

Bill Williams Planning Area

Background

The Bill Williams Planning Area is located in the west central part of the State. It lies within western Yavapai County, northern La Paz County and the southeastern portion of Mohave County. The Planning Area includes the entire Big Sandy Groundwater Basin in the north and the entire Bill Williams Groundwater Basin in the south. Communities within the planning area include: Valentine, Cane Springs, and Wikieup in the Big Sandy Basin; Skull Valley, Kirkland, Peeples Valley, and Yarnell, in the eastern portion of the Bill Williams Basin; and Bagdad and Swansea in the central and western portion of Bill Williams Basin, respectively.



A significant portion of this Planning Area is in federal ownership (*see Figure P.A. 4-1*). Nearly 58 percent of the land in the Bill Williams Basin is managed by federal agencies, the majority of this, 46 percent, by the US Bureau of Land Management (BLM). Much of this land has been set aside in Wilderness Areas – Rawhide Mountains, Swansea, Arrasta Mountain, Tres Alamos, Aubrey Peak and Upper Burro Creek. The remaining lands in the Bill Williams Basin are State Trust Lands (over 30 percent) and private lands (nearly 15 percent).

Forty percent of the land in the Big Sandy Basin is in private ownership (*see Figure P.A. 4-1*). The BLM manages 29 percent of the land, and just over 28 percent of the lands are State Trust Lands. Less than one percent each is controlled by the USDA Forest Service (primarily in the high elevations in the eastern portion of the basin) and the Hualapai Tribe.

Water Supply Conditions

Groundwater

The Bill Williams Planning Area is located within both the Basin and Range and Central Highlands Transition Zone physiographic provinces. The boundary between these provinces divides this planning area nearly in half from southeast to northwest. The Basin and Range province is characterized by long broad alluvial valleys separated by mountain ranges, with thick productive sand and gravel alluvial aquifers located in the valley centers which, subject to available renewable supplies, may facilitate artificial underground water storage and recovery activities. The Central Highlands Transition Zone is characterized by rugged mountains of igneous, metamorphic and sedimentary rocks and has a mixture of both fractured rock and alluvial basins. Groundwater in these fractured rock aquifers is much more limited than in the thin alluvial deposits along stream courses.

Groundwater conditions within the Planning Area are variable due primarily to the nature of the physiographic provinces (*see Figure P.A. 4-2*). Overall, the amount of groundwater in storage in the Big Sandy Basin has been estimated to range from 9.5 to 21 MAF. Groundwater levels in the western basin have generally remained steady or have seen rises of up to 0.2 feet per year from 1992 through 2012, with the exceptions being the Valentine area where declines of 0.8 feet per year have been recorded from 1992 to 2012, and the area around Wikieup where water levels have declined an average of 0.6 feet per year from 1992 to 2012.

Groundwater in storage in the Bill Williams Basin is estimated to range from 10 to 23 MAF. Groundwater in the western part of the Planning Area occurs primarily in recent stream alluvium and basin-fills. Groundwater levels in wells located in the central and eastern part of the basin, including Skull Valley, Kirkland, Peeples Valley and Yarnell have declined up to 1.4 feet per year with the largest declines in Peeples Valley and Kirkland. In the southwest part of the basin groundwater levels were generally rising at 0.02 feet per year from 1992 to 2012.

Groundwater quality varies greatly within the Planning Area. The quality of the groundwater may exceed limits established for drinking water standards but often is a result of naturally occurring conditions in the aquifer. Frequently equaled or exceeded parameters include fluoride and arsenic. Other parameters that have been measured and have equaled or exceeded drinking water standards include cadmium, copper, lead, nitrates, total dissolved solids and radionuclides.

Surface Water

The Bill Williams Planning Area lies mostly within the Bill Williams Watershed which drains into Lake Havasu on the western border. Perennial stream reaches within the Big Sandy Basin include Cottonwood Creek, Willow Creek, Ft. Rock Creek, Trout Creek, and the Big Sandy River. 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.

Perennial stream reaches within the Bill Williams Basin include the Bill Williams River, Santa Maria River, Big Sandy River, and Burro Creek (*see Figure P.A. 4-3*). It is estimated that approximately 500 acre-feet of surface water from springs near Bagdad in the Bill Williams Basin provides municipal and industrial supplies for the town of Bagdad and the Bagdad mine. The Bills Williams River flows from east to west and forms the boundary between Mohave and La Paz Counties. Alamo Lake and Dam on the Bill Williams River was constructed by the US Army Corps of Engineers primarily as a flood control structure in 1968, significantly impacting streamflow below the dam. The dam is now operated in a manner that provides both flood control and benefits downriver wildlife refuges and vegetation along the River. Median annual streamflow in the Bill Williams River below Alamo Dam is about 34,000 acre-feet, but in 1993 a maximum flow of almost 702,000 acre-feet was recorded.

Several lakes and streams within the Bill Williams Basin have been identified as having impaired waters. Water quality standards were exceeded in two reaches of Boulder Creek, one reach of Burro Creek, Alamo Lake and Coors Lake. The mercury drinking water standard was exceeded in every impaired stream or lake. Other parameters exceeded in Alamo Lake include ammonia and pH levels. Arsenic, copper and zinc were exceeded in Boulder Creek. Boulder Creek and Alamo Lake are part of the ADEQ water quality improvement effort called the Total Maximum Daily Load (TMDL) program.

