the plant communities present are purely Mohavean or Sonoran in composition. However, no plant communities in the region of influence are predominantly Mohavean, and for the purposes of this Draft EIS desertscrub communities will be referred to as Sonoran, following Brown and Lowe (1980).

Vegetation along the perennial reaches of the Big Sandy River is characteristic of the Sonoran

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Riparian Deciduous Forest Woodland as described by Minckley and Brown (1994).

Sonoran desertscrub, semi-desert grassland, Great Basin conifer woodland, and xeroriparian vegetation are described in more detail below. Lists of plant species identified in the region of influence are presented in Table 3.11-1. Approximate areas of these vegetative communities are shown on Figure 3.11-1.

Sonoran Desertscrub – Arizona Upland Subdivision

The Arizona Upland Subdivision of Sonoran Desertscrub forms a curving border at the northeastern edge of the Sonoran Desert. Most of this subdivision is on slopes, broken ground, and multi-dissected sloping plains. The subdivision generally is characterized as a scrubland or low woodland of leguminous trees. Several open layers of shrubs and perennial succulents fill in intervening spaces (Turner and Brown 1982). Trees found in the region of influence that are characteristic of this subdivision include blue paloverde, foothill paloverde, honey mesquite, and cat-claw acacia. In some portions of the region of influence foothill paloverde is accompanied by or replaced by crucifixion thorn.

Cacti are an important component of this subdivision. Species present in the region of influence include saguaro, hedgehog cactus, beavertail cactus, and Christmas cholla.

Semi-Desert Grassland

In general, semi-desert grassland is present surrounding the Chihuahuan desert, and in some areas in west-central Arizona. It is a perennial grass-scrub dominated landscape. Semi-desert grassland in the region of influence is bounded at lower elevations by Sonoran Desertscrub and at higher elevations by Great Basin conifer woodland. Although semi-desert grassland is positioned geographically between distinct vegetation communities and shares floral and faunal constituents of these communities, it is a distinctive and separate biome (Brown 1982a). Grass species present in the region of influence that are characteristic of semi-desert grassland include bush muhly, three-awn, and black grama. Shrub species present include creosote bush, mesquite, crucifixion thorn, and snakeweed. Buckwheats, mallow, whipple cholla, and banana yucca also are common in the region of influence.

Great Basin Conifer Woodland

These woodlands are structurally simple and tend to be present in rocky habitats with thin soil. They are characterized by unequal dominance of Utah juniper and singleleaf piñon. Juniper is generally more prevalent than singleleaf piñon. Great Basin conifer woodland is generally open-spaced (as is the case in the region of influence), except at higher elevations and in less xeric sites (Brown 1982b). Species present in the region of influence that are typical of this community include buckwheats, globe mallow, beavertail cactus, and crucifixion thorn. Common shrubs include barberry, and banana yucca. Turbinella oak is sparsely scattered in this vegetation community.

Xeroriparian Vegetation

Xeroriparian vegetation includes plants that may be limited to, or are noticeably more abundant in, ephemeral washes. This community is present because of higher water availability at drainages, although drainages often provide only seasonal water flow. Xeroriparian communities are dominated by trees that are also present in the adjacent uplands in smaller, shrub-like forms. Vegetation present in these communities is often denser and larger than vegetation found in surrounding areas. Some species present in xeroriparian habitats are not found in surrounding communities. An example of one of these species is the desert willow. Xeroriparian

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TABLE 3.11-1 PLANT SPECIES WITHIN THE REGION OF INFLUENCE	
Common Name	**Scientific Name**
Sonoran Desertscrub	
Arabian grass	*Schismus arabicus*
Aster	*Aster subulatus*
Barrel cactus	*Ferocactus* sp.
Beavertail cactus	*Opuntia basilaris*
Blue paloverde	*Parkinsonia florida*
Brassica	*Brassica* sp.
Burro-brush	*Hymenoclea monogyra*
Catclaw acacia	*Acacia greggii*
Cheeseweed	*Hymenoclea salsola*
Chia	*Salvia columbariae*
Christmas cholla	*Opuntia leptocaulis*
Creosote bush	*Larrea tridentata*
Crucifixion thorn	*Canotia holacantha*
Desert broom	*Baccharis sarothroides*
Desert chicory	*Rafinesquia neomexicana*
Desert marigold	*Baileya multiradiata*
Desert trumpet	*Eriogonum inflatum*
Dock	*Rumex* sp.
Fairyduster	*Calliandra eriophylla*
Fiddleneck	*Amsinckia intermedia*
Filaree	*Erodium cicutarium*
Five-stamen tamarisk	*Tamarix chinensis*
Four-wing salt bush	*Atriplex canescens*
Globemallow	*Sphaeralcea ambigua*
Goldenhead	*Acamptopappus sphaerocephalus*
Grey thorn	*Ziziphus obtusifolia*
Hedgehog cactus	*Echinocereus engelmanii*
Honey Mesquite	*Prosopis glandulosa*
Jimmyweed	*Isocoma pleurifolia*
Joshua-tree	*Yucca brevifolia*
Lehman's lovegrass	*Eragrostis lehmanniana*
Little leaf paloverde	*Parkinsonia microphylla*
Lupine	*Lupinus* spp.
Machaeranthera	*Machaeranthera pinnatifida*
Mexican poppy	*Eschscholtzia mexicana*
Mohave aster	*Xylorhiza tortifolia*
Mormon tea	*Ephedra trifurca*
Narrowleaf golden weed	*Haplopappus linearifolius*
Ocotillo	*Fouquieria splendens*
Owl clover	*Orthocarpus purpurescens*
Paper Daisy	*Psilostrophe cooperi*
Parry dalea	*Marina parryi*
Phacelia	*Phacelia* sp.
Pincushion	*Cheanactis macrantha*
Popcorn flower	*Cryptantha* sp.

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TABLE 3.11-1 PLANT SPECIES WITHIN THE REGION OF INFLUENCE	
Common Name	**Scientific Name**
Purple mat	*Nama demissum*
Rayless goldenrod	*Isocoma wrightii*
Rock gilia	*Gilia scopulorum*
Sacred datura	*Datura meteloides*
Saguaro	*Carnegiea gigantea*
Skeleton weed	*Eriogonum deflexum*
Teddy–bear cholla	*Opuntia bigelovii*
Tobacco	*Nicotiana obtusifolia*
Tumbleweed	*Salsola iberica*
Turpentine bush	*Ericameria linearifolia*
Wallace eriophyllum	*Eriophyllum wallacei*
White brittlebush	*Encelia farinosa*
White bursage	*Ambrosia dumosa*
White rhatany	*Krameria grayi*
White-thorn acacia	*Acacia constricta*
Wire lettuce	*Stephanomeria* sp.
Wolfberry	*Lycium* sp.
Wooly daisy	*Eriophyllum lanosum*
Wooly plantain	*Plantago insularis*
Semi-Desert Grassland	
Arizona necklace	*Sophora arizonica*
Banana yucca	*Yucca baccata*
Beavertail cactus	*Opuntia basilaris*
Big galleta	*Pleuraphis rigida*
Big root	*Marah gilensis*
Bladder sage	*Salazaria mexicana*
Black grama	*Bouteloua eriopoda*
Blue paloverde	*Parkinsoniua florida*
Brassica	*Brassica* sp.
Brownfoot	*Acourtia wrightii*
Burrobrush	*Hymenoclea monogyra*
Bush muhly	*Muhlenbergia porteri*
Canaigre	*Rumex hymenosepalus*
Catclaw	*Acacia greggii*
Cheeseweed	*Hymenoclea salsola*
Chia	*Salvia columbariae*
Cholla cactus	*Opuntia* spp
Christmas cholla	*Opuntia leptocaulis*
Creosote bush	*Larrea tridentata*
Crucifixion thorn	*Canotia holacantha*
Desert marigold	*Baileya multiradiata*
Desert trumpet	*Eriogonum inflatum*
Fiddleneck	*Amsinckia intermedia*
Filaree	*Erodium cicutarium*
Fluffgrass	*Erioneuron pulchellum*
Fremont barberry	*Berberis fremontii*
Globemallow	*Sphaeralcea ambigua*
Goldenhead	*Acamptopappus sphaerocephalus*

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TABLE 3.11-1 PLANT SPECIES WITHIN THE REGION OF INFLUENCE	
Common Name	**Scientific Name**
Groundsel	*Senecio multiflora*
Guara	*Gaura* sp.
Hairy grama	*Bouteloua hirsuta*
Hill locust	*Lotus humistratus*
Indian ricegrass	*Oryzopsis hymenoides*
Joshua-tree	*Yucca brevifolia*
Lehman's lovegrass	*Eragrostis lehmanniana*
Locoweed	*Astragalus* sp.
Lupine	*Lupinus* spp.
Mexican poppy	*Eschscholtzia mexicana*
Narrowleaf golden weed	*Haplopappus linearifolius*
Needle grass	*Stipa* sp.
Oneseed juniper	*Juniperus monosperma*
Paintbrush	*Castilleja* spp.
Paper flower	*Psilostrophe cooperi*
Phacelia	*Phacelia* sp.
Pincushion	*Cheanactis* sp.
Popcorn flower	*Cryptantha* spp.
Prickly-pear cactus	*Opuntia* sp.
Primrose	*Camissonia clauiformis*
Purple mat	*Nama demissum*
Rayless encelia	*Encelia frutescens*
Red brome	*Bromus madritensis*
Rock gilia	*Gilia scopulorum*
Sacred datura	*Datura meteloides*
Snakeweed	*Gutierrezia sarothrae*
Tansy mustard	*Descuraniana* sp.
Telegraph plant	*Heterotheca camphorata*
Three-awn grass	*Aristida* sp.
Tumbleweed	*Salsola iberica*
Turbinella oak	*Quercus turbinella*
Turpentine bush	*Ericameria linearifolia*
Twist flower	*Streptanthus cordatus*
Wallace eriophyllum	*Eriophyllum wallacei*
Whipple cholla	*Opuntia* whipplei
White brittlebush	*Encelia farinosa*
White bursage	*Ambrosia dumosa*
White ratany	*Krameria grayi*
Wild buckwheat	*Eriogonum fasciculatum*
Wolfberry	*Lycium* sp.
Wooly plantain	*Plantago insularis*
Yucca	*Yucca* sp.
Great Basin Conifer Woodland	
Algerita	*Berberis haematocarpa*
Arizona necklace	*Sophora arizonica*
Banana yucca	Yucca baccata
Beavertail cactus	*Opuntia basilaris*
Bladder sage	*Salazaria mexicana*

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TABLE 3.11-1 PLANT SPECIES WITHIN THE REGION OF INFLUENCE	
Common Name	**Scientific Name**
Brownfoot	*Acourtia wrightii*
Bush muhly	*Muhlenbergia porteri*
California buckwheat	*Eriogonum* sp.
Chia	*Salvia columbariae*
Cholla cactus	*Opuntia* spp.
Clematis	*Clematis* sp.
Colorado four-o-clock	*Mirabilis multiflora*
Combur	*Pectocaryia* sp.
Crucifixion thorn	*Canotia holacantha*
Desert ceanothus	*Ceanothus greggii*
Desert globemallow	*Sphaeralcea ambigua*
Desert needlegrass	*Stipa speciosa*
Desert trumpet	*Eriogonum inflatum*
Fiddleneck	*Amsinckia intermedia*
Filaree	*Erodium cicutarium*
Fluffgrass	*Erioneuron pulchellum*
Fremont barberry	*Berberis fremontii*
Fremont phacelia	*Phacelia fremontii*
Goldenhead	*Acamptopappus sphaerocephalus*
Goosefoot	*Chenopodium berlandieri*
Graythorn	*Ziziphus obtusifolia*
Hairy grama	*Bouteloua hirsuta*
Large yellow desert primrose	*Oenethera primaveris*
Locoweed	*Astragalus* sp.
Lotus	*Lotus* sp.
Mexican poppy	*Eschscholtzia mexicana*
Mountain mahogany	*Cercocarpus montanus*
Narrowleaf golden weed	*Haplopappus linearifolius*
Oneseed juniper	*Juniperus monosperma*
Paintbrush	*Castilleja* spp.
Phacelia	*Phacelia* sp.
Popcorn flower	*Cryptantha* sp.
Primrose	*Camissonia clauiformis*
Red brome	*Bromus madritensis*
Salsify	*Tragopogon porrifolius*
Silver puffs	*Uropappus lindleyi*
Singleleaf pinyon	*Pinus monophylla*
Small-headed snakeweed	*Gutierrezia sarothrae*
Three-awn grass	*Aristida* sp.
Turbinella oak	*Quercus turbinella*
Turpentine bush	*Ericameria linearifolia*
Utah juniper	*Juniperus osteosperma*
Vervain	*Verbena* sp.
Wallace eriophyllum	*Eriophyllum wallaceii*
White ratany	*Krameria grayi*
Wild buckwheat	*Eriogonum fasciculatum*
Winterfat	*Ceratoides lanata*
Wooly plantain	*Plantago insularis*

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TABLE 3.11-1 PLANT SPECIES WITHIN THE REGION OF INFLUENCE	
Common Name	**Scientific Name**
Wooly-fruited bursage	*Ambrosia eriocentra*
Xeroriparian Areas	
Arabian grass	*Schismus arabicus*
Blazing star	*Mentzelia jonesii*
Brassica	*Brassica* sp.
Burro brush	*Hymenoclea monogyra*
Catclaw acacia	*Acacia greggii*
Cheeseweed	*Hymenoclea salsola*
Chia	*Salvia columbariae*
Cream cups	*Platystemon californicus*
Crucifixion thorn	*Canotia holacantha*
Desert broom	*Baccharis sarothroides*
Desert dandelion	*Malacothrix glabrata*
Desert willow	*Chilopsis linearis*
Dock	*Rumex* sp.
Fiddleneck	*Amsinckia intermedia*
Filaree	*Erodium cicutarium*
Fluffgrass	*Erioneuron pulchellum*
Fremont barberry	*Berberis fremontii*
Gilia	*Gilia hutchinsifolia*
Lotus	*Lotus* sp.
Lupine	*Lupinus* spp.
Mexican poppy	*Eschscholtzia mexicana*
Owl clover	*Orthocarpus purpurascens*
Phacelia	*Phacelia* spp.
Popcorn flower	*Cryptantha* spp.
Primrose	*Camissonia clauiformis*
Purple mat	*Nama demissum*
Rabbitbrush	*Chrysothamnus nauseosis*
Red brome	*Bromus madritensis*
Rock gilia	*Gilia scopulorum*
Sacred datura	*Datura meteloides*
Seep willow	*Baccharis glutinosa*
Spreading fleabane	*Erigeron divergens*
Tansy mustard	*Descuraniana* sp.
Thistle	*Cirsium* sp.
Tidy-tips	*Layia glandulosa*
Tobacco	*Nicotiana obtusifolia*
Turbinella Oak	*Quercus turbinella*
Turpentine bush	*Ericameria linearifolia*
Wallace eriophyllum	*Eriophyllum walacei*
Western honey mesquite	*Prosopis glandulosa*
Wolfberry	*Lycium* sp.
Wooly-fruited bursage	*Ambrosia eriocentra*

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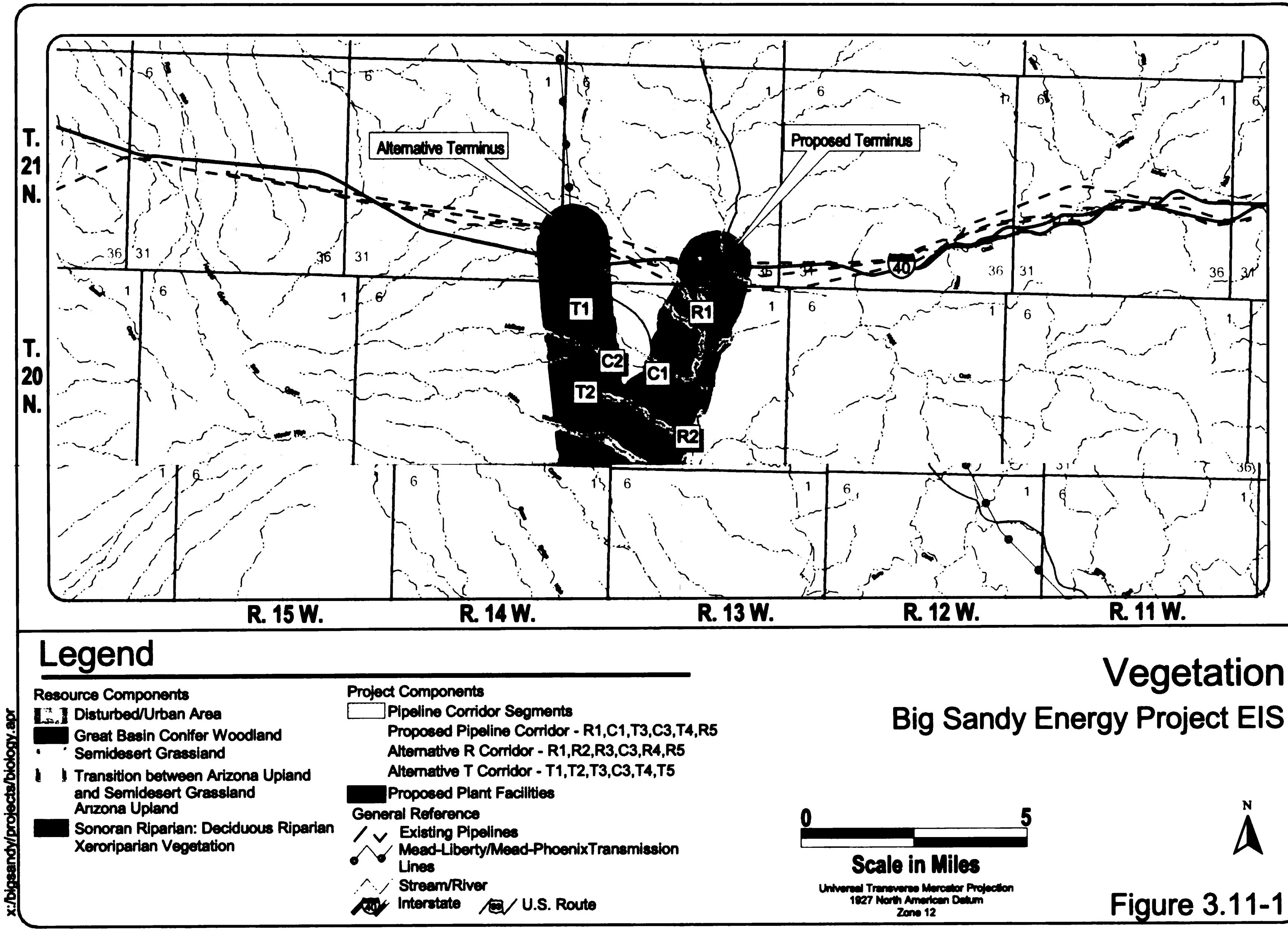

Vegetation

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Figure 3.11-1

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communities provide habitat for wildlife, corridors for wildlife movement, and greater water availability than in surrounding areas.

Species Protected Under Arizona Native Plant Law

Several native plant species present in the region of influence are not special status species as defined and discussed in Section 3.14, but are protected under the Arizona Native Plant Law. Saguaros, banana yuccas, joshua trees, and ocotillo are listed by the Arizona Department of Agriculture (ADA) as *salvage-restricted.* Plants in this category have a high potential for damage by theft or vandalism. Blue paloverdes, foothill paloverdes, honey mesquites, and banana yucca are listed as *harvest-restricted.* These species are subject to excessive harvesting or overcutting because of the intrinsic value of their by-products, fiber, or woody parts. Crested saguaros, which are listed as *highly safeguarded,* may be found anywhere saguaros are present. Species in the highly safeguarded category include plants whose prospects for survival in this state are in jeopardy, plants that are in danger of extinction throughout all or a significant portion of their ranges, or plants that are likely to become jeopardized or in danger of extinction (ADA 1999).

Under the Arizona Native Plant Law, protected species may not be legally possessed, taken or transported from the growing site without a permit from ADA. If protected native plants will be cleared, the land owner or owner's agent must provide written notification to the ADA. In addition, Federal and state agencies have their own mitigation requirements for ADA-protected plant species.

3.11.2 Environmental Consequences

3.11.2.1 Identification of issues

The following issues were identified as the basis for the assessment of impacts:

- Removal of plant species protected under the Arizona Native Plant Law
- Reduction of habitat for listed and special status species
- Removal of xeroriparian vegetation

3.11.2.2 Significance Criteria

Xeroriparian vegetation is relatively uncommon within Arizona vegetation communities. Therefore, impacts on vegetation by the Proposed Action and alternatives would be considered significant if unmitigated loss of xeroriparian vegetation would occur.

3.11.2.3 Impact Assessment Methods

Current conditions were evaluated using existing resources, such as a vegetation map and report prepared by Greystone (2000) and several reconnaissance surveys. Impacts to individual vegetation communities were evaluated by comparing acreages that would be disturbed with the total amount of those communities present within the state. Because xeroriparian habitats are relatively rare within native vegetation communities, impacts to xeroriparian communities were evaluated by determining if any removal of xeroriparian vegetation would occur.

3.11.2.4 Actions Incorporated into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse impacts to vegetation:

- Reclamation plans have been developed for private, state, and BLM-managed lands and would be implemented on the selected pipeline route. Revegetation of native plants in areas of temporary disturbance would be completed in accordance with the Reclamation Operation Maintenance Plan for BLM-Managed Public Lands and

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Reclamation Plan for State and Private Lands (Appendix B). Two-tracks constructed for access to the pipeline would be reseeded. All other areas of temporary disturbance in the proposed power plant site vicinity or along the pipeline route would be subject to salvage of native plant species and reseeded.

- The Reclamation Plan for BLM-Managed Public Lands stipulates that if reseeding on BLM-managed land is determined to be unsuccessful, a second attempt would be made.

- Native vegetation protected by the Arizona Native Plant Law is present throughout the region of influence. All areas of potential disturbance, including the proposed power plant site, substation, evaporation ponds, access road, and pipeline route, would be subject to pre-construction surveys to identify species listed under the Arizona Native Plant Law. Surveys for these species would be conducted according to the procedures detailed in Section 2.2.8.10. Protected plant species from all disturbed areas would be salvaged and transplanted, although the Arizona Native Plant Law does not require the salvage of protected plants from private land. Plants salvaged from state and private lands would be transplanted to ADOT project sites. Protected plants on BLM-managed public lands would be salvaged, stored in nursery areas, and transplanted in the pipeline corridor, as specified in Section 2.2.8.9 Reclamation and salvage procedures for protected plants on private and BLM-managed public lands are described in the Reclamation Operation Maintenance Plan for BLM-Managed Public Lands and Reclamation Plan for State and Private Lands, respectively (Appendix B).

- As noted in Section 2.2.8.9, measures to reduce the impacts of clearing of native vegetation include revegetation of temporarily disturbed areas. The overall intent of these reclamation activities is to reestablish a vegetative cover that is similar to pre-construction conditions and consistent with adjacent vegetation communities. Revegetation procedures are described in the Reclamation Operation Maintenance Plan for BLM-Managed Public Lands and Reclamation Plan for State and Private Lands (Appendix B).

- The reclamation plans propose revegetation of impacted ephemeral stream channels with appropriate xeroriparian native plant species. Revegetation procedures would be as described in the Reclamation Operation Maintenance Plan for BLM-Managed Public Lands and Reclamation Plan for State and Private Lands.

3.11.2.5 Impact Assessment

Proposed Action

The proposed Project would physically disturb approximately 621 acres. Plant communities present within the region of influence are characteristic of Sonoran desertscrub, semi-desert grassland, and Great Basin conifer woodland. Impacts on these vegetation communities are summarized in Table 3.11-2.

<u>Proposed Power Plant, Substation, Access Road, and Associated Facilities</u>

Construction activities at the proposed power plant site, substation, and evaporation ponds would affect approximately 56 acres. The proposed plant access road construction would impact 21 acres, well pad sites and well pad access roads would impact 26 acres, and the proposed agricultural activities would impact 107 acres, for a total of 108 acres. Of these 108 acres, 34 acres would not be impacted by permanent facilities. These areas would be reclaimed through regrading and revegetation, as described in the Reclamation Plan for State and Private Lands, but this restoration process would require several years. The remaining 74 acres of non-sensitive vegetation would be permanently lost. All of this area is within the Arizona

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TABLE 3.11-2 IMPACTS ON VEGETATION COMMUNITIES			
Vegetation Community	Total Acres of Disturbance*	Acres of Permanent Disturbance*	Acres of Temporary Disturbance*
Power Plant and Associated Facilities (Substation, Evaporation Ponds, Access Road, etc.)			
Sonoran desertscrub	108	74	34
Semi-desert grassland	0	0	0
Great Basin conifer woodland	0	0	0
Proposed Gas Pipeline Corridor			
Sonoran desertscrub	252	30	222
Semi-desert grassland	145	17	128
Great Basin conifer woodland	9	1	8
Alternative R Gas Pipeline Corridor			
Sonoran desertscrub	251	30	221
Semi-desert grassland	142	17	125
Great Basin conifer woodland	0	0	0
Alternative T Gas Pipeline Corridor			
Sonoran desertscrub	251	27	224
Semi-desert grassland	104	11	93
Great Basin conifer woodland	63	7	56
Crossover Segment C2			
Sonoran desertscrub	0	0	0
Semi-desert grassland	12	0	12
Great Basin conifer woodland	0	0	0
OPGW Installation			
Sonoran desertscrub	2.5	0	2.5
Semi-desert grassland	2.5	0	2.5
Great Basin conifer woodland	0	0	0
Agricultural Activities			
Sonoran desertscrub	107	107	0
Semi-desert grassland	0	0	0
Great Basin conifer woodland	0	0	0

* Acreages are approximate and impacts were attributed to the most abundant vegetation type within each corridor segment. If two or more vegetation types are present, impacts were split proportionately between these vegetation types. Xeroriparian vegetation is present along ephemeral drainages in all three listed vegetation communities (refer to Section 3.12.2.1).

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Upland Subdivision of Sonoran desertscrub. Vegetation in these areas has been previously disturbed by livestock grazing.

The proposed power plant site, associated substation, evaporation ponds, and agricultural activities are located on land that encompasses several ephemeral drainages. Removal of this vegetation along these drainages would constitute a significant impact on xeroriparian vegetation. The exact area of impacted xeroriparian vegetation cannot be estimated because of variable widths of this vegetation and discontinuous distribution along the washes. Descriptions of, and impacts on, these drainages are described in Section 3.12.2.

The proposed access road to the plant site would impact the xeroriparian vegetation along Sycamore Creek and several small ephemeral channels. Unmitigated removal of this vegetation would represent a significant impact. Description of, and impacts on these drainages are described in Section 3.12.2.

Sonoran desertscrub is extensive in Arizona and removal of 108 acres would not negatively impact this community on a regional level. Measures developed to reduce impacts to native vegetation and incorporated into the Proposed Action would reduce the loss of ADA-protected plants and may promote the revegetation of areas of temporary disturbance.

<u>Communication Facilities</u>

The OPGW option for the Proposed Action would pass through areas of Sonoran desertscrub, semi-desert grassland, and Great Basin conifer woodland. Because this line would be installed on existing structures, the OPGW would have no permanent impact on vegetation communities in this vicinity. However, up to 5 acres would be temporarily disturbed for construction activities. The area disturbed would be reclaimed in accordance with either the Reclamation Operation Maintenance Plan for BLM-Managed Public Lands or the Reclamation Plan for State and Private Lands (refer to Appendix B).

The microwave dishes would be installed on existing towers and would have no impact on vegetation.

Proposed Gas Pipeline Corridor Plant communities present along the proposed natural gas pipeline corridor include Great Basin conifer woodland, semi-desert grassland, and Sonoran desertscrub. Construction of the pipeline within this corridor would impact approximately 406 acres, as detailed below. Up to 48 acres would be permanently disturbed to provide a 10-foot wide two-track (refer to Section 2.2.5).

Native vegetation along corridor segment R1 is mostly semi-desert grassland. A few small areas of Great Basin conifer woodland are present at the northern end and western edge of this corridor segment. Ongoing cattle grazing has impacted vegetation along this corridor segment. Because the alignment through this corridor segment is within Hackberry Road, the disturbance to vegetation is estimated to be approximately 24 acres, assuming that the 90-foot-wide disturbed area would be wider than the existing roadway. Native vegetation along corridor segment C1 is primarily semi-desert grassland. Great Basin conifer woodland is present near the intersection of corridor segments C1 and T3. On-going livestock grazing has impacted the vegetation in these communities. Construction activities along this corridor segment would disturb approximately 31 acres. Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance of approximately 3 acres.

Native vegetation along corridor segment T3 is mainly semi-desert grassland, with a few small patches of Great Basin conifer woodland and xeroriparian vegetation. This corridor segment has experienced impacts on vegetation as a result of on-going livestock grazing. Construction activities within corridor segment T3 would result in the disturbance of 94 acres.

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Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance to 10 acres.

Corridor segment C3 is in a transition zone between semi-desert grassland and Sonoran desertscrub. The vegetation in this corridor segment includes species that are characteristic of both of these communities. Construction activities along corridor segment C3 would disturb 20 acres. Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance to 2 acres.

Native vegetation along corridor segment T4 is characteristic of the Arizona Upland Subdivision of Sonoran desertscrub. As on other corridor segments, native vegetation has been impacted by on-going livestock grazing activities. Pipeline construction activities within this corridor segment would result in disturbance to 153 acres of native vegetation. Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance to 17 acres.

Vegetation along corridor segment R5 is also representative of the Arizona Upland Subdivision of Sonoran desertscrub. Construction of the pipeline in this corridor segment would result in the disturbance of 84 acres of vegetation. Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance to 11 acres.

Semi-desert grassland, Great Basin conifer woodland, and Sonoran desertscrub are extensive in Arizona and disturbance of 406 acres would not adversely impact these communities on a regional level. Measures developed and incorporated into the Proposed Action to reduce impacts on native vegetation would reduce the loss of ADA-protected plants and may promote the revegetation of areas of temporary disturbance. Reseeding would also promote the revegetation of xeroriparian communities impacted by the pipeline.

Continued disturbance, such as livestock and off-road vehicles, would severely limit the germination and long-term establishment of plants (Burgess and Graves 1983). Even when revegetation efforts are successful, complete rehabilitation of plant communities is very slow. A study of natural revegetation of pipeline routes in the Mohave desert predicted that plant biomass recovery to predisturbance conditions could take as long as 100 years (Lathrop and Archbold 1980). Although revegetation efforts may decrease recovery time, complete rehabilitation is not expected to occur quickly.

The proposed pipeline corridor crosses many small drainages, most of which support xeroriparian vegetation. This vegetation would be cleared within a 90-foot corridor around the gas pipeline. Permanent removal of any xeroriparian vegetation would constitute a significant impact. Descriptions of, and impacts on, these drainages are discussed in Section 3.12.2.

Alternative R Gas Pipeline Corridor

Plant communities present along the alternative natural gas pipeline corridor include semi-desert grassland, Great Basin conifer woodland, and Sonoran desertscrub. Construction of this route would impact approximately 393 acres, as detailed below. Approximately 47 acres would be permanently disturbed to provide a 10-foot-wide two-track. Corridor segments R1, C3, and R5 are described above under the proposed corridor.

Native vegetation along corridor segment R2 is characteristic of semi-desert grassland. On-going cattle grazing has impacted vegetation along this corridor segment. Construction activities along corridor segment R2 would disturb up to 9 acres. Because the alignment through this corridor segment is within Hackberry Road, the disturbance to vegetation is estimated to be approximately 5 acres. Native vegetation within corridor segment R3 is representative of semi-desert grassland. On-going livestock grazing has impacted the vegetation in this corridor segment.

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Construction activities within this corridor segment would impact 103 acres. Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance to 11 acres.

Native vegetation on corridor segment R4 is representative of the Arizona Upland Subdivision of Sonoran desertscrub. Pipeline construction activities within this corridor segment would impact 153 acres. Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance to 17 acres.

Semi-desert grassland, Great Basin conifer woodland and Sonoran desertscrub are extensive in Arizona and disturbance to 393 acres would not negatively impact these communities on a regional level. As stated for the proposed corridor, measures incorporated into the Proposed Action to reduce impacts to native vegetation would reduce the loss of ADA-protected plants and may promote the revegetation of areas of temporary disturbance. Reseeding would also promote the revegetation of xeroriparian communities impacted by the pipeline. Successful reseeding of native plants is more likely when further disturbance to impacted areas does not occur.

The alternative corridor crosses small drainages, many of which support xeroriparian vegetation. This vegetation would be cleared within a 90-foot corridor around the gas pipeline. Permanent removal of xeroriparian vegetation would constitute a significant impact. Descriptions of, and impacts on, these drainages are discussed in Section 3.12.2.

Alternative T Gas Pipeline Corridor

Plant communities present along the transmission line corridor include semi-desert grassland, Great Basin conifer woodland, and Sonoran desertscrub. Construction of this route would impact 418 acres, as detailed below. Approximately 45 acres would be permanently disturbed to provide a 10-foot wide two-track.

Corridor segments T3, C3, and T4 are described above under the proposed corridor.

Vegetation along corridor segment T1 is characteristic of Great Basin conifer woodland, interspersed with small patches of grasslands. Ongoing cattle grazing has impacted vegetation along this corridor segment. Construction of the natural gas pipeline in this corridor segment would impact 41 acres. Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance to 4 acres.

Native vegetation along corridor segment T2 included areas of Great Basin conifer woodland interspersed with areas of semi-desert grasslands. On-going cattle grazing has also impacted vegetation along this corridor segment. Construction of the pipeline in this corridor segment would impact 24 acres. Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance to 3 acres.

Native vegetation along corridor segment T5 is representative of the Arizona Upland Subdivision of Sonoran desertscrub. Pipeline construction activities within this corridor segment would impact 86 acres of vegetation. Construction and maintenance of a two-track in this corridor segment would result in permanent disturbance to 9 acres.

Semi-desert grassland, Great Basin conifer woodland and Sonoran desertscrub are extensive in Arizona and disturbance to 418 acres would not adversely impact these communities on a regional level. As stated for the proposed and Alternative R gas pipeline corridors, measures incorporated into the Proposed Action would reduce the loss of ADA-protected plants and may promote the revegetation of areas of temporary disturbance. Reseeding also would promote the revegetation of xeroriparian communities impacted by the pipeline. Successful reseeding of native plants is more likely when further disturbance to impacted areas does not occur.

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The alternative pipeline corridor crosses many small drainages, many of which support xeroriparian vegetation. This vegetation would be cleared within a 90-foot corridor around the gas pipeline. Permanent removal of any xeroriparian vegetation would constitute a significant impact. Descriptions of, and impacts on, these drainages are discussed in Section 3.12.2.

Crossover Segment C2

Native vegetation within crossover segment C2 is dominated by semi-desert grassland with a small area of Great Basin conifer woodland at the northwest end of the corridor segment. Pipeline construction activities in this corridor segment would impact 25 acres. Because the alignment through this corridor segment is within the old route for US 93, the disturbance to vegetation is estimated to be approximately 12 acres. No additional maintenance pathway would be required in this corridor segment, and there would be no new permanent disturbance to vegetation.

Semi-desert grassland and Great Basin conifer woodland are extensive in Arizona and disturbance to 25 acres would not adversely impact these communities on a regional level. As stated for each corridor, measures developed to reduce impacts to native vegetation would reduce the loss of ADA-protected plants and may promote the revegetation of areas of temporary disturbance. Successful reseeding of native plants is more likely when further disturbance to impacted areas does not occur.

No-Action Alternative

Under the No-Action Alternative, no native vegetation would be cleared. No impacts would occur on species protected under Arizona Native Plant Law or xeroriparian vegetation. The private lands cleared for the groundwater production and monitoring wells that were used to identify and test the lower aquifer would remain.

Mitigation and Residual Impacts

If adopted, the following measures would be implemented to avoid or reduce significant impacts:

- Revegetating impacted ephemeral stream channels within the proposed or alternative gas pipeline corridors with appropriate native plant species would mitigate impacts on xeroriparian vegetation. Revegetation procedures would be similar to those described for native vegetation communities in the Reclamation Operation Maintenance Plan for BLM-Managed Public Lands and the Reclamation Plan for State and Private Lands where applicable. Where possible, transplanted shrubs should be used in the xeroriparian areas to reduce the time for restoration.

- Loss of xeroriparian vegetation along the ephemeral streams eliminated by construction at the well sites and at the agricultural development in Section 7 would be mitigated by planting appropriate native shrub species adjacent to the alternate stormwater channel, following procedures described in the Reclamation Plan for State and Private Lands. Where possible, transplanted shrubs should be used along this channel. Species that should be planted include honey mesquite, desert willow, catclaw acacia, white ratany, and graythorn, where conditions are appropriate.

- Loss of xeroriparian vegetation along the ephemeral streams eliminated by construction of the power plant, substation, and evaporation ponds would be mitigated by planting appropriate native shrub species adjacent to the stormwater diversion channel, following procedures described in the Reclamation Plan for State and Private Lands. Where possible, transplanted shrubs should be used along this channel. Species that should be planted include honey mesquite, desert willow, catclaw acacia,

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white ratany, and graythorn, where conditions are appropriate.

- As mitigation for impacts from the access road on xeroriparian vegetation and wildlife habitat in Sycamore Creek, the vegetation on gravel bars adjacent to the roadway would be enhanced. The proposed areas for enhancement would be on the downstream side of the crossing. Habitats in these locations would be most likely to persist through flood events. Potential species that should be added to the vegetation in this floodplain include desert willow, catclaw acacia, honey mesquite, graythorn, wolfberry, and desert broom.

- With the implementation of these measures, there would be no residual significant impacts.

3.12 WETLANDS, RIPARIAN AREAS, AND WATERS OF THE UNITED STATES

This section describes the affected environment and environmental consequences relating to wetlands, riparian areas, and waters of the United States.

3.12.1 Wetlands and Riparian Areas

3.12.1.1 Affected Environment

The following sections describe the current wetland and riparian area conditions; this provides a baseline for the assessment of impacts and environmental consequences.

Region of Influence

The region of influence for assessing impacts on wetlands includes the perennial flow reach of the Big Sandy River, between Wikieup and Granite Gorge, with its associated jurisdictional waters of the United States; a small wetland near the proposed power plant site; the wetland associated with Cofer Hot Spring; and the Big Sandy River marsh. The only riparian area (other than xeroriparian habitats on ephemeral streams, which are discussed in Section 3.11) of concern for this Project is the riparian area on the Big Sandy River. The Big Sandy River wetland, riparian area, and associated waters of the United States are discussed as a single system.

For the purpose of this Draft EIS, the wetland definition adopted by the U.S. Environmental Protection Agency (EPA) and Army Corps of Engineers (COE) for administering Section 404 of the Clean Water Act was used. According to this definition, wetlands are:

> "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (33 CFR 328.3(a)[7])

In accordance with this definition, a given area is designated as under the wetland regulatory jurisdiction of the COE if the hydrology results in inundated or saturated soils during the growing season, hydric soils are present, and the dominant vegetation is hydrophytic (COE 1987). Exceptions to these criteria may be allowed in disturbed conditions.

The jurisdictional authority for wetland protection is derived from several sources, beginning with the Clean Water Act of 1972. Section 404 authorizes the COE to grant permits for activities in wetlands or other jurisdictional waters of the United States, and it gives the COE authority to enforce against violations. Executive Order 11990 directs Federal agencies to take action to minimize the destruction, loss, or degradation of wetlands. Western's (DOE) regulations to comply with this order are specified in 10 CFR 1022, Compliance with Floodplain/Wetlands Environmental Review Requirements. BLM is responsible for monitoring and preserving wetlands and riparian areas under its administration. Specific

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procedures for ecological site inventories in riparian and wetland sites are discussed in BLM Manual 1737, Riparian Area Management (BLM 1992).

Delineations of the wetlands that could be directly impacted have been prepared and submitted to the COE. Final concurrence from COE has not been received, and the areas reported below for those wetlands may be subject to revision.

Wetland Delineation Methods

Delineation procedures were based on diagnostic environmental indicators of wetland vegetation, wetland soils, and wetland hydrology. These procedures, outlined in the *Corps of Engineers Wetland Delineation Manual* (1987), are commonly known as the Triple Parameter Method. By definition, an area is designated as a wetland when there are positive indicators for wetland vegetation, soils, and hydrology.

A listing of plant species has been developed for use in delineating wetland areas (USFWS 1988). This listing assigns plant species to one of five indicator status categories ranging from obligate wetland species that almost always occur in wetlands, to upland species that rarely occur in wetlands. Under normal conditions, hydrophytic vegetation is determined to be present if more than 50 percent of the dominant species are in the obligate (OBL), facultative wetland (FACW), or Facultative (FAC) indicator categories.

Diagnostic indicators of hydric soils are related to soil saturation, which leads to anaerobic conditions in the soil. Under these conditions, decomposition of organic material is inhibited and soil minerals are reduced, giving characteristic soil colors that can be quantified by comparison with Munsell Soil Color Charts. A chroma of one or less in unmottled soils or a chroma of two or less in mottled soils generally indicates a hydric soil. In addition, soils that are saturated during the growing season satisfy a criterion for hydric soils. A hand auger was used to collect soil samples from a depth of 8 to 12 inches, or below the A horizon. Larger test pits were dug with a shovel.

A site is determined to have wetland hydrology if it is inundated or saturated to the surface continuously for at least 5 percent of the growing season in most years. In most areas, this represents a period of inundation or saturation of at least 14 consecutive days during the growing season. If no water is present at the time of evaluation, other indicators may include topographic low points or channels, flood debris, complete absence of vegetation, presence of hydric soils, or oxidized rhizospheres.

Existing Conditions

<u>Wetland and Riparian Area #1 – Big Sandy River</u>

Wetland and Riparian Area #1 is an extensive area with wetland conditions adjacent to a perennial reach of the Big Sandy River upstream of the US 93 bridge in Section 1, T15N, R13W (Figure 3.12-1). This is the largest riparian area within the region of influence. This riparian area is particularly important because it supports a population of southwestern willow flycatchers, an endangered species (refer to Section 3.14).

This wetland and associated riparian area extends upstream and downstream from the bridge for a total length within the region of influence of approximately 6 miles (refer to Figure 3.4-5). This wetland begins where the perennial flow originates in the Big Sandy River east of Wikieup. On private land in the vicinity of the US 93 bridge, this wetland has been heavily impacted by year-long livestock grazing, not authorized by a BLM grazing permit.

The delineation of this wetland was originally conducted by Greystone in July 2000, with subsequent adjustments by Environmental Planning Group (EPG), Inc. in December 2000. In addition to the delineated wetland, the Big Sandy River bed includes a wide area of other waters of the United States on each side of the wetland (Waters of the United States is defined

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below in Section 3.12.2). This area extends the full length of the bridge from one abutment to the other, for a length of approximately 1,200 feet. This entire width shows evidence of intermittent flow that probably occurs at irregular intervals based on rainfall patterns. This area is dominated by riparian vegetation, including Fremont cottonwood, Goodding willow, screwbean mesquite, arrowweed, seep willow, and saltcedar. This area exhibits a number of characteristics of the Sonoran Desert cottonwood-willow riparian forest community, which is among the most threatened habitat types in the United States.

Using the wetland classification system of Cowardin et al. (1979), Wetland #1 is primarily an upper perennial riverine system with unconsolidated bottom and shore (R3UB). The wetland area adjacent to the river channel includes areas of palustrine emergent (PEM) and palustrine scrub-shrub (PSS) vegetative communities. Because of heavy impacts of grazing and trampling, vegetation is dominated by species tolerant of disturbances, including saltcedar, screwbean mesquite, arrowweed, seep willow, and bermuda grass. Table 3.12-1 provides a list of plant species observed in the wetland areas and in surrounding uplands. Watercress is present in the stream channel. A few individuals of Fremont cottonwood, Goodding willow, and spiny rush also are present in this vicinity.

Soils within the wetland area are typical of shifting riverbeds. There generally is a relatively thin surface layer of sandy clay, with occasional cobbles, underlain by sand. Soil color is not an acceptable indicator of hydric soil conditions in sandy soils, but other indicators such as a thin organic layer and perennially saturated conditions confirm the hydric soil designation in this wetland.

This wetland is supported hydrologically by a shallow water table and by perennial surface flow in the Big Sandy River. However, the zone of soil saturation and seasonal flow is much wider than the normal base flow width of the river. At the time of the December 2000 observations, soils were saturated at or near the surface throughout the wetland area.

Wetland #2 – Plant Site

Wetland #2 is a small area at an elevation of 2,060 feet in the southwest corner of Section 5, T15N, R12W (Figure 3.12-2). This wetland originates in an area of groundwater seepage at the head of a small channel that continues south off of the property. A portion of this wetland is fenced to exclude cattle and burros. An old springhouse is located within the fenced area. Previous water quality testing has shown water in this spring to have high concentrations of arsenic (Greystone 2001). The delineation of this wetland was originally conducted by Greystone in July 2000, with subsequent adjustments by EPG in December 2000. The area of this wetland on the Project property is estimated to be approximately 0.64 acre.

This wetland has been heavily impacted by past disturbances. Heavy grazing has stripped most of the vegetation outside the fence, and soils have been compacted. There appears to have been some grading or heavy equipment use on the northern and western edges of the wetland. An old jeep track is located on the western edge of the wetland area. There also appears to be an older area of earth movement at the easternmost part of the wetland, where no vegetation is present in the wetland or the adjacent upland.

Using the wetland classification system of Cowardin et al. (1979), this wetland contains areas of palustrine emergent vegetation (PEM) and palustrine scrub-shrub, broad-leaved deciduous vegetation (PSS1). Because of heavy impacts of grazing and trampling, the area outside the fence is limited to emergent vegetation, dominated by Olney bulrush, flat-sedge, and bermuda grass. The area within the fence has had no grazing or trampling disturbance, and it supports a wider diversity of emergent and shrub species, including southern cattail, Olney bulrush, Goodding willow, saltcedar, and seep-willow.

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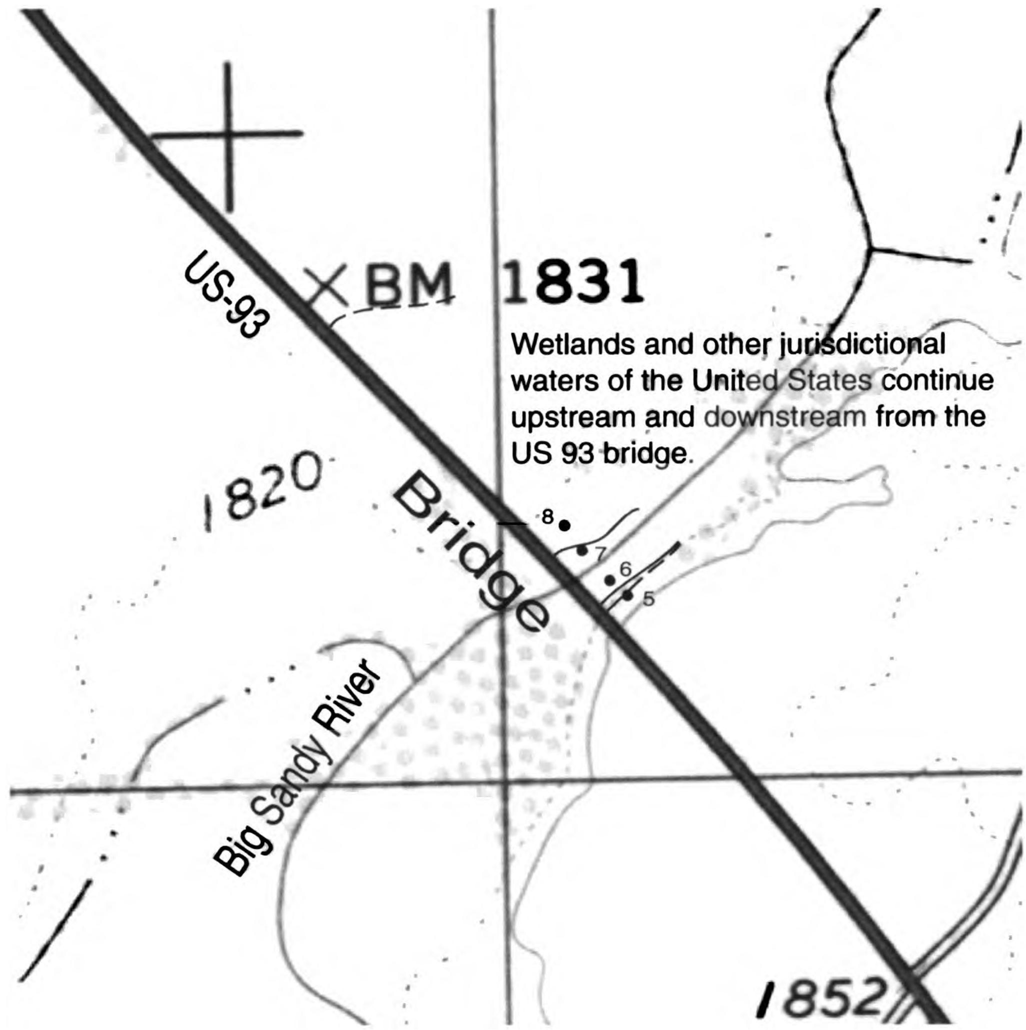
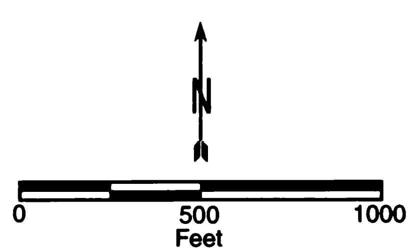


Approximate Wetland Boundary

Approximate Jurisdictional Waters of the United States Boundary

Approximate Data Point Location



Ref.: USGS topographic map, Wikieup quad, 1967.

BIG SANDY ENERGY PROJECT Sketch of Wetland #1		
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TABLE 3.12-1 PLANT SPECIES OBSERVED IN AND NEAR WETLAND AREAS*				
Common Name	Scientific Name	Wetland Indicator Status**	Locations Observed	
			Wetland	Upland
Annual saltmarsh aster	*Aster subulatus*	OBL	X	
Arrowweed	*Pluchea sericea*	FACW	X	X
Bermuda grass	*Cynodon dactylon*	FACU	X	X
Cat-claw acacia	*Acacia greggii*	UPL		X
Creosote-bush	*Larrea tridentata*	UPL		X
Desert broom	*Baccharis sarothroides*	FAC	X	X
Fremont cottonwood	*Populus fremontii*	FACW	X	
Goodding willow	*Salix gooddingii*	OBL	X	
Graythorn	*Ziziphus obtusifolia*	UPL		X
Honey mesquite	*Prosopis glandulosa*	FACU		X
Jimmy-weed	*Isocoma heterophylla*	UPL		X
Mullein	*Verbascum thapsus*	UPL		X
Olney bulrush	*Scirpus americanus*	OBL	X	
Saltcedar	*Tamarix* sp.	NI	X	
Sand-spurry	*Spergularia marina*	OBL	X	
Screwbean mesquite	*Prosopis pubescens*	FACW	X	
Seep-willow	*Baccharis glutinosa*	FACW	X	
Smooth flat-sedge	*Cyperus laevigatus*	FAC	X	
Southern cattail	*Typha domingensis*	OBL	X	
Spiny rush	*Juncus acutus*	FACW	X	
Tree tobacco	*Nicotiana glauca*	FAC		X
Water-cress	*Rorippa nasturtium-aquaticum*	OBL	X	
White ratany	*Krameria grayi*	UPL		X
Wolfberry	*Lycium* sp.	UPL		X

* Species observed during December 2000 site visit.
** Wetland indicator status categories (COE 1987):
OBL – Obligate wetland species, nearly always found in wetlands, >99 percent in wetlands.
FACW – Facultative wetland species, usually found in wetlands, 67 to 99 percent in wetlands.
FAC – Facultative species, equally likely to be found in wetlands or uplands, 33 to 67 percent in wetlands.
FACU – Facultative upland species, usually found in uplands, 1 to 33 percent in wetlands.
UPL – Upland species, nearly always found in uplands, <1 percent in wetlands.
NI – No indicator status.

Soils within the wetland area show considerable variability, partially related to disturbance factors. The western edge of the wetland has been partially covered with a thin (1- to 2-inch) layer of material eroded from adjacent areas that have been disturbed by roads and grading. Cattle and burros have also trampled this area, leading to mixing and compaction of the upper soil layers. Soils within the fenced area are relatively undisturbed. Oxidized root zones are present in the A horizon, and the B horizon (generally greater than 8 inches below the surface) generally has low chromas with distinct mottles. A very strong sulfur smell was obvious in saturated soil samples and where the soil was disturbed by walking across it.

Areas of saturated soil and surface water were observed in July and December 2000. An old springhouse is located within the fenced area,

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and pieces of plastic pipe were present in the wetland, indicating that this site had been developed for ranch use at some time in the past. The area of groundwater seepage is obvious because of a layer of whitish mineral deposits on the surface, resulting from seepage and evaporation of groundwater with a high mineral content. From this seepage area, surface flow continues south off of the property in a channel heavily covered with Olney bulrush.

Wetland #3 – Cofer Hot Spring

Cofer Hot Spring provides water to several small wetland areas These wetlands have not been delineated because they would not be subject to dredge or fill activities associated with the Project. The spring emerges in the landowner's backyard; wetland vegetation immediately surrounding the spring is routinely mowed by the landowner. Water from the spring runs through a flume and series of ditches feeding agricultural fields. Return water from irrigation, and any excess water not used for irrigation, is collected by several ditches and flows through a series of small ponds before entering a larger pond approximately 0.5 mile downstream of the spring. Wetland vegetation has developed around the ponds and to a small extent along ditches. Approximately 4 acres of wetlands are supported by waters from the spring, including approximately 2 acres of open water in the largest pond.

Wetland #4 – Big Sandy River Marsh

The Big Sandy River marsh in Section 24 contains at least a narrow strip of dense wetland vegetation closely surrounding a perennial reach of the Big Sandy River. This wetland has not been delineated because it would not be subject to dredge and fill activities associated with the Project. Due to its location within the Big Sandy River floodplain, this wetland is scoured by larger flood events, preventing the development of any substantial tree or shrub layers. The wetland contains high quality herbaceous vegetation dominated by cattail and bulrush. Wetland vegetation covers at least 22 acres in a narrow strip along about 1 mile of river.

3.12.1.2 Environmental Consequences

Identification of Issues

The following issues were identified as the basis for the assessment of impacts:

- impacts on wetlands
- loss or degradation of distinctive riparian vegetation, particularly cottonwood-willow communities
- indirect impacts on wetlands or riparian areas, which could occur through degradation of water quality, through diversion of water sources, or through erosion and sedimentation resulting from altered drainage patterns.

Significance Criteria

The effects of the Proposed Action and alternatives would be considered significant if there is any substantial unmitigated impact on wetlands or riparian zones.

Impact Assessment Methods

Wetlands were delineated using the methods described in Section 3.12.1.1. For the power plant and associated facilities, natural gas pipeline, and site access road where an area was determined to be a wetland according to the delineation criteria, the total area of impact was calculated. For the pipeline, an area of temporary impact was calculated based on a zone of impact 50 feet wide. A 50-foot zone of impact was assumed for (as opposed to a 90-foot zone of impact elsewhere on the pipeline alignment) because of special efforts incorporated into the Proposed Action to minimize impacts within these sensitive areas.

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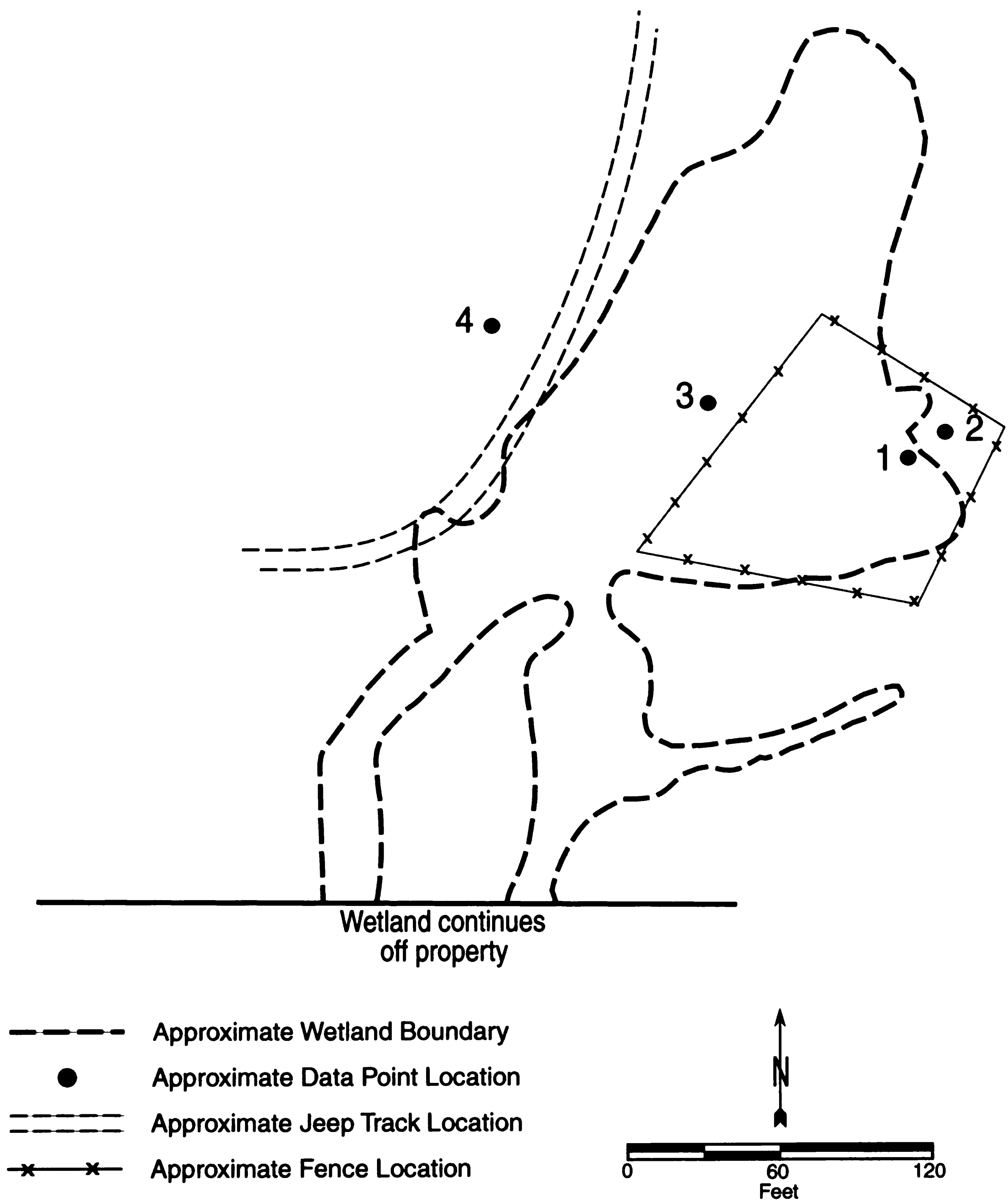

BIG SANDY ENERGY PROJECT
Sketch of Wetland #2

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Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The following measures are included in the Proposed Action to reduce or prevent potential adverse impacts on wetlands and riparian areas.

Wetland and Riparian Area #1 – Big Sandy River

If trenching and backfilling are used to construct the natural gas pipeline in this crossing, construction would comply with FERC's "Wetland and Water Body Construction and Mitigation Procedures," as noted in Section 2.2.7.6. Other measures to minimize erosion and sedimentation impacts in this wetland are discussed in Section 2.2.8.2. During clearing, woody plants would be cut at ground level, and roots would be left intact to allow for regeneration. For this crossing, the construction activities would be confined to a narrow zone. After construction, the disturbed areas in Wetland #1 would be restored by backfilling and recontouring to preconstruction contours as noted in Section 2.2.8.2. The disturbed area would be covered with erosion control matting and would be reseeded.

Wetland #2 – Plant Site

Appropriate measures would be taken during construction to avoid indirect impacts on this wetland resulting from erosion or sedimentation related to construction activities, as noted in Section 2.2.8.2.

Wetland #3 – Cofer Hot Spring

Caithness has agreed in concept with the landowner to provide a well to access water from the lower aquifer to replace any water lost from reduction in spring flow. The landowner could use this water in a manner that maintains these wetlands.

Wetland #4 – Big Sandy River Marsh

Because the Project has the potential to reduce the quantity of groundwater that may be supporting the wetland, Caithness has proposed to augment the flow of water to this wetland (refer to Section 3.4.2.4 for additional details).

Impact Assessment

Proposed Action

Wetland and Riparian Area #1 – Big Sandy River

Construction Impacts— The Big Sandy River wetland at the US 93 bridge would be crossed by corridor segment R5 of the proposed gas pipeline corridor (refer to Section 2.2). If the natural gas pipeline across the Big Sandy River is constructed by trenching, installation, and backfill, there would be impacts on the wetlands associated with the river. The degree of impact is related to the type of vegetation being disturbed. Areas dominated by emergent vegetation with few, widely spaced shrubs can be restored to their preconstruction condition in a relatively short time. Areas with a dense stand of medium-sized shrubs or small saplings take a longer time period to restore, with a few to several years required to approach preconstruction conditions. If large riparian trees are lost during construction, the time required for full restoration could be of decades. Assuming a 50-foot-wide construction zone and a length of impact of approximately 175 feet, the area of temporary impact would be 8,750 square feet (sq. ft.) (0.20 acre). Measures to be undertaken as part of the Proposed Action to minimize erosion and sedimentation related to pipeline construction at the Big Sandy River crossing are described in Section 2.2.8.2.

Following trenching, pipeline installation, and backfilling, this wetland area would be restored to conditions approximating conditions prior to disturbance. There would be no need for continuing access. After three to five years vegetation would become reestablished, and there would be no continuing impacts on the Big Sandy River riparian zone related to the proposed natural gas pipeline. These impacts would not be significant.

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If the pipeline is installed under the Big Sandy River and riparian zone by directional drilling, there would be no impacts on these wetlands. A detailed drilling plan, including depths and distances, would be developed prior to construction. Directional drilling would require additional work areas of approximately 100 feet by 300 feet on each side of the river. These work areas would be located outside the wetlands. Because appropriate measures would be taken as part of the Proposed Action during construction to avoid indirect impacts on wetlands, no impacts would be anticipated resulting from erosion or sedimentation from these areas.

Operational Impacts—Groundwater withdrawal for cooling water at the proposed power plant and for agricultural use was considered as a potential impact on wetlands. Because the Proposed Action contains measures to augment shallow groundwater and surface water, groundwater pumping is not likely to cause adverse impacts on this wetland.

The potential for operational impacts is very small. Repair caused by a failure of the pipe installed through the wetland would require new disturbance of the wetland at the area affected by the repair. Failure of a pipeline installed by directional drilling could be replaced or repaired without wetland disturbance.

Wetland #2 – Plant Site

Construction Impacts—The proposed layout for the power plant, substation, evaporation ponds, and plant driveway has been designed to avoid any direct impacts on Wetland #2. Together with the erosion and sedimentation control measures taken as a part of the Proposed Action (refer to Section 2.2.8.2), there would be no significant impacts on this wetland.

Operational Impacts—The proposed drainage plan would divert runoff from the ridge north of the plant site to a sedimentation basin west of the substation. This basin would discharge through a culvert to a stormwater discharge erosion protection structure near the west edge of Wetland #2. Water from this structure would be sent into the drainage that runs through the wetland. This flow is not expected to cause any impacts on the wetland because it is comparable to the current runoff that reaches this wetland through the natural channels that would be altered during plant construction.

Wetland #3 – Cofer Hot Spring

As discussed in Section 3.4.2.5, the Proposed Action is likely to substantially reduce or eliminate the flow of Cofer Hot Spring during the life of the Project. The approximately 4 acres of wetlands supported by flows from the spring likely would be reduced over time. Therefore, it is likely that the size of this wetland would decline over the life of the Project and eventually be eliminated. This impact would be significant.

Wetland #4 – Big Sandy River Marsh

Groundwater withdrawal for cooling water at the proposed power plant and for agricultural use was considered as a potential impact on wetlands. Because the Proposed Action contains measures to augment shallow groundwater and surface water, groundwater pumping is not likely to cause adverse impacts on this wetland.

Communication Facilities

The OPGW option would connect the proposed Big Sandy substation with the existing Peacock substation near I-40. This line would cross the Big Sandy River north of Wikieup, upstream from the perennial reach of the river. A survey of this route for wetlands was conducted as a part of the Alternative T gas pipeline corridor, with results documented in Greystone (2000). There are no wetlands along this route, thus installation of the OPGW would have no impact on wetlands.

The microwave dishes would be installedhes on existing towers and would have no impact on wetlands.

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Alternative R Gas Pipeline Corridor

Corridor segment R5 of this alternative crosses the Big Sandy River at the US 93 bridge. Potential impacts would be as described above for the Proposed Action.

