Section 4.1
Big Sandy Basin

4.1.1 Geography of the Big Sandy Basin

The Big Sandy Basin, located in the east central part of the planning area, is the second largest basin at 1,988 square miles. Geographic features and principal communities are shown on Figure 4.1-1. The basin is characterized by a large valley and mid-elevation mountain ranges and plateaus. Vegetation types include Arizona upland Sonoran desertscrub, Plains and Great Basin and semi-desert grasslands, interior chaparral, Rocky Mountain and madrean montane forest and Great Basin conifer woodland (see Figure 4.0-9). Riparian vegetation is found along some streams and includes cottonwood/willow, mesquite and tamarisk along the Big Sandy River and mesquite, cottonwood/willow and mixed broadleaf along sections of Trout Creek.

- Principal geographic features shown on Figure 4.1-1 are:
    - Big Sandy River running north to south through Cane Springs and Wikieup
    - Hackberry Wash south of Valentine
    - Trout Creek, a major tributary to the Big Sandy River, flowing east to west in the middle of the basin
    - The Aquarius Mountains east of the Big Sandy River
    - The Cottonwood Mountains south of Valentine
    - The Hualapai Mountains along the western boundary of the basin, which contains the highest point in the basin and planning area, Hualapai Peak at 8,417 feet.
    - The lowest point in the basin, about 1,650 feet, is south of Wikieup where the Big Sandy River exits the basin

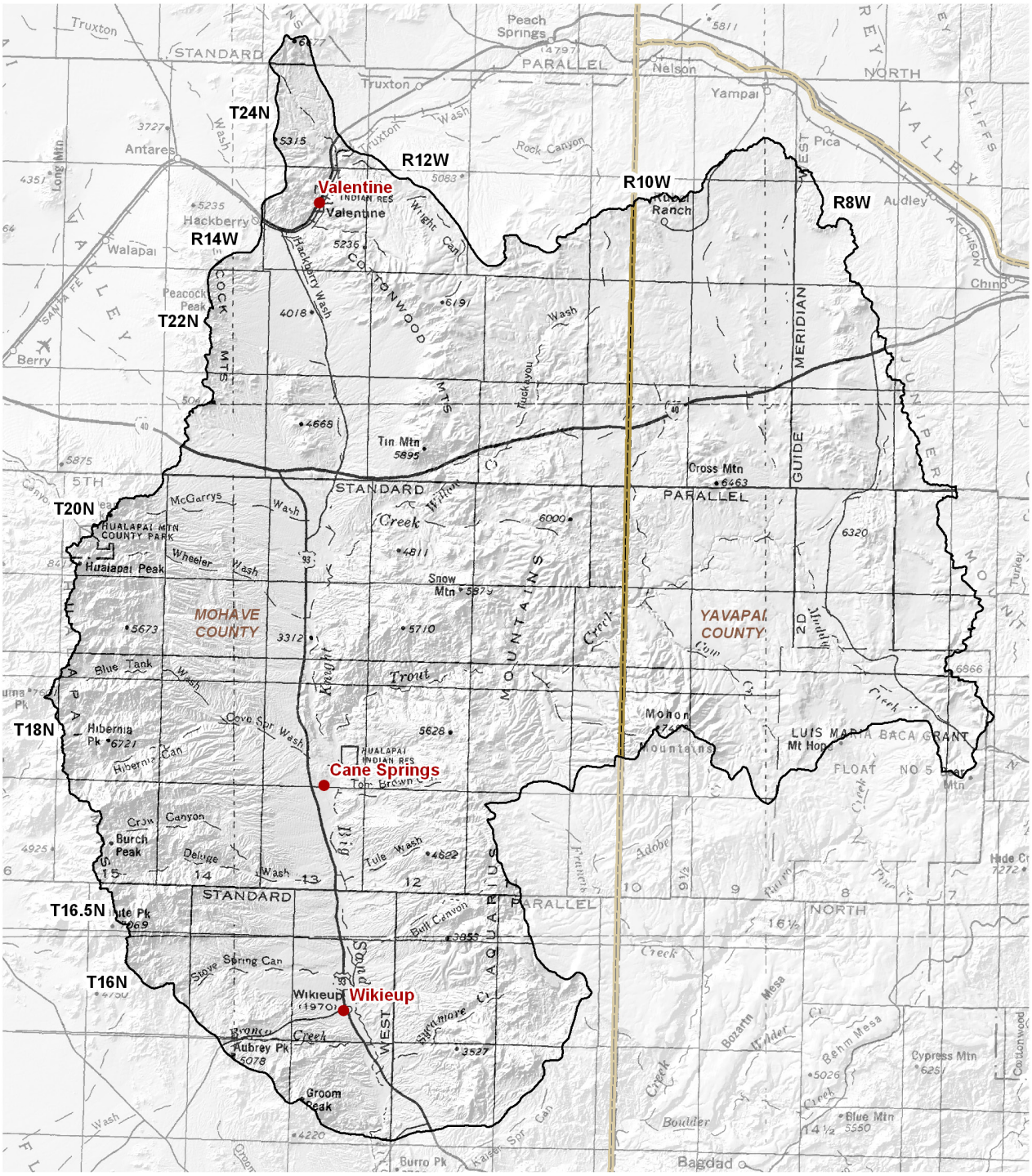


Figure 4.1-1
Big Sandy Basin
Geographic Features

COUNTY
City, Town or Place

Base Map: USGS 1:500,000, 1981

4.1.2 Land Ownership in the Big Sandy Basin

Land ownership, including the percentage of ownership by category, for the Big Sandy Basin is shown in Figure 4.1-2. A principal feature of land ownership in this basin is the large amount of private and federal lands interspersed with state trust lands creating a checkerboard pattern. For a discussion of how this land pattern was created see section 4.0.9. A description of land ownership data sources and methods is found in Volume 1, Appendix A. More detailed information on protected areas is found in Section 4.0.4. Land ownership categories are discussed below in the order from largest to smallest percentage in the basin.

Private

- 40.6% of the land is private.
- The majority of the private land is interspersed with state trust, national forest and BLM lands.
- There are a number of larger parcels of private land along the northeastern, northwestern and southeastern basin boundaries.
- Land uses include domestic, commercial, ranching and farming.

U.S. Bureau of Land Management (BLM)

- 29.7% of the land is federally owned and managed by the Kingman Field Office of the BLM.
- All BLM lands are located in the western portion of the basin.
- Primary land uses are grazing and recreation.

State Trust Land

- 28.5% of the land in this basin is held in trust for the public schools and seven other beneficiaries under the State Trust Land system.
- The majority of the state trust land occurs in a checkerboard pattern interspersed with private and federal land. Larger contiguous portions of state trust land are found in the northern portion of the basin.
- Primary land use is grazing.

National Forest

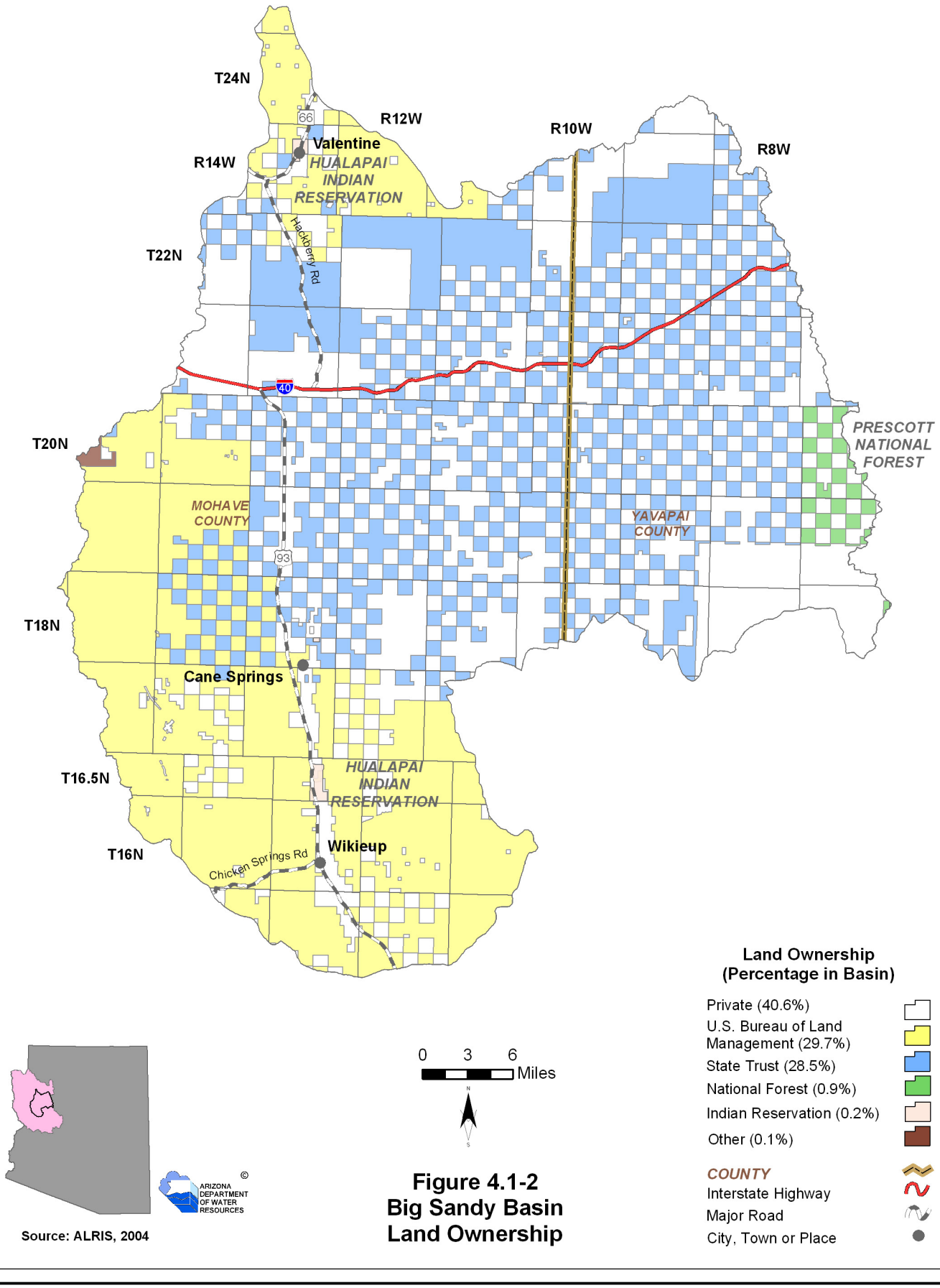
- 0.9% of the land is federally owned and managed by the United States Forest Service (USFS).
- All forest lands in the basin are part of the Prescott National Forest.
- All forest lands are intermingled with private land.
- Land uses include grazing, timber production and recreation.