Reclaimed Water

Population centers are small and widely dispersed throughout the Planning Area and no significant wastewater treatment facilities were identified by ADWR in the Planning Area and may be site specific (e.g., Alamo State Park). As such reclaimed water reuse in the planning area is minimal, although Freeport McMoRan Copper and Gold, Inc. (FMC) reports that reclaimed water is used at the Bagdad Mine.

Ecological Resources

A number of listed threatened and endangered species may be present in the Planning Area. The presence of a listed species may be a critical consideration in water resource management and supply development in certain locations within the Planning Area (see *Figure P.A. 4-3*). The Bill Williams River National Wildlife Refuge (NWR), located along the Bill Williams River at its confluence with Lake Havasu, includes lands originally set aside as Havasu NWR and additional lands purchased by US Fish and Wildlife Service (FWS) since then. The refuge extends 12 miles upstream and protects one of the last stands of natural cottonwood-willow habitat along the lower Colorado River. The refuge provides habitat for at least two endangered species, the Yuma clapper rail and the southwestern willow flycatcher. This area is also supported from regulated releases of water from Alamo Dam. Beaver dams are now common and riparian vegetation has increased substantially in many places. In addition, Alamo Wildlife Area, managed by the Arizona Game and Fish Department, is located at the confluence of the Big Sandy, Santa Maria, and Bill Williams Rivers where riparian vegetation has increased including native cottonwood and black willow.

Water Demands

Water use in the Bill Williams Planning Area is primarily groundwater with a small amount of surface water used in the Town of Bagdad. Groundwater use has increased in the Big Sandy Basin but has decreased in the Bill Williams Basin. Table P.A. 4-1 illustrates the baseline and projected demands for the Bill Williams Planning Area. No increases are projected for agricultural water uses and minimal increases in projected municipal demands are anticipated due to the significant amounts of federal lands in the area. There is significant industrial groundwater demand in the Big Sandy Basin; increases in mining operations are projected, specifically at the FMC Bagdad Mine site. Groundwater is pumped and transported via pipeline from the Big Sandy Basin to the mine site in the Bill Williams Basin.

Characteristics Affecting Future Demands and Water Supply Availability

Limited Groundwater Data

Except for the community water systems, no water users in the Planning Area have an obligation to meter or report their water use. As such, information regarding water demands and sustainable groundwater development is insufficient for this Planning Area, which makes it difficult to estimate the impacts of current or projected water demands.

Land Use

Significant portion of this Planning Area contain federal land designations which limit the potential for increased water supply development. The majority of these are discussed below under Sensitive Environmental Areas.

Sensitive Environmental Areas

In addition to the Bill Williams River NWR, the large number of wilderness areas administered by the BLM is a prominent feature of the Planning Area. These areas are designated under the 1964 Wilderness Act to preserve and protect the designated area in its natural condition. Wilderness areas represent almost 12 percent of the lands within the Bill Williams Basin. Additionally, several "unique waters", designated as having exceptional recreational or ecological significance and/or providing habitat for threatened or endangered species, (Arizona Department of Environmental Quality - A.A.C.

R18-11-112) have been identified in the Planning Area. Designated unique waters include sections of Peoples Canyon, Francis Creek, and Burro Creek in the Bill Williams Basin.

Table P.A. 4-1 Projected Demands (in acre feet) – Bill Williams Planning Area

Sector	2010	2035	2060
Agriculture	2,700	2,700	2,700
Dairy	0	0	0
Feedlot	0	0	0
Municipal	1,555	2,060	2,409
Other Industrial	0	0	0
Mining	14,917		
High		30,000	30,000
Low		10,000	10,000
Power Plants	0		
High		0	0
Low		0	0
Rock Production	40		
High		113	133
Low		47	55
Turf	0		
High		0	0
Low		0	0
Total (High)	19,212	34,873	35,242
Total (Low)	19,212	14,807	15,164

The potential for increased water production from within this Planning Area may be impacted by these designations and water supply development will have to take this into account, either through mitigation or development and utilization of water supplies that do not impact these areas. Mining is very important to the economic prosperity of this State, and strategies to address the water supply needs for both of these uses will need to be addressed.

Unresolved Indian Water Rights Claims

The Hualapai Tribe Reservation is located in the Western Plateau Planning Area, but also has a smaller portion of its lands in the Bill Williams Planning Area located in a small strip along highway 93 north of Wikieup and around Valentine. The Hualapai Tribe, the State of Arizona, and several non-Indian water users are currently engaged in settlement discussions, but details of those discussions are not available at this time.

Unresolved Non-Indian Water Rights Claims

FMC operates a well field located along the Big Sandy River largely north of Wikieup that provides water to the Bagdad Mine. At the present time, these withdrawals are presumed to have the legal character

of groundwater. The shallow nature of the wells may, upon resolution of the issue in groundwater/surface water issue in the Arizona court system, result in a judicial finding that the wells are pumping surface water at some time in the future. In order to protect its ability to continue to exercise these wells to serve the Bagdad Mine, FMC has acquired Planet Ranch, lands with surface water rights along the Bill Williams River downstream of Alamo Dam, and has applied to ADWR for a sever and transfer a portion of those rights to its Wikieup well field.