Alternative T Gas Pipeline Corridor

Potential impacts on wetlands would be the same as for the Proposed Action except there are no wetlands along this alternative pipeline corridor. Thus, constructing the pipeline within this corridor would have no impacts on wetlands.

No-Action Alternative

If the proposed power plant and related facilities are not constructed, there would be no new disturbances to wetland areas, and current conditions would continue. Impacts of grazing animals in the wetlands associated with the Big Sandy River would continue, as would the impacts of grazing animals in the unfenced portion of Wetland #2.

Mitigation and Residual Impacts

No measures to mitigate the significant impact on Cofer Hot Spring have been identified.

If adopted, the following measures would be implemented to minimize adverse impacts not considered to be significant:

- The disturbed riparian areas of the Big Sandy River would be replanted with woody native species at a density of 3 to 1 of the individuals removed to accelerate restoration. Species would include Goodding willow, Fremont cottonwood, screwbean mesquite, and arrowweed.
- Temporary fencing to exclude livestock would be installed around the restoration area at Wetland #1 to ensure success of the revegetation efforts. This fencing could be removed after the trees and shrubs have become well established and would be less susceptible to damage by livestock.

If adopted, the following measures would be implemented to enhance the existing environment:

- Conditions at Wetland #2 would be substantially restored and enhanced by installing appropriate fences around the wetland and a suitable buffer area to exclude grazing animals. This fencing also would restrict access and limit potential impacts on this wetland by humans. Restoration of the heavily impacted area outside the fence at this wetland would be accelerated by planting native shrub species in the wetter areas. Possible species would include Goodding willow, seep-willow, screwbean mesquite, and arrowweed. This site may not have enough water to support Fremont cottonwood.

3.12.2 Waters of the United States

This section describes the affected environment and environmental consequences related to waters of the United States. Additional information regarding the Big Sandy River and springs is provided in Section 3.5.

Federal regulatory definitions of other waters of the United States are sufficiently broad to cover virtually any perennial, intermittent, or ephemeral stream (wash). These definitions include the following:

> "All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; (33 CFR 328.3(a)[1])
>
> All interstate waters including interstate wetlands; (33 CFR 328.3(a)[2])
>
> All other waters such as intrastate lakes, rivers, streams (including intermittent

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streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce; (33 CFR 328.3(a)[3])

All impoundments of waters otherwise defined as waters of the United States under the definition; (33 CFR 328.3(a)[4])

Tributaries of waters identified in paragraphs (a) [1]-[4] of this section." (33 CFR 328.3(a)[5])

These definitions can be interpreted to include all stream channels in this Project vicinity where there is evidence of flowing water. All channels in this vicinity are tributaries to the Big Sandy River, which in turn is tributary to the Bill Williams River and the Colorado River.

Delineation procedures for waters of the United States are based on environmental indicators of surface water flow. These washes do not have the characteristic soils or vegetation to be considered wetlands. The presence of surface water or saturated soil is very sporadic, depending on rainfall events, and these areas are not likely to satisfy the hydrology criterion for wetlands. The limits of waters of the United States in washes are normally considered to be the ordinary high water marks on each side of the wash. These limits are marked by evidence such as a bare sandy or gravelly streambed, lines of flow debris, or scouring evidence of flow.

The jurisdictional authority for protection of waters of the United States is derived from those sources cited for wetland protection in Section 3.12.1.1. Field characteristics to identify the limits of these jurisdictional waters of the United States are described above.

3.12.2.1 Affected Environment

The following sections describe the current waters of the United States; this provides a baseline for the assessment of impacts and environmental consequences.

Region of Influence

The region of influence for the analysis of impacts on waters of the United States includes the perennial and ephemeral portions of the Big Sandy River, washes in the proposed plant and substation vicinity, washes crossed by the plant access road, and washes crossed by either the proposed or alternative gas pipeline corridors, or the proposed OPGW route.

Existing Conditions

Proposed Power Plant Site, Substation, and Evaporation Ponds

The proposed power plant site and the associated substation and evaporation ponds would be located in the southwest corner of Section 5, T15N, R12W. This quarter-section encompasses several washes that are all tributaries of Gray Wash, which flows into the Big Sandy River about 1.5 miles south of the US 93 bridge. These washes have sandy-gravelly beds that are normally dry, except during heavy storm events. Four washes within the power plant and substation area were designated (Greystone 2001). Average widths of these washes are 9.2 feet, 9.8 feet, 8.6 feet, and 29 feet.

Well Sites in Section 7

Four water production wells and three monitor wells in the middle and lower aquifers would be located in the west half of Section 7, T15N, R12W. This half-section is crossed by six washes draining from northeast to southwest. These washes are part of a small, unnamed drainage basin between Sycamore Creek and Gray Wash, with an outlet to the Big Sandy River approximately 0.2 miles upstream from Gray Wash. These washes have sandy-gravelly beds that are normally dry, except during heavy storm events. The widths of these washes are 43.3 feet, 5.0 feet, 4.0 feet, 6.0 feet, 5.9 feet, and 4.0 feet.

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Agricultural Development in Section 7

Up to 107 acres in the northwest corner of Section 7, T15N, R12W would be developed for agricultural use by MCEDA with land and water provided by Caithness as part of the Project. As noted above, this area is crossed by numerous washes that drain to the Big Sandy River.

Access Road

The proposed access road to the power plant site would run in an east-west direction from US 93 to the southwest corner of Section 5, T15N, R12W. This access road would follow the boundary line between Section 6 and Section 7, T15N, R12W, and it would connect to US 93 just east of the Big Sandy River. This access road would cross two washes, tributaries of Gray Wash, in the southwest corner of Section 5, with widths at the crossing estimated to be 70 feet and 6 feet. These washes have sandy or sandy-gravelly beds that are normally dry, except during heavy storm events.

The access road would cross washes on the boundary line between Section 6 and Section 7, all of which are in the unnamed basin between Sycamore Creek and Gray Wash. Measured widths of these washes are 7.1 feet, 18.5 feet, 71.2 feet, and 9.0 feet. These washes also have sandy or sandy-gravelly beds that are normally dry, except during heavy storm events (Greystone 2001).

The access road would cross Sycamore Creek, a wide wash in the southern half of Section 1, T15N, R13W. The total width of Sycamore Creek was measured at 1,350 feet. Sycamore Creek has a drainage basin of at least 20 square miles in the Aquarius Mountains. In this vicinity of the proposed access road crossing, Sycamore Creek is a wide zone of interbraiding channels. Because the channel locations and numbers may vary upstream or downstream from crossing, and because the channel locations will change over time as a result of flood events, the entire crossing must be considered as a water of the United States. All parts of this channel showed evidence of relatively recent flow at the time of a site visit in December 2000.

Communication Facilities

The OPGW option would connect the proposed Big Sandy substation with the existing Peacock substation near I-40. This line would be installed on existing transmission line towers. A survey of this route for waters of the United States was conducted as a part of the Alternative T gas pipeline corridor, with results documented in Greystone (2000). This route would cross 172 washes that are waters of the United States. Because installation of this line would be on existing structures with an existing maintenance road for construction access, the OPGW would have no new impact on waters of the United States.

The installation of microwave dishes on existing microwave towers would not affect waters of the United States.

Proposed Gas Pipeline Corridor

The proposed gas pipeline corridor begins at the existing pipeline north of I-40 and follows Hackberry Road to the southwest. North of the intersection with US 93, this corridor crosses over to follow the transmission line corridor south to its crossing over US 93 north of Wikieup. The corridor then follows US 93 south to the proposed access road and then east to the proposed power plant site. This corridor includes corridor segments R1, C1, T3, C3, T4, and R5, as described in Section 2.2 and illustrated on Figure 2-12.

Corridor segment R1 along Hackberry Road crosses 14 washes with sandy or sandy-gravelly beds. These channels were all measured at Hackberry Road and are tabulated in the *Big Sandy Energy Project – Wetlands and Waters of the United States Project Report* (Greystone 2001). These channels range in width from a minimum of three feet to a maximum of 170 feet at an unnamed wash about 1 mile south of I-40. Two other washes in this corridor segment are

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between 20 and 30 feet wide, and four washes are between 10 and 20 feet wide, and seven washes are less than 10 feet wide. All of these ephemeral channels drain from the northwest and flow southeast into Knight Creek (Greystone 2001).

Corridor segment C1 extends west from Hackberry Road across US 93, and then southwest to connect with the transmission line corridor. This corridor segment crosses eight washes with sandy or sandy-gravelly beds. Continuations of five of these channels upstream from corridor segment C1 were measured and tabulated in Greystone (2001). One wash in this corridor segment was not measured either upstream or downstream, but it was measured on a subsequent site visit in March 2001. These channels range in width from a minimum of 3 feet to a maximum of about 40 feet at Bottleneck Wash. Only three of washes in this corridor segment are greater than 10 feet wide. All of these ephemeral channels drain from the northwest and flow southeast into Knight Creek.

Corridor segment T3 follows an existing transmission line south from corridor segment C1 for approximately 9 miles. Within this corridor segment the pipeline would cross 47 washes with sandy or sandy-gravelly beds. These channels were measured adjacent to the maintenance road in the transmission line rights-of-way. The widest of these crossings are at Mesa Wash (40.2 feet), Wheeler Wash (40 feet), Kabba Wash (36 feet), and an unnamed wash south of Wheeler Wash (31.3 feet). Five washes are between 20 and 30 feet wide, six washes are between 10 and 20 feet wide, and 32 washes are less than 10 feet wide. Because this corridor extends 1,000 feet on either side of the transmission line rights-of-way, the actual widths of wash crossings could be somewhat greater or less than these measurements, depending on whether the pipeline is located downstream or upstream from the transmission line rights-of-way. The actual number of washes could also vary because of channels combining or new washes developing up or down the slope (Greystone 2001).

Corridor segment C3 includes both the transmission line route and the US 93 route for a distance of approximately 1 mile. Greystone (2001) measured six washes along the transmission line right-of-way in this corridor segment, and nine washes adjacent to the highway. Because some washes flow together and new washes originate between the transmission line and US 93, there is no direct correspondence between the transmission line washes and the US 93 washes. In addition, a large ridge east of the highway diverts stream flow to the north or south. The two widest of these crossings are at an unnamed tributary of Knight Creek (28 feet) and an unnamed tributary of Cane Springs Wash (22 feet), and the minimum wash width in this corridor segment is 1.1 feet. Four of these washes are between 10 and 20 feet wide, and the remaining nine washes are less than 10 feet wide. Because this corridor extends 1,000 feet on either side of the transmission line corridor, the actual widths of wash crossings could be somewhat greater or less than these measurements, depending on the specific location of the pipeline.

Corridor segment T4 follows the transmission line south from C3. Greystone (2001) measured 61 washes along the transmission line right-of-way in this corridor segment. These washes range from a minimum width of 1.5 feet to a maximum of 51.3 feet. The widest of these wash crossings are an unnamed wash about 9 miles north of Wikieup (51.3 feet), an unnamed wash about 10 miles north of Wikieup (48.5 feet), Tompkins Canyon (39.5 feet), an unnamed wash about 3 miles north of Wikieup (34.8 feet), and Cane Springs Wash (36.1 feet). Six of the channels in this corridor segment are between 20 and 30 feet wide, 24 of these washes are between 10 and 20 feet wide, and the remaining 26 washes are less than 10 feet wide. Because this corridor extends 1,000 feet on the east side of the Mead-Liberty 345-kV transmission line right-of-way and up to 3,000 feet on the west side of the Mead-Liberty 345-kV transmission line right-of-way, the actual widths of wash crossings could be somewhat greater or less than these measurements, depending on the specific

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location of the pipeline. The actual number of washes could also vary because of washes combining or new washes developing up or down the slope. All of these washes drain from the west and flow east into the Big Sandy River.

Corridor segment R5 follows US 93 south from T4 to the proposed county road. Greystone (2001) measured washes and one perennial channel adjacent to the highway in this corridor segment. The minimum wash width in this corridor segment is 2.1 feet. The widest ash is the Big Sandy River, where waters of the United States are approximately 1,200 feet wide, as discussed under Wetland #1 in Section 3.12.1.1. The widest of washes are Bronco Creek (257.6 feet), an unnamed wash on the south edge of Wikieup (117.5 feet), Natural Corrals Wash (123 feet), and an unnamed wash on the north edge of Wikieup (41.4 feet). Two of these washes are between 20 and 30 feet wide, two washes are between 10 and 20 feet wide, and the remaining 28 washes are each less than 10 feet wide. Because this corridor extends up to 400 feet on east side of the highway right-of-way, the actual widths of wash crossings could be somewhat greater or less than these measurements, depending on the specific location of the pipeline. All of these washes drain from the west and flow east into Big Sandy River.

Alternative R Gas Pipeline Corridor

The Alternative gas pipeline corridor would follow corridor segments R1, R2, R3, C3, R4, and R5, as described in Section 2.2.

Corridor segments R1, C3, and R5 are the same as described above for the proposed gas pipeline corridor.

Corridor segment R2 follows Hackberry Road between corridor segment C1 and US 93. Only washes are located in this corridor segment. These washes have widths of 8.5 feet and 2.6 feet, respectively. Both of these washes drain from the northwest and flow southeast into Knight Creek.

Corridor segment R3 follows US 93 south from Hackberry Road to corridor segment C3. Within this corridor segment, the pipeline would cross 39 washes with sandy or sandy-gravelly beds. The widest of these crossings are at Antelope Wash (96.0 feet), Moss Wash (65.0 feet), Kabba Wash (60.0 feet), two unnamed tributaries of Knight Creek (49.0 and 47.0 feet), and Bottleneck Wash (45.0 feet). Two washes are between 30 and 40 feet wide, five washes are between 20 and 30 feet wide, six washes are between 10 and 20 feet wide, and 20 washes are less than 10 feet wide. The narrowest wash in this corridor segment is 1.7 feet wide. Because this corridor segment extends 400 feet east of the highway right-of-way, the actual widths of wash crossings could be somewhat greater or less than these measurements, depending on the final pipeline location (Greystone 2001). All of these washes drain from the northwest and flow southeast into Knight Creek.

Corridor segment R4 follows US 93 south from corridor segment C3 to the transmission line crossing. Within this corridor segment, the pipeline would cross 74 washes with sandy or sandy-gravelly beds. The widest of these crossings are at Cane Springs Wash (170.0 feet), Deluge Wash (147.0 feet), and an unnamed wash about 9 miles north of Wikieup (60.7 feet). Eight other washes are between 40 and 60 feet wide, three washes are between 30 and 40 feet wide, two washes are between 20 and 30 feet wide, 14 washes are between 10 and 20 feet wide, and 44 washes are less than 10 feet wide. The narrowest wash in this corridor segment is 1.1 feet wide. Because this corridor segment extends at least 400 feet east of the highway right-of-way, the actual widths of wash crossings could be somewhat greater or less than these measurements, depending on the final pipeline location. In one area near Gunsight Canyon, the corridor segment extends approximately 1,500 feet east of the highway right-of-way to accommodate a future relocation of the highway (Greystone 2001). All of these washes drain from the west and flow east into the Big Sandy River.

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Alternative T Gas Pipeline Corridor

The Alternative T gas pipeline corridor would parallel the transmission line from the existing pipeline north of I-40 to the proposed power plant site. This route would include corridor segments T1, T2, T3, C3, T4, and T5, as described in Section 2.2.

Corridor segment T1 would follow the transmission line south from the existing pipeline to the old route of US 93. Within this corridor segment, the pipeline would cross 18 washes with sandy or sandy-gravelly beds. The widest of these crossings are unnamed washes with widths of 48.0, 45.2, 38.3, and 35.0 feet. Five washes are between 20 and 30 feet wide, four washes are between 10 and 20 feet wide, and five washes are less than 10 feet wide. The narrowest wash in this corridor segment is 1.5 feet wide. Because this corridor segment extends 1,000 feet on either side of the transmission line rights-of-way, the actual widths of wash crossings could be somewhat greater or less than these measurements, depending on whether the pipeline is located downstream or upstream from the transmission line rights-of-way. The actual number of washes could also vary because of channels combining or new washes developing up or down the slope (Greystone 2001). All of these washes drain from the northwest and flow southeast into Knight Creek.

Corridor segment T2 would follow the transmission line rights-of-way south from the old route of US 93 to the crossover corridor, C1.Within this corridor segment, the pipeline would cross 15 washes with sandy or sandy-gravelly beds. The widest of these crossings is Bottleneck Wash with a width of 31.3 feet. Five washes are between 10 and 20 feet wide, and nine washes are less than 10 feet wide. The narrowest wash in this corridor segment is 4.0 feet wide. Because this corridor segment extends 1,000 feet on either side of the transmission line rights-of-way, the actual widths of wash crossings could be somewhat greater or less than these measurements, depending on whether the pipeline is located downstream or upstream from the transmission line right-of-way. The actual number of washes could also vary because of channels combining or new washes developing up or down the slope (Greystone 2001). All of these washes drain from the northwest and flow southeast into Knight Creek.

Corridor segments T3, C3, and T4 are the same as described above for the proposed gas pipeline route.

Corridor segment T5 would follow the transmission line rights-of-way southeast from the crossover of US 93 to the proposed power plant site, except for a diversion to cross the Big Sandy River at a perpendicular location. Within this corridor segment, the pipeline would cross 25 washes with sandy or sandy-gravelly beds. These washes range in width from a minimum of 2.5 feet to a maximum of 725 feet at the Big Sandy River. Other wide washes are at Bitter Creek (89.0 feet), Sycamore Creek (64.2 feet), and Boner Canyon (39.3 feet). Nine washes are between 10 and 20 feet wide, and 12 washes are less than 10 feet wide. Because this corridor segment extends 1,000 feet on either side of the transmission line rights-of-way, the actual widths of wash crossings could be somewhat greater or less than these measurements, depending on whether the pipeline is located downstream or upstream from the transmission line rights-of-way. The actual number of washes could also vary because of channels combining or new washes developing up or down the slope (Greystone 2001).

Crossover Segment C2

Crossover segment C2, on the old route of US 93 between the current highway and the transmission line rights-of-way, is not proposed to be used in any of the alternatives. Because this corridor segment is oriented parallel to the primary drainage direction in this vicinity, it would cross only one wash with a width of 3 feet. This stream channel flows from northwest to southeast into Bottleneck Wash.

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3.12.2.2 Environmental Consequences

Identification of Issues

The following issue was identified as the basis for the assessment of impacts:

Impacts on jurisdictional waters of the United States may include the effects of filling or dredging waters of the United States for construction of the plant, substation, associated facilities, evaporation ponds, and access road, and the natural gas pipeline. Temporary impacts would be related to construction of the natural gas pipeline between the proposed power plant site and the existing pipeline near I-40.

Significance Criteria

Because "Waters of the United States" are part of a specifically defined regulatory program, the effects of the Proposed Action and alternatives would be considered significant if there would be significant impacts on the resources associated with the functions of the waters of the United States. For the purposes of this Draft EIS, significant impacts on the following resources also would be considered significant impacts on waters of the United States:

- *Groundwater* – Waters of the United States perform valuable functions of groundwater recharge and baseflow discharge from groundwater.
- *Surface Water* – Waters of the United States provide channels to transport surface flow in perennial, ephemeral, or intermittent systems.
- *Floodplains* – Waters of the United States and associated floodplains provide storage areas for storm waters.
- *Recreation, Wilderness, and Visual Resources* – Waters of the United States may provide recreational areas and may be aesthetically valuable as visual resources.
- *Vegetation* – Waters of the United States may support broadleaf riparian forests adjacent to perennial channels or xeroriparian vegetation adjacent to washes.
- *Wetlands* – Waters of the United States constitute a broad group of aquatic features that include wetlands.
- *Fisheries* – Waters of the United States in perennial or intermittent systems may support native fish populations.
- *Wildlife* - Waters of the United States and their associated vegetative communities support valuable wildlife habitat.
- *Threatened, Endangered, or Sensitive Species* - Waters of the United States and their associated vegetative communities may support a variety of threatened, endangered, and sensitive species.

Impact Assessment Methods

Waters of the United States were delineated using the methods described in Section 3.12.2.1 for the proposed power plant and associated facilities, natural gas pipeline, and site access road. Where an area was determined to be a jurisdictional water according to the delineation criteria, the total area of impact was calculated. For the pipeline, an area of temporary impact was calculated based on a zone of impact 90 feet wide. For the access road, the zone of permanent impact with regard to waters of the United States would be 75 feet, including the paved surface, the shoulders, and the slope areas down to undisturbed conditions.

Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The following actions have been incorporated into the Proposed Action to reduce or prevent impacts on waters of the United States.

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Proposed Power Plant Site

- To minimize erosion, the offsite stormwater system would discharge through an erosion protection structure into an existing wash that enters the west side of Wetland #2.

- To provide for the stormwater transport function of the existing washes on the proposed plant site, an offsite ditch and the onsite stormwater collection system would be constructed.

Access Road

- The stormwater transport function of Sycamore Creek and other washes would be maintained by providing culverts sized to handle the 100-year, 24-hour storm event at each of the crossings. At the Sycamore Creek crossing, the expected culvert design would be as described in Section 2.2.4.

- During construction in or near waters of the United States, appropriate measures would be taken to avoid or minimize downstream indirect effects, as noted in Section 2.2.8.2. Silt fences and/or straw bales would be used to control erosion and sedimentation. Any spills of fuels, lubricating fluids, or hydraulic fluids from construction equipment would be recovered immediately to avoid downstream movement in subsequent rainstorms.

Well Sites in Section 7

- During drilling activities in or near waters of the United States, measures would be taken to avoid or minimize downstream indirect effects, as noted in Section 2.2.8.2. Silt fences and/or straw bales would be used to control erosion and sedimentation. Any spills of fuels, lubricating fluids, or hydraulic fluids from construction or drilling equipment would be recovered immediately to avoid downstream movement in subsequent rainstorms.

- Impacts on waters of the United States caused by construction of the monitoring wells would be reduced by providing an alternate channel for transport of stormwater that would have been carried in the disturbed channels.

Gas Pipeline Route

- Construction in this area would comply with FERC's "Wetland and Water Body Construction and Mitigation Procedures," as noted in Section 2.2.7.6. Other measures to minimize erosion and sedimentation impacts in this wetland are discussed in Section 2.2.8.2. During clearing, woody plants would be cut at ground level, and roots would be left intact to allow for regeneration. Any spills of fuels, lubricating fluids, or hydraulic fluids from construction equipment would be recovered immediately to avoid downstream movement in subsequent rainstorms. After construction, these streams would be recontoured to their preconstruction conditions, and would be reseeded. During construction in these waters of the United States, appropriate measures would be taken to avoid or minimize downstream indirect effects. Silt fences and/or straw bales would be used to control erosion and sedimentation.

Impact Assessment

Proposed Action

Proposed Power Plant Site

The proposed power plant site is located in the southern part of Section 5, T15N, R12W, adjacent to the existing Mead-Phoenix Project 500-kV transmission line. Three small washes would be impacted by construction of the power plant and substation. These washes flow into an unnamed wash that is a tributary of Gray Wash. Gray Wash flows into the Big Sandy River about 1 mile downstream from Sycamore Creek. Construction of the evaporation ponds west of the existing Mead-Phoenix Project transmission

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line would impact four other small washes and one larger wash. These washes are also tributaries of Gray Wash.

Construction activities would result in the losses of 1,544 linear feet of wash channel. The total area of impact on waters of the United States for the power plant and substation would be 24,977 sq. ft. (about 0.6 acre).

Impacts on washes from the evaporation pond were estimated from the preliminary drainage plan map (refer to Figure 2-15) prepared by Caithness. The four small washes have a combined length of approximately 1,960 feet, as measured on the preliminary drainage plan map. The larger wash has a length of approximately 210 feet. The total area of impact for the small washes would be 9,800 sq. ft., and the impact area for the larger wash would be 4,200 sq. ft., for a total impact area of 14,000 sq. ft. (about 0.3 acre).

Access Road

Between US 93 and the proposed plant site, the proposed access road would cross one large wash and several small washes. The most significant crossing is on Sycamore Creek, in the southeast corner of Section 1, T15N, R13W. The total width of this wash was measured at approximately 1,350 feet (Greystone 2001). Assuming a construction width of 75 feet on the road, the total temporary area of direct impact in Sycamore Creek would 0.75 acres. The concrete box culvert across Sycamore Creek would be constructed of 10 individual boxes each having a dimension of 8 by 12 by 58 feet. The adjacent boxes would be placed parallel to the stream flow, and at a 60-degree angle to the road, as described in Section 2.2.4. The total area of permanent impact would be 0.47 acre.The other wash crossings are much smaller. All of these are located near the heads of small drainage basins, with drainage areas much less than 0.25 square mile. These washes have widths of 3.6 feet to 18.8 feet. The combined area of impact for these channels would be 0.02 acre of permanent disturbance.

Including Sycamore Creek, the total area of impact on waters of the United States related to the proposed access road would be 0.75 acre. The access road would be a permanent installation, and therefore impacts would be permanent. However, because the final access road surface would be narrower than the 75-foot-wide corridor assumed for construction, permanent disturbance would be 0.49 acre.

Well Sites in Section 7

Four of the production and monitoring wells were located to avoid impacts on waters of the United States. Production well PW2, and observation well OWMA2 and observation well OW2 would each impact one ephemeral wash. Impacts were calculated for these wells based on a 200-foot square pad centered at the well sites. The areas of impact for these three wells are 1,953 sq. ft., 1,017 sq. ft., and 1,215 sq. ft., respectively. The total area of impact related to these wells would be 4,185 sq. ft. (0.096 acre).

Agricultural Development in Section 7

As noted above, the Proposed Action includes providing land and water to MCEDA for agricultural development in Section 7, T15N, R12W. Up to 107 acres could be developed for growing a variety of crops. The area available for development includes numerous washes that would be affected by conversion to agricultural fields. Based on Greystone (2001), the northwest corner of Section 7 is crossed by two medium-sized washes and nine tributary washes. Conversion of this area to agricultural use would result in a loss of these waters of the United States. The total impact on waters of the United States for the agricultural development would be approximately 3.260 acres. This area could be reduced if larger washes could be avoided, but irrigated agriculture requires large, flat areas for crops. Because of the density of washes in this area, it would not be possible to avoid all washes.

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Communication Facilities

The OPGW option would connect the proposed Big Sandy substation with the existing Peacock substation near I-40. Because the line would be installed on existing structures and drainage would be avoided during selection of pulling and tensioning sites, installation of the OPGW would have no impact on waters of the United States.

The microwave dishes would be installed on existing towers and would have no impact on waters of the United States.

Proposed Gas Pipeline Corridor

The proposed natural gas pipeline route would follow the route of the proposed access road from the proposed power plant site to US 93. The pipeline would be located adjacent to the roadway and would have a temporary impact width of 40 feet. As noted above under the access road impacts, this segment of the pipeline would cross one large and six small washes. At the Sycamore Creek crossing, the anticipated area of impact would be 1.240 acres. The total area of impact in this corridor segment, including Sycamore Creek, would be 1.408 acres.

From the junction of the proposed access road and US 93, the proposed pipeline route would cross approximately 172 washes that are jurisdictional waters of the United States, not including the Big Sandy River. The actual number could be slightly higher or lower, depending on the exact alignment of the pipeline within the corridor. In each of these washes, the pipeline construction procedure would include trenching, laying the pipe, backfilling, and recontouring the surface.

The width of each of these washes was measured, and areas of direct construction impacts were calculated based on a 90-foot-wide construction corridor. It is important to remember that the final placement of the pipeline within the corridor may change the number of wash crossings and the total area of impact, but the anticipated areas of impact given below are expected to be representative of the final impacts.

Within corridor segment R1, the anticipated area of impact on waters of the United States would be 0.67 acre in 14 washes. In corridor segment C1, there would be approximately 0.2 acre of impact in 8 washes. In corridor segment T3, the anticipated area of impact would be 1.050 acre in 47 washes. Within corridor segment C3, the anticipated area of impact is expected to be between about 0.09 acre on six washes and 0.18 acre on nine washes, depending on the final location of the pipeline. Another wash is located parallel to US 93 and within 400 feet of the highway for a distance of approximately 1,500 feet. If the pipeline were not located to avoid this wash, there would be an additional impact on waters of the United States of up to about 0.31 acre.

In corridor segment T4, the anticipated area of impact would be about 1.64 acre in 61 ephemeral streams. Within corridor segment R5, the expected area of impacts would be about 1.51 acre in 36 washes. In addition, the impact on waters of the United States associated with the Big Sandy River crossing by trenching would be 1.38 acres.The maximum total area of impact on waters of the United States for the proposed pipeline route would be approximately 8 acres, including the 1.38 acres for the Big Sandy River crossing. This assumes that the pipeline would avoid those waters of the United States that parallel the pipeline route.

Alternative R Gas Pipeline Corridor

The Alternative R gas pipeline route would cross approximately 175 washes that are jurisdictional waters of the United States. The actual number could be slightly higher or lower, depending on the exact location of the pipeline within the corridor. In each of these washes, the pipeline construction procedure would include trenching, laying the pipe, backfilling, and recontouring the surface.

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The width of each of these washes was measured at the highway, and areas of impact were calculated based on a 90-foot-wide construction corridor. It is important to remember that the final placement of the pipeline within the corridor may change the number of wash crossings and the total area of impact, but the anticipated areas of impact given below are expected to be representative of the final impacts. The impacts on waters of the United States in corridor segments R5, C3, and R1 would be the same as the Proposed Action.

In corridor segment R2, there would be approximately 0.02 acre of impact in two ephemeral streams. In corridor segment R3, the anticipated area of impact would be about 1.49 acres in 39 washes. In corridor segment R4, the anticipated area of impact would be about 2.67 acres in wash. In addition, another wash is located parallel to US 93 and within 400 feet east of the highway for a distance of approximately 4,500 feet, north of Cane Springs Wash. If the pipeline were not located to avoid this wash, there would be additional impacts on waters of the United States of up to about 1.67 acre. Near the south end of corridor segment R4, the corridor extends about 1,500 feet east of the existing highway. This portion of the corridor includes a linear distance of about 8,000 feet within the Big Sandy River floodplain in waters of the United States. If the pipeline were not located to avoid this floodplain, there would be an additional impact on waters of the United States of up to about 16.53 acres.

The total area of impact on waters of the United States for the Alternative R gas pipeline corridor would be approximately 11 acres, assuming that the pipeline would avoid those waters of the United States that parallel the pipeline route.

Alternative T Gas Pipeline Corridor

The Alternative T gas pipeline route would cross approximately 172 washes that are jurisdictional waters of the United States. The actual number could be slightly higher or lower, depending on the exact location of the pipeline within the corridor. In each of these washes, the pipeline construction procedure would include trenching, laying the pipe, backfilling, and recontouring the surface.

The width of each of these washes was measured at the transmission line rights-of-way, and areas of impact were calculated based on a 90-foot-wide construction corridor. It is important to remember that the final placement of the pipeline within the corridor may change the number of wash crossings and the total area of impact, but the anticipated areas of impact given below are expected to be representative of the final impacts. The impacts on waters of the United States in corridor segments T4, C3, and T3 would be the same as the Proposed Action.

Within corridor segment T1, the anticipated area of impact on waters of the United States would be about 0.75 acre in 18 washes. In corridor segment T2, there would be approximately 0.34 acre of impact in 15 washes. Within corridor segment T5, the expected area of impacts would be about 2.26 acres in 25 washes. The crossing at the Big Sandy River accounts for most of this area, with an impact area of 1.498 acre.

The total area of impact on waters of the United States for the Alternative T gas pipeline route would be approximately 6.22 acres, assuming that the pipeline would avoid those waters of the United States that parallel the pipeline route.

No-Action Alternative

Under the No-Action Alternative, there would be no disturbances to waters of the United States at the proposed power plant site. No natural gas pipeline would be constructed, and there would be no disturbance to wash crossings on either of the potential routes. The access roads and well pads constructed on private land to serve the wells that were used to identify and test the lower aquifer would remain.

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Mitigation and Residual Impacts

Section 3.4 of this Draft EIS did not identify any significant effects to the groundwater recharge and base flow discharge functions of the affected waters of the United States and no mitigation measures were identified.

Section 3.6 of this Draft EIS did not identify any significant effects on the flood-carrying capacity or stormwater storage functions of the affected waters of the United States, and no mitigation measures were identified.

Section 3.9 of this Draft EIS did not identify any significant effects on recreational and aesthetic functions of affected waters of the United States, and no mitigation measures were identified.

Section 3.11 of this Draft EIS identified significant impacts on xeroriparian vegetation supported by affected waters of the United States and identified mitigation measures to reduce those impacts to less than significant.

Section 3.12.1 of this Draft EIS did not identify any significant impact on wetland functions or the affected waters of the United States, and identified mitigation measures to minimize adverse effects not considered to be significant.

Section 3.13 of this Draft EIS identified significant impacts on the wildlife habitat function of affected waters of the United States and identified mitigation measures to reduce those impacts to less than significant, as well as mitigation measures to minimize adverse impacts not considered to be significant.

Section 3.13 of this Draft EIS did not identify any significant effects on the native fish habitat function of the waters of the United States, and no mitigation measures were identified.

Section 3.14 of this Draft EIS identified impacts on threatened and endangered species supported by affected waters of the United States and identified mitigation measures to avoid or reduce these impacts. Section 3.14 of this Draft EIS did not identify any significant impacts on sensitive species supported by affected waters of the United States and identified measures to avoid or reduce these impacts.

3.13 FISHERIES AND WILDLIFE

This section describes the affected environment and environmental consequences relating to fish and wildlife. Special status species are addressed in Section 3.14.

3.13.1 Affected Environment

This section describes the existing fish and wildlife; this information provides a baseline for the assessment of impacts and environmental consequences.

3.13.1.1 Region of Influence

Fisheries

The region of influence for the analysis for fisheries and aquatic resources includes the entire length of the Big Sandy River. This river originates at the confluence of Knight Creek and Trout Creek and extends downstream 37.8 miles to Alamo Reservoir. The region of influence includes waters within the proposed Project area that could be directly impacted, as well as potentially affected areas downstream from the Project area. The upstream portion of the river was included for additional information.

Wildlife

The region of influence for wildlife resources includes the 120-acre proposed power plant site (a portion of Section 5, T15N, R12W) and its 150-foot-wide access corridor; the proposed pipeline corridor; the alternative pipeline corridors; a 0.5-mile buffer around the proposed power plant site, access road right-of-way, and each pipeline route; the 107-acre proposed agricultural area; and riparian area of the Big Sandy River downstream to Alamo Lake; and the proposed OPGW route.

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Sources of Information

Information regarding fish and wildlife was derived primarily from field reconnaissance and the following documents; *Aquatic Baseline Technical Report* (Greystone 2000a) and the *Wildlife Report* (Greystone 2000b). Additional supporting information includes Fresques et al. (1997), Kepner (1979), BLM (1993), Hall (1980), Peck (1979), Jones (1981), raw data from AGFD (1993) and BLM (1994). Other useful references include Minkley (1973), Lee et al. (1980), Stebbins (1985), Hoffmeister (1986), Page and Burr (1991), and National Geographic Society (1999).

3.13.1.2 Existing Conditions

Aquatic Habitat

The perennial reaches of the Big Sandy River north of Granite Gorge have a generally low gradient, with broad floodplains and sandy substrates. Run habitats are the dominant condition in this river. These habitats are characterized by swiftly flowing water; little or no surface agitation, waves, or turbulence; no major flow obstructions; and a water surface roughly parallel to the overall stream gradient. A few isolated pools are also located in some reaches of the river.

Aquatic habitat is present at the wetland on the proposed plant site in the southwest corner of Section 5, T15N, R12W. The affected environment and potential impacts on this area are discussed in detail in Section 3.12.

Water Quantity and Quality

Greystone (2000a) noted that during a 1979 survey on the Big Sandy River, 9 out of 10 sample points were wet and supported fish. The tenth point had no fish. During surveys in 1996 and 2000, five of the original nine sites were dry.

Locations of Aquatic Surveys

Greystone (2000a) surveyed 18 sites on the Big Sandy River, as follows:

Site ID	Location Description
BS1	13,700 feet (2.6 miles) north of the Santa Maria River
BS2	31,300 feet (5.9 miles) upstream of BS1
BS3a	35,700 feet (6.8 miles) upstream of BS2
BS3b	At second Signal Road (County Hwy. 137) crossing as driving west from US 93
BS4	2,600 feet (0.5 miles) downstream of Burro Creek
BS5	At first Signal Road (County Hwy. 137) crossing as driving west from US 93
BS6	26,600 feet (5 miles)upstream of BS5
BS7	1,350 feet (0.3 mile) downstream of Gray Wash
BS8a	3,500 feet (0.7 mile) downstream of US 93 bridge
BS8b	At and upstream of US 93 bridge
BS9	3,020 feet (0.6 mile) upstream of Bronco Creek
BS10a	Just downstream of Chicken Springs Road (County Hwy. 131) on east side of US 93, just west of Back Road (County Hwy. 159) at spring issue point and start of perennial flows
BS10b	Just upstream of Chicken Springs Road (County Hwy. 131) on east side of US 93, just west of Back Road (County Hwy. 159)
BS11	At Back Road crossing (County Hwy. 159), 1,900 feet south of the Mead-Phoenix Project 500-kV transmission line crossing
BS12	18,200 feet (3.5 miles) upstream of BS 11
BS13	15,500 feet (2.9 miles) upstream of Tule Wash
BS14	4,200 feet (0.8 mile) upstream of Tom Brown Canyon, at Upper Trout Creek Road crossing
BS15	1,550 feet (0.3 mile) below Knight Creek/Trout Creek confluence (near Cane Springs Wash)

Twelve of the 18 sites surveyed on the Big Sandy River by Greystone (2000a) were dry, but the field survey followed a long-term drought. It is assumed that the six sites examined that had surface water were perennial. The upper portion of the Big Sandy River, from its origin at the

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confluence of Knight Creek and Trout Creek to a point just east of Wikieup, was dry. Perennial flow began east of Wikieup and continued downstream, with long stretches of flowing water and some dry reaches down to Alamo Reservoir.

At the time of the aquatic site reconnaissance, the aquatic habitat of the Big Sandy River was of particularly poor quality as the result of low flow rates. Flow rates tabulated by Greystone (2000a) at the sample points with flowing water ranged from 0.05 cubic feet per second (cfs) at point BS4 to 3.26 cfs at BS6. A USGS gaging station (#09424450) near sample point BS3a recorded a median flow of 5.0 cfs between 1966 and 1999 (USGS 2001). This river system is subject to occasional flooding associated with unusually heavy storm events. The highest measured discharge rate was 68,700 cfs in February 1993.

A summary of water quality data for the Big Sandy River at the USGS gaging station south of Wikieup is presented in Table 3.5-1. Results of the water quality analyses completed by Greystone (2000a) are listed in Table 3.13-1. High temperatures were recorded at sample point BS4 (31.6 degrees Celsius [°C]) and BS6 (28.8°C), and dissolved oxygen was low at sample point BS10a (3.46 milligrams per liter [mg/L]). These measurements are one-time readings, and are of limited use in assessing overall water quality.

Fish

Fish species observed in the Big Sandy River and its tributaries are listed in Table 3.13-2 (AGFD 1993; BLM 1994; Fresques et al. 1997; Kepner 1979). Seven species of fish were identified and counted in the Big Sandy River during Greystone's survey (2000a), as listed in Table 3.13-3. These species were longfin dace, common carp, green sunfish, mosquitofish, red shiner, black bullhead, and yellow bullhead. Additional details on these earlier studies are provided in Greystone (2000a).

Greystone (2000a) documented increases in the abundance and diversity of exotic species and the loss of native species by comparing the results of its 2000 survey with the results of the 1979 and 1996 surveys by others. Two native species, Sonora sucker and roundtail chub, were recorded in 1979 but were not found in 1996 (Fresques et al. 1997) or 2000 (Greystone 2000a) at these same sites (roundtail chubs were found at a separate location by BLM in 1994). Native fish species accounted for 57.8 percent of the total fish counted in 1979, but only 8 percent in 2000. The longfin dace was the most abundant fish species in most sites sampled in 1979, but it was not most abundant at any of the revisited sites in 2000. Mosquitofish were not present in 1979; by 1996 they were common but not most abundant; and in 2000, mosquitofish was the most abundant species at most of the monitoring sites.

Macroinvertebrates

Macroinvertebrates were sampled at three sites with surface water during June and July 2000 (Greystone 2000a). The results were analyzed and several standard metrics were calculated, including total abundance, species richness, EPT (Ephemeroptera, Plecoptera, and Trichoptera) taxa, percent contribution of the dominant taxon, percent chironomidae, ratio of EPT and chironimidae abundances, Shannon Diversity Index, evenness, Hilsenhoff Biotic Index, and Community Tolerance Quotient. Definitions of these metrics are provided in Greystone (2000a). Although some of these metrics may not be directly applicable to the Big Sandy River System, they are presented for general information purposes.

Macroinvertebrate sampling was completed once at each of the three sample sites. Because these are one-time samples and because all samples were collected during June and July, these data are of limited use in describing

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TABLE 3.13-1 OBSERVED WATER QUALITY, JUNE 2000 (GREYSTONE 2000A)					
Water Quality Characteristics	**Sample Point Numbers**				
	BS4	**BS6**	**BS8a**	**BS9**	**BS10a**
pH (s.u.)	9.44	7.71	7.70	8.34	7.17
Conductivity (µs/cm)	507	1149	1311	832	602
Dissolved oxygen (mg/l)	-	8.42	8.59	4.30	3.46
Temperature (°C)	31.6	28.8	24.1	19.9	23.2
Flow rate (cfs)	0.05	3.26	2.35	0.99	.033

TABLE 3.13-2 PRIOR FISH OBSERVATIONS IN THE BIG SANDY RIVER (AGFD 1993; BLM 1994; FRESQUES ET AL. 1997; KEPNER 1979)		
Scientific Name	**Common Name**	**Status**
Black Bullhead	*Ictalurus melas*	Exotic
Common Carp	*Cyprinus carpio*	Exotic
Green Sunfish	*Lepomis cyanellus*	Exotic
Longfin Dace	*Agosia chrysogaster*	Native
Mosquitofish	*Gambusia affinis*	Exotic
Red Shiner	*Cyprinella lutrensis*	Exotic
Roundtail Chub	*Gila robusta*	Native
Sonora Sucker	*Catostomus insignis*	Native
Yellow Bullhead	*Ictalurus natalis*	Exotic

TABLE 3.13-3 OBSERVED NUMBERS OF FISH, JUNE 2000 (GREYSTONE 2000a)								
	Sample Point Numbers							
Fish Species	**BS4**	**BS6**	**BS8a**	**BS8b**	**BS9**	**BS10a**	**Total**	**%**
Green Sunfish	1	-	-	-	3	-	4	0.2
Common Carp	130	-	-	-	-	-	130	4.9
Longfin Dace	10	2	65	78	-	63	218	8.2
Red Shiner	24	-	7	-	-	41	72	2.7
Black Bullhead	-	-	-	-	35	-	35	1.3
Yellow Bullhead	7	2	-	-	-	-	9	0.3
Mosquitofish	343	223	672	59	474	412	2183	82.3
Total Abundance	515	227	744	137	512	516	2651	100.0
Number of Species	6	3	3	2	3	3	-	-
Minimum population (fish/100m)	844	1081	2657	761	1679	1147	-	-

overall macroinvertebrate populations in the Big Sandy River.

The results of the Greystone (2000a) sampling are summarized in Table 3.13-4. The macroinvertebrate communities found in the Big Sandy River generally are species considered to be tolerant of low to intermittent base flows, sandy substrates, high water temperature, and low dissolved oxygen.

The Modified Hilsenhoff Biotic Index (HBI) is an indicator of the benthic community's overall tolerance to pollution (Hilsenhoff 1987; Plafkin et al. 1989). This index originally was developed as an indicator of organic enrichment, but it also

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TABLE 3.13-4 MACROINVERTEBRATE BIOASSESSMENT METRICS – BIG SANDY RIVER (GREYSTONE 2000a)				
Metrics	Sampling Sites			
	BS4	BS8b	BS9	BS10a
General Metrics				
Total Abundance (#/ft^2)	35	13	63	206
Total Number of Taxa	14	7	11	19
Number of EPT Taxa	1	2	1	1
Percent EPT Taxa	11.4	61.5	4.7	1.3
Percent Dominant Taxon	34.3	53.8	66.0	67.2
Percent Chironomidae	-	2.6	2.1	3.2
EPT/Chironomidae ratio	-	24.00	2.25	0.40
Diversity Indices				
Shannon Index	2.75	1.90	1.88	2.09
Evenness	0.64	0.57	0.36	0.26
Biotic Indices				
Hilsenhoff Biotic Index	7.2	4.9	5.0	5.4
Community Tolerance Quotient	99.1	78.6	105.1	78.5
Percent Composition by Order				
Ephemeroptera	11.4	61.5	4.8	1.3
Plecoptera	0.0	0.0	0.0	0.0
Trichoptera	0.0	0.0	0.0	0.0
Odonata	35.2	5.1	2.7	8.7
Diptera	8.6	2.6	3.2	3.2
Coleoptera	0.0	0.0	1.6	78.2
Hemiptera	1.0	0.0	0.0	0.6
Miscellaneous Taxa	39.0	2.6	87.8	7.9

is believed to be a good indicator of inorganic pollution. Values range from 3.75 to 10.0, with higher numbers indicating more stressed conditions or communities more tolerant of polluted conditions. Observed values in the Big Sandy River ranged from 4.9 to 7.2 (Greystone 2000a).

The Community Tolerance Quotient (CTQ) was developed for use in western streams to assess non-point source pollution (Winget and Mangum 1979). Average values for a sample range from 40 to 108. Values in the Big Sandy River ranged from 78.5 to 105.1 (Greystone 2000a).

Riparian Habitat

The Big Sandy River in the Wikieup vicinity (near corridor segment R5) provides riparian habitat that is valuable to many terrestrial or semi-aquatic vertebrates. This reach of the Big Sandy River exhibits a number of characteristics of the Sonoran desert cottonwood-willow riparian forest community, which is among the most threatened habitat types in the United States. This habitat is described in more detail in Section 3.11.

Riparian areas and springs in the arid Southwest provide habitat for many wildlife species that use these sites for food, shelter, or water. Almost all of the wildlife species present in the adjacent upland areas would depend on these riparian habitats to some degree. The vegetation components most important to wildlife (tree species and densities, foliage height diversity and volume, and patchiness) are all provided in healthy cottonwood-willow communities (Ohmart et al. 1988). Although the cumulative impacts to wildlife are not fully understood, it is believed that the survival of 85 percent of the wildlife species in Arizona depends directly on the few remaining riparian areas (Richter 1987).

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Reptiles and Amphibians

Relatively few species of reptiles and amphibians were observed during the data collection in aquatic habitats (near corridor segment R5; Greystone 2000a). Observed species are listed in Table 3.13-5. Lowland leopard frogs were found at upstream sites on the Big Sandy River at the US 93 bridge and near the head of the perennial flow reach just east of Wikieup. Arizona toads were found farther downstream below the US 93 bridge, below the confluence with Burro Creek, and at the wetland at the proposed power plant site. A Sonoran mud turtle was seen in the Big Sandy River at the US 93 bridge. Additional species observed in the area include a red-spotted toad, Woodhouse's toad, and spiny soft-shelled turtle (Smith, personal communication, 2001).

Upland areas in the region of influence have vegetation characteristic of Sonoran desertscrub, semi-desert grassland, and Great Basin conifer woodland (refer to Section 3.11). These habitats support a variety of reptiles, including the western whiptail, gila monster, and desert tortoise.

The following reptile species were observed during wildlife inventories in the region of influence: common chuckwalla, desert iguana, zebra-tailed lizard, black-necked garter snake, long-nosed leopard lizard, lesser earless lizard, and western diamondback rattlesnake (Greystone 2000b; EPG, unpublished data). Additional species observed in the area include canyon tree frog (Smith, personal communication, 2001). These species, and additional species that may occur in the region of influence, are listed in Table 3.13-5.

Mammals

The riparian and upland regions in the region of influence (refer to Section 3.11) support a variety of small mammals such as pocket mice, black-tailed jackrabbits, and kangaroo rats; and large mammals such as coyotes and mule deer. Mammal species that may occur in the region of influence are listed in Table 3.13-6. Of these species, the following were observed during wildlife inventories: desert cottontail, black-tailed jackrabbit, Ord's kangaroo rat, Merriam's kangaroo rat, white-throated wood rat, coyote, javelina, and mule deer (Greystone 2000b). Additional species observed in the area include porcupines, and gray fox (Smith, personal communication). Riparian areas in the region of influence (near corridor segment R5) support additional mammal species. Raccoon and beaver have been observed in the area (Greystone 2000b; Smith, personal communication, 2001). Although there are no records of coati in the area, coati tracks were observed and photographed during a site reconnaissance in November 2000.

A small wetland adjacent to the proposed power plant site and water at the proposed crossing of the Big Sandy River near the Highway 93 bridge provide foraging habitat for insectivorous bats. Three bat species—Yuma myotis, pallid bat, and California leaf-nosed bat—were captured during a single evening of mist-netting at the wetland (Greystone 2000b). Several bat roosts also were identified along pipeline corridor segments R3, C3, R4, and R5. The US 93 bridge over the Big Sandy River (in corridor segment R5) was used as both a day and night roost by at least two species of bats. Four additional bridges showed signs of use as a night roost, and 41 of 63 concrete box culverts showed signs of roost activity. Culverts close to water features tended to have a higher level of use than those farther from water (Greystone 2000b). For further information on bats, refer to Section 3.14.

Wild Horses and Burros

The southernmost part of the region of influence (corridor segment T5) is within the Big Sandy Herd Management Area (BLM 1993). Burros, although not considered a wildlife species, were sighted within the region of influence during site reconnaissance visits.

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TABLE 3.13-5 REPTILES AND AMPHIBIANS THAT MAY OCCUR IN THE PROJECT AREA	
Common Name	**Scientific Name**
Arizona Toad	*Bufo microscaphus*
Banded Gila monster	*Heloderma suspectum cinctum*
Banded sand snake	*Chilomeniscus cinctus*
Black-necked garter snake	*Thamnophis cyrtopsis*
Black-tailed rattlesnake	*Crotalus molossus*
Canyon tree frog	*Hyla arenicolor*
Chuckwalla	*Sauromalus obesus*
Coachwhip	*Masticophis flagellum*
Colorado River toad	*Bufo alvarius*
Common kingsnake	*Lampropeltis getulus*
Couch's spadefoot	*Scaphiopus couchii*
Desert horned lizard	*Phrynosoma platyrhinos*
Desert iguana	*Dipsosaurus dorsalis*
Desert night lizard	*Xantusia vigilis*
Desert spiny lizard	*Sceloporus magister*
Desert tortoise	*Gopherus agassizii*
Gila spotted whiptail	*Cnemidophorus flagellicaudus*
Arizona skink	*Eumeces gilberti arizonensis*
Gopher snake	*Pituophus catenifer*
Great Plains skink	*Eumeces obsoletus*
Great Plains toad	*Bufo cognatus*
Greater earless lizard	*Cophosaurus texanus*
Ground snake	*Sonora semiannulata*
Lesser earless lizard	*Holbrookia maculata*
Long-nosed leopard lizard	*Gambelia wislizenii*
Long-nosed snake	*Rhinocheilus lecontei*
Long-tailed brush lizard	*Urosaurus graciosus*
Lowland leopard frog	*Rana yavapaiensis*
Lyre snake	*Trimorphodon biscutatus*
Mojave black-collared lizard	*Crotaphytus bicinctores*
Mojave rattlesnake	*Crotalus scutulatus*
New Mexico spadefoot	*Spea multiplicata*
Night snake	*Hypsiglena torquata*
Plateau lizard	*Sceloporus undulates*
Plateau striped whiptail	*Cnemidophorus velox*
Red-spotted toad	*Bufo punctatus*
Rosy boa	*Charina trivirgata*
Short-horned lizard	*Phrynosoma douglassii*
Side-blotched lizard	*Uta stansburiana*
Sonoran mud turtle	*Kinosternon sonoriense*
Southwestern black-headed snake	*Tantilla hobartsmithi*
Speckled rattlesnake	*Crotalus mitchellii*
Spiny softshell	*Trionyx spiniferous*
Spotted leaf-nosed snake	*Phyllorhynchus decurtatus perkinsi*
Tree lizard	*Urosaurus ornatus*
Western banded gecko	*Coleonyx variegatus*

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TABLE 3.13-5 REPTILES AND AMPHIBIANS THAT MAY OCCUR IN THE PROJECT AREA	
Common Name	**Scientific Name**
Western blind snake	*Leptotyphlops humilis*
Western diamondback rattlesnake	*Crotalus atrox*
Western glossy snake	*Arizona occidentalis*
Western patch-nosed snake	*Salvadora hexalepis*
Western rattlesnake	*Crotalus viridis*
Western shovel-nosed snake	*Chionactus occipitalis*
Western whiptail	*Cnemidophorus tigris*
Woodhouse's toad	*Bufo woodhousei*
Zebra-tailed lizard	*Callisaurus draconoides*

TABLE 3.13-6 MAMMAL SPECIES THAT MAY OCCUR IN THE PROJECT AREA	
Common Name	**Scientific Name**
Allen's lappet-browed bat	*Idionycterus phyllotis*
Arizona pocket mouse	*Perognathus amplus*
Badger	*Taxidea taxus*
Beaver	*Castor canadensis*
Big brown bat	*Eptesicus fuscus*
Black-tailed jackrabbit	*Lepus californicus*
Bobcat	*Felis rufus*
Botta's pocket gopher	*Thomomys bottae*
Brazilian free-tailed bat	*Tadarida brasiliensis*
Brush mouse	*Peromyscus boylii*
Burro	*Equus asinus*
Cactus mouse	*Peromyscus eremicus*
California leaf-nosed bat	*Macrotus californicus*
California myotis	*Myotis californicus*
Cave myotis	*Myotis velifer*
Cliff chipmunk	*Eutamias dorsalis*
Coati	*Nasua nasua*
Collared peccary	*Tayassu tajacu*
Coyote	*Canis latrans*
Desert cottontail	*Sylvilagus audubonii*
Desert pocket mouse	*Chaetodipus penicillatus*
Desert shrew	*Notiosorex crawfordi*
Desert woodrat	*Neotoma lepida*
Gray fox	*Urocyon cinereoargenteus*
Harris' antelope squirrel	*Ammospermophilus harrisii*
Kit fox	*Vulpes velox*
Merriam's kangaroo rat	*Dipodomys merriami*
Mountain lion	*Puma concolor*
Mule deer	*Odocoileus hemionus*
Ord's kangaroo rat	*Dipodomys ordii*
Pallid bat	*Antrozous pallidus*
Porcupine	*Erethizon dorsatum*
Raccoon	*Procyon lotor*
Red bat	*Lasiurus borealis*

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TABLE 3.13-6 MAMMAL SPECIES THAT MAY OCCUR IN THE PROJECT AREA	
Common Name	**Scientific Name**
Ringtail	*Bassariscus astutus*
Rock pocket mouse	*Chaetodipus intermedius*
Rock squirrel	*Spermophilus variegatus*
Round-tailed ground squirrel	*Spermophilus tereticaudus*
Southern grasshopper mouse	*Onychomys torridus*
Spotted bat	*Euderma maculatum*
Stephen's woodrat	*Neotoma stephensi*
Striped skunk	*Mephitis mephitis*
Townsend's big-eared bat	*Plecotus townsendii*
Western harvest mouse	*Reithrodontomys megalotis*
Western pipistrelle	*Pipistrellus hesperus*
Western small-footed myotis	*Myotis ciliolabrum*
Western spotted skunk	*Spilogale gracilis*
White–throated woodrat	*Neotoma albigula*
Yuma myotis	*Myotis yumanensis*

Raptors

Three habitat types were identified as having a high potential for nesting raptors (Greystone 2000b). These habitats were the mesquite and cottonwood/willow areas along the Big Sandy River (near corridor segment R5), sandstone cliffs along tributary drainages (corridor segment T5), and the Mead-Phoenix Project 500-kV transmission structures (corridor segments T1, T2, T3, T4, T5, and C3). Good quality cottonwood/willow habitat exists along the Big Sandy River from Sections 10 and 11, T17N, R13W south to the proposed power plant site. This habitat typically supports a high abundance of raptors.

Surveys for nesting raptors were completed in these areas throughout the region of influence (Greystone 2000b). No active raptor nests were located. Surveys along the Big Sandy River were completed when trees were leafed out, and any existing nests may have been missed. Four red-tailed hawks were observed soaring over the proposed power plant site, and two sharp-shinned hawks and one Cooper's hawk were sighted in mesquite bosque areas during the raptor surveys. A golden eagle was sighted at the northern end of Hackberry Road during a separate site reconnaissance.

Other Birds

Birds common to the Sonoran desertscrub, semi-desert grassland, and Great Basin conifer woodland habitats found in the region of influence include the verdin, cactus wren, curve-billed thrasher, black-tailed gnatcatcher, and Gambel's quail. Riparian areas along the Big Sandy River provide nesting habitat and migratory corridors for neotropical migratory birds. Several obligate riparian species such as summer tanager, yellow-breasted chat and Arizona Bell's vireo have been sighted in the region of influence (Smith, personal communication, 2001). Bird species observed in the region of influence and additional species that may occur in the region of influence are listed in Table 3.13-7.

3.13.2 Environmental Consequences

This section considers potential Project impacts on specific species as well as impacts on all classes of wildlife except threatened and endangered, proposed, and otherwise sensitive species, which are addressed in Section 3.14.2.4.

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3.13.2.1 Identification of Issues

The following issues were identified to guide impact assessment relating to fisheries and wildlife:

- impacts on raptors and raptor nesting activities
- impacts on aquatic and riparian habitats that could affect wildlife
- impacts on habitat for obligate and facultative riparian species
- exposure of wildlife to brine in evaporation ponds
- indirect impacts from employees associated with power plant construction and operation
- disturbance to known wildlife movement corridors
- habitat fragmentation

3.13.2.2 Significance Criteria

The effects of the Proposed Action and alternative pipeline route would be considered significant if any of the following were to occur:

- unpermitted violation of any protection provision of statutes and regulations pertaining to fish and wildlife
- substantial reduction in breeding opportunities for birds
- nest loss by one pair of common black-hawk, zone-tailed hawk, ferruginous hawk, Swainson's hawk, or golden eagle; or nest loss by two or more pairs of any other raptor species
- any unmitigated loss of aquatic habitat greater than 0.5 acre or long-term adverse effects on native fish species
- any physical barrier that permanently prevents movement within the Big Sandy River, Sycamore Creek, or Carrow-Stephens Ranches ACEC movement corridors

TABLE 3.13-7
BIRD SPECIES THAT MAY OCCUR IN THE PROJECT AREA

Common Name	Scientific Name	Season of Occurrence
Abert's towhee	*Pipilo aberti*	R
American crow	*Corvus brachyrynchos*	R
American goldfinch	*Carduelis tristis*	W
American kestrel	*Falco sparverius*	R
American pipit	*Anthus rubescens*	W
American robin	*Turdus migratorius*	W
Anna's hummingbird	*Calypte anna*	R
Ash-throated flycatcher	*Myiarchus cinerascens*	S
Bald eagle	*Haliaeetus leucocephalus*	W
Barn owl	*Tyto alba*	R
Bell's vireo	*Vireo bellii*	S
Bendire's thrasher	*Toxostoma bendirei*	S
Bendire's thrasher	*Toxostoma bendirei*	S
Bewick's wren	*Thryomanes bewickii*	R
Black phoebe	*Sayornis nigricans*	R
Black-chinned hummingbird	*Archilocus alexandri*	S
Black-chinned sparrow	*Spizella atrogularus*	W
Black-crowned night heron	*Nycticorax nycticorax*	R
Black-headed grosbeak	*Pheuticus melanocephalus*	S

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TABLE 3.13-7 BIRD SPECIES THAT MAY OCCUR IN THE PROJECT AREA		
Common Name	**Scientific Name**	**Season of Occurrence**
Black-tailed gnatcatcher	*Polioptila melanura*	R
Black-throated sparrow	*Amphispiza bilineata*	R
Blue grosbeak	*Guiraca caerulea*	S
Blue-gray gnatcatcher	*Polioptila caerulea*	W
Brewer's blackbird	*Euphagus cyanocephalus*	W
Brewer's sparrow	*Spizella breweri*	W
Brown creeper	*Certhia americana*	R
Brown-crested flycatcher	*Myiarchus tyrannulus*	S
Brown-headed cowbird	*Molothrus ater*	R
Bullock's oriole	*Icterus bullockii*	S
Burrowing owl	*Athene cunicularia*	R
Cactus wren	*Campylorynchus brunneicapillus*	R
Canada goose	*Branta canadensis*	W
Canyon towhee	*Pipilo fuscus*	R
Canyon wren	*Catherpes mexicanus*	R
Cassin's kingbird	*Tyrannus vociferans*	S
Cedar waxwing	*Bombycilla cedrorum*	W
Chipping sparrow	*Spizella passerina*	W
Cliff swallow	*Petrochelidon pyrrhonota*	S
Common black hawk	*Buteogallus anthracinus*	S
Common nighthawk	*Cordeiles minor*	S
Common poorwill	*Phalaenoptilus nuttallii*	S
Common raven	*Corvus corax*	R
Common yellowthroat	*Geothlypis trichas*	S
Cooper's hawk	*Accipiter cooperii*	R
Costa's hummingbird	*Calypte costae*	S
Crissal thrasher	*Toxostoma crissale*	R
Curve-billed thrasher	*Toxostoma curvirostre*	R
Dark-eyed junco	*Junco hyemalis*	W
Elf owl	*Micrathene whitneyi*	S
European starling	*Sturnus vulgaris*	R
Ferruginous hawk	*Buteo regalis*	R
Fox sparrow	*Passerella iliaca*	W
Gambel's quail	*Callipepla gambellii*	R
Gila woodpecker	*Melanerpes uropygialis*	R
Golden eagle	*Aquila chrysaetos*	R
Gray vireo	*Vireo vicinior*	S
Great blue heron	*Ardea herodias*	W
Great horned owl	*Bubo virginianus*	R
Greater roadrunner	*Geococcyx californianus*	R
Great-tailed grackle	*Quiscalus mexicanus*	R
Green heron	*Butorides virescens*	R
Green-tailed towhee	*Pipilo chlorurus*	W
Hermit thrush	*Catharus guttatus*	W
Hooded oriole	*Icterus cucullatus*	S
Horned lark	*Eremophila alp estris*	R
House finch	*Carpodacus mexicanus*	R
House sparrow	*Passer domesticus*	R
House wren	*Troglodytes aedon*	R

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TABLE 3.13-7 BIRD SPECIES THAT MAY OCCUR IN THE PROJECT AREA		
Common Name	**Scientific Name**	**Season of Occurrence**
Inca dove	*Columbina inca*	R
Killdeer	*Charadius vociferous*	R
Ladder-backed woodpecker	*Picoides scalaris*	R
Lark bunting	*Calamospita melanocorys*	W
Lark sparrow	*Chondestes grammacus*	R
Lazuli bunting	*Passerina amoena*	S
Lesser goldfinch	*Carduelis psaltria*	R
Lesser nighthawk	*Cordeiles acutipennis*	S
Lincoln's sparrow	*Melospiza lincolnii*	W
Loggerhead shrike	*Lanius ludovicianus*	R
Lucy's warbler	*Vermivora luciae*	S
Mallard	*Anas platyrhynchos*	W
Merlin	*Falco columbarius*	W
Mountain bluebird	*Sialia currucoides*	W
Mourning dove	*Zenaida macroura*	R
Northern cardinal	*Cardinalis cardinalis*	R
Northern flicker	*Colaptes auratus*	R
Northern harrier	*Circus cyaneus*	W
Northern mockingbird	*Mimus polyglottos*	R
Northern rough-winged swallow	*Stelgidopteryx serripennis*	S
Orange-crowned warbler	*Vermivora celata*	W
Osprey	*Pandion haliaetus*	W
Peregrine falcon	*Falco peregrinus*	R
Phainopepla	*Phainopepla nitens*	R
Prairie falcon	*Falco mexicanus*	R
Red-tailed hawk	*Buteo jamaicensis*	R
Red-winged blackbird	*Agelaius phoeniceus*	R
Rock dove	*Columba livia*	R
Rock wren	*Salpinctes obsoletus*	R
Rough-legged hawk	*Buteo lagopus*	W
Ruby-crowned kinglet	*Regulus calendula*	W
Rufous-crowned sparrow	*Aimophila ruficeps*	R
Sage sparrow	*Amphispiza belli*	W
Sage thrasher	*Oreoscoptes montanus*	W
Savannah sparrow	*Passerella sandwichensis*	W
Say's phoebe	*Sayornis saya*	R
Scott's oriole	*Icterus parisorum*	S
Scrub jay	*Aphelocoma californica*	R
Sharp-shinned hawk	*Accipiter striatus*	R
Snowy egret	*Egretta thula*	R
Song sparrow	*Melospiza melodia*	R
Southwestern willow flycatcher	*Empidonax traillii extimus*	S
Spotted sandpiper	*Actitus macularia*	W
Spotted towhee	*Pipilo maculatus*	W
Summer tanager	*Piranga rubra*	S
Swainson's hawk	*Buteo swainsoni*	S
Townsend's solitaire	*Myadestes townsendi*	W
Turkey vulture	*Cathartes aura*	R
Verdin	*Auriparus flaviceps*	R

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TABLE 3.13-7 BIRD SPECIES THAT MAY OCCUR IN THE PROJECT AREA		
Common Name	**Scientific Name**	**Season of Occurrence**
Vermillion flycatcher	*Pyrocephalus rubinus*	R
Vesper sparrow	*Pooecetes gramineus*	W
Violet-green swallow	*Tachycineta thalissina*	S
Virginia's warbler	*Vermivora virginiae*	S
Western bluebird	*Sialia mexicana*	W
Western kingbird	*Tyrannus verticalis*	S
Western meadowlark	*Sturnella neglecta*	R
Western screech-owl	*Otus kennicottii*	R
Western tanager	*Piranga ludoviciana*	S
Western wood pewe	*Contopus sordidulus*	S
White-crowned sparrow	*Zonotrichia leucophrys*	W
White-faced ibis	*Plegadis chihi*	S
White-throated swift	*Aeronautes saxatalis*	R
White-winged dove	*Zenaida asiatica*	S
Yellow warbler	*Dendroica petechia*	S
Yellow-billed cuckoo	*Coccyzus americanus*	S
Yellow-breasted chat	*Icteria virens*	S
Yellow-rumped warbler	*Dendroica coronata*	W
Zone-tailed hawk	*Buteo albonotatus*	S
Season of occurrence: R=resident W=winter S=summer		

- concentrations known to be toxic of brine or chemical constituents in the evaporation ponds, and time of exposure long enough to cause adverse effects on wildlife

3.13.2.3 Impact Assessment Methods

Biologists from EPG completed a reconnaissance survey of the proposed power plant site on November 27 and 28, 2000. The survey included both vehicular and pedestrian surveys of the region of influence. EPG completed a second reconnaissance survey of the plant site and pipeline corridors on March 29 and 30, 2001. Between May and August 2000, field inventories for wildlife species were conducted concurrently with surveys for nesting raptors, yellow-billed cuckoos, southwestern willow flycatchers, vegetation, and fish (Greystone 2000b). Lists of species expected to occur in the region of influence were compiled based on these surveys and a background literature search (Tables 3.13-5, 3.13-6, and 3.13-7).