Indian Reservation

- 0.2% of the land is under ownership of the Hualapai Tribe.
- Tribal lands are located in a small strip along Highway 93 north of Wikieup and around Valentine.
- Land uses include domestic, commercial and grazing.

Other (Game and Fish, County and Bureau of Reclamation Lands)

- 0.1% of the land is owned and managed by Mohave County as the Hualapai Mountain Park, located in T20N, R15W on the western basin boundary.
- Primary land use is recreation.



Source: ALRIS, 2004

Figure 4.1-2
Big Sandy Basin
Land Ownership

4.1.3 Climate of the Big Sandy Basin

Climate data from NOAA/NWS Co-op Network stations are complied in Table 4.1-1 and the locations are shown on Figure 4.1-3. Figure 4.1-3 also shows precipitation data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. The Big Sandy Basin does not contain Evaporation Pan, AZMET and SNOTEL/Snowcourse stations. More detailed information on climate in the planning area is found in Section 4.0.3. A description of the climate data sources and methods is found in Volume 1, Appendix A.

NOAA/NWS Co-op Network

- Refer to Table 4.1-1A
- There are two NOAA/NWS Co-op network climate stations in the basin. The average monthly maximum temperature occurs in July at both stations and ranges between 86.4°F at Wikieup to 80.5°F at Truxton Canyon. The average monthly minimum temperature occurs in January and ranges between 48.4°F at Wikieup to 40.9°F at Truxton Canyon.
- Highest average seasonal rainfall occurs in the winter (January - March) at the Wikieup station, while the Truxton Canyon station reports comparable precipitation in the summer (July-September) and winter. For the period of record, the highest annual rainfall is 11.56 inches at Truxton Canyon and the lowest is 9.88 inches at Wikieup.

SCAS Precipitation Data

- See Figure 4.1-3
- Additional precipitation data shows rainfall as high as 22 inches at the southeastern-most tip of the basin (T18N, R7W) in the Juniper Mountains and as low as eight inches in the areas south of Wikieup and north of Valentine.

Table 4.1-1 Climate Data for the Big Sandy Basin

A. NOAA/NWS Co-op Network:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Temperature Range (in F)		Average Total Precipitation (in inches)				
			Max/Month	Min/Month	Winter	Spring	Summer	Fall	Annual
Truxton Canyon	3,820	1948-1980[1]	80.5/Jul	40.9/Jan	3.87	1.34	3.86	2.48	11.56
Wikieup	2,010	1971-2000	86.4/Jul	48.4/Jan	4.34	0.69	2.75	2.10	9.88

Source: WRCC, 2005

Notes:
[1]Average temperature for period of record shown; average precipitation from 1971-2000

B. Evaporation Pan:

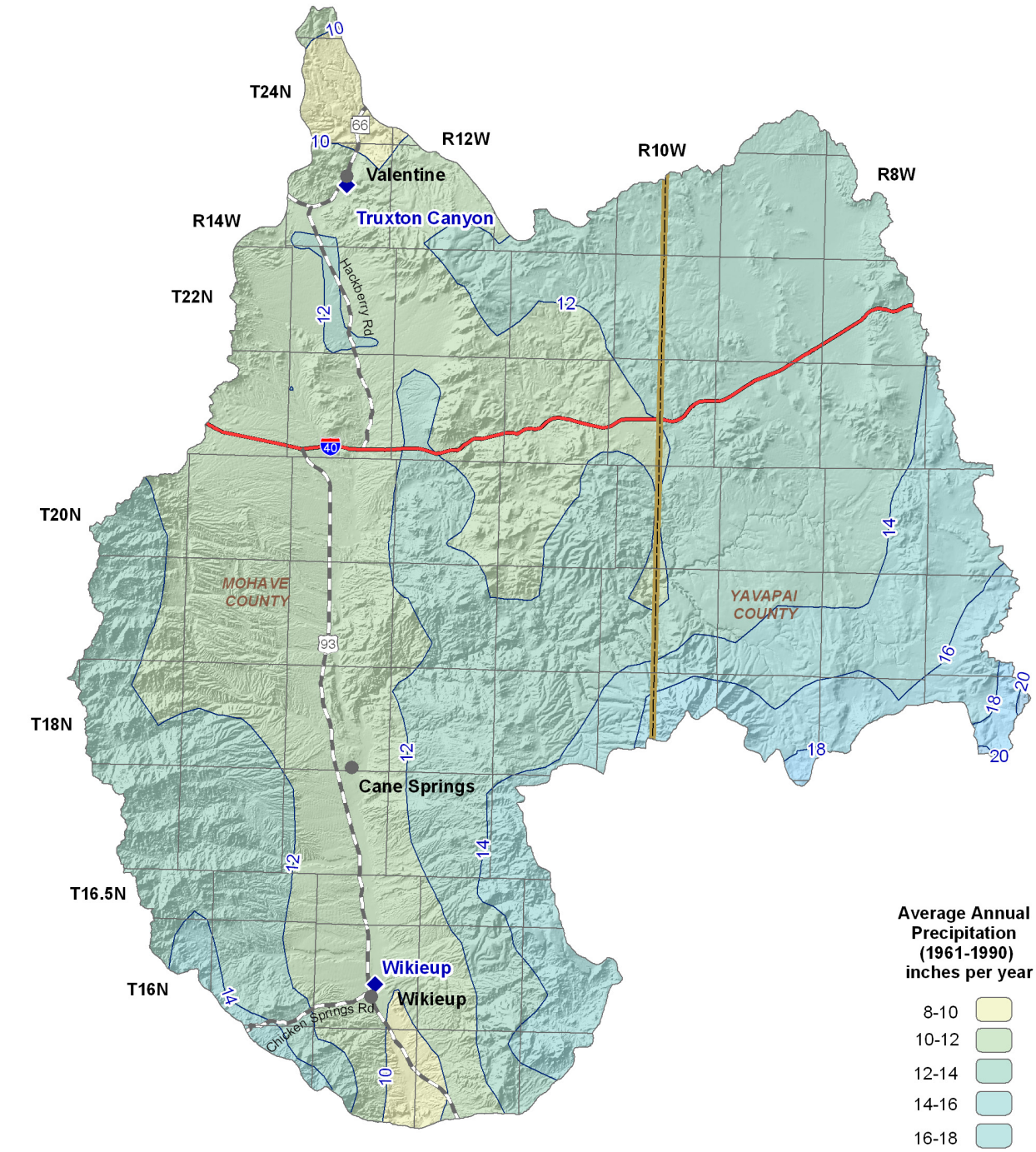
Station Name	Elevation (in feet)	Period of Record Used for Averages	Avg. Annual Evap (in inches)
None			

C. AZMET:

Station Name	Elevation (in feet)	Period of Record	Average Annual Reference Evaportranspiration, in inches (*Number of years to calculate averages*)
None			

D. SNOTEL/Snowcourse:

Station Name	Elevation (in feet)	Period of Record	Average Snowpack, at Beginning of the Month, as Inches Snow Water Content *(Number of measurements to calculate average)*					
			Jan	Feb	March	April	May	June
None								



Precipitation Data Source: Oregon State Univeristy, 1998

Figure 4.1-3
Big Sandy Basin
Meteorological Stations
and Annual Precipitation

4.1.4 Surface Water Conditions in the Big Sandy Basin

Streamflow data, including average seasonal flow, average annual flow and other information is shown in Table 4.1-2. Flood ALERT equipment in the basin is shown in Table 4.1-3. Reservoir and stockpond data, including maximum storage or maximum surface area, are shown in Table 4.1-4. The location of streamflow gages identified by USGS number, flood ALERT equipment, USGS runoff contours and large reservoirs are shown on Figure 4.1-4. Descriptions of stream, reservoir and stockpond data sources and methods are found in Volume 1, Appendix A.

