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

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).

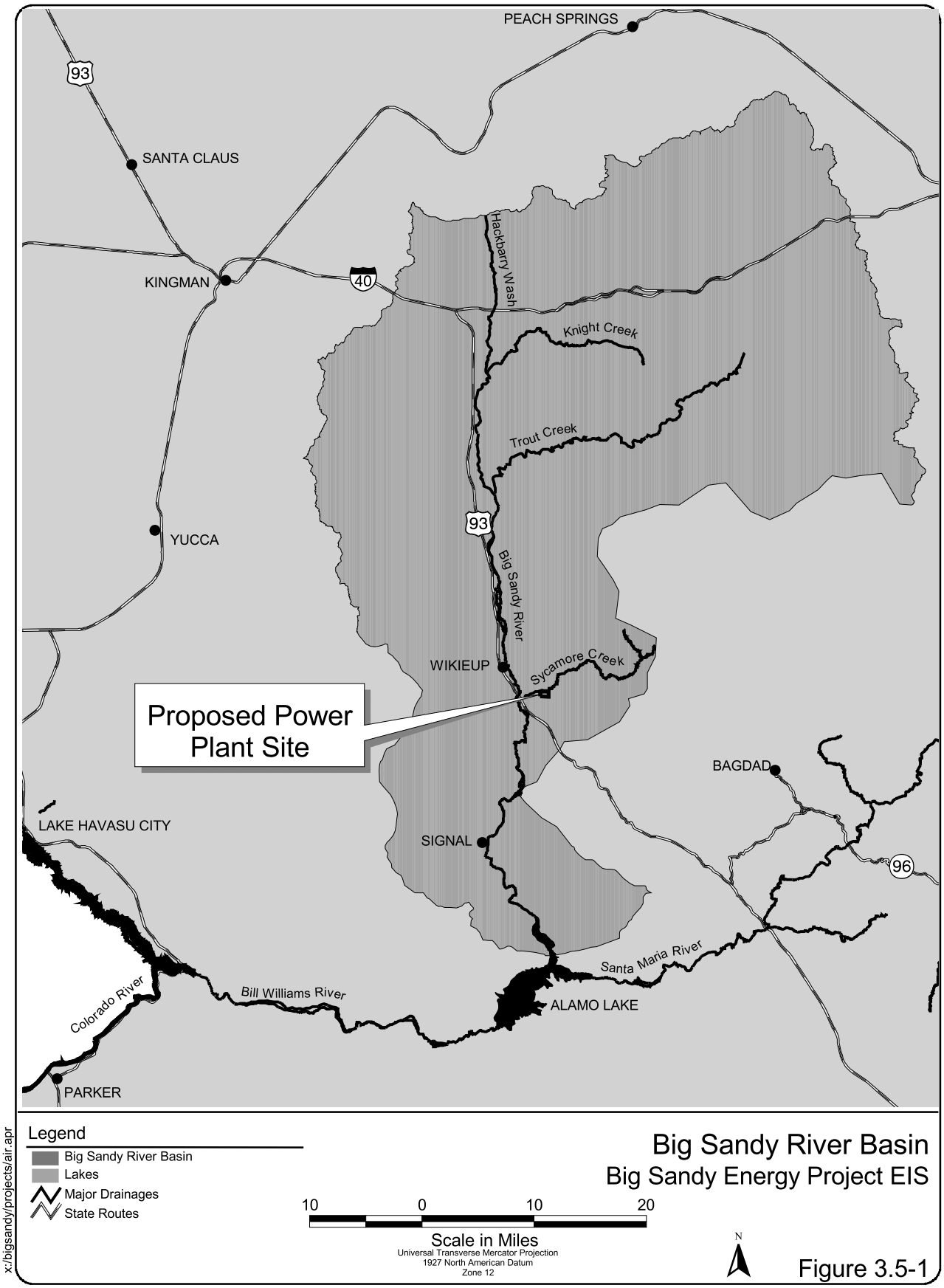
Water quality data for the Big Sandy River at the gaging station south of Wikieup are available from 1977 through 1979. A brief summary of these data are presented in Table 3.5-1. Based on these data, the river meets all primary Federal drinking water standards for the selected analytes with the exception 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.

