MEMORANDUM

TO: John Weldon and Mark McGinnis – Salmon, Lewis & Weldon, P.L.C.

FROM: Jon Ford

CC: Craig Sommers – ERO Resources Corporation

FILE: 1328SLW01

DATE: January 29, 2009

RE: Current Big Chino Model Status and Preliminary Results

Model Status

The current status of our Big Chino Ground Water model is that a steady state calibration has been completed and a preliminary transient calibration has been completed. The preliminary transient model has been used to estimate the depth to water in the year 2110 in the vicinity of Prescott's Big Chino Water Ranch and we have estimated the 2110 Verde River base flow discharge from the Big Chino Springs (headwaters of the Verde River).

The advantages of our model over Southwest Ground-water Consultants' (SGC) model are the following:

1) Because it simulates the entire basin, it includes all of the natural inflows and outflows particularly to the Verde River, and

2) It is calibrated to water levels throughout the basin and to base flow in the Verde River.

This means that our model provides a more accurate estimate of the impact of pumping in the Big Chino Valley on the Verde River compared to SGC's model.

Model Configuration

The model uses MODFLOW 2000 and the boundaries are shown on Figure 1. It includes all of the Big Chino Valley except the extreme northwest corner. The boundary in this area is similar to that used in the SGC model. The major difference in lateral extent between the SGC model and ours is that ours extends to the Verde River and it also includes Williamson Valley Wash.

The model contains three layers, as follows:

Layer 1 – Tertiary basin fill, including volcanic flows and the playa (clay)

Layer 2 – Paleozoic rocks (limestones and quartzite)

Layer 3 – Pre-Cambrian igneous and metamorphic rocks

The thickness of the tertiary sediments was derived from geophysical data (Langenheim, et al, 2005, Figure C12a; and Ostenna, et al, 1993, Section II, Plates 7-8) and from borehole data. Similarly, the distribution of playa sediments was derived from geophysical data (Langenheim, et al, 2005, Figure C7) and borehole data. The thickness and extent of Paleozoic sediments was derived from Krieger (1965), Figures 16-17; DeWitt (2008), SI Map 2996; and from borehole data.

The model cells are 2000 feet square. The Layer 1 transmissivity distribution is shown on Figure 2 and the Layer 2 transmissivity distribution is shown on Figure 3. The specific yield and specific storage vary by layer and by dominant lithology within each layer, as summarized in Table 1.

Table 1 – Model Specific Yield and Specific Storage

Layer	Lithology	Specific Yield	Specific Storage
Layer 1	Tertiary basin fill	0.03 - 0.15	1.0×10^{-6} – 1.0×10^{-5}
	Volcanic flows	0.03 - 0.05	1.0×10^{-6} - 2.5×10^{-5}
	Playa	0.02	1.0×10^{-5}
Layer 2	Paleozoic rocks	0.01 - 0.03	1.0×10^{-6} – 1.0×10^{-5}
	Fractured rock	0.04 - 0.05	1.0×10^{-6}
Layer 3	Pre-Cambrian igneous and metamorphic rock	0.02 - 0.05	1.0×10^{-7} – 1.0×10^{-6}

Model Inflows and Outflows

Inflows to the model (21,600 af/yr) include:

- Precipitation recharge (17,900 af/yr) distributed in proportion to elevation, with the highest elevations having the highest recharge. The precipitation recharge on the valley floor is zero.
- Flood recharge along Big Chino Wash in the Paulden area (1,200 af/yr).
- Ground water inflow from the Little Chino Basin (2,500 af/yr).

Outflows from the model include:

- Discharge at the Big Chino Springs.
- Net well pumping (pumping – return flow).

The estimated net historic pumping by decade is shown in Table 2.

Table 2 – Estimated Net Historic Pumping in the Big Chino Valley (acre-feet/year)

	1940-1950	1950-1960	1960-1970	1970-1980	1980-1990	1990-2000	2000-2010
Irrigation	4366	7706	8604	7643	6022	4792	5603
Domestic	27	40	60	150	341	910	1398
Stock	55	65	75	83	89	102	118
Other	0	0	95	95	184	255	495
TOTAL	4447	7812	8834	7971	6636	6059	7614

Calibration Targets

The Steady State Calibration target was our interpretation of the predevelopment potentiometric surface (Figure 4). The map was constructed using historic water level measurement reported to ADWR by well drillers at the time of well construction and anecdotal data (Wirt, 2005, OF 2004-1411A). Transient calibration targets were our interpretation of the current potentiometric surface (Figure 5) and the current discharge of the Big Chino Springs as measured by the Verde River Paulden stream gage.