Based on this knowledge of the region of influence and on the Project description, potential impacts on fish and wildlife species were determined.

3.13.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The following surveys (refer to Section 2.2.8) have been incorporated into the Proposed Action and committed to by Caithness (refer to Appendix C):

- The Proposed Action contains measures designed to monitor groundwater levels and provide water to augment shallow groundwater and surface water flows in the Big Sandy River sufficient to prevent changes to these hydrologic systems which may otherwise occur as a result of the Project. Therefore, no changes to shallow groundwater levels or surface water flows in the Big Sandy River are predicted as a result of the Project.

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- Pre- construction surveys for breeding raptors would be completed prior to ground disturbance activities.

> **_Protection of Migratory Birds_**
>
> The United States has ratified international conventions with Canada, Mexico, Japan, and Russia regarding the protection of migratory birds. The Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703-711) implements the protective measures of these conventions. The MBTA prohibits "taking," which is the killing, possession, or transport of any migratory bird or their eggs, parts, or nests except as authorized by a valid permit. These actions may be permitted only for educational, scientific, and recreational purposes, and harvest is limited to levels that prevent overutilization. Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, was issued in January 2001 and emphasizes that Federal actions are subject to the MBTA and directs Federal agencies to evaluate the effects of agency actions in NEPA documents like this Draft EIS.
>
> Permits can be issued by U.S. Fish and Wildlife Service (USFWS) under the MBTA for the intentional take of specific birds and nests that have been identified prior to application for the permit. However, unlike the Endangered Species Act, no permits can be issued for take that is incidental to the action being taken. All bird species likely to be found in the Project region of influence, with the exception of house sparrow, European starling, and rock dove, are protected under the MBTA. Any incidental take (e.g., if birds, nestlings, or eggs are destroyed during construction activities) of these protected species would constitute a violation of the MBTA.

3.13.2.5 Impact Assessment

Proposed Action

<u>Proposed Power Plant Site and Access Road</u>

Construction Impacts – The only aquatic resource in the vicinity of the proposed power plant site is the small wetland in the southwest corner of Section 5, T15N, R12W. The proposed layout for the power plant, substation, and access road is designed to avoid any direct impacts on this wetland.

There are no large trees at the proposed power plant site that would support nests of large raptor species such as the zone-tailed hawk, common black-hawk, ferruginous hawk, or golden eagle. Saguaros present on the site may support nests of the red-tailed hawk, Swainson's hawk, American kestrel, elf owl, and western screech owl.

If a saguaro with an active raptor nest is removed during construction activities, loss of the nest would result. Construction activities in close proximity to an active raptor nest also may result in nest failure. Loss of one Swainson's hawk nest or two or more nests of any other raptor species would be considered a significant impact.

Direct mortality of fossorial mammals and reptiles may occur during construction of the proposed power plant and access road. Construction activities may also interrupt foraging and breeding activities of birds and other animals in proximity to the construction site. These impacts on breeding birds would not be significant because the disturbed habitat is extensive in Arizona and removal of these lands would not result in a substantial reduction of the breeding opportunities for birds on a regional level.

If vegetation at the proposed plant site and along the proposed access road is cleared during the nesting seasons of migratory birds, loss of nests and eggs and mortality of nestlings may occur. Because this would not result in any substantial reduction in breeding opportunities for birds, no significant biological impacts are anticipated. However, losses would violate the Migratory Bird Treaty Act unless permits are obtained from the USFWS prior to construction. These losses without a permit would be considered significant.

The volume of traffic along the proposed access road would be high during construction of the

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power plant and may result in mortality of some small mammals and reptiles attempting to cross the road. Construction of the access road and increased traffic may temporarily interrupt the movement of large mammals during construction hours.

Operational Impacts – The only aquatic resource in the vicinity of the proposed power plant site is a small wetland in the southwest corner of Section 5, T15N, R12W. Indirect operational impacts to this aquatic habitat from erosion or sedimentation are not expected because drainage control measures are part of the Proposed Action. Failure of a dike at the evaporation ponds could release concentrated brine into the natural drainage network. However, measures are incorporated into the Proposed Action to avoid this release, and this potential discharge would enter the drainage downstream from the aquatic habitat and perennial flow from this spring. Thus, there would be no direct impact to the aquatic habitat. No long-term impacts are expected for this aquatic habitat.

Because the Proposed Action contains measures to augment shallow groundwater and surface water, groundwater withdrawal for cooling water at the proposed power plant and for agricultural purposes is not likely to impact aquatic resources or wildlife. No habitat for obligate or facultative riparian wildlife would likely be lost, and groundwater pumping would not likely cause adverse impacts on wildlife. Also, there would not likely be long-term impacts on these aquatic resources, nor on any vegetation that depends on surface water.

Traffic to and from the proposed power plant site and noise from operation of the generating facility would result in minor increased daily disturbance to terrestrial wildlife. Where the access road crosses Sycamore Creek a concrete box culvert would be constructed of 10 individual boxes each having a dimension of 8 by 12 by 58 feet. The adjacent boxes would be placed parallel to the stream flow, and at a 60-degree angle to the road, as described in Section 2.2.4. The roadway would be directly on top of the culvert, and the sides would be graded to a 25 percent slope. Although large mammals may be reluctant to cross under the roadway through the culvert, the height, width, and grade of the box culvert should allow for big game and other wildlife movement. There are no plans to fence the roadway, which would otherwise present an impediment to wildlife movement. Because this crossing does not present a physical barrier that prevents wildlife movement, these impacts would not be significant.

Evaporation ponds occupying 18 acres would be established as part of the proposed Project to accommodate wastewater. These evaporation ponds could provide a place where transient, migratory, or wintering waterbirds such as herons, ducks, and shorebirds could feed and rest. Waterbirds would be attracted to the ponds by standing water and by food items such as brine shrimp that may become established in the ponds.

A literature search pertaining to evaporation (brine) ponds at power generation facilities and the potential for wildlife impacts was completed using Cambridge Scientific Abstracts, an internet search tool that provides access to more than 70 databases covering the scientific and technical research literature.

Most recently, Tanner et al. (1999) published a study of the algae, invertebrates, and chemistry of two large, hypersaline, industrial wastewater ponds near Phoenix, Arizona (Tanner et al. 1999). Negative impacts associated with waterbird use of selenium-contaminated evaporation ponds are generally reported for birds that feed and reside at these evaporation ponds for the duration of the breeding season (Adams et al. 1998; Lemly 1997; Robinson and Oring 1996). The presence of a vegetated or barren mud shoreline, shallow wading habitat, and vegetation in deeper water are key factors that attract wildlife, particularly waterbirds, to reside through the breeding season at evaporation ponds (Byron et al. 1999). The absence of attractive habitat for breeding

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waterbirds and other wildlife, including bats, can minimize exposure and preclude impacts, even when water and dietary selenium concentrations exceed chronic threshold concentrations (Byron et al,. 1999). If chronic toxicity levels of any constituent are reached in the evaporation ponds for this Project and wildlife are attached have access to the ponds, impacts would be considered significant.

Because the evaporation ponds would be adjacent to the existing Mead-Phoenix Project and Mead-Liberty transmission lines, birds moving toward the evaporation ponds to land may strike the existing power lines to the east of the proposed evaporation ponds. These collisions may result in mortality or injury of birds. Because few collisions are likely, this would not likely lead to substantial reductions in breeding opportunities for birds, and no significant biological impacts are anticipated. Any losses would violate the Migratory Bird Treaty Act, unless permits are obtained from USFWS prior to construction. These losses without a permit would be considered significant.

Because the operation of the proposed power plant and access road would not significantly degrade surface water quality in the Big Sandy River downstream watercourses (refer to Section 3.5.2.5), there would be no significant impacts on aquatic resources from these operations.

Agricultural Area

Construction Impacts – There are no aquatic resources in the proposed agricultural area.

Direct mortality of fossorial mammals and reptiles may occur during removal of native vegetation in the proposed agricultural area. Construction activities may interrupt foraging and breeding activities of birds and other animals in proximity to the agricultural area. These impacts on breeding birds would not be significant because the disturbed habitat is extensive in Arizona and removal of these lands would not result in a substantial reduction to the breeding opportunities for birds on a regional level.

If clearing of vegetation takes place during the nesting seasons of migratory birds, loss of nests and eggs and mortality of nestlings may occur. Because this would not result in any substantial reduction in breeding opportunities for birds, no significant biological impacts are anticipated. However, these losses would violate the Migratory Bird Treaty Act unless permits are obtained from the USFWS prior to construction. These losses without a permit would be considered significant.

If saguaros that contain active raptor nests are removed from the agricultural site, loss of the nest would occur. Nesting raptors may also be affected by human activity near their nests during breeding season, and disturbances in the vicinity of the nest may result in nest failure. Raptor species that might nest on the proposed agricultural site include the red-tailed hawk, Swainson's hawk, elf owl, western screech owl, and American kestrel. If one Swainson's hawk nest or two nests of any other raptor species are lost, these impacts would be considered significant.

Removal of natural vegetation from the proposed agricultural area would result in the permanent loss of breeding and foraging areas for species that use Arizona Upland vegetation. The area that would be occupied by the agricultural land represents a very small percentage of all Arizona Upland habitat.

Operational Impacts –Agricultural activities would include the use of pesticides and herbicides, which could have toxic effects on wildlife using the agricultural area, particularly on insectivorous birds. However, because the Proposed Action contains measures to minimize the application of agricultural chemicals, no significant biological impacts are anticipated. Any losses of migratory birds would violate the Migratory Bird Treaty Act unless permits are obtained from the USFWS prior to construction.

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Communication Facilities

The OPGW would cross the Big Sandy River north of Wikieup, upstream from the perennial reach of the river. There is no aquatic habitat associated with the proposed route for the OPGW, and there would be no impact to aquatic habitats.

Although the OPGW option would be installed on existing structures, about 5 acres within the existing right-of-way would be disturbed for pulling and tensioning sites. Construction activities associated with the installation of the OPGW may result in direct mortality of fossorial mammals and reptiles and may interrupt breeding and foraging activities of birds and other animals in the vicinity. These impacts on breeding birds would not be considered significant because the disturbed habitat is extensive in Arizona and removal of these lands would not result in a substantial reduction in breeding opportunities for birds on a regional level.

If construction takes place during the nesting seasons of migratory birds, loss of nests and eggs and mortality of nestlings may occur. Because this would not result in any substantial reduction in breeding opportunities for birds, no significant biological impacts are anticipated. However, losses would violate the Migratory Bird Treaty Act, unless permits are obtained from the USFWS prior to construction. These losses without a permit would be considered significant.

Large raptors such as red-tailed hawks, Swainson's hawks, ferruginous hawks, and golden eagles may nest on the transmission line towers. Construction activities in close proximity to an active nest may result in nest failure. Loss of one Swainson's hawk, ferruginous hawk, or golden eagle nest, or two red-tailed hawk nests would be a significant impact.

The OPGW system would not pose any long-term operation impacts on wildlife.

The primary communication system includes installation of microwave dishes. Since the microwave dishes would be installed on existing towers, no impact on wildlife or wildlife habitat would occur.

Proposed Gas Pipeline Corridor

Construction Impacts – The only direct impacts to the aquatic habitats on the Big Sandy River would be related to construction activities adjacent to the US 93 bridge over the Big Sandy River (corridor segment R5). If the natural gas pipeline is constructed by trenching, installation, and backfill, there would be temporary impacts related to substrate disturbance on the aquatic habitat associated with the river and the riparian area. Assuming a 50-foot wide construction zone and a length of impact of approximately 150 feet across the aquatic habitat, the area of temporary impact would be 7,500 square feet (0.17 acres). Potential indirect impacts include downstream erosion, sedimentation and increased turbidity related to construction activities. Fluid spills from construction equipment could also impact this aquatic habitat and downstream portions of the Big Sandy River. Since appropriate control measures, as described in Section 2.2.8.2, would be implemented, the impacts to this habitat would not be significant.

If the pipeline is installed under the Big Sandy River by directional drilling, there would be no construction impacts on these aquatic habitats.

Direct mortality of fossorial mammals and reptiles may occur during construction of all corridor segments of the natural gas pipeline. Mortality of small mammals and reptiles also may occur as a result of those animals falling into the pipeline trench and being unable to escape. Construction activities may interrupt foraging and breeding activities of birds and other animals in proximity to the pipeline. These impacts on breeding birds would not be considered significant because the disturbed habitat is extensive in Arizona and removal of these lands would not result in a substantial reduction in the breeding opportunities for birds

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on a regional level. The trench for the pipeline would be 28 inches wide, which is small enough for wide-ranging mammals such as deer or coyotes to cross easily, and habitat fragmentation would not be an issue.

If vegetation along the pipeline alignment is cleared during the nesting seasons of migratory birds, loss of nests and eggs and mortality of nestlings may occur.Because this would not result in any substantial reduction in breeding opportunities for birds, no significant biological impacts are anticipated. However, these losses would violate the Migratory Bird Treaty Act, unless permits are obtained from the USFWS prior to construction.

If construction of the pipeline results in the removal of large trees or saguaros that contain active raptor nests, loss of the nest would occur. Nesting raptors also may be affected by human activity near their nests during the breeding season, and disturbances in the vicinity of the nest may result in failure of the nest. If one black-hawk, zone-tailed hawk, ferruginous hawk, Swainson's hawk, or golden eagle nest, or two nests of any other raptor species are lost, these impacts would be considered significant.

No access path would be maintained across the aquatic habitat in the Big Sandy River. There would be no impacts on this habitat related to operation of the proposed Project.

Although all disturbed portions of the pipeline would be revegetated and/or reseeded, full recovery of plant communities following disturbance can be very slow (refer to Section 3.11). Because there would a permanently disturbed access road and because recovery of vegetation could be slow, the pipeline route may not offer optimal foraging, sheltering, or nesting habitat to local wildlife. This would be a long-term adverse impact but would not be considered significant because they would not result in substantial reduction in breeding opportunities for birds nor present a physical barrier to wildlife movement.

The pipeline would be inspected on a regular basis. Routine monitoring of the pipeline would be completed by vehicle on the 10-foot-wide two-track. In sensitive areas such as riparian areas and ACECs, monitoring would be completed on foot. Monitoring by vehicle may result in the direct mortality of small mammals and reptiles. Because the pipeline trench would be backfilled after completion of the pipeline, construction of the pipeline along the proposed route would not create any permanent physical barriers to wildlife movement in the Sycamore Creek (corridor segment R5), Big Sandy (corridor segment R5), or Carrow-Stephens (corridor segment T4) movement corridors.

Alternative R Gas Pipeline Corridor

Construction Impacts – Impacts to aquatic habitats in corridor segment R5 would be the same as the Proposed Action.

Short-term impacts to mammals, raptors, other birds, and reptiles along all segments of the Alternative R gas pipeline corridor would be the same as the Proposed Action.

Operational Impacts –In the Carrow-Stephens ACEC (corridor segment R4) wildlife movement corridor, future construction on US 93 may move the road several hundred feet to the west. If the gas pipeline were built in fill for the existing highway alignment, it could interfere with restoration of the wildlife movement corridor after the highway is moved. This interference could be a significant impact on wildlife use of this corridor.

Other operational impacts would be the same as those discussed for the proposed gas pipeline corridor.

Alternative T Gas Pipeline Corridor

Construction Impacts –There is no perennial flow in the Big Sandy River at the Alternative T pipeline crossing (corridor segment T5), and there would be no impact to aquatic habitat. Short-term impacts to other mammals, raptors,

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other birds, and reptiles would be the same as the Proposed Action.

Operational Impacts –Impacts on wildlife would be the same as the Proposed Action

Crossover Segment C2

Construction Impacts – There are no aquatic resources in corridor segment C2. Impacts on mammals, reptiles, raptors, and other birds as the result of pipeline construction in corridor segment C2 would be the same as the Proposed Action.

Operational Impacts – There are no aquatic resources in crossover segment C2. Impacts on wildlife would be the same as the Proposed Action.

No-Action Alternative

There would be no disturbances on aquatic or terrestrial wildlife. The access roads and well pads constructed on private lands, to serve the wells used to identify and test the lower aquifer, would remain.

3.13.2.6 Mitigation and Residual Impacts

If adopted, the following measures would be implemented to avoid or reduce significant impacts:

- If active raptor nests are located on the plant site during construction, construction would be postponed until young have fledged from the nest to avoid impacts on these species. If active raptor nests are located along the pipeline alignment during construction, and the nest structure would be removed by construction, the pipeline alignment would be adjusted within the pipeline corridor to avoid removal of the nest. If the nest can be avoided but the birds are disturbed by nearby construction activities, significant impacts would be avoided by postponing construction until young have fledged from the nest. If active raptor nests are located on transmission line towers where the OPGW would be installed, loss of these nests would be avoided by postponing installation of the wire until after young have fledged from the nest.

- To avoid the loss of active nests of migratory birds or the substantial reduction of breeding opportunities for birds, all surface-disturbing activities would be completed outside of the applicable nesting season. If construction cannot be scheduled outside of the breeding season, pre-construction surveys for nesting migratory birds would be completed for all areas where ground disturbance is expected during the breeding season. The location and species of each active nest could be recorded. Caithness would then apply to the USFWS for a depredation permit for all known nests of migratory birds.

- The area around the evaporation ponds and transmission lines would be monitored for bird mortalities, and the location, date, species, and probable cause of death would be recorded for each carcass found. Methods to prevent bird impacts with transmission lines, such as increasing the visibility of the transmission lines to birds by using colored or reflective tags or colored insulating sleeves, would be implemented if collisions are identified as a substantial cause of mortality.

- Impacts on the Carrow-Stephens Ranches ACEC wildlife movement corridor in corridor segment R4 would be avoided by designing the gas pipeline to avoid placement in fill where the existing highway alignment crosses ephemeral stream channels. When the highway is moved, the pipeline would not remain in fill above drainage bottoms as a barrier to wildlife movement.

If adopted, the following measures would be implemented to minimize adverse impacts not considered to be significant:

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- To minimize the attractiveness of the evaporation ponds to birds, the ponds would be designed to minimize the creation of vegetated or barren mud shorelines, shallow wading habitat, and vegetation in deeper water.

- Water chemistry of the evaporation ponds, including concentrations of potentially toxic constituents (arsenic and selenium), would be monitored. If concentrations of any constituents approach levels known to be chronically toxic to wildlife, the sampling frequency would be increased to at least quarterly. At least weekly observations of bird use of the evaporation ponds would be recorded. The area around the evaporation ponds would be monitored for wildlife mortalities, and the location, date, species, and probably cause of death would be recorded for each carcass found.

- If the concentrations of any constituents of the evaporation ponds reach levels known to be toxic, and the number of birds using the evaporation ponds for extended periods is high or substantial wildlife mortalities are recorded, then Caithness would implement measures to reduce pond toxicity (such as removing toxic sediments or concentrated brine) or reduce or exclude wildlife (such as construction additional fences or using distractive devices).

- Plugs of soil would be left approximately every 0.25 mile during trenching of the gas pipeline, allowing small mammals and reptiles that fall into the trench a chance to escape.

3.14 THREATENED, ENDANGERED, PROPOSED, AND OTHER SPECIAL STATUS SPECIES

This section describes the affected environment and environmental consequences relating to threatened and endangered species. This section also addresses species that are proposed for threatened or endangered status, as well as other special status species.

3.14.1 Affected Environment

The following sections describe the current threatened, endangered, and special status species. This information provides a baseline for assessment of impacts and environmental consequences.

Threatened and Endangered Species—Impacts on threatened and endangered species proposed and listed under the Endangered Species Act (ESA) of 1973, as amended, that could occur within the vicinity of the Project are addressed here. Listed species with the potential to occur in the region of influence include southwestern willow flycatcher, bald eagle, Yuma clapper rail, and Arizona cliffrose.

Other Special Status Species—There are additional species that are considered BLM sensitive species and/or species of special concern in Arizona and one species, the mountain plover, which is proposed to be listed as threatened by the U.S. Fish and Wildlife Service (USFWS).

Federal Consultation

Impacts on species listed under the ESA are addressed through consultations by Federal agencies with the U.S. Fish and Wildlife Service (USFWS), as specified in Section 7 of the ESA. Consultations begin informally when a Federal agency requests a list of species listed under the ESA. If a listed species exists in the Project area, a biological assessment (BA) is prepared. The initial determination of effect is made by the lead agency (50 CFR Part 420). If the BA determines that the Proposed Action may adversely affect a listed species or its habitat, then the Federal agency must enter formal consultation with the USFWS. USFWS would then prepare a biological opinion (BO) that determines whether or not the Project will adversely affect listed species or critical habitat. The process of formal consultation with the USFWS ensures that Federal actions conserve listed species and their critical habitat. The BO is based on information provided in the BA, but the BO may concur with or dispute the determination of impact.

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A meeting including representatives of USFWS, BLM, and Western was held in Phoenix on August 31, 2000, to initiate informal consultation and preparation of a Biological Assessment (BA) for the Big Sandy Energy Project, and a follow-up meeting was held on March 22, 2001. A BA is currently being drafted, and will be submitted to USFWS soon after publication of this Draft EIS. After submission of the BA, this process is expected to move into formal consultation because of the potential for adverse impacts on endangered species. The USFWS would then prepare a Biological Opinion (BO) that determines whether or not the Project would adversely affect listed species or critical habitat. The results of the BO are expected to be available before issuance of the Final EIS and incorporated therein.

Because the mountain plover is proposed to be Federally listed, it is afforded some protection under the ESA. Some species considered by BLM to be sensitive are those that were once listed as "candidate" species under the ESA. In some cases (e.g., Sonoran desert tortoise), the BLM may require pre-construction surveys for sensitive species on BLM lands before issuing permits. The Arizona Game and Fish Department (AGFD) maintains a list of species of special concern in Arizona. Arizona Revised Statutes (ARS) Section 17-231 gives authority to the Arizona Game and Fish Commission (AGFC) to establish policies and programs for management, preservation, and harvest of wildlife. In addition, ARS Section 17-231 allows AGFC to adopt rules and orders for the protection of wildlife.

3.14.1.1 Region of Influence

Southwestern Willow Flycatcher

The region of influence for the analysis of impacts to the southwestern willow flycatcher is the suitable and potential habitat for the flycatcher found in riparian areas associated with perennial or intermittent water along the Big Sandy River. Suitable and potential habitat is found in corridor segment R5.

> ***About the Southwestern Willow Flycatcher***
>
> The southwestern willow flycatcher is a small bird that breeds in the southwestern United States (California, Nevada, Arizona, New Mexico, Colorado, Utah, and Texas) in the spring and early summer and spends the remaining two-thirds of the year in the semi-tropical areas of Central and South America. It is a grayish, olive green bird about 5.75 inches tall with few distinguishing characteristics. It hunts for insects in "riparian" habitat, which generally is composed of dense shrub and tree vegetation along rivers, streams, and other wetland areas. The southwestern willow flycatcher breeds in dense riparian habitats from sea level in California to nearly 8,000 feet in Arizona and southwestern Colorado. Declining southwestern willow flycatcher numbers have been attributed to the loss, modification, and fragmentation of riparian breeding habitat; the loss of wintering habitat in Central and South America; and brood parasitism by the brown-headed cowbird. Habitat loss and degradation are caused by a variety of factors, including urban, recreational, and agricultural development; water diversion and groundwater pumping; channelization; dams; and livestock grazing. Fire is an increasing threat to flycatcher habitat, especially in dense saltcedar vegetation and where water diversion and/or groundwater pumping has dried the riparian vegetation. Flycatchers depend on vigorous, dense plant growth along flowing streams. This plant growth provides critical forage and cover for wildlife and is valued by people for recreational purposes. Plants and trees in these areas depend on high groundwater tables, periodic flooding, and wide floodplains. These perennial waters are limited in the arid Southwest. The dramatic decline of flycatchers throughout their range is a reminder of the fragile condition of our riparian ecosystems.

Bald Eagle

The region of influence for analysis of impacts to the bald eagle includes the Big Sandy River from I-40 to Alamo Lake, approximately 25 miles south of Wikieup, and the proposed activities within Section 5. Suitable habitat for the bald eagle is present in riparian areas

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associated with perennial water along the Big Sandy River and Alamo Lake.

Yuma Clapper Rail

The region of influence for the Yuma clapper rail includes emergent wetlands along the Big Sandy River south of Wikieup.

Arizona Cliffrose

The region of influence for the Arizona cliffrose includes the area that would be impacted by construction from Interstate 40 south to a point on US 93 approximately 2.5 miles south of the US 93/Big Sandy River crossing.

Other Special Status Species

The region of influence for special status species would include the area that would be impacted by construction, operation, and maintenance of the Proposed Action. This area includes the proposed power plant site, substation, evaporation ponds, access road, either the proposed or alternative natural gas pipeline route, the agricultural development area, and the proposed OPGW route and microwave tower sites.

The region of influence for special status fisheries includes the entire length of the Big Sandy River. This river originates at the confluence of Knight Creek and Trout Creek and extends downstream 37.8 miles to Alamo Reservoir. The region of influence includes waters within the proposed Project area that could be directly impacted, as well as potentially affected areas downstream from the Project area. The upstream portion of the river was included for additional information.

3.14.1.2 Existing Conditions

Southwestern Willow Flycatcher

Southwestern willow flycatcher territories and nest sites usually are located near open water, cienegas, marshy seeps, or saturated soils (Sogge et al. 1997). These flycatchers normally select nest sites in thickets of shrubs and trees between four and seven meters in height, with dense foliage between ground level and four meters (USFWS 1995a). Occupied habitats always have dense vegetation in the patch interior, and dense patches often are interspersed with small clearings, open water, or areas of sparse shrubs.

Suitable and potential habitat for the southwestern willow flycatcher was identified in corridor segment R5 along perennial reaches of the Big Sandy River. Surveys for the flycatcher were conducted within a 2-mile stretch of the Big Sandy River, centered on the US 93 Bridge crossing the river. Surveys were completed in May, June, and July of 2000 using the USFWS survey protocol. Survey areas are located in Sections 1, 2, 11, and 12, T15N, R13W (Greystone 2000b). Seventy-seven southwestern willow flycatchers were detected during five separate surveys. Fifteen confirmed pairs occur within the survey areas (Figure 3.14-1) based upon hearing calls and observing the flycatchers and an estimated 22 to 28 territories. This may be one of the densest populations in Arizona.

Bald Eagle

In Arizona, bald eagles were reported in the 1800s and early 1900s to nest along rivers in the White Mountains and along the Salt and Verde rivers. Millsap (1981) reported bald eagles wintering on Alamo Lake, but intensive nest searches did not locate any nests in the Bill Williams drainage basin. Currently, bald eagles are known to nest along the Salt and Verde rivers and their tributaries upstream of the Salt and Verde confluence; along the Bill Williams River and its tributaries; on the Agua Fria River near Lake Pleasant; and on the Gila River near San Carlos Lake (Hunt et al. 1992).

Since Millsap (1981),four nest territories have been reported on the Bill Williams River or its tributaries (Hunt et al. 1992). The two nest territories on the Bill Williams River are located at Alamo Reservoir and approximately 2 miles

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downstream from the Alamo Dam. A third territory is located on the Big Sandy River, at the approximate high-water limit for the Alamo Reservoir. This territory is approximately 20 miles downstream from the US 93 bridge crossing the Big Sandy River. The fourth territory in this vicinity is on Burro Creek, approximately 28 miles upstream from its confluence with the Big Sandy River. This territory is approximately 23 miles southeast of the proposed power plant site, across the Aquarius Mountains. According to results of the 2001 mid-winter bald eagle surveys conducted by AGFD, the nest territories on the Big Sandy River and Burro Creek are currently unoccupied. The Big Sandy River nest territory is no longer on the list of breeding areas to be surveyed. However, the other two nest territories are active. There is a pair of breeding adults on Ive's Wash, downstream of Alamo Dam, and another breeding pair immediately north of Alamo Reservoir (Driscoll, personal communication, 2001).

Approximately 200 to 250 bald eagles winter in Arizona, primarily in the Flagstaff and Colorado River regions (AGFD 1996; Phillips et al. 1964). Wintering bald eagles began concentrating in the Glen and Grand Canyon portions of the Colorado River during the 1980s, after the completion of Glen Canyon Dam in 1963 enabled the non-native rainbow trout to colonize the main stem of the Colorado River (Brown et al. 1989). In most years there is an influx of bald eagles, most of which are immature, into the Lower Colorado River Valley in January or February. Some of these birds may be from the Arizona breeding population (Rosenberg et al. 1991). It is possible that migratory eagles could pass through the Big Sandy Valley. Bald eagles winter on the Big Sandy River and at Alamo Reservoir (Peck, personal communication, 2001).

Bald eagles are opportunistic feeders. Fish make up the majority of the diet for many bald eagles, and waterbirds also can be an important food source. Eagles also consume mammals, shellfish, and carrion (Hunt et al. 1992). Bald eagles forage from perches near water and will also steal prey from osprey, gulls, and other eagles.

Along the Salt and Verde river drainages in Arizona, fish are the most common prey item, followed by mammals (cottontail, jackrabbit, squirrel, and woodrat), waterfowl, and reptiles (Sonora mud turtles, spiny softshell turtles, and snakes). Eagles also have been observed foraging on frogs and crayfish (Grubb 1995). Potential prey items available in the Big Sandy River include common carp, green sunfish, black bullhead, yellow bullhead, and Sonora mud turtle (refer to Section 3.13.1.2). Other fish species in this area are too small to provide a significant food resource for eagles. Although the reach of the Big Sandy River at the US-93 bridge (in corridor segment R5) is perennial, the normal channel is relatively small, and this reach is unlikely to support many fish that are large enough to be potential prey items for eagles. Small mammals, waterfowl, and other reptiles also are available in the vicinity, but these species normally account for a very small proportion of an eagle's diet.

Yuma Clapper Rail

The Yuma clapper rail is a subspecies of clapper rail that breeds in freshwater marshes in the Salton Sea area of California, along the lower Colorado River, in the Colorado River Delta of Sonora and Baja California del Norte, on the Salt and Gila rivers upstream to the confluence with the Verde River, and at Picacho Reservoir (AGFD 1996; Todd 1986). The breeding range of the Yuma clapper rail is geographically isolated from those of all other subspecies of clapper rail. It is thought that the Yuma clapper rail was restricted to the Yuma area prior to 1940 but has since expanded its range. This range expansion is the result of river impoundments creating marsh habitat in places where it did not previously exist (Ohmart and Smith 1973; Rosenberg et al. 1991).

The Yuma clapper rail is dependent upon freshwater marshes that support dense woody or

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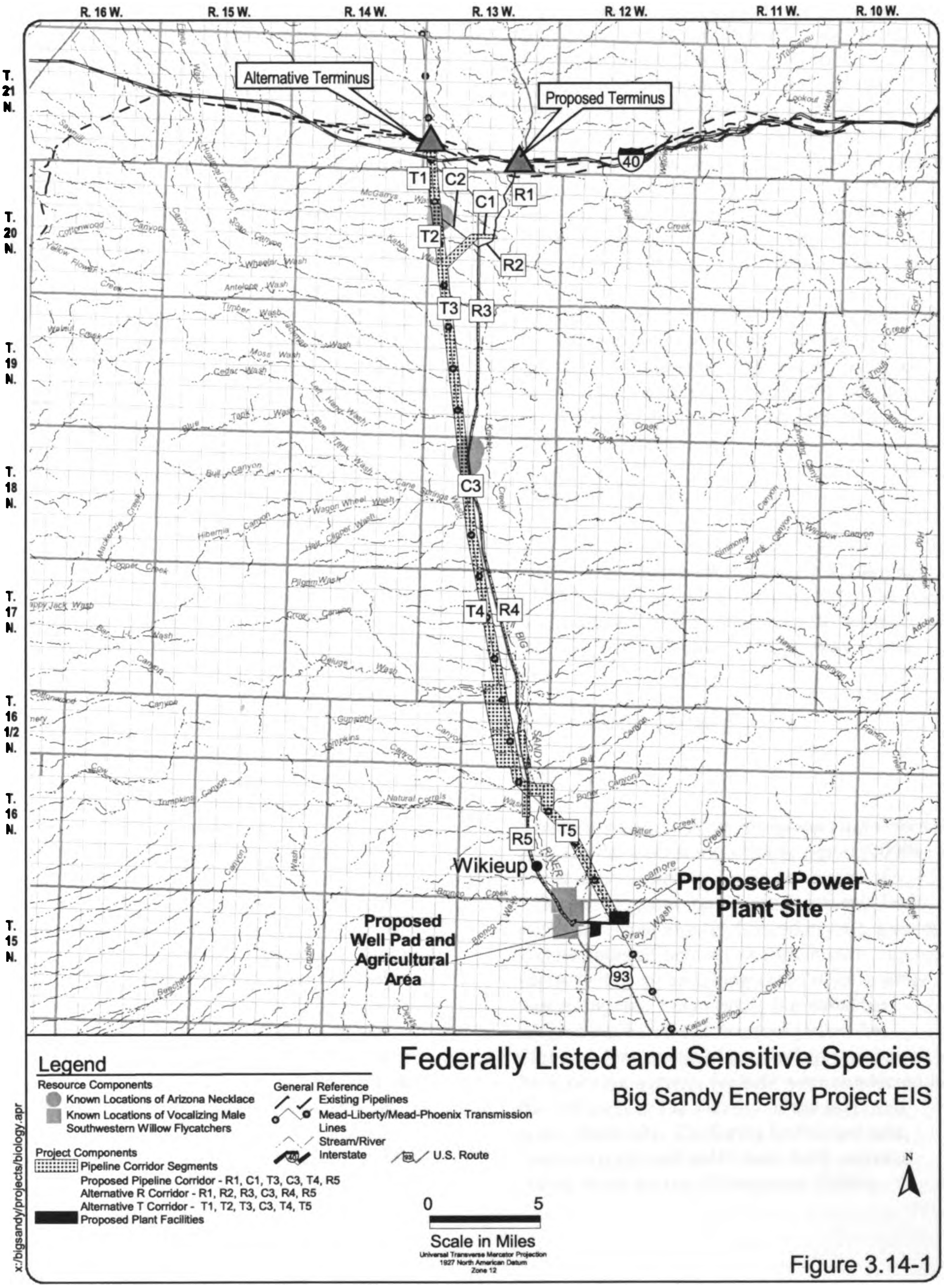

Federally Listed and Sensitive Species

Big Sandy Energy Project EIS

Figure 3.14-1

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herbaceous vegetation exceeding 16 inches in height (Todd 1986). Vegetation typical of clapper rail habitat includes patches of emergent plant species such as cattail and giant bulrush. Pond openings and flowing channels are also important, as are emergent soils. Water depth at preferred sites is 12 inches or less. The interface between water and soil is important, and rails use areas where the slope of the soil-to-water contact is relatively gentle.

Within the region of influence, emergent wetlands occur along perennial stretches of the Big Sandy River from corridor segment R5 downstream to Alamo Lake. Springs also could support emergent wetland vegetation; however, springs do not support large enough patches of emergent vegetation to provide habitat for the clapper rail. The emergent wetland near the proposed power plant site has some cattail and bulrush, but the area is too small to support clapper rails.

Yuma clapper rails on the Colorado River feed very heavily on introduced crayfish (Lower Colorado River Multi-Species Conservation Program 2001; New Mexico Game and Fish Department 2001). No crayfish are present in the perennial reach of the Big Sandy River near Wikieup. The lack of suitable prey species also makes this region unlikely to support a population of Yuma clapper rails.

Arizona Cliffrose

Arizona cliffrose was placed on the Federal endangered species list in 1984 and is known from four sites in Arizona. The species was first described by Kearney in 1943 and was originally known as *Cowania subintegra.* The type locality for this Arizona endemic is in the Burro Creek drainage approximately 12 miles southeast of the proposed power plant site, where there are three populations. This plant grows only on Tertiary limestone lakebed deposits and is restricted to the nutrient-poor calcareous soils found in these areas (USFWS 1995b).

Populations of Arizona cliffrose also have been found near Bylas, on the San Carlos Apache Reservation in Graham County, near Cottonwood in Yavapai County, and near Horseshoe Lake in Maricopa and Yavapai counties. There are no known populations of this species within the region of influence; however, there are two small Tertiary limestone lakebed deposits in the vicinity of the proposed power plant site along corridor segment T5, and it is possible that other small exposures may exist.

Possible threats to the Arizona cliffrose would include urbanization, mining, habitat decline due to overuse or browsing of plants by livestock and burros, road construction, off-road vehicle use, pesticide application, and inundation (USFWS 1995b).

Mountain Plover

The USFWS has proposed to list the mountain plover as threatened under the ESA. Mountain plovers breed in high-elevation shortgrass prairie in the Great Plains region. They do not breed in the region of influence, but they may winter there.

Other Special Status Species

Bats

The following sensitive bat species have been listed in the Greystone wildlife report (2000b) as potentially occurring within the region of influence: big free-tailed bat, California leaf-nosed bat, cave myotis, fringed myotis, greater western mastiff bat, occult little brown bat, small-footed myotis, long-eared myotis, long-legged myotis, Townsend's big-eared bat, Allen's big-eared bat, western yellow bat, Mexican long-tongued bat, and spotted bat. Mist-netting surveys for bats were conducted in the wetlands in the vicinity of the proposed power plant site. California leaf-nosed bats, Yuma myotis, and pallid bats were captured during these surveys (Greystone 2000b).

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A study conducted between 1959 and 1964 in Mohave County included extensive surveys of bat roost locations and mist netting of bats over water sources (Cockrum et al. 1996). Most of the field work for this study was conducted in the southern and southwestern parts of the county, with relatively little effort in the Big Sandy Valley. Based on the results of this study, at least ten species of bats were present in the region of influence of the Big Sandy Energy Project. These species are California leaf-nosed bat, Yuma myotis, cave myotis, occult little brown bat, fringed myotis, California myotis, western pipistrelle, Townsend's big-eared bat, Brazilian free-tailed bat, and western mastiff bat.

A more recent survey of bats in this vicinity was conducted in 1997 and 1998 (Brown and Berry 1999). The primary focus of this study was in abandoned mines and water sources in the Hualapai Mountains, but some of the locations were within the region of influence of the Big Sandy Energy Project. Bats were identified by a combination of techniques, including mist netting or hand netting at roost sites, mist netting at water sources, and recording and analysis of echo-location signals. Of the 19 species of bats observed in the Hualapai Mountains, at least 10 species were confirmed to be present in or near the region of influence. Species netted or recorded at the Big Sandy bridge on US 93 (corridor segment R5) were California myotis, cave myotis, Yuma myotis, western pipistrelle, pallid bat, spotted bat, western mastiff bat, pocketed free-tailed bat, Brazilian free-tailed bat. Townsend's big-eared bat and California leaf-nosed bats were detected at the Warm Springs mine in Kaiser Canyon, about 8 miles southeast of the Big Sandy Bridge.

General information on bat species distribution and habitat requirements was obtained from Hoffmeister (1986). Big free-tailed bats are sparsely distributed in a variety of habitats in Arizona, and they appear to require rocky cliffs with fissures for roosting. No suitable habitat for the big free-tailed bat would be affected by the Proposed Action or the alternative pipeline corridors. The cave myotis is relatively common and widespread in Arizona. They typically roost in caves and mines, but they also may use bridges. Roost sites are generally close to water. The cave myotis could use the bridge over the Big Sandy River or other bridges over ephemeral channels on US 93 for roost sites, but there are no caves or mines that would be affected by the Proposed Action or alternative pipeline corridors.

The fringed myotis may be found from chaparral to pine forest habitats, and their preferred habitat appears to be oak woodland. Suitable habitat for these bats might be present in the conifer woodlands in corridor segments R1, T1, T2, T3, C1, and C2. The small-footed myotis typically forages over oaks, chaparral, junipers, and riparian areas. Suitable habitat for this bat is present in the northern parts of the region of influence or along the Big Sandy River (corridor segments R1, R5, T1, T2, T3, C1, and C2). Townsend's big-eared bats are widely distributed in a variety of habitats in Arizona, and they could forage in the region of influence. These bats normally require caves or mine tunnels for day roosts, and these features are not available in areas that would be impacted by the Proposed Action or alternative pipeline corridors. Allen's big-eared bats are found in ponderosa pines and piñon-juniper woodland, and suitable habitat is present in the northern end of the region of influence in corridor segments R1, T1, T2, T3, C1, and C2. Greater western mastiff bats have a disjunct distribution, and typically roost in crevices in cliffs. The Proposed Action or alternative pipeline corridors would not impact any suitable cliff habitat. Spotted bats are very sparsely distributed in a variety of habitats, but their appearance in the region of influence would be a rare event.

The occult little brown bat is generally found in ponderosa pine or pine-oak woodland, and the region of influence is outside its normal geographic range. The long-legged myotis is normally found in ponderosa pine or other coniferous forests, and it is unlikely to be present in the region of influence. The long-eared myotis is also a bat of ponderosa pine or

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spruce fir forests, and the region of influence is outside its normal geographic range. The western yellow bat is typically found roosting in palm fronds, and the region of influence is outside its normal geographic range. The Mexican long-tongued bat is a nectar-feeding bat found in desertscrub in the southeastern corner of Arizona. The region of influence is outside its normal geographic range.

Birds

The region surrounding the Project area is home to many raptor species that are considered sensitive. These sensitive raptors that have at least some potential to occur in the region of influence include the golden eagle, sharp-shinned hawk, Cooper's hawk, Swainson's hawk, ferruginous hawk, common black hawk, zone-tailed hawk, merlin, peregrine falcon, western burrowing owl, and loggerhead shrike. All species listed here are considered sensitive species by the BLM. AGFD considers all raptors listed here except the burrowing owl and loggerhead shrike to be species of special concern. The loggerhead shrike is included in discussions of sensitive raptor species because of its raptorial behavior. The sharp-shinned hawk, Cooper's hawk, Swainson's hawk, and zone-tailed hawk could use trees found in riparian or xeroriparian areas for nesting (corridor segments T2, T3, T4, T5, R3, R4, R5, and C3). The golden eagle, merlin, and peregrine falcon use cliffs, and burrowing owls may use mammal burrows for nesting or they may dig their own burrows in sandy soil. The loggerhead shrike could nest in trees or shrubs found throughout the region of influence. The common black hawk nests in well-developed riparian corridors with wide stretches of perennial water that support fish. The ferruginous hawk could nest in grasslands and open juniper woodlands, (corridor segments T1, T2, T3, R1, R2, R3, and C3).

Millsap (1981) conducted a detailed study of raptors (not including owls) in an area of northeast Arizona that included the Big Sandy Valley. In this study, the most common raptors nesting in the Wikieup vicinity included turkey vulture, red-tailed hawk, Cooper's hawk, American kestrel, and prairie falcon. Common black hawks were observed nesting on Burro Creek, northern goshawks were nesting in the Hualapai Mountains, and golden eagles and zone-tailed hawks also nested in mountainous areas (Millsap 1981). Common wintering raptors included Cooper's hawk, red-tailed hawk, northern harrier, and American kestrel. Several other species of raptors, including ferruginous hawk, rough-legged hawk, Harris's hawk, Swainson's hawk, sharp-shinned hawk, merlin, and peregrine falcon, were noted as rare or irregular visitors to this area.

Other sensitive species of birds that could be found in the Project area include white-faced ibis, yellow-billed cuckoo, and western bluebird. The white-faced ibis and western bluebird could be found during migration along the Big Sandy River; however, these species are not expected to breed in the region of influence.

The western bluebird breeds in ponderosa pine forests, and the white-faced ibis does not breed in Arizona. No adverse impacts are anticipated for the mountain plover, western bluebird, or white-faced ibis.

The western yellow-billed cuckoo currently is being reviewed by the USFWS to determine whether it should be proposed for listing under the ESA. A yellow-billed cuckoo was observed 1 mile northeast of Wikieup, in the floodplain of the Big Sandy River, in 1979 (Hall 1980). Yellow-billed cuckoos are generally restricted to tall cottonwood and willow riparian woodland for nesting (Ehrlich et al. 1992, Corman and Magill 2000), but the predominant riparian species found along the Big Sandy River is tamarisk. Populations of western yellow-billed cuckoo are known to have been depressed by impacts associated with tamarisk invasion (DeLoach 1996). The yellow-billed cuckoo could use riparian areas along the Big Sandy River for temporary foraging during migration, but this site does not provide suitable breeding

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habitat for this species. No adverse effects related to this Project are anticipated.

Reptiles

Six species of reptiles may be present on the Project site that are classified by BLM as sensitive species and by AGFD as species of special concern, including the desert night lizard, Arizona skink, chuckwalla, desert rosy boa, desert tortoise, and banded Gila monster. All six species are found in the BLM Hualapai-Aquarius planning area (Jones 1981). Chuckwallas generally require rock outcrops, cliffs, or other extensive rocky areas to provide cover and nest sites. Creosote bush is often present in their habitat (Stebbins 1985).

Although the desert night lizard is a diurnal forager, it is seldom seen due to its secretive habits and use of dead vegetation and rocks for cover. It does not require permanent water. Its diet is made up of arthropods that may be found in dry upland areas (corridor segments C3, T4, T5, R4, and R5).

The banded Gila monster uses areas that contain loose sandy soil required for burrowing although they are known to find refuge in existing burrows of other animals. It is frequently found on irrigated lands or rocky areas. The areas with permanent or semi-permanent water may act to concentrate populations in arroyos or stream banks (Stebbins 1985).

The Arizona skink is known from both streamside habitat and juniper woodland. There are known populations in the Hualapai and Harcuvar mountains, and this lizard may be present in the region of influence.

The desert rosy boa generally requires rocky desert substrate and is known to forage in the vicinity of water. These snakes are mostly nocturnal and seldom seen.

The Sonoran desert tortoise generally uses rock shelters, but may also excavate burrows. They also are known to use stream banks for burrows and forage. These animals are active during the day and may be highly visible during warm months. All areas that would be disturbed by this Project are identified as Category III habitat for desert tortoise. Category III areas include habitat that is not essential to the maintenance of viable populations. They may have a low- to medium-density tortoise population that is not contiguous with a higher density population, and the tortoise population may be stable or decreasing in a Category III habitat.

Amphibians

Two species of amphibians, the Arizona toad and lowland leopard frog, are classified as sensitive species and species of special concern. Both species use stream habitat for foraging and reproduction. The Arizona toad was observed in the Project area during the wildlife surveys (Greystone 2000b). The lowland leopard frog is dependent on a permanent water source for survival and reproduction. Lowland leopard frogs are found in perennial reaches at and below the proposed pipeline crossing site in the Big Sandy River (Greystone 2000a; Smith, personal communication, 2001).

Fish

Five species of fish are considered sensitive by BLM. These species include the longfin dace, desert sucker, Sonora sucker, speckled dace, and roundtail chub. A complete list of fish species observed in the Big Sandy River and its tributaries are listed in Tables 3.13-2 (Greystone 2000a) and 3.13-3 (AGFD 1993; BLM 1994; Fresques et al. 1997; Kepner 1979). Additional details on these earlier studies are provided in Greystone 2000a.

Greystone (2000a) documented increases in the abundance and diversity of exotic species and the loss of native species by comparing the results of its 2000 survey with the results of the 1979 and 1996 surveys by others. Two native species, Sonora sucker and roundtail chub, were recorded in 1979 but were not found in 1996 (Fresques et al. 1997) or 2000 (Greystone

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2000a) at these same sites (roundtail chubs were found at a separate location by BLM in 1994). Native fish species accounted for 57.8 percent of the total fish counted in 1979, but only 8 percent in 2000. The longfin dace was the most abundant fish species in most sites sampled in 1979, but it was not most abundant at any of the revisited sites in 2000. Mosquitofish were not present in 1979; by 1996 they were common but not the most abundant; and in 2000, mosquitofish was the dominant species at all but one monitoring site.

Plants

Several species of sensitive plants are reported to occur in Mohave County. Thorn milkwort is in the Polygalaceae family. This species is an Arizona state-listed species. It occurs at an elevation of 2,500 to 5,000 feet. This shrubby species grows up to 3 feet high, tending to form hummocks. It is intricately branched with small, yellow flowers appearing in June. There are no known occurrences of thorn milkwort in the region of influence.

Arizona necklace is a legume that is found only in western Arizona. This species in an Arizona state-listed species. It occurs southeast of Yucca (Mohave County), in the foothills of the Hualapai Mountains. This species is shrubby, up to 11.5 feet high, with leaflets usually less than 0.4 inch. Lilac-colored flowers appear in March. It is known to occur along the Big Sandy River at elevations between 2,000 and 4,000 feet on dry, rocky hillsides and on banks of arroyos. Groups of these plants were located on both alternative pipeline corridors near the north end of the region of influence in corridor segments T1, T2, R3, C2, and C3 (Figure 3.14-1). It is possible that there are isolated populations of Arizona necklace along corridor segment T3.

Linear-leaf sand spurge is a perennial species in the Euphorbiaceae family. This species in an Arizona state-listed species. This species has linear leaves, and highly branching stems from a stout, woody root. It flowers in April and October. It has been documented near Yucca and Topock (Mohave County), western Pima County, and southern Yuma County at elevations from 500 to 2,000 feet. An individual plant was found and tagged during the design of the Big Sandy Bridge replacement in corridor segment R5 (ADOT 2000).

Sand cholla is an Arizona state-listed cactus. This species grows in a clump from a bristle-covered tuber, favoring higher elevation dry-lake borders and sandy flats. It is located in the northern Mojave Desert from eastern California to southern Utah from 4,400 to 5,000 feet. It grows up to 10 inches in height and is narrowly club-shaped to cylindrical. The flowers are pink to purple and appear April to June. The yellow-green flattened but slender stems are about 1 inch in diameter, and the smooth red fruit is fleshy and barbed, up to 1 inch long. This species does not occur in the elevation range of the region of influence and would not be included in pre-construction surveys.

Aquarius milk-vetch is a legume species found in Apache, Mohave, Gila, and Yavapai counties. This plant occurs in limestone lakebed deposits. It flowers in March and April and produces pods with long soft hairs. This plant species is listed by the BLM as a special status plant species.

Crownless milkweed vine is in the Asclepiadaceae family. It is a BLM-sensitive species that occurs in sandy loamy uplands with creosote bush, rayless goldenhead, and big galleta in Mohave and Sonoran Desertscrub at about 500 to 2,000 feet. The milkweed vine is generally inconspicuous, climbing relatively low-growing shrubs for support. The glabrous slender twining stems have narrowly linear leaves. The flowers are small and yellowish and appear in clusters of three to five from April to June. There are confirmed occurrences near Wikieup, Dolan Springs, Yucca, and Hardyville.

Parish's phacelia is in the Hydrophyllaceae family. It occurs in clay or alkaline soils, in limestone lakebed deposits, at elevations of 2,600 to 3,900 feet. It is an annual that stands 2 to 7 inches tall with elliptic basal leaves.

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Flowers are lavender with a yellow base and are bell shaped. This species is listed by the BLM as a special status plant species.

Three hearts is also in the Hydrophyllaceae family. Three hearts is a BLM-sensitive species that occurs on sandy or gravelly desert slopes, generally in the shelter of shrubs. It is a perennial species with stems branching from a woody taproot. The leaves are entire and mostly basal. White and purple flowers appear in short racemes in April. Known occurrences are in northwestern Mohave County at approximately 2,000 feet.

Another BLM-sensitive species is shrubby senna, a legume that grows in sandy or gravelly washes. It is a shrubby plant about 3 feet high that has branches ending in a thorn and armed with weak spines. Shrubby senna has two to four leaflets, but is leafless most of the year. Yellow flowers in loose terminal panicles appear from February to October. It occurs in Yucca and Mohave counties at approximately 2,000 feet.

The following five species are categorized as BLM-sensitive, but are not likely to occur within the region of influence.

Antelopebrush is a shrub in the Rosaceae family. It occurs in Apache to Coconino County on open slopes and mesas and coniferous forests from 2,300 to 9,000 feet. This species is an intricately branched shrub with small three-toothed leaves. The solitary yellow flowers have five petals and appear from April to June. Antelopebrush is a very important browse plant for wildlife and cattle. This species occurs in northern Arizona and is not found in Mohave County; therefore, it is not likely to occur in the region of influence.

California flannelbrush is in the Sterculiaceae family. Known occurrences are in Yavapai and Gila counties. It occurs in oak pine woodlands, rocky ridges, and usually on north slopes in canyons 1,300 to 6,500 feet high. This species is a large evergreen shrub or small tree with thick leaves that usually are palmately lobed. Solitary showy flowers with bright yellow (sometimes orange) sepals appear in May. This species is not known to occur in Mohave County; therefore, it is not likely to occur in the region of influence.

Aravaipa woodfern is a woodland fern that occurs along streams and seepage areas at 200 to 1,800 feet. Its blade is widest at or near the base. The fern is found near the Santa Maria River (southwestern Yavapai County), Aravaipa Canyon (Graham and Pinal counties), and Santa Catalina Mountains (Pima County). This species is on the lower end of the elevation range of the region of influence and is not expected to be encountered.

Striped horsebrush is a shrub in the composite family. This species occurs in piñon-juniper woodlands on rocky slopes at 4,600 to 6,900 feet. It is commonly less than 3 feet high. The stems have spines, derived from the main leaves and pale yellow flowers. The stems become glabrous in stripes below the spines, contributing to its common name. Striped horsebrush occurs in elevations higher than those in the region of influence; therefore, it is not expected to be encountered.

Nevin's birdsbeak is in the Schrophulariaceae family. It occurs in Mohave County scattered among pines, in the Hualapai Mountains at approximately 6,500 feet. Pink or lavender flowers appear along the branches in September. Nevin's birdbeak occurs in elevations higher than those in the region of influence; therefore, it is not expected to be encountered.

3.14.2 Environmental Consequences

3.14.2.1 Identification of Issues

The following issues were identified as the basis for assessment of impacts.

- Potential adverse impacts on the southwestern willow flycatcher, bald eagle, Yuma clapper rail, and Arizona cliffrose. These potential impacts include direct and indirect effects on these species as a result of construction, operation, and maintenance of

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the proposed Project. Potential impacts include direct mortality of individuals; loss of habitat due to clearing of vegetation; clearing in limestone lakebed deposits; and loss of aquatic, riparian, or marsh habitats by lowering water levels due to groundwater pumping for the proposed Project.

- Potential direct and indirect adverse impacts on sensitive species as a result of construction, operation, and maintenance of the proposed Project.
- Impacts on threatened, endangered, or sensitive species due to noise produced by construction and operation of the proposed Project.

3.14.2.2 Significance Criteria

The effects of the Proposed Action and alternatives would be considered significant if the following were to occur:

- loss of population or habitat of other sensitive species that would cause the species to become listed as endangered or threatened
- loss of one active nest for sensitive raptors
- removal or alteration of hibernacula or maternity colonies for bats
- substantial adverse impacts on populations or habitats of sensitive reptiles or amphibians
- any unmitigated loss of aquatic habitat greater than 0.5 acre or any long-term adverse effects on native fish
- destruction of a substantial population of a sensitive plant species
- any impact on a portion of a limestone lakebed deposit containing sensitive species

The significance of the impacts of the Project on threatened and endangered species or their habitats is being deferred in this Draft EIS until completion of the BA.

In the BA, three choices are possible for a listed species or area of critical habitat. A determination of "No Effect" means that there are absolutely no effects of the Project, either positive or negative. Any possibility of effect, no matter how small or unlikely, must be given a determination of "may affect, but not likely to adversely affect." This determination means that all effects of the Project are beneficial, insignificant, or discountable. Beneficial effects have contemporaneous positive effects without any adverse side effects to the species or habitat. Insignificant effects relate to the size of the impact and should never reach the scale where "take" of the species would occur. Discountable effects are those that are extremely unlikely to occur. The third possible determination is that of "may affect, is likely to adversely affect," which means that there is at least one adverse effect. A combination of beneficial and adverse effects is still "likely to adversely affect," even if the net effect is neutral or positive.

If the determination in the BA is that the Project "may affect, likely to adversely affect" threatened and endangered species, the Final EIS will determine that the effects of the Proposed Action will be significant.

3.14.2.3 Impact Assessment Methods

Southwestern Willow Flycatcher

The proposed gas pipeline corridor crosses the Big Sandy River only once, and the crossing occurs in a reach of perennial water. Impacts on the flycatcher were determined by evaluating the Project area for suitable habitat. Once suitable habitat was identified, surveys were conducted in the areas that were within approximately 1 mile north and south of the US 93 Big Sandy River bridge (habitat is along perennial reaches or river with riparian vegetation) to determine whether or not southwestern willow flycatchers

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were present. Impacts associated with the proposed Project were evaluated to determine effects on the southwestern willow flycatcher in the area of the pipeline crossing.Downstream more than 1 mile from the US 93 Big Sandy River bridge crossing, where surveys were not conducted for the southwestern willow flycatcher, potential impacts of construction, operation, and maintenance of the proposed Project were analyzed.

Bald Eagle

For the bald eagle, the known distribution of eagles in the region of influence was reviewed, and the proposed power plant site was evaluated for potential nesting habitat and potential foraging or roosting sites during nesting or winter seasons. The impact assessment is based on anticipated effects of the Proposed Action and alternatives on potential habitat areas and on how these habitat impacts might affect bald eagles and their use of this area.

Yuma Clapper Rail

Impacts were assessed by determining what types of impacts could adversely affect the Yuma clapper rail. It was then assessed whether or not these impacts could occur during construction or operation of the proposed Project.

Arizona Cliffrose

For the Arizona cliffrose, known population locations were reviewed, and the proposed power plant site was evaluated for areas with the suitable environmental conditions necessary for the establishment, growth, and reproduction of the plant. The impact assessment is based on the anticipated effects of the Proposed Action on Arizona cliffrose populations.

Other Special Status Species

For other sensitive species, the occurrence of each species in the Project area was reviewed. Any impacts anticipated during construction at the proposed plant site, or along the proposed or alternative gas pipeline corridors were assessed relative to the presence of other sensitive species.

3.14.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potentially adverse impacts on threatened or endangered species:

- Erosion sedimentation and control measures, implemented to reduce erosion, and prevent siltation in the waterways, including specific methods at the Big Sandy River Crossing to limit the disturbance.
- A groundwater monitoring plan would be implemented to allow the predicted change to groundwater levels to be measured, impacts to be anticipated, and flows in the shallow groundwater and the Big Sandy River augmented as described in Section 3.4.2.4.
- A stormwater pollution prevention plan has been prepared which would divert surface water around areas of potential contamination and retain all contaminated water on site.
- Reclamation plans have been developed to reduce the affect to vegetation on private, state, and BLM-managed public lands.
- Pre-construction biological studies would be conducted to identify the presence of Sonoran desert tortoise and breeding raptors.
- Pre-construction surveys would be conducted to identify suitable habitat for sensitive plant species. In habitat that could not be avoided, surveys would be conducted to identify any populations of individual sensitive plant species.

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- A spill prevention control and countermeasure plan would establish a plan for response to a spill of petroleum products on site.

- Construction activities are anticipated to occur 10 –hours per day, 5 –days per week to reduce the potential impacts from construction noise during the night.

- A biological monitor would be on site during all ground disturbing activities to mitigate impacts on desert tortoise (refer to Appendix C).

- The following measures would be implemented in areas designated as Category III desert tortoise habitat to reduce or minimize impact:

- Surface-disturbing activities would be minimized along the proposed pipeline corridor.

- Access to roads not needed after construction would be restricted, and the roads would be scarified. Access roads scheduled for upgrading in desert tortoise habitat would not be widened, if possible, nor would berms be disturbed during grading. New permanent access roads would not be created in desert tortoise habitat except where the right-of-way is not adjacent to an existing right-of-way or road.

- Stockpile areas in desert tortoise habitat would be placed either in less valuable habitat, or minimized in size.

- Where feasible, following completion of construction activities, the landscape would be restored to pre-construction conditions using techniques such as recontouring, topsoil replacement, and re-seeding. Seed mixtures would only include native species that have the greatest potential for establishment and wildlife use (refer to Appendix B).

3.14.2.5 Where feasible, Impact Assessment

Proposed Action

<u>Southwestern Willow Flycatcher</u>

Proposed Power Plant Site and Access Road

Direct Impacts – Proposed construction, operation, and maintenance of the power plant, substation, and evaporation ponds in Section 5, T15N, R12W would have no direct impact on the Southwestern willow flycatcher. No willow flycatcher habitat is present in the area where these facilities would be installed.

Indirect Impacts – Because the Proposed Action contains measures to augment shallow groundwater and surface water flow in the Big Sandy River, groundwater withdrawal for Project operations is not predicted to result in a lowering of the shallow groundwater table or reduced flow in the Big Sandy River, either of which would lead to the diminishment of flycatcher habitat. As discussed in Section 3.4, it is anticipated that there will be no change in the upper groundwater aquifer or surface water flow in the Big Sandy River in the vicinity of the Project or downstream.

Construction would bring many workers close to existing and potential flycatcher habitat. This would create the potential for disturbance to flycatchers due to increased camping, hiking, biking, off-road vehicles, fires, wood-gathering, and other recreational uses.

Agricultural Development

Direct Impacts – The proposed agricultural development is located in an area of Sonoran desertscrub with no riparian vegetation and no suitable habitat for willow flycatchers. Development of these lands for agriculture would have no direct impact on the Southwestern willow flycatcher or its habitat.

Indirect Impacts – The potential indirect impacts on southwestern willow flycatchers

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related to the agricultural development are the withdrawal and consumption of groundwater and increased brown-headed cowbird populations. Potential effects of groundwater withdrawal on flycatcher habitat are discussed above.

Agricultural fields provide enhanced foraging habitat for brown-headed cowbirds compared with the foraging currently available in the Sonoran desertscrub of this area. Additional foraging opportunities within 2 miles of the Big Sandy River riparian area could allow for an increase in the cowbird population, which could adversely affect the southwestern willow flycatchers through increased rates of parasitism.

Communication Facilities

The OPGW option would not cross any riparian area, so no direct impacts on the southwestern willow flycatcher or flycatcher habitat would occur.

Microwave dishes would be installed on existing microwave towers with the primary and redundant communication systems. No flycatcher habitat is present near existing microwave towers, thus no direct impacts would occur.