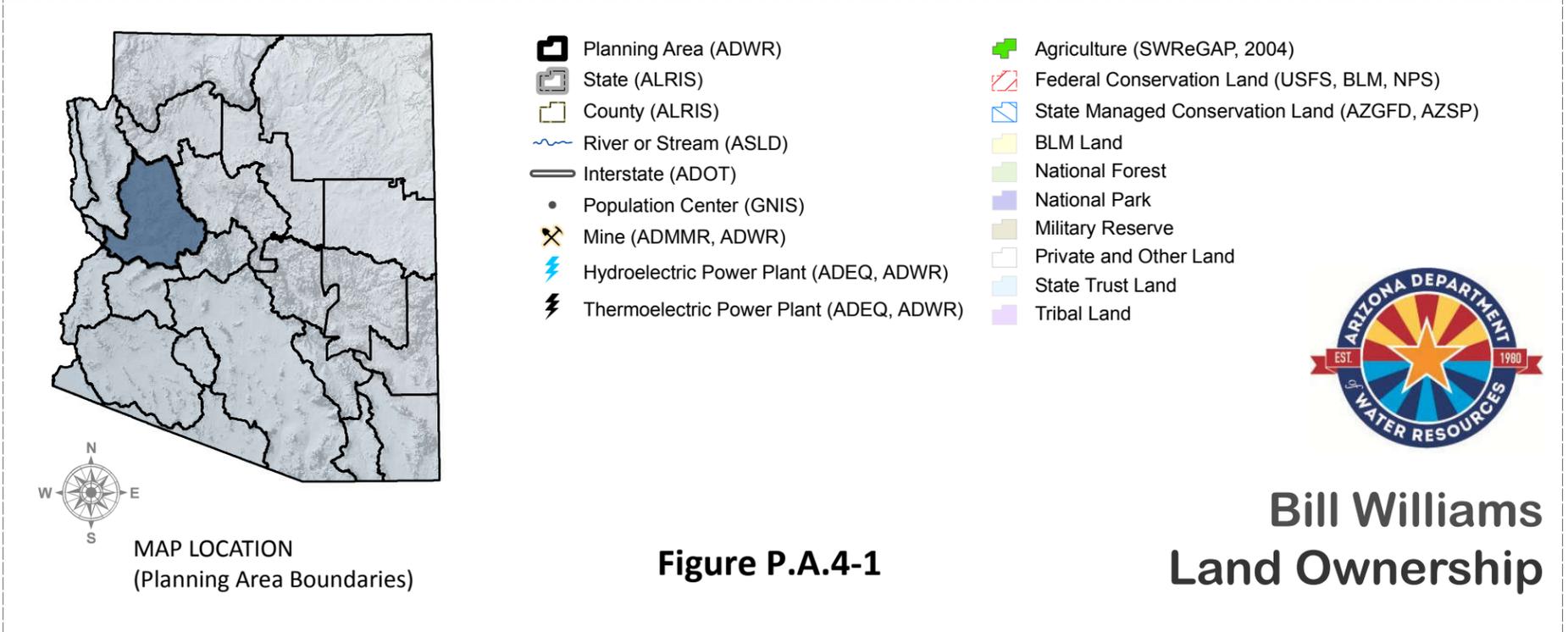
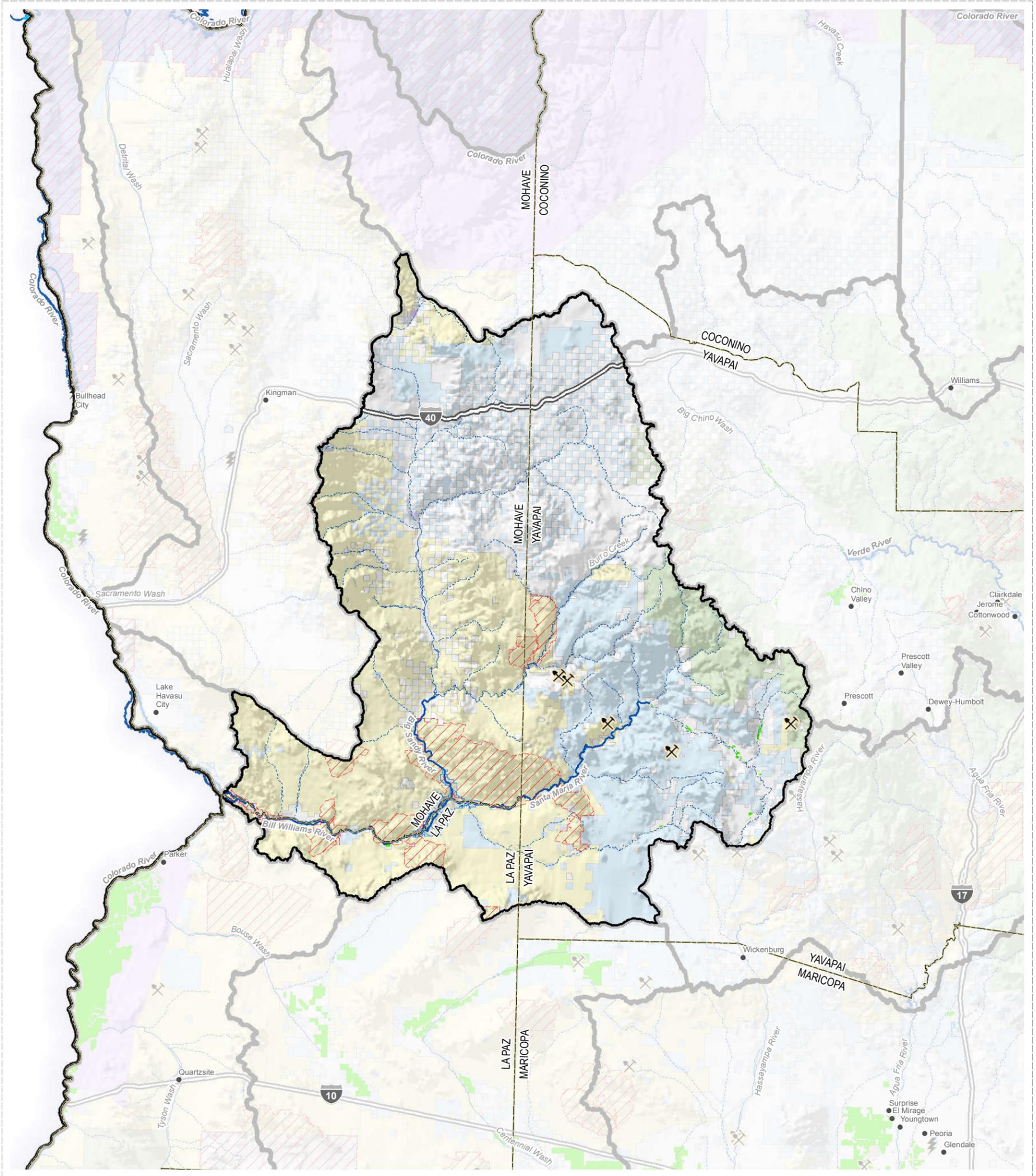
Strategies for Meeting Future Water Demands