Future Simulation Setup

To assess the impact of future ground water pumping and export out of the Big Chino basin, we used our preliminary Big Chino transient model. Pumping was simulated from 1940 to 2010 according to Table 2 and from 2010 to 2110 according to Table 3. Future Big Chino Water Ranch (BCWR) and Chino Grande (CG) pumping were derived from Table 4-8 of SGCs September 2007 report, except that the CG pumping demand is capped at 18,500 af/yr and pumping does not begin until 2014. Future export from HIA pumping is based upon the ultimate export of 3 af/ac per year from 2788 acres out of 3307 acres. The export is completely phased in by 2040. The ultimate export rate is 8925 af/yr; however, 3380 ac/ft per year are already represented in the model as current irrigation consumptive use. The exported water would come from the Big Chino Water Ranch, CV Ranch, Wineglass Ranch, and other HIA land along the Big Chino Wash. For future domestic, municipal, and industrial (DMI) pumping other than for Chino Grande, we used the mid-range net additional pumping demand and phasing derived by Ed Harvey (personal communication). This pumping is distributed to the Yavapai Ranch, the area around Paulden, and in the Williamson Valley.

Table 3 – Future Simulation Net Pumping (acre-feet/yr)

Start Year	End Year	BCWR w/o HIA	Chino Grande Municipal Use	HIA Export above Existing Irrigation	Existing DMI and Irrigation	Future Additional DMI	Total
2010	2012	1,510	0	2,520	7,600	440	12,070
2012	2014	1,510	0	2,520	7,600	870	12,500
2014	2017	1,510	3,100	2,520	7,600	1,400	16,130
2017	2020	1,510	6,200	2,520	7,600	1,850	19,680
2020	2025	3,890	9,250	2,520	7,600	2,290	25,550
2025	2035	5,480	9,250	3,660	7,600	5,560	31,550
2035	2060	8,700	9,250	4,860	7,600	9,420	39,830
2060	2110	14,000	9,250	4,990	7,600	15,030	50,870

Future Simulation Results

Figure 6 shows the following:

- The flow in the Verde River has declined from the predevelopment flow from approximately 29 cfs to approximately 22 cfs (a loss of approximately 7 cfs due to historic pumping).
- Conservatively, the Verde River base flow will decline to approximately 7-11 cfs in 2110 response to adding the additional pumping. This is a further decline of approximately 11-15 cfs over current conditions. So, the Verde River base flow a hundred years in the future would likely be less than one-half of the current flow and could possibly be less than one-third of the current flow.

If pumping continued after 100 years, eventually the base flow would be zero because the net pumping exceeds recharge.

The range of uncertainty shown on Figure 6 is a consequence of the fact that we have not completed the final transient calibration of our model. The uncertainty shown is based upon our knowledge gained by making a series of runs varying the key components of hydraulic conductivity, recharge, and specific yield/storativity.

The drawdown for the future simulation in 2110 after 100 years of BCWR and CG pumping is shown on Figure 7. It shows that the drawdown in the vicinity of BCWR will be approximately 600-700 feet. Since the average depth to ground water in this portion of the basin is approximately 100 feet, the average depth to ground water after 100 years of pumping will be approximately 700-800 feet. If there is additional pumping in addition to the amount simulated, as there may be, the drawdown will be greater than that shown on Figure 7. This means that the depth to ground water will be even deeper. With any additional pumping not included in the simulation, it is possible that the depth to ground water will approach or exceed the 1000 foot depth Assured Water Supply criterion.

Additionally, the simulation shows that the drawdown is so great that the pumping rate in the vicinity of the BCWR likely cannot be maintained beyond 100 years. This means that in the northern part of the basin, the BCWR, CG, and Yavapai Ranch pumping will significantly deplete the aquifer. While adding wells in areas of less drawdown would recover the lost yield for some period of time, the life of the pumping is probably limited to no more than 100 to 200 years.