Streamflow Data

- Refer to Table 4.1-2.
- Data from two stations on two watercourses are shown in the table and on Figure 4.1-4. One station has been discontinued and the other is a real-time station.
- The average seasonal flow is highest in the summer (July-September) and lowest in the spring (April-June) and the fall (October-December).
- Maximum annual flow in the basin was 8,326 acre-feet in 1976 at the Cottonwood Wash station and minimum annual flow was 22 acre-feet in 2002 at the Truxton Wash station.

Flood ALERT Equipment

- Refer to Table 4.1-3.
- As of October 2005 there were four stations in the basin, all in Mohave County.

Reservoirs and Stockponds

- Refer to Table 4.1-4.
- The basin contains one large reservoir with a maximum capacity of 2,284 acre-feet which is used for fire protection or as a stock or farm pond.
- Surface water is stored or could be stored in 10 small reservoirs in the basin.
- There are 426 registered stockponds in this basin.

Runoff Contour

- Refer to Figure 4.1-4.
- Average annual runoff is one inch per year, or 53.5 acre-feet per square mile, in the in the south-central portion of the basin near Cow Creek decreasing to 0.1 inches, or 5.35 acre-feet per square mile, to the north and west.

Table 4.1-2 Streamflow Data for the Big Sandy Basin

Station Number	USGS Station Name	Drainage Area (in mi^2)	Gage Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow/Year (in acre-feet)				Years of Annual Flow Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9404343	Truxton Wash near Valentine	380	3,770	3/1993-current (real time)	26	8	61	5	22 (2002)	543	875	2,527 (1995)	9
9424200	Cottonwood Wash No. 1 near Kingman	143	4,545	2/1964-9/1978 (discontinued)	37	7	44	12	601 (1975)	2,867	3,026	8,326 (1976)	13

Source: USGS (NWIS) 2005 & 2008

Notes:
Statistics based on Calendar Year
Annual Flow statistics based on monthly values
Summation of Average Annual Flows may not equal 100 due to rounding.
Period of record may not equal Year of Record used for annual Flow/Year statistics due to only using years with a 12 month record
In Period of Record, current equals November 2008
Seasonal and annual flow data used for the statistics was retrieved in 2005

Table 4.1-3 Flood ALERT Equipment in the Big Sandy Basin

Station ID	Station Name	Station Type	Install Date	Responsibility
1570	Hualapai Mountain	Weather Station	NA	Mohave County FCD
1580	Cedar Hills	Precipitation	NA	Mohave County FCD
7640	Greenwood Village	Precipitation	NA	Mohave County FCD
7650	Wikieup	Weather Station	NA	Mohave County FCD

Source: ADWR 2005b

Notes:
FCD = Flood Control District
NA = Information is not available to ADWR at this time

Table 4.1-4 Reservoirs and Stockponds in the Big Sandy Basin

A. Large Reservoirs (500 acre-feet capacity and greater)

MAP KEY	RESERVOIR/LAKE NAME	OWNER/OPERATOR	MAXIMUM STORAGE (AF)	USE[1]	JURISDICTION
1	Lake Mary (Oro Ranch Dam)	Private	2,284	P	State

Source: Compilation of databases from ADWR & others

B. Other Large Reservoirs (50 acre surface area or greater)[2]

MAP KEY	RESERVOIR/LAKE NAME	OWNER/OPERATOR	MAXIMUM SURFACE AREA (acres)	USE	JURISDICTION
None identified by ADWR at this time					

C. Small Reservoirs (greater than 15 acre-feet and less than 500 acre-feet capacity)

Total number: 3
Total maximum storage: 492 acre-feet

D. Other Small Reservoirs (between 5 and 50 acres surface area)[2]

Total number: 7
Total surface area: 92 acres

E. Stockponds (up to 15 acre-feet capacity)

Total number: 426 (from water right filings)

Notes:
[1] P=fire protection, stock or farm pond
[2]Capacity data not available to ADWR

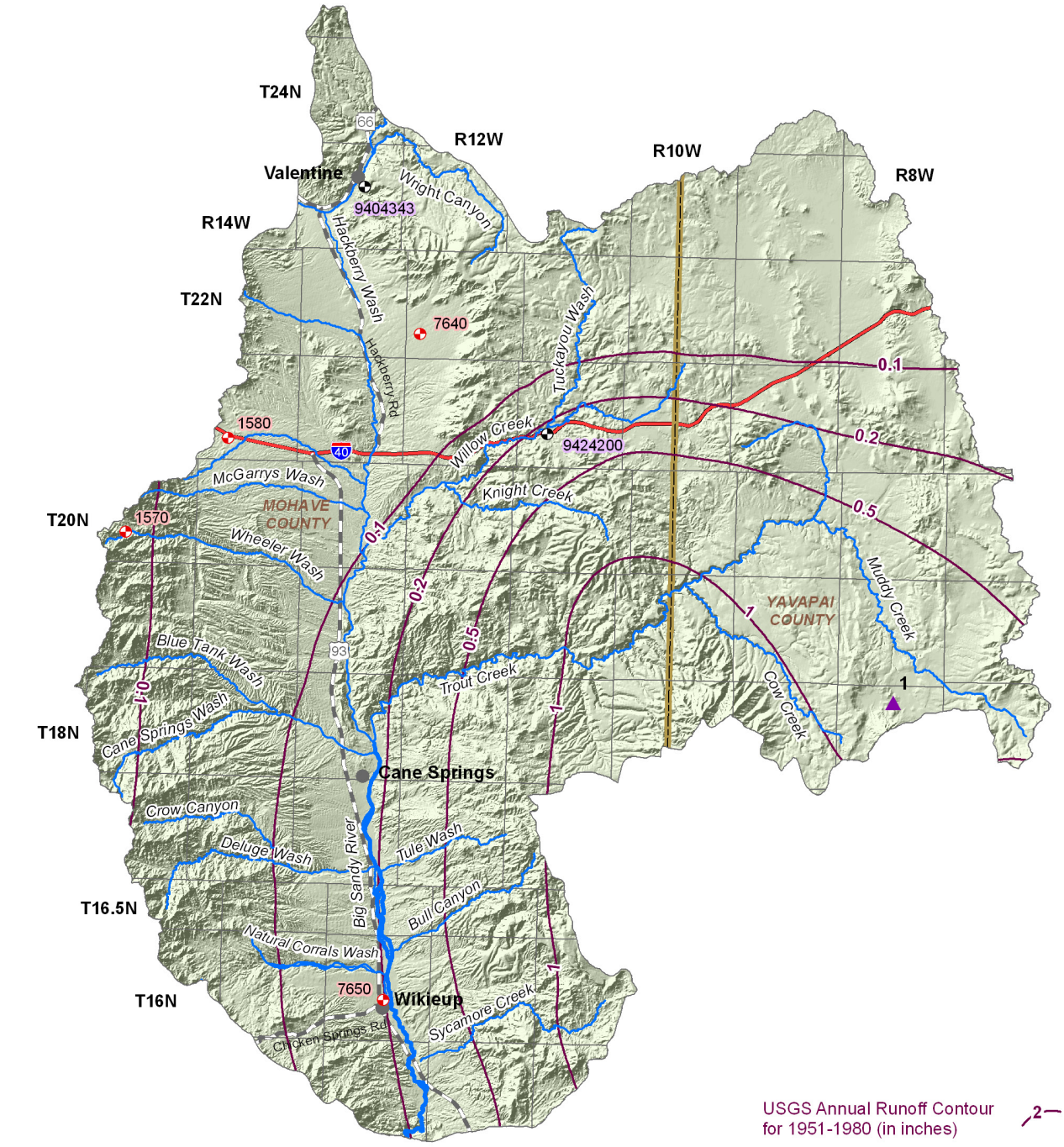


Figure 4.1-4
Big Sandy Basin
Surface Water Conditions

4.1.5 Perennial/Intermittent Streams and Major Springs in the Big Sandy Basin

Major and minor springs with discharge rates and date of measurement, and the total number of springs in the basin are shown in Table 4.1-5. The locations of major springs as well as perennial and intermittent streams are shown on Figure 4.1-5. Descriptions of data sources and methods for intermittent and perennial reaches and springs are found in Volume 1, Appendix A.

- There are five perennial streams located in the basin, Cottonwood Creek, Willow Creek, Fort Rock Creek, Trout Creek and the Big Sandy River.
- Numerous intermittent streams are located throughout the basin with a relatively large emanating from the western basin boundary.
- There are six major springs with a measured discharge of 10 gallons per minute (gpm) or greater at any time. The largest discharge is 1,600 gpm at an unnamed spring near the Big Sandy River south of Cane Springs.
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 4.1-5B. There are 11 minor springs identified in this basin.
- Listed discharge rates may not be indicative of current conditions. All of the measurements were taken during or prior to 1982.
- The total number of springs identified by the USGS varies from 165 to 179, depending on the database reference.