Settlement of federal water rights claims are likely the most significant issue that needs to be addressed, in addition to the resolution of FMC's sever and transfer applications for the Planet Ranch property. Monitoring water levels and aquifer performance along the Big Sandy River will assist in understanding the long-term sustainability of the water supplies in this area and the availability of water supplies for possible mine expansions and environmental maintenance. Because projected water demand increases are still small for this area, no additional strategies are being developed at this time.

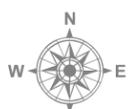
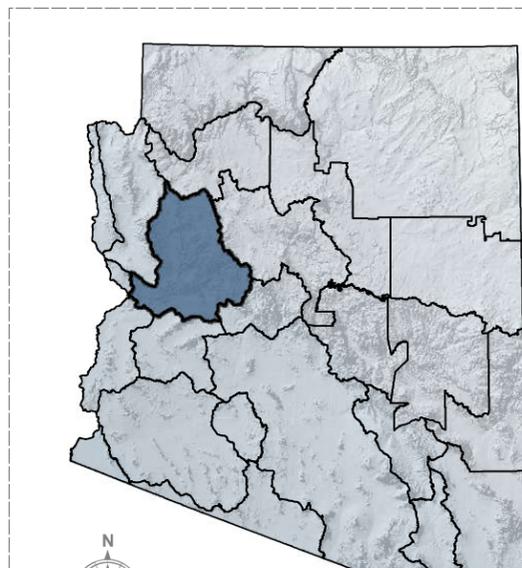
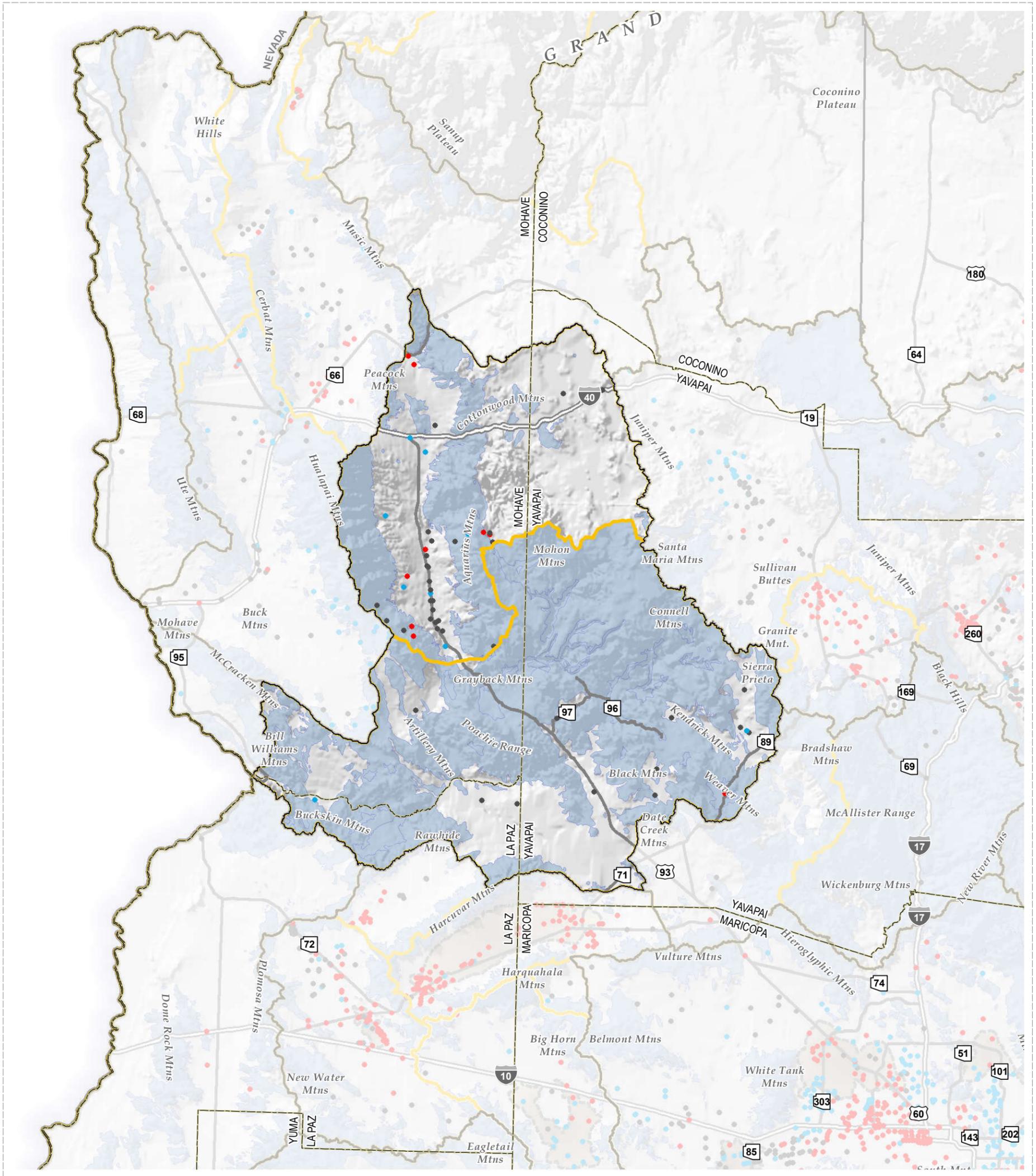