If all pumping were to cease in the future, the cone of depression would continue to expand for a period of time and the base flow in the Verde River would continue to decrease. Eventually, precipitation recharge would refill enough of the cone of depression that the decline in Verde River base flow will cease and begin to slowly increase. Typically, it takes twice as long as the length of the pumping period for the base flow to recover. So, if pumping occurs for 150 years, base flow recovery would not be complete for approximately an additional 300 years. So, the depletion resulting from the pumping would likely last 450 or more years.

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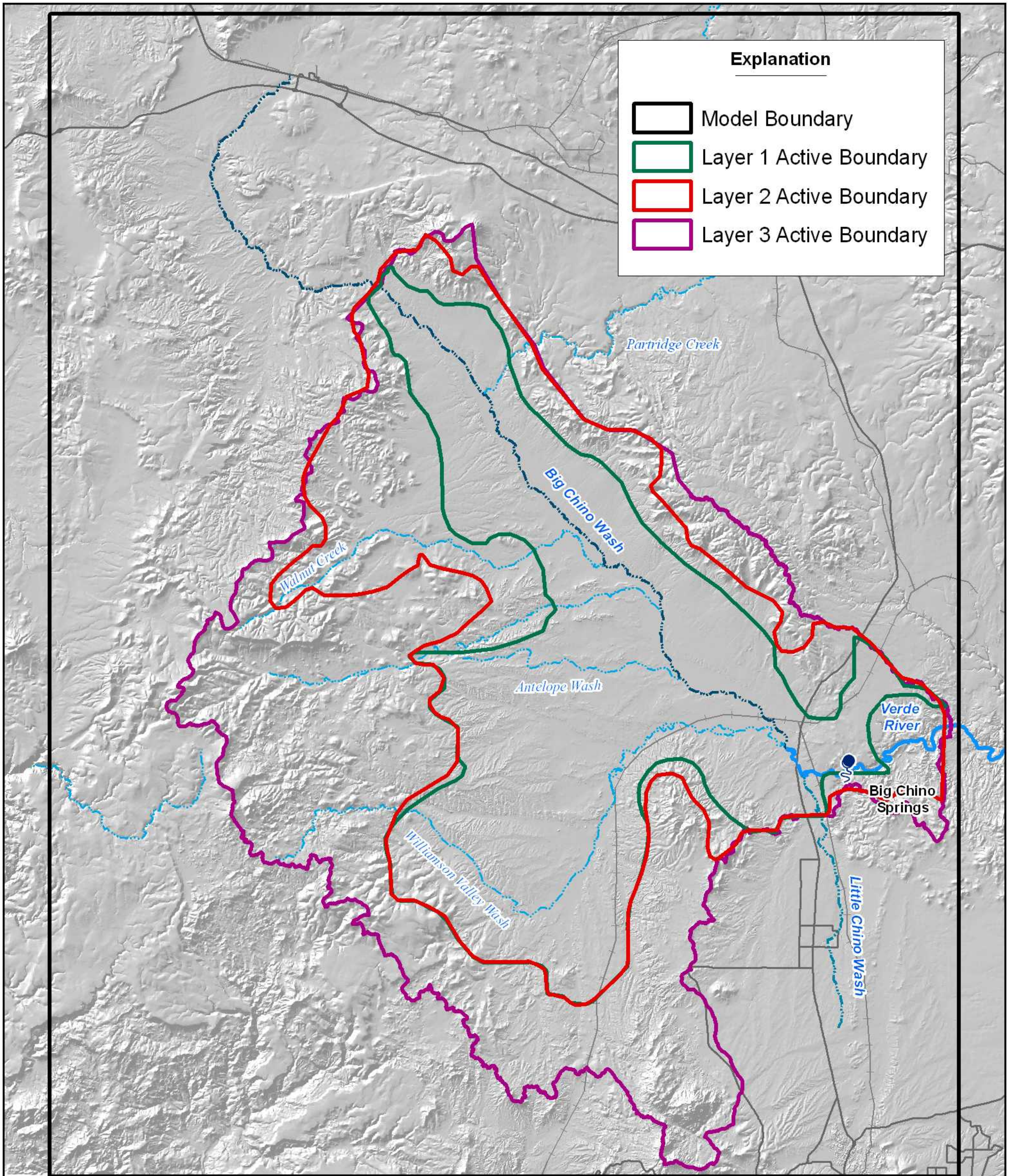
Figures