Proposed Natural Gas Pipeline

Direct Impacts – Depending upon which construction technique for the natural gas pipeline is implemented, the Project could result in temporary direct impacts on the Southwestern willow flycatcher and its habitat. If the pipeline is constructed by trenching, laying pipe, and backfilling at the crossing of the Big Sandy River, it would be necessary to remove riparian vegetation. Removal of riparian vegetation would result in a temporary loss of occupied, suitable, or potential flycatcher habitat. The total area of impact within the riparian zone is estimated to be 66,000 sq. ft. (1.38 acres), assuming a 50-foot wide construction zone. Of this area, only about 37,500 sq. ft. (0.86 acre) is suitable habitat for flycatchers.

It is also possible that the trenching method could result in direct loss of a flycatcher nest, although the Greystone surveys found no flycatcher territories within 200 feet of the existing bridge. However, trenching would not occur during the breeding season. The proposed zone for construction, within 400 feet upstream from the bridge, has been subjected to other disturbances in the past. Close to the bridge there is an area that has had some grading and vegetation removal. Cattle grazing throughout the riparian area is an on-going disturbance. The area close to the bridge is currently occupied by species tolerant of disturbance, including saltcedar, screwbean mesquite, arrowweed, and Bermuda grass. More Fremont cottonwoods and Goodding willows are present farther from the bridge.

Other possible impacts related to the trenching method for pipeline construction could include erosion, sedimentation, and spills. These impacts would not affect the flycatcher population upstream from the construction site. Because most occupied flycatcher habitat is in areas extending away from the river, erosion is not expected to be a problem, unless severe flooding removes the vegetation in occupied habitat. Additional sediment loads in the river are unlikely to have any direct effect on the flycatchers. Fluid spills from construction equipment could adversely affect downstream habitat by contamination that could affect the insect prey populations.

Caithness has developed an erosion and sedimentation control plan that would be implemented as a part of the Proposed Action. Best management practices and procedures in this plan would include use of erosion control fabric, diversion ditches, ditch stabilization, sediment barriers, sediment filtering devices, erosion control berms, riprap, and revegetation. Likewise, a hazardous material management and spill prevention and countermeasure plan would be implemented during construction to ensure the safe handling, storage, and disposal of hazardous materials, as well as procedures to follow in case of a release.

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As an optional construction technique, the natural gas pipeline could be installed under the Big Sandy River and riparian zone by directional drilling. Staging and drilling areas would be located outside the riparian zone on each side of the river, although there still would be some potential for erosion, sedimentation, or spills to impact the riparian zone. To avoid any disturbance to the flycatchers, the Proposed Action would conduct this operation during the period from September to April when southwestern willow flycatchers are absent from this region. With the implementation of erosion, sedimentation, and spill control measures, the directionally drilled pipeline option would have no direct impact on southwestern willow flycatchers or suitable habitat.

Indirect Impacts – Disturbance of riparian vegetation along the Big Sandy River could increase the chance of brood parasitism of southwestern willow flycatcher by brown-headed cowbirds. These cowbirds typically parasitize nests found at the edge of flycatcher habitat. Removal of riparian vegetation along the proposed gas pipeline route would increase the amount of edge habitat in the riparian area and increase the risk of parasitism until the vegetation has returned to preconstruction conditions.

Bald Eagle

Construction of the power plant, substation, and evaporation ponds in Section 5, T15N, R12W would not impact any aquatic resources or riparian areas that might provide foraging area for the bald eagle. This area has no large trees that could provide nest sites, perches, or overnight roosting sites for bald eagles. Likewise, construction of the access road from US 93 would have no impact on aquatic resources or riparian areas, and it would not affect any large trees. Bald eagles show little aversion to loud noise in their habitat. In long-term monitoring of bald eagle related to construction of a secondary sewage treatment plant for Seattle, Washington, eagle responses to construction truck traffic within 1,000 feet of an active nest were recorded (Strong et al. 1992). In more than 6,000 observations, the eagles completely ignored the truck traffic over 90 percent of the time, and they never took flight or showed any other type of avoidance response. In a study or human disturbances in Arizona, eagles at nest sites on the Salt and Verde rivers showed approximately 3 percent avoidance responses to vehicles, aircraft, and other noises (Grubb and King 1991). Avoidance responses increased with decreasing distance to the source of the disturbance. Noise produced by construction and operation of the facility would have no impacts on the bald eagle.

The proposed gas pipeline corridor would cross the Big Sandy River at the US 93 bridge in corridor segment R5. If the pipeline is constructed by trenching, laying pipe, and backfilling at this crossing, there would be impacts on the wetland and riparian area (refer to Section 3.12). Assuming a 50-foot-wide construction zone in riparian areas, riparian vegetation would be removed within an area of 1.38 acres. However, due to the small area of disturbance in the river channel, there would be little, if any, impact on the populations of prey species. If the pipeline is installed by directional drilling, there would be no impact on the riparian habitat. There would be no long-term impacts on potential eagle foraging habitat on the Big Sandy River. The proposed gas pipeline corridor would not affect any other potential eagle foraging areas, and it would not impact any trees large enough to be potential nest or roost sites.

The OPGW option and/or microwave dish installations would not impact any potential foraging areas, and would not impact any trees large enough to be potential nest or roost sites.

A literature search pertaining to evaporation (brine) ponds at power generation facilities and the potential for wildlife impacts was completed using Cambridge Scientific Abstracts, an internet search tool that provides access to more than 70 databases covering the scientific and technical research literature.

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Most recently, Tanner et al. (1999) published a study of the algae, invertebrates, and chemistry of two large, hypersaline, industrial wastewater ponds near Phoenix, Arizona (Tanner et al. 1999). Negative impacts associated with waterbird use of selenium-contaminated evaporation ponds are generally reported for birds that feed and reside at these evaporation ponds for the duration of the breeding season (Adams et al. 1998; Lemly 1997; Robinson and Oring 1996). The presence of a vegetated or barren mud shoreline, shallow wading habitat, and vegetation in deeper water are key factors that attract wildlife, particularly waterbirds, to reside through the breeding season at evaporation ponds (Byron et al. 1999). The absence of attractive habitat for breeding waterbirds and other wildlife, including bats, can minimize exposure and preclude impacts, even when water and dietary selenium concentrations exceed chronic threshold concentrations (Byron et al,. 1999). If chronic toxicity levels of any constituent are reached in the evaporation ponds for this Project, habitat is present, and bald eagle prey have access to the ponds, impacts on bald eagle may occur.

Evaporation ponds used to dispose of waste cooling water could attract waterfowl. Bald eagles could be attracted to the evaporation ponds by these waterfowl, a potential prey item of the eagle. Numbers of waterfowl are not expected to be large enough to support a wintering population of bald eagles, although transient eagles could capture some waterfowl from the ponds, if present. If compounds are concentrated to toxic levels in the evaporation ponds and likewise in waterfowl using the ponds, there would be a risk of bald eagles consuming the contaminated waterfowl. Because of the transient nature of the waterfowl and eagles, the toxicity risk to eagles would be small.

Because the evaporation ponds would be adjacent to the existing transmission lines, bald eagles moving in pursuit of waterfowl are at risk for collisions with transmission lines. These collisions may result in mortality or injury of bald eagles. Because the Proposed Action contains measures to augment shallow groundwater and surface water in the Big Sandy River, groundwater pumping for the Project is predicted to cause no adverse impacts on the bald eagle.

Yuma Clapper Rail

Because the Proposed Action contains measures to augment shallow groundwater and surface water in the Big Sandy River, groundwater pumping for the Project is not predicted to result in a lowering of the shallow groundwater table or reduced flow in the Big Sandy River. Thus, there would likely be no adverse impacts on the Yuma clapper rail.

Sufficient emergent wetland vegetation to constitute Yuma clapper rail habitat is not present in wetlands along the proposed gas pipeline corridor. Construction of the pipeline and installation of OPGW or microwave dishes with the Proposed Action would have no impact on the Yuma clapper rail.

Because no habitat for the Yuma clapper rail is found at the proposed power plant site, noise from construction and operation of the facility would not impact populations of this bird.

Arizona Cliffrose

Known populations of Arizona cliffrose are situated far enough from the proposed power plant site to prevent any impacts on this endangered shrub. The Proposed Action would not affect any known population of Arizona cliffrose but it is possible that small exposures may exist. However, pre-construction surveys for Arizona cliffrose habitat (Tertiary limestone lakebed deposits) would be completed as part of the Proposed Action within the region of influence. If habitat could not be avoided, surveys would be conducted during its flowering period from April to June. . Arizona cliffrose habitat or any identified individuals would be avoided and no impacts would occur on this species.

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The installation of the OPGW option would locate the pulling and tensioning stations to avoid individuals and populations of the Arizona cliffrose. Therefore, there would be no impacts on the Arizona cliffrose from this installation. Microwave dishes would be installed on existing towers and would have no impact on the Arizona cliffrose.

Mountain Plover

Some suitable habitat for wintering mountain plovers is present in the semi-desert grasslands near the northern end of the proposed gas pipeline corridor in corridor segments R1, C1, and T3. There would be minimal impacts on habitat for this species because disturbed areas within the proposed pipeline corridor would be re-seeded with native vegetation.

Suitable habitat also is present along the route for the northern portion of the OPGW installation option. Since disturbed areas would be reseeded with native vegetation, there would be minimal impacts on habitats for the mountain plover. Microwave dish installations would not impact mountain plover habitat.

Other Special Status Species

Bats

Several sensitive species of bats are known to forage over the wetland adjacent to the proposed power plant site and over the Big Sandy River riparian area and in xeroriparian and upland habitat. Bats also are known to use the bridges and culverts on US 93 for day and night roosting. Construction of the proposed power plant, substation, agricultural development, and OPGW option is not expected to impact any known roosting sites or maternity colonies. Construction of the proposed power plant, associated facilities, agricultural activities, and pipeline would permanently remove approximately 319 acres of predominantly Sonoran desertscrub foraging habitat. In addition, 250 acres of similar habitat would be disturbed but revegetated. Limited xeroriparian foraging habitats exist on the proposed power plant site.

The evaporation ponds and night lighting at the proposed power plant site may beneficially attract a large number of insects that could provide an additional foraging resource for bats. Water quality of the ponds would have the potential to affect bats if they drink contaminated water. There is some potential for the bioaccumulation of contaminants to adversely affect bats through consumption of insects, although this is unlikely. Pipeline construction along the proposed gas pipeline corridor and the OPGW option would be a temporary disturbance for bats roosting under bridges and culverts. Agricultural chemicals, including pesticides, are proposed for use on the proposed agricultural fields, and could result in a direct, adverse impact on bats that would consume contaminated insects. There is no evidence that microwave dish installation would have any adverse impacts on bat activities. These impacts would not be significant because they do not directly affect hibernacula or maternity colonies.

Birds

Construction at the proposed power plant site is not expected to have a significant impact on sensitive species of birds. Raptor nest sites, including large trees and cliffs, do not occur at the proposed power plant site so impacts on nesting raptors are not expected. A few scattered saguaros exist at the proposed power plant site. Some of these saguaros could support nests of large raptors, and cavities in the saguaros could provide nest sites for American kestrels, western screech-owls, and elf owls. Nesting habitat for other sensitive bird species also is absent from the proposed power plant site. As noted in Section 3.11, groundwater pumping associated with the Proposed Action is not expected to have any impact on riparian vegetation.

Construction of the OPGW option, microwave dish installations, or the proposed gas pipeline is not expected to impact birds identified as

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sensitive species. Tensioning and pulling sites for the OPGW installation would be surveyed for nests and any discovered nests would be avoided during the OPGW installation. A few of the larger cottonwood trees in the riparian zone of the Big Sandy River could support nests for raptors. Although the pipeline crossing of the Big Sandy River could require the removal of large riparian trees with a diameter at breast height (DBH) of greater than 12 inches, this impact would not be significant as long as the trees did not contain an active raptor nest. Impacts on most nesting raptors are not expected; however, there is some chance that ferruginous hawks, loggerhead shrikes, or burrowing owls could be found along the proposed gas pipeline corridor. Pre-construction surveys for breeding raptors would be conducted. Shrikes may nest along the proposed gas pipeline corridor. Impacts on these species would be considered significant if active nests were lost.

Ground-disturbing activities would be scheduled outside of the breeding season of the yellow-billed cuckoo, which is mid-June through mid-August. Other sensitive species of birds are not expected to be impacted during construction of the proposed pipeline.

ReptilesConstruction of the power plant and associated facilities under the Proposed Action would result in the loss of chuckwalla habitat and possibly the loss of individual chuckwalla. Because of the extent of chuckwalla habitat and individuals of this species in the region of influence, these impacts would not be considered significant.

Habitat for the desert night lizard may be subject to adverse impacts as a result of vegetation removal and soil disturbance associated with the Proposed Action. Ground disturbance would total approximately 5 acres for the OPGW installation, approximately 406 acres in the proposed pipeline corridor and 108 acres for the proposed power plant site and associated facilities. Ground disturbance would total approximately 107 acres for the agricultural fields. Because of the extent of desert night lizard habitat and individuals of this species in the region of influence, these impacts would not be considered significant.

Some habitat for the banded Gila monster may be adversely impacted by the Proposed Action as a result of vegetation removal and soil disturbance. These animals may be subject to incidental take by construction or maintenance vehicle traffic. Because of the extent of Gila monster habitat and individuals of this species in the region of influence, these impacts would not be considered significant.

Habitat for the Arizona skink is limited in the region of influence to the riparian zone on the Big Sandy River and the juniper woodland near the north end of the pipeline corridor. Because the Proposed Action contains measures to augment shallow groundwater and surface water in the Big Sandy River, groundwater pumping for the Project is not predicted to affect riparian vegetation. However, there would be a small, temporary disturbance to the riparian vegetation in the Big Sandy River if the pipeline is constructed there by trenching. There also would be some small impacts on juniper woodland habitat from construction of the pipeline in these areas. OPGW pulling and tensioning sites likely would be sited around juniper woodland habitat. Because extensive juniper woodland habitat is present in the Hualapai Mountains, these impacts would not be significant.

The desert rosy boa is nocturnal and there is little chance of incidental death by construction and maintenance vehicle traffic. However, soil disturbance and vegetation removal may result in some habitat degradation. Because of the extent of desert rosy boa habitat and individuals of this species in the region of influence, these impacts would not be considered significant.

Habitat for the Sonoran desert tortoise would be adversely impacted through vegetation removal and soil disturbance associated with the Proposed Action. Ground disturbance would total about 621 acres under the Proposed Action

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(229 acres of permanent disturbance and 393 acres of temporary disturbance) and an additional 5 acres of temporary disturbance for the OPGW option, if selected. Microwave dish installation would not affect any desert tortoise habitat. Desert tortoises are diurnally active and may be subject to incidental take by construction and maintenance vehicle traffic, especially during the summer months. Pre-construction surveys and other measures would be implemented as part of the Proposed Action to avoid or relocate identified individuals. This would avoid any significant impacts.

Amphibians

The OPGW option and microwave dish installations would not impact amphibian habitat. Depending upon which construction technique for the gas pipeline is implemented, the Proposed Action could result in impacts on the Arizona toad and the lowland leopard frog and their habitat. If the pipeline is constructed by trenching, laying pipe, and backfilling at the crossing of the Big Sandy River, then wetland habitat for these amphibians could be temporarily impacted. Impacts would not be significant because of the small area of habitat that would be impacted and the relatively low density of amphibians. If the natural gas pipeline is installed under the Big Sandy River and riparian zone by directional drilling, the pipeline is not likely to impact the Arizona toad or lowland leopard frog or their habitats. Because the Proposed Action contains measures to augment shallow groundwater and surface water flow in the Big Sandy River, no impact is expected on wetlands, and thus there is expected to be no adverse impacts on lowland leopard frogs, Arizona toads, or their habitat on the Big Sandy River.

Fish

The OPGW option and microwave dish installations would not impact fish habitat. Depending upon which construction technique for the gas pipeline is implemented, the Proposed Action could result in impacts on fish and their habitat. If the pipeline is constructed by trenching, laying pipe, and backfilling at the crossing of the Big Sandy River, then wetland habitat for these fish could be temporarily impacted. Impacts would not be significant because of the small area of habitat that would be impacted and the relatively low density of fish. If the natural gas pipeline is installed under the Big Sandy River and riparian zone by directional drilling, the pipeline is not likely to impact fish. Because the Proposed Action contains measures to augment shallow groundwater and surface water flow in the Big Sandy River, groundwater pumping would likely cause no adverse impacts on fish or their habitat on the Big Sandy River.

If the pipeline is installed under the Big Sandy River riparian zone by directional drilling, there would be no impacts on these aquatic habitats from this activity.

Plants

Thorn milkwort, linear-leaf sand spurge, and three hearts were not observed in the Project area during a survey for special status species (Greystone 2000c); however, these species could occur in the region of influence. Significant impacts are not expected for these species because detailed field surveys would be conducted in all suitable habitat prior to construction or OPGW installation. If habitat cannot be avoided, field surveys would be conducted during the appropriate flowering period to identify any individuals or populations of this species.Arizona necklace was not observed along the proposed gas pipeline corridor (Greystone 2000c). However, it was observed during a site reconnaissance by EPG, Inc. on the proposed pipeline corridor in segment C3 and along corridor segments T1, T2, C2, and R3. Because of the limited distribution of this species within the region of influence, these populations are substantial, and the destruction of them would be considered significant. Detailed field surveys would be conducted to identify suitable habitat. If habitat cannot be avoided, field surveys would be

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conducted during the appropriate flowering period to identify any individuals or populations of this species. Loss of these populations would be significant.Aquarius milk-vetch and Parish's phacelia could occur in lakebed deposits in the Big Sandy Valley; however, there are no known occurrences of these plants in the region of influence. It is possible that small exposures of Tertiary limestone lakebed deposits may exist, but no significant impact on these species is expected if they are not found on the ancient lakebed deposits. Detailed field surveys would be conducted to identify suitable habitat. If habitat cannot be avoided, field surveys would be conducted during the appropriate flowering period to identify any individuals or populations of this species.California flannelbrush, Aravaipa woodfern, and sand cholla are not likely to occur in the region of influence. Therefore, significant impacts are not expected for these species under the Proposed Action.

Alternative R Gas Pipeline Corridor

Southwestern Willow Flycatcher

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Bald Eagle

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Yuma Clapper Rail

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Arizona Cliffrose

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Mountain Plover

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Other Special Status Species

Bats

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Birds

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Reptiles

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Amphibians

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Fish

Potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Plants

With the exception of the Arizona necklace, potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Arizona necklace was observed at the northern end of the Alternative R gas pipeline corridor in segments C3 and R3. Because of the limited distribution of this species within the region of

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influence, these populations are substantial, and the destruction of them would be considered significant. Detailed field surveys would be conducted to identify suitable habitat. If habitat cannot be avoided, field surveys would be conducted during the appropriate flowering period to identify any individuals or populations of this species. Loss of these populations would be significant.

Alternative T Gas Pipeline Corridor

Southwestern Willow Flycatcher

Potential impacts of this alternative would be the same as those discussed for the Proposed Action except that the Alternative T gas pipeline corridor would not cross the perennial reach of the Big Sandy River where it supports riparian vegetation.

Bald Eagle

Potential impacts of this alternative would be the same as those discussed for the Proposed Action except that the Alternative T gas pipeline corridor would not cross the perennial reach of the Big Sandy River where it supports riparian vegetation.

Yuma Clapper Rail

Potential impacts of this alternative would be the same as those discussed for the Proposed Action, except that this would be that the Alternative T gas pipeline corridor would not cross the perennial reach of the Big Sandy River where it supports riparian vegetation.

Arizona Cliffrose

Construction of the gas pipeline in the Alternative T gas pipeline corridor would not impact any known populations of Arizona cliffrose. Potential habitat would be impacted in corridor segment T5, where Tertiary limestone lakebed deposits have been found.

Mountain Plover

The potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Other Special Status Species

Bats

Potential impacts of this alternative would be the same as those discussed for the Proposed Action except that the Alternative T gas pipeline corridor would not be located close to existing bridges or culverts that could be used by bats.

Birds

Potential impacts of this alternative would be the same as those discussed for the Proposed Action except that the Alternative T gas pipeline corridor would present a slightly higher potential for raptor nests because it would follow the transmission line rights-of-way. .

Reptiles

Potential impacts of this alternative would be the same as those discussed for the Proposed Action except where the Alternative T gas pipeline corridor crosses the Big Sandy River at a point that is dry except during storm flow events. The sandy banks may be used by Sonoran desert tortoises, and these habitats may be affected by construction. These impacts would be comparable to those under the Proposed Action.

Amphibians

Potential impacts of this alternative would be the same as those discussed for the Proposed Action, except there would be no direct impact on the perennial flow of the Big Sandy River.

Fish

Potential impacts of this alternative would be the same as those discussed for the Proposed

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Action, except there would be no direct impact on the perennial flow of the Big Sandy River.

Plants

With the exception of the Arizona necklace, potential impacts of this alternative would be the same as those discussed for the Proposed Action.

Arizona necklace was observed near the northern end of the Alternative T gas pipeline corridor in segments C3, T1, and T2. It is possible that there are isolated populations along corridor segment T3. Because of the limited distribution of this species within the region of influence, these populations are substantial, and the destruction of them would be considered significant. Detailed field surveys would be conducted to identify suitable habitat. If habitat cannot be avoided, field surveys would be conducted during the appropriate flowering period to identify any individuals or populations of this species. Loss of these populations would be significant.

Crossover Segment C2

Along this corridor segment, there is potential habitat for some sensitive bat species such as the fringed myotis, small-footed myotis, and Allen's big-eared bat. Populations of Arizona necklace also are found within corridor segment C2. However, the pipeline would be routed within an existing road, so it is not likely that adverse impacts would occur to these species.

Communication Facilities

The presence of any special status species at any locations that would be affected by the installation of the OPGW (pulling and tensioning sites) or installation of the microwave towers would be identified through pre-construction field surveys. Potential impacts could be avoided by altering the location of the facilities as needed.

No-Action Alternative

<u>Southwestern Willow Flycatcher</u>

Under the No-Action Alternative, the Project would not be constructed, and there would be no impacts on the willow flycatcher.

<u>Bald Eagle</u>

No impacts, adverse or otherwise, are expected on this endangered raptor under the No-Action Alternative.

<u>Yuma Clapper Rail</u>

The No-Action Alternative would have no effect on the Yuma clapper rail.

<u>Arizona Cliffrose</u>

No impacts, adverse or otherwise, are expected on this endangered plant under the No-Action Alternative.'

<u>Mountain Plover</u>

The No-Action Alternative would have no effect on the Mountain Plover.

<u>Other Special Status Species</u>

Bat, bird, reptile, amphibian, and fish populations and their use of this area would be expected to continue at their current levels. Plants would not be impacted by the No-Action Alternative. The groundwater production and monitoring wells, and associated access roads completed on private land and used to test the lower aquifer, would remain.

3.14.2.6 Mitigation and Residual Impacts

If adopted, the following measures would be implemented to avoid or reduce impacts on the southwestern willow flycatcher:

- To reduce or avoid cowbird parasitism on southwestern willow flycatcher, agricultural

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activities in Section 7 would be restricted to those that could occur without increasing cowbird foraging habitat.

- To reduce potential impacts on southwestern willow flycatcher habitat, camping, hiking, biking, off-road vehicles, fires, wood-gathering, and other recreational uses by Project construction workers would be excluded within the areas of known or potential habitat controlled by Caithness.

- To avoid impacting southwestern willow flycatchers by attracting people or livestock, the use of surveyors' flagging in flycatcher habitat would be as inconspicuous as practical, and the flagging would be removed when Project construction is completed.

- Should the agencies with regulatory responsibilities applicable to the Project, in consultation with agencies with appropriate expertise, determine that on the basis of the available evidence the Project poses a substantial threat to the southwestern willow flycatcher or its habitat, modifications to the Project up to and including the cessation of groundwater pumping may be required in accordance with the agencies' applicable authority.

If adopted, the following additional measures would be implemented to avoid or reduce impacts on the southwestern willow flycatcher if the natural gas pipeline is constructed across the Big Sandy River by trenching:

- In cooperation with USFWS and AGFD, monitoring of the southwestern willow flycatcher population would be conducted until the riparian vegetation is restored. Data would be collected on specific habitat requirements, nest site selection, reproductive success, and cowbird parasitism. Special permits from USFWS would be required for this monitoring. If excessive rates of parasitism are documented, cowbird control measures (traps) would be implemented at the restoration area in the Big Sandy riparian area. Excessive parasitism and trapping protocols would be defined by USFWS and/or AGFD.

- To accomplish restoration of riparian vegetation that supports southwestern willow flycatcher, temporary fencing to exclude livestock would be installed around the restoration area at and adjacent to Wetland #1 to ensure success of the revegetation efforts. This fencing would be removed after the trees and shrubs have become well established and would be less susceptible to damage by livestock.

- To restore southwestern willow flycatcher habitat in the riparian areas of the Big Sandy River, areas to be disturbed would be replanted with woody native species at a density of 3 to 1 of the individuals removed to accelerate restoration. Species would include Goodding willow, Fremont cottonwood, screwbean mesquite, and arrowweed.

If adopted, the following measures would be implemented to avoid or reduce impacts on the bald eagle:

- Mitigation measures presented in Section 3.13.2.6 for mortality of birds colliding with the transmission line would be implemented.

- To prevent impacts from exposure to toxic contaminants in evaporation ponds, the mitigation measure in Section 3.13.2.6 regarding exposure to wildlife to contaminants in the evaporation ponds would be implemented.

If adopted, the following measures would be implemented to minimize adverse impacts not considered to be significant on other sensitive species:

- To prevent impacts on the bats from exposure to toxic contaminants in

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evaporation ponds, the mitigation measure in Section 3.13.2.6 regarding exposure to wildlife to contaminants in the evaporation ponds would be implemented.

- To prevent abandonment of nests, construction would be prohibited within 0.25 mile of any nesting raptor during the period the nest is active. Within the riparian habitat, large trees that could provide suitable nesting sites for raptors would be avoided.

- To reduce the adverse impacts of the Project on the banded Gila monster, desert night lizard, rosy boa, chuckwalla, and Arizona skink and to help avoid incidental deaths of these animals by construction vehicles and maintenance traffic, any of these species identified during the surveys to relocate desert tortoise would be relocated as well.

- All rosy boa or chuckwalla found within construction areas could be moved a minimum of 500 feet (not more than 1 mile from their original location) and placed in a shady location. Rosy boa or chuckwalla that wander onto construction areas during construction periods also could be removed to a safe location, if necessary, and would be moved solely for the purpose of preventing death or injury.

- To the extent practical, to avoid harming individual sensitive plants, pipeline alignments would be re-routed within the selected corridor to avoid sensitive plant species. If sensitive plants cannot be avoided, seeds would be collected to aid in revegetation to the extent practical and added to the seed mix in areas where the individuals are found.

If adopted, the following measure would be implemented to enhance the existing environment:

- To enhance bat roosting habitat in the Project vicinity, box culverts that would be installed at the Sycamore Creek crossing would include domed and roughened roofs, or shallow roof crevices.

3.15 CULTURAL RESOURCES

The cultural environment includes those aspects of the physical environment that relate to human culture and society, along with the social institutions that form and maintain communities and link them to their surroundings. The BLM (Manual 8100, *Cultural Resource Management*) uses the term *cultural resources* to include *cultural properties* and *traditional lifeway values* defined as follows:

- *cultural property*: a definite location of past activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups. Cultural properties are concrete, material places and things that are located, classified, ranked, and managed through the system of identifying, protecting, and utilizing for public benefit.

- *traditional lifeway value*: a social and/or cultural group's traditional patterns of religious belief, cultural practice, or social interaction. Traditional lifeway values sometimes imbue cultural resources with significance. They can be identified through consultation and considered through public participation during planning and environmental review.

Section 101(b)(4) of NEPA established a Federal policy of conserving the historic and cultural, as well as the natural, aspects of our national heritage. Regulations implementing NEPA stipulate that Federal agencies consider the consequences of their undertakings on historic and cultural resources (40 CFR Part

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1502.16[g]). Numerous other laws, regulations, and executive orders define other requirements for protecting cultural resources, but the primary requirements are those of Section 106 of the National Historic Preservation Act (NHPA). NHPA mandates that as Federal undertakings are planned and implemented, the responsible Federal agencies give due consideration to historic properties, which are defined as districts, sites, buildings, structures, and objects included in or eligible for the National Register of Historic Places (National Register). Federal undertakings include projects, activities, or programs funded in whole or in part by a Federal agency, or requiring a Federal permit, license, or approval. Regulations for *Protection of Historic Properties* (36 CFR Part 800) implement the NHPA by defining a process for demonstrating such consideration through consultation with State Historic Preservation Officers (SHPOs), the Federal Advisory Council on Historic Preservation (ACHP), and other interested organizations and individuals.

Cultural resources are addressed in this Draft EIS in compliance with both NEPA and NHPA. The cultural resource component of the affected environment is described first, and then the potential impacts of the Proposed Action and alternatives are discussed.

3.15.1 Affected Environment

3.15.1.1 Region of Influence

The region of influence, or analysis area, for assessing impacts on cultural resources was considered to be the "area of potential effects," as defined by regulations for *Protection of Historic Properties.* These regulations define the area of potential effects as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties" (36 CFR Part 800.16(d).

The area of potential direct effects was considered to be the area of the Project parcels or rights-of-way where ground-disturbing activities could occur. These include the plant site, well field and agricultural development parcel, new access road, four other groundwater monitoring wells, two existing roads used to access those wells, the pipeline that would supply natural gas to the plant, and communications systems (microwave and possibly OPGW).

Potential indirect effects include visual and noise intrusions that could diminish the historic values of certain types of cultural resources. The area of potential indirect effects is defined as extending up to 3 miles from the Project facilities. This zone encompasses about 317.5 square miles.

The Big Sandy River Basin was defined as the region of influence for considering potential cumulative impacts. This Basin encompasses about 2,732 square miles of east central Mohave County.

3.15.1.2 Existing Conditions

Cultural History

Human societies have lived in Arizona at least since the end of the Pleistocene epoch some 12,000 years ago. The early occupants, labeled Paleo-Indians, experienced a regional climate that was cooler and wetter than today, and large Pleistocene mammals, such as mammoths, mastodons, and camels, lived in the area. Archaeological evidence of the Paleo-Indian occupation of west-central Arizona is meager, and limited primarily to isolated finds of distinctive spear points used by early Paleo-Indian hunters. The large Pleistocene megafauna became extinct due to overhunting or inability to adapt to the warming and drying climate. Human societies that occupied this subsequent Archaic era came to rely on many species of smaller game and a wide variety of native plants for food. These Archaic-era hunters and foragers occupied the region for thousands of years. Populations remained small throughout this long period and, to date, little evidence of Archaic era

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occupation has been found in the Big Sandy Valley.

About 700 years ago, residents of the region began to grow some of their own food. They adopted a more settled life style, and began to make ceramic vessels to store, cook, and serve food. Increasing population densities led to more cultural variability and groups began to be differentiated on the basis of geographical location, settlement and subsistence patterns, cultural practices, and styles of artifacts. The Cerbat branch of the Patayan culture appear to have been the primary occupant of the Big Sandy Valley during this time. The Cerbat typically lived in circular brush wikieups, but also used rock shelters and caves as habitation sites. Small triangular, side-notched arrow points, shallow-basin grinding slabs, and sherds of pottery are archaeological indicators of sites dating from this era of occupation.

Most archaeologists conclude that the Cerbat are the ancestors of the modern Hualapai Tribe. When Europeans first arrived, the Hualapais occupied a large part of northwestern Arizona between the Grand Canyon and the Bill Williams River.

Spanish explorers arrived in what is now southern Arizona in the early 1500s, but had little direct impact on the Hualapai culture. A missionary, Father Francisco Garcés, made the first direct contact with the Hualapai in 1776. Subsequently, a few trading and trapping expeditions crossed the region, but the Hualapais tended to avoid them. Intense Euroamerican interaction began only in the 1850s after the United States acquired the territory and the U.S. military explored the area searching for routes for wagon roads and railroads. Gold and silver were discovered in the mountains of the region, and miners flocked to the area throughout the 1860s and 1870s.

Initial encounters between the Hualapais and Euroamericans were friendly, but conflicts with Euroamerican miners and immigrants soon developed. Animosity culminated in the Hualapai War between 1866 and 1869. This war consisted of a series of retaliatory attacks, ambushes, and raids conducted by the Hualapais and Euroamericans alike. U.S. Army troops based at Fort Mohave destroyed perhaps a fourth of the tribe between June 1867 and December 1868. The Hualapais surrendered after an epidemic of whooping cough or dysentery further reduced the remaining population.

In 1874 the U.S. Army moved the Hualapais to Camp La Paz on the Colorado River Indian Reservation. To escape the poor conditions on the reservation, the Hualapais fled back to their aboriginal territory a year later. They discovered that their traditional way of life was no longer possible because Euroamerican ranchers, farmers, and miners had claimed most of the Hualapai lands during the short time the Hualapai Tribe was confined to the Colorado River Indian Reservation. The Hualapais were forced to work for wages in order to survive. In 1883, the Federal government established the Hualapai Indian Reservation, encompassing only a small portion of their aboriginal territory.

Ranchers and farmers followed the miners, and soon began to establish themselves along the Big Sandy River. By 1874, the county tax assessor documented 26 heads of household, presumably for ranches and farms, along the Big Sandy River Valley. The cattle industry in the area was booming by the late 1880s. In 1883, the Atchison, Topeka and Santa Fe railroad was completed, providing greater access to suppliers and markets. This railroad, as well as the construction of numerous wagon roads linking towns, ranches, and farms, drew additional settlers to the Big Sandy Valley. Between 1890 and the 1920s, some 2,000 acres were cultivated, with principal crops being alfalfa, barley, and vegetables. During historic times, the valley was the most productive farmland in the county, but after a few destructive floods destroyed fields and eroded topsoil, production declined and never again achieved such high yields.

Many of the mines closed in the 1930s and, combined with droughts and the Great

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Depression, contributed to the economic decline of the area. Cattle ranching gradually began to recover, but the Taylor Grazing Act of 1934, designed to limit grazing to more sustainable levels, prevented the livestock industry from restocking the range with the size of herds grazed in earlier times. In 1957, construction of US 93 was completed, and Interstate 40 was completed to Kingman by 1979. Farming began to decline in the 1980s after the mine near Bagdad began to buy up large parcels of land along the Big Sandy River for the water rights.

Inventory Methods

Records maintained by agencies and museums were reviewed for information about prior cultural resource surveys and previously recorded archaeological and historical sites within 3 miles of the facilities of the proposed Project. Information about 52 prior studies and 100 previously recorded archaeological and historical sites was identified and compiled.

Intensive field survey within areas of potential effects was undertaken to supplement the previous studies. The survey encompassed about 563 acres, including the proposed plant site, water well field, four other observation wells, two existing access roads used to access those wells, the alignment of a new access road, and an agricultural development area.. Prior surveys have been conducted along US 93 and the Mead-Phoenix 500kV Transmission Project. The results of those surveys were used to evaluate the proposed and alternative pipeline corridor segments and OPGW communication system alternative from a cultural resource perspective. Additional inventory survey will be conducted as needed in accordance with a Section 106 programmatic agreement being developed for the Project.

Because portions of the Hualapai Indian Reservation are in the vicinity of the Project, the Hualapai Tribe was invited to be a cooperating agency in preparing this Draft EIS. Arrangements also were made for the Hualapai Tribe Department of Cultural Resources to conduct an ethnographic study to identify any traditional cultural resources that could be affected by the Project, and also participate in the field survey for archaeological and historical resources. Western also contacted the Yavapai-Prescott Tribe, Yavapai-Apache Nation, Fort Mojave Indian Tribe, Colorado River Indian Tribes, Navajo Nation, and Hopi Tribe. These tribes indicated they either had no traditional cultural interests in the Project area or that their traditional cultural interests were limited and they deferred to the Hualapai Tribe to address impacts on traditional cultural resources.

Cultural Resource Inventory

The cultural resources within the Project area are briefly described in this section. Further details and information about data sources are available in technical reports prepared for agency review and Section 106 consultations (Bassett and others 2001; Hualapai Tribe Department of Cultural Resources 2001)

Traditional Cultural Resources

An ethnographic study conducted by the Hualapai Tribe Cultural Resources Department documented that tribal members maintain strong ties to the Big Sandy Valley, particularly to the area where the confluence of Knight Creek and Trout Creek form the Big Sandy River. Around 1910 the Federal government designated land in this area, which is about 45 miles south of the main Hualapai Reservation, as an element of the larger reservation. Almost all of this land was allotted to tribal members who eventually sold the land to non-Indians. Only three parcels totaling about 700 acres still retain reservation status. Two of these parcels are allotted to tribal members and the other remains under tribal control.

About 20 Hualapai families lived in this area during the early twentieth century, and some of today's tribal elders remember living in the area during their youth. The last Hualapai families moved away around the 1960s. Although no tribal members reside on these parcels today, the

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parcels are frequently visited and are recognized as assets.

Although the Hualapai Tribe has lost rights and access to most of the Big Sandy Valley, Tribal members think of the valley as an integral part of their aboriginal territory and consider it a traditional cultural landscape. Water sources, including the Big Sandy River and numerous springs scattered throughout the valley and adjacent mountains, are recognized as particularly important elements of that landscape. Early ethnographic studies documented that the Hualapais occupied four villages in the Big Sandy River Valley during the 1880s (Kroeber 1935). The largest community, *Hapuk*, composed of some 25 to 30 extended families, was scattered along a 15-mile stretch of the Big Sandy River between Wikieup and Signal, where surface flows usually are perennial. Another village of about 5 to 10 households was near the confluence of Knight Creek and Trout Creek and the nearby Cane Wash. Smaller villages of five or fewer households were in the northern end of the valley near Wheeler Wash and Bottleneck Wash, which are tributaries to Knight Creek. Although physical evidence of these villages has not been specifically identified, the ethnohistoric accounts reflect strong traditional Hualapai cultural ties to the Big Sandy Valley.

The Hualapai Tribe also considers the Big Sandy River Valley to be part of a spiritual landscape that includes a segment of the Salt Song Trail, a spiritual path that runs through their aboriginal territory. The Salt Song spiritual journey begins south of the Project area, travels north along of the Big Sandy River, and eventually crosses the Colorado River. The Big Sandy River Valley probably served as a secular travel corridor as well.

Hualapais regard archaeological sites as sacred remnants of their ancestral culture. Their traditional ethic is to avoid archaeological sites and respect their ancestors by leaving archaeological sites undisturbed.

Archaeological and Historical Sites

Seven archaeological and historical sites have been recorded in the vicinity of the proposed power plant, wells, and access roads (Table 3.15-1). Fifty-one isolated finds of aboriginal and historic Euroamerican artifacts also were identified within the surveyed areas, but all of these are evaluated as lacking historic values that warrant preservation or protection.

Three archaeological sites are within or partially within the plant site. Site AZ M:6:46 (ASM) is an undated scatter of fewer than 200 aboriginal flaked stone artifacts. Site AZ M:6:47 (ASM) is a scatter of aboriginal and historic Euroamerican artifacts and features around a spring. The site represents an aboriginal camp and historic era development of the spring for watering livestock. Site AZ M:6:48 (ASM) is a circular rock alignment that might be a wikieup (brush shelter) foundation but lacks artifacts to support that inference. All three of these sites are evaluated as eligible or potentially eligible for the National Register of Historic Places because of their potential to yield important information about the cultural history of the Big Sandy Valley (Criterion D).

Another site, AZ M:6:49 (ASM), is a historic Euroamerican trash dump adjacent to the proposed new access road. Site AZ M:6:50 (ASM) is another small trash dump adjacent to an observation well. Both of these sites are estimated to have no more than about 100 artifacts and are evaluated as lacking historic values that warrant protection or preservation, and therefore are not National Register-eligible.

Site AZ M:6:51 (ASM) is a scatter of about 100 aboriginal artifacts and a cleared area that may be the remnants of a structure or activity area. This site is located west of US 93 adjacent to a two-track that is used to access Observation Well 8 and the observation well east of Banegas Well. This site is evaluated as being National Register-eligible for its potential to yield important information about the aboriginal

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	TABLE 3.15-1 SUMMARY OF ARCHAEOLOGICAL SITES IN THE VICINITY OF THE PLANT SITE, WELLS, AND ACCESS ROADS			
	Site Number/Name	**Site Type**	**National Register Eligibility (Criterion)**	**Potential Project Impacts**
1	AZ M:6:3 (ASM) Hillside to Kingman highway	historical road completed in 1924	recommended eligible (D)	no historical integrity within new access road right-of-way; occasional use of two-track segment for monitor well access will not affect historic values
2	AZ M:6:46 (ASM)	scatter of undated flaked stone artifacts (<200)	recommended potentially eligible (D)	none
3	AZ M:6:47 (ASM)	scatter of a few hundred Cerbat Patayan/Hualapai aboriginal and Euroamerican artifacts and features (spring box, 2 concrete troughs, metal tank, 2 rock alignments, check dams, 2 artifact clusters, 3 rock cairns)	recommended eligible (D)	northern portion of scatter will be disturbed by construction of access road on the power plant site
4	AZ M:6:48 (ASM)	circular rock alignment without artifacts	recommended potentially eligible (D)	none
5	AZ M:6:49 (ASM)	1930s trash scatter (~100 artifacts)	recommended not eligible	may be disturbed by new access road
6	AZ M:6:50 (ASM)	post-1920s trash scatter (<100 artifacts)	recommended not eligible	none
7	AZ M:6:51 (ASM)	Cerbat Patayan (possibly Prescott culture) artifact scatter (~100) with cleared area	recommended eligible (D)	none

occupation of the Big Sandy Valley (Criterion D).

The road that passes by site AZ M:6:51 (ASM) is a segment of the old Hillside to Kingman highway, which was completed in 1924, and replaced by US 93 in the 1950s. This segment of the road continues to be used as a ranch road. The new access road east of US 93 also crosses the alignment of the old highway but the road corridor in this area has been highly altered by upgrading and maintenance of Cholla Canyon Ranch Road. The old Hillside to Kingman highway has been designated as site AZ M:6:3 (ASM), and those portions of the road that retain historic integrity have been evaluated as being eligible for the National Register because of the information they might provide about early highway construction (Criterion D).

The proposed natural gas pipeline would be buried within a corridor that in part follows Hackberry Road, the Mead-Liberty and Mead-Phoenix transmission lines, and US 93 . ADOT has completed cultural resource surveys along US 93 in conjunction with planning upgrades of the highway, and other surveys were conducted prior to the construction of the Mead-Phoenix 500-kV Transmission Line Project. These studies provide information for assessing

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potential impacts of the proposed pipeline. Available survey information indicates 29 historical and archaeological sites and historical roads have been recorded within the proposed pipeline corridor. Some of the historical roads are crossed more than once. Thirteen of the 29 recorded resources appear to have no significant historic values that warrant preservation (Table 3.15-2). Part of the Carrow-Stephens Ranches ACEC also is within the corridor but no archaeological or historical sites have been recorded in that portion of the ACEC, and the corridor is wide enough to accommodate a specific alignment that could completely avoid the ACEC (refer to Section 3.10).

The significant or potentially significant resources include eight historical ranches, three historical roads, a historical beehive site, and four aboriginal sites.

The Alternative R gas pipeline corridor has been more completely inventoried than the proposed corridor and 36 historical and archaeological sites and historical roads have been recorded in this corridor. Again, some of the roads are crossed more than once. Fifteen of the 36 recorded resources appear to have no significant values that warrant preservation (Table 3.15.3). The significant or potentially significant resources include ten historical ranches, five historical roads, a historical beehive site, and five aboriginal sites. The Carrow-Stephens Ranches ACEC is the most sensitive of these resources (refer to Section 3.10).

The Alternative T gas pipeline corridor has been less completely inventoried than the proposed corridor or the Alternative R gas pipeline corridor. Twelve historical and archaeological sites and historical roads have been recorded in this corridor, including one road that is crossed twice. Four of the 12 recorded resources appear to have no significant values that warrant preservation (Table 3.15.4). The significant or potentially significant resources include three historical ranches, three historical roads, and two aboriginal sites. The Carrow-Stephens Ranches ACEC also is within the corridor but no archaeological or historical sites have been recorded in that portion of the ACEC, and the corridor is wide enough to accommodate a specific alignment that could completely avoid the ACEC (refer to Section 3.10).

The other corridor segment that could be used to cross over from the transmission corridor to the road corridor is segment C2. This corridor segment is the right-of-way for Old US 93, and at this location follows the original Hillside to Kingman Highway, which was built in 1924. This road is designated as site AZ M:6:3 (ASM), and has been evaluated elsewhere as historically significant, but this segment has not be evaluated. This segment of the road is a crowned-and-ditched road that is well maintained and may have lost its historical integrity.

In summary, 16 significant or potentially significant archaeological and historical sites and roads have been recorded within the proposed pipeline corridor, 20 within the Alternative R gas pipeline corridor, and 8 within the Alternative T gas pipeline corridor. These numbers are based on only a sample of each corridor, and the extent of survey varies from corridor to corridor in about direct proportion to the number of recorded cultural resources. Other resources are likely to be identified once a right-of-way is defined and the specific areas of potential effect are intensively surveyed in accordance with the Section 106 programmatic agreement developed for the Project.

The primary substation communications system involves adding one microwave dish to an existing facility on Hayden Peak and a communication tower in the new substation. This system is not expected to affect any archaeological or historical sites. After the system is more specifically designed potential impacts on cultural resources, including traditional cultural places, will be further considered in consultation with the Hualapai Tribe in accordance with the Section 106 programmatic agreement developed for the Project.

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	TABLE 3.15-2 ARCHAEOLOGICAL AND HISTORICAL SITES ALONG THE PROPOSED PIPELINE		
	Site Number/Name	Description	National Register Eligibility (Criterion)
Corridor Segment R1			
1	AZ G:14:8 (ASM) Hackberry Road	historical road	recommended not eligible
Corridor Segment C1			
2	AZ G:14:5 (ASM) Kingman to Round Valley road	historical road, ca. 1900-1950	recommended not eligible
3	AZ M:6:3 (ASM) Hillside to Kingman highway	historical road, ca. 1880s-1960s	recommended eligible (D)
Corridor Segment T3			
	none recorded		
Corridor Segment C3			
4	AZ M:2:2 (ASM)	Cerbat/Hualapai bedrock grinding slicks	recommended eligible (D)
5	AZ M:2:3 (BLM)	aboriginal flaked stone and ceramic sherds, badly eroded	recommended not eligible
6	AZ M:2:36 (ASM) Signal to Kingman and Hackberry road-west	historical road, ca. 1912-1950s	recommended eligible (D)
Corridor Segment T4			
7	AZ G:14:7 (ASM)	telephone line, ca. 1880-1950s	recommended not eligible
8	AZ M:2:8 (ASM) Cane Springs Site, *Taka Minva*	base camp of Lower Big Sandy band of the Hualapai	recommended eligible (A and D)
9	AZ M:2:7 (ASM)	ranch, ca. 1929-1990s	recommended potentially eligible (D)
10	AZ M:2:9 (ASM)	ranch, ca. 1900-1969	recommended potentially eligible (D)
11	AZ M:2:22 (ASM)	road, ca. 1930s-1950s	recommended not eligible
12	AZ M:2:26 (ASM)	road, ca. 1918-present	recommended not eligible
13	AZ M:2:36 (ASM) Signal to Kingman and Hackberry road-west	historical road, ca. 1912-1950s	recommended eligible (D)
Corridor Segment R5			
14	AZ M:6:1 (BLM)	Hualapai camp, location uncertain	unevaluated
15	AZ M:6:3 (ASM) Hillside to Kingman highway	historical road, ca. 1880s-1960s	recommended eligible (D)
16	AZ M:6:4 (ASM) Bland homestead	historical homestead, 1915-1918	recommended potentially eligible (D)
17	AZ M:6:6 (ASM) US 93 Big Sandy River Bridge	historical bridge, constructed 1948-1949	not eligible and demolished
18	AZ M:6:7 (ASM)	historical ranch, ca. 1880s-1960s	recommended potentially eligible (D)

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TABLE 3.15-2
ARCHAEOLOGICAL AND HISTORICAL SITES ALONG THE PROPOSED PIPELINE

	Site Number/Name	Description	National Register Eligibility (Criterion)
19	AZ M:6:8 (ASM)	5 to 7 petroglyphs, cultural tradition undetermined	undetermined
20	AZ M:6:26 (ASM)	apiary, ca. 1930s-1950s	recommended potentially eligible (D)
21	AZ M:6:27 (ASM)	trash scatter, ca. 1932-present	recommended not eligible
22	AZ M:6:28 (ASM)	trash dump, ca. 1900-1950	recommended not eligible
23	AZ M:6:29 (ASM) Signal to Kingman and Hackberry road	historical road, ca. 1870?-1950s?	recommended eligible (D)
24	AZ M:6:30 (ASM)	ranch, ca. 1900-present	recommended potentially eligible (D)
25	AZ M:6:31 (ASM)	ranch, ca. 1900-1950s?	recommended potentially eligible (D)
26	AZ M:6:32 (ASM)	trash scatter, early to mid-1900s to present	recommended not eligible
27	AZ M:6:33 (ASM) Morrow Ranch	historical ranch, ca. 1917-present	recommended not eligible
28	AZ M:6:34 (ASM)	historical or modern ranch	not determined
29	AZ M:6:40 (ASM) Chicken Springs Road	historical road, early 1900s – present	recommended not eligible
30	AZ M:6:43 (ASM)	ranch, ca. 1920s?	unevaluated
31	AZ M:6:49 (ASM)	1930s trash scatter (~100 artifacts)	not eligible

TABLE 3.15-3
ARCHAEOLOGICAL AND HISTORICAL SITES ALONG THE ALTERNATIVE R GAS PIPELINE CORRIDOR

	Site Number/Name	Description	National Register Eligibility (Criterion)
Corridor Segment R1			
1	AZ G:14:8 (ASM) Hackberry Road	historical road	recommended not eligible
Corridor Segment R2			
	none recorded		
Corridor Segment R3			
2	AZ G:14:5 (ASM) Kingman to Round Valley road	historical road, ca. 1900-1950	recommended not eligible
3	AZ G:14:6 (ASM) Cofer Road	historical road, ca. 1920s-present	recommended eligible (D)
4	AZ M:2:36 (ASM) Signal to Kingman and Hackberry road-west	historical road, ca. 1912-1950s	recommended eligible (D)

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TABLE 3.15-3 ARCHAEOLOGICAL AND HISTORICAL SITES ALONG THE ALTERNATIVE R GAS PIPELINE CORRIDOR			
	Site Number/Name	**Description**	**National Register Eligibility (Criterion)**
5	AZ M:6:3 (ASM) Hillside to Kingman highway	historical road, ca. 1880s-1960s	recommended eligible (D)
Corridor Segment C3			
6	AZ M:2:2 (ASM)	Cerbat/Hualapai bedrock grinding slicks	recommended eligible (D)
7	AZ M:2:3 (BLM)	aboriginal flaked stone and ceramic sherds, badly eroded	recommended not eligible
8	AZ M:2:36 (ASM) Signal to Kingman and Hackberry road-west	historical road, ca. 1912-1950s	recommended eligible (D)
Corridor Segment R4			
9	AZ M:2:6 (ASM) Carrow-Stephens Ranch	historical ranch complex, ca. 1882-1940	recommended eligible (A and D), Area of Critical Environmental Concern
10	AZ M:2:9 (ASM)	ranch, ca. 1900-1969	recommended potentially eligible (D)
11	AZ M:2:10 (ASM)	ranch, ca. 1920-1950	recommended potentially eligible (D)
12	AZ M:2:12 (ASM)	ranch, ca. 1900-1969	recommended potentially eligible (D)
13	AZ M:2:12 (SWD)	Cerbat/Hualapai camp, location uncertain	unevaluated
14	AZ M:2:13 (ASM)	historical two-track	recommended not eligible
15	AZ M:2:14 (ASM)	Patayan/Cerbat/Hualapai artifact scatter	recommended potentially eligible (D)
16	AZ M:2:22 (ASM)	road, ca. 1930s-1950s	recommended not eligible
17	AZ M:2:26 (ASM)	road, ca. 1918-present	recommended not eligible
18	AZ M:2:35 (ASM)	trash scatter, ca. 1930s-1950s	recommended not eligible
19	AZ M:2:36 (ASM) Signal to Kingman and Hackberry road-west	historical road, ca. 1912-1950s	recommended eligible (D)
20	AZ M:6:3 (ASM) Hillside to Kingman highway	historical road, ca. 1880s-1960s	recommended eligible (D)
21	AZ M:6:29 (ASM) Signal to Kingman and Hackberry road	historical road, ca. 1870?-1950s?	recommended eligible (D)
Corridor Segment R5			
22	AZ G:14:7 (ASM)	telephone line, ca. 1880-1950s	recommended not eligible
23	AZ M:6:1 (BLM)	Hualapai camp, location uncertain	unevaluated
24	AZ M:6:3 (ASM) Hillside to Kingman highway	historical road, ca. 1880s-1960s	recommended eligible (D)

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TABLE 3.15-3 ARCHAEOLOGICAL AND HISTORICAL SITES ALONG THE ALTERNATIVE R GAS PIPELINE CORRIDOR			
	Site Number/Name	Description	National Register Eligibility (Criterion)
25	AZ M:6:4 (ASM) Bland homestead	historical homestead, 1915-1918	recommended potentially eligible (D)
26	AZ M:6:6 (ASM) US 93 Big Sandy River Bridge	historical bridge, constructed 1948-1949	not eligible and demolished
27	AZ M:6:7 (ASM)	historical ranch, ca. 1880s-1960s	recommended potentially eligible (D)
28	AZ M:6:8 (ASM)	5 to 7 petroglyphs, cultural tradition undetermined	undetermined
29	AZ M:6:26 (ASM)	apiary, ca. 1930s-1950s	recommended potentially eligible (D)
30	AZ M:6:27 (ASM)	trash scatter, ca. 1932-present	recommended not eligible
31	AZ M:6:28 (ASM)	trash dump, ca. 1900-1950	recommended not eligible
32	AZ M:6:29 (ASM) Signal to Kingman and Hackberry road	historical road, ca. 1870?-1950s?	recommended eligible (D)
33	AZ M:6:30 (ASM)	ranch, ca. 1900-present	recommended potentially eligible (D)
34	AZ M:6:31 (ASM)	ranch, ca. 1900-1950s?	recommended potentially eligible (D)
35	AZ M:6:32 (ASM)	trash scatter, early to mid-1900s to present	recommended not eligible
36	AZ M:6:33 (ASM) Morrow Ranch	historical ranch, ca. 1917-present	recommended not eligible
37	AZ M:6:34 (ASM)	historical or modern ranch	not determined
38	AZ M:6:40 (ASM) Chicken Springs Road	historical road, early 1900s – present	recommended not eligible
39	AZ M:6:43 (ASM)	ranch, ca. 1920s?	unevaluated
40	AZ M:6:49 (ASM)	1930s trash scatter (~100 artifacts)	not eligible

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	TABLE 3.15-4 ARCHAEOLOGICAL AND HISTORICAL SITES ALONG THE ALTERNATIVE T GAS PIPELINE CORRIDOR		
	Site Number/Name	**Description**	**National Register Eligibility (Criterion)**
Corridor Segment T1			
1	AZ M:6:3 (ASM) Hillside to Kingman highway	historical road, ca. 1880s-1960s	recommended eligible (D)
Corridor Segment T2			
2	AZ G:14:5 (ASM) Kingman to Round Valley road	historical road, ca. 1900-1950	recommended not eligible
Corridor Segment T3			
	none recorded		
Corridor Segment T4			
3	AZ G:14:7 (ASM)	telephone line, ca. 1880-1950s	recommended not eligible
4	AZ M:2:8 (ASM) Cane Springs Site, *Taka Minva*	base camp of Lower Big Sandy band of the Hualapai	recommended eligible (A and D)
5	AZ M:2:7 (ASM)	ranch, ca. 1929-1990s	recommended potentially eligible (D)
6	AZ M:2:9 (ASM)	ranch, ca. 1900-1969	recommended potentially eligible (D)
7	AZ M:2:22 (ASM)	road, ca. 1930s-1950s	recommended not eligible
8	AZ M:2:26 (ASM)	road, ca. 1918-present	recommended not eligible
9	AZ M:2:36 (ASM) Signal to Kingman and Hackberry road-west	historical road, ca. 1912-1950s	recommended eligible (D)
Corridor Segment T5			
10	AZ M:6:22 (ASM) NA18150	camp, no ceramic sherds, cultural tradition undetermined	recommended eligible (D)
11	AZ M:6:3 (ASM) Hillside to Kingman highway	historical road, ca. 1880s-1960s	recommended eligible (D)
12	AZ M:6:29 (ASM) Signal to Kingman and Hackberry road	historical road, ca. 1870?-1950s?	recommended eligible (D)
13	AZ M:6:31 (ASM)	ranch, ca. 1900-1950s?	recommended potentially eligible (D)

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Two options are being considered for the dual/redundant communication system. One option would involve installation of an OPGW as a replacement of one of the static wires on the existing Mead-Liberty 345-kV transmission line, between the plant site and the Peacock Substation, about 40 miles to the north. In addition, new microwave dishes would need to be installed at three existing microwave facilities in the Phoenix metropolitan area and Bradshaw Mountains.

No inventory surveys have yet been conducted for this option, but the right-of-way for the Mead-Phoenix 500-kV Transmission Project is immediately adjacent to the Mead-Liberty line, which has been surveyed for cultural resources. As described above in the discussion of the Alternative T gas pipeline corridor, five potentially significant archaeological and historical sites and three historical roads have been recorded along this route between the plant site and the Interstate 40 corridor. Two additional sites have been recorded between Interstate 40 and the Peacock Substation. These include site AZ G:14:1 (MNA), a Cerbat/Hualapai scatter of flaked stone, and site AZ G:14:2 (MNA), a 1920s-1950s historic trash scatter and camp. When recorded, both sites were evaluated as having significant historic values when recorded. If this option were selected for construction, cultural resource inventories and assessments would be undertaken in accordance with the Section 106 programmatic agreement.

The second option for the dual/redundant substation communication system involves use of an existing Salt River Project microwave system. This option would require installing microwave dishes at the new substation and an existing Salt River Project microwave tower, and a new tower may be needed to complete a microwave path. If warranted, cultural resource inventories and assessments would be undertaken in accordance with the Section 106 programmatic agreement.

3.15.2 <u>Environmental Consequences</u>

3.15.2.1 Identification of Issues

Agency and public scoping identified the following three cultural resource issues that warranted consideration:

- potential impacts on the Carrow-Stephens Ranches ACEC
- potential impacts on traditional Native American Indian cultural resources
- compliance with Section 106 of the National Historic Preservation Act (identification, evaluation, and assessment of effects on sites, districts, structures, and objects eligible for the National Register)

3.15.2.2 Significance Criteria

Regulations implementing NEPA stipulate that evaluations of the significance of impacts consider both context and intensity or severity of impacts. One specific factor to be considered is "the degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources" (43 CFR 1508.27[b][8]). The following two criteria were defined for identifying significant impacts:

- impacts inconsistent with BLM management prescriptions for the Carrow-Stephens Ranches ACEC (refer to Section 3.10)
- adverse impacts on traditional cultural resources or other National Register-eligible properties that cannot be satisfactorily mitigated as determined through consultation with the SHPO and other interested parties

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3.15.2.3 Impact Assessment Methods

The criteria for assessing impacts were those stipulated by the regulations for *Protection of Historic Properties*, which state than an undertaking may have an adverse effect when it:

> "may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR Part 800.5(a)(1)).
>
> Examples of adverse effects include:
>
> (i) Physical destruction, damage, or alteration of all or part of the property;
>
> (ii) Alteration of a property. . . that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR Part 68) and applicable guidelines;
>
> (iii) Removal of the property from its historic location;
>
> (iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
>
> (v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;
>
> (vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
>
> (vii) Transfer, lease or sale of the property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance (36 CFR Part 800.5(a)(2))."

The proposed Project may have direct and indirect effects on historical resources. These impacts can be limited to the construction period and therefore be short-term, or they may stem from operation of the system and be long-term or permanent.

The following two types of direct effects were evaluated:

- right-of-way and property acquisition
- physical disturbance, noise, and vibration due to construction activities

The following three types of indirect impacts were considered:

- modifications of visual settings
- noise and vibration associated with operations
- land use changes stimulated by the Project

3.15.2.4 Actions to Reduce or Prevent Impacts Incorporated into the Proposed Action

- The Proposed Action includes the following actions to reduce or prevent potential adverse environmental impacts on significant cultural resources:
- The detailed evaluation of any effects to cultural resources would be conducted in accordance with the terms of the programmatic agreement developed for the Project in compliance with Section 106 of the National Historic Preservation Act. This agreement defines a consultation process for avoiding or mitigating any identified adverse effects on significant cultural resources.

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- Under the agreement, any unknown cultural resources or human remains discovered during the course of construction also would be protected, evaluated, and treated in accordance with the programmatic agreement. A plan to recover archaeological data from site AZ M:6:47 (ASM) is being developed and would be implemented in accordance with the Section 106 programmatic agreement. The plan would be implemented in close coordination with all participants, including the Hualapai Tribe

3.15.2.5 Impact Assessment

Proposed Action

Potential impacts on the Carrow-Stephens Ranches ACEC are addressed in Section 3.10.

The entire Project is within an area that the Hualapai Tribe considers to be an important traditional cultural landscape. Although the specific locations of ethnohistoric Hualapai villages have not been identified, the Tribe concludes that the intrusion of the proposed Project into the Big Sandy Valley would adversely affect the traditional cultural landscape that the valley represents for the Tribe. The Tribe also considers archaeological sites that reflect the occupation of the area by the Hualapai and their ancestors to be traditional cultural places. [The Tribe has concerns about potential impacts on other resources such as water supplies and air quality (refer to Section 5.3).] Tribal members would like all archaeological sites that reflect their heritage to be preserved and protected in place. They view archaeological studies as adverse effects. However, the tribal Department of Cultural Resources concludes that, in some circumstances, archaeological study of sites is an appropriate mitigation measure.

Two of the three archaeological sites within or partially within the proposed power plant site would not be affected by the Project (refer to Table 3.15-1). Site AZ M:6:46 (ASM) is on a high ridge at the northern end of the plant site parcel. Most of the site is outside the parcel and no construction activities are proposed on the ridge where the site is located. Site AZ M:6:48 (ASM) is within the right-of-way held by Western for the Mead-Liberty 345-kV transmission line that passes through the plant site. No construction activities are proposed at the site location.

Construction of facilities at the proposed power plant site would destroy part of archaeological site AZ M:6:47 (ASM) situated around a spring at the southern edge of the plant site. The wetlands at the spring would be avoided, but the access road into the proposed power plant site would disturb part of the scatter of artifacts around the northern margins of the spring. The site extends south onto Federal land managed by the BLM and that portion of the site would not be disturbed.

A corridor for the natural gas pipeline has been proposed but a specific right-of-way within that corridor has not been identified. Analysis of available survey data indicates that 15 properties eligible for or potentially eligible for the National Register of Historic Places have been recorded within this corridor. These resources include four aboriginal sites, eight ranches, three roads, and one beehive site (refer to Table 3.15-2). A 90-foot-wide construction disturbance through this corridor would not necessarily affect all of these resources, but other resources might be identified as intensive surveys are conducted in accordance with the Section 106 programmatic agreement developed for the Project. If any of these resources would be adversely affected, this would represent a significant adverse impact if the effects could not be satisfactorily mitigated. However, the programmatic agreement includes Section 106 consultation, which would ensure that impacts are mitigated to below significant levels.

The proposed primary substation communication system relies on microwave relays, as does one of the options for the dual/redundant system. These systems require installation of microwave dishes mostly within

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existing microwave communication facilities and are not expected to adversely affect any significant cultural resources.

One option for a dual/redundant substation communications system involves installation of an OPGW on the Mead-Liberty transmission line. Ten National Register eligible or potentially eligible resources have been identified adjacent to this line.

Installation of the fiber optic line is not expected to require any new roads, but heavy trucks require pads about every 3 miles to pull and tension the OPGW. Each of these pads involves disturbance of about 0.33 acre. If this option were selected, there is good potential for making slight adjustments to avoid direct impacts on any significant cultural resources that might be found by surveys undertaken in accordance with the Section 106 programmatic agreement developed for the Project. The direct physical disturbance of any characteristics of archaeological and historical resources that make them eligible for the National Register of Historic Places would be an adverse effect, as defined by regulations for *Protection of Historic Properties* (36 CFR part 800.5).

The visual intrusion of the plant and introduction of noise represents a long-term alteration of the setting of the three sites discovered within the plant site. These modifications of the site settings would not affect the informational values of the sites, but from the Hualapai perspective they represent effects just as adverse as the direct physical destruction of part of the site.

Land use changes stimulated by the Project were considered as sources of potential indirect impacts on cultural resources. The construction of the Project is likely to stimulate a temporary population increase of about 3 percent in Kingman (550 workers) and 10 percent in Wikieup (15-20 persons) (refer to Section 3.16.2.4). The workers in Kingman would largely replace the Griffith Energy power plant construction force currently residing in Kingman, and therefore not stimulate new growth. The small magnitude of change in Wikieup is not expected to stimulate growth that would result in any substantial indirect impacts on cultural resources.