January 2014

NOTE: Because GIS data for this project were acquired from multiple sources employing different land base grids and varying accuracy standards, some inconsistencies were encountered. The user is responsible for understanding the accuracy limitations of GIS data layers and is responsible for the results of any application of the data for other than their intended purpose.



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MAP LOCATION
(Planning Area Boundaries)

- Planning Area (ADWR)
 - State (ALRIS)
 - County (ALRIS)
 - Groundwater Basin (ADWR)
 - Area of Active Land Subsidence (ADWR)
 - Hard Rock Geology (AZ Bureau of Mines, UofA)
 - Interstate (ADOT)
- Recent Water Level Change * (1990's through 2000's)
 - Minor WL Change +5' to -5'
 - Negative
 - Positive

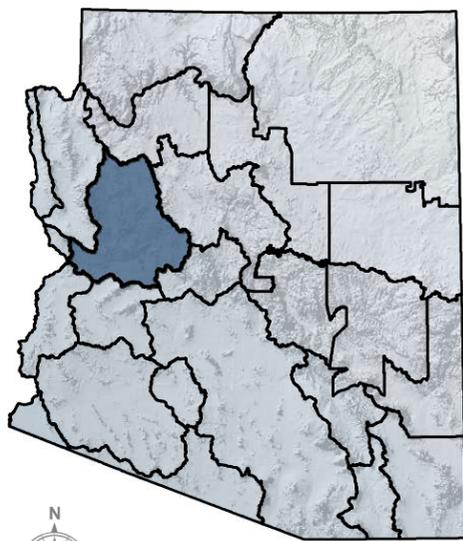
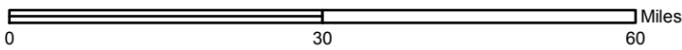
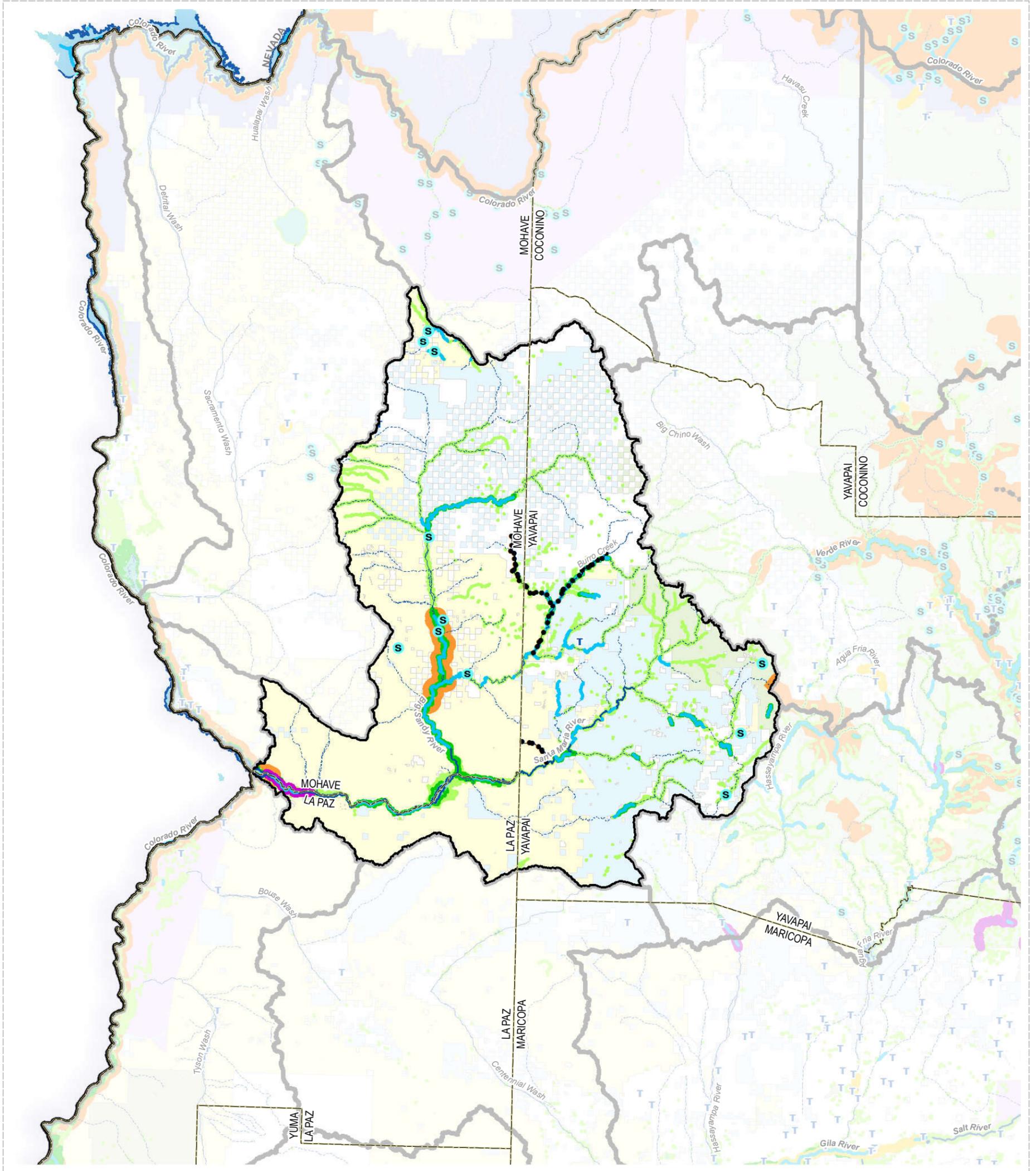
* Data provided by ADWR