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January 19, 2007

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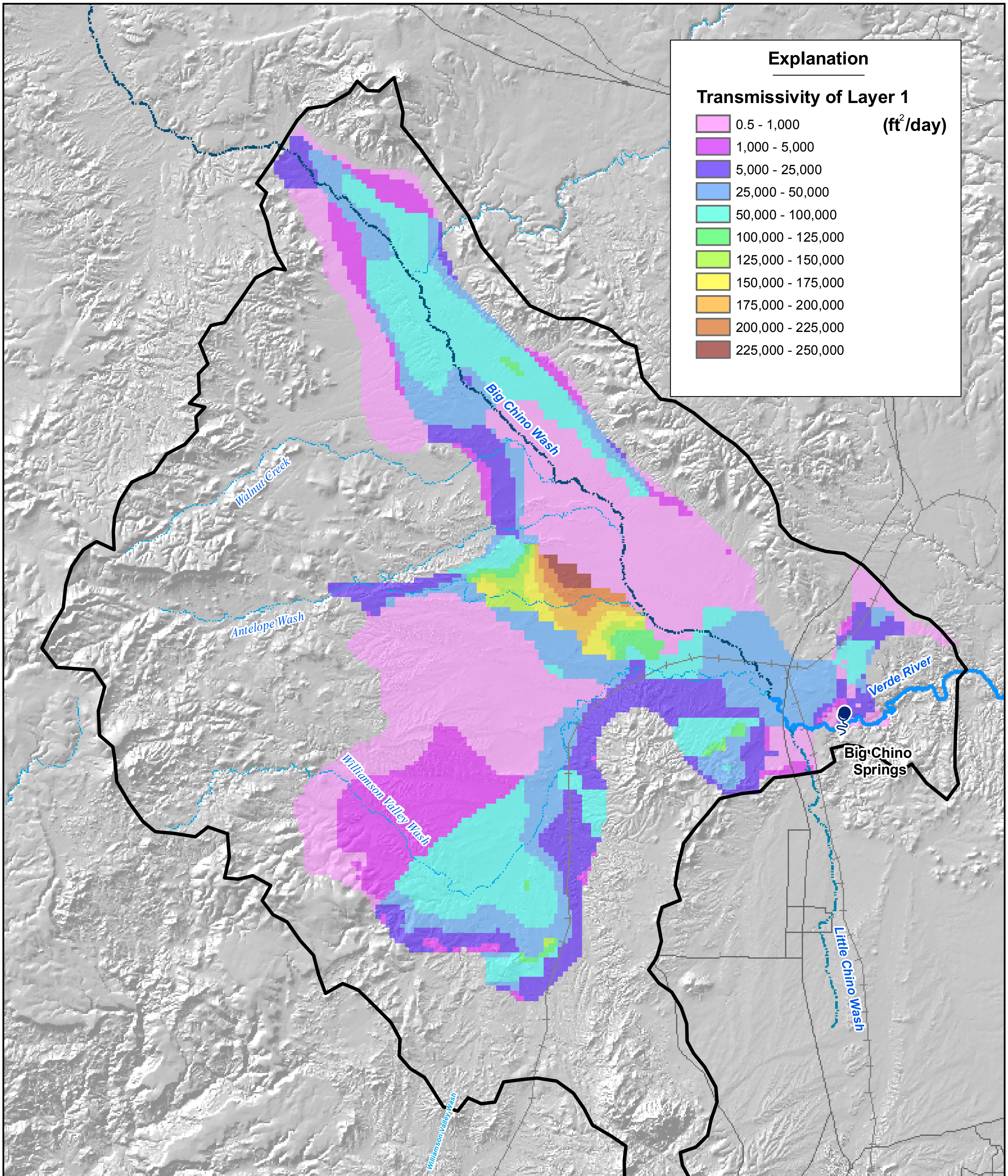
Model Boundaries