Alternative Gas Pipeline Corridors

Analysis of available survey data indicates that 21 properties eligible for or potentially eligible for the National Register of Historic Places have been recorded within the Alternative R gas pipeline corridor. These resources include five aboriginal sites, ten ranches, four roads, and one beehive site (refer to Table 3.15-3). This corridor crosses the Carrow-Stephens Ranches ACEC (refer to Section 3.10). A 90-foot-wide construction disturbance through this corridor would not necessarily affect all of these resources, but other resources might be identified as intensive surveys are conducted in accordance with the Section 106 programmatic agreement developed for the Project. If any of these resources would be adversely affected, this would represent a significant adverse impact if the effects could not be satisfactorily mitigated. However, the Programmatic Agreement includes Section 106 consultation, which would ensure that impacts are mitigated to below significant levels.

Analysis of available survey data indicates that eight properties eligible for or potentially eligible for the National Register of Historic Places have been recorded within the Alternative T gas pipeline corridor. These resources include two aboriginal sites, three ranches, and three roads (refer to Table 3.15-4). A 90-foot-wide construction disturbance through this corridor would not necessarily affect all of these resources, but other resources might be identified as intensive surveys are conducted in accordance with the Section 106 programmatic agreement developed for the Project.

No-Action Alternative

The Project would not be developed under the No-Action Alternative. Construction and

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operation of the Project would not affect any cultural resources. Mitigation and Residual Impacts

- The potential impacts of the Proposed Action are expected to be "adverse" as defined by regulations implementing the National Historic Preservation Act (36 CFR Part 800.5). The implementation of mitigation measures, in accordance with the Section 106 programmatic agreement, is expected to reduce the impacts on the informational values of archaeological and historical sites and the residual impacts to archeological and historical site information values would be below the level of NEPA significance as defined by criteria discussed in Section 3.15.2.2.

- The Hualapai Tribe concludes that impacts on their traditional landscape would be a significant as defined by NEPA. If adopted, the following measures would be implemented to reduce significant impacts on cultural resources:

- Impacts on the traditional Hualapai cultural landscape and associated archaeological sites would be mitigated by supporting participation of the Hualapai Tribe in the ongoing Salt Song Project. This Project, which is being coordinated by the American Indian Studies Program at the University of Arizona, is focused on identifying the few individuals who still know and sing the Salt Songs that describe the spiritual landscape of the Hualapai and neighboring tribes. The Project is seeking to document traditional knowledge about the songs before it disappears. The Proposed Action would disturb an archaeological site around a spring, and such springs are mentioned in the Salt Songs. The disturbance of the site and construction of the Project represent an impact on the traditional Hualapai world. The Hualapai Tribe concludes that support for preserving an aspect of traditional Hualapai culture would be a way of compensating for such impacts and a valuable educational opportunity for tribal members.

- Construction crews would be trained formally about environmental commitments, including the importance of avoiding damage to any cultural resources that may be adjacent to construction areas and of reporting any archaeological finds.

- Even with the implementation of these measures, significant impacts would remain.

3.16 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.16.1 Affected Environment

3.16.1.1 Region of Influence

The socioeconomic region of influence for this Project is defined as Mohave County. This area is the geographic region within which the majority of effects are likely expected to occur. Although the majority of information is presented for the county, the description of the affected environment and the analysis of potential impacts also address conditions in Kingman and Wikieup, because both communities are within a daily commuting radius of the proposed power plant site.

Kingman is the county seat and a major population center of Mohave County. Kingman is located in northwestern Arizona at the intersection of I-40 and US 93 at an elevation of 3,400 feet. It was established in the early 1880s and was incorporated in 1952. Mohave County also includes Colorado City, Bullhead City, Lake Havasu City, and a number of unincorporated communities. Kingman is less than a one-hour drive from the proposed power plant site and provides access to a wide range of trade, public services, and community services.

3.16.1.2 Existing Conditions

Existing socioeconomic conditions are described for Mohave County, Kingman and Wikieup and

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do not significantly vary according to individual pipeline corridor segment.

Population

Between 1980 and 1990, the population of Arizona increased by approximately 35 percent. By comparison, the population of the United States grew by about 9 percent over the same period. During this same period, Mohave County's population grew by 67 percent. From 1990 to 1996, the population of Mohave County increased by 42 percent, which was a larger percentage than any other Arizona county. Table 3.16-1 compares the population growth (1980 to 1999) for the county, and the cities of Kingman, Bullhead City, Colorado City, and Lake Havasu City. The Arizona Department of Economic Security estimates that through the year 2010, Mohave County will grow at an average annual rate of just over 3 percent (MCEDA 1998).

In 1990, approximately 96 percent of county residents were white, and about 4 percent were of Hispanic origin (1990 Census). This ethnic composition has changed very little since that time. For example in 1998, approximately 96 percent of county residents were white, 2 percent were Native American, and 7 percent were of Hispanic origin (Greystone 2000). These numbers total more than 100 percent because some individuals identify themselves as more than one ethnicity. The 1990 median age was 41 years for county residents and 37 years for residents of Kingman. By comparison, the 1990 population of residents near the proposed power plant site was 94 persons (Census Bureau tract 9523, -block group 1). Census tract 9523 is approximately 400 square miles in area and is bounded on the west by US 93 and on the east by the Mohave County line. Of this total, 0 percent were Native American and 20 percent were of Hispanic origin.

The unincorporated community of Wikieup, located less than 5 miles from the proposed power plant site, is primarily a residential community with an estimated current population of 250 to 300 individuals (House, personal communication, 2000). The U.S. Bureau of the Census does not conduct a more exact population count because the community is unincorporated. Interviews with several local residents suggest that the population has not increased over the past several years. This is consistent with the fact that long-term post office mailbox rentals have not increased (House, personal communication, 2000).

Employment, Labor Force, and Local Economy

The July 2000 total civilian labor force for Mohave County was 66,125 individuals. Of this total, 2,725 individuals were unemployed, equivalent to a seasonally adjusted unemployment rate of 4.2 percent.

TABLE 3.16-1
STUDY AREA POPULATION GROWTH
1980 TO 1999

Area	1980	1990	1999	Increase 1980-1999
Arizona	2,716,546	3,665,228	4,924,350	81%
Mohave County	55,865	93,497	142,925	156%
Kingman (1)	9,257	12,722	20,000	116%
Bullhead City (1)	10,719	21,951	29,315	173%
Colorado City (1)	1,439	2,426	4,365	203%
Lake Havasu City (1)	15,909	24,363	41,045	158%

Sources: U.S. Bureau of the Census 1980, 1990; Arizona Department of Economic Security, Population Statistics Unit 1999
(1) Located within Mohave County

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By comparison, the July 2000 unemployment rate for Kingman was 2.9 percent. Major industries in the county include manufacturing, tourism, ranching, mining, and services.

Approximately 80 percent of all non-farm county employment is associated with the service sector (Mohave County and MSA Current Employment Statistics 2000). Rapidly growing industries in the county include government, hospitals, and masonry.

The largest employers in the area include county government (1,200 employees), the Kingman Regional Medical Center (728 employees), Kingman elementary schools (643 employees), and Citizens Utilities (450 employees). Other significant employers include American Woodmark Company, the General Cable Corporation, the City of Kingman, and Wal-Mart (City of Kingman 2000).

The economy of Wikieup is service-based and the community has two gas stations, two restaurants, two mini-marts, two small motels, and one school. The largest employer in town is the Mobil gas station and restaurant, with a payroll of about 10 individuals counting part-time workers.

Income and Wages

In 1998, Mohave County had a *per capita* income of $19,039, which was about 80 percent of the statewide average. Over the past 10 years, the county *per capita* income has grown by an average annual rate of about 3.6 percent (BEARFACTS, Mohave Arizona - 1988 to 1998). By comparison, the growth in income for the state was 4.4 percent over the same period. Total earnings of persons employed in Mohave County increased from $511,701,000 in 1988 to $1,102,379,000 in 1998, which was equivalent to an average annual growth rate of 8 percent. Total earnings is the sum of wages and transfer payments (including unemployment, disability payments, public assistance and other activities). The rapid growth in earnings for the county is attributed to strong population growth.

Average wage rates for construction workers in the county are summarized in Table 3.16-2. These worker types are highlighted because they are generally representative of workers who would be required for Project construction.

Housing

The assessment of available housing units is an important step in the socioeconomic analysis because it identifies whether in-migrating workers would likely find temporary lodging. In 1980, there were 28,356 dwelling units in the county. This total grew to 50,822 units (an 80 percent increase) by 1990. Almost half of this total was single-family units and just over 40 percent were mobile homes.

In 1990, a typical three-bedroom house in Kingman rented for between $500 and $700 per month. One- and two-bedroom apartments rented from about $400 to $600 per month (U.S. Bureau of the Census 1990). Median home values in Kingman and Bullhead City in 1990 were $63,000 and $97,000, respectively.

TABLE 3.16-2
TYPICAL WAGE RATES FOR CONSTRUCTION WORKERS

Construction Worker Type	Average Hourly Wage
Laborer	$8.57
Carpenter	$13.24
Electrician	$14.59
Concrete finisher	$14.22
Boiler maker	$20.14
Pipe fitter	$15.83
Iron worker	$15.85
Truck driver / teamster	$13.21
Mason	$9.70
Welder	$11.32
All other construction trades	$13.79

Source: Arizona Department of Economic Security 2000a

This assessment of vacant or available housing units focuses on apartments, campground spaces, hotels, and motels rather than on

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residential units that are for sale. This is because skilled construction workers who come from outside the local area normally do not become permanent residents and do not purchase residential property.

Kingman Area

The City of Kingman reports that there currently are about 600 apartments in the Kingman area at large complexes (City of Kingman 2000). This total does not include apartments at many smaller apartment buildings scattered throughout the city. There are also six recreational vehicle (RV) camping areas with an estimated 377 campground spaces in the area (City of Kingman 2000). Campground spaces were counted only if they were suitable for year-round stay and had full utilities and hookups. These include the following facilities:

Blake Ranch RV Park	(60 spaces)
Circle S Campground	(50 spaces)
Fort Beale RV Park	(42 spaces)
KOA Campground	(100 spaces)
Quality Stars RV Park	(46 spaces)
Zuni Village RV Park	(79 spaces)
Approximate Total	(377 spaces)

There also are 1,736 hotel or motel rooms in the Kingman area (Kingman Area Chamber of Commerce 2000; City of Kingman 2000). The total number of apartments, camping spaces, and motel rooms is therefore approximately 2,700 units in the Kingman area.

To identify the number of vacant (available) units, telephone contacts were made with local managers of selected apartments, campgrounds, and motels. This included managers at the three largest apartment facilities in the city (Copper Ridge, Centennial Parkview, and Kingman Station). Based on these informal interviews, it appears that the combined vacancy rate (apartments, campground spaces, hotels, and motels) currently may be in the range of 10 to 20 percent. While some apartments are nearly full, others have higher vacancies. Relatively low vacancies are attributed to current construction activity in the area associated with the Griffith Energy power plant, North Star Steel, ADOT highway projects, and residential development along the I-40 corridor.

It is estimated that there are a combined total of about 400 vacant units or camping spaces in the Kingman area. This information is summarized in Table 3.16-3.

TABLE 3.16-3
NUMBER OF VACANT HOUSING UNITS
APARTMENTS, CAMP SPACES, HOTELS AND MOTELS
KINGMAN AREA

Unit Type	Total Units	Average Vacancy Rate [c]	Average Vacant Units [d]
Apartments [a]	600	10-15 %	75
RV Camp Spaces [a]	377	10-20 %	60
Hotels and Motel Rooms [b]	1,736	10-20 %	260
Total [d]	2,700	NA	400

Sources:
(a) City of Kingman 2000
(b) Personal communications with City of Kingman Chamber of Commerce staff and selected hotel/motel managers, 2000
(c) Average vacancy rates are approximate and are based in part on telephone interviews with local facility managers
(d) Total estimated units do not include smaller apartment units throughout the Kingman area. Therefore, these estimates are conservatively low.
Some numbers are rounded.

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Wikieup Area

Wikieup has limited space for short-term stays. Currently, there are 5 spaces at the Wikieup Trading Post and Motel, 4 rooms at the Wikieup Motel and 35 spaces at the Saguaro RV Park (also located in Wikieup). This totals only 44 motel units or camping spaces in the immediate area. It is reported that there are no vacant motel units in Wikieup and currently only five vacant spaces at the Saguaro RV Park. These facilities are near capacity because ADOT construction workers are staying in Wikieup during a US 93 widening project. There also are scattered small RV campgrounds along US 93 north of Wikieup that could accommodate a small number of construction workers.

Some local Wikieup residents have expressed an interest in developing additional RV camper spaces. The largest such future park would be called the "Bunkhouse" and potentially could have around 60 spaces with either a septic treatment system or a separate sewage treatment facility. If this Project were developed, it potentially would bring the total number of motel units and campground spaces in Wikieup to approximately 100 units/spaces. Such development is speculative and will not necessarily occur. It is unclear what portion of future housing in Wikieup would be built without construction of the Big Sandy plant.

Transportation and Traffic

Mohave County is crossed by I-40 (west to Barston and Los Angeles, California and east to Albuquerque, New Mexico); US 93 (a designated North American Free Trade Agreement route); and State Routes 66 and 68. Burlington Northern Santa Fe Railroad Company and Amtrak provide rail service. There are approximately 20 trucking companies that operate in the county. Bus transportation is provided by Amtrak. The airports in Bullhead City, Colorado City, Kingman, and Lake Havasu City provide air service.

Current traffic levels, accident rates, and safety along I-40 and US 93 are described in more detail in Section 3.17.

Public Utilities

Electricity in the county is provided by Citizens Utilities Electric and Mohave Electric Cooperative (a non-profit, customer-owned utility). Citizens Utilities' distribution service area is 7,500 square miles and includes Lake Havasu City and Kingman, as well as the surrounding areas to the north (near Hoover Dam). Citizens serves approximately 42,000 customers. Mohave Electric's service area is 1,300 square miles in size and includes Bullhead City as well as portions of Mohave, Coconino, and Yavapai counties. Mohave currently serves 27,000 customers. The energy charge for residential service is $0.0765 per kilowatt-hour (KWh).

El Paso Natural Gas Company, Transwestern Company, and Questar operate natural gas transmission pipelines within the boundaries of Mohave County. Gas is available to portions of Mohave County from the regulated distribution companies that serve the county (Southwest Gas Corporation and Citizens Utilities).

Water is supplied through allocations from the Colorado River and from groundwater wells. Because of the county's proximity to the water source, water delivery costs are kept to a minimum. The Sacramento Aquifer, which is divided into three subareas, underlies the county. These subareas included the Northern Golden Valley area, central I-40 industrial corridor, and Southern Dutch Flats area. Lake Havasu City, the City of Kingman, and Bullhead City each obtain potable water from groundwater sources and water wells. As illustrated in Table 3.16-4, the communities of Lake Havasu City, Kingman, and Bullhead City have water capacity (available water) that exceeds current demand.

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TABLE 3.16-4 COMPARISON OF AVERAGE WATER DEMAND AND CAPACITY LAKE HAVASU CITY, KINGMAN AND BULLHEAD CITY			
Indicator	**Lake Havasu City**	**Kingman**	**Bullhead City**
Water Capacity	18 MGD	12 MGD	10 MGD
Average Water Demand	12.4 MGD	9 MGD	4.5 MGD
Source: MCEDA 1998 mgd - million gallons per day			

Wastewater treatment facilities serve Bullhead City, Kingman, Lake Havasu City, and the surrounding areas. For each city, the current treatment capability exceeds average demand by a wide margin (Greystone 2000).

Waste Management and Allied Waste, both private contractors, dispose of municipal solid waste. Tri-State Refuse and Disposal, Hargus Disposal, and Westside Services are local independent companies that provide services in various parts of the county. The City of Kingman has its own hauling operations.

Mohave County currently operates two municipal solid waste landfills. Each landfill is approximately 160 acres and has an operating life of more than 30 years. There currently are no hazardous waste treatment, storage, or disposal facilities in the county. However, there are treatment and storage facilities that are regulated by ADEQ.

Taxes

Arizona has a general sales tax of 5 percent. Mohave County collects an additional quarter cent sales tax and the communities of Bullhead City, Kingman, and Lake Havasu City have a sales tax of 2 percent. Colorado City and Kingman have an additional 2 percent tax on hotel and motel stays. Table 3.16-5 summarizes the property tax rate breakdown for incorporated and unincorporated areas.

Property taxes are a significant source of local revenue and are based on the County Assessor's valuations. The assessed value is a percentage of the full cash value of the property with improvements, including machinery and equipment. Three property classes would likely apply to the proposed power plant and auxiliary facilities. These are summarized in Table 3.16-6.

TABLE 3.16-5 PROPERTY TAX RATES FOR 1999 (PER $1,000 ASSESSED VALUATION)			
Entity	**City Rate ($)**	**Unincorporated No Fire Protection Rate ($)**	**Unincorporated With Fire Protection Rate ($)**
State of Arizona (school equalization)	0.5300	0.5300	0.5300
Mohave County	1.7500	1.7500	0.5300
Mohave Community College	0.8522	0.8522	0.8522
Mohave Union High School	2.2024	2.2024	2.2024
Kingman Elementary School District 4	2.3513	2.3513	2.3515
City of Kingman	0.6703	0.0000	0.0000
Source: MCEDA 2000			

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TABLE 3.16-6 RATIO OF ASSESSED VALUE TO CASH VALUE		
Class Number	**Description of Class**	**Ratio of Assessed Value to Cash Value**
Class 2	Telephone and telegraph companies, gas, water and electric utilities	25 percent
Class 3	Commercial and industrial property, including machinery and equipment	25 percent
Class 11	Leased improvements on government property	1 percent
Source: City of Kingman 2000		

In 1999 Mohave County established an overall 1999-2000 budget and revenue sources. The budget shows that funds from all revenue sources would total $137,459,123, which included $29,810,213 that was unspent and carried over from the previous year. Sources of funds included property taxes, sales taxes, highway users tax, fines and fees, Federal grants, and several other types of transfers or charges. Property taxes were targeted to reach $27.7 million, or about 20 percent of total revenue and "fines and fees" made up about 23 percent of this total (Mohave County Office of Financial Services 2000).

Approximately 70 percent ($95,838,000) of this projected revenue would pay for various charges, services, and personnel services (wages, overtime, and benefits). Table 3.16-7 illustrates the specific government service category that would benefit from allocated revenue. Public Works, Public Safety, and Health and Community Services would spend more than $77 million, or about 56 percent of all available funds. In 1999, Mohave County school districts received approximately $111 million from local, county, state, and Federal sources. Of this total, approximately 89 percent of school funds came from local or state sources.

Education

There are 222 school districts in Arizona with an average daily attendance of nearly 670,530 students. In Mohave County, there are 16 school districts, the average student-teacher ratio is approximately 19 to 1, and the total enrollment is approximately 15,000 students (MCEDA 1998). Six districts serve the principal cities and towns in the county. The Kingman Elementary School District Number 4 operates six elementary schools and one junior high school in Kingman and the surrounding area. The elementary schools are Palo Christi, La Senita, Manzanita, Hualapai, Cerbat, and Black Mountain. Total enrollment at these elementary schools is 3,351. There are more than 900 students enrolled at the Kingman Junior High School and about 1,800 students are enrolled at the two Kingman high schools.

TABLE 3.16-7 BUDGETED EXPENDITURES BY CATEGORY MOHAVE COUNTY 1999-2000	
Service Category	**Adopted Amount (million dollars)**
General Government	12.2
Judicial	13.9
Public Safety	16.7
Public Works	46.2
Health and Community Services	14.4
Education	5.2
Culture and Recreation	5.7
Central Services	12.1
Capital Outlay	7.1
Debt Service	1.8
Contingency	2.2
Total Budget	**137.5**
Source: Mohave County Office of Financial Services, 2000.	

The Mohave County Community College is located in Kingman and is a two-year public

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institution founded in 1971. The total enrollment in 1999 was 6,766 students with 60 full-time faculty and 345 part-time instructors.

The Owens-Whitney Elementary School (District Number 6) is located in Wikieup and serves the surrounding community. It serves students from kindergarten through eighth grade and had a spring 2000 enrollment of approximately 40 students (Burdsal, personal communication, 2000). The 1999 attendance rate was over 95 percent and the school has two full-time teachers and two teacher-assistants. The capacity of the school is not defined, but the school administrator indicated that the enrollment was once as high as 60 students. There currently are 10 high school students in Wikieup who attend classes in Kingman (Wikieup does not have a high school).

Health Care

The county is served by four hospitals and numerous clinics or extended health care facilities. The four hospitals are the Kingman Regional Medical Center (Kingman), Bullhead Community Hospital (Bullhead City), Havasu Samaritan Regional Hospital (Lake Havasu City), and Mohave Valley Hospital (Bullhead City).

The closest emergency medical care facility to the proposed plant site is located in Kingman. The Kingman Regional Medical Center has 124 beds, with a staff of 51 physicians and 4 operating rooms. It offers a full range of therapeutic and diagnostic facilities, including air rescue and other medical services.

Fire Protection

There are 17 fire districts in the county that provide services to most urban areas. Fire protection within Kingman is provided by the Kingman Municipal Fire Department, which has 4 fire stations, 35 firefighters, and 29 volunteers (City of Kingman Community Perspectives, updated January 2000). The Lake Havasu City also operates a fire department. Staff with the Pinion-Pine Fire District report that although Wikieup is not within their fire district, they normally respond to fires, car accidents, or other emergencies along the US 93 corridor. In an emergency, firefighters could reach Wikieup in about 45 minutes.

The district also is on call to respond to wildfires throughout the state. During construction of the proposed power plant, an onsite emergency fire team hired by the construction contractor would be available to provide fire suppression at the site.

Law Enforcement

Law enforcement is provided throughout the county by the Mohave County Sheriff's Department and by municipal police departments. The County Sheriff's Department has 234 employees (127 located in Kingman). There are 35 Sheriff's officers assigned to the Kingman area. The main county correction facility holds 290 individuals.

The Kingman Police Department has 48 sworn officers and 25 other staff, including communications specialists, records personnel, and other support staff. Police jail facilities are operated and maintained by the county. The department has 59 vehicles and on the average responds to 1,947 calls each month. During construction of the proposed power plant, a private security team hired by the construction contractor would be available to provide law enforcement at the plant site.

3.16.2 Environmental Consequences

3.16.2.1 Identification of Issues

Several socioeconomic issues were identified during the EIS scoping process, including the following:

- creation of jobs for local residents
- impacts on the quality of life

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- increased availability of natural gas or power for local residents
- local services that could be inadequate for the construction workforce
- possibility of increased property values
- possible effects on low-income or minority residents of the Wikieup area
- sudden increase in population
- tax payments to local government
- the economic effect if some water wells dry up (or the well water flow is substantially reduced)
- effects to the Hualapai Tribe

3.16.2.2 Significance Criteria

The significance criteria listed below were used to determine the severity of some socioeconomic impacts; an impact would be considered significant if any of the following were to occur:

- The tax benefits to the county would be inadequate to deal with added demand on local infrastructure.
- There would be substantial changes to quality of life.
- A disproportionate effect to low income or minority populations would occur.
- The additional supply of natural gas and power would cause additional growth in the local area.

3.16.2.3 Impact Assessment Methods

Socioeconomic impacts were identified by first inventorying current services (police protection, fire protection, health care, housing, transportation, and other services). These service levels were then compared to the expected increment of change caused by construction and operation of the plant and auxiliary facilities. The analysis showed whether construction-related population increases could affect the ability of some local services and infrastructure to function normally.

The assessment of some socioeconomic effects involved contacting agency officials, local business owners, and local residents in Wikieup. It also was based on a review of published studies and other literature.

Due to the regional nature of socioeconomic resources, impacts were not evaluated for each corridor segment for the Proposed Action and alternatives.

3.16.2.4 Actions to Reduce or Prevent Impacts Incorporated into the Proposed Action

The Proposed Action includes the following measures to reduce or prevent potential adverse environmental impacts to socioeconomics:

- Fire services would be supplied at the proposed power plant site by Caithness.
- Security services would be supplied at the proposed power plant site by Caithness.
- Water supply, wastewater treatment, and electricity would be supplied to the site by Caithness.

3.16.2.5 Impact Assessment

Proposed Action

<u>Population</u>

Temporary population increases would occur with construction of Phases 1 and 2 of the power plant, the natural gas pipeline, and the access road. A permanent population increase would be expected for long-term operation of the plant. The Proposed Action indicates that the average quarterly workforce for Phase 1 would be

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around 350 persons and about 650 workers would be required on peak. The numbers of expected construction workers for Phases 1 and 2 are presented in Tables 3.16-8 and 3.16-9, respectively. These tables also show worker "duration" by quarter.

About one-third of all construction workers (100 individuals) needed for the proposed Project already reside in the Kingman area, and likely would be available after mid-2001 when construction begins on Phase 1. Some construction workers were (or are) involved with the Griffith Energy power plant, (located just south of Kingman), which is expected to be completed by mid-2001.

Construction

Over the 20-month construction period for Phase 1, it is estimated that an average of approximately 250 individuals would temporarily move to Mohave County (most are assumed to stay in the Kingman area, which is calculated as 350 workers on average, less 100 workers assumed to reside in the Kingman area already). Added to this population increase would be about 35 non-local individuals (on average) who would construct the natural gas pipeline, and 15 to 20 non-local workers who would install the OPGW.

Based on experience with the construction of other power projects throughout the country, skilled craft workers normally do not bring families with them on construction assignments. Therefore, this estimate of temporary population increases does not include spouses or children. Following completion of Phase 1, most skilled craft workers would be expected to leave the area to work on other industrial or commercial projects.

During "peak" construction of Phase 1 , it is expected that the workforce would reach 650 individuals. Depending on the craft type and worker specialty, some workers may be required only for a few months, while others could be needed for over one year. Of this total, about 550 workers are expected to in-migrate to the local area, which is calculated based on 650 workers less 100 individuals who already reside in the Kingman area. Based on the current lack of accommodations in Wikieup, it is assumed that nearly all workers (about 95 percent) would stay in the Kingman area and commute to the power plant site. The balance of the Phase 1 workers may attempt to find housing or camping spaces in Wikieup.

The temporary addition of 550 workers (Phase 1, on-peak) to the Kingman area would represent a population increase of about 3 percent. This assumes that all workers would stay in Kingman. An increase of this level would probably be noticeable by some residents but would not be disruptive to the community and would not create a substantial change to the quality of life, thus impacts would not be significant.

This conclusion is consistent with the short-term population increase caused by construction of the nearby Griffith Energy power plant, which involved most workers staying in Kingman (completion of that plant is expected by mid 2001). Griffith Energy, MCEDA, the Kingman Chamber of Commerce, and local apartment managers reported that Kingman readily absorbed the population for the Griffith project. A similar result is expected for the Project workforce. After completion of the proposed power plant, most skilled craft workers would leave the area for other project work.

The temporary population increase in Wikieup attributed to construction of Phase 1 would depend on the availability of local rental housing, motel units, or camping spaces. Currently, there are only 44 spaces or units in Wikieup with only about 5 vacancies (House, personal communication, 2000). Unless additional housing units or camping spaces are made available, the construction population increase is expected to be limited to a maximum of only about 15 to 20 persons (about 3 percent of the peak workforce, or 10 percent of the

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TABLE 3.16-8
AVERAGE CONSTRUCTION WORKFORCE PER QUARTER BY CRAFT TYPE
PHASE 1

Starting Month	Qtr	Boiler-maker	Carpenter Mill Wright	Labor	Pipefitter	Electrician	Operator	Iron Worker	Sheet Metal Worker	Mason Insulator	Teamster	Total by Quarter
Jul-01	3rd	0	9	20	0	2	19	0	0	4	22	76
Oct-01	4th	37	41	32	7	13	15	20	0	4	11	180
Jan-02	1st	93	46	32	17	20	15	46	7	15	7	298
Apr-02	2nd	110	54	24	115	98	20	32	24	7	6	490
Jul-02	3rd	67	37	24	234	234	9	15	0	24	6	650
Oct-02	4th	17	28	19	234	195	6	6	0	37	6	548
Jan-03	1st	4	6	6	104	45	6	2	0	1	2	176
Max Workers		110	54	32	234	234	20	46	24	37	22	650

Source: Greystone 2000

TABLE 3.16-9
AVERAGE CONSTRUCTION WORKFORCE PER QUARTER BY CRAFT TYPE
PHASE 2

Starting Month	Qtr.	Boiler-Maker	Carpenter Mill Wright	Labor	Pipefitter	Electrician	Operator	Iron Worker	Sheet Metal Worker	Mason Insulator	Teamster	Total by Quarter
Jan-04	3rd	0	6	13	0	1	13	0	0	3	15	51
Apr-04	4th	25	27	21	5	9	10	13	0	3	7	120
Jul-04	1st	62	31	21	11	13	10	31	5	10	5	199
Oct-04	2nd	73	36	16	77	65	13	21	16	5	4	327
Jan-05	3rd	45	25	16	156	156	6	10	0	16	4	434
Apr-05	4th	11	19	13	156	130	4	4	0	25	4	366
Jul-05	1st	3	4	4	69	30	4	1	0	1	1	117
Max Workers		110	36	21	156	156	13	31	16	25	15	434

Source: Greystone 2000

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Wikieup population). An increase of this level would be noticeable by residents but would not be disruptive to the community or create a substantial change to the quality of life, thus impacts would not be significant.

Phase 2 of the Proposed Action would require about two-thirds of the workers needed for construction of Phase 1. Therefore, the peak number of Phase 2 workers would be about 430 individuals and the average workforce would be about 240 persons. No additional construction of natural gas pipelines would be needed for Phase 2. As with Phase 1, it is expected that almost all workers would prefer to live in the Kingman area and commute each day to the site. However, if more motels, camping spaces, etc. are constructed by the estimated construction start date for Phase 2, the temporary population increase in Wikieup could be greater than estimated in this analysis.

It is important to note that construction of Phases 1 and 2 would not take place at the same time. Therefore, the construction workforces are not coincident (additive). Tables 3.16-8 and 3.16-9 illustrate the respective construction totals by quarter for each phase. Construction of each phase is expected to take approximately 20 months and there would be a break between construction of the two phases. Because it would result in less impacts than Phase 1, construction of Phase 2 would not create significant impacts.

If substantial numbers of new dwelling units or RV spaces are developed in or around Wikieup, the added population could exceed estimates shown in this analysis. This, in turn, could result in noticeable increases in traffic, congestion, noise, and dust that may affect the quality of life for some residents. Further, a sudden increase in Wikieup's population could cause local restaurants or stores to become crowded, which could inconvenience local residents who are used to a slower pace. Construction of the gas pipeline through Wikieup (corridor segment R5) would add to the short-term congestion and traffic, further negatively affecting the quality of life of Wikieup residents. Such changes to the quality of life would be temporary and therefore not significant.

Power Plant Operation

The Proposed Action indicates that there would be around 22 power plant operators. Most operators are assumed to live in the Kingman area. Again, depending on local accommodations, a few operators may choose to settle in Wikieup. Increases of these levels would not create a substantial change to the quality of life and would not be significant.

Employment, Labor Force and Local Economy

A description of construction and operations employment was presented in the previous section because such employment is directly related to short-term population growth. In summary, construction of the proposed Project would employ up to 650 workers for Phase 1, 15 to 20 workers for OPGW installation, and about 430 workers for Phase 2. The average number of workers would be considerably less for Phase 2. This is because during construction of Phase 1, some work (such as site clearing and grading) would be performed for Phase 2. Phase 2 workforce numbers also are relatively small because both phases would share some facilities.

The workforces would consist of various skilled and semi-skilled trade workers such as boiler makers, carpenters, laborers, pipe fitters, electricians, equipment operators, iron workers, sheet metal workers, masons, and teamsters. Caithness estimates that roughly one-third of the average construction workforce (100 people) already reside in the Kingman area. Caithness also may train some local individuals to perform unskilled or semi-skilled construction tasks and also may provide appropriate training for qualified applicants for power plant operation.

Construction and operation of the proposed Project would increase short-term and long-term employment in Mohave County. As salaries are respent, benefits also would be felt in various

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retail sectors, as more goods and services would be locally sold. Additional economic benefits would be generated as equipment and Project materials are bought from local companies. Positive local economic effects would be associated with worker salaries, *per diem* payments and local purchases of equipment, supplies, and material. These are described in the following section.

Based on past experience with large industrial construction projects, it is expected that around 5 to 10 percent of workers may be unskilled or semi-skilled and could be offered positions as laborers, truck drivers, small equipment operators, etc. Some area residents could benefit from these positions, since construction salaries would average two to three times that of many local service jobs.

Additional benefits to the local economy would be associated with the creation of nearby agricultural facilities located in Section 7 (about 0.5 mile southwest of the power plant site). This agricultural operation would be owned by MCEDA. Agricultural facilities may be operated by MCEDA or leased to private groups, creating local jobs, wages, and income from the sale of food products (Goodale, personal communication, 2000).

Economic Effect of Impacts to Water Wells

Because there would not be a significant impact on the shallow groundwater resources tapped by area water wells (refer to Section 3.4) there would be no adverse economic effect to water wells.

Income, Wages, and Local Purchases

Worker Salaries

With an expected construction schedule of 21 months for each phase, and a combined total of about 2 million labor hours for both phases, construction salaries would be approximately $23.5 million for Phase 1 including the OPGW, and $15.7 million for Phase 2. Total salaries for both phases would be $39.1 million (Greystone 2000). Worker salaries for both phases by craft type are presented in Tables 3.16-10 through 3.16-12. Pipe fitters are projected to make $12 million, electricians would be paid $10 million, and boilermakers would earn $7 million.

Construction of the natural gas pipeline would take from six to eight months and would generate salaries of about $2.2 million. The capital cost of the pipeline is estimated to be from $12 million to $16 million (Van Brunt, personal communication, 2000). Pipeline construction would require about 50 workers on peak with an average of about 35 individuals.

On the average, approximately one-third of the salary total would be paid to construction workers who already live in Mohave County and the other two-thirds to workers who would temporarily move to the vicinity (the share of non-local workers would be greater during peak activity). Worker salaries would be respent locally until most of the money is spent on goods or services outside the local area. A significant number of non-local workers temporarily staying in the area may send paychecks home to families, while most salaries of local workers initially would be spent in the local area.

It is estimated that for each construction dollar spent in Arizona, approximately two dollars of total additional industry output could be generated for the state. Therefore, the additional industry output associated with Phases 1 and 2 and the pipeline would be approximately $83 million (this sum is calculated as $39.1 million [both phases] plus $2.2 million [pipeline] times a factor of 2). Construction of the Project also would generate substantial increases in household income and secondary jobs, mostly in the service or retail sectors.

Plant operators would earn additional salary income. Based on a workforce of around 22 individuals, the annual salary for operators would total about $1.3 million per year.

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TABLE 3.16-10
AVERAGE CONSTRUCTION PAYROLL ($ MILLION) BY CRAFT TYPE
PHASE 1

Starting Month	Qtr.	Boiler-Maker	Carpenter Mill Wright	Labor	Pipefitter	Electrician	Operator	Iron Worker	Sheet Metal Worker	Mason Insulator	Teamster	Total by Quarter
Jul-01	3rd	$0.000	$0.077	$0.111	$0.000	$0.019	$0.138	$0.000	$0.000	$0.025	$0.189	$0.559
Oct-01	4th	$0.492	$0.358	$0.181	$0.073	$0.125	$0.111	$0.209	$0.000	$0.026	$0.096	$1.671
Jan-02	1st	$1.199	$0.390	$0.176	$0.172	$0.187	$0.108	$0.467	$0.059	$0.093	$0.059	$2.910
Apr-02	2nd	$1.440	$0.465	$0.134	$1.183	$0.929	$0.146	$0.330	$0.206	$0.044	$0.052	$4.929
Jul-02	3rd	$0.891	$0.323	$0.136	$2.445	$2.253	$0.067	$0.157	$0.000	$0.154	$0.052	$6.478
Oct-02	4th	$0.226	$0.245	$0.107	$2.445	$1.878	$0.044	$0.063	$0.000	$0.237	$0.052	$5.297
Jan-03	1st	$0.048	$0.047	$0.030	$0.971	$0.387	$0.040	$0.019	$0.000	$0.063	$0.016	$1.621
Total		$4.296	$1.905	$0.875	$7.289	$5.778	$0.654	$1.245	$0.265	$0.642	$0.516	$23.465

Source: Caithness and Greystone 2000

TABLE 3.16-11
AVERAGE CONSTRUCTION PAYROLL ($ MILLION) BY CRAFT TYPE
PHASE 2

Starting Month	Qtr.	Boiler-Maker	Carpenter Mill Wright	Labor	Pipefitter	Electrician	Operator	Iron Worker	Sheet Metal Worker	Mason Insulator	Teamster	Total by Quarter
Jan-04	3rd	$0.000	$0.051	$0.074	$0.000	$0.013	$0.092	$0.000	$0.000	$0.017	$0.126	$0.373
Apr-04	4th	$0.328	$0.239	$0.121	$0.049	$0.083	$0.074	$0.139	$0.000	$0.017	$0.064	$1.115
Jul-04	1st	$0.800	$0.260	$0.117	$0.115	$0.125	$0.072	$0.311	$0.039	$0.062	$0.039	$1.941
Oct-04	2nd	$0.960	$0.310	$0.089	$0.789	$0.620	$0.097	$0.220	$0.137	$0.029	$0.035	$3.288
Jan-05	3rd	$0.594	$0.215	$0.091	$1.631	$1.503	$0.045	$0.105	$0.000	$0.103	$0.035	$4.321
Apr-05	4th	$0.151	$0.163	$0.071	$1.631	$1.253	$0.029	$0.042	$0.000	$0.158	$0.035	$3.533
Jul-05	1st	$0.032	$0.031	$0.020	$0.648	$0.258	$0.027	$0.013	$0.000	$0.042	$0.011	$1.081
Total		$2.865	$1.271	$0.584	$4.862	$3.854	$0.436	$0.830	$0.177	$0.428	$0.344	$15.651

Source: Caithness and Greystone 2000
It is assumed that the salary cost for Phase 2 would be about two-thirds of the salary cost of Phase 1.

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TABLE 3.16-12
AVERAGE CONSTRUCTION PAYROLL ($ MILLION) BY CRAFT TYPE
PHASES 1 AND 2

Starting Month	Qtr.	Boiler-	Carpenter	Labor	Pipefitter	Electrician	Operator	Iron	Sheet metal	Mason	Teamster	Total by Quarter
Jan-04	3rd	$0.000	$0.128	$0.185	$0.000	$0.032	$0.230	$0.000	$0.000	$0.042	$0.315	$0.932
Apr-04	4th	$0.820	$0.597	$0.302	$0.122	$0.208	$0.185	$0.348	$0.000	$0.043	$0.160	$2.786
Jul-04	1st	$1.999	$0.650	$0.293	$0.287	$0.312	$0.180	$0.778	$0.098	$0.155	$0.098	$4.851
Oct-04	2nd	$2.400	$0.775	$0.223	$1.972	$1.549	$0.243	$0.550	$0.343	$0.073	$0.087	$8.217
Jan-05	3rd	$1.485	$0.538	$0.227	$4.076	$3.756	$0.112	$0.262	$0.000	$0.257	$0.087	$10.799
Apr-05	4th	$0.377	$0.408	$0.178	$4.076	$3.131	$0.073	$0.105	$0.000	$0.395	$0.087	$8.830
Jul-05	1st	$0.080	$0.078	$0.050	$1.619	$0.645	$0.067	$0.032	$0.000	$0.105	$0.027	$2.702
Total		$7.161	$3.176	$1.459	$12.151	$9.632	$1.090	$2.075	$0.442	$1.070	$0.860	$39.116

Source: Based on data provided by Caithness and Greystone 2000

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Per Diem Payments

Non-local construction workers typically are paid a *per diem* rate for daily housing and meal costs. Workers normally spend the *per diem* on motel accommodations, RV campground space rent, restaurants, groceries, gasoline, and entertainment. For the Project, the *per diem* rate would be approximately $50 per worker per day. Over the two 21-month construction periods for Phase 1, including the OPGW option, and Phase 2, workers would be paid about $12.4 million in *per diem* (this is based on an average construction workforce of 350 workers for Phase 1, 240 for Phase 2, and 35 gas pipeline workers). Additional *per diem* would be associated with pipeline construction workers.

Spending activity associated with the Project construction would have a strong, positive effect on local businesses in Mohave

County. Employment of local construction workers also would benefit the Mohave County economy through direct expenditure of their earnings on housing, food, and other locally provided goods and services. Local workers also would pay property taxes and sales taxes. A detailed projection of tax benefits to the county is presented later in this section.

Purchases of Equipment and Materials

Caithness has not yet identified the exact equipment, materials, and other construction supplies that would be locally purchased. Money spent locally on equipment or supplies would benefit the local economy as retail businesses sell more products and eventually hire more employees. As with construction worker salaries, money spent on local equipment purchases would then be respent. During facility operation, it is estimated that Caithness would spend about $2 million on supplies annually.

Housing

Based upon this analysis, it is expected that even if all non-local construction workers chose to stay in Kingman, there would be adequate rental housing, motel units, RV and camping spaces, etc. This conclusion is supported not only by a survey of the larger apartment complexes and RV parks in Kingman, but also is confirmed by the experience of Griffith project workers being able to find short-term housing in Kingman. In many instances, workers may rent a house or condominium and reduce the cost by having a roommate. This further simplifies the process of locating suitable housing.

As previously described, there are currently only about five vacant motel units or camping spaces in Wikieup and the Engineering Procurement and Construction contractor does not plan to construct worker housing. Unless additional housing is built in Wikieup, workers may have little choice but to commute to the power plant site from Kingman.

Transportation and Traffic

The average daily traffic along US 93 between I-40 and Wikieup currently is between 5,000 and 6,000 vehicles (ADOT 2000). The Proposed Action indicates that the contractor does not plan to offer busing to the site so all workers must use personal vehicles. If all construction workers commute to the site from Kingman (and assuming that most workers carpool, with an average of about 1.5 individuals per vehicle), there would be a daily increase of about 230 two-way vehicles along US 93 (for Phase 1, this is calculated as 350 workers, on average, divided by 1.5 persons per vehicle). This would represent an increase of about 5 percent beyond current traffic levels, which would not result in a substantial change to the quality of life. It is therefore not considered to be a significant traffic increase. Transportation and traffic issues are described in more detail in Section 3.17.

Public Utilities

A natural gas tap line to Wikieup is not part of the Proposed Action and it is unknown whether local natural gas suppliers are interested in constructing such a tap line. The decision to later construct a

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service line to the town would be based on consideration of economic factors that are beyond the scope of this analysis and would be up to gas distributors in Mohave County. Compared to routing the gas pipeline along corridor segment T5, constructing the line through Wikieup (corridor segment R5) could increase the likelihood that a local gas company may later provide gas service to the town. Even so, there is no certainty that local gas service would ever be provided.

MEC could provide some construction power and station service to the proposed substation though a tap of the existing 69-kV transmission line. This service would not affect service to existing MEC customers.

Taxes

The Mohave County Tax Assessor estimates that Phase 1 would generate about $2.6 million each year in property tax revenue to the county. Of this sum, about $1.9 million would be paid to county school districts. Caithness estimates that Phase 2 would generate an additional $864,000 each year. Following completion of both phases, the annual combined property tax payment to the county would be approximately $3.5 million. Tax payments would be allocated to the Owens Elementary School and could provide facilities for a local volunteer fire department. Projected property tax payments for Phases 1 and 2 are presented in Tables 3.16-13 through 3.16-15.

Education

Construction and operation of the power plant would not cause adverse effects or overcrowding to Mohave County schools. This is because families are not expected to accompany non-local construction workers during construction. This assumption is consistent with current ADOT highway construction taking place south of Wikieup. The Owens Elementary School Administrator reports that ADOT workers typically have not brought families with them during construction (Burdsal, personal communication, 2000).

During plant operation, some workers and families may reside in Wikieup. However, this small increase in the number of children would readily be accommodated at the elementary school (Burdsal, personal communication, 2000).

Health Care

Adequate health care facilities exist in the county to accommodate all in-migrating workers. The additional medical demands of the increased population would not cause hospital capacities to be exceeded. The construction contractor would have at least one onsite medic to treat minor injuries.

Fire Protection and Law Enforcement

Fire protection and law enforcement services in Kingman would not be adversely affected by the estimated in-migration of 500 to 550 construction workers on peak. A short-term population increase of this size would represent only about 3 percent of the city's current population.

With a current staff of 35 Sheriff's officers and 48 police officers in Kingman, law enforcement in the Kingman area would not be adversely affected during power plant construction. The construction contractor also would have several security staff on site to maintain order.

Environmental Justice (Executive Order 12898)

The goal of environmental justice is to ensure that all people, regardless of race, national origin, or income, are protected from disproportionate impacts of environmental hazards. To be classified as an environmental justice community, residents must be a minority and/or low-income group; excluded from the environmental policy setting and/or decision-making process; subject to a disproportionate impact from one or more environmental hazards; and experience a disparate implementation of

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TABLE 3.16-13 ESTIMATED ANNUAL PROPERTY TAXES - PHASE ONE			
	Primary Rate	Percent	Amount
Mohave County	1.7500	17.57	$455,531
Mohave Community College	0.9417	9.45	$245,128
School Equalization	0.5123	5.14	$133,354
Owens Elementary School	3.0500	30.82	$793,926
Mohave Union High School	2.2490	22.58	$585,527
Sub Total	8.5034	85.37	$2,213,466
	Secondary Rate	Percent	Amount
MHUS Secondary	0.4718	4.74	$122,811
Mohave Valley TV CID	0.0867	0.87	$22,568
Fire Dist. Assistance Fund	0.1000	1.00	$26,030
Mohave County Library District	0.2986	3.00	$77,727
Flood Control District	0.5000	5.02	$130,152
Sub Total	1.4571	14.63	$379,289
Total	**9.9605**	**100.00**	**$2,592,755**

Source: Mohave County Assessor, 2000

TABLE 3.16-14 ESTIMATED ANNUAL PROPERTY TAXES – PHASE 2			
	Primary Rate	Percent	Amount
Mohave County	1.7500	17.57	$151,829
Mohave Community College	0.9417	9.45	$81,701
School Equalization	0.5123	5.14	$44,447
Owens Elementary School	3.0500	30.82	$264,616
Mohave Union High School	2.2490	22.58	$195,156
Sub Total	8.5034	85.37	$737,748
	Secondary Rate	Percent	Amount
MHUS Secondary	0.4718	4.74	$40,933
Mohave Valley TV CID	0.0867	0.87	$7,522
Fire Dist. Assistance Fund	0.1000	1.00	$8,676
Mohave County Library District	0.2986	3.00	$25,906
Flood Control District	0.5000	5.02	$43,380
Sub Total	1.4571	14.63	$126,417
Total	**9.9605**	**100.00**	**$864,165**

Source: Mohave County Assessor, 2000 and Caithness

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TABLE 3.16-15 ESTIMATED ANNUAL PROPERTY TAXES – PHASES 1 AND 2			
	Primary Rate	**Percent**	**Amount**
Mohave County	1.7500	17.57	$607,360
Mohave Community College	0.9417	9.45	$326,829
School Equalization	0.5123	5.14	$177,800
Owens Elementary School	3.0500	30.82	$1,058,542
Mohave Union High School	2.2490	22.58	$780,683
Sub Total	8.5034	85.37	$2,951,214
	Secondary Rate	**Percent**	**Amount**
MHUS Secondary	0.4718	4.74	$163,744
Mohave Valley TV CID	0.0867	0.87	$30,090
Fire Dist. Assistance Fund	0.1000	1.00	$34,706
Mohave County Library District	0.2986	3.00	$103,633
Flood Control District	0.5000	5.02	$173,531
Sub Total	1.4571	14.63	$505,706
Total	**9.9605**	**100.00**	**$3,456,920**

Source: Mohave County Assessor, 2000 and Caithness

environmental regulations, requirements, practices, and activities in their communities.

Executive Order 12898 focuses Federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed Federal agencies to develop environmental justice strategies to aid Federal agencies in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order also is intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low- income communities access to public information on, and an opportunity for public participation in, matters relating to human health or the environment.

To determine if the Proposed Action may cause disproportionate effects on low-income or minority communities, a comparison was made between the construction areas, Mohave County, and the state of Arizona.

Adverse effects from pipeline construction could be caused by right-of-way clearing, the creation of equipment staging areas, and during installation.

The proposed location of the gas pipeline would follow corridor segments R1, C1, T3, C3, T4 and R5 and would pass through two Census Bureau tracts (9508 and 9523). Tables 3.16-16 and 3.16-17 summarize 1990 income and ethnicity for the proposed pipeline route and power plant site and compare local conditions with similar indicators for the county and state.

These tables illustrate that there is little difference between the percentages of non-white residents in tract 9508 compared to the countywide average. Although the percent of non-white residents in tract 9523-1 (which includes the proposed power plant site) is 20 percent, (considerably higher than the Mohave County average) it is nearly identical to the statewide figure.

The 1990 per capita income average for tract 9508 is similar to the county and state average. However, the per capita income level for tract 9523 (blocks one and two) is only about half of the county or state averages.

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Although the proposed power plant site is located in a census tract with relatively high numbers of non-white residents and low incomes, a disproportionate environmental justice impact would not occur. This is because the region is rural and sparsely populated with scattered residences. Wikieup, the closest community to the proposed power plant site, is almost 4 miles to the northwest and the closest residence to the site is more than 0.5 mile away. Therefore, construction of the proposed plant and ancillary facilities would not affect low-income or minority populations.

TABLE 3.16-16
SUMMARY OF 1990 DEMOGRAPHIC CONDITIONS
NATURAL GAS PIPELINE ROUTE

Census Tract	Block Group	Non-White Residents	Per Capita Income
9508 (a)	1	7 %	$13,877
9523 (a,b)	1	20 %	$7,341
9523 (a)	2	3 %	$5,505

Source: Bureau of the Census, 1990
(a) Includes the location of the natural gas pipeline
(b) Includes the location of the proposed power plant site

TABLE 3.16-17
COMPARISON OF 1990 DEMOGRAPHIC CONDITIONS
MOHAVE COUNTY AND ARIZONA

Area	Non-White Residents	Per Capita Income
Mohave County	5 %	$11,933
State of Arizona	19 %	$13,461

Source: Bureau of the Census 1990

There are no concentrations of Native American populations in the Project vicinity. A discussion of Native American traditional cultural resources is presented in Section 3.15, and Indian Trust Assets are discussed in Section 5.3.

Alternative R Gas Pipeline Corridor

As with the Proposed Action, impacts were only assessed on a regional basis, and therefore socioeconomic effects for Alternative R would be the same as the Proposed Action. Although this alternative would involve a somewhat different gas pipeline route than the Proposed Action, the same Census Bureau tracts would be crossed and disproportionate Environmental Justice impacts would not occur.

Alternative T Gas Pipeline Corridor and Communication Facilities

As with the Proposed Action, impacts were only assessed on a regional basis, and therefore socioeconomic effects for Alternative T and the proposed communication facilities that would parallel this route would be the same as the Proposed Action. Although Alternative T would involve a somewhat different gas pipeline route compared to the Proposed Action, the same Census Bureau tracts would be crossed and disproportionate Environmental Justice impacts would not occur.

No-Action Alternative

Under the No-Action Alternative, no additional facilities would be constructed for the Project and there would be no socioeconomic impacts

3.16.2.6 Mitigation and Residual Impacts

No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts. As a result, no additional measures to mitigate significant impacts have been identified for socioeconomics and there would be no residual significant impacts.

3.17 PUBLIC SAFETY AND SERVICES

3.17.1 Affected Environment

3.17.1.1 Region of Influence

The region of influence for assessing impacts on public safety and services is defined as Mohave County. Although the majority of information is presented for the county, the description of the affected environment and the analysis of

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potential impacts emphasize conditions in the Kingman, US 93 corridor, and Wikieup areas

3.17.1.2 Existing Conditions

Traffic and Transportation

ADOT reports that average two-way daily traffic along I-40 for 1999 was 26,119 vehicles. This was measured from milepost 53 (just east of Kingman) to milepost 72 (near the intersection with US 93). Along US 93 (between I-40 and Wikieup), the average daily two-way traffic count was 5,442 vehicles. This is equivalent to an annual total of 264.52 million vehicle-miles over the 61.6-mile distance between Kingman and Wikieup (Cathpole, personal communication, 2001).

The accident rate along I-40 between Kingman and US 93 was 0.20 accident per million vehicle-miles in 2000, which was associated with 36 accidents. The statewide accident average for a four-lane divided highway is 0.7 accident per million vehicle-miles. The LOS for I-40 between Kingman and US 93 is rated by ADOT as either "B" or "C" (ADOT 1999)

In 1999, there were 5,442 two-way vehicles along US 93 between I-40 and Wikieup. From 1992 through 1997, the average accident rate between I-40 and just south of Wikieup (from milepost 91.5 to milepost 127.0) was 0.78 accident per million vehicle-miles. By comparison, the average accident rate for a typical two-lane rural highway in Arizona is 0.97 accident per million vehicle-miles. Although this accident rate is less than the statewide average, ADOT has indicated that there are 11, 1-mile sections along US 93 between I-40 and Wikieup where the accident rate is at, or substantially higher than, the state average (ADOT 2000). Areas of higher accident rates occur at mileposts 96, 98, 105, 108, 110, 112, 114, 117, 118, 120, and 124.

More recent data suggest that the accident rate along US 93 has improved since 1997. In 2000, with total vehicle traffic of 85.01 million vehicle-miles, there were a reported 49 accidents (equal to an accident rate of 0.58 accident per million vehicle-miles). Sleepy or intoxicated drivers caused approximately 17 percent of all traffic accidents along this part of US 93. About one-third of all accidents took place after dark and ADOT determined that pavement conditions were not a factor for the reported accidents.

The current Level of Service (LOS) for this portion of US 93 is rated as "E," which indicates that there can be substantial travel delays and difficulty in passing. As described in Section 3.16,, the LOS is a qualitative measure describing traffic operational conditions in terms of speed, travel time, freedom to maneuver, safety, and other factors. A rating of "A" represents the best operating conditions and a rating of "F" indicates heavy congestion and traffic that is exceeding highway capacity.

ADOT reports that in 1997, there were 50 vehicles per day along Hackberry Road, near US 93.

Neither the state of Arizona nor Mohave County keeps traffic count records for the section of old US Route 93, which is corridor segment C2.

Public Services

Existing public services are described for Mohave County, Kingman and Wikieup and do not significantly vary according to individual pipeline corridor segment.

Public services are described in detail in Section 3.16, and are only summarized in this section.

The county is served by four hospitals and numerous clinics or extended health care facilities. The Kingman Regional Medical Center has 124 beds, with a staff of 51 physicians and offers a full range of facilities. The closest emergency medical care facility to Wikieup is located in Kingman.

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There are 17 fire districts in the county that provide services to most urban areas. Fire protection within Kingman is provided by the Kingman Municipal Fire Department, which has 4 fire stations, 35 firefighters, and 29 volunteers (City of Kingman Community Perspectives, updated January 2000). The Pinion-Pine Fire District reports that although Wikieup is not within its fire district, the District normally responds to fires, car accidents, and other emergencies along the US 93 corridor. In an emergency, firefighters could reach Wikieup in about 45 minutes. The District also is on call to respond to wildfires throughout the state.

Law enforcement is provided throughout the county by the Mohave County Sheriff's Department and by municipal police departments. The County Sheriff's Department has 234 employees (127 located in Kingman). There are 35 Sheriff's officers assigned to the Kingman area. The main county correction facility holds 290 individuals.

Wikieup obtains drinking water from nearby wells and relies on leach fields or septic systems for wastewater disposal.

Mohave County Emergency Plans

Mohave County has an Emergency Operations Plan that provides a framework for rapid response to peacetime disasters. This plan defines local emergencies as the existence of conditions of disaster that are likely to be "beyond the control" of the services of a political subdivision. The plan provides for a range of disaster-related efforts, including emergency health care, evacuation, damage assessments, provision of food and clothing, and other services. It also includes a Hazardous Materials Emergency Response Plan.

Electric and Magnetic Fields

The proposed power plant would interconnect with the existing Mead-Phoenix Project 500-kV transmission line. Both current and voltage are required to transmit electrical energy over a transmission line. The voltage is expressed in volts and is the source of an electric field. The current, a flow of electrical charge measured in amperes (amps), is the source of a magnetic field. The electric and magnetic field effects of the Mead-Phoenix Project were addressed in the *Environmental Analysis of the Changes to the Proposed Mead-Phoenix Transmission Project*, issued by Western in September 1989 (Appendix G). The calculated electric field for the Mead-Phoenix Project 500-kV transmission line is 8.2 kilovolts/meter (KV/m) at the centerline of the right-of-way and 1.7 KV/m at the edge of the right-of-way. A 60-hertz magnetic field is created in the space around the transmission line conductors by the electric current flowing in the conductors. The magnetic field is expressed in units of gauss or milligauss (mG), where 1 milligauss is 1/1,000 of a gauss. The maximum magnetic field calculated for the Mead-Phoenix Project 500-kV transmission line when it is carrying 1,000 amps is 168 mG at the center of the right-of-way. At the edge of the right-of-way, the magnetic field was calculated to be 36 mG.

3.17.2 Environmental Consequences

3.17.2.1 Identification of Issues

Public safety and service issues related to this Project include the following:

- potential for increased electromagnetic radiation
- potential impacts on traffic flow and safety from transportation of plant components, equipment, and construction materials to the site
- potential hazard if ADOT bridge construction coincides with transportation of heavy equipment
- worker and public health and safety, including construction and operation practices

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- transportation, storage, and handling of potentially hazardous materials

- effect of increased traffic created by the commuting workforce

- gas pipeline operational safety (including low probability/severe consequence catastrophic accidents

- increased demand for police and fire protection, and emergency medical services.

3.17.2.2 Significance Criteria

Impacts on public safety and services would be considered significant if any of the following were to occur:

- traffic associated with the Project substantially degrades the LOS on US 93 or traffic safety substantially deteriorates

- substantial adverse effects occur to public or worker health and safety

- substantial deterioration of public services occurs

- substantial increases in electric and magnetic fields occur

3.17.2.3 Impact Assessment Methods

Impact assessment methods are directly tied to applicable regulations or standards and vary according to the individual issue. For electric and magnetic fields, impacts were assessed by comparison to the original analysis conducted for the Mead-Phoenix Project. Impacts related to increased construction traffic (both for equipment deliveries and commuting workers) were assessed by determining if the Arizona Department of Transportation (ADOT) has safety concerns or if ADOT expects that the LOS on nearby highways may be "downgraded" to reflect increased congestion. The same standard was used to determine if commuting operating workers would increase traffic along I-40 or US 93 to unsafe levels.

For the handling and storage of hazardous materials or other waste, potential impacts were estimated by identifying if (during construction and operation) site contractors would comply with Federal, state, and local regulations. Potential impacts of gas pipeline construction and operation are directly related to strict compliance with applicable US Department of Transportation regulations. Impact assessment methods also showed if facility construction and operation would place demands on local or regional public services, such as police or fire protection.

3.17.2.4 Actions Incorporated into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse environmental impacts to public safety and services:

- proper design of plant facilities

- onsite fire protection

- onsite security

- preparation of Health and Safety Plan and Procedures including the following:

  - safety responsibilities of the site manager

  - responsibilities of the Public Health and Safety Officer

  - use of safety equipment for workers

  - worker training

- proper hazardous materials and waste handling and disposal

- SPCC/HMSPC Plans

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- Emergency Plans
- coordination with ADOT and provision of turnouts on routes traveled by heavy loads.
- pipeline testing and inspection

3.17.2.5 Impact Assessment

Proposed Action

Electric and Magnetic Fields

The interconnection and wheeling of power on the Mead-Phoenix Project 500-kV transmission line from the proposed power plant would not increase the maximum current that the transmission line is capable of carrying because the Mead-Phoenix Project 500-kV transmission line would still operate within its maximum working range. The interconnection and wheeling of power on the Mead-Phoenix Project 500-kV transmission line would not change the voltage and, therefore, the electric fields would not change.

However, the proposed interconnection, substation, and power plant would each create electric and magnetic fields (EMF) within areas currently not subjected to fields. These areas include the new tap line connecting the Mead-Phoenix Project 500-kV transmission line with the proposed power plant and substation. The proposed new tap lines, each shorter than 500 feet, would generate EMF at the same strengths of the Mead-Phoenix Project 500-kV transmission line.

Western addressed electric and magnetic fields and effects for a 500-kV transmission in the EIS for the Navajo Transmission Project (NTP) (DOE/EIS-0231, Draft issued September 1996, Final issued August 1997). Information on EMF from the NTP EIS is incorporated by reference and included in Appendix G. The electrical effects of the proposed transmission line interconnection would be the same as the effects addressed for NTP. These effects include corona effects and field effects. Corona is the electrical breakdown of air into charged particles; it is caused by the electric field at the surface of the conductors. Effects of corona are audible noise, radio and television interference, visible light, and photochemical oxidants. Field effects are induced currents and voltages, as well as related effects that might occur as a result of EMF at ground level. The corona and field effects for the proposed Big Sandy transmission line additions would be similar to those predicted for NTP. The level of noise at the edge of the right-of-way of the new interconnecting lines and the fence line for the proposed substation would be less than the noise generated by the proposed power plant, and thus would not be detectable.

Since the issuance of the NTP EIS, more research has been conducted examining long-term health effects. There is considerable uncertainty about the EMF/health effects issue. The following have been established from the available information by Western:

- Any exposure-related health risk to the exposed individual likely would be small.
- The most biologically significant types of exposures have not been established.
- Most health concerns are about the magnetic field.
- The measures employed for such field reduction can affect line safety, reliability, efficiency, and maintainability, depending on the type and extent of such measures.

No Federal regulations have been established specifying environmental limits on the strengths of fields from power lines. However, the Federal government continues to conduct and encourage research necessary for an appropriate policy on the EMF issue.

In the face of the present uncertainty, several states have opted for design-driven regulations ensuring that fields from new lines are generally similar to those from existing lines. Some states (Florida, Minnesota, New Jersey, New York,

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and Montana) have set specific environmental limits on one or both fields in this regard. These limits are, however, not based on any specific health effects. Most regulatory agencies believe that health-based limits are inappropriate at this time. They also believe that the present knowledge of the issue does not justify any retrofit of existing lines. No regulations have been established in Arizona.

Before the present health-based concern developed, measures to reduce field effects from power line operations were mostly aimed at the electric field component, whose effects can manifest as radio noise, audible noise, and nuisance shocks. The present focus is on the magnetic field because only this type of field can penetrate building materials to potentially produce the types of health impacts that are of concern. It is important to note when considering the effects of magnetic fields from power lines that an individual in a home could be exposed for short periods to much stronger fields while using some common household appliances (National Institutes of Environmental Health Sciences [NIEHS] and DOE 1995). Scientists have not established which of these types of exposures would be more biologically meaningful in the individual. High-level magnetic field exposures regularly occur in areas other than the power line environment.

Western and the EPRI, formerly Electric Power Research Institute, continue to review the results of EMF and health-related research. The results of recent research and reviews follow.

In June, 1999 the NIEHS released its report *Health Effects From Exposure to Power-line Frequency Electric and Magnetic Fields* (NIEHS 1999). The report's Executive Summary concludes that

> "extremely-low-frequency electric and magnetic field (ELF-EMF) exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion [NIEHS], this finding is in sufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern."

Nevertheless, the report goes on to recommend some actions:

> "In summary, the NIEHS believes that there is weak evidence for possible health effects from ELF-EMF exposures, and until stronger evidence changes this opinion, inexpensive and safe reductions in exposure should be encouraged."

The NIEHS report, submitted to Congress, is the culmination of a long-term commitment of the NIEHS under the Research and Public Information Dissemination (RAPID) Project which began with the Energy Policy Act of 1992. RAPID's objective was to accelerate applied EMF research with a focused program supported by matching funds from the Federal government and the private sector. The electric utility industry provided most of the private sector funds.

The most significant source for the NIEHS report was the NIEHS Working Group Report, which resulted from a nine-day meeting in June 1998. The Working Group considered all literature relevant to the potential effects of power-frequency EMF on health, including cancers of several types, adverse pregnancy outcomes, chronic illnesses (e.g., Alzheimer's disease and amyotrophic lateral sclerosis), and neurobehavioral changes (e.g., depression, learning, and performance). The Working Group found limited support for a causal relationship between childhood leukemia and residential exposure to EMF, and between adult chronic

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lymphocytic leukemia and employment in jobs with potentially high magnetic field exposure. Based on this assessment and charged with ranking EMF according to International Agency for Research on Cancer criteria, the Working Group assigned EMF a 2B ranking, which translates to "possible human carcinogen." For all other health outcomes, the Working Group concluded that the evidence was inadequate.