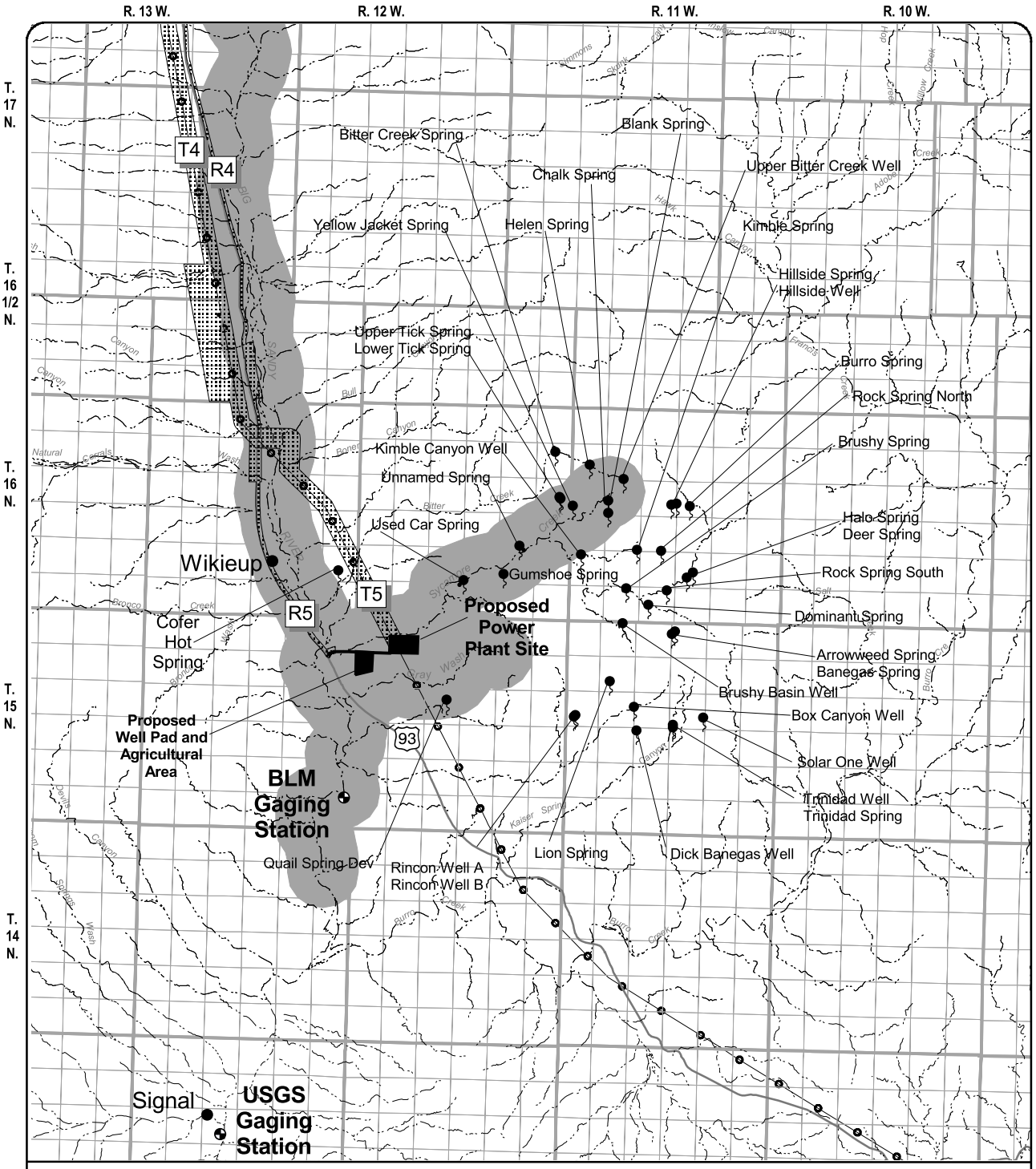
Communication Facilities

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,



Big Sandy River Basin
Big Sandy Energy Project EIS

Figure 3.5-1



Legend

Resource Components
- Important Streams
- Springs
- Gaging Station

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
- U.S. Route

0 5

Scale in Miles

Universal Transverse Mercator Projection
1927 North American Datum
Zone 12

Surface Water Resources Map of the Big Sandy Basin

Big Sandy Energy Project EIS

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Figure 3.5-2

x:/bigsandy/projects/surfacewater.apr

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

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.

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

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 g/L, which exceed the Big Sandy River arsenic surface water quality standard of 50 g/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

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.

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.