Figure 1



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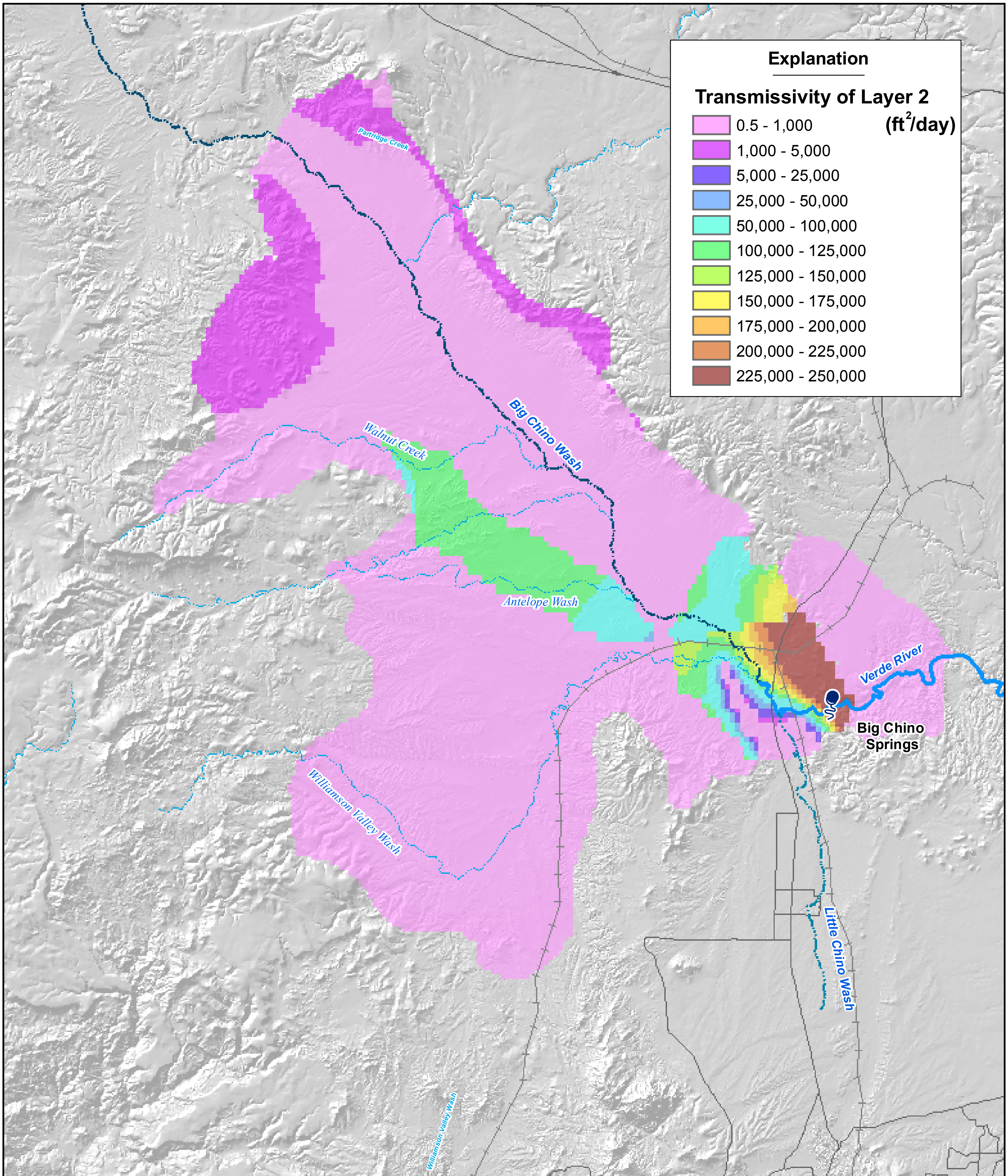
Transmissivity of Layer 1 in the Big Chino Valley