Although regulatory actions are not in the purview of the NIEHS, they suggest that

> "the power industry continue its current practice of siting power lines to reduce exposures and continue to explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards. We [NIEHS] also encourage technologies that lower exposures from neighborhood distribution lines provided that they do not increase other risks, such as those from accidental electrocution or fire."

Proposed use of the existing Mead-Phoenix Project transmission line would not lead to increased exposures because the line is in an area that is generally inaccessible to the general population.

Safety Issues Related to Increased Traffic

Construction of the proposed power plant would create short-term effects associated with delivery of steam turbines, combustion turbines, generators, transformers, and other equipment. It also would create short-term effects from the commuting workers. The heavy equipment would be delivered by ship to the Port of Houston, Texas, and then loaded on dedicated rail cars for shipment to Kingman. From Kingman, the equipment shipments would be moved along I-40 east to US 93, then south to the site access road located about 2 miles south of Wikieup. The total distance to be traveled on roadways would be approximately 60 miles.

Shipment of heavy equipment would require an oversize load permit issued by ADOT. Application for this permit would be made directly by the haul contractor and the permit would be in compliance with ADOT General Order No. R17-4 through R17-208 (Rules and Regulations for Over-dimensional and Over-weight Vehicles).

The oversize load application requires submittal of detailed drawing of all overpasses, overhead utility lines, bridges, intersecting roads, and other features that could pose safety problems. ADOT normally requires a "pilot" car with flashing lights that precedes the load, a highway patrol officer, additional supports for bridges, and restrictions on the time of day delivery is made. At an average speed of about 7 miles per hour, each heavy equipment trip would take about 8 hours.

Approximately 45 deliveries of heavy equipment are estimated to be necessary and this would affect traffic along both I-40 and US 93. The heat recovery steam generators likely would be delivered during months 6 through 9, the combustion turbine in construction months 7 through 9. The steam turbines would be delivered in months 8 to 10. Added to this traffic load would be numerous smaller truck deliveries (excluding heavy equipment).

The delivery of oversize loads may require temporary closure of I-40 or US 93. This possibility cannot be assessed by ADOT until formal application is made for an oversize load permit. Caithness has proposed to use special temporary passing lanes or "turn-outs" every mile or so along US 93 that would allow motorists to pass the oversize load with limited delays.

It is estimated that in construction month 7, there would be about 20 heavy equipment deliveries and about 500 additional deliveries of mechanical equipment, electrical equipment, piping, concrete, rebar, and other supplies. The total deliveries for month 7 therefore would be approximately 500 delivery trips. Also during

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this month, it is estimated for Phase 1 that there would be approximately 300 construction workers commuting to the site each day. It was assumed that there would be about 1.5 workers per vehicle, so the total number of two-way worker vehicles would be 200 vehicles. The total traffic increase for month 7 would therefore be approximately 700 vehicles.

This increased traffic would represent about 12 percent on US 93 compared to current 24-hour average daily levels. The temporary traffic increase along I-40 would be only about 4 percent. Because of the short-term nature of this traffic increase, ADOT would not expect to downgrade the LOS for either I-40 or US 93. Phase 2 would require additional equipment deliveries and commuting construction workers. However, those levels would be less than estimated for Phase 1.

Strict compliance with all provisions and mitigation imposed by the oversize load permit would ensure that significant traffic impacts do not occur.

The vehicle traffic associated with power plant operations (delivery of supplies and the commuting workforce) would have only a minor effect on traffic. Total daily vehicle deliveries and commuting operators probably would not exceed an average of 30 or 35 vehicles per day.

Construction of the natural gas pipeline through Wikieup would temporarily disrupt local traffic and may increase safety concerns for motorists and pedestrians. In this respect, the Proposed Action would be similar to Alternative R (which would also pass through the town) and less favorable than Alternative T, which would use corridor segment T5.

Potential Hazard if ADOT Bridge Construction Coincides with Project Construction

ADOT would not expect any substantial traffic or safety issues if construction of the new US 93 bridge and the proposed Project were to coincide (Elters 2000).The Proposed Action includes close coordination with ADOT to ensure that bridge construction does not take place when heavy equipment is delivered. Therefore, no significant impacts would occur.

Worker and Public Health and Safety, Including Construction and Operation Practices

Implementation of the specific programs and measures to ensure public health and safety as well as worker safety included in the Proposed Action would minimize adverse effects to public services or worker health and safety to below the level of significance.

Effect of Increased Traffic Created by the Commuting Workforce

The effect of the commuting workforce on traffic is described above. During peak construction of Phase 1, there would be a commuting workforce of about 650 individuals and essentially all of the workers would come from Kingman. With an assumed level of car pooling (1.5 workers per vehicle), this means that the daily two-way peak would be about 430 vehicles. This short-term increase would represent an increase of about 7 percent compared to current traffic along US 93. This effect would be noticeable by area residents but would not be significant. It would not likely cause ADOT to downgrade the LOS for either I-40 or US 93. Phase 2 would require additional commuting construction workers; however, these levels would be less than Phase 1.

Construction workers would not likely use corridor segment R1 (Hackberry Road) because it is unimproved and would be much slower compared to US 93.

Gas Pipeline Operational Safety

After installation, the pipeline would be hydrostatically tested to verify the integrity of the completed steel pipeline system. In accordance with 49 CFR 192 regulations, the hydrostatic test pressure would range from 1.1 to 1.5 times the pipeline's maximum operating

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pressure. To accomplish this integrity testing, the pipeline would be hydrostatically tested in sections, at locations to be determined based upon elevation change, and water transferred across sections after testing. The pipeline owner and operator would conduct maintenance of the pipeline. Routine activities primarily would involve inspection for leaks. Inspection of the line would be accomplished in accordance with U. S. Department of Transportation regulations, Part 192.105, 106, and 107.

The pipeline would be patrolled by air every six months. Routine inspection also would be conducted annually using a two-track vehicle or by foot. If leaks were encountered, they would be isolated, exposed, and repaired in accordance with industry practices. Because the potential for a catastrophic event is low, the operation of the pipeline would not result in substantial effects to public or worker safety and therefore there would be no significant impact.

Should a catastrophic event such as a gas pipeline explosion occur, the site construction or site operations manager would immediately contact appropriate staff with Mohave County (Emergency Operations Plan), Arizona (Emergency Response and Recovery Plan), and the US Department of Transportation. Onsite staff would assist these and other agencies with such essential functions as communications, fire fighting, emergency medical assistance, law enforcement, assistance, evacuation, and search and rescue.

<u>Increased Demand for Police and Fire Protection, and Emergency Medical Services</u>

The Proposed Action includes all necessary utilities at the plant site, including security, fire suppression, water supply, wastewater disposal, and emergency medical care. Individuals trained in cardio pulmonary resuscitation (CPR) and emergency medical procedures will be on site. Hazardous waste material would be removed by a licensed contractor and properly disposed in an approved landfill. Therefore, construction and operation of the power plant and ancillary facilities (including the pipeline) would not place significant additional demands on or deteriorate county public services.

Alternative R Gas Pipeline Corridor

The effects of this alternative would be the same as for the Proposed Action except for safety issues related to traffic. Construction would take place generally along US 93 that would also be used for equipment deliveries and by commuting construction workers. These effects would not rise to the level of significance.

Alternative T Gas Pipeline Corridor

The effects of this alternative would be the same as for the Proposed Action except construction of the gas pipeline along the Alternative T gas pipeline corridor would have less of an effect on traffic than the Proposed Action or Alternative R. These effects would be less than significant.

Corridor Segment C2

Use of corridor segment C2 for any pipeline route would not result in any adverse impacts that would differ substantially from the Proposed Action, nor would construction in this corridor segment cause any significant effects.

Communication Facilities

The installation of the OPGW and microwave towers would have little or no effect on public safety and services.

No-Action Alternative

No adverse effects on public safety and services would occur if the No-Action Alternative were adopted.

3.17.2.6 Mitigation and Residual Impacts

No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts. As a result, no additional measures to

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mitigate significant impacts have been identified for public safety and services and there would be no residual significant impacts.

3.18 NOISE

This section describes the existing noise environment at and in the vicinity of the proposed power plant site, and assesses potential noise impacts associated with the Proposed Action and alternatives. Noise-sensitive receptors that may be affected by noise are identified, as well as the laws, ordinances, regulations, and standards that regulate noise levels at those receptors. The following discussion describes the results of sound level measurements, acoustical calculations, and assessment of potential noise impacts. Where appropriate, mitigation measures are proposed to reduce potential Project-related noise impacts to acceptable levels.

3.18.1 Affected Environment

Noise-sensitive receptors are land uses associated with indoor and outdoor activities that may be subject to stress or significant interference from noise. They often include residential dwellings, mobile homes, hotels, motels, hospitals, nursing homes, educational facilities, and libraries. Industrial, commercial, and agricultural and undeveloped land uses generally are not considered sensitive to ambient noise. A land use map (Figure 3.7-1) that identifies residences and other land uses where quiet is an important attribute of the environment within the region of influence is located in Section 3.7.

The general area surrounding the proposed power plant site, pipelines, and associated facilities varies from flat areas, to rolling hills, to fairly mountainous and rocky terrain east of the proposed power plant site. The area is primarily open rangeland that is undeveloped or grazed by livestock and/or wild burros. The general area shows evidence of some vehicle traffic; however, the disturbance appears predominantly limited to small areas (e.g., near well sites). The developed uses in the vicinity are limited to the Mead-Phoenix Project 500-kV transmission line, the Phelps Dodge water pipeline, scattered water wells, a clay mining operation, and one residence. The residence is located approximately 1 mile southwest of the proposed power plant site (and directly east of the proposed wells and agricultural use).

Land uses along the proposed pipeline corridor are primarily open space. There are four residences within corridor segment T5 just east of the Big Sandy River crossing. West of the Big Sandy River, there are six residences located within corridor segment T4. Five additional residences are located just outside the corridor, generally located along the highway. There is only one residence located in corridor segment T3. There is one residence along Hackberry Road, but it is outside the corridor.

There are approximately 41 residences dispersed along US 93 (R3, R4, and R5). There is also a small subdivision, Sierra Vista Estates, south of I-40 in T20N, R14W, Sections 12 and 13, which is approximately 0.75 miles west of the Mead-Liberty 345-kV transmission line and one residence just east of corridor segment T2.

3.18.1.1 Fundamentals of Acoustics

Noise generally is defined as loud, unpleasant, unexpected, or undesired sound that disrupts or interferes with normal human activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance of the noise and its appropriateness in the setting, the time of day and the type of activity during which the noise occurs, and the sensitivity of the individual.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound generally is characterized by a number of

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variables including frequency and intensity. Frequency describes the sound's pitch and is measured in Hertz (Hz), while intensity describes the sound's loudness and is measured in decibels (dB). Decibels are measured using a logarithmic scale. A sound level of 10 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels. The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. An increase (or decrease) in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds.

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

60 dB + 60 dB = 63 dB

80 dB + 80 dB = 83 dB

Hertz is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. A particular tone that makes the drum skin vibrate 100 times per second generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived as a tonal pitch of 100 Hz. Sound frequencies between 20 Hz and 20,000 Hz are within the range of sensitivity of the best human ear.

Sound from a tuning fork (a pure tone) contains a single frequency. In contrast, most sounds one hears in the environment do not consist of a single frequency, but rather a broad band of frequencies differing in sound level. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies of a sound according to a weighting system that reflects that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources that creates a relatively steady background noise in which no particular source is identifiable. A single descriptor called the Leq (equivalent sound level) is used. Leq is the energy-mean A-weighted sound level during a measured time interval. It is the "equivalent" constant sound level that would have to be produced by a given source to equal the fluctuating level measured.

Finally, another sound measure known as the Average Day-Night Noise Level (Ldn) is defined as the A-weighted average sound level for a 24-hour day. It is calculated by adding a 10 dB penalty to sound levels in the night (10:00 p.m. to 7:00 a.m.) to compensate for the increased sensitivity to noise during the quieter evening and nighttime hours. Sound levels of typical noise sources and environments are provided in Table 3.18-1 as a frame of reference.

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TABLE 3.18-1 SOUND LEVELS OF TYPICAL NOISE SOURCES AND NOISE ENVIRONMENTS (A-WEIGHTED SOUND LEVELS)			
Noise Source (at a Given Distance)	**Scale of A-Weighted Sound Level in Decibels (dBA)**	**Noise Environment**	**Human Judgment of Noise Loudness (Relative to a Reference Loudness of 70 Decibels*)**
Military Jet Take-off with After-burner (50 ft)	140		
Civil Defense Siren (100 ft)	130	Carrier Flight Deck	
Commercial Jet Take-off (200 ft)	120		**Threshold of Pain** *32 times as loud
Pile Driver (50 ft)	110	Rock Music Concert	*16 times as loud
Ambulance Siren (100 ft) Newspaper Press (5 ft) Power Lawn Mower (3 ft)	100		**Very Loud** *8 times as loud
Motorcycle (25 ft) Propeller Plane Flyover (1,000 ft) Diesel Truck, 40 mph (50 ft)	90	Boiler Room Printing Press Plant	*4 times as loud
Garbage Disposal (3 ft)	80	High Urban Ambient Sound	*2 times as loud
Passenger Car, 65 mph (25 ft) Living Room Stereo (15 ft) Vacuum Cleaner (3 ft) Electric Typewriter (10 ft)	70		**Moderately Loud** *70 decibels (Reference Loudness)
Normal Conversation (5 ft) Air Conditioning Unit (100 ft)	60	Data Processing Center Department Store	*1/2 as loud
Light Traffic (100 ft)	50	Private Business Office	*1/4 as loud
Bird Calls (distant)	40	Lower Limit of Urban Ambient Sound	**Quiet** *1/8 as loud
Soft Whisper (5 ft)	30	Quiet Bedroom	
	20	Recording Studio	**Just Audible**
	10		**Threshold of Hearing**

3.18.1.2 Region of Influence

The region of influence is based on the location of noise sensitive receptors, such as residences, relative to the plant, the pipeline corridors, and the communication facility locations, and the radius of the significant noise contours.

3.18.1.3 Existing Conditions

The ambient noise in the vicinity of the Project area is typical of a rural area. Noise was measured for a 24-hour period on Friday, June 9, 2000 at 8:00 a.m. (Caithness 2000). Noise was measured within 150 feet of the nearest residence to the proposed power plant site (Figure 3.18-1). A Metrosonics DB3080 noise meter, set to record the average noise (L_{eq} dBA) in 30-minute intervals, was used to measure the noise. The A-weighted scale was used to measure noise and the slow response option (five measurements per second) was applied.

The general background noise was 42.5 dBA. The exception was when unrelated construction activities (water well drilling and pipeline trench construction) were occurring from 8:00 a.m. to noon. During this time, the average background

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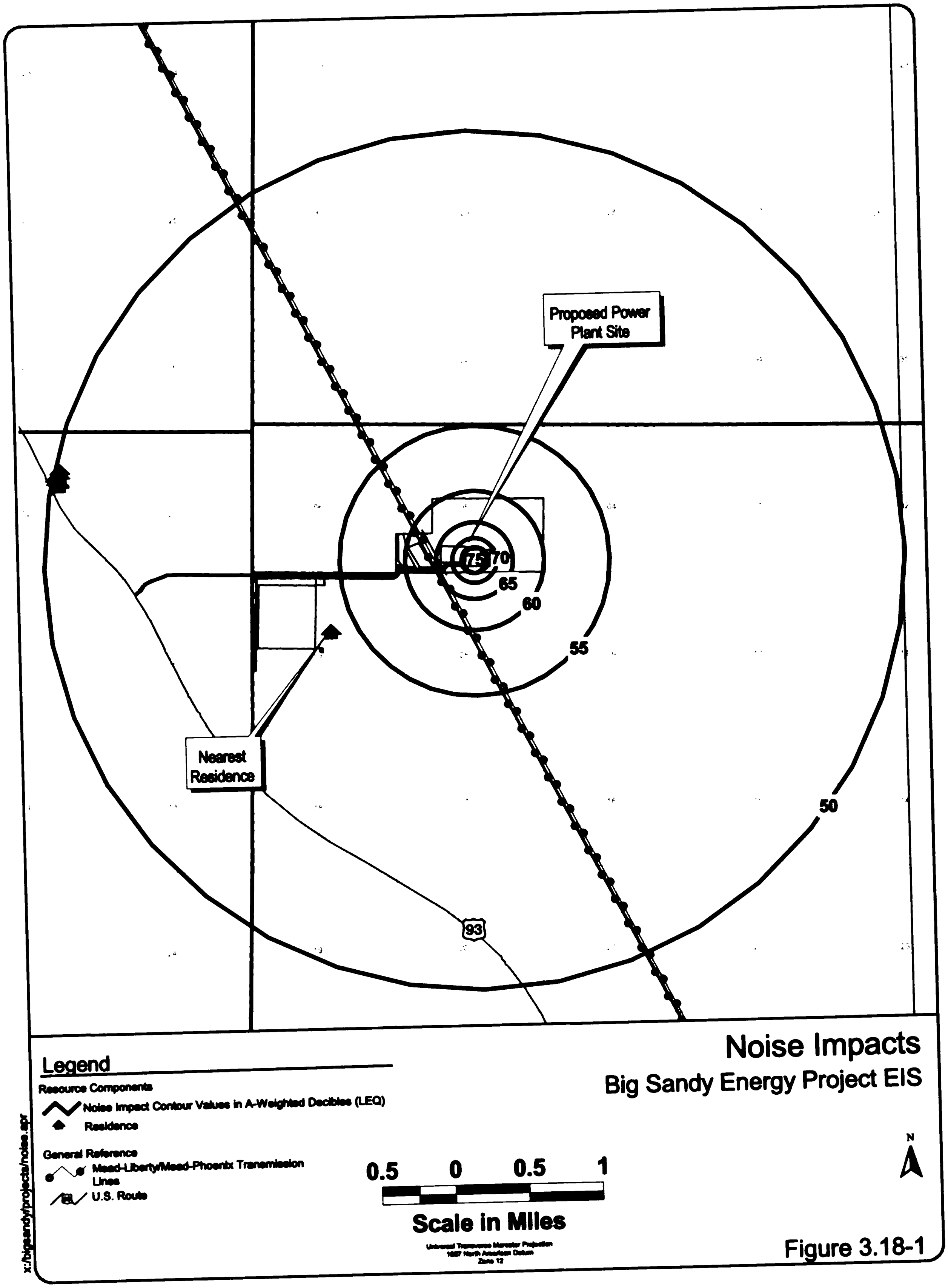

Figure 3.18-1

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noise was about 58 dBA. The graphical representation of the 24-hour noise survey is shown on Figure 3.18-2. During the 24-hour period, the average noise was 45.9 dBA. Figure 3.18-3 shows the noise level (51.8 dBA) from 8:00 a.m. to noon when construction was occurring. Figure 3.18-4 shows the background noise (42.5 dBA) recorded from noon until 8:00 a.m. the next morning in the absence of construction activities. This is assumed to be the typical background noise level for the general Project area. Sound levels at specific locations would be dependent on that location's proximity to existing noise sources such as roadways and industrial and agricultural equipment.

3.18.2 Environmental Consequences

3.18.2.1 Identification of Issues

The following issues were identified during the preparation of this noise analysis:

- Potential noise impacts from operation of the proposed power plant.
- Potential noise impacts from construction of all Project facilities including the access road, wells, and natural gas pipeline.

3.18.2.2 Significance Criteria

Significance criteria were based on Mohave County noise standards and EPA noise compatibility guidelines, as described below.

Mohave County

The Mohave County General Plan identifies sound levels that are considered to be compatible with various land uses. Sound levels up to 65 dBA Ldn are considered compatible with residential land uses. Implementation measure N2 of the General Plan "requires developments which generate offsite noise levels in excess of 65 dBA Ldn to mitigate noise levels so they do not exceed the County's standards."

U.S. Environmental Protection Agency

The EPA has published acoustical guidelines designed to protect the public health and welfare with an adequate margin of safety. The guidelines are presented in Table 3.18-2. The guidelines classify the various areas according to the primary activities that are most likely to occur in each. A review of the table shows that an indoor noise environment of 45 dBA Ldn will permit speech communication in homes, while an outdoor Ldn not exceeding 55 dBA will permit normal speech communication. An $Leq_{(24)}$ of 70 dB is identified as protecting against damage to hearing.

Therefore, impacts related to noise would be considered significant if the EPA guidelines of 55 dBA $Leq_{(24)}$ at the nearest residence was exceeded or if the county standard of 65 dBA Ldn would be exceeded.

3.18.2.3 Impact Assessment Methods

The assessment of noise impacts required the identification of Project-related noise sources and the location of noise-sensitive receptors. Acoustical calculations were performed to estimate the noise levels from Project construction and operation at the closest noise-sensitive receptors. Impacts were based on the Project's compliance with applicable noise criteria, as reflected in the significance criteria.

3.18.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action incorporates the following noise abatement measures to reduce or prevent impacts:

Noise reduction measures would be included in the design of the turbines and the turbine housing. The air intake system would include silencers to reduce noise from the combustion turbine compressor inlet. The turbines would be contained within an insulated shell to further reduce noise levels.

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TABLE 3.18-2
YEARLY AVERAGE EQUIVALENT SOUND LEVELS IDENTIFIED AS REQUISITE TO PROTECT THE PUBLIC HEALTH AND WELFARE WITH AN ADEQUATE MARGIN OF SAFETY

	Measure	Indoor			Outdoor		
		Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects(b)	Activity Interference	Hearing Loss Consideration	To Protect Against Both Effects(b)
Residential with Outside Space and Farm Residences	Ldn	45		45	55		55
	$L_{eq}(24)$		70			70	
Residential with No Outside Space	L_{dn}	45		45			
	$L_{eq}(24)$		70				
Commercial	$L_{eq}(24)$	(a)	70	70(c)	(a)	70	70(c)
Inside Transportation	$L_{eq}(24)$	(a)	70	(a)			
Industrial	$L_{eq}(24)$(d)	(a)	70	70(c)	(a)	70	70(c)
Hospitals	L_{dn}	45		45	55		55
	$L_{eq}(24)$		70			70	
Educational	$L_{eq}(24)$	45		45	55		55
	$L_{eq}(24)$(d)		70			70	
Recreational Areas	$L_{eq}(24)$	(a)	70	70(c)	(a)	70	70(c)
Farm Land and General Unpopulated Land	$L_{eq}(24)$				(a)	70	70(c)

Source: EPA 1974

CODE:

(a) Since different types of activities appear to been associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communication is a critical activity

(b) Based on lowest level.

(c) Based only on hearing loss.

(d) An $L_{eq(8)}$ of 75 dB may be identified in these situations so long as the exposure over the remaining 16 hours per day is low enough to result in a negligible contribution to the 24-hour average (i.e., no greater than 1 db.)

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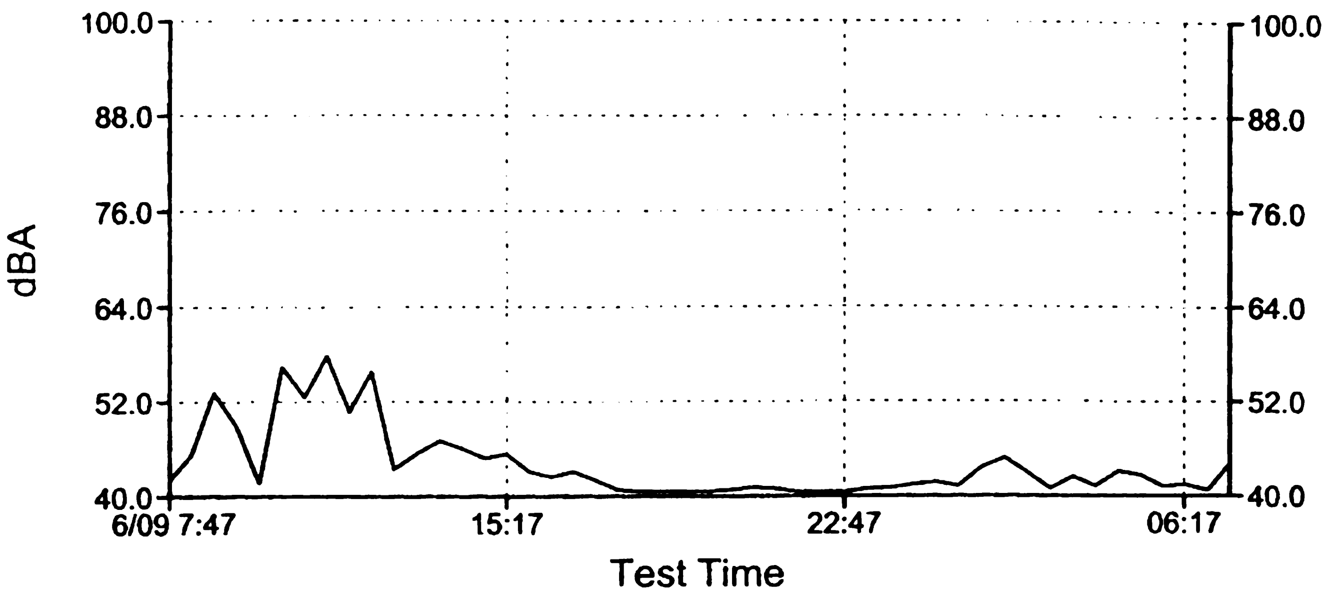

Overall Leq = 45.9db

24-hour Noise Survey Results

Big Sandy Energy Project EIS

Figure 3.18-2

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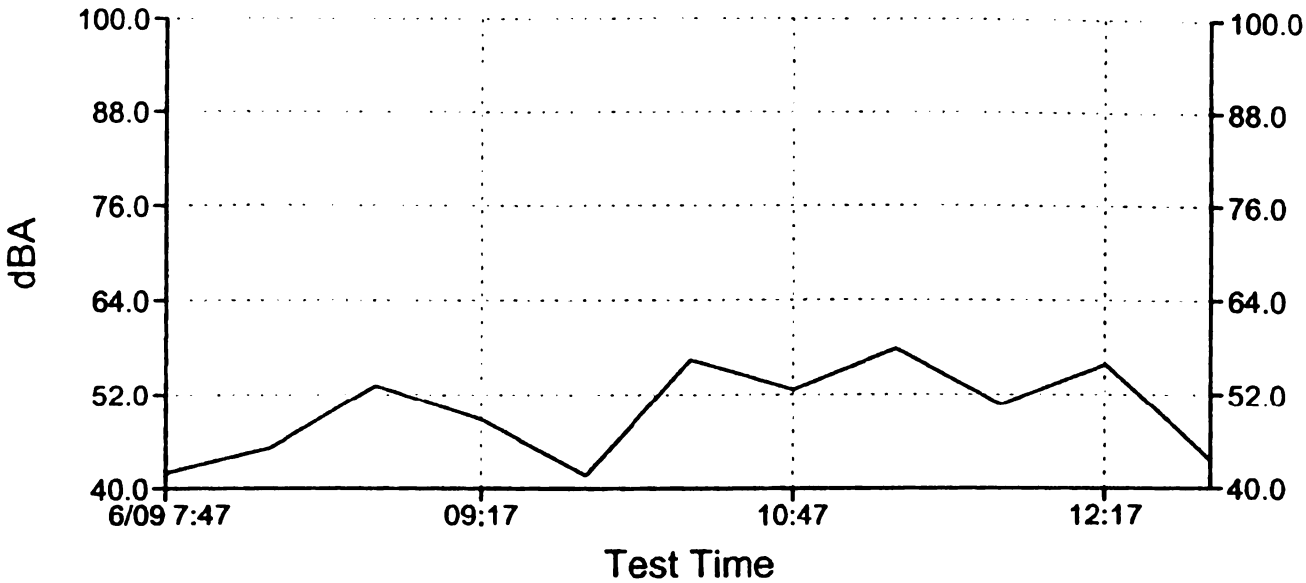

Overall Leq = 51.8db
During Construction Activities

Noise Survey Results During Construction
Big Sandy Energy Project EIS

Figure 3.18-3

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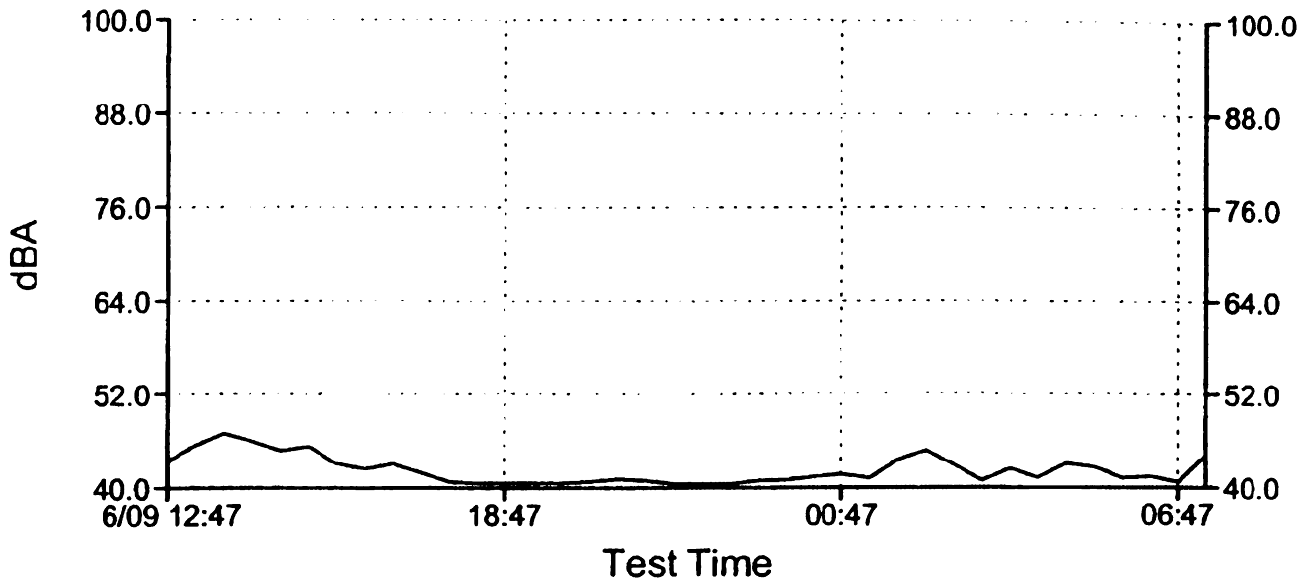

Overall Leq = 42.5db
No Construction Activities

Background Noise with No Construction Activities
Big Sandy Energy Project EIS
Figure 3.18-4

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- Construction other than well drilling is anticipated to occur 10-hours per day, 5 days per week, thereby limiting the potential for noise on nights and weekends. Construction equipment would be required to have manufacturer's recommended mufflers.

3.18.2.5 Impact Assessment

Proposed Action

Proposed Power Plant

Construction of the power plant would result in a temporary increase in the ambient noise level in the vicinity of the construction activity. The magnitude of the impact depends on the type of construction activity, noise level generated by various pieces of construction equipment, duration of the construction phase, distance between the noise source and receiver, presence or absence of noise barriers, and time of day. Figure 3.18-5 shows noise levels generated by typical pieces of construction equipment. The construction noise is anticipated to be generated only during daylight hours, and would be temporary.

Noise is produced during the operation of a power plant. The primary noise sources at a typical power plant include combustion turbine generators (CTGs) and associated CTG air inlets, heat recovery steam generators (HRSGs), steam turbine generators (STGs), cooling tower fans, transformer areas, feed pumps (i.e., boiler, return, and circulation), and ancillary switchgear. The overall noise level generated by these components would depend on the physical layout of the facility, numbers of individual equipment units, and mitigation measures incorporated into the facility design.

Equipment needed to operate the proposed power plant has a guaranteed noise limit of 66 dBA at 400 feet from the "noise envelope" of the equipment. The noise envelope encloses the turbines, HRSG, STG, cooling towers, and ancillary equipment. It must be noted that this is the noise at steady state (100 percent load) baseload operation exclusive of transients, startup and shutdown, pulse filter cleaning, HRSG duct firing, steam bypass, atmospheric venting, and other off-normal and emergency conditions. However, this guarantee is for a two-on-one 520-MW configuration (two turbines, two HRSGs, and one STG). As a conservative estimate of the extra one-on-one configuration (one turbine, one HRSG, and one STG planned for Phase 2), it is assumed that the noise estimate of a one-on-one configuration would be similar, although the one-on-one configuration has one less turbine. The proposed configuration is thus assumed to generate approximately 69 dBA Leq at the 400 feet "noise envelope" of the equipment.

Acoustical calculations were performed to estimate the Project-generated sound level at various distances from the power plant fence line. Calculations assumed that the sound level from the Project components would be constant and would decay based on "point source" acoustical characteristics. A point source decays sound at a rate of 6 dB per doubling of distance from the source-receiver pair. This is a logarithmic relationship describing the acoustical spreading of a pure undisturbed spherical wave in air. The effects of atmospheric absorption, ground attenuation, and intervening topography and structures that may further reduce propagated noise levels, were not considered due to many uncertainties. Therefore, the results are considered to be the worst case.

The results of the calculations are summarized in Table 3.18-3. The predicted noise level at 400 feet represents the closest point of the noise envelope to the southern property boundary, and thus represents the highest noise level off the proposed power plant site. Since all other plant facilities would be farther from the property boundary, the predicted noise along the southern property line represents the maximum "fence line" noise. A review of Table 3.18.3 shows that the 65 dBA Ldn Mohave County compatibility requirement is located at approximately 910 feet from the fence line. The EPA 55 dBA Ldn compatibility guideline is located approximately

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Table 3.18-3 PREDICTED NOISE LEVELS FROM BIG SANDY POWER PLANT			
Distance from Big Sandy Power Plant (feet)	**Average Hourly Noise Level from Big Sandy Power Plant (L_{eq})**	**Average Hourly Noise Level from Big Sandy Power added to Measured Ambient Noise (Leq)**	**Total Day/Night Noise Level (Ldn)**
Fence line	69.0	69.0	75.4
100	67.1	67.1	73.5
600	61.0	61.1	67.5
910	58.2	58.7	65.0
1,600	55.0	55.3	61.7
2,600	51.5	52.0	58.4
3,600	49.0	49.9	56.3
4,600	47	48.4	54.8
5,045 (nearest residence)	46.3	47.8	54.2
5,600	45.5	47.2	53.6
6,600	44.1	46.4	52.8
7,600	43.0	45.8	52.2
8,600	42.0	45.2	51.6
9,600	41.0	44.8	51.2

4,000 feet from the fence line. No residences are located within the 55 dBA or the county 65 dBA Ldn noise contour. Therefore, no significant noise impacts would be expected from power plant operation.

Proposed Access Road, Water Pipelines, and Wells

No residences are located in close proximity of the proposed access road and wells; therefore, no significant noise impacts would occur.

Communication Facilities

Noise impacts from installation of the OPGW option or microwave option would be short term and small in magnitude due to the limited time frame of construction activity. Accordingly, any one location would be affected only for only three to five days for the OPGW, each of the 15 pulling sites would be about 3 miles apart and ground disturbance activities would last only 1 or 2 day(s) of the 75-day construction period at each site. The slightly elevated noise levels associated with construction vehicles would cease after construction or installation activities cease. All of the construction activities are expected to occur within the existing right-of-way and would be temporary.

Proposed Gas Pipeline Corridor

As described in Section 2.0, the corridor for the proposed natural gas pipeline would include corridor segments R1, C1, T3, C3, T4, and R5. Noise sensitive receptors along each corridor segment are described below.

Corridor segment R5 follows the alignment of the proposed access road west to US 93, turns north and follows along the east side of the US 93 to the intersection of the highway and the

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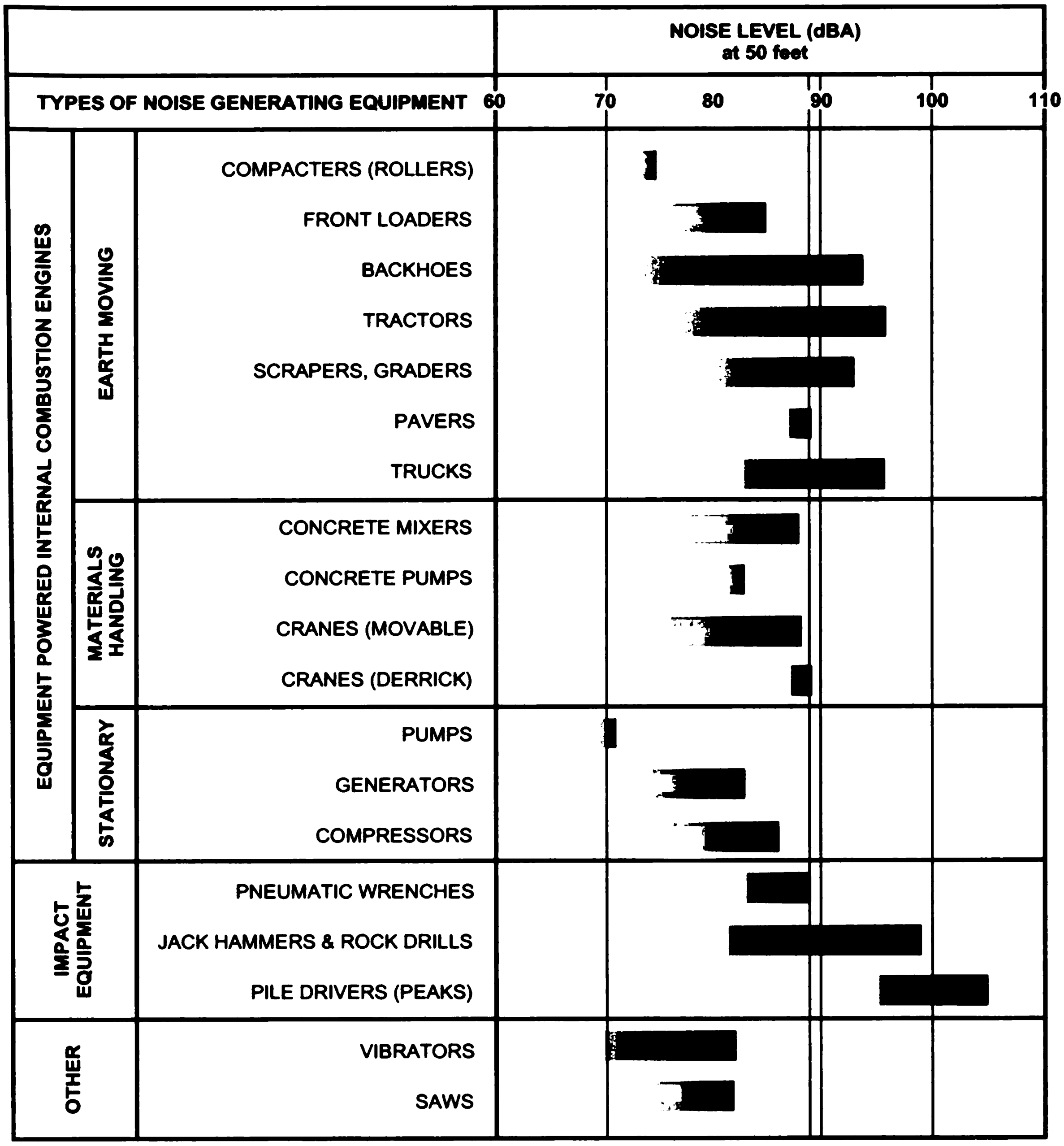

Typical Construction Equipment Noise Generation Levels

Figure 3.18-5

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Mead-Phoenix Project 500-kV transmission line. This corridor segment crosses the Big Sandy River and through the community of Wikieup. There are four residences that would be located in or near the corridor segment just south of Wikieup.

Through about 2 miles of Wikieup the land in the corridor tends to be partially to completely disturbed by development and ranching activities; there are up to 15 residences and up to 6 businesses, including a gas station, located in or near the pipeline corridor.

Corridor segment T4 parallels each side the Mead-Phoenix Project 500-kV and Mead-Liberty 345-kV transmission lines through a designated 1-mile wide utility corridor. There are four residences located in the corridor, several along US 93; five additional residences are located between the highway and the transmission line corridor. Despite the residences, a majority of this corridor is undisturbed rangeland that is used for grazing.

Similar to corridor segment T4, the land within corridor segment C3 includes relatively undisturbed areas used for grazing. There are no residences located in this corridor segment.

Corridor segment T3 includes relatively undisturbed rangeland, though some development is present toward the northern end of the corridor segment. There is one residence within this corridor segment.

Corridor segment C1 crosses undeveloped rangeland that is used for grazing. The corridor crosses both Old US 93 and US 93. Old US 93 is a well-maintained dirt road that provides access to Windmill Ranch residences (40-acre parcel residential area) and Sierra Vista Estates (residential subdivision in Section 13, T20N, R14W)

Corridor segment R1 parallels Hackberry Road, a dirt road maintained by Mohave County. The corridor crosses through relatively undisturbed rangeland that is used for grazing. Disturbance is limited to access roads, an old mining area (Section 3, T20N, R13W), and one residence located along the east side of the road (Section 3, T20N, R13W).

Noise from pipeline construction is anticipated to be short term and temporary, and would occur only during the daytime hours.

Alternative Gas Pipeline Corridors

The alternative natural gas pipeline corridors follow entirely along road alignments (Alternative R) or entirely along the transmission line alignment (Alternative T). Noise sensitive receptors near each corridor segment, which have not been described under the proposed corridor, are described below.

Corridor segment R4 includes areas east of and adjacent to the US 93 right-of-way. The land is relatively undisturbed and is primarily used for grazing, though there are some scattered residences. This corridor segment also crosses through the Carrow-Stevens Ranches ACEC (refer to Section 3.10). There are about eight residences located within the corridor along the east side of US 93; additional residences are present outside of the corridor segment to the east of the corridor segment and west of US 93.

The land uses present in corridor segment R3 are very similar to those described for corridor segment R4. There are about four residences located within the corridor segment; additional residences are present outside the corridor segment and along the west side of US 93.

Corridor segment R2 follows along Hackberry Road, which is an unpaved public road reportedly maintained by Mohave County. The land in the area is undisturbed; there are no developed uses except one residence that is located outside the corridor segment.

Corridor segment T5 generally follows the Mead-Phoenix Project 500-kV and Mead-Liberty 345-kV transmission lines from the plant site to its intersection with US 93, except for the

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area where the corridor segment crosses the Big Sandy River. There are about four residences located in this corridor segment.

Corridor segment T2 is primarily undisturbed rangeland. There are two residences located in the corridor segment and one additional residence just outside the corridor segment.

Land uses in corridor segment T1 are similar to those described for corridor segment T2; there are no residences located in this corridor segment.

Corridor segment C2 follows Old US 93. This corridor segment is narrow, including only the road right-of-way. The land use near the road is generally grazing—there are a few scattered residences (on minimum 40-acre parcels).

Noise from pipeline construction would be short-term and temporary, and would occur only during the daytime during the week.

No-Action Alternative

- The Project would not be developed under the No-Action Alternative. Under this alternative, Project generated sound levels identified in the sections above would not occur.

3.18.2.6 Mitigation and Residual Impacts

- No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts. No measures to mitigate adverse impacts have been identified for noise. There would be no residual significant impacts.

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Chapter 4

Cumulative Impacts

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4.0 CUMULATIVE IMPACTS

This chapter defines cumulative impacts, describes the methodology for assessing these impacts, describes projects and activities considered in this assessment, and presents the results organized by resource topic.

4.1 DEFINITION OF CUMULATIVE IMPACTS

The Council on Environmental Quality's (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) define cumulative impacts as

> "the impacts on the environment which result from the incremental impact of the [proposed] action when added to other past, present, and reasonably foreseeable future actions and regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (Title 40 Code of Federal Regulations [CFR] Part 1508.7)

4.2 IMPACT ASSESSMENT METHODOLOGY

A cumulative impact analysis is based on a number of assumptions. CEQ guidance limits cumulative impact analysis to "important issues of national, regional, or local significance" (CEQ 1997). Therefore, not all issues identified for direct or indirect impact assessment in this EIS are analyzed for cumulative effects. Potential impacts from the Big Sandy Energy Project (Project) action and alternatives are captured and characterized for each resource topic in Chapter 3.0. Because of the wide geographic scope of a cumulative impact assessment and the variety of activities assessed, cumulative impacts are commonly examined at a more qualitative and less detailed level than are direct and indirect impacts caused by the action alternatives.

Public documents prepared by agencies of Federal, state, and local government are the primary sources of information regarding present and reasonably foreseeable future actions. Actions undertaken by private persons and entities are assumed to be captured in the information provided by such agencies. Cited Records of Conversation document some of the many follow-up phone calls made to verify, update, or expand on information in public documents.

The regions of influence are specific to each resource topic and are the same as presented for each resource topic in Section 3.0. Forty years is the period considered for reasonably foreseeable future actions. Criteria determining the significance of cumulative impacts are the same as presented in Section 3.0. Unless otherwise noted, there is no difference in the intensity or context of potential cumulative impacts between the Proposed Action, Alternative R, or Alternative T, which are described in Section 2.0.

4.3 PROJECTS AND ACTIVITIES CONSIDERED

Following are descriptions of past, present, and reasonably foreseeable future projects and activities that would potentially contribute to cumulative impacts if the Project is implemented. Additional information concerning some projects and activities is included in results presented for some resource topics.

4.3.1 Griffith Energy Project

This project involves building and operating the Griffith Energy Project (Griffith), a 520-megawatt, natural gas-fired, combined cycle power plant, on private land south of Kingman, Arizona (Western Area Power Administration [Western] 1999). Griffith interconnects with the Western Pacific Northwest-Pacific Southwest Intertie and Parker-Davis transmission systems to supply power to the competitive electric

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wholesale market. Construction of this plant is expected to be completed in Summer 2001. The Sacramento Valley Aquifer is the source of water for Griffith.

4.3.2 Mead-Phoenix 500-kV Transmission Line Project

This project is a 500-kilovolt (kV), alternating-current transmission line running north-south through the Project region of influence and between the Westwing (Perkins) Substation north of Phoenix, Arizona and the Mead Substation located in Boulder City, Nevada (Western 1989). The transmission line, built in 1994 and 1995, is approximately 225 miles long with approximately 120-foot steel lattice towers spaced approximately 1,200 feet apart. Right-of-way in this area is 150, 175, or 200 feet depending on whether it is along an existing 500-kV line, a 345-kV line, or standing alone.

4.3.3 Mead-Liberty 345-kV Transmission Line Project

The Mead-Liberty transmission line parallels the Mead-Phoenix project described above. It was constructed in 1966 and 1967 (Swanson 2001).

4.3.4 U.S. Highway 93 Wikieup-Interstate 40 (I-40) Widening

Currently, the Arizona Department of Transportation (ADOT) is finalizing an Environmental Assessment for this highway improvement project. ADOT proposes to widen in phases the existing highway between Wikieup and Interstate 40 (I-40) to four lanes divided by an open median, a concrete median barrier, or a continuous left-turn lane (ADOT 2000). The project would utilize an existing ADOT right-of-way (200 feet wide) and would require 1,263 acres of additional right-of-way from private landowners, the BLM, and the Arizona State Land Department. Currently, only two small segments totaling approximately 7 miles that are located just south of I-40 on U.S. Highway 93 (US 93) are in ADOT's construction plans for funding in 2003 and 2004; additional construction would occur after 2004 (Ellis 2001).

4.3.5 US 93 Highway Santa Maria-Wikieup Widening

ADOT is currently implementing this highway improvement project for a segment of US 93 from Wikieup south to the Santa Maria River (ADOT 1995). It involves widening the existing two-lane roadway to four lanes divided by an open median, a concrete median barrier, or a continuous left-turn lane. ADOT currently has 200 feet of existing right-of-way along the roadway. An additional 108 feet of right-of-way (256 acres) will be required for the proposed improvements.

4.3.6 US 93 Big Sandy River Bridge Addition

ADOT is proposing to build an additional bridge across the Big Sandy River west of the existing bridge as part of the US 93 widening projects described above. The existing bridge will provide two lanes for north-bound traffic while the new bridge will provide two lanes for southbound traffic. Construction is not slated to begin until 2003, a full year after the Project-related gas pipeline crossing of the Big Sandy River would be completed (Ellis 2001).

4.3.7 Cattle Grazing in Southern Big Sandy Valley

The Greenwood Peak Community, Groom Peak, and Gray Wash allotments are located approximately 3 miles south of Wikieup. There are no division fences or natural boundaries separating the Greenwood Peak Community allotment from the Groom Peak allotment, and livestock readily drift from one to the other. Cattle are grazed yearlong on the Groom Peak and Gray Wash allotments (Bureau of Land Management [BLM] 2000a).

These allotments run north and south along the Big Sandy River south of Wikieup to the middle Signal Road crossing and extend east across US 93 into the Aquarius Mountains and west into the Hualapai Mountains. Cattle graze yearlong

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throughout each allotment and there are no pasture fences on the BLM-administered portions of these allotments (BLM 2000b). Grazing also occurs on Banegas Ranch, as described below.

4.3.8 Banegas Ranch

This is an existing ranch located 3 miles south of Wikieup along the Big Sandy River, with existing rights to divert approximately 2,400 acre feet per year from the Big Sandy River. However, historical water use has probably been no greater than 300 acre feet per year. About 50 acres will continue to be irrigated; crops include Bermuda grass, hay, alfalfa forage, and nut trees (Koblitz 2001). Grazing consists of approximately 250 animal unit months (AUMs) (cattle). Caithness purchased the ranch and is in the process of transferring a portion of the property to MCEDA. The ranch will continue to utilize water rights for ranch operations including irrigation of forage crops and water for livestock.

4.3.9 Residential Development in Big Sandy Valley

There are 40-acre plots being sold for ranchettes in the *Windmill Ranches* development located approximately 15 to 20 miles north of Wikieup on both sides of US 93. Using conservative numbers, there is the potential for approximately 250 shallow water wells if all the 250 lots are built on. At this time, less than one-tenth of the parcels are inhabited. Most are being sold to out-of-state owners and are not being developed. Because these parcels are greater than 36 acres, they do not have to go through a development review process by Mohave County Planning. There are several other residential areas north of *Windmill Ranches* and south of the I-40/US 93 intersection on Old Highway 93 for sale; these include *Silverado Acre Estates Tract 3805*, a subdivision with 1-acre lots, and *Silverado Ranches* with 40-acre parcels (Taylor 2001 and Delmar 2001).

4.3.10 Hualapai Lands in Big Sandy Valley

The Hualapai Tribe is considering developing a 60-acre parcel of Trust Land located approximately 18 miles north of the Project plant site. The Hualapai would use the existing 50-gpm well on the property (Bravo 2000) as a source of water for a potential aquaculture or agriculture project. In addition, there are two individually owned tribal parcels (allotted lands) in the vicinity of the 60-acre parcel which have the potential to be developed for agricultural or other purposes in the reasonably foreseeable future.

4.3.11 Arkosic Road

Mohave County has applied for a perpetual right-of-way for an approximately 1.8 mile-long public road (to be called Arkosic Road) and utility corridor across approximately 3.6 acres of public lands administered by BLM near Wikieup. The proposed Arkosic Road is identical to the county road proposed as part of the Project (refer to Section 2.2.4 for a detailed description), and Caithness has agreed to build and pave Arkosic Road. The BLM is currently preparing an Environmental Assessment for Arkosic Road pursuant to NEPA. The purpose of Arkosic Road would be to provide a public road and utility corridor for existing and future property owners in the area. Legal access is needed for current residents and an existing mining operation. The unpaved road used by residents and the mine to access US 93 at milepost 128 has been closed by ADOT for safety reasons. For the purpose of this cumulative assessment the potential effects of Arkosic Road are already covered by the Proposed Action.

4.3.12 Phelps Dodge Bagdad Mine Wellfield

The Phelps Dodge Bagdad Mine is located on Burro Creek, approximately 18 miles east-southeast of the proposed power plant site. The mine produces copper and molybdenum ore through open-pit mining methods. Copper and molybdenum concentrates are produced from the ore using conventional milling and froth flotation methods, and are shipped offsite for

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smelting. Cathode copper is produced by leaching low-grade ore and extracting copper from the pregnant leach solution using solvent extraction and electrowinning methods.

Water is supplied to the Bagdad Mine by as many as 14 shallow groundwater production wells located along the Big Sandy River, between 5 and 13 miles north-northwest of the proposed power plant and production wellfield. The Bagdad production wells range in depth from about 100 to 140 feet, and are all completed in the upper aquifer. Water from the Bagdad wellfield is delivered to the mine through a pipeline. Power is delivered to the wellfield by an H-frame, wood pole transmission lien that is located between the existing Mead-Liberty and Mead-Phoenix Project transmission lines, north of the wellfield.

The total amount of groundwater withdrawn by Phelps Dodge to supply the Bagdad Mine is unknown, but has been estimated by the U.S. Geological Survey to be approximately 2,005 acre-feet per year (refer to Section 3.4).

4.3.13 Cell Tower Sites in Big Sandy Valley

Mohave County has approved the installation of seven cell tower sites in the Big Sandy Valley from I-40 south to the county line. These towers will be located adjacent to US 93 in elevated areas approximately 7 to 10 miles apart. The towers will be approximately 190 feet high, will be constructed as steel lattice structures, and will have no lighting requirements. The nearest location to the power plant site is in the southeast quarter of Section 1, T15N, R13W. An additional repeater tower will be located on Aubrey Peak, approximately 10 miles east of the valley (Delmar 2001).

4.4 IMPACTS AND MITIGATION BY RESOURCE

This section, organized by resource topic, presents the results of analyses of potential cumulative impacts attributable to implementation of the Big Sandy Energy Project action alternatives. When applicable mitigation measures which could reduce or avoid impacts are discussed. Impacts are analyzed with an amount of detail commensurate with their importance. Each resource was evaluated using the same significance criteria defined in Section 3.0.

4.4.1 Air Resources

Negligible emissions of regulated air pollutants are expected associated with the existing Mead-Phoenix Project 500-kV and Mead-Liberty 345-kV transmission lines, existing cattle grazing in the Southern Big Sandy Valley, residential development, and future development of Hualapai lands in the Big Sandy Valley. Therefore, it is not anticipated that these activities or structures would contribute significantly to cumulative impacts to air resources in combination with the Proposed Action.

Griffith is located about 70 kilometers (km) (43 miles) from the proposed power plant site. Evaluation of cumulative air quality impacts resulting from existing and permitted sources is a requirement of New Source Review permitting. For such evaluations, Arizona regulations require that sources within 50 km (31 miles) of a Proposed Action must be considered in the ambient air impact analysis. Beyond that range, it has been found that gas-fired utility plants usually result in negligible impacts relative to the significance criteria thresholds. Therefore, it is not likely that Griffith will contribute to an exceedance of significance criteria within the region of influence of the project when combined with the Proposed Action.

Construction projects have only a short-term effect on air quality. Emissions of gaseous pollutants from construction vehicles, and particulate emissions from earth moving and other activities tend to have very localized effects. The cumulative effect of the US 93 highway and bridge improvements projects and other projects involving construction in combination with construction of the Project would be negligible, since there is almost no overlap in the time frame for the construction activities. Construction phase and operational

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impacts of the Proposed Action have been evaluated by refined dispersion modeling, and indicate that these impacts do not exceed significance criteria. Adding the short-term construction effects of other projects in the vicinity of the Proposed Action is not anticipated to cause exceedances of the significance criteria.

If future land development within the Project region of influence is residential, then there would be relatively little contribution to air quality impacts from the development itself. A potential increase in vehicle traffic in the vicinity may have a minor, localized effect on air quality. Future land development when combined with the Proposed Action would not adversely contribute to the air quality parameters (e.g., NAAQS and increments) used as the significance criteria for the Project.

The Proposed Action, when added to identified past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is not expected to cause exceedances of significance criteria thresholds for air resources; therefore, there would be no significant cumulative impacts.

4.4.2 Geology/Paleontology

There are no known areas of regional geological or potential mineral resource development of economic importance in the region of influence. Therefore, the cumulative actions when added to the Proposed Action would not have significant impacts. The Project and cumulative actions would not impact any existing mining operations. The Project and cumulative actions may remove a small portion of the Valley's sand and gravel resources from potential development, ; however, this impact would not be significant because of the extent of these resources in the Big Sandy Valley and northwestern Arizona.

Significant portions of vertebrate fossils have been found within portions of the Big Sandy formation in the southern end of the Big Sandy Basin. However, most of the past, present, and reasonably foreseeable future actions in the region of influence would not have the potential to adversely affect any undiscovered fossil resources, or would be required to survey and recover these resources before construction (e.g., US 93 projects). Therefore, any impacts on paleontological resources would be less than significant.

The Proposed Action, with mitigation, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is not expected to cause exceedances of significance criteria thresholds for geological and paleontological resources; therefore, there would be no significant cumulative impacts.

4.4.3 Soils

The development projects included in Section 4.3 have potential to impact soils in the region of influence. However, since these projects fall under Federal, state, tribal, and local jurisdiction, it is expected that best management practices to reduce soil erosion would be implemented. The Project, with mitigation, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is not expected to exceed significance criteria thresholds for soils. Therefore, there would be no significant cumulative impacts.

4.4.4 Groundwater

The past, present, and reasonably foreseeable actions are not expected to impact springs and seeps. However, since the Project would impact Cofer Hot Spring, there would be significant cumulative impacts.

Negligible impacts on groundwater resources are expected associated with the existing transmission lines and the US 93 road-widening and bridge projects. Therefore, it is not anticipated that these activities would contribute to cumulative impacts on groundwater resources in combination with the Project.

Griffith is located in the Sacramento Valley groundwater basin. Water for Griffith will be supplied by groundwater pumped from the Project property. Because Griffith is located in a separate groundwater basin approximately 40

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miles from the Project, there are no potential cumulative impacts to the groundwater resources of the Big Sandy groundwater basin attributed to the two projects.

The total amount of groundwater consumed to support grazing is believed to be on the order of 80 acre-feet per year (refer to Table 3.4-1). This amount of groundwater consumption was analyzed as part of the affected environment in Section 3.4 and, therefore, there would be no cumulative effects beyond the Project.

The source of water for land being developed for residential use will likely be groundwater pumped from the upper alluvial aquifer. Based on the planned development of the *Windmill Ranches* development located approximately 15 miles north of Wikieup, there is the potential for approximately 250 lots supplied by 250 shallow water supply wells at buildout. Assuming each well will supply one single-family residence with an average occupancy of 3.5, and an average water use of 120 gallons per capita per day, the total annual water use of the development at buildout is estimated to be 105,000 gallons per day, or about 117 acre-feet per year. It is assumed that nearly half of this water will be recharged to the upper aquifer through septic systems. The net consumption of groundwater would be about equal to the exiting consumption of groundwater for domestic uses, or 0.25 percent of total groundwater outflow.

There are three existing parcels belonging to the Hualapai Tribe in the Big Sandy Valley. One well, placed in the upper aquifer, is located on tribal land. This well has not been used for the past 30 years, but according to tribal members, may potentially be used in the future for aquaculture or agricultural purposes. Because this well would be pumping a relatively small volume of water from the upper aquifer (about 80 ac-ft/yr), the impacts on the groundwater resources of the Big Sandy basin would be minor.

The groundwater production wells that would be used to supply the power plant would be completed solely in the lower aquifer. The Bagdad Mine groundwater production wells are completed in the upper aquifer, and are located north of the predicted area of potential impact to the upper aquifer from the Proposed Action (refer to Section 3.4, Groundwater). Because of this, there would be no potential cumulative impact to the lower aquifer.

The potential cumulative impact to the upper aquifer from groundwater pumping to supply the power plant and the Bagdad Mine can be expressed as the total amount of groundwater withdrawn from the two aquifers. The results of groundwater modeling indicate that groundwater flow from the middle aquifer to the upper aquifer may be reduced by as much as 564 ac-ft/yr as a result of pumping to supply the power plant (refer to Section 3.4, Groundwater). The cumulative impact to the upper aquifer, based on the predicted flow reductions to the upper aquifer (564 ac-ft/yr) and pumping to supply the Bagdad Mine (2,005 ac-ft/yr), is therefore estimated to be 2,569 ac-ft/yr, most of which is attributed to mine pumping.

The potential cumulative impact to the groundwater resources of the Big Sandy Basin from the Proposed Action (4,850 ac-ft/yr) and the Bagdad Mine (2,005 ac-ft/yr) can be expressed as the total amount of groundwater withdrawn (approximately 6,855 ac-ft/yr).

Because only minor changes to the amounts of water used by these past, present, and reasonably foreseeable future actions in the Big Sandy Valley and because the water system is currently balanced (i.e., average use equals average water recharge), cumulative impacts to groundwater resources are not expected to be significant.

4.4.5 Surface Water

The only past, present, or reasonably foreseeable actions in the Big Sandy Valley that consume surface water resources are cattle grazing and the agricultural operations including the Banegas Ranch and evapotranspiration from vegetation including the increasing populations of tamarisk. These are existing and were considered as part of the affected environment in Section 3.5. Temporary impacts on surface water quality would occur during construction of the proposed

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gas pipeline across washes and at crossings of the Big Sandy River. Similar impacts likely would occur resulting from the construction of the US 93 bridge addition and road expansion. However, these impacts would be short-lived and would not occur at the same time, and thus would not be considered significant when added to the effects of the Proposed Action.

The Proposed Action, with mitigation, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is not expected to cause exceedances of significance criteria thresholds for surface water; therefore, there would be no significant cumulative impacts.

4.4.6 Floodplains

Federal and/or county regulations require projects to mitigate potential adverse impacts to affected floodplains. Such mitigation measures are the responsibility of those constructing or operating the projects and activities. Given these requirements, the Proposed Action, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley would not result in significant cumulative impacts on floodplains.

4.4.7 Land Use and Access

None of the past, present, and reasonably foreseeable future actions in the region of influence are anticipated to result in any substantive inconsistency with land use laws, ordinances, or regulations (BLM, state, or county). The US 93 widening and bridge additions would provide minor positive effects on area access. Thus, the Proposed Action when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is not anticipated to exceed significance criteria as a result of the Proposed Action. Therefore, there would be no significant cumulative impacts.

4.4.8 Grazing Management

Cumulative impacts on grazing management are expected to be minor for all of the projects and activities considered for analyzing Project cumulative impacts. Impacts on grazing allotments from the projects and activities described above would remove small portions of the land available for grazing within the region of influence.

The Proposed Action, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is not expected to cause significant impacts on grazing management.

4.4.9 Recreation, Wilderness, and Visual Resources

Some additional temporary demand for recreation facilities, developed and undeveloped, and wilderness would result from large construction projects such as Griffith and US 93 road and bridge improvement projects. Smaller increases in permanent recreation and wilderness demand may occur from the additional population in Windmill Ranches. Because of the wide range of recreation and wilderness opportunities in the area and the small increases in demand, the cumulative impacts would be less than significant.

The US 93 bridge and widening, and cell towers could result in substantial impacts on the scenic quality or landscape characteristics of the area. Visual impacts related to the cell towers would depend on tower location. The Griffith project is outside the region of influence for visual analysis. The transmission projects represent minor to substantial impacts on the visual quality of the valley, since they can be a noticeable to dominant feature in the area depending on distance and viewpoint. None of the remaining projects or actions (grazing, Banegas Ranch, residential development, Hualapai lands, Phelps Dodge Bagdad Mine wellfield) substantially alter the visual quality of the valley. The visual impacts related to US 93 actions, cell towers, and transmission lines could be considered adverse in a predominantly rural/residential area. The proposed Project would contribute to the cumulative impact, but would provide a different visual effect than the cell towers and transmission line structures.

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The Proposed Action, when added to any other past, present, and reasonably foreseeable actions in the Big Sandy Valley, is not expected to cause exceedances of the significance criteria thresholds for recreation, wilderness, and visual resources. There would be no significant cumulative impacts on recreation or wilderness. However, there would be cumulative adverse impacts on visual resources.

4.4.10 Areas of Critical Environmental Concern

The widening of US 93 through the Carrow-Stephens Ranches ACEC would have adverse impacts, since any construction would result in removal of vegetation within the ACEC. The ranch has been affected by the initial construction of US 93 past the historic ranch buildings. Widening of this area would include relocation of US 93 to avoid historic areas and some regrading of areas to reduce visual impacts, resulting in a positive impact. Cumulatively, these actions would require removal of native vegetation, which violates BLM Management Prescription 10 for the ACEC and triggers the significance criterion of inconsistency with the BLM Management Prescriptions. No cumulative impacts would be anticipated on the Three Rivers Riparian ACEC from any of the past, present, or reasonably foreseeable actions.

The Proposed Action, with mitigation, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, would likely cause an exceedance of a significance criteria threshold for the Carrow-Stephens Ranches Area of Critical Environmental Concern (ACEC) unless mitigation would be implemented. Therefore, there would be a potential for significant cumulative impacts on the Carrow-Stephens Ranches ACEC.