Table 4.1-5 Springs in the Big Sandy Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm)[1]	Date Discharge Measured
		Latitude	Longitude		
1	Unnamed[2]	345407	1133724	1,600	8/21/1980
2	Unnamed[2]	344002	1133513	400	8/20/1980
3	Valentine[2]	352325	1133920	400	10/1/1943
4	Unnamed[2]	352505	1133830	330	During or prior to 1943
5	Cofer Hot	344144	1133423	200	During or prior to 1982
6	Unnamed[2]	352159	1133713	10	During or prior to 1964

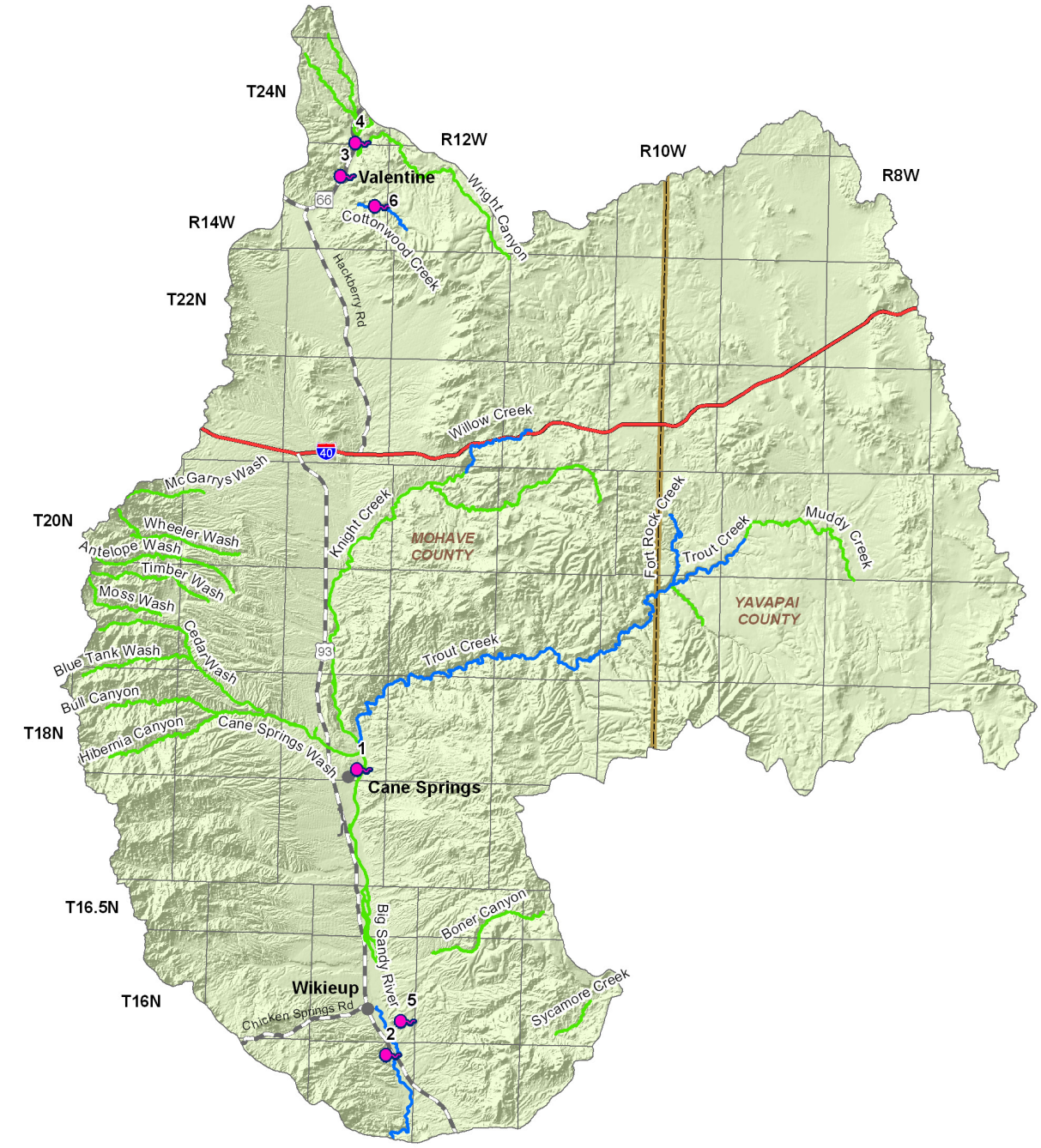
B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm)[1]	Date Discharge Measured
	Latitude	Longitude		
Unnamed[2]	352350	1134039	5	1/1965
Unnamed	352340	1134034	5	1/1965
Unnamed	352420	1133930	3	1/1965
Unnamed	352013	1134342	3	1/1965
Unnamed	352354	1133814	3	1/1965
Unnamed	352232	1134101	3	1/1965
Unnamed	352230	1134159	3	1/1965
Unnamed	352301	1133740	2	1/1965
Unnamed	352827	1134217	2	During or prior to 1965
Cane	345524	1133950	1	6/1/1980
Unnamed	352311	1133955	1	2/1965

Source: Compilation of databases from ADWR & others

C. Total number of springs, regardless of discharge, identified by USGS (see ALRIS, 2005a and USGS, 2006a): 165 to 179

Notes:
[1]Most recent measurement identified by ADWR
[2]Spring is not displayed on current USGS topo maps



ARIZONA DEPARTMENT OF WATER RESOURCES ©

Stream Data Source: AGFD, 1993 & 1997

0 3 6 Miles

Figure 4.1-5
Big Sandy Basin
Perennial/Intermittent Streams and Major (>10 gpm) Springs

Springs 1
Intermittent Streams
Perennial Streams
COUNTY
Interstate Highway
Major Road
City, Town or Place

4.1.6 Groundwater Conditions of the Big Sandy Basin

Major aquifers, well yields, estimated natural recharge, estimated water in storage, number of index wells and date of last water-level sweep are shown in Table 4.1-6. Figure 4.1-6 shows aquifer flow direction and water-level change between 1990-1991 and 2003-2004. Figure 4.1-7 contains hydrographs for selected wells shown on Figure 4.1-6. Figure 4.1-8 shows well yields in five yield categories. A description of aquifer data sources and methods as well as well data sources and methods, including water-level changes and well yields are found in Volume 1, Appendix A.

Major Aquifers

- Refer to Table 4.1-6 and Figure 4.1-6.
- Major aquifers in the basin include recent stream alluvium, basin fill and sedimentary rock (R Aquifer).
- This basin contains two sub-basins, Wikieup and Fort Rock.
- Flow direction is generally from the north to the south.

Well Yields

- Refer to Table 4.1-6 and Figure 4.1-8.
- As shown on Figure 4.1-8 well yields in this basin range from less than 100 gpm to greater than 2,000 gpm.
- One source of well yield information, based on 87 reported wells, indicates that the median well yield in this basin is 300 gpm.

Natural Recharge

- Refer to Table 4.1-6.
- The estimated natural recharge for this basin is 22,000 acre-feet per year (AFA).

Water in Storage

- Refer to Table 4.1-6.
- Storage estimates range from 9.5 million acre-feet (maf) to 21 maf to a depth of 1,200 feet.

Water Level

- Refer to Figure 4.1-6. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures 18 index wells in this basin. Hydrographs for four of these wells are shown in Figure 4.1-7.
- The deepest recorded water level in the basin is 488 feet near the northeastern basin boundary and the shallowest is 15 feet south of Wikieup.

Table 4.1-6 Groundwater Data for the Big Sandy Basin

Basin Area, in square miles:	1,988	
Major Aquifer(s):	**Name and/or Geologic Units**	
	Recent Stream Alluvium	
	Basin Fill	
	Sedimentary Rock (R Aquifer)	
Well Yields, in gal/min:	6.6 (1 well measured)	Measured by ADWR (GWSI) and/or USGS
	Range 1-2,250 Median 300 (87 wells reported)	Reported on registration forms for large (>10-inch) diameter wells (Wells55)
	Range 30-1,000	ADWR (1990 and 1994b)
	Range 0-500	Anning and Duet (1994)
Estimated Natural Recharge, in acre-feet/year:	22,000	Freethey and Anderson (1986)
Estimated Water Currently in Storage, in acre-feet:	9,500,000 (to 1,200 ft)	ADWR (1990)
	10,000,000[1] (to 1,200 ft)	Freethey and Anderson (1986)
	21,000,000 (to 1,200 ft)	Arizona Water Commission (1975)
Current Number of Index Wells:	18	
Date of Last Water-level Sweep:	2008 (104 wells measured)	