Figure 2



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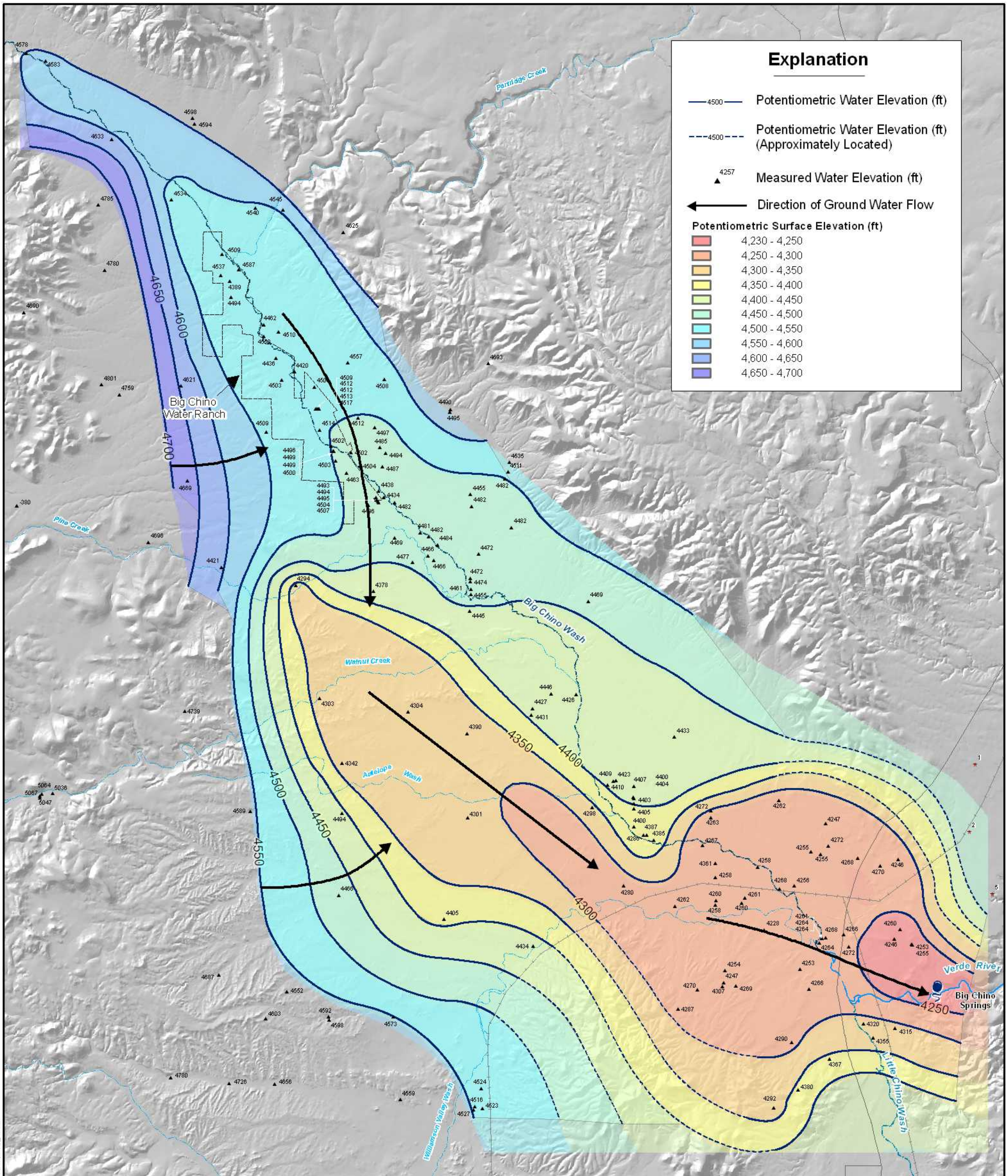
Transmissivity of Layer 2 in the Big Chino Valley

Figure 3



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Notes

Definition: Potentiometric Surface – the total pressure surface of ground water. It is the level that water rises in a well. This may be above the top of the aquifer. The water table is the potentiometric surface where the water level is below the top of the aquifer.