Figure P.A.4-2

Bill Williams Groundwater Hydrology

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(Planning Area Boundaries)

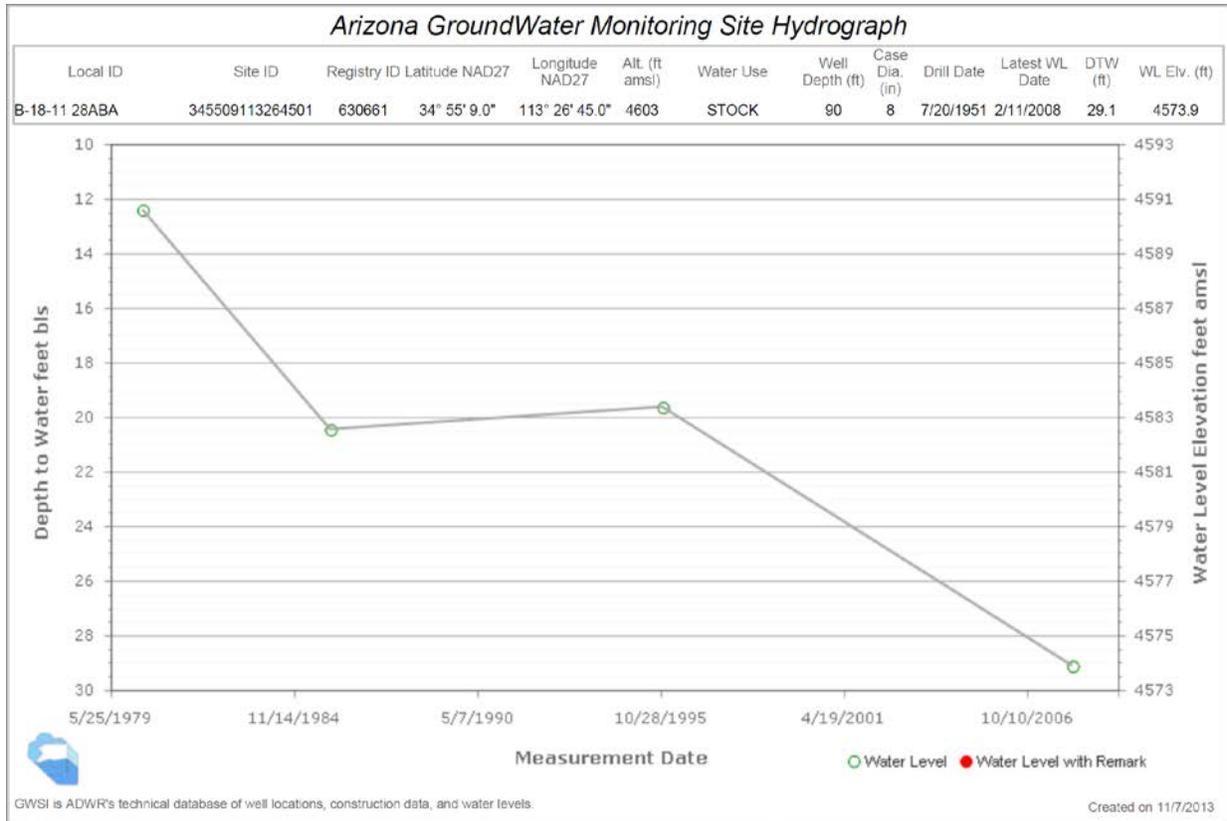
- | | |
|----------------------------------------|---------------------------------------------------|
| Planning Area (ADWR) | 1993 Riparian Inventory (AZGFD) |
| State (ALRIS) | Modeled Riparian Habitat (AZGFD) |
| County (ALRIS) | Designated ESA Critical Habitat (USFWS) |
| Reservoir or Lake (NHD) | Proposed ESA Critical Habitat (USFWS) |
| Waste Water Treatment Plant (ADEQ) | Federally Designated Wild and Scenic River (USFS) |
| Major Spring (ADWR, Pima County) | BLM Land |
| Perennial Flow (ADEQ, USGS) | National Forest |
| River or Stream (ASLD) | National Park |
| Outstanding Arizona Water (ADEQ) | Military Reserve |
| Effluent Dependent Stream (ADWR, NEMO) | Private and Other Land |
| Instream Flow Certificate (ADWR) | State Trust Land |
| | Tribal Land |