Notes:
[1]Predevelopment Estimate

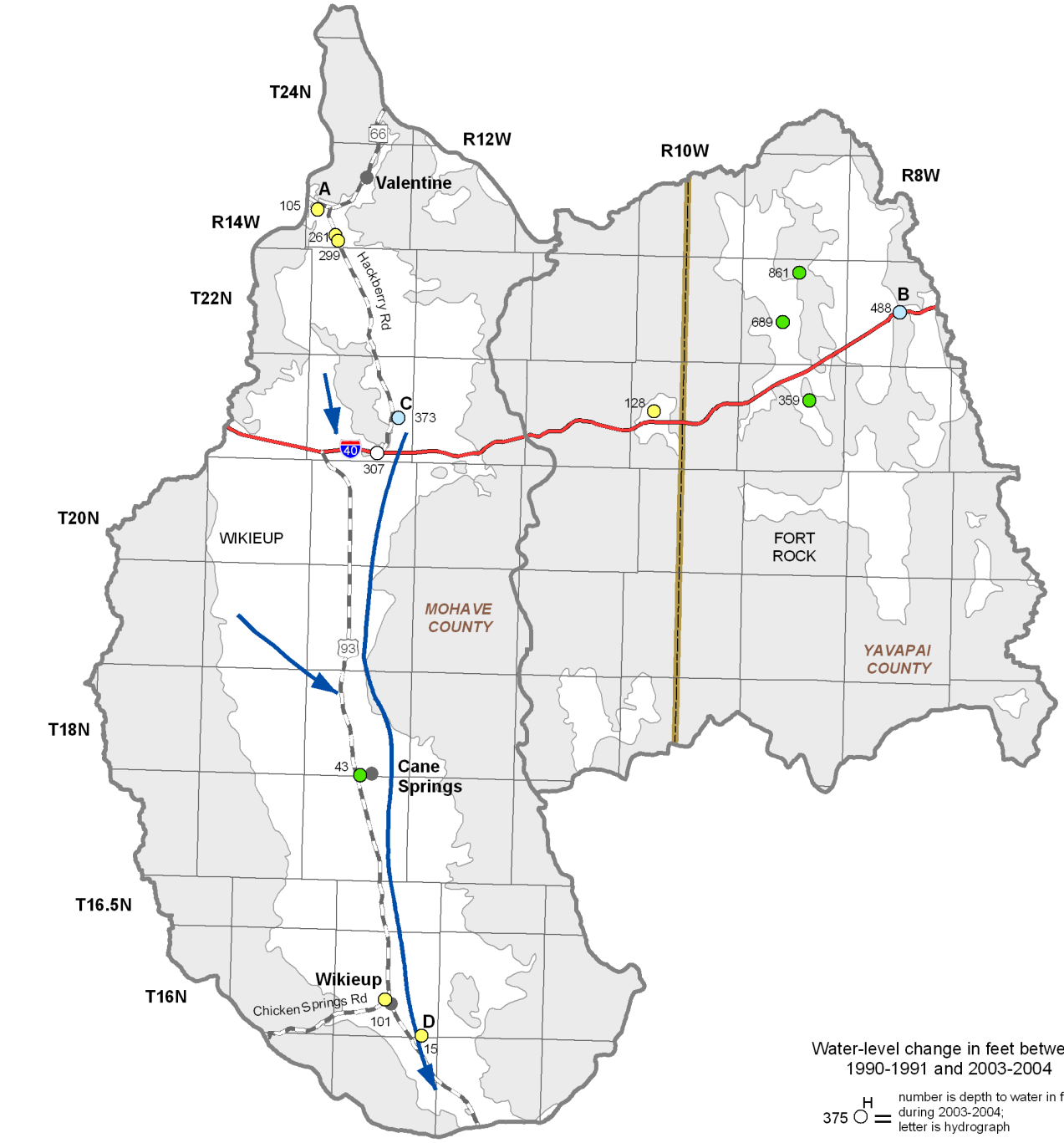
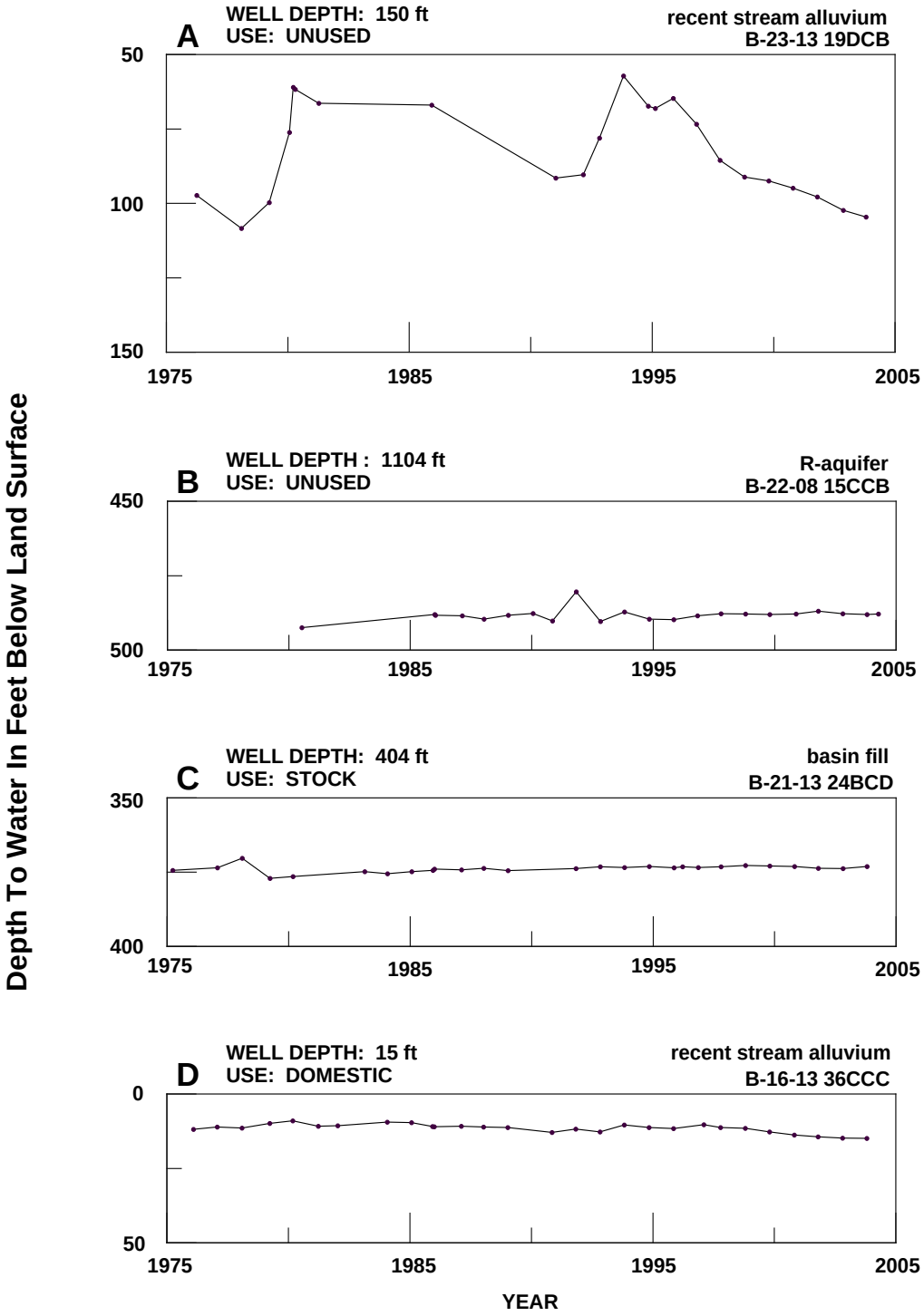


Figure 4.1-6
Big Sandy Basin
Groundwater Conditions

Figure 4.1-7
Big Sandy Basin
Hydrographs Showing Depth to Water in Selected Wells