4.4.11 Vegetation

All of the past, present, and reasonably foreseeable future actions in the Big Sandy Valley would result in some disturbance to vegetation. Any projects occurring in the Big Sandy Valley that result in the clearing of xeroriparian communities would require proper mitigation and/or compensation in order not to exceed significance thresholds.

The Griffith and US 93 road and bridge projects likely would result in permanent clearing of native plant communities. However, Griffith is located approximately 40 miles from the Proposed Action and impacts on vegetation associated with each project are expected to be local and isolated. The two US 93 road-widening projects would overlap in part with the proposed pipeline. Impacts on vegetation along this corridor can be lessened by minimizing the areas of disturbance, reseeding, and fencing revegetation areas to avoid disturbance by livestock and off-road vehicles. Because the US 93 River Bridge Addition Project is scheduled to occur approximately two years after the construction phase of the Project is completed, impacts on vegetation associated with each project are expected to be isolated and minor as long as planned revegetation efforts are successful. However, an unmitigated loss of xeroriparian habitat would be a significant cumulative impact.

The existing transmission lines have caused both temporary and permanent disturbance to vegetation communities. Both routes have been revegetated and the impacts associated with these lines when added to the Proposed Action would not be cumulatively significant.

Changes to native plant communities have resulted from current and historic cattle grazing in the southern Big Sandy Valley, including Banegas Ranch. Continued grazing at Banegas Ranch may limit revegetation of native plant communities. Adverse impacts can be minimized by fencing revegetation areas to allow native plant communities to reestablish.

Future residential development on private lands as well as residential and/or agricultural development on Hualapai lands in the Big Sandy Valley would result in both temporary and permanent disturbance to vegetation communities. The nature and severity of the impact would depend on the size of area

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disturbed, as well as the nature and success of any revegetation efforts made, but significance criteria are not expected to be exceeded.

The Proposed Action, with mitigation, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is expected to cause exceedances of significance criteria thresholds for vegetation. Therefore, there is a potential for significant cumulative impacts.

4.4.12 Wetlands, Riparian Areas, and Waters of the United States

The Griffith project has impacted waters of the United States as a result of disturbances occurring during construction activities. Because the Griffith project is located 40 miles from the Proposed Action, it would not contribute to cumulative effects in the Big Sandy Valley.

Several washes classified as waters of the United States cross the existing transmission lines in the Big Sandy Valley. Impacts would be minimal and cumulative since existing access roads would be used.

The US 93 road-widening and Big Sandy River Bridge addition projects would result in impacts on wetlands and riparian areas where the highway crosses the Big Sandy River. These three projects would involve the placement of permanent surface structures. Depending on the nature of mitigation measures taken, impacts to wetlands and riparian areas due to these projects could be significant. However, it is expected that ADOT requirements for mitigation would reduce impacts to a less than significant level. Therefore, the Proposed Action, when added to other past, present, and reasonably foreseeable future actions, would not result in significant cumulative impacts on wetland and riparian areas at the Big Sandy River. A decline in flows at Cofer Hot Spring from the Proposed Action would be a significant impact. No other effects on flows are expected from past, present, or reasonably foreseeable future actions.

Existing cattle grazing in the southern Big Sandy Valley, including Banegas Ranch, is causing adverse effects to wetlands and riparian areas adjacent to the Big Sandy River. Future residential development on private lands as well as residential and/or agricultural development on Hualapai lands in the Big Sandy Valley may result in either temporary or permanent disturbance to waters of the United States. The severity of the impact on waters of the United States would depend on the size of area disturbed, as well as nature and the success of mitigation efforts. Since such developments would be under the jurisdiction of the U.S. Army Corps of Engineers, adequate mitigation would be required in residential developments, and cumulative impacts on waters of the United States would be mitigated. However, long-term cumulative impacts in areas of future development are not expected to exceed significance criteria.

Based on the significance criteria for this Project, and the impact that would occur on the wetland resulting from a decline in flows at Cofer Hot Spring, the cumulative impacts resulting from the Proposed Action, alone or when added to other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, would be considered significant.

4.4.13 Fisheries and Wildlife

Some bird mortality may occur from bird collisions with the existing Mead-Phoenix 500-kV and Mead-Liberty 345-kV transmission lines. Also, construction of these lines may have resulted in loss of nests or nesting habitat. Nesting habitat also likely would be lost as a result of ADOT's road widening projects, residential development, and the Griffith project. The loss of nesting habitat would be an adverse cumulative impact, but would not be significant since there would not be a reduction in bird breeding opportunities.

The addition of a bridge on US 93 over the Big Sandy River may have an adverse effect on night-roosting bats that use the existing US 93 bridge structure. If construction occurs during daylight hours, this should not impact night-roosting bats. The Big Sandy River Bridge addition would cause short-term impacts to

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fisheries and wildlife due to habitat disturbance associated with construction activities, and adverse cumulative impacts would likely occur.

Cumulative impacts to fisheries and wildlife are expected to be minor as a result of the US 93 road improvements projects, existing cattle grazing, and potential land development in the Big Sandy Valley.

Existing cattle grazing in the southern Big Sandy Valley is causing adverse effects to the Big Sandy River water quality, as well as to fisheries and wildlife inhabiting the Big Sandy River and adjacent riparian areas. Potential land development in the Big Sandy River Valley also may adversely impact fisheries and wildlife by degrading or destroying their habitats. Mitigation for residential development would reduce adverse impacts. However, due to the small-scale nature of development in the valley and the limited impacts of grazing, impacts to fisheries and wildlife are not expected to be significant. The Proposed Action, with mitigation, when added to other past, present, and reasonably foreseeable actions, is not expected to cause an exceedance of the significance criteria threshold for fisheries and wildlife. However, any migratory bird losses due to the Proposed Action or past, present, and reasonably foreseeable future actions would result in a violation of the Migratory Bird Treaty Act, and result in significant cumulative impacts.

4.4.14 Threatened, Endangered, Proposed, and Other Special Status Species

There is a potential for adverse cumulative impacts on threatened, endangered, and proposed, species; however, the determination on the significance of cumulative impacts on these species is deferred until consultation with USFWS is completed.

There is a potential for cumulative impacts on the southwestern willow flycatcher from the Proposed Action and the US 93 Big Sandy River bridge addition. Any crossing of the perennial reach of the Big Sandy River and removing riparian vegetation could decrease habitat available to the flycatcher. Even if these areas are revegetated, cattle grazing in the Big Sandy Valley, including Banegas Ranch, would have an additive negative effect if cattle are not fenced out of the riparian areas until vegetation is well established. Any impacts on riparian areas along the Big Sandy River may also decrease breeding habitat for the Yuma clapper rail and western yellow-billed cuckoo and foraging habitat for the bald eagle. Any impacts on areas of Tertiary limestone lakebed deposits would adversely affect habitat for the Arizona cliffrose. The final determination of the significance of these impacts would come from Section 7 consultation with USFWS.

Sensitive species of bats may be temporarily displaced by actions in the Big Sandy Valley including the Proposed Action and other past, present, and reasonably foreseeable future actions. The bats may use the bridge crossing over the Big Sandy River for a roosting site; therefore, the bridge addition project could negatively impact sensitive bats. In addition, culverts under US 93 may be used for roosting sites, and highway construction could cause the bats to leave.

Ground-clearing disturbances also have the potential to impact sensitive species of reptiles. Proposed projects such as the residential land development, and the Griffith project, would permanently alter habitat and make it unavailable to reptiles. Mitigation measures taken to minimize habitat destruction and direct mortality of these animals during construction would reduce impacts. All habitat loss for the desert tortoise must be mitigated in order to reduce further impacts on this species.

The proposed US 93 bridge addition project over the Big Sandy River may impact sensitive amphibian and fish species within the river and surrounding riparian areas. Mitigation measures required for road construction would limit the extent and intensity of impacts.

The Proposed Action, when added to other past, present, and reasonably foreseeable future actions, has the potential to have cumulative impacts on sensitive plant species' habitat.

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Projects on private land would need to comply with the Arizona Native Plant Law administered by the Arizona Department of Agriculture. Projects under Federal jurisdiction would include measures to minimize impacts on sensitive plants. Thus, no significant cumulative impacts on sensitive plant species are anticipated.

4.4.15 Cultural Resources

Although available information is not precise, it indicates that, on average, various types of projects and activities are disturbing or destroying only a few significant cultural resources each year from an inventory of a few thousand significant resources within the Big Sandy River Basin. Impacts from regulated projects and activities within this area are being mitigated.

Recent projects in the Big Sandy River Basin include the Mead-Phoenix 500-kV Transmission Project and US 93 upgrades between the Santa Maria River and Wikieup. Cultural resource surveys for these projects resulted in the discovery and recording of about 50 archeological and historical sites. Adverse effects to most of the significant sites in this inventory have been avoided and mitigation studies have been conducted at fewer than ten significant sites that were adversely affected. Although these sites have been lost from the regional inventory of cultural resources, important archaeological and historical information was recovered and preserved.

A survey of cultural resources was completed for the improvements project for US 93 from Wikieup north to I-40. It identified almost 60 additional archaeological and historical sites, and slightly more than half of these are considered significant. Analysis of how many of these sites will be affected by the planned upgrades, which are scheduled to occur over the next two decades, is ongoing. Surveys also would be required for other projects requiring Federal permits, such as Griffith and cell tower sites.

Cultural resource surveys were not conducted for projects undertaken prior to regulatory requirements for environmental review, such as the Mead-Liberty 345-kV Transmission Line Project. Also, surveys are not required for private land developments, such as the ongoing residential developments in the northern portion of the Big Sandy River Basin. Impacts from these unregulated activities also are not mitigated, and therefore probably represent the most substantial increment to cumulative impacts on cultural resources within the region.

The Proposed Action and other past, present, and reasonably foreseeable future actions are within an area that the Hualapai Tribe considers an important traditional cultural landscape. The Tribe concludes that any intrusion into the Big Sandy Valley would adversely affect the traditional cultural landscape and would therefore have significant cumulative impacts.

The Proposed Action, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, would cause an exceedance of significance criteria thresholds for traditional cultural resources. Therefore, significant cumulative impacts would occur.

4.4.16 Socioeconomics and Environmental Justice

Because the Griffith project would be completed near the time construction starts on the Big Sandy Energy Project, there would be little overlap of construction craft workers. As the Griffith project is completed, many workers are expected to remain in the Kingman area and would then be hired to work on the Project. This represents a positive cumulative effect, because workers could continue to live in the Kingman area without having to relocate.

Road construction along US 93 from Santa Maria to Wikieup is currently ongoing. Construction of two small segments along US 93 from Wikieup to I-40, located just south of the Interstate, would occur during construction of the Proposed Action. They should not significantly hamper the commuting workforce

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from Kingman as the new roadway will parallel the existing two-lane highway.

Development of the Hualapai land project would provide positive benefits related to environmental justice; however, none of these positive impacts would be considered significant.

The Proposed Action, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is not expected to cause exceedances of significance criteria thresholds for socioeconomics and environmental justice. Therefore, significant cumulative impacts would not occur.

4.4.17 Public Safety and Services

EMF levels were modeled in the 1986 *Mead-Phoenix ±500-kV DC Transmission Line Project Environmental Impact Statement*. Those levels were previously found to not pose a risk to human health and safety. In general, road-widening projects along US 93 would not cause traffic congestion. This is because new lanes would be constructed parallel to the existing route without road closure.

The cumulative possibility of catastrophic accidents at the Griffith project or during ADOT bridge construction is considered remote. In the unlikely event of disasters, applicable Federal, state and county emergency preparedness procedures, described in Section 3.17, would be followed. ADOT emergency procedures would apply in the event of construction or traffic accidents that could occur during road and bridge construction.

Applicable procedures for human health and safety would likely be strictly enforced for any project or action involving hazardous materials or wastes or safety concerns, such as road or cell tower construction. This would include the proper handling and storage of all hazardous materials, as well as procedures for waste disposal, and implementation of worker health and safety procedures.

The Proposed Action, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is not expected to cause exceedances of significance criteria thresholds for public safety and services if the procedures above are implemented. Therefore, significant cumulative impacts are not likely to occur.

4.4.18 Noise

Increases in ambient noise levels resulting from construction activities (e.g., US 93 project, residential or road construction) would be short term and temporary, and likely would be limited to daylight hours. These impacts would not be considered significant.

The Proposed Action, when added to any other past, present, and reasonably foreseeable future actions in the Big Sandy Valley, is not expected to cause exceedances of significance criteria thresholds for noise. Therefore, significant cumulative impacts would not occur.

4.5 SUMMARY OF CUMULATIVE IMPACTS

Significant adverse cumulative impacts would not occur on air, geology/paleontology, soils, surface water, floodplains, land use, grazing management, recreation, wilderness, waters of the United States, fisheries, wildlife (with the exception of migratory bird losses), socioeconomics, environmental justice, public safety and services, and noise. For most resource areas, the degree of cumulative adverse impacts would depend on the extent of mitigation employed to reduce adverse impacts. Positive cumulative economic and public service impacts would occur as a result of the Proposed Action and past, present, and reasonably foreseeable future actions.

Use of mitigation specified in this Draft EIS would reduce many impacts of the Proposed Action to less than significant. However, potentially significant cumulative impacts may occur to migratory birds, due to nest losses and collisions.

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Existing roads, buildings, and transmission structures already provide visual impacts in the Big Sandy Valley. Proposed cell towers would contribute to this impact. The proposed Project would add less than significant impacts to the cumulative impacts.

Based on the significance criteria for this Project, the impacts on Cofer Hot Spring would be significant since the groundwater withdrawal would affect a spring and a wetland. The cumulative effects of all of past, present, and foreseeable future actions would be a significant impact on Hualapai traditional cultural resources. Impacts on the Carrow-Stephens Ranches ACEC would be both positive and significantly adverse, due to the nature of the significance criteria and BLM Management Prescriptions for these areas.

A determination on the significance or cumulative impacts on threatened and endangered proposed and listed species will be made after the completion of consultation with USFWS and is anticipated to be reflected in the Final EIS

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Chapter 5

Other Required Considerations

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5.0 OTHER REQUIRED CONSIDERATIONS

5.1 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) require consideration of "irreversible and irretrievable commitments of resources" that would result from the Project or its alternatives. However, CEQ has not defined each of these terms. For the purposes of this analysis, the term "irreversible commitment" has been interpreted to mean material, non-material, and financial resources consumed (e.g., minerals, soil productivity) that cannot be replaced. For example, the use of natural gas for electricity generation represents an irreversible commitment of natural gas for that purpose. An "irretrievable commitment" of resources refers to the loss of production, harvest, or use of natural resources, that occur over the life of the proposed Project. The amount of production foregone is irretrievable, but the action can be reversed. For example, some or all of the grazing acreage in the plant site is irretrievably lost while the area serves as a power plant. The productivity of the area for grazing is lost, but after the power plant use is finished, the plant could be removed, the site reclaimed, and grazing could resume.

For this Project, the Proposed Action and alternatives differ only in the route and location of the natural gas pipeline to the proposed power plant, and in the redundant communication systems for operation of the substation. Unless specific commitments of resources differ between the Proposed Action and Project alternatives, commitments of resources are discussed together. The resources examined correspond with the resources discussed in Section 3.0. Additional sections outline the resource commitments for construction activities and plant operations. For all resources, including construction materials and fuels, the No-Action alternative would result in no irreversible commitment of resources, and a small irretrievable commitment of soil, land use, vegetation, and grazing where the existing well pads and access road are located.

5.1.1 Air Resources

During power plant and pipeline construction, an increase of gas emissions including nitrogen oxide (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), and particulates (PM_{10}), and an increase of fugitive dust, is anticipated. Sources contributing to these increases include construction vehicles and equipment, as well as earth clearing/grading operations. Impacts to air resources are not expected to be significant, but degradation to air quality that would occur during construction would be irretrievable. Air quality impacts associated primarily with earth moving activities and equipment would be reversible upon completion of Project construction. Plant operations would result in emissions of PM_{10}, NO_x, SO_2, and formaldehyde for the life of the Project. Pipeline operation may also result in irretrievable changes in regional haze and nitrogen and sulfur deposition. Minor visibility impairment is expected due to NO_x, SO_2, and particulates represents an irretrievable commitment over the life of the Project. These air quality effects would be reversible following the life of the Project.

5.1.2 Geology/Paleontology

There are no known areas of regional geological importance or mineral resource development potential that would be destroyed or made inaccessible by the proposed power plant and its associated facilities (e.g., evaporation ponds). There are no known paleontological resources that would be located along the proposed or alternative pipeline routes. Mitigation during construction would protect previously unidentified fossil localities. Therefore, the Proposed Action would result in no irretrievable or irreversible commitments of geological or paleontological resources.

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5.1.3 Soils

Soils would potentially be lost through water and wind erosion as a result of the Proposed Action. Increased soil erosion may occur where vegetation is removed and the surface is disturbed during construction. Additionally, the compaction of soils, loss of topsoil, and mixing of topsoils and subsoils may inhibit natural revegetation, increasing potential soil erosion. Increased erosion may reduce the productivity of the soil. Though actions have been incorporated into the Proposed Action to reduce soil erosion, the loss of soil during construction and operation of the Project represents an irretrievable and irreversible commitment of resources.

5.1.4 Groundwater

Groundwater resources would be irreversibly and irretrievably committed as a part of the Proposed Action. Groundwater would be extracted from the lower aquifer at a maximum rate of 3,000 gallons per minute (gpm) for about 40 years. Most of this water would cycle through the plant and be lost to evaporation; the remaining cycled water would be discharged into an evaporation pond. A small percentage of pumped water would be used for agricultural activities. Only some water used for agricultural activities and flow augmentation could potentially recharge groundwater. Water consumed by plant operations and evaporation ponds represents an irretrievable commitment of groundwater resources. Though drawdown of the aquifers would be irretrievable over the life of the Project, the aquifers could recharge to its existing level over time and this commitment would be considered reversible. The Project is likely to affect Cofer Hot Spring whose flow would likely be reduced over the 40-year life of the Project. This reduction of flow to Cofer Hot Spring would also be irretrievable over the life of the Project, and until the aquifer is recharged.

5.1.5 Surface Water

Surface water quantity and quality could be affected as a result of the Proposed Action. Grading for the plant site and access road, as well as construction of the pipeline, may temporarily disturb surface water quality in immediately adjacent areas by increasing sedimentation and turbidity. The commitment of surface water resources represents an irretrievable loss; however, loss of these resources would be anticipated for only the life of the Project.

The reduction of flow to the Big Sandy River would be mitigated through the addition of other surface water sources. This is an irretrievable commitment of this water resource.

5.1.6 Floodplains

The Proposed Action may result in the irretrievable commitment of floodplain resources during pipeline construction depending upon the method of pipeline installation. If a directional drilling method is used for pipeline installation, there would be no effect on floodplain resources and no irretrievable commitment of resources would occur. However, if the trenching method is employed for pipeline installation, there would be some temporary irretrievable impacts on floodplains.

5.1.7 Land Use and Access

The Proposed Action would result in irretrievable commitments of land use resources. The proposed power plant, associated substation, evaporation ponds, agricultural activities, access road, and optical ground wire (OPGW) installation, would be located on 159 acres of predominantly grazing land. Land uses along the pipeline route may be temporarily or permanently disrupted, depending on the particular use and particular alignment. For example, structural land uses within the selected alignment would need to be relocated for the life of the Project, but grazing uses only need to be relocated during pipeline construction and until revegetation occurred. The changes to land use would be reversible over varying lengths of time, which represents an irretrievable commitment of land uses ranging from the construction period to the life of the Project.

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5.1.8 Grazing Management

As described under land uses, lands currently used for grazing would be affected by the Proposed Action because these lands would be temporarily disturbed or would no longer be available for grazing over the life of the Project. Grazing range areas within the pipeline corridors would be reclaimed to restore nearly all forage production. Though all areas could be reclaimed for grazing, the loss of grazing land represents an irretrievable commitment of grazing resources.

5.1.9 Recreation, Wilderness, and Visual Resources

5.1.9.1 Recreation and Wilderness

Recreation and wilderness resources may experience some irretrievable impacts as a result of the Project. The temporary increased population from construction may utilize recreation and wilderness resources. Recreational resources could also be affected by the improved access to remote areas by the proposed access road. The road would allow increased use of off-highway vehicles in the landscape surrounding the proposed power plant site, potentially increasing disturbance and erosion. These effects resulting from the Proposed Action represent an irretrievable commitment of recreational and wilderness resources.

5.1.9.2 Visual Resources

Irreversible and irretrievable commitments of visual resources would result from construction of the proposed power plant, access road, agricultural development, and pipeline. The proposed power plant and facilities would permanently alter the existing terrain and vegetation, resulting in irreversible and irretrievable commitments of visual resources. The power plant and associated structures, vapor plumes, and lighting at night would alter views within the Big Sandy Valley for the life of the Project, and would therefore be considered an irretrievable commitment of resources.

5.1.10 Areas of Critical Environmental Concern

The pipeline along the transmission lines (Proposed Action and Alternative T gas pipeline corridor) would be routed to avoid the historical Carrow-Stephens Ranches altogether to avoid an irretrievable commitment of this resource. Since no other ACEC would be affected, there would be no irreversible or irretrievable commitment of resources.

5.1.11 Vegetation

Construction activities at the proposed power plant site and associated facilities, including the proposed access road and OPGW sites, would disturb approximately 159 acres of vegetation. Of the 159 acres, 24 acres would be temporarily disturbed and then reclaimed through regrading and revegetation. Pipeline construction along the proposed route would result in the disturbance of 399 acres within a 90-foot right-of-way and an additional 7 acres for extra workspace. Most of the area disturbed by construction of the pipeline would be reclaimed and revegetated, resulting in a permanent disturbance area of only about 48 acres. The loss of vegetation at the plant site and associated facility areas, along the access road, in the agricultural area, at the OPGW sites, and along the pipeline route would be anticipated to last for at least the life of the Project and would be considered an irretrievable commitment of biological resources.

5.1.12 Wetlands, Riparian Areas, and Waters of the United States

5.1.12.1 Wetlands and Riparian Areas

There should be no direct or indirect impacts on wetlands or riparian areas due to erosion and sedimentation at the plant site. Construction of the natural gas pipeline across the Big Sandy River (corridor segment R5) has the potential to temporarily disturb riparian areas, depending on the construction method employed. A trenching, installation, and backfill method would result in irretrievable impacts on a 50-foot-wide swath through this riparian area, while directional

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drilling under the Big Sandy River and riparian zone would not have any substantial impacts on wetlands. The reduction in flow at Cofer Hot Spring would have the potential to impact the wetland at that location, and would be an irretrievable commitment of resources. Crossing the Big Sandy River in corridor segment T5 would not require disturbance to wetlands or riparian areas; no irretrievable commitment of resources would be anticipated.

The use of groundwater could affect flow in the Big Sandy River out of Granite Gorge. Measures are planned that would augment these flows and prevent the irretrievable commitment of resources.

5.1.12.2 Waters of the United States

Several ephemeral streams are located within or adjacent to the proposed power plant site and the associated substation and evaporation pond, as well as in the vicinity of four water production wells and three monitor wells. In addition, ephemeral streams cross the proposed agricultural area. The access road to the proposed power plant site and the optical ground wire would also cross ephemeral stream channels. Due to the extensive grading and recontouring, both an irreversible and irretrievable commitment of waters of the United States would occur.

The proposed pipeline route would cross 175 ephemeral stream channels; and the alternative pipeline route would cross 172 ephemeral stream channels. There would be temporary, irretrievable, affects on waters of the United States during construction of the gas pipeline. Recontouring and revegetation of wash areas would restore these areas, to the extent feasible, to preconstruction conditions.

5.1.13 Fisheries and Wildlife

Direct mortality of fossorial mammals and reptiles may occur during the construction of the proposed power plant and pipeline and installation of the communication facilities. Foraging and breeding activities of birds and other animals in proximity to the construction site may be temporarily interrupted. Small raptor species that nest in large trees or saguaros may experience irreversible nest failure due to the removal of saguaros and large trees for construction. Nesting raptors also may be affected by human activity near their nests during the breeding season. Construction of the proposed power plant may result in the direct mortality of the desert tortoise due to construction traffic. Destruction of burrows may result in displacement of tortoise. The increased construction traffic on the proposed access road may result in the mortality of small mammals and reptiles attempting to cross the road. These would be considered irreversible and irretrievable commitments of wildlife resources.

The pipeline route may result in direct short-term impacts on fisheries and wildlife as a result of construction activities adjacent to US 93. If the trenching method were used to install the underground pipeline, there would be several temporary impacts on aquatic habitats associated with the Big Sandy River resulting in a irretrievable commitment of fishery and wildlife resources.

The proposed evaporation ponds could provide a place where transient, migratory, or wintering waterbirds such as herons, ducks, and shorebirds could feed and rest. Heavy metal concentrations potentially could occur in the ponds, resulting in detrimental impacts on waterbirds. Due to the proximity of the evaporation ponds to the existing Mead-Phoenix and Mead-Liberty transmission lines, the possibility of birds striking transmission lines would be greater. Adverse effects of the evaporation ponds on wildlife would be considered an irretrievable commitment of wildlife resources, and any loss of migratory birds would be an irreversible impact.

5.1.14 Threatened, Endangered, Proposed, and Other Special Status Species

Several threatened, endangered, proposed, candidate, and other special status species may be affected as a result of the construction and

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operation of the Proposed Action. Mitigation efforts would be made for each of these species to minimize irreversible and irretrievable impacts on that species. Species with the potential to be irreversibly or irretrievably impacted as a result of the construction and/or operation of the Proposed Action are discussed below.

5.1.14.1 Southwestern Willow Flycatcher

The southwestern willow flycatcher may experience some temporary disturbance of nesting habitat and breeding activities as a result of construction activities. Construction-generated noise and vegetation removal along the pipeline route could disrupt southwestern willow flycatcher habitat. As a result, the southwestern willow flycatcher population in the Project area may be irreversibly reduced. If boring was used to install the pipeline at the Big Sandy River (in corridor segment R5), removal of habitat resulting in potentially irreversible commitment of endangered species resources may be eliminated. The Alternative T gas pipeline corridor does not cross the Big Sandy River in an area of perennial water with associated riparian vegetation, so impacts on the southwestern willow flycatcher or its habitat would not be expected.

5.1.14.2 Bald Eagle

Irretrievable commitments of resources could occur from the installation of evaporation ponds, which may attract waterfowl, a potential food source for bald eagles. As a result of feeding on this waterfowl, eagles may consume heavy metals from the evaporation ponds. Also, the location of the ponds may increase the collision risk for bald eagles with transmission lines resulting in some eagle mortality. Loss of individual birds would be considered an irreversible impact.

Construction of the natural gas pipeline along corridor segment R5 would disrupt some riparian vegetation, but this disturbance would not significantly affect the abundance of bald eagle prey. Construction within corridor segment T5 would not impact any aquatic resources or riparian areas that might provide foraging areas for the bald eagle. Therefore, activities along the proposed or alternative natural gas pipeline routes would not result in additional resource commitments.

5.1.14.3 Bats

The proposed power plant, associated facilities, and pipeline would require permanent disturbance of about 229 acres of Sonoran desertscrub, which is foraging habitat for bats. Additionally, construction activities may generate noise and dust in or near bat habitat (e.g., bridges, culverts) that would temporarily affect bats. These effects would be considered an irretrievable commitment of resources that could affect bats.

Additionally, pesticides introduced into the Project area as a result of agricultural development on the Project site may have an adverse effect on bats. Depending on the long-term effects, this could result in an irreversible and irretrievable commitment of resources.

5.1.14.4 Other Special Status Species

Access road traffic potentially may be linked to increases in banded Gila monster and Sonoran desert tortoise mortality. Mortality of individuals would represent irretrievable commitments of special status species; sufficient mortality of these species could represent an irreversible commitment of special status species in the Project area. Arizona toad, lowland leopard frog, and desert skink wetland habitats may experience temporary impacts during pipeline installation across the Big Sandy River. This represents an irretrievable commitment of resources that may affect special status species.

The alternative gas pipeline route and the OPGW crosses the Big Sandy River at a point that is dry except during storm flow events (corridor segment T5). Only a narrow portion of stream bank would be disturbed from pipeline installation in this area; impacts on Sonoran

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desert tortoises, the banded Gila monster, and other special status species as a result of construction activities are not expected to result in irretrievable or irreversible commitments of resources.

5.1.15 Cultural Resources

Construction of facilities at the proposed power plant site would destroy part of archaeological site AZ M:6:47 (ASM) situated around a spring at the southern edge of the proposed power plant site. The wetlands at the spring would be avoided, but the access road into the proposed power plant site would disturb part of the scatter of artifacts around the northern margins of the spring. This would constitute an irreversible commitment of cultural resources. Construction of the pipeline in any of the corridors may disturb other significant archeological sites or historic roads. Such impacts would be considered an irreversible commitment of cultural resources.

The presence of the power plant, pipeline, and associated facilities in the Big Sandy Valley represents an irreversible commitment of the traditional cultural landscape of the area.

5.1.16 Socioeconomics and Environmental Justice

Construction of the Project would require an irretrievable commitment of labor resources during the construction phase of the Project, which would subsequently trigger irretrievable commitments of housing, health care, fire protection, law enforcement, and transportation resources. Operation of the Project would also require an irretrievable commitment of labor resources and subsequently the other resources, but to a much lesser extent. No commitment of resources is anticipated to be associated with environmental justice issues.

5.1.17 Public Safety and Services

The proposed transmission interconnection, substation, and power plant would create electric and magnetic fields (EMF) within areas currently not subjected to fields. Because these exposures are in areas not accessible to the general population, and EMF levels would not exceed current levels of the existing transmission line, no commitment of public safety or services would occur.

The proposed power plant and pipeline construction would result in increased roadway traffic to the construction areas. Increased traffic would also be generated from the delivery of oversized and heavy equipment. The increased demand on transportation and public safety resources associated with the transportation routes (e.g., law enforcement) as a result of the increased traffic would represent a brief, but irretrievable, commitment of resources.

Caithness would provide all necessary utilities on site including security, fire suppression, water supply, wastewater disposal, and emergency medical care. This would ensure that there would be no temporary stresses on local public utilities during Project construction and operation; no commitment of public service resources would be anticipated.

5.1.18 Noise

Construction of the proposed plant, access road, wells, natural gas pipeline, and installation of the communication facilities would temporarily increase the ambient noise in the vicinity of the construction activity. Similarly, operation of the plant would increase the ambient noise near the power plant for the life of the Project. Noise impacts generated by construction of the plant and associated facilities, and along the natural gas pipeline route, would be an irretrievable commitment of resources, as would noise impacts generated by plant operations.

5.1.19 Construction Materials and Fuels

The construction of the proposed power plant would involve the use of aggregate materials. The use of construction materials represents an irreversible commitment of these resources. The following construction materials would be used:

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- 15,600 cubic yards of concrete
- 4,400 cubic yards of sand
- 8,900 cubic yards of aggregate
- 18,000 cubic yards of backfill gravel
- 2,184,000 pounds of rebar

Additionally, natural gas would be burned by the project and fossil fuels would be burned by vehicles and equipment associated with construction activities. This represents an irreversible and irretrievable commitment of fossil fuel resources.

5.1.20 Plant Operations

The main resources consumed by operation of the Big Sandy Power Plant would be water and natural gas. Water resource commitments are discussed in Sections 5.1.4 and 5.1.5. The natural gas used over the life of the Project could not be replaced. Therefore, the natural gas resources that would be consumed by plant operations represents an irreversible and irretrievable commitment of resources.

Table 5-1 summarizes the irreversible and irretrievable commitment of resources.

5.2 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

This section discusses the trade-off between the local short-term use of the environment versus the potential long-term productivity. For purposes of this section, short-term is defined as the construction period of the Project, and long-term is defined as 40 years (the expected life of the proposed power plant).

CEQ regulations (Title 40 Code of Federal Regulations [CFR] Part 1502.16) stipulate that the environmental consequences section of an EIS include a description of:

> "...the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity."

Over the life of the proposed power plant, associated facilities, and pipeline, the construction phase would represent the period of greatest short-term impact on the environment. Construction would include the temporary disturbance of about 8 acres for the access road, 393 acres for the gas pipeline, 11 acres for the power plant and associated facilities, 10 acres for wells, and 5 acres for OPGW installation. About 136 acres would be permanently disturbed for the life of the Project and associated facilities, including 107 acres used for agricultural development. The access road would occupy approximately 13 acres, and the well sites and roads would permanently occupy 16 acres. Following the construction phase of the proposed Project, the land disturbed temporarily for pipeline installation would be reclaimed, to the extent feasible, to preconstruction conditions. However, a two-track would be maintained along the pipeline to provide inspection and maintenance access, resulting in long-term, or permanent, disturbance of about 48 acres along the pipeline.

Air Resources—Potential effects on air quality from the proposed power plant would be long term, but within state emission standards. Potential short-term impacts would result from the creation of fugitive dust and gaseous emissions from ground transportation vehicles and construction equipment.

Geology—No significant effects on geology/paleontology are expected in the short or long term as a result of the Project construction or operation.

Soils—Potential effects on soil productivity and loss through water and wind erosion would be both short term and long term, but could be minimized by use of erosion control measures (e.g., mulching, silt fences, watering) and revegetation following the construction phase.

Groundwater—Potential effects on groundwater resources, including draw down of the deepest

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TABLE 5-1
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Resource	Type of Commitment/ Reason for Commitment	Irreversible	Irretrievable
Air	Degradation of air quality/ Construction and operation	No	Yes
Geology	None	No	No
Soils	Soil loss through water and wind erosion/ Construction and operation	Yes	Yes
Groundwater	Consumptive uses/ Construction and operation	No	Yes
Surface Water	Operation	No	Yes
Floodplains	Disturbance within floodplains/ Construction activities	No	Yes
Land Use and Access	Designation of new land uses/ Construction and operation	No	Yes
Grazing Management	Reduced land and water allotments; Threatened and endangered species habitat location/ Construction and operation	No	Yes
Recreation, Wilderness, and Visual Resources	Increased access for power plant; Degradation of natural scenic quality/ Construction and operation	Yes	Yes
Areas of Critical Concern	Disturbance of archaeological or historic resources	No	No
Vegetation	Disturbance and/or loss of vegetation and habitat/ Construction and operation	No	Yes
Wetlands, Riparian Areas, and "Waters of the U.S."	Disturbance of ephemeral streams/loss of wetland area Construction and operation	Yes	Yes
Fisheries and Wildlife	Disturbance and/or loss of wildlife species, including migratory birds/ Construction and operation	Yes	Yes
Threatened and Endangered Species	Disturbance and/or loss of wildlife species/ Construction and operation	Yes	Yes
Cultural Resources	Destruction of archaeological site/loss of traditional cultural landscape Construction activities	Yes	Yes
Socioeconomics and Environmental Justice	Increased regional and local employment and revenues/ Construction and operation	No	Yes
Public Safety and Services	Increased transmission line loading; Increased traffic/ Construction and operation	No	Yes
Noise	Construction and operation	No	Yes
Construction Materials	15,600 Concrete (cubic yards) 4,400 Sand (cubic yards) 8,900 Aggregate (cubic yards) 18,000 Backfill Gravel (cubic yards) 2,184,000Rebar (lbs)	Yes	No
Consumed Materials	Natural Gas and other Fossil Fuels	Yes	Yes

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aquifer, would be long term, but the potential exists for aquifer recharge. During the life of the Project, water vapor would be added to the atmosphere from the evaporation of water in the plant cooling system.

Surface Water—Surface water resources would potentially be affected over the long term. The impacts to surface water would include the reduced flow of the outflow of Big Sandy River. Caithness proposes to augment flows annually to mitigate decreases in surface water flow.

Floodplains—Floodplains would experience short-term impacts associated with the construction of the natural gas pipeline. The pipeline would be buried 4 to 5 feet deep; no long-term impacts to floodplains would be anticipated. Additionally, if a directional drilling method is used for pipeline installation, there would be no short-term or long-term impacts on floodplains.

Land Use and Access—Construction and operation of the proposed power plant and access road would modify existing land uses at the plant site and in nearby areas. Planned land uses would generally not be affected, except in future residential areas that would need to account for the natural gas pipeline. Access is not anticipated to significantly change as a result of the Project. Land use changes would be considered long-term effects.

Grazing Management—Potential effects on grazing management would occur over the short term and long term. Losses of immediate grazing areas as a result of the pipeline and access roads would be short-term impacts in areas where reclamation and revegetation could occur. In areas of permanent disturbance (e.g., plant site), losses of grazing area would be considered a long-term impact.

Recreation, Wilderness, and Visual Resources—Recreation and visual resources would be impacted over the short and long term. Long-term impacts to recreational resources could occur as a result of increased accessibility to currently inaccessible areas due to the construction of new access roads, which could result in adverse effects on various resources including vegetation and wildlife resources. Though downward lighting, painting the power plant facilities to blend in with the natural environment, and revegetation would minimize impacts to visual resources from plant facilities, the potential impacts to visual resources would occur over the long term. Short-term impacts to visual resources would be anticipated from construction of the pipeline. Wilderness is not anticipated to be affected in the short or long term.

Areas of Critical Environmental Concern—No disturbance to historical elements of the Carrow-Stephens Ranches ACEC would occur if the ACEC is avoided.

Vegetation—Vegetation removed at the plant site and associated facilities, in the agricultural area, and along the access road would be considered a long-term impact. Vegetation removed within the pipeline corridor would be considered a short-term impact, where reclamation and revegetation would occur following pipeline installation (except along the two-track maintenance road).

Wetlands, Riparian Areas, and Waters of the United States—Potential effects on wetlands, riparian areas, and waters of the United States would be both short and long term. There is one wetland within the proposed power plant site, but it will not be disturbed. The wetland associated with Cofer Hot Spring would be affected until the aquifer recharges. Depending on the construction method employed, construction of the natural gas pipeline across the Big Sandy River may temporarily disturb wetlands. Several ephemeral streams, which are considered waters of the United States are located within the proposed power plant, substation, evaporation ponds, and well site areas. These streams would incur long-term impacts. Ephemeral streams crossed by the

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proposed and alternative pipeline routes and access road would incur short-term impacts as part of construction activities.

Fisheries and Wildlife—Effects on fisheries and wildlife would be long term as a result of the proposed power plant, access road, and pipeline construction and operation. Fisheries would be potentially affected by lowered water levels in the Big Sandy River. Wildlife could be potentially affected over the long-term by increased traffic and noise on the access road. Though heavy metal concentrations in water and biota present in the evaporation ponds would be monitored, and wildlife use of the ponds would be stopped if heavy metal concentrations reach levels known to be toxic to waterfowl, the birds could be subject to long-term impacts from potentially heavy metal-contaminated food sources in the evaporation ponds.

Threatened, Endangered, Proposed, Candidate, and Other Special Status Species—Effects on threatened, endangered, proposed, candidate, and other special status species may be short- and long-term as a result of the construction and operation of the Proposed Action. The southwestern willow flycatcher may experience temporary disturbance of nesting habitat and breeding activities as a result of construction noise. The bald eagle may be impacted by heavy metal-contaminated food sources and collisions with transmission lines. In addition, special status species may experience temporary impacts due to pipeline installation and construction across the Big Sandy River and in wetland habitats.

Cultural Resources—Any disturbance or destruction of cultural resources would be long term.

Socioeconomics—Local economies would be expected to experience both short-term and long-term benefits as a result of the proposed power plant construction and operation. Power plant construction, operation, and maintenance would provide local and regional residents with increased employment opportunities. Impacts to the local workforce and housing would be short term when considering construction employees, and long term for the permanent plant employees.

Public Safety and Services—Effects on public safety and services are expected to be temporary, as a result of increased traffic due to construction activities. No substantial increased exposure to EMF is anticipated as a result of the proposed Project.

Noise—Noise impacts associated with construction activities would be considered short-term. Increases to the ambient noise level within close proximity of the plant would be considered long-term impacts.

In general, most resources within the natural, human, and cultural environments would experience short-term impacts, principally from construction activities, though some resources would experience effects on long-term productivity. The Proposed Action would help meet long-term power demands of existing population areas, across the western United States.

5.3 INDIAN TRUST ASSETS

Federally recognized Indian tribes are domestic dependent nations, and the relationship between the Federal government and those tribes is characterized as one of guardian to ward. In that guardian role, the Federal government is obligated to protect tribal interests, a duty that is referred to as trust responsibility. This trust doctrine is defined through treaties, laws, executive orders, judicial decisions, and agreements.

The *Bureau of Land Management* (BLM) *Manual* (512 DM 2), in accordance with Secretarial Order 3175 (*Departmental Responsibilities for Indian Trust Resources*, dated 8 November 1993) requires the BLM to explicitly address potential impacts on Indian trust resources in planning and decision documents. The Department of Energy (DOE) *American Indian & Alaska Native Tribal Government Policy* states that the DOE must be

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diligent in fulfilling its Federal trust obligations to American Indian governments. Western Area Power Administration (Western), as an agency within DOE, is obligated to carry out this policy.

Indian trust resources include money, land, and other assets held by the Federal government in trust, or that are restricted against alienation for Indian tribes or individual Indians. Trust resources also include natural resources, either on or off Indian lands, retained by, or reserved by or for Indian tribes through treaties, statutes, judicial decisions, and executive orders, and are protected by a fiduciary obligation on the part of the United States. The DOE also interprets trust responsibilities as including interaction with tribal governments with regard to impacts of DOE programs, policies, and regulations to protect American Indian traditional and cultural life ways.

Indian trust responsibility commonly is thought of as encompassing the following three areas:

1. protection of trust land, assets, and resources
2. protection of tribal sovereignty and self-government
3. provision of services

Protection of Trust Land, Assets, and Resources—The Big Sandy Energy Project entails a decision by Western in response to an application for an interconnection to an electrical transmission line, and a BLM decision regarding an application for rights-of-way across public land. The Project does not involve broad Western or BLM programs, policies, and regulations that could affect Indian trust assets. However, both agencies have worked to implement their agency policies to explicitly consider potential effects that the proposed Big Sandy Energy Project might have on Indian trust assets.

The Hualapai Tribe has three parcels of trust land (one tribal, and two allotted to individual tribal members) located in the upper Big Sandy River Valley approximately 18 miles north of the proposed power plant site. These parcels, which encompass a total of about 700 acres, are approximately 0.5 to 1.5 miles east of the proposed gas pipeline route. Another isolated parcel of Hualapai Reservation land is located north of the Big Sandy River Valley at Valentine, more than 30 miles north of the Project area. The main Hualapai Reservation, which encompasses more than 1,500 square miles, begins about 10 miles north of Valentine and extends to the Colorado River.

The Hualapai Tribe expressed concerns about the potential impacts of the Project on the resources of these reservation lands, particularly potential decreases in surface water and groundwater supplies, as well as degradation of air quality and potential impacts to endangered species such as the Southwestern willow flycatcher. The Hualapai Tribe also expressed concerns about cultural resources throughout their traditional territory, which encompassed the Big Sandy River Valley.

Other tribes also were consulted, including the Yavapai-Prescott Tribe, Yavapai-Apache Nation, Fort Mojave Indian Tribe, Colorado River Indian Tribes, Navajo Nation, and Hopi Tribe. None of these tribes identified any concerns about potential impacts on Indian trust assets.

The assessment of potential impacts considered natural and cultural resources of Hualapai Reservation lands, as applicable, including surface water and groundwater, natural vegetation and wildlife, air quality, and ambient noise levels. Also, potential impacts on current and future uses and economic development of the reservation lands in the Big Sandy Valley were considered (refer to Section 3.0). The modeling for air quality impacts did consider the main Hualapai Reservation bordering the Colorado River to be a Class I area, just as sensitive as the Grand Canyon, and this conservative approach identified no significant impacts. The results of the groundwater modeling indicate that the northern boundary of the deep aquifer that would be the source for the Project water supply is approximately 13 miles south of the closest parcels of the Hualapai

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Reservation. Therefore, no significant impacts to the groundwater or surface water supplies of the Hualapai reservation lands are expected. Similarly, no significant impacts to the vegetation or wildlife of the reservation parcels have been identified. The Project is not expected to affect the potential for future development of the reservation parcels.

Although the technical studies concluded there would be no significant impacts on Hualapai Reservation lands, the Hualapai Tribal Council remains unconvinced by the technical models and is reluctant to support the Project unless Caithness can guarantee that there will be no significant impacts on the Tribe's air and water resources over the life of the Project. The air permit would stipulate that air emissions be monitored and a program to monitor groundwater impacts also would be implemented. BLM and Western will continue to have discussions with the Hualapai Tribe about actions needed to protect tribal rights.

Arrangements also were made for the Hualapai Tribe Department of Cultural Resources (2001) to participate in the study of cultural resources and to conduct an ethnographic study to assess how the Project might affect traditional cultural places and resources. The results of this study were considered in preparing this Draft Environmental Impact Statement (EIS) and are being incorporated into the ongoing consultations being conducted in accordance with Section 106 of the National Historic Preservation Act. The Department of Cultural Resources is continuing to participate in additional pre-construction cultural resource surveys and in development and implementation of measures to mitigate any identified adverse effects.

Protection of Tribal Sovereignty and Self-Government—The Project has promoted sovereignty and self-government for the Hualapai Tribe by arranging for the Tribe to fully participate, within a government-to-government relationship, as a cooperating agency in the preparation of this Draft EIS.

Provision of Services—The provision of services to Indian tribes typically is the role of agencies such as Bureau of Indian Affairs and Indian Health Service. The Big Sandy Energy Project has no role in or impacts on provision of such services.

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Chapter 6
Consultation and Coordination

BIG SANDY
Energy Project
Environmental Impact Statement

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6.0 CONSULTATION AND COORDINATION

This section describes the consultation and coordination the Bureau of Land Management (BLM) and Western Area Power Administration (Western) have had with government agencies and the public during preparation of this Draft Environmental Impact Statement (EIS). Information is presented concerning the scoping process, additional public involvement, additional agency consultation, as well as planned future agency and public involvement. A list of agencies, organizations, and individuals to whom copies of the Draft EIS were sent is also included.

6.1 SCOPING PROCESS

Scoping was the first step in the EIS process and is required by Council on Environmental Quality (CEQ) regulations (Title 40 Code of Federal Regulations [CFR] Part 1501.7). Scoping is a process for determining the range of issues to be addressed in an EIS and for identifying significant issues associated with the alternatives. The objectives of the scoping process were to notify interested persons, agencies, and other groups about the Proposed Action and the alternatives being considered; solicit comments about environmental issues, alternatives to the Proposed Action, and other items of interest; and consider those comments in the preparation of the EIS.

The scoping process began after BLM and Western published a Notice of Intent (NOI) in the Federal Register on April 18, 2000 (Volume 65, Number 75, pages 20811-20812). The NOI (Appendix H) was published to notify the public that BLM and Western were intending to prepare an EIS for the proposed Big Sandy Energy Project and to invite other Federal agencies, Native American tribes, state and local governments, and the general public to participate in the scoping process. The NOI also announced a public scoping meeting held in Wikieup, Arizona, provided Project contacts, and presented supplementary background information. The scoping period ended on June 2, 2000, but BLM and Western solicited and accepted comments throughout the EIS preparation process.

In addition to publishing the NOI, display ads announcing the scoping meeting were published in the *Kingman Daily Miner* on April 18, 2000 and May 1, 2000. BLM and Western hosted the public scoping meeting on May 3, 2000 in Wikieup. Thirty-eight people attended representing agencies, the Wikieup community and interested parties. Table 6-1 lists the notes recorded on flip charts at the meeting, the actual questions and comments heard, and the responses which were provided by BLM, Western, or Caithness. All of these comments have been reviewed and considered at various stages during the preparation of this Draft EIS. Many are explicitly addressed in pertinent sections of the first five chapters of this document. Note that some aspects of the Proposed Action have changed since the time of the scoping meeting; these changes are reflected in the rest of this document, although the orginal responses listed in Table 6-1 has not been revised.

In addition to the public scoping meeting, BLM and Western representatives met with the Arizona Department of Water Resources (ADWR), the chair of the Arizona Power Plant and Transmission Line Siting Committee under the Arizona Corporation Commission, Arizona State Land Department (ASLD), Arizona Game and Fish Department (AGFD), and U.S. Fish and Wildlife Service (USFWS) at the start of the Project. Discussions with other agencies with jurisdiction or interest in the Project also occurred at that time.

BLM and Western received more than 45 comment response sheets and/or letters and numerous requests for inclusion on the Project mailing list. BLM and Western have used the scoping results to define the following major

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issues which have been addressed in this Draft EIS:

- Short-term and long-term effects of groundwater use for proposed power plant cooling, including effects on future water supplies in the Wikieup area and stream flows in the Big Sandy River.

- Direct and indirect effects on fish and wildlife resources and habitats, including the endangered southwestern willow flycatcher and wetland and riparian habitats.

- Direct and indirect effects on the community and values of Wikieup from construction activity, air emissions, future land use changes, landscape changes, noise, and taxation changes.

- Direct and indirect effects on water quality and use in the Project area, including any effects from the proposed pipeline construction.

- Effects on cultural resources and traditional cultural values and uses of Native Americans.

- Effects on existing land uses from the pipeline construction.

Suggestions for alternative power plant facility locations and cooling methods also were received during the scoping period. BLM and Western, with assistance from URS Corporation technical experts, evaluated the feasibility of these alternatives to determine if they warranted full analysis in the EIS (refer to Section 2.4).

As part of the scoping process, BLM and Western consulted with state and local agencies and tribes to the fullest extent possible to reduce duplication between NEPA and comparable state, local, and tribal requirements and ensure consistent decision making. AGFD, ADWR, Arizona Department of Transportation (ADOT), Mohave County, USFWS, and Hualapai Tribe agreed to participate as cooperating agencies in the preparation of this Draft EIS. (See Section 1.3.3 for more information on cooperating agency involvement.) The U.S. Army Corps of Engineers and Arizona Department of Environmental Quality (ADEQ) also were invited to be cooperating agencies but declined.

6.2 ADDITIONAL PUBLIC INVOLVEMENT

In addition to scoping, Western and BLM have conducted public workshops and prepared and distributed newsletters which are described below. Western has the lead responsibility for administering all aspects of public involvement for this EIS process. Western's web site for the Project can be accessed at:

www.wapa.gov/interconn/intsandy.htm

This website contains the following documents specific to this EIS process, and will be updated as the EIS process progresses:

- NOI

- Newsletters

- Map of proposed Project area

- Scoping meeting results

- Project timeline

- Questions and comments

- Record of public workshop held in Wikieup on August 29, 2000

- Record of public workshop held in Peach Springs on August 30, 2000 hosted by the Hualapai Tribe

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TABLE 6-1 COMMENTS RECEIVED AT SCOPING MEETING		
Verbatim Flipchart Notes from Scoping Meeting	**Actual Question/Comment Heard at Scoping Meeting**	**Response Provided at Scoping Meeting and/or Answers to Questions**
Quest. for Caithness	N/A	N/A
Normal water req. for each phase?	How much water would be required for each phase?	The estimated average water demand for both phases is 3200-acre feet per year. The EIS will address water consumption impacts.
Why is water from Baghdad not feasible?	Cyprus-Bagdad has offered water for the plant site. What is happening with that?	Cyprus-Bagdad has offered to Caithness to study what options would be available and feasible for using water pumped from the Big Sandy floodplain for the Cyprus-Bagdad mine. The Cyprus-Bagdad pipeline parallels the transmission line corridor near the proposed plant site. The EIS will address the Cyprus-Bagdad water supply options.
Why Gas source from North now? (Orig. from West)	Why has the proposed natural gas (NG) source changed from the El Paso Natural Gas Company transmission line to the west to the NG supply lines to the north. Initially, the route to the west was described as better because of the existing NG supply line right-of-way.	Caithness changed the proposed route to the north because of the McCracken Mountains Area of Critical Environmental Concern and associated desert tortoise habitat and opportunities to utilize the U.S. Highway 93 right-of-way. Upon completion of the scoping process and preliminary environmental inventory, Western and BLM will determine NG pipeline routing alternatives that will be addressed in the EIS.
Still considering a tap for Wikieup?	Will there be a tap of the proposed NG pipeline to supply NG to Wikieup?	Providing NG to the Wikieup area is not part of the Proposed Action. However, Caithness' proposal will do nothing to preclude a NG supply company from providing service to the Wikieup area.
What are the ton per yr of pollution?	How many tons of air pollutants will be emitted from the 720 MW power plant? Caithness has this information and should share it at the scoping meeting.	The EIS will discuss the impacts on air resources, including the amount of air pollutants emitted by the proposed power plant. Western and BLM will independently evaluate and verify the air modeling results in consultation with the Arizona Department of Environmental Quality. Preliminary studies indicate that the maximum yearly potential emissions from the generating facility will be about 213.4 tons of oxides of nitrogen (NO_x), 254 tons of carbon monoxide, 45.2 tons of volatile organic compounds (VOCs), 33.9 tons of sulfur dioxide, 72.4 tons (from NG combustion) and 34.7 tons (from the cooling towers) of PM-10, and a total of 17.45 tons hazardous air pollutants.

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TABLE 6-1 COMMENTS RECEIVED AT SCOPING MEETING		
Verbatim Flipchart Notes from Scoping Meeting	**Actual Question/Comment Heard at Scoping Meeting**	**Response Provided at Scoping Meeting and/or Answers to Questions**
My land is being crossed pipeline No more lines on my land	Concerns were expressed about the proposed NG pipeline crossing private land. A ranch owner does not want any more pipelines across his ranch. There would be problems burying the pipeline with Hackberry Road.	Western and BLM will explore routing alternatives to minimize impacts on private lands. The routing alternatives will be addressed in the EIS.
Light pollution looked at, pointed down possibly	What about light pollution? Will the power plant's light cause pollution? Can the lights be designed to minimize light pollution?	Caithness will need to comply with the Mohave County Dark Sky Ordinance, which includes requirements for shielding and filtering. The EIS will address the effects of power plant lighting and possible mitigation measures.
Where is the power going? Anything to County	Will the County get any of the power produced by the power plant or will it all be shipped out?	The proposed Project would be a merchant plant, selling power on the open market. Citizen's Utilities and Mohave Power Cooperative serve Mohave County. Citizen's and Mohave Power Cooperative could pursue purchasing power from the Big Sandy Energy Project or numerous other power suppliers in a deregulated utility environment.
Set parameters must be met? Guidebk ARE THERE Provide website	Are there set parameters that must be studied? Where is this information available?	The EIS will meet the requirements of the CEQ Regulations for Implementing NEPA (40CFR 1500-1508), the DOE NEPA Implementing Procedures (10 CFR 1021, as amended), the Department of the Interior NEPA Implementing Regulations (517DM 1-7), and the BLM NEPA Manual and Handbook (MS 1790, H-1790-1). The CEQ and DOE regulations and related guidelines are available at http://tis.eh.doe.gov/nepa/
Close consultation re: Effects to Res. Trad. & Cultural values & interests TRIBAL CONCERNS Coop Agency?	The Hualapai Tribe wants close consultation with Western and BLM considering concerns about impacts to reservation and cultural and traditional values, for example natural resources and plants. The Hualapai Tribe requested to be a cooperating agency.	Western and BLM invited the Hualapai Tribe to be a cooperating agency, and the Hualapai Tribal Council passed a resolution to become a cooperating agency.

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TABLE 6-1 COMMENTS RECEIVED AT SCOPING MEETING		
Verbatim Flipchart Notes from Scoping Meeting	**Actual Question/Comment Heard at Scoping Meeting**	**Response Provided at Scoping Meeting and/or Answers to Questions**
Oppose to the project (TRIBE) No mention on draw down Big Sandy HABITAT Crit. Native Species Natrl Res's Air Quality process	Dr. Kerry Christensen with the Hualapai Tribe is opposed to the Project. Issues with the aquifer drawdown and its effects on the Big Sandy River and associated species habitat, including the southwestern willow flycatcher need to be addressed. What will be the specific drawdown of the Big Sandy? How does the air permitting process work for a two-phase project?	The EIS will address the effects of water pumping on the Big Sandy River and associated wildlife habitats and natural resources. The purpose of the EIS is to analyze the concerns and issues raised during scoping. The drawdown of the aquifer will be addressed in the EIS. The air quality permitting process will address both phases of the Project. If the second phase is not implemented within a time specified by the ADEQ, a new application will need to be submitted for the second phase.
What happens if our wells go dry? 50 yrs	What happens if existing wells in the Wikieup area go dry? In 5, 10, or 15 years?	The EIS process involves assessing the impacts to environmental resources, including ground water resources. If impacts are identified, the process is designed to mitigate impacts. The EIS will address the effects of water pumping on existing wells in the Wikieup area. Following the impact assessment, a determination of appropriate monitoring and potential mitigation will be developed and presented in the EIS.
Criteria for water draw down?	How do you test a well for drawdown? How do you test a well for using water for a 10 to 50 year period?	Western and BLM will rely on hydrologists to define tests for determining drawdown. Western and BLM will independently evaluate and verify any tests conducted by Caithness addressing water drawdown effects. A pump test protocol has been developed and reviewed by several hydrologists. The protocol includes pumping water from a production well and observing effects in nearby observation wells. The test will be implemented in late August or early September. The results will be used, together with a basin-wide water budget, to help assess long term impacts.
What happens to water being used?	What happens to the water that is used for the power plant?	Ninety to 95% of the water used for cooling evaporates. About 5% of the water will be discharged to evaporation ponds or used for beneficial agricultural purposes. A detailed water balance for the Project is being developed.

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TABLE 6-1 COMMENTS RECEIVED AT SCOPING MEETING		
Verbatim Flipchart Notes from Scoping Meeting	**Actual Question/Comment Heard at Scoping Meeting**	**Response Provided at Scoping Meeting and/or Answers to Questions**
Scenic Highway what hap to it?	What will happen to the scenic highway designation on US Highway 93?	ADOT is a cooperating agency and the impacts on designation will be discussed with ADOT. No effect on the scenic highway designation is expected. The EIS will address the visual resource impacts of the Project, including views from US Highway 93.
Water is a crit resource, bring MC into crit res. comm. for proper water use	Referencing a recent Arizona Republic article, a Hualapai tribal representative suggested bringing Mohave County into the State's groundwater critical resource committee. What are the existing ground water management goals?	Mohave County is a cooperating agency on the EIS. However, BLM and Western cannot influence what the county will do regarding participation in state committees.
Endangered species in Wikieup? (US)	What about the threatened and endangered species that live in Wikieup -- the humans? What about the impacts of lack of water on the people in Wikieup?	The EIS will address impacts to the community of Wikieup, including air, water, social and economic impacts.
BigSandy as Wild/Scenic River Will this effect its status?	Will the proposed Big Sandy Energy Project effect the status of the Big Sandy River as a wild and scenic river?	The portion of the Big Sandy River north of the U.S. Highway 93 bridge does not have the potential to be designated. A portion from the bridge downstream has potential for designation. The EIS will address impacts to the Wild and Scenic River designation. The hydrology studies will determine potential impacts, and all will be disclosed in the EIS.
How is Western paid for this? No compensation? What is the trans. tariff rate	Will Western make a profit from the Big Sandy Project? Who will pay Western's salaries? Does Western receive compensation for granting the interconnection? What is the transmission tariff rate?	Western, as a Federal agency, does not make a profit. Western, in considering applications for interconnection or transmission service, must ensure that its costs for studying the interconnection are not borne by its customers or the public. Therefore, all of Western's costs in addressing the applications are borne by the applicant. The EIS will address Western's policies on open transmission access and include information on the transmission tariff. The transmission tariff rate for firm point-to-point transmission service on the Intertie 500-kV transmission system is currently $17.23/kW-year.
HB2324 Net Tax Revenue to MC?	What is the net tax revenue that Mohave County will receive?	The EIS will address the socioeconomic impacts to Mohave County, including taxation.

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TABLE 6-1 COMMENTS RECEIVED AT SCOPING MEETING		
Verbatim Flipchart Notes from Scoping Meeting	**Actual Question/Comment Heard at Scoping Meeting**	**Response Provided at Scoping Meeting and/or Answers to Questions**
Potential for this p. to prov. benefits?	What are the potential benefits that this Project could provide?	The EIS will address the socioeconomic impacts to Mohave County, including taxation.
How much really comes to Wikieup for comm. imprvmt?	The County has not addressed how $4.5 million in tax revenue will be addressed. How much will come to Wikieup from County taxes? Will all go to the County seat or will some go to Wikieup?	The EIS will address the socioeconomic impacts to Mohave County and to Wikieup, including taxation.
Will neg. comm. from the commun. be effective in this process? Will they be considered	There was local opposition to the rezoning, but the Board of Supervisors voted for it. How effective will local voices be?	All comments will be addressed during the EIS process. The decision makers will consider all comments received. Local comments have been useful in helping BLM and Western define issues for the EIS.
Will the local comm. comments have more weight? For example, Case Grande	Will the local community have greater weight than other comments? Will information be provided on what happened with the Cassia Grande power plant?	All comments will be considered equally. BLM and Western will collect information on the Casa Grande power plant and determine if it relates to the proposed Project.
Where are the decision makers in the process. Who makes the decision?????Mike Hacskaylo Administrator	Why are not the decision makers at the scoping meeting? Why aren't people at the scoping meeting who can answer questions.	The decision makers are Mike Hacskaylo, Western's Administrator and John Christensen, BLM Kingman Field Office Manager. The EIS process is intended to disclose the positive and negative impacts for the decision makers review.
Concern that the process doesn't happen in conjunction w/answers Decisions w/held until after voting	There is a concern that the decisions have already been made and public input will not be considered.	Western, BLM and the Federal cooperating agencies cannot make a decision until the EIS process is complete.
Touch on Env. Justice in such an area	Environmental Justice is an issue because there are small populations.	The EIS will address potential environmental justice impacts to low income and minority populations, not small populations.
Pres. Council asks to supp. sustainability Renewables & How Western should be add. this, taking account. Why not more participants in renew.	Based on Presidential mandates, what is Western doing to support sustainable energy and renewables?	Western does have a renewable energy program. However, this program is not related to the purpose and need for the Big Sandy Energy Project. Western will share what it is doing to support sustainable energy and renewables with interested parties.

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TABLE 6-1 COMMENTS RECEIVED AT SCOPING MEETING		
Verbatim Flipchart Notes from Scoping Meeting	**Actual Question/Comment Heard at Scoping Meeting**	**Response Provided at Scoping Meeting and/or Answers to Questions**
How could MC use fresh water for power plant - Why is this a good idea?	How and why does Mohave County want to use good, fresh groundwater and let others use the effluent? Does the tax revenue provide more benefit than loss of a precious resource? Why not use other types of water resources?	Mohave County has approved with conditions the use of water for power plant use when the Board of Supervisors approved the rezoning for the power plant. The EIS will not attempt to assign monetary values to different resources.
Who is on the env. study? How are they selected? Who funds? Not lowest Want an impartial decision maker bidder? Include tribe in dec.	Who is going to be on the environmental studies team and how are they going to be selected? Important not to select the lowest bidder. The tribe needs to be included in the environmental studies.	Western and BLM have selected URS to conduct the environmental studies based on its technical qualifications. URS will be working with the Hualapai tribe in conducting environmental studies. The Hualapai Tribe is a cooperating agency.
How far away can the location be changed before the process starts over? What is process? Is it shortened?	How far away can Caithness move the plant before the (County rezoning) process is voided?	The rezoning applies to 120-acre parcel. If the plant moves outside of the 120-acre parcel, Caithness would have to apply for rezoning.
No rubber stamp for EIS team	Realistic, important decision needed on environmental contract. There should not be a rubber stamp of the environmental studies team. The environmental studies team has to make impartial decisions.	Caithness, BLM and Western have executed a memorandum of understanding that affirms that BLM and Western will independently direct the EIS contractor.
If plant goes in & there is an effect on the water-at what point would you stop?	If the power plant is constructed and it has an effect on the area's water supply, at what point would Caithness stop generating electricity?	A pump test protocol has been developed and reviewed by several hydrologists. The protocol includes pumping water from a production well and observing effects in nearby observation wells. The test will be implemented in late August or early September. The results will be used, together with a basin-wide water budget, to help assess long term impacts. The results will dictate whether monitoring and mitigation is needed to protect the area's water supply.
Addressing where the water is coming from-source Aquifer recharge?	Will Western and BLM address where the water is coming from? The aquifer recharge? Will isotope testing be conducted?	BLM and Western will address where water is coming from and aquifer recharge and will conduct isotope testing.

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TABLE 6-1 COMMENTS RECEIVED AT SCOPING MEETING		
Verbatim Flipchart Notes from Scoping Meeting	**Actual Question/Comment Heard at Scoping Meeting**	**Response Provided at Scoping Meeting and/or Answers to Questions**
In comp. - other ppts & solar/wind generation using less water Dry cooling	The studies need to compare the environmental impacts of the proposed power plant to other generation types (e.g. solar and wind). Will the studies address a dry cooling option, as being used in a Boulder City, Nevada power plant?	BLM and Western are still developing the alternatives that will be addressed in the EIS, including alternative generation technologies and cooling options. Alternatives selected for detailed review in the EIS must substantially meet the purpose and need for the Project and be technically and economically feasible.
Detailed hydrolog. study	A detailed hydrological study is needed.	See response to similar comments above.
Sugg. that the closer you are to the project more you are against it. Plant.? Bullhead City or Lake Havasu	Why can't the plant be located closer to Bullhead City or Lake Havasu City where water is available.	The EIS will address the availability of water from the Colorado River. BLM and Western are still developing the alternatives that will be addressed in the EIS.
If power leaving Wikieup why is it benefit ?	If the power is leaving Wikieup, why is the Project a benefit to the Wikieup area.	The EIS will address both the potential benefits and negative impacts to the Wikieup area.