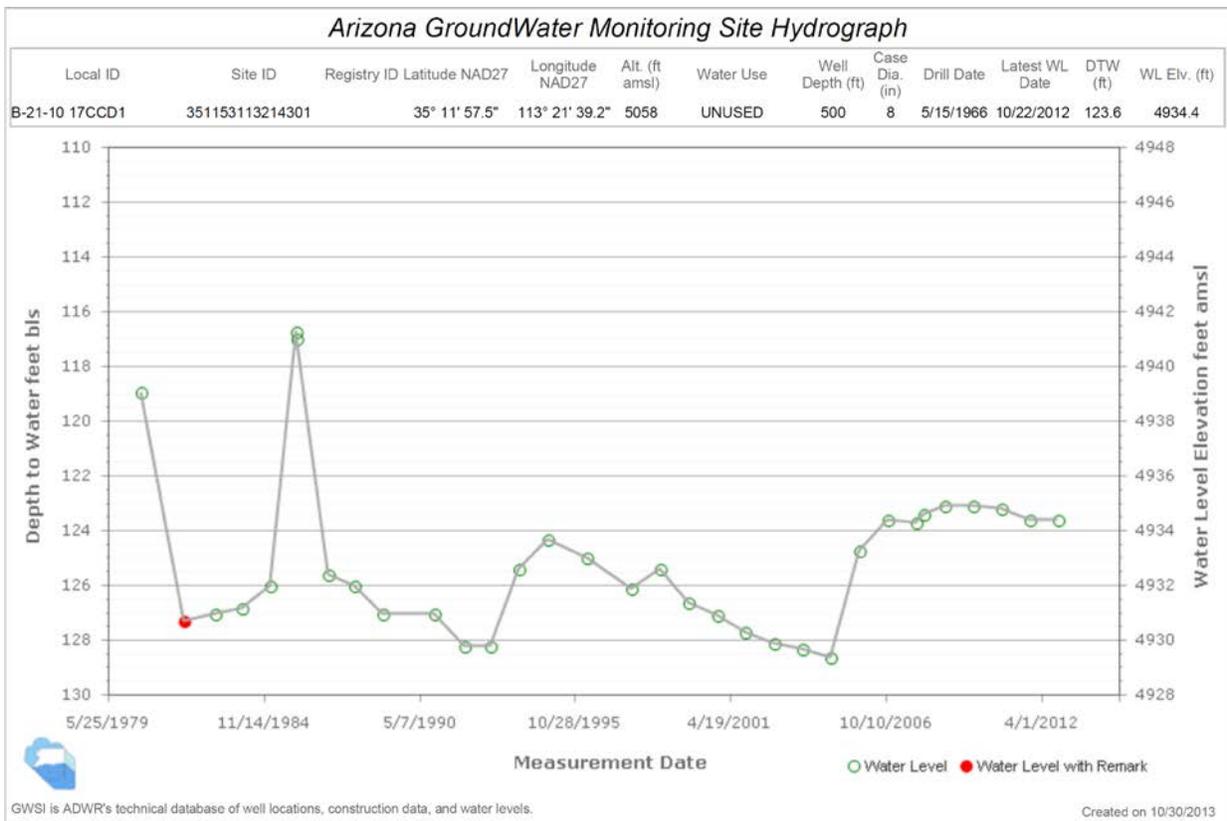
Figure P.A.4-3

Bill Williams Surface Water and Natural Features

Big Sandy Basin – Bill Williams Planning Area

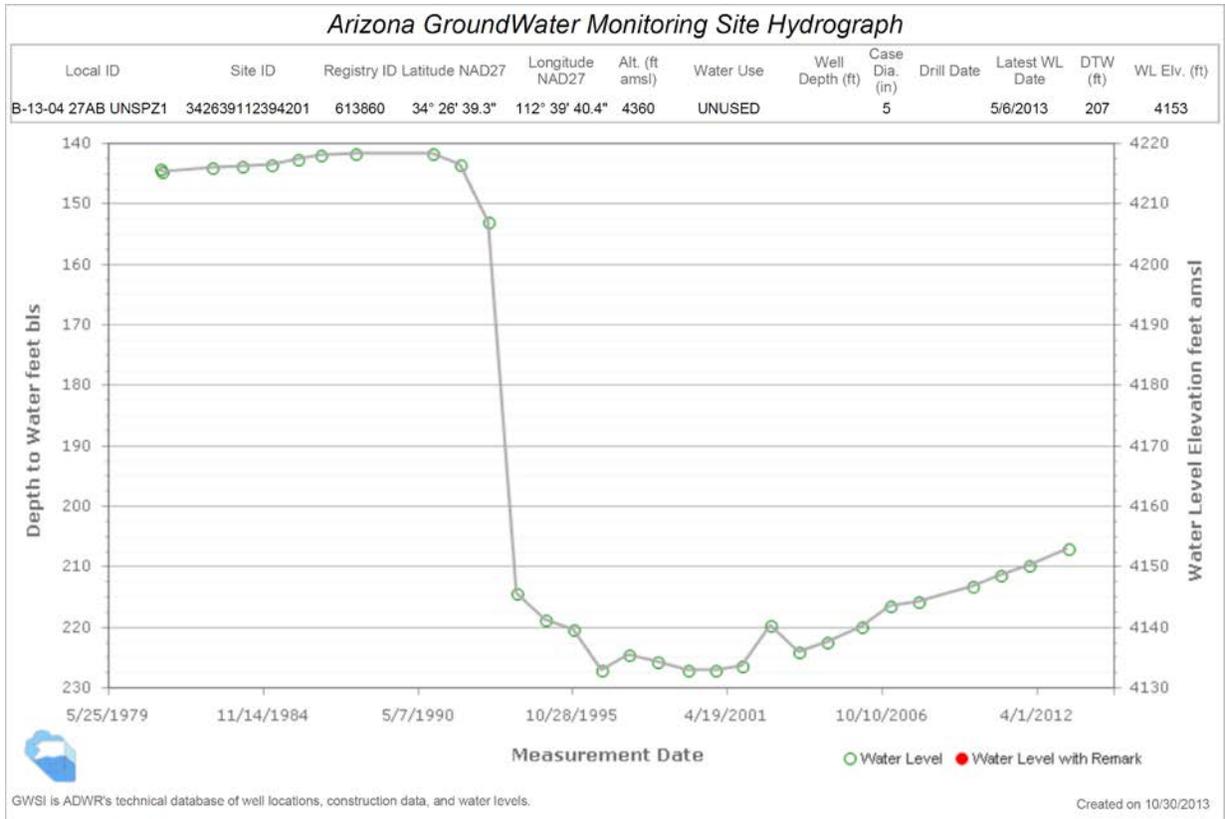


B-18-11 28ABA Big Sandy basin, Fort Rock sub-basin, SW portion of sub-basin in Skunk Canyon/Simmons Gulch area.

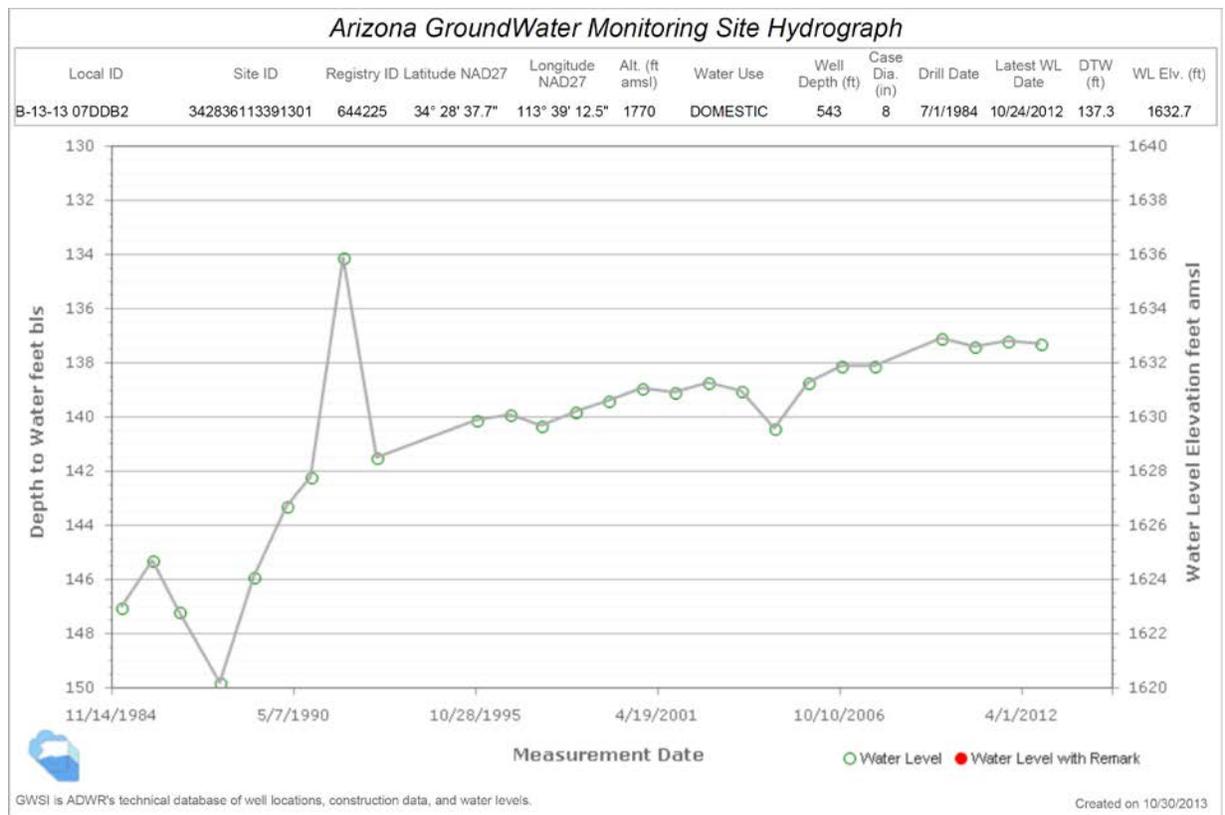


B-21-10 17CCD1 Big Sandy basin, Fort Rock sub-basin.

Bill Williams Basin – Bill Williams Planning Area



B-13-04 27AB UNSPZ1 Bill Williams basin, Skull Valley sub-basin about 3.5 miles NE of Kirkland Junction.



B-13-13 07DDB2 Bill Williams basin, Alamo Reservoir sub-basin about 1.8 miles west of Big Sandy River at Signal.