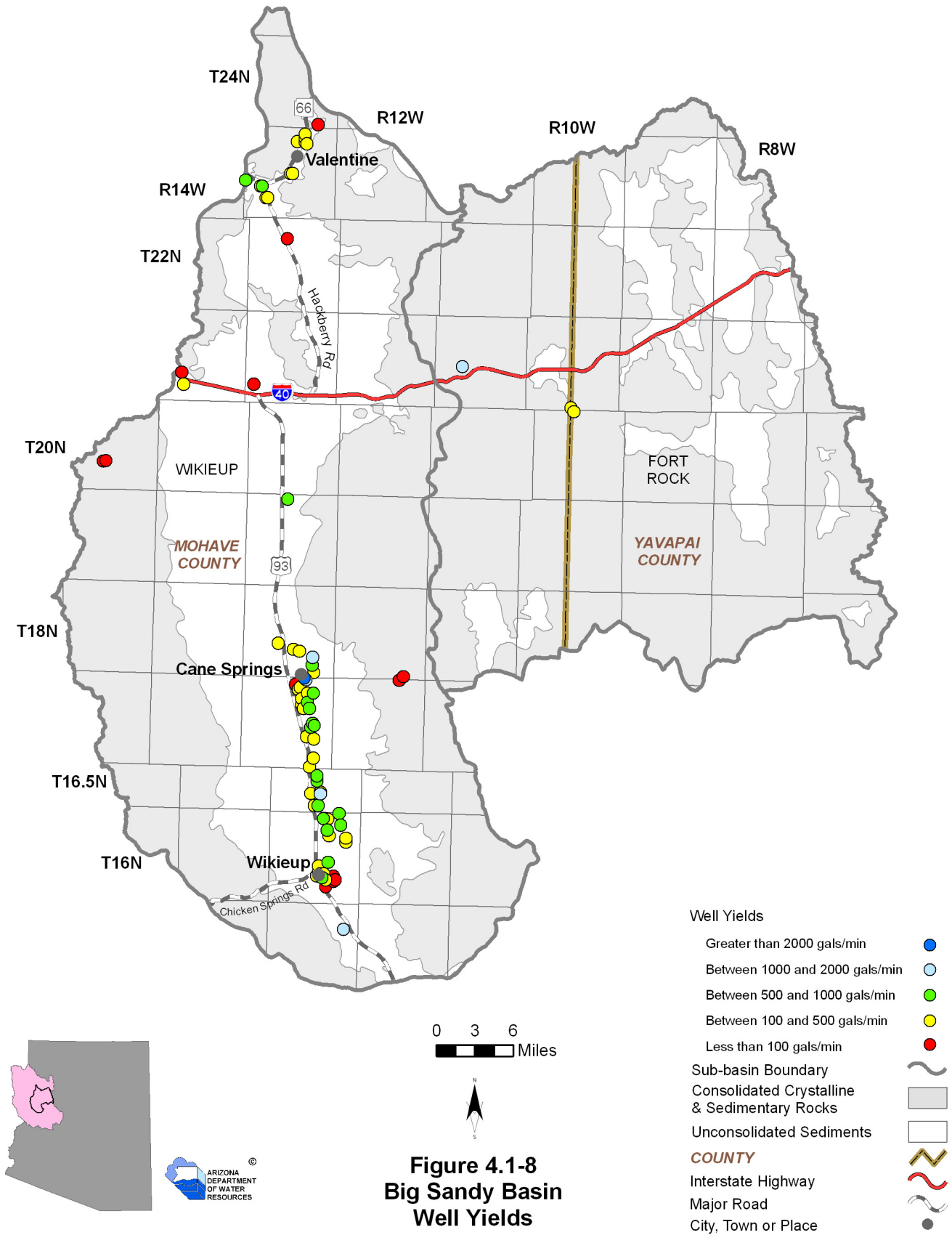


Figure 4.1-8
Big Sandy Basin
Well Yields

4.1.7 Water Quality of the Big Sandy Basin

Sites with parameter concentrations that have equaled or exceeded drinking water standard(s) (DWS), including location and parameter(s) are shown in Table 4.1-7A. There are no impaired lakes or streams in this basin. Figure 4.1-9 shows the location of exceedences keyed to Table 4.1-7A. Not all parameters were measured at all sites; selective sampling for particular constituents is common. A description of water quality data sources and methods is found in Volume 1, Appendix A.

Well, Mine or Spring sites that have equaled or exceeded drinking water standards (DWS)

- Refer to Table 4.1-7A.
- Sixty-four sites have parameter concentrations that have equaled or exceeded DWS.
- Frequently equaled or exceeded parameters include radionuclides, fluoride and lead
- Other parameters commonly equaled or exceeded in the sites measured in this basin were arsenic, antimony, beryllium and cadmium.

Table 4.1-7 Water Quality Exceedences in the Big Sandy Basin[1]

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard[2]
		Township	Range	Section	
1	Spring	24 North	13 West	5	Rad
2	Spring	24 North	13 West	5	Rad
3	Well	23 North	13 West	19	As
4	Well	23 North	13 West	20	As, Pb
5	Well	23 North	13 West	29	As
6	Well	23 North	14 West	35	Pb
7	Well	22 North	13 West	34	As
8	Well	21 North	13 West	30	F
9	Well	21 North	14 West	15	F
10	Well	21 North	14 West	24	As, F
11	Well	21 North	14 West	29	F, Pb
12	Well	21 North	14 West	29	As, F
13	Well	21 North	14 West	29	As, F
14	Well	21 North	14 West	29	As
15	Spring	20 North	11 West	18	Rad
16	Well	20 North	12 West	13	Rad
17	Well	20 North	12 West	28	Rad
18	Spring	20 North	12 West	32	Rad
19	Well	20 North	12 West	34	Rad
20	Spring	20 North	12 West	35	Rad
21	Well	20 North	13 West	25	Rad
22	Well	20 North	14 West	1	Sb, As, F, Rad
23	Well	20 North	14 West	17	Rad
24	Well	20 North	14 West	19	Be, Cd, F
25	Spring	20 North	15 West	35	Rad
26	Spring	19 North	12 West	9	Rad
27	Well	19 North	13 West	8	Rad
28	Well	19 North	13 West	16	Rad
29	Well	19 North	14 West	10	F
30	Spring	19 North	15 West	14	Rad
31	Well	19 North	15 West	23	F
32	Well	18 North	9 West	9	Cd
33	Well	18 North	11 West	3	As
34	Well	18 North	11 West	27	As
35	Well	18 North	12 West	2	F
36	Well	18 North	12 West	25	Rad
37	Well	18 North	12 West	25	As
38	Spring	18 North	12 West	30	F
39	Well	18 North	14 West	11	F
40	Spring	18 North	14 West	25	As
41	Spring	18 North	14 West	31	As, Rad
42	Well	17 North	13 West	2	As, Pb
43	Well	17 North	13 West	14	As, Pb
44	Well	17 North	13 West	22	F
45	Well	17 North	13 West	23	Pb
46	Well	17 North	13 West	26	Pb
47	Well	17 North	13 West	31	As
48	Well	16.5 North	13 West	22	Pb
49	Well	16.5 North	13 West	22	Pb
50	Well	16.5 North	13 West	27	Pb
51	Well	16.5 North	13 West	27	Pb
52	Well	16.5 North	13 West	34	Pb
53	Spring	16.5 North	15 West	25	As
54	Well	16 North	13 West	3	Pb
55	Well	16 North	13 West	3	Pb
56	Well	16 North	13 West	9	Rad
57	Well	16 North	13 West	10	F
58	Well	16 North	13 West	10	Pb
59	Well	16 North	13 West	22	As
60	Spring	16 North	13 West	25	As, F
61	Well	16 North	13 West	27	As
62	Well	16 North	13 West	27	As
63	Well	16 North	13 West	36	F
64	Well	16 North	13 West	36	As, F

Source: Compilation of databases from ADWR & others

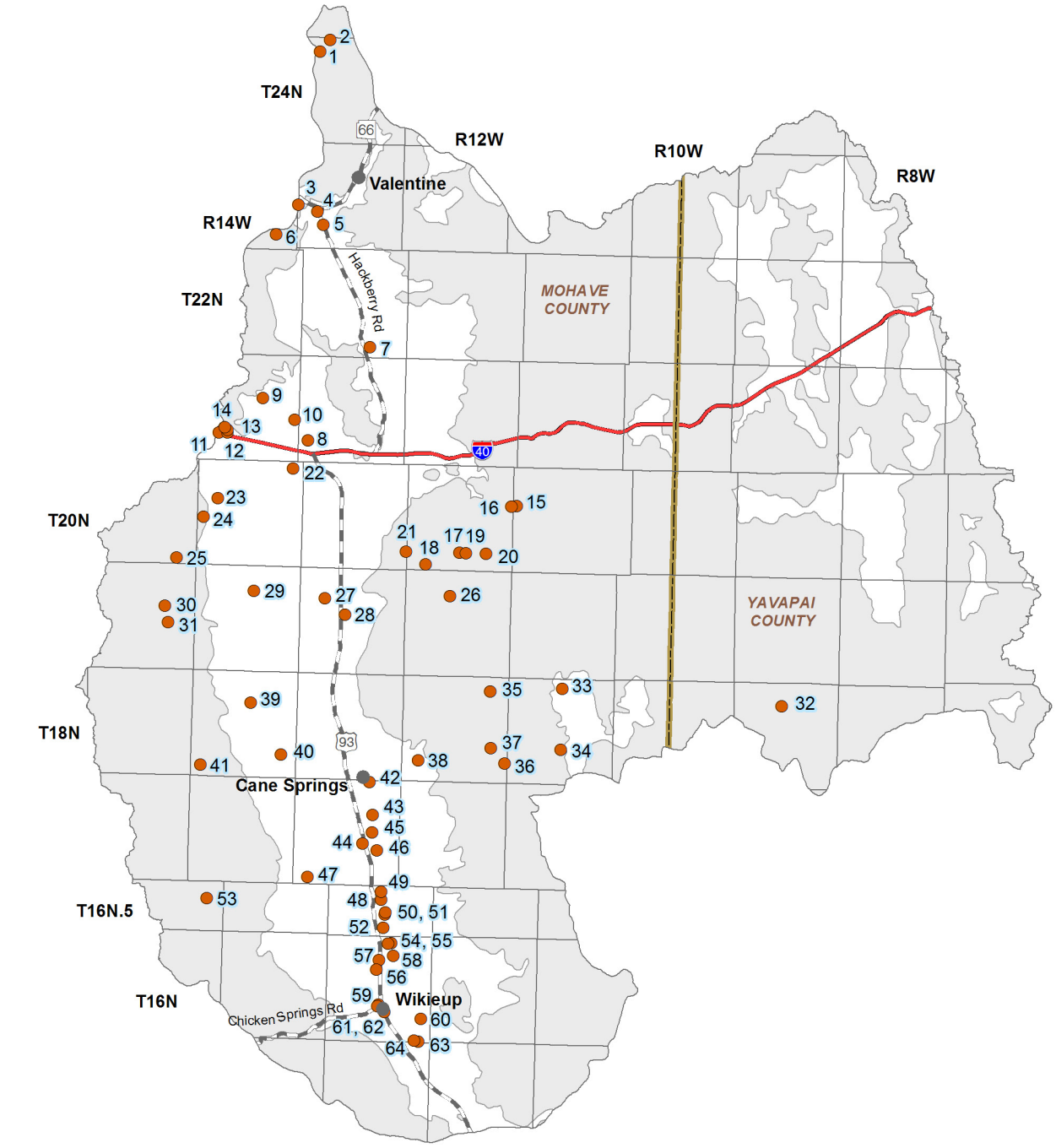
B. Lakes and Streams

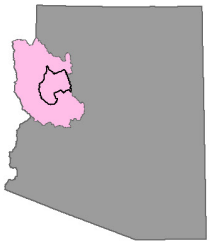
Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard	Parameter(s) Exceeding Use Standard
None identified by ADWR at this time						

Notes:

[1] Most water quality samples collected between 1980 and 2004.