6.2.1 Public Workshops

Two public workshops were held to describe the Project and EIS environmental planning process to community members, as well as solicit public comments on the Project.

The first workshop was held on August 29, 2000 in Wikieup. BLM and Western described completed or ongoing environmental studies conducted since the May 3, 2000 scoping meeting, and provided meeting participants an opportunity to ask questions and discuss the Project with BLM and Western's EIS preparation team. Thirty people attended, representing both the community of Wikieup and other interested parties. A summary of questions and comments raised at the August 29, 2000 public information workshop followed by responses from BLM and Western staff is available on Western's website and the public reading rooms listed in Section 6.4 below.

The Hualapai Cultural Resource Program hosted a public information workshop on the proposed Big Sandy Energy Project on August 30, 2000 in Peach Springs. Nine people from the Hualapai community attended. The participants were briefed on Project activities and the status of ongoing cultural resource studies. Concerns which were expressed generally focused on potential impacts on the Hualapai land parcels located within the Big Sandy Valley and whether the Project would have potential benefits for the Hualapai Tribe. A summary of the workshop is available on Western's website and in the public reading rooms listed in Section 6.4 below.

6.2.2 Newsletters

BLM and Western have mailed nearly 600 copies of four different Project newsletters. The newsletters have been prepared and distributed to property owners in the vicinity of the proposed power plant site and proposed and alternative gas pipeline corridors; Federal, state,

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and local agencies with interest or jurisdiction in the Project area; and interested parties. All newsletters contained general information such as Project background, description, and contacts.

The first newsletter was distributed in April 2000. This newsletter provided a list of decisions or approvals to be made, brief description of the EIS process and issues identified as potential areas for study, description of the public participation process, Project contact names and addresses, and anticipated Project schedule. The newsletter announced the time and location of the May 3, 2000 public information and scoping meeting and provided a response sheet and mailing instructions for persons interested in commenting on the Project.

The second newsletter was distributed in August 2000. This newsletter contained a summary of the scoping results, list of cooperating agencies, summary of EIS preparation activities completed to date, and an updated Project schedule.

The third newsletter was distributed in November 2000. This newsletter contained a summary of activities completed since the distribution of the August 2000 newsletter which included the following:

- two public information workshops held in August 2000
- groundwater testing
- consultation with the USUSFWS concerning the endangered southwest willow flycatcher

The fourth newsletter was distributed in April 2001. This newsletter described changes to the proposed Project, and presented a map of the new proposed and alternative gas pipeline corridors, a revised Project timeline, and schedule for the EIS process.

6.3 ADDITIONAL AGENCY CONSULTATION AND COORDINATION

As described below, additional BLM and Western consultation and coordination has included the review of planned impact assessments with cooperating agencies, review of investigations and studies regarding groundwater with the Hualapai Tribe, USFWS and ADWR, and consultation with USFWS regarding endangered species.

Following scoping but before environmental impacts assessments were commenced, all cooperating agencies were invited to review and comment on the following aspects of each resource topic addressed in Chapter 3 during meetings held on November 29 and 30, 2000 at the BLM Kingman Field Office in Kingman, Arizona and follow-up teleconferences on December 4, 7, and 8, 2000:

- identification of issues to be assessed
- significance criteria
- region of influence (area potentially impacted by construction and operation of the Proposed Action and alternatives)
- elements and tasks (to describe the existing environment and environmental consequences)
- assessment of data adequacy to perform the elements and tasks

Throughout the EIS process, BLM and Western have worked with ADWR, USFWS, and URS groundwater scientists and hydrologists as well as the Hualapai Tribe to plan and review the extensive investigations and studies described in Section 3.4, Groundwater. BLM and Western invited cooperating agencies to participate in numerous teleconferences regarding groundwater issues and meetings were held in Phoenix, Arizona on July 13, 2000 and August 31, 2000, and November 17, 2000 in Denver, Colorado.

Section 7 of the Endangered Species Act requires that BLM and Western consult with USFWS regarding threatened or endangered species which might be impacted. BLM and Western conducted informal consultation regarding the endangered southwestern willow

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flycatcher during meetings with the USFWS in Phoenix on August 31, 2000 and March 22, 2001. Formal consultation with USFWS will occur as the EIS process progresses (refer to Section 3.14 for information concerning threatened and endangered species.)

6.4 FUTURE PUBLIC AND AGENCY INVOLVEMENT

Formal public scoping for the EIS closed on June 2, 2000. However, coordination and involvement with the public and appropriate Federal, tribal, state, and local government agencies will continue, and BLM and Western encourage comments on the proposed Project throughout the NEPA process (refer to Section 1.2, Readers Guide to This Document and the NEPA Process, for more information).

As part of the ongoing public participation process, BLM and Western will provide for public review of, and Western will conduct hearings on, this Draft EIS. The public and government agencies may submit comments on this Draft EIS during the comment period. Written comments should be addressed to the following:

> Mr. John Holt, Environmental Manager
> Western Area Power Administration
> Desert Southwest Region
> P.O. Box 6457
> Phoenix, Arizona 85005

In addition, a public workshop will be held at Bible Church in Wikieup on July 10, 2001 prior to the public hearing to provide interested members of the public an opportunity to ask questions about the EIS analyses. A public hearing is planned, where oral comments will be recorded and then addressed in the Final EIS. The public hearing will be held on July 24, 2001 in Wikieup. Notices of the public workshop and hearing will be published in the *Kingman Daily Miner* at least 15 days in advance; the announcements will identify the location and time of the workshops and hearings.

The Final EIS will respond to all oral and written comments received during the public review of the Draft EIS. After BLM and Western issue the Final EIS, public review during a 30-day waiting period will be encouraged, as well as public review of the independent BLM and Western Records of Decision (RODs).

Copies of the Draft and Final EISs, as well as supporting information such as references cited in the EISs that are not commonly available to the public, will be available for review in a public reading room at the BLM Kingman Field Office, 2474 Beverly Avenue, Kingman, Arizona.

As required by DOE regulations (10 CFR 1021.331, Western will prepare a Mitigation Action Plan (MAP) which will address mitigation commitments expressed in the ROD. Copies of the MAP will be placed in the public reading room for inspection. Copies of the MAP will also be available upon written request to Western.

6.5 LIST OF AGENCIES, ORGANIZATIONS, AND INDIVIDUALS TO WHOM COPIES OF THE DRAFT EIS ARE SENT

The agencies, organizations, and individuals listed in Table 6-2 received copies of the Draft EIS:

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TABLE 6-2 AGENCIES, ORGANIZATIONS, AND INDIVIDUALS TO WHOM COPIES OF THE DRAFT EIS WERE SENT
Federal Agencies

Federal Energy Regulatory Commission
    Office of Energy Projects
Office of Deputy A/S of the USAF
    Environment, Safety, and Occupational Health
Office of Civil Engineer
    Directorate of Environmental Quality
U.S. Department of the Army
    Corps of Engineers
U.S. Department of Energy
    Western Area Power Administration
    Reading Room
    Office of NEPA Oversight
U.S. Department of Health and Human Services
U.S. Department of Interior
    Bureau of Indian Affairs
    Bureau of Land Management
    Bureau of Mines
    Bureau of Reclamation
    Fish and Wildlife Service
    Minerals, Management Service
    National Park Service
    National Resource Library
    Office of Environmental Policy and Compliance
    Office of Public Affairs
U.S. Department of Transportation, Federal Highway Administration
    Western Resource Center
U.S. Environmental Protection Agency
    Office of Federal Activities
U.S. Geological Survey
    Environmental Affairs Program
U.S. Postal Service
    Wikieup Station

State Agencies

Arizona Corporation Commission
    Power Plant and Transmission Line Siting Committee
Arizona Department of Commerce
Arizona Department of Environmental Quality
Arizona Department of Transportation
Arizona Department of Water Resources
Arizona Game and Fish Department
Arizona State Land Department
Arizona State Clearinghouse
    Department of Commerce

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TABLE 6-2 AGENCIES, ORGANIZATIONS, AND INDIVIDUALS TO WHOM COPIES OF THE DRAFT EIS WERE SENT
Local Agencies
Mohave County Planning and Zoning Department Board of Supervisors Public Land Use Committee
Organizations
Advisory Council on Historic Preservation Ahamakav Cultural Society Caithness Big Sandy L.L.C. Environmental Management Associates, Inc. Greystone Hopi Tribe Navajo Nation Historic Preservation Owens School Rural Utility Services Sierra Club, Southwest Office URS Corporation Yavapai Tribe

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TABLE 6-2
AGENCIES, ORGANIZATIONS, AND INDIVIDUALS TO WHOM COPIES OF THE DRAFT EIS WERE SENT

Individuals

Abbott, Dave & Ann	Grim, Gary	Raymond, Jean*
Adams, Teresa	Haffner, John W.	Reyes, Alicia L.
Ambrose, Jerry	Halleman, Richard*	Robles, Ruben and Margarita
Anderson, Carol	Hayden, Phil Jr.	Russell, Fred
Anderson, Reed	Helstrom, Norma A.*	Russmann, Dale C.
Andrews, Ronald	Hermanek, Bernice	Sandler, Everett L.
Axen, Rita	Hernandez, Jesus	Saunders, Mike
Baebler, GeorgeT.	Hollingsworth, Thomas*	Sayles, Roger & Elizabeth*
Ball, John B.	Hudson, Charles F	Schott, Terry L.
Barlow, Oliver	Jamie, Martin	Seel, Robert
Benninghoff, Bernard	Janis, Lynn B.	Shurley, Bob
Benninghoff, John W.	Johnson, John & Roslyn*	Siefker, Bryan & Marnia
Berschawer, Bert	Jones, Roy	Skinner, Jim
Berry, Madgie	Judd, Elise Huff	Smith, Bob
Black, Joyce	Judd, Steve*	Smith, Rob
Bluett, Thomas T.	Kenebrew, David	Sorenson, Thomas J.
Bosma, Julia	Kostelny, Joseph (Mrs.)	Steel, Robert*
Boucier, Tim	Krueger, Orville	Straight, Roy & Ruth
Bowers, David	Lazich, Michael C.	Sullens, June
Brattstrom, Bayard H. Dr.	LeBlanc, Melvin	Sullens, Lee
Brown, Dan	Lewis, Patti	Sumner, Thell & Clara
Broz, Robert	Lindstrom, Wilbur	Tarvin, Shelly
Bryan, David	Lustig, John	Tenney, Joe
Burge, Krystal	Lynn, Howard	Travis, John & Marci
Carter, Bill	MacMillan, Geraldine A.	Trinkhaus, Walter J.
Carter, William	Majenty, Rory	Trust, Lee*
Colbert, Bill	Martin, Don*	Vanaman Jr., John W.
Cole, John K.	Mazzone, Christina Beniamino	Van Brunt, Don
Conwell, James R.	McCafferty, F. Mr. Mrs.	Van Cleve, Hayden
Crawford, Robert	Meyer, J. Peter	Van Hoven, Joan
Davis, Jonni	Miles, Jennee	Varga, Henry
Dommrad, Stephen E.	Moore, Beverly J. & Merle W.	Verno, A.J.
Dunton, Roy*	Mowl, Richard	Wedlow, Fay L.
Duffey, Kathleen	Neander, Herbert	Weldon, James A. & Georgette
E.K. Holsinger	Nelssen, John B.	Wheless, Lee R.*
Eller, Marvin	Nelssen, Marcia*	Whitworth, Marjorie A.
Erhardt, Jack	Neri, Anthony J.	Williams, Gary
Essinger, J.H.	Newell, John W.	Wilson, Ron
Filippelli, Ralph	Nielson, Burt*	Wilson, Ronald
Fisher, William D.	Noli-Decker Carol A.	Wissinger, LeRoy*
Fisher, Daniel L	Owen, D.S.	Wolf, Kenneth G.
Flood, Tim	Paez, Antonio C. & Lillian R.	York, Leona Mae
Foote, Ron*	Parker, Michael T.	Zodieru, Jehuda S. & Karen I.*
Francis, Walter	Pattillo, Eddie	
Frank, William & Alice	Perkins, Mary Jane	* Indicates requested Executive Summary of DEIS only
Freitag, Theodore A.	Petrosius, Joseph I.*	
Gardner, Tim L.*	Proctor, Edwin E.	
Garrity, Brian L.	Pruitt, Larry M.	
Giardini, Mike	Purdy, Forrest & Jan*	
Goodale, Bill	Pynn, Howard	
Gregorich, Andrew	Rafa-Niedoborski, Lois	
Gregory, Florence F.*		

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Chapter 7
List of Preparers and Contributors

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7.0 LIST OF PREPARERS AND CONTRIBUTORS

As required by National Environmental Policy Act (NEPA) Regulations (40 Code of Federal Regulations [CFR] Part 1502.17), this section lists the people primarily responsible for preparing this environmental impact statement (EIS) and presents their qualifications. URS Corporation and EPG, the third party contractors selected to prepare the EIS, have, in accordance with 40 CFR 1506.5(c), certified that they do not have any financial or other interest in the outcome of this project. In addition to the specific responsibilities listed, many Bureau of Land Management and Western Area Power Administration personnel also contributed substantial time consulting with other agency personnel in preparing this EIS (refer to Section 6.2, Additional Agency Consultation).

Name	Education And Experience	Project Role
Bureau of Land Management		
John L. Anderson	MS, Botany 25 years of experience	Technical reviewer for Vegetation and Threatened and Endangered Species
Bruce M. Asbjorn	BS, Range/Forest Management 22 years of experience	Technical reviewer for Wilderness, Recreation, Wild/Scenic Rivers, Visual Resources, Land Use and Access, Noise, and Areas of Critical Environmental Concern
Brad Blomquist		
John R. Christensen	BS, Forestry 24 years of experience	BLM decision maker
Joyce Cook	Realty Specialist 27 years of experience	Technical reviewer for Description of the Proposed Action and Alternatives
Lin D. Fehlmann	BS, Secondary Education Biology 21 years of experience	Technical reviewer for Description of the Proposed Action and Alternatives, Surface Water, Ground Water, and Description of Proposed Action and Alternatives
Paul Hobbs	BS, Soil Science 19 years of experience	Technical reviewer for Geology/Paleontology, Soils, and Floodplains
Don McClure		
Kurt Pavlat	BS, Agriculture MS, Agriculture 10.5 years of experience	Technical reviewer for Grazing Management
Rebecca Peck	BS, Wildlife Management 22 years of experience	Technical reviewer for Vegetation, Fisheries and Wildlife, Threatened and Endangered Species, Areas of Critical Environmental Concern
John Rose	BA, Anthropology Ph.D. Anthropology 19 years of experience	Technical reviewer for Cultural Resources, Indian Trust Assets, and Areas of Critical Environmental Concern
Jeff Simms	BS, Fisheries Science MS, Wildlife and Fisheries Science 10 years of experience	Technical reviewer for Fisheries and Wildlife
David R. Smith	BS, Wildlife Ecology MS, Wildlife and Fisheries Science 17 years of experience	Technical reviewer for Threatened and Endangered Species; Wetland Riparian and Waters of the United States; Surface Water; Vegetation; and Fisheries and Wildlife

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Name	Education And Experience	Project Role
Paul Summers	BS, Geology 32 years of experience	Technical reviewer for Geology/Paleontology, Groundwater, and Surface Water, and Description of Proposed Action and Alternatives
Western Area Power Administration		
Mary Barger	BA, Anthropology 25 years of experience	Technical reviewer for Cultural Resources
John Bridges	BS, Zoology MS, Zoology 24 years of experience	Technical reviewer for Biological Resources
Nickolas Chevance	BA, Anthropology MA, Anthropology 23 years of experience	Technical reviewer for Cultural Resources
John Holt	BS, Environmental Health 20 years of experience	NEPA Compliance Officer
Ken Mathias, P.E.	BS, Mechanical Engineering MS, Geology and Geophysics 20 years of experience	Technical reviewer for Air Quality, Noise, Electromagnetic fields, and Hazardous Substances
Robert Orr	BS, Geology MS, Geology 10 years of experience	Technical reviewer for Geology and Groundwater
David Pearson	BS, Civil Engineering 20 years of experience	Technical reviewer for Surface Water and Soils
Art Royball	BS, Wildlife Biology 15 years of experience	Technical reviewer for Wetlands, Riparian Areas, and Waters of the United States
Dave Swanson	BA, Biological Sciences 25 years of experience	Western Project Manager. Trust Assets
Environmental Management Associates, Inc.		
Dwight L. Carey	BS, Geology MS, Geology D.Env., Environmental Science and Engineering 29 years of experience	Contract BLM Project Manager
Terry R. Thomas	BS, Biology MS, Plant Science D.Env., Environmental Science and Engineering 27 years of experience	Technical reviewer for Affected Environment and Environmental Consequences
URS Corporation		
Carol Anderson	BS, Journalism MEPM-Master of Environmental Policy and Management 22 years of experience	Cumulative Impacts
Brad Archer (Arizona State University)	BS, Geology MS, Geology 30 years of experience	Conducted paleontological surveys and prepared technical report
Jennifer Baker	MEM, Environmental Management MPP, Public Policy BA, Biology 6 years of experience	Areas of Critical Environmental Concern, Land Use/Access; co-author of Irreversible and Irretrievable Commitment of Resources and Short-term Uses versus Long-term Productivity

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Name	Education And Experience	Project Role
Annette Barndt	BS, Environmental Studies/Biology MS, Environmental Management 11 years of experience	Relationship to Policy, Plans and Programs; Permits and Approvals Required; Consultation and Coordination; Irreversible and Irretrievable Commitment of Resources; Short-term Uses Versus Long-term Productivity; Cumulative Impacts
Cortney C. Brand	BS, Geology MS, Geology 6 years of experience	Surface Water, Geology/Paleontology, and Groundwater
David Carr	MS, Geology BS, Geosciences 22 years of experience	Groundwater and Soils
Lauren Clubb	BA, Environmental Science 1.5 years of experience	Irreversible and Irretrievable Commitments of Resources, Short-term Uses Versus Long-term Productivity
Keryn Darr	BA, English 5 years of experience	Technical Editing and Document Production Coordination
Jeffrey Dawson	BS, Biology MS, Botany 24 years of experience	Technical reviewer for Wildlife and Fisheries, Vegetation, and Threatened and Endangered Species
James M. Doenges	BS, Biology MS, Biology 15 years of experience	URS NEPA Document Manager; preparer of Summary, Sections 1.1, 1.2, 1.3, and 6.0; contributor to Chapters 2, 3, and 4
Robert Farmer	Ph.D., Chemical Engineering MS, Chemical Engineering BS, Chemical Engineering 16 years of experience	Air Resources
Jeffrey Fuller	BS, Environmental Health 17 years of experience	Noise
David Gaige	BS, Mechanical Engineer MS, Environmental Engineer 26 years of experience	URS Project Director
Andy Herb	MS, Environmental Science 3 years of experience	Technical reviewer for Wetland, Riparian Areas, and Waters of the United States
Bill Jamieson	BS, Zoology 14 years of experience	Air Resources
David Jones	BS, Landscape Horticulture Graduate Studies, Environmental Planning 10 years of experience	Technical reviewer for Land Use, Recreation, and Visual Resources
Gwen Knadel	MS, Geology BS, Geology 5 years of experience	Groundwater Modeling
Erica Koch	BS, Land Use/Environmental Resources 1.5 years of experience	Preparers and Contributors and EIS Administrative Support
C. Blair Linford	BS, Geology 1 year of experience	Soils
Mitchell Meek	BFA, Graphic Design 16 years of experience	Graphic Design
Sally K. Miller	BS, Geology MS, Environmental Health/Industrial Hygiene 18 years of experience	Technical reviewer for Public Safety and Services

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Name	Education And Experience	Project Role
Lisa Millet	BA, Geology MS, Environmental Policy and Management 15 years of experience	Technical reviewer for Permits and Approvals Required
Joanna Moreno	BS, Physics and Meteorology 23 years of experience	Lead groundwater modeler
David K. Nicholson, P.G.	BA, Geology MS, Economic Geology MS, Environmental Engineering 11 years of experience	Technical reviewer for Groundwater, Surface Water, and Geology
Todd Ringsmuth	BS, Civil Engineering 8 years of experience	Floodplains
A.E. Rogge	PhD, Anthropology MA, Anthropology BA, Anthropology 30 years of experience	Cultural Resources, Areas of Critical Environmental Concern, Indian Trust Assets
David Schafer (Schafer and Associates)	BS, Math MS, Computer Science 30 years of experience	Technical reviewer for Groundwater Technical Report and groundwater modeling
Randall Simpson	BLA, Landscape Architecture BS, Environmental Design 9 years of experience	Visual, Recreation, and Wilderness Resources
Gordon C. Tucker Jr.	Ph.D., Anthropology 27 years of experience	Technical reviewer for Cultural Resources Indian Trust Assets, and Areas of Critical Environmental Concern
Nancy L. Van Dyke	BA, Biology MS, Environmental Science 22 years of experience	Technical reviewer for Soils, Description of Proposed Action and Alternatives, and Affected Environment and Environmental Consequences
John Van Kirk	MA, Geography 15 years of experience	Technical reviewer for Air Quality
Jennifer Wennerlund	BS, Geography, Cartography/Remote Sensing/Land Use Planning 12 years of experience	Geographic Information Systems (GIS), figures
Carrie Westhoff	BS, Civil Engineering 1 year of experience	Floodplains
Environmental Planning Group, Inc.		
Adam Duerr	MS, Renewable Natural Resources BS, Renewable Natural Resources 3 years of experience	Grazing Management
Kirsten Lake	BS, Ecology and Evolutionary Biology 6 years of experience	Vegetation
Mary Anne McLeod	MS, Wildlife Conservation BA, Physics 7 years of experience	Fisheries and Wildlife
Mike Schroff	BS, Wildlife Ecology 10 years of experience	Fisheries and Wildlife
E. Linwood Smith	Ph.D., Zoology MS, Zoology BA, Zoology 30 years of experience	Biological resources team leader
Locana de Souza	BS, Wildlife Ecology 3 years of experience	Threatened and Endangered Species

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Name	Education And Experience	Project Role
Thomas R. Strong	Ph.D., Biology MS, Chemical Engineering BS, Chemical Engineering 20 years of experience	Wetlands, Riparian Areas, and Waters of the United States
Arizona Department of Water Resources		
Dale Mason	BS, Geology 14 years of experience	Technical reviewer for Surface Water, Groundwater, Groundwater Technical report, and Description of Proposed Action and Alternatives
Arizona Game and Fish Department		
Duane Aubuchon	BS, Renewable Natural Resources 15 years of experience	Technical reviewer for Surface Water, Groundwater, Floodplains, Land Use and Access, Areas of Critical Environmental Concern, Vegetation; Wetlands, Riparian and Waters of the United States; Fisheries and Wildlife, Threatened and Endangered Species

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8.0 REFERENCES

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Chapter 9
Glossary

BIG SANDY
Energy Project
Environmental Impact Statement

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9.0 GLOSSARY

A-Horizon

The surface layer of soil, or topsoil, generally characterized by the accumulation of organic material.

A-weighted

A weighting function applied to the noise spectrum, which approximates the response of the human ear.

Access (road)

Road used for passage to and along transmission line for purposes of construction and maintenance, or the road providing a means or entry to the power plant and associated facilities.

Advisory Council on Historic Preservation (ACHP)

An independent federal agency that provides a forum for influencing federal activities, programs, and policies as they affect historic resources. The ACHP was established by the National Historic Preservation Act in 1966, with the goal of having federal agencies as responsible stewards of our Nation's resources when their actions affect historic properties. The ACHP is the only entity with the legal responsibility to balance historic preservation concerns with federal project requirements.

Aesthetic Quality

A perception of the beauty of a natural or cultural landscape.

Affected Environment

A geographic area and the associated natural, human, and cultural resources that could be influenced by a proposed action. Also, the chapter in an environmental impact statement that describes the existing condition of the environment.

Aggradation

The process of sediment deposition by running water, as in the channel of a stream.

Aggregate

A mass or body of rock particles, mineral grains, or both.

Aggregation

The natural deposition of sediments in a river channel, gradually building up the slope or level of the riverbed.

Air Emissions

The release or discharge of a pollutant (from a stationary source) by an owner or operator into the ambient air either (1) by means of a stack or (2) as a fugitive dust, mist, or vapor as a result inherent to the manufacturing or formulating process.

Air Quality Standards

The level of pollutants prescribed by law or regulation that cannot be exceeded during a specified time in a defined area.

Air Quality Classifications

Classifications established under the Prevention of Significant Deterioration portion of the Clean Air Act that limit the amount of air pollution considered significant within an area. Class I applies to areas where almost any change in air quality would be significant, Class II applies to areas where the deterioration normally accompanying moderate well-controlled growth would be permitted, and Class III applies to areas where industrial deterioration would generally be allowed.

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Alignment

The specific, surveyed route of a linear feature such as a transmission line or pipeline.

Allotment

A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under management of an authorized agency.

Alluvial Basin

A structural trough filled with alluvium. An alluvial basin is typically bounded by fault-block mountain ranges.

Alluvial Fan Deposit

Unconsolidated to semi-consolidated sediment deposited during the formation of an alluvial fan. Alluvial fans form at the edges of mountain ranges where streams flow from the mountains onto the alluvial plain.

Alluvium (Alluvial Deposits)

A general term for clay, silt, sand, gravel, or similar consolidated material deposited during comparatively recent geologic time by a stream or other body of running water in the bed of the stream, river, or floodplain, or as a cone or fan at the base of a mountain slope.

Ambient (air)

That portion of the atmosphere, external to buildings, to which the general public has access.

Ampere (amp)

A unit of measure for an electrical current; the amount of current that flows in a circuit at an electromotive force of 1 volt and at a resistance of 1 ohm.

Anaerobic

A condition in which molecular oxygen is absent from the environment.

Animal Unit Month (AUM)

Acres of forage required to sustain a cow, cow/calf unit (one cow and one calf), or equivalent for one month.

Annual (botany)

A plant that lives and grows for only one year or season.

Anticline

A sharply arched fold of stratified rock composed of strata that slope downward in opposite directions from the apex of the arch.

Aquatic Animals

Animals that carry out respiration by means of a gill structure permitting gaseous exchange between the water and circulatory system.

Aquatic Flora

Plant life associated with the aquatic ecosystem, including, but not limited to, algae and higher plants.

Aquifer

A water-bearing layer of permeable rock, sand, or gravel. A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to conduct groundwater and yield water to wells and springs.

Aquifer Boundary

At term that refers to the physical limit of an aquifer. Examples of aquifer boundaries include an area where an aquifer is exposed at the land surface, and an abrupt or gradational transition into an adjacent hydrogeologic unit.

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Aquifer Test

A test performed to obtain data on the hydraulic characteristics and yield of an aquifer. An aquifer test is typically conducted by pumping a well at a constant rate for a specified period of time while monitoring the discharge rate and measuring water levels in the pumping well (see constant-discharge aquifer test). Water levels may also be measured in other nearby wells during the test. A constant-discharge aquifer test may be preceded by step-drawdown test (see definition).

Aquitard

A saturated hydrogeologic unit characterized by very low hydraulic conductivity. An aquitard is capable of transmitting groundwater at a very low flow rate.

Archaeology

The science that investigates the history of peoples by the remains belonging to the earlier periods of their existence.

Archaeological Site

Any locale showing evidence of human activity.

Archival

Pertaining to or contained in documents or records that preserve information about an event or individual.

Area of Critical Environmental Concern (ACEC)

A BLM designation for an area within public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life from natural hazards.

Arkosic Gravel

Gravel composed predominantly of feldspar, and/or rock fragments containing an abundance of feldspar.

Arroyo

A term applied in the arid and semiarid regions of the southwestern United States to the small, deep, flat-floored channel or gully of an ephemeral stream or of an intermittent stream usually with vertical or steeply cut banks of unconsolidated material at least 2 feet high; it usually is dry, but may be transformed into a temporary watercourse or short-lived torrent after heavy rainfall.

Artesian Aquifer

An aquifer under confining (or artesian) pressure due to the presence of an overlying aquitard or other confining layer. Wells that penetrate artesian aquifers under sufficient confining pressure will produce groundwater that flows naturally out of the well.

Artifact

Any object showing human workmanship or modification, especially from a prehistoric or historic culture.

Background

That portion of the visual landscape lying from the outer limit of the middleground to infinity. Color and texture are subdued in this area, and visual sensitivity analysis here is primarily concerned with the two-dimensional shape of landforms against the sky.

Base Load

The load level at which a gas turbine is normally operated.

Baseload Plant

A power plant that generates enough kilowatt hours, for any 12-calendar-month period, to

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exceed its design capacity multiplied by 3,500 hours.

Basin

A depression of the earth's surface, of tectonic origin, in which sediments have been deposited.

Basin-fill Sediment

Unconsolidated to semi-consolidated sediment deposited in an alluvial basin.

Basin and Range Province

Topographic and physiographic province or landscape characterized by a series of tilted fault block mountains and broad intervening basins.

Bedrock

A general term for solid rock that lies beneath soil, loose sediments, or other unconsolidated material.

Best Management Practice (BMP)

Methods determined to be the most effective, practical means of preventing or reducing pollution.

Biological Assessment

A document prepared, usually in conjunction with an environmental impact statement, that analyzes the specific impacts of a project on any species listed as threatened or endangered under the Endangered Species Act, that may occur in a project area or be affected by a proposed action. The Biological Assessment (BA) is a requirement of the Section 7 (Section 7(a)2 of the Endangered Species Act) consultation between a federal agency and the U.S. Fish and Wildlife Agency (USFWS). USFWS uses the information in a BA to render an opinion as to whether the proposed project will jeopardize the continued existence of any listed species. USFWS may suggest or require adjustments to the proposed action to avoid adverse impact or jeopardizing the existence of a species.

Blowdown Water

The minimum discharge of recirculating water for the purpose of discharging materials contained in the process, the further buildup of which would cause concentrations or amounts exceeding limits established by best engineering practices.

British Thermal Unit (BTU)

The amount of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit.

Burning Agents

Those materials that, through physical or chemical means, improve the combustibility of the materials to which they are applied.

Caliche

Cemented deposit of secondary calcium carbonate found in layers or disseminated throughout the horizon of certain soils in arid to semiarid regions.

Cambrian

The earliest geologic period in the Paleozoic Era, spanning the time of 570 to 500 million years ago, and marked by a profusion of marine animals.

Candidate Species

A plant or animal species not yet officially listed as threatened or endangered; however currently undergoing status review by USFWS.

Capacity

The maximum load that can be generated or transmitted by a generating or transmission facility for a given period of time without exceeding approved limits of temperature or stress.

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Carbon Monoxide (CO)

A colorless, odorless, poisonous gas, produced by incomplete combustion of carbon-based fuels including gasoline, oil, and wood.

Centerline

A line along the approximate middle of the right-of-way of a linear feature such as a transmission line or pipeline.

Chroma

The relative purity or saturation of a color; intensity of distinctive hue as related to grayness; one of the three variables of color.

Clean Water Act

Section 404 of this Act identifies conditions under which a permit is required for construction projects that result in the discharge of fill or dredged material into, or dredging of materials from, waters of the United States. Section 402 of this Act identifies conditions under which a permit is required for the discharge of pollutants into waters of the United States.

Combined Cycle

A power plant operational system that uses a combination of one or more combustion turbine units and one or more steam turbine units to generate electricity, with a substantial portion of the required energy input of the steam turbine unit(s) provided by the exhaust gas from the combustion turbine unit(s).

Combustion

The production of heat and light energy through a chemical process, usually oxidation. One of the three basic contribution processes of air pollution, the others being attrition and vaporization.

Combustion Turbine

A machine that has propeller-like blades that are moved by combustion gases to spin a rotor in a generator to produce electricity.

Confined Aquifer

An aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself; an aquifer containing confined groundwater.

Cooling Tower

A structure used to cool water. Water is pumped to the top of the tower, sprayed into the tower, and is cooled by evaporation. The water is then either recycled within the tower or discharged.

Conductor

The wire cable strung between transmission line towers through which the electrical current flows.

Conglomerate

A type of sedimentary rock consisting predominantly of cemented cobble- and gravel-sized particles, and that may also include sand and finer-grained particles.

Constant-Discharge Test

A type of aquifer test performed by pumping a well at a constant rate for a specified period of time while monitoring the discharge rate and measuring water levels in the pumping well. A constant-discharge test is typically performed to obtain data on the hydraulic characteristics and yield of an aquifer.

Constant-Head Boundary

A groundwater modeling term that refers to a type of boundary within a model wherein the head, or water level, within a cell is held constant. Constant-head boundaries are typically used to simulate groundwater flow into

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the model domain, or the effect of a perennial stream hydraulically connected to an aquifer.

Construction, Operation and Maintenance Plan (COMP)

A detailed plan depicting engineering, access, construction, environmental, and reclamation that is prepared prior to construction and operation of a proposed action.

Corona

The electrical breakdown of air into charged particles caused by the electric field at the surface of transmission line conductors. Effects of corona are audible noise, radio and television interference, visible light, and photochemical oxidants.

Corridor

A continuous strip of land of defined width, through which a linear utility route (or routes) passes.

Council on Environmental Quality (CEQ)

An advisory council to the President of the United States established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effort on the environment studies, and advises the President on environmental matters.

Cretaceous

The third and latest period of the Mesozoic Era, spanning in time from 136 to 65 million years ago, marked by the dying out of toothed birds and dinosaurs, and the development of early mammals.

Critical Habitat

As defined under the Endangered Species Act, critical habitat exists only after U.S. Fish and Wildlife Service officially designates it. Critical habitat are areas (1) within the geographic area occupied by a species at the time it is listed on which are found those physical or biological features essential to the conservation of the species and that may require special management consideration or protection; and (2) those specific areas outside the geographic area occupied by a species at the time it is listed essential to the conservation of the species.

Cultural Resources

Remains of human activity, occupation, or endeavor, as reflected in districts, sites, buildings, objects, artifacts, ruins, works of art, architecture, and natural features important in human events.

Cumulative Impact

The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Decibel (dB)

A measure of intensity, which defines a sound's loudness.

Degradation

The wearing down or away, and general lowering or reduction, of the earth's surface by the processes of weathering and erosion.

Demineralizer

A piece of equipment that removes dissolved minerals from water.

Devonian

A geologic period during the Paleozoic Era, spanning in time from 395 to 345 million years ago, marked by an abundance of fishes and the appearance of the first land plants and amphibians.

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Directional Drilling

The technique of drilling at an angle from the vertical by deflecting the drill bit. Directional wells often are drilled to reach an oil- or gas-bearing reservoir where conventional drilling cannot be performed.

Distance Zone

A visibility threshold distance where visual perception changes. The zones are usually defined as foreground, middleground and background.

Diversity

The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area.

Drainage Basin

The region or area bounded peripherally by a drainage divide or occupied by a river system.

Drawdown

The lowering of the water table of an unconfined aquifer or the potentiometric surface of a confined aquifer by pumping of groundwater from wells.

Ecology

The study of the relationships between living organisms and their environment.

Ecosystem

A complex system composed of a community of plants and animals, and that system's chemical and physical environment.

Ecotone

A transitional zone between two adjacent ecological communities.

Electric and Magnetic Field (EMF)

A space or region within which magnetic forces are present around an electrical current.

Electrostatic Field

Pertaining to a space or region within which atmospheric electricity at rest interferes with radar, radio or television reception.

Emergent (vegetation)

Vegetation with all or part of their vegetative and reproductive parts above the water.

Emission

Pollution discharged into the atmosphere from a source.

Endangered Species

Any plant or animal species in danger of extinction throughout all or a significant portion of its range as defined by the Endangered Species Act of 1973.

Endangered Species Act of 1973 (ESA)

Section 7 of the ESA requires federal agencies to consult with the U.S. Fish and Wildlife Service to ensure that undertaking, funding, permitting, or authorizing an action is not likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat.

Endemic

Plants or animals that are native to a particular region or country.

Environment

The surrounding conditions, influences or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.

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Environmental Assessment

An evaluation of existing resources and potential impacts on them from a proposed action or change to the environment.

Environmental Impact Statement (EIS)

A formal public document prepared to analyze the impacts on the environment of the proposed project or action and released for comment and review. An EIS must meet the requirements of NEPA, CEQ guidelines, and directives of the agency responsible for the proposed project or action.

- **Draft EIS**

  The document prepared by a Federal agency or department or under Federal guidance that attempts to identify and analyze the environmental impacts of a proposed action and feasible alternatives.

- **Final EIS**

  The Draft EIS is circulated for public comments that are addressed in the Final EIS.

Environmental Justice (Executive Order 12898)

Ensures that all people, regardless of race, national origin, or income, are protected from disproportionate impacts of environmental actions.

Eolian

Sediment carried, formed, or deposited by the wind, as sand dunes.

Ephemeral Stream

A stream or portion of a stream that flows only briefly in direct response to precipitation in the immediate vicinity, whose channel is at all times above the water table.

Erosion

The wearing away of land surface by wind or water. Erosion occurs naturally from weather or runoff but can be intensified by land-clearing practices.

Ethnography

That aspect of cultural and social anthropology devoted to the first-hand description of particular cultures.

Evaporation Pond

A pond designed to receive and store discharged process wastewater, cooling tower blowdown water, and stormwater from a power plant, while it evaporates into the atmosphere.

Evapotranspiration

The return of water to the atmosphere through the combined effects of evaporation and plant transpiration.

Fault

A fracture or fracture zone in the earth's surface along which there has been displacement of the sides relative to one another parallel to the fracture.

Fauna

Animals collectively, especially the animals of a specified region or time.

Federal Energy Regulatory Commission (FERC)

Agency primarily responsible for ensuring adequate energy supplies at just and reasonable rates and providing regulatory incentives for increased productivity, efficiency, and competition.

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Federal Land Policy and Management Act of 1976 (FLPMA)

Established public land policy for management lands administered by the Bureau of Land Management (BLM). FLPMA specifies several key directions for the BLM, notably (1) management on the basis of multiple-use and sustained yield, (2) land use plans prepared to guide management actions, (3) public lands for the protection, development, and enhancement of resources, (4) public lands retained in Federal ownership, and (5) public participation used in reaching management decisions.

Field Effect

Induced currents and voltages, as well as related effects that might occur as a result of EMF at ground level.

Finite-Difference Groundwater Flow Model

A type of numerical groundwater flow model that consists of a rectilinear model grid configured to represent an aquifer or aquifer system. Each cell within the model grid represents a small portion of an aquifer with prescribed physical dimensions and hydraulic properties. Finite-difference models may be either two-dimensional or three-dimensional, depending on the complexity of the problem to be solved.

Firm Energy

Noninterruptible energy and power guaranteed by the supplier to be available at all times except for reasons of uncontrollable forces or continuity of service provisions.

Floodplain

That portion of a river or stream valley, adjacent to the river channel, which is built of sediments and is inundated with water when the stream overflows its banks.

Floodplain Deposit

A sedimentary deposit formed on the floodplain of a river or stream.

Foliage

The leaves of a growing plant or tree.

Forage

All browse and herbaceous foods available to grazing animals, which may be grazed or harvested for feeding.

Foreground

The visible area from a viewpoint or use area out to a distance of one-half mile. The ability to perceive detail in a landscape is greatest in this zone.

Foreground/Middleground

The area visible from a travel route, residence or other use area to a distance of 3 to 5 miles. The outer boundary of this zone is defined as the point where texture and form of individual plants are no longer apparent in the landscape. Vegetation is apparent only in patterns or outline.

Fossil

The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust; exclusive of organisms that have been buried since the beginning of historical time.

Fugitive Dust

Airborne solid particulate matter emitted from any source other than through a stack or vent.

General-Head Boundary

A groundwater modeling term that refers to a type of boundary within a model wherein the head, or water level, within a cell is allowed to fluctuate within a prescribed range.

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Generic Mitigation

Measures, techniques, or practices applied/used generally to reduce adverse impacts on a non-specific basis.

Genus

One of the major taxonomic groups used to scientifically classify plants or animals: several closely related species, or one species, make up one genus, while several genera, or one genus, make up a family.

Geologic Formation

A rock unit distinguished from adjacent deposits by some common character, such as its composition, origin, or the type of fossil associated with the unit.

Geology

The study of the planet earth, the rocks of which it is composed, and the processes that have acted on these materials since its origin.

Granitic Rock

Rock composed of granite and/or igneous rock similar in composition to granite. Granite is an intrusive igneous rock composed primarily of feldspar and quartz.

Grazing Potential

The potential of an area to support livestock grazing measured by the number of acres of land required to support one animal unit (AUM) for a month.

Groundwater

Water below the earth's surface that flows or seeps downward and saturates soil or rock, supplying springs and wells. The area where water fills fractures and spaces in soil, sand, or rocks is called the saturated zone. The top of this zone is called the water table. Groundwater is stored in, and moves slowly through, layers of soil, sand, and rocks called aquifers.

Groundwater Flow Model

A computer model designed to simulate the configuration and hydraulic properties of an aquifer or aquifer system (see also definition of finite-difference groundwater flow model). After a computer model has been developed, it is typically used to predict the effects of pumping or other stresses on an aquifer.

Groundwater Underflow

The natural movement of groundwater from a groundwater basin into an adjacent basin.

Habitat

The region where a plant or animal naturally grows or lives. A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and home range.

Hazardous Materials

Materials determined to be physical or chemical health hazards based on statistically significant evidence.

Heat Recovery System Generator

A system that uses the heat available in the combustion turbine exhaust gas to produce steam for the steam turbine in a combined-cycle operation.

Herbaceous

Of, or having the nature of, an herb or herbs as distinguished from woody plants.

Herbivore

An animal that feeds only on plants.

Hertz

A measure of frequency, which defines a sound's pitch.

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Historic Preservation

The preservation of historic districts, sites, buildings, structures, and objects.

Holocene

The second geologic epoch of the Quaternary period, commencing with the end of the last glacial period (the Pleistocene epoch). This era was marked by the establishment of modern climatic and environmental conditions, and spans from roughly 9,000 BC to present.

Homogenous

Having similarity in structure because of similarity in descent.

Hydraulic Conductivity

A hydraulic property of an aquifer that describes the rate groundwater can flow through a unit area of the aquifer under a hydraulic gradient of 1:1.

Hydraulic Connection

Two hydrogeologic units are considered to be hydraulically connected if they are adjacent to one another, both are saturated with groundwater, and groundwater can move from one unit to the other.

Hydraulic Gradient

Change in elevation of the groundwater table with distance. The hydraulic gradient is used in conjunction with hydraulic conductivity to define the rate and direction of groundwater flow through an aquifer.

Hydraulic Properties

A general term that refers to the ability of an aquifer to store, transmit, and yield groundwater. Aquifer storage is typically expressed as the storage coefficient, or storativity. The ability of an aquifer to transmit water is usually expressed as hydraulic conductivity or transmissivity. Aquifer yield typically refers to the sustainable pumping rate of a well completed in an aquifer.

Hydric Soil

A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation.

Hydrogeologic Unit

A geologic formation, or part of a formation, with similar hydrologic characteristics.

Hydrologic System

The distribution of surface and underground waters.

Hydrology

The science that relates to properties, distribution, and circulation of water.

Hydrophytic Vegetation

Plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content; plants typically found in wetlands and other aquatic habitats.

Igneous Rock

Rocks solidified from molten magma occurring as intrusives or extrusives (volcanics), at or below the surface of the earth.

Impact

A modification in the status of the environment brought about by a proposed action.

- **Direct Impacts**

  Caused by the action and occur at the same time and place (40 CFR 1508.8(a)).

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- **Indirect Impacts**

  Caused by the action later in time or farther removed in distance, but still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth-rate, and related effects on air and water and other natural systems, including ecosystems.

Indicator Species

Species of fish, wildlife, or plants that reflect ecological changes caused by land management activities.

Infrastructure

The basic facilities on which a community depends, such as schools, power plants, or transportation and communication systems.

Insectivore

An animal that feeds chiefly on insects.

Intermittent

A river or stream that flows for a period of time, usually seasonally during rainy periods, and, stops during dry periods. In arid regions, dry periods may be interrupted by occasional flash floods from brief but intense rain storms.

Intrusive Igneous Rock

Rock formed by magma forced into or between other rocks while in a molten state.

Jurassic

The second period of the Mesozoic Era, spanning in time from about 190 to 136 million years ago, characterized by the dominance of dinosaurs and the appearance of flying reptiles and birds.

Jurisdictions

The limits or territory within which authority may be exercised.

Kilovolt (kV)

1,000 volts (a volt is a measure of electrical potential difference which would cause a current of 1 ampere to flow through a conductor whose resistance is 1 ohm).

Kilovolts Per Meter (kV/m)

A unit measure of electric field strength.

Kilowatt (kW)

A unit of power equivalent to 1,000 watts.

Kilowatt Hour (kW/h)

A power demand of 1,000 watts for one hour. Power company utility rates typically are expressed in cents per kW/h.

Lacustrine Deposit

A sedimentary deposit formed in and around the margins of a lake.

Landform

A term used to describe the many types of land surfaces that exist as a result of geologic activity and weathering (e.g., plateaus, mountains, plains, and valleys).

Landscape Character Type

The arrangement of a particular landscape as formed by the variety and intensity of the landscape features and the four basic elements of form, line, color, and texture. These factors give the area a distinct quality that distinguishes it from immediate surroundings.

Level of Service (LOS)

In transportation studies, a qualitative measure of traffic flow along a given road considering a

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variety of factors, including speed and travel time, traffic interruptions, and freedom to maneuver LOSs are designated "A" through "F"; "A" being a free-flow condition with low volumes at high speeds and "F" being a congested condition of low speeds and stop-and-go traffic. Intermediate levels describe conditions between these extremes. A LOS below "C" involves unstable to forced traffic flow in which a driver's freedom to select a speed is restricted and in which traffic stoppages cause congestion.

Lithology

A term that refers to the composition of a rock formation. The study of rocks with the unaided eye, or with little magnification.

Load

The demand on an energy producing system; the energy consumption or requirement of a piece of equipment.

Loam

A rich, permeable soil composed of clay, silt, sand, and organic matter.

Macroinvertebrate

Animals without backbones that are visible without a microscope; insects.

Maximum Contaminant Level (MCL)

The designation given by the U.S. Environmental Protection Agency to water-quality standards promulgated under the Safe Drinking Water Act. The MCL is the greatest amount of a contaminant that can be present in drinking water without causing a risk to human health.

Megawatts (MW)

1,000 kilowatts or 1 million watts (a watt is a unit of electrical power equal to 1/756th horsepower).

Merchant Plant

A power plant that operates without long-term power contracts for the purpose of selling power on the wholesale electric market.

Mesa

An isolated, nearly level land mass, formed of nearly horizontal rocks, standing above the surrounding country and bounded with steep sides.

Metamorphic Rock

Rock that has been formed through metamorphism. Metamorphism is the change in the mineralogical, structural, or textural composition of rocks under intense heat and pressure (e.g., turning limestone into marble).

Migratory

Birds, animals, or people that migrate, or move from one region or country to another.

Mineral Resources

Any inorganic or organic substance occurring naturally in the earth that has a consistent and distinctive set of physical properties. Examples of mineral resources include coal, nickel, gold, silver, and copper.

Mississippian

A period of the Paleozoic Era, spanning in time from about 345 to 320 million years ago.

Mitigation

Actions to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

Monocline

A rock fold or strata that slope in one direction.

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Mudstone

A hardened sedimentary rock consisting of clay that is similar to shale, but does not occur in distinct, bonded layers.

National Ambient Air Quality Standards (NAAQS)

The allowable concentrations of air pollutants in the air specified by the federal government. The NAAQS are divided into primary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public health) and secondary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public welfare) from any unknown or expected adverse effects of air pollutants.

National Environmental Policy Act of 1969 (NEPA)

Public Law 91-190. Establishes environmental policy for the nation. Among other items, NEPA requires Federal agencies to consider environmental values in decision-making processes.

National Historic Preservation Act of 1966 (NHPA)

Federal undertakings must comply with Section 106 of NHPA, which mandates that potential effects on significant historic properties be considered prior to approval of such undertakings. Significant historic properties are defined as sites, districts, buildings, structures, and objects eligible for the National Register of Historic Places. Consideration of these resources is to be made in consultation with the State Historic Preservation Officer and other interested agencies and parties.

National Register of Historic Places

A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance, established by the National Historic Preservation Act of 1966 and maintained by the National Park Service.

Native Vegetation

Vegetation naturally originating in a certain region or country.

Natural Gas

A mixture of gaseous hydrocarbons, composed primarily of methane, occurring naturally in the earth, often among petroleum deposits, that is used as a fuel.

Natural Gas Supply

The means by which the power plant receives natural gas that is converted into heat energy, which in turn is converted into mechanical and then electrical energy.

Nitrogen Oxides (NO_x)

Smog formers, produced from burning fuels including gasoline and coal, that react with volatile organic compounds to form smog. NO_x also are major components of acid rain.

No-Flow Boundary

A groundwater modeling term that refers to a type of boundary within a model that prevents the flow of water from one model cell to an adjacent cell. A no-flow boundary is typically used to simulate the physical limit of an aquifer (see definition of aquifer boundary).

Noise

Loud, unpleasant, unexpected, or undesired sound that disrupts or interferes with normal human activities.

Off-Highway Vehicle (OHV)

Any motorized vehicle capable of or designed for travel on or immediately over natural terrain. OHV use includes driving off a designated road for purposes including, but not limited to

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recreation, ranching, mineral operations, hunting, fuelwood gathering, etc.

Ohm

A measure of the electrical resistance of a material equal to the resistance of a circuit in which the potential difference of 1 volt produces a current of 1 ampere.

One-hundred-year Flood

A flood with a probability to occur once every one hundred years or a 1-in-100 chance of a flood occurring in a given year.

Oxidized Rhizospheres

Oxidized channels and soil surrounding living roots and rhizomes of hydrophytic plants.

Ozone

Ozone (O_3) – A bluish, toxic gas with a pungent odor formed by three oxygen atoms rather than the usual two. Ozone occurs in the stratosphere and plays a role in filtering out ultraviolet radiation from the sun's rays. At ground level ozone is a major component of smog.

Paleontology

The science of life in past geological time based on fossilized plants and animals.

Paleozoic

The geologic era between the Precambrian and Mesozoic eras covering the time between 570 million and 225 million years ago. The era was characterized by the development of the first fishes, amphibians, reptiles, and land plants.

Panoramic

An unlimited view in all directions.

Parent Material

The rock formation that a soil originated from through chemical and physical processes.

Particulate Matter (PM)

Tiny bits of solid material such as dust and soot released into and move around in the air. Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, incineration of garbage , mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining operations, agricultural burning (field and slash burning), and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose, and throat irritation and other health problems.

Parts Per Million

The number of "parts" by weight of a substance per million parts of water. This unit commonly is used to represent pollutant concentrations. It is approximately equal to 1 milligram per liter.

Pennsylvanian

A period of the Paleozoic Era, spanning from about 320 to 280 million years ago.

Perennial Stream

A stream or portion of a stream that flows throughout the year.

Permeability

The measure of the ease with which a fluid can diffuse through a particular porous material.

Permian

The seventh and last period of the Paleozoic Era, spanning from about 280 to 225 million years ago, characterized by increased reptile life and major mountain building in North America.

Petroglyph/Pictograph

A generally prehistoric symbolic design or drawing of an animal, human, or geometric or abstract image pecked or carved into a rock or cliff face.

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pH

A measure of the relative acidity or alkalinity of water. Water with a pH of 7 is neutral; lower pH levels indicate increasing acidity, while pH levels higher than 7 indicate increasingly basic solutions.

Physiographic Province

An area characterized by distinctive topography, geologic structure, climate, drainage patterns, and other features and phenomena of nature.

Pipeline

A line of pipe equipped with pumps and valves and other control devices for moving liquids, gases, and slurries (fine particles suspended in liquid).

Pithouse

A prehistoric dwelling partially constructed beneath the earth's surface.

Plateau

An elevated tract of relatively level land, such as a tableland or mesa.

Playa

The shallow central basin of a desert plain, in which water gathers after a rain and is evaporated.

Pleistocene

The first geologic epoch during the Quaternary period, spanning from 1.8 million years ago to about 9000 BC, characterized by extensive continental glaciation in the Northern Hemisphere.

PM_{10}

Coarse particulate matter less than 10 micrometers in diameter that generally are emitted from sources such as vehicles traveling on unpaved roads, materials handling, and crushing and grinding operations, as well as wind blown dust.

Policy

A guiding principle upon which is based a specific decision or set of decisions.

Power Plant

A stationary electric generating unit consisting of a boiler, a gas turbine, or a combined-cycle unit that employs a generator to produce electric power for purposes of sale or exchange and has the design capability of consuming any fuel (or mixture thereof) at a fuel heat input rate of 100 BTUs per hour or greater.

Precambrian

The earliest geologic era covering all time from the formation of the earth and ending at the Paleozoic Era which began about 570 million years ago.

Prey

An animal hunted or killed for food by another animal.

Primitive

Of or pertaining to an earliest or original stage or state.

Proposed Action

Construction activities, facilities, routes, and other activities proposed by the applicant.

Protective Withdrawal

Lands that have been withdrawn from availability under the various land and mining laws for administrative or protective reasons (e.g., recreation sites, office, or warehouse sites).

Public Involvement

The opportunity for participation by affected citizens in rulemaking, decisionmaking, and

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planning with respect to public lands, including public meetings or hearings held at locations near the affected lands, or advisory mechanisms, or other such procedures as may be necessary to provide public comment.

Pumping Test

A test made by pumping a well for a period of time and observing the change in hydraulic head in the aquifer. A pumping test may be used to determine the capacity of a well and the hydraulic characteristics of the aquifer.

Purpose and Need

A statement that generally reflects what the applicant (or proponent) intends to accomplish by the proposed action.

Quaternary

The geologic period following the Tertiary in the Cenozoic Era, beginning about 1.8 million years ago, composed by the Pleistocene and Holocene epochs, characterized by the evolution of Hominids into modern humans.

Range

A large, open area of land over which livestock can roam and graze.

Raptor

A bird of prey with sharp talons and a strongly curved peak (e.g., hawk, owl, vulture, eagle).

Reclamation

Returning disturbed lands to a form and productivity that will be ecologically balanced.

Reconnaissance

Preliminary examination or survey of a land area.

Recontouring

Returning a surface to or near to its original form through some type of action such as grading.

Record of Decision (ROD)

A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action.

Recovery

The rise in water level in a pumping well and nearby observation wells after groundwater pumping has ceased.

Reference Centerline

For purposes of assessing impacts and recommending mitigation, a centerline is assigned that may be slightly adjusted during engineering design.

Region

A large tract of land generally recognized as having similar character types and physiographic types.

Residual Impact

The resulting impact of an action remaining after application of mitigation.

Revegetation

The reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance such as reseeding.

Right-of-way

Strip of land acquired by legal means, over which the power line and access roads would pass.

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Riparian

An aquatic or terrestrial ecosystem that is associated with bodies of water, such as streams, lakes, or wetlands, or is dependent upon the existence of perennial, intermittent, or ephemeral surface or subsurface water drainage.

Route

The general path of a linear feature such as a transmission line or pipeline and associated facilities.

Runoff

The total amount of water flowing in a stream. It includes overland flow, return flow, interflow, and base flow.

Sandstone

A sedimentary rock composed primarily of sand grains, mainly quartz, that are cemented together by other minerals.

Scenic Quality Class

A BLM designation (A, B, or C) assigned a scenic quality rating unit to indicate the visual importance or quality of a unit relative to other units within the same physiographic province.

Scenic Quality Rating Unit (SQRU)

A portion of the landscape that displays primarily homogeneous visual characteristics of the basis landscape features (landform, water, vegetation, and structures and modifications) which separate it from the surrounding landscape.

Scope

The range of actions, alternatives, and impacts to be considered in an environmental impact statement.

Scoping

A term used to identify the process for determining the scope of issues related to a proposed action and for identifying significant issues to be addressed in an environmental impact statement.

Sediment

Solid fragmental material, either mineral or organic, that is transported or deposited by air, water, gravity, or ice.

Seismicity

The likelihood of an area being subject to earthquakes. The phenomenon of earth movements.

Selective Mitigation

Measures or techniques developed to reduce adverse impact on a case-by-case, or selective, basis.

Semi-arid

A climate or region characterized by little yearly rainfall and by the growth of a number of short grasses and shrubs.

Sensitivity

The state of being readily affected by the actions of external influence.

Sensitive Species

Those species for which population viability is a concern as evidenced by significant current or predicted downward trends in (1) population numbers or densities, or (2) habitat capability that would reduce a species' existing distribution.

Significance Criteria

Criteria identified to determine whether or not impacts on specific resources would be significant.

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Significance

The importance or weight of an impact as determined by its context and intensity, or severity.

Simulations

The use of a computer to calculate the effect of a given physical process.

Slope

The degree of deviation of a surface from the horizontal.

Soil Series

A group of soils having genetic horizons (layers) that, except for texture of the surface layer, have similar characteristics and arrangement in profile.

Solid Waste

Non liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes also include sewage sludge, agricultural refuse, demolition wastes, and mining residues. Technically, solid waste also refers to liquids and gases in containers.

Species of Concern

An informal term that refers to species the U.S. Fish and Wildlife Services believes might be in need of concentrated conservation actions. Species of concern receive no legal protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species.

Spill Prevention, Containment, and Countermeasures Plan

A plan developed and implemented by onshore facilities that includes physical structures and other measures to respond to and prevent spills of oil or hazardous substances from reaching navigable waters.

Spring

A location where ground water flows naturally onto the land surface.

Stable Isotope

Atoms of an element that vary from one another only in the number of protons are referred to as isotopes of that element. Stable isotopes are isotopes that do not undergo radioactive decay. The most common stable isotopes are isotopes of oxygen and hydrogen.

Steam Turbine

A machine that has propeller-like blades that can be moved by steam to spin a rotor in a generator to produce electricity.

Step-Drawdown Test

A type of aquifer test performed by pumping a well at a several sequential rates to assess well efficiency and/or select the optimum pumping rate for a constant-discharge test.

Storage Coefficient

A hydraulic property of an aquifer that describes the amount of water released from storage during pumping.

Stormwater

Water from precipitation that flows across the ground and pavement when it rains or when snow and ice melt. Collectively, the draining water is called stormwater runoff.

Stormwater Pollution Prevention Plan

A plan developed under the Clean Water Act that discusses measures taken to prevent the release of pollutants from stormwater runoff.

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Strata

Plural of stratum. Horizontal layer of sedimentary rock.

Stream Channel Deposit

A sedimentary deposit formed in a stream channel.

Subspecies

Any natural subdivision of a species that exhibits small, but persistent morphological variations from other subdivisions of the same species living in different geographical regions or times.

Substation

An assemblage of equipment, enclosed by fence, occurring at points along a transmission line. A facility in an electrical transmission system with the capability to route and control electrical power, and to transform power to a higher or lower voltage. Equipment includes transformers, circuit breakers, and other equipment for switching, changing, or regulating the voltage of electricity.

Surface Water

Water that flows exclusively across the surface of the land from the point of application to the point of discharge.

Tertiary

The first period in the Cenozoic Era, spanning from 65 to 1.8 million years ago.

Threatened Species

Any species likely to become endangered within the foreseeable future throughout all or a significant part of its range.

Total Dissolved Solids (TDS)

A term that describes the quantity of dissolved minerals and salts in water.

Traditional Cultural Resource

A historic resource that is significant because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

Transition Zone

The area between two discrete environmental areas, and thus containing elements of each. For example, the transition zone between an upland pinon forest and a lowland desert scrub environment.

Transmission Line

An electrical conductor/cable that carries high-voltage electricity from a generator to other locations for distribution.

Transmissivity

A hydraulic property of an aquifer that describes the rate of flow of groundwater through a unit width of the saturated thickness of the aquifer under a hydraulic gradient of 1:1.

Triassic

The first period in the Mesozoic Era, spanning from 225 to 190 million years ago and following the Permian Period of the Paleozoic Era; characterized by the appearance of many reptiles, including the dinosaurs.

Tributary

A stream or river that flows into a larger body of water.

Turning Dead-end Structure

A transmission line tower structure that is more robust than a typical structure, used (1) to add longitudinal strength to the line, (2) at turning points (angles), (3) for added safety at crossings of other utilities such as other transmission liens and roads, and (4) to interrupt long distances of

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suspension structures that would otherwise provide more exposure to catastrophic line failure over long distance.

Two-Track

A 10-foot-wide travelway periodically used by vehicles.

Uranium

A very heavy, silvery, metallic element that is crucial to the research and development of atomic energy.

Utility Corridor

A route designated for use by utilities for locating pipelines, cables, and transmission lines.

Variety Class

A designation (A, B, or C) assigned to a homogeneous area of the landscape to indicate the visual importance or quality relative to other landscape areas within the same physiographic province (USFWS designation).

Vegetation Communities

Species of plants that commonly live together in the same region or ecotone.

Vegetation Type

A plant community with distinguishable characteristics described by the dominant vegetation present.

Viewshed

Visible portion of the specific landscape seen from a specific viewpoint, normally limited by landform, vegetation, distance and existing cultural modifications.

Visual Contrast

The effect of a striking difference in the form, line, color or texture of an area being viewed.

Visual Contrast Rating

A method of determining the extent of visual impact for an existing or proposed activity that would modify any landscape feature (land and water form, vegetation and structures).

Visual Management Objectives

The term used in this study to generally define VRM (BLM) or VQO classes (Forest Service).

Visual Management System

System of land management based upon meeting visual resource goals (Forest Service).

Visual Resource Management (VRM) classes

Classification of landscapes according to the kinds of structures and changes that are acceptable to meet established visual goals (BLM).

Visual Resources

The visible physical features of a landscape (topography, water, vegetation, animals. structures, and other features) that constitute the scenery of an area.

Visual Sensitivity Levels

The index of the relative degree of user interest in scenic quality and concern for existing or proposed changes in the landscape features of that area in relation to other areas in the study area.

Visual Quality Objectives

Classification of landscape areas according to the types of structures and changes that are acceptable to meet established visual goals (Forest Service designation).

Volatile Organic Compounds (VOCs)

Compounds including organic chemicals (containing carbon), which are the basic chemicals found in lining things and in products

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derived from living things, such as coal, petroleum, and refined petroleum products and volatile chemicals, which produce vapors readily. VOCs include gasoline, industrial chemicals, and solvents. Many VOCs also are hazardous air pollutants.

Volcanic Rock

Rock formed from the extrusion of magma onto or near the earth's surface. Also referred to as extrusive igneous rock.

Volt

A unit of electrical force equal to that amount of electromotive force that will cause a steady current of 1 ampere to flow through a resistance of 1 ohm.

Voltage

The amount of electromotive force, measured in volts, that exists between two points.

Wall Boundary

A groundwater modeling term that refers to a type of boundary within a model that simulates the lateral limit of an aquifer, and prevents the flow of water from one model cell to an adjacent cell. A wall boundary is a type of no-flow boundary (see definition of no-flow boundary).

Wash

An intermittent stream channel.

Waste Management

The handling, storage, and disposal of unwanted materials.

Wastewater

Water containing dissolved or suspended solids that has been used in homes, industries, and businesses that is not for reuse unless it is treated.

Water Level Drawdown

The decline in elevation of the groundwater table, or the water level in a well, due to natural causes (such as decreased precipitation or an increase in riparian vegetation) or groundwater pumping.

Water Level Recovery

The rise in elevation of the groundwater table, or the water level in a well, due to natural causes (such as increased precipitation or a decrease in riparian vegetation) or a decrease in groundwater pumping.

Water Table

The upper surface of the saturated portion of an aquifer.

Watershed

The land area that drains water to a particular stream, river, or lake. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large watersheds often contain numerous smaller subwatersheds.

Waters of the United States

All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce including adjacent wetlands and tributaries to waters of the United States; and all waters by which the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce.

Wetlands

Those areas that are inundated by surface or groundwater with a frequency sufficient to support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

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Wilderness, Wilderness Area

An area formally designated by Congress as a part of the National Wilderness Preservation System.

Wilderness Characteristics

Qualities identified by Congress in the Wilderness Act of 1964 including size; naturalness; outstanding opportunities for solitude or a primitive and unconfined type of recreation; and supplemental values such as geological, archaeological, historical, ecological, scenic, or other features.

Xeroriparian

Riparian habitats generally associated with an ephemeral water supply. These communities typically contain plant species also found in upland habitats, however, these plants are typically larger and/or occur at higher densities than adjacent uplands.

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Chapter 10

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