[2] Sb = Antimony
As = Arsenic
Be = Beryllium
Cd = Cadmium
F= Fluoride
Pb = Lead
Rad = One or more of the following radionuclides - Gross Alpha, Gross Beta, Radium, and Uranium





0 3 6 Miles

Well, Spring or Mine Site that has Equaled or Exceeded DWS

Consolidated Crystalline & Sedimentary Rocks

Unconsolidated Sediments

COUNTY

Interstate Highway

Major Road

City, Town or Place

ARIZONA DEPARTMENT OF WATER RESOURCES ©

Figure 4.1-9
Big Sandy Basin
Water Quality Conditions

4.1.8 Cultural Water Demand in the Big Sandy Basin

Cultural water demand data including population, number of wells and the average well pumpage and surface water diversions by the municipal, industrial and agricultural sectors are shown in Table 4.1-8. There are no wastewater treatment plants in this basin. Figure 4.1-10 shows the location of demand centers. A description of cultural water demand data sources and methods is found in Volume 1, Appendix A. More detailed information on cultural water demand is found in Section 4.0.7.

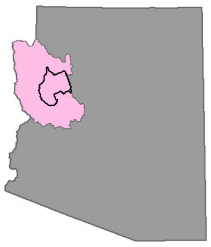
Cultural Water Demand

- Refer to Table 4.1-8 and Figure 4.1-10.
- Population in this basin is relatively small but has almost tripled since 1980, increasing from 434 in 1980 to 1,142 in 2000.
- All water use in this basin is groundwater. Groundwater demand has increased, with an average of 2,500 AFA in 1971-1975 to an average of approximately 15,900 AFA in 2001-2005.
- Agricultural demand is minimal, with less than 300 AFA from 1991-2005. Agricultural demand centers are small acreages located south of Cane Springs and south of Wikieup along Highway 93.
- Municipal groundwater demand is also minimal in this basin, with less than 300 AFA on average. Municipal demand centers are located in the vicinity of Wikieup and at Cane Springs along Highway 93.
- There is significant industrial groundwater demand in this basin. 15,600 AFA on average during 2001-2005 was pumped and transported via pipeline to the Bagdad Mine in the Bill Williams Basin.
- As of 2005 there were 1,240 registered wells with a pumping capacity of less than or equal to 35 gpm and 222 wells with a pumping capacity of more than 35 gpm.

Table 4.1-8 Cultural Water Demand in the Big Sandy Basin[1]

Year	Estimated and Projected Population	Number of Registered Water Supply Wells Drilled		Average Annual Demand (in acre-feet)						Data Source
				Well Pumpage			Surface-Water Diversions			
		Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial[2]	Agricultural	Municipal	Industrial	Agricultural	
1971		420[2]	155[2]	2,500			NR			ADWR (1994a)
1972										
1973										
1974										
1975										
1976				7,000			NR			
1977										
1978										
1979										
1980	434									
1981	445	80	5	10,000			NR			
1982	456									
1983	467									
1984	479									
1985	490									
1986	501	76	22	14,400			NR			
1987	512									
1988	523									
1989	534									
1990	546									
1991	605	112	9	<300	16,200	<300[3]	NR			USGS (2007) ADWR (2008b)
1992	665									
1993	725									
1994	784									
1995	844									
1996	903	246	16	<300	16,800	<300[3]	NR			
1997	963									
1998	1,023									
1999	1,082									
2000	1,142									
2001	1,198	306	15	<300	15,600	<300[3]	NR			
2002	1,254									
2003	1,311									
2004	1,367									
2005	1,423									
2010	1,704									
2020	2,166									
2030	2,541									
	WELL TOTALS:	**1,240**	**222**							

Notes:
NR = Not reported
[1] Does not include evaporation losses from stockponds and reservoirs, or effluent.
[2] Groundwater withdrawn in the Big Sandy Basin is delivered to the Bill Williams Basin for industrial use at the Bagdad Mine.
[3] Agricultural water use in this basin is based on ADWR registered wells used for agricultural purposes.



ARIZONA DEPARTMENT OF WATER RESOURCES ©

Primary Data Source: USGS National Gap Analysis Program, 2004

0 3 6
Miles

Figure 4.1-10
Big Sandy Basin
Cultural Water Demand

Demand Centers

- Agriculture
- M&I - Low Intensity
- Indian Reservation
- Small Mine\Quarry
- Indian Reservation Boundary
- COUNTY
- Interstate Highway
- Major Road
- City, Town or Place

4.1.9 Water Adequacy Determinations in the Big Sandy Basin

Water adequacy determination information including the subdivision name, location, number of lots, adequacy determination, reason for the inadequacy determination, date of determination and subdivision water provider are shown in Table 4.1-9. Figure 4.1-11 shows the locations of subdivisions keyed to the Table. A description of the Water Adequacy Program is found in Volume 1, Appendix C. Adequacy determination data sources and methods are found in Volume 1, Appendix A.

- All lots receiving an adequacy determination are in Mohave County. Four water adequacy determinations have been made in this basin through December 2008.
- Data on the number of lots with an adequate determination was not available to the Department. Three determinations of inadequacy with a total of 608 lots have been made; all located in the northern portion of the basin.
- All inadequacy determinations were because the applicant chose not to submit necessary information and/or available hydrologic data was insufficient to make a determination.

Table 4.1-9 Adequacy Determinations in the Big Sandy Basin[1]

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No.[2]	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination[3]	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section						
1	Greenwood Village # 1	Mohave	22 North	12 West	29, 30, 31, 32	214.0	52-300043	Inadequate	A1	08/23/95	Dry Lot Subdivision
2	Mountain Shadow Estates Tract 3806	Mohave	20 North	14 West	8	54.0	52-400466	Inadequate	A1	02/20/01	Subdivision wells
3	Orchards, The Tract 3800	Mohave	16 North	13 West	27	NA	NA	Adequate		08/31/92	Dry Lot Subdivision
4	Silverado Acre Estates Unit 1, Tract 3805	Mohave	20 North	13 West	17	340.0	52-300264	Inadequate	A1	02/13/97	Dry Lot Subdivision

Source: ADWR 2008a

Notes:

[1]Each determination of the adequacy of water supplies available to a subdivision is based on the information available to ADWR and the standards of review and policies in effect at the time the determination was made. In some cases, ADWR might make a different determination if a similar application were submitted today, based on the hydrologic data and other information currently available, as well as current rules and policies.

[2] Prior to February 1995, ADWR did not assign file numbers to applications for adequacy. Between 1995-2006 all applications for adequacy were given a file number with a 22 prefix. In 2006 a 53 prefix was assigned to all water adequacy reports and applications regardless of their issue date.

[3] A. Physical/Continuous
1) Insufficient Data (applicant chose not to submit necessary information, and/or available hydrologic data insufficient to make determination)
2) Insufficient Supply (existing water supply unreliable or physically unavailable; for groundwater, depth-to-water exceeds criteria)
3) Insufficient Infrastructure (distribution system is insufficient to meet demands or applicant proposed water hauling)

B. Legal (applicant failed to demonstrate a legal right to use the water or failed to demonstrate the provider's legal authority to serve the subdivision)
C. Water Quality
D. Unable to locate records
NA= Data not currently available to ADWR

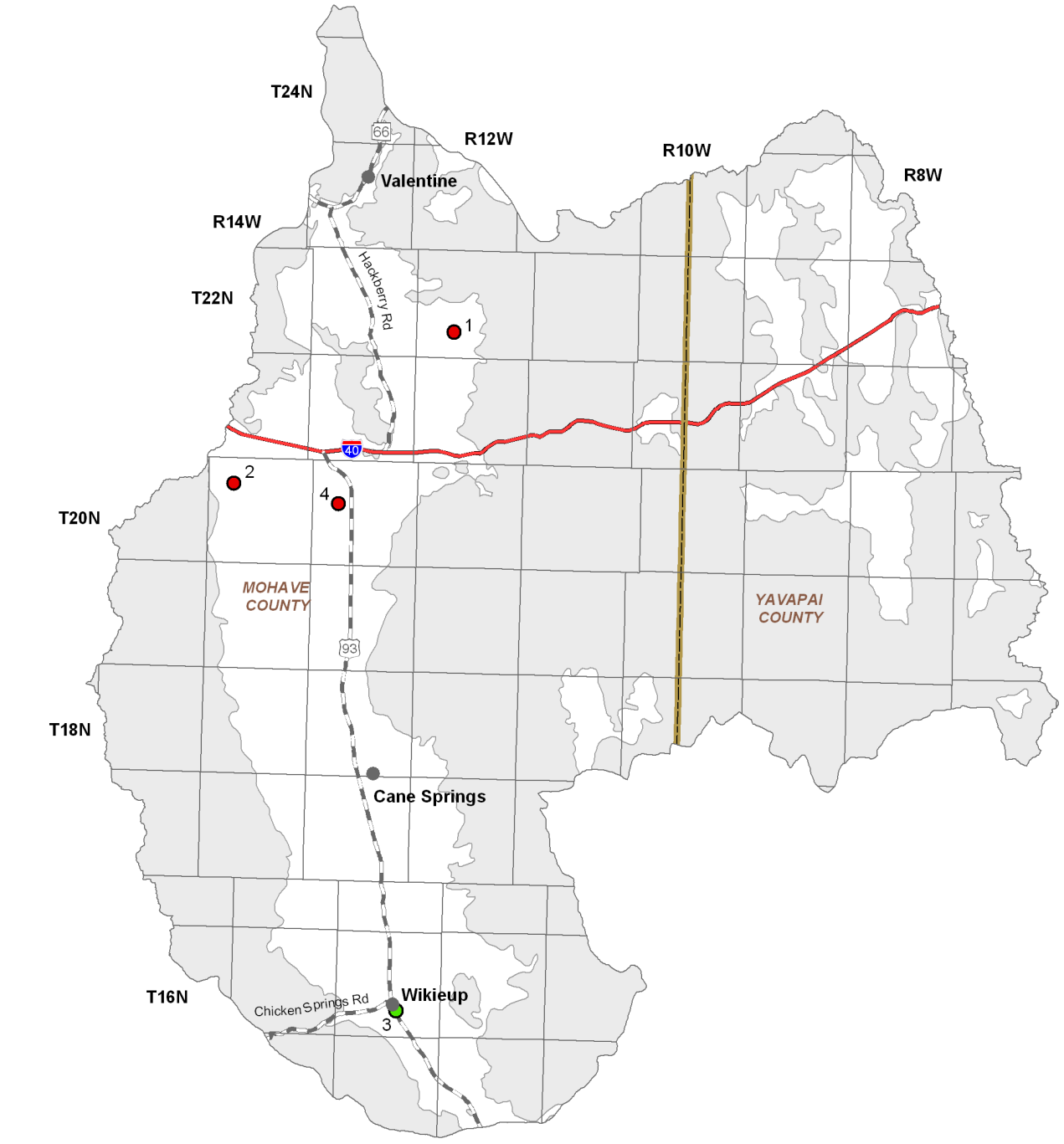


Figure 4.1-11
Big Sandy Basin
Adequacy Determinations

Big Sandy Basin
References and Supplemental Reading

References

A

Anning, D.W. and N.R. Duet, 1994, Summary of ground-water conditions in Arizona, 1987-90, USGS Open-file Report 94-476.

Arizona Department of Economic Security (DES), 2005, Workforce Informer: Data file, accessed August 2005, http://www.workforce.az.gov. (Cultural Water Demand Table)

Arizona Department of Environmental Quality (ADEQ), 2005, ADEQSWI: Data file, received September 2005. (Effluent Generation Table)

_____, 2004a, Water quality exceedences by watershed: Data file, received June 2004. (Water Quality Map and Table)

_____, 2004b, Water quality exceedences for drinking water providers in Arizona: Data file, received September 2004. (Water Quality Map and Table)

Arizona Department of Mines and Mineral Resources (ADMMR), 2005, Active mines in Arizona: Database, accessed at http:// www.admmr.state.az.us. (Cultural Water Demand Map)

Arizona Department of Water Resources (ADWR), 2008a, Assured and adequate water supply determinations: Database, ADWR Office of Assured and Adequate Water Supply.

_____, 2008b, Industrial demand outside of the Active Management Areas 1991-2007: Unpublished analysis by ADWR Office of Resource Assessment Planning.

_____, 2007, Cultural Water Demands in the Upper Colorado River Planning Area: Unpublished analysis, ADWR Office of Resource Assessment Planning.

_____, 2005a, Automated recorder sites: Data files, ADWR Basic Data Unit.

_____, 2005b, Flood warning gages: Database, ADWR Office of Water Engineering.

_____, 2005c, Groundwater Site Inventory (GWSI): Database, ADWR Hydrology Division.

_____, 2005d, Inspected dams: Database, ADWR Office of Dam Safety. (Reservoirs and Stockponds Table)

_____, 2005e, Non-jurisdictional dams: Database, ADWR Office of Dam Safety. (Reservoirs and Stockponds Table)

_____, 2005f, Registry of surface water rights: ADWR Office of Water Management. (Reservoirs and Stockponds Table)

_____, 2005g, Wells55: Database.

_____, 1994a, Arizona Water Resources Assessment, Vol. I, Inventory and Analysis.

_____, 1994b, Arizona Water Resources Assessment, Vol. II, Hydrologic Summary.

_____, 1990, Draft outline of basin profiles for the state water assessment: ADWR Statewide Planning Division, Memorandum to L. Linser, January, 16, 1990.

Arizona Game and Fish Department, 1997 & 1993, Statewide riparian inventory and mapping project: GIS cover.

Arizona Land Resource Information System (ALRIS), 2005a, Springs: GIS cover, accessed January 2006 at http://www.land.state.az.us/alris/index.html.

_____, 2005b, Streams: GIS cover, accessed 2005 at http://www.land.state.az.us/alris/index.html.

_____, 2005c, Water features: GIS cover, accessed July 2005 at http://www.land.state.az.us/alris/index.html.

_____, 2004, Land ownership: GIS cover, accessed in 2004 at http://www.land.state.az.us/alris/index.html.

Arizona Water Commission, 1975, Summary, Phase I, Arizona State Water Plan, Inventory of resource and uses.

F

Freethey, G.W. and T.W. Anderson, 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: USGS Hydrologic Investigations Atlas-HA664.

G

Gebert, W.A., D.J. Graczyk and W.R. Krug, 1987, Average annual runoff in the United States, 1951-1980: GIS Cover, accessed March 2006 at http://aa179.cr.usgs.gov/metadata/wrdmeta/runoff.htm. (Surface Water Conditions Map)

O

Oregon State University, Spatial Climate Analysis Service (SCAS), 1998, Average annual precipitation in Arizona for 1961-1990: PRISM GIS cover, accessed in 2006 at www.ocs.orst.edu/prism.

U

U.S. Army Corps of Engineers (USACE), 2004 and 2005, National Inventory of Dams: Arizona Dataset, accessed November 2004 to April 2005 at http://crunch.tec.army.mil/nid/webpages/nid.cfm (Reservoirs and Stockponds Table)

United States Geological Survey, 2008 & 2005, National Water Information System (NWIS) data for Arizona: Accessed October 2008 & December 2005 at http://waterdata.usgs.gov/nwis.

_____, 2007, Water withdrawals for irrigation, municipal, mining, thermoelectric-power, and drainage uses in Arizona outside of the active management areas, 1991-2005: Data file, received November 2007.

_____, 2006a, National Hydrography Dataset: Arizona dataset, accessed at http://nhd.usgs.gov/.

_____, 2006b, Springs and spring discharges: Dataset, received November 2004 and January 2006 from USGS office in Tucson, AZ.

_____, 2004, National Gap Analysis Program - Southwest Regional Gap analysis study- land cover descriptions: Electronic file, accessed January 2005 at http://earth.gis.usu.edu / swgap.

_____, 1981, Geographic digital data for 1:500,000 scale maps: USGS National Mapping Program Data Users Guide.

W

Western Regional Climate Center (WRCC), 2005, Precipitation and temperature stations: Data file, accessed December 2005 at http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwDI~GetCity~USA.

Supplemental Reading

Andersen, M., 2005, Assessment of water availability in the Lower Colorado River basin: in Conservation and Innovation in Water Management: Proceedings of the 18th annual Arizona Hydrological Society Symposium, Flagstaff, Arizona, September, 2005.

Cady, C.V., 1981, Maps showing groundwater conditions in the Big Sandy Area, Yavapai and Mohave Counties, Arizona: ADWR Hydrologic Map Series No. 5.

Fielding, G., 2001, A groundwater reconnaissance survey of the Sacramento Valley, Big Sandy Valley, Detrital Valley, Hualapai Valley and the Meadview watershed: University of Arizona, 7 p.

Freilich, Leitner & Carlisle, 2005, Mohave County general plan: Mohave County draft report, 204 p.

Hirschboeck, K.K., 2004, Using tree rings to determine the long-term record of synchronous extreme stream flow episodes in the Salt-Verde and Upper Colorado River basins: in The Value of Water: Proceedings from the 17th annual Arizona Hydrological Society symposium, September 2004, Tucson, Arizona.

Klawon, J.E., 2000, Hydrology and geomorphology of the Santa Maria and Big Sandy Rivers and Burro Creek in western Arizona: AZGS Open File Report 00-02.

Manera, P., 2000, Water Resources of the Southern Portion of the Big Sandy Valley, Wikieup, Mohave County, Arizona, Submitted by Caithness Big Sandy, LLC.

Robertson, F.N., 1991, Geochemistry of groundwater in alluvial basins of Arizona and adjacent parts of Nevada, New Mexico and California: USGS Professional Paper 1406-C, 87 p.

Towne, D.C., 2006, Ambient groundwater quality of the Big Sandy Basin: A 2003-2004 baseline study, Arizona Department of Environmental Quality Open File Report 06-09, 66p.

Santec Consulting, 1999, Small and minor watercourses analysis for Mohave County, Arizona, Arizona State Land Department, Final Report.

URS, 2001, Groundwater Technical Report Prepared for Big Sandy Energy Project, URS Job No. 68-00044533.00.

U.S. Department of the Interior, Bureau of Land Management, 2001, Big Sandy Energy Project Environmental Impact Statement, April 2001.

Webb, R.H., S.A. Leake, and R.M. Turner, 2007, The Ribbon of Green: Change in Riparian Vegetation in the Southwestern United States, University of Arizona Press.