Sources: ADWR, ADWR GWSI, USGS WRI Open File Report 76-78, American Geologic Institute's Dictionary of Geologic Terms, Remick Well Data, USGS 1/3 Arc Second National Elevation Dataset 10 meters Geographic NAD 83

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Predevelopment Big Chino Valley Potentiometric Surface Elevation Map

Figure 4

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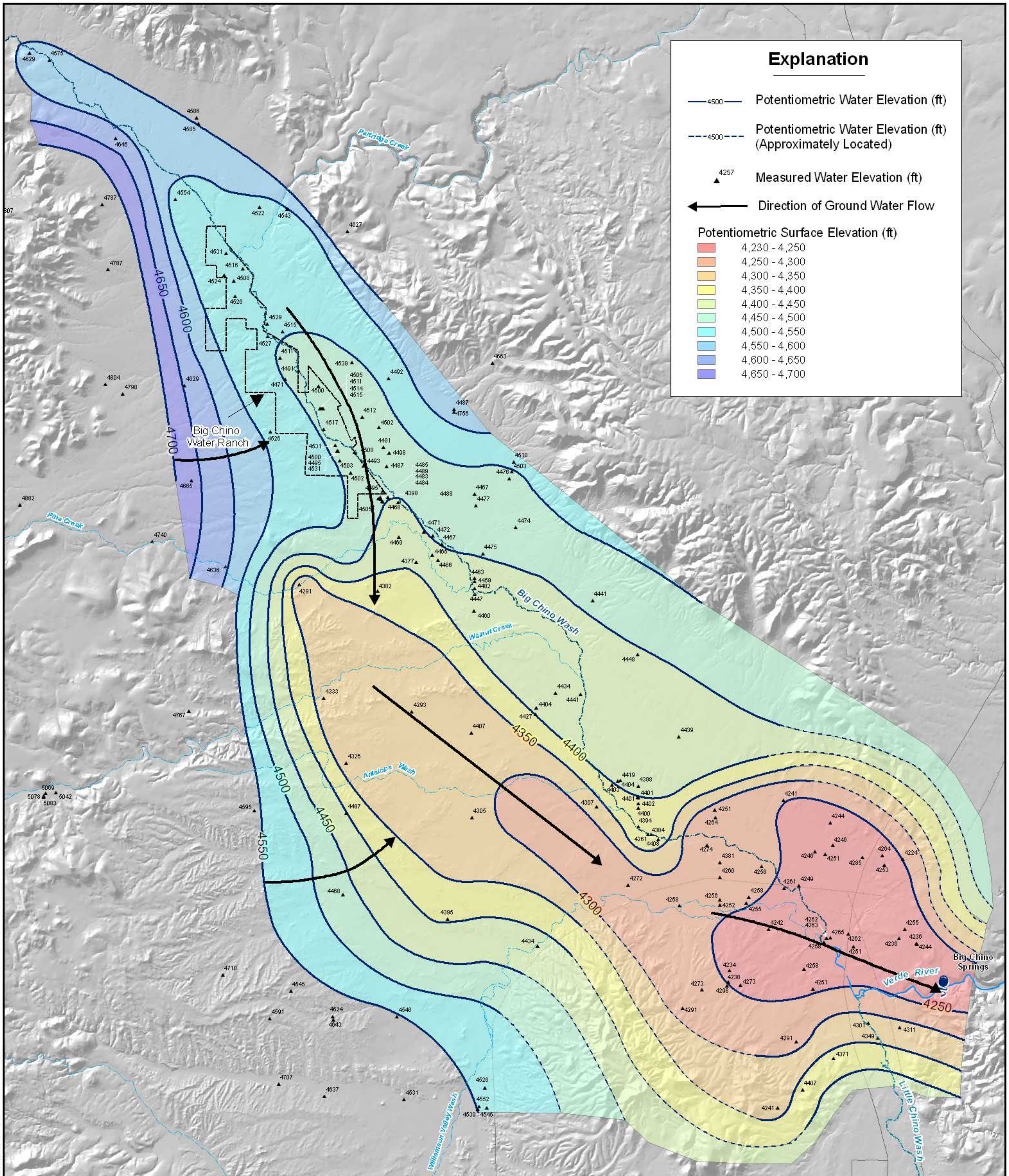

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Current Big Chino Valley Potentiometric Surface Elevation Map

Figure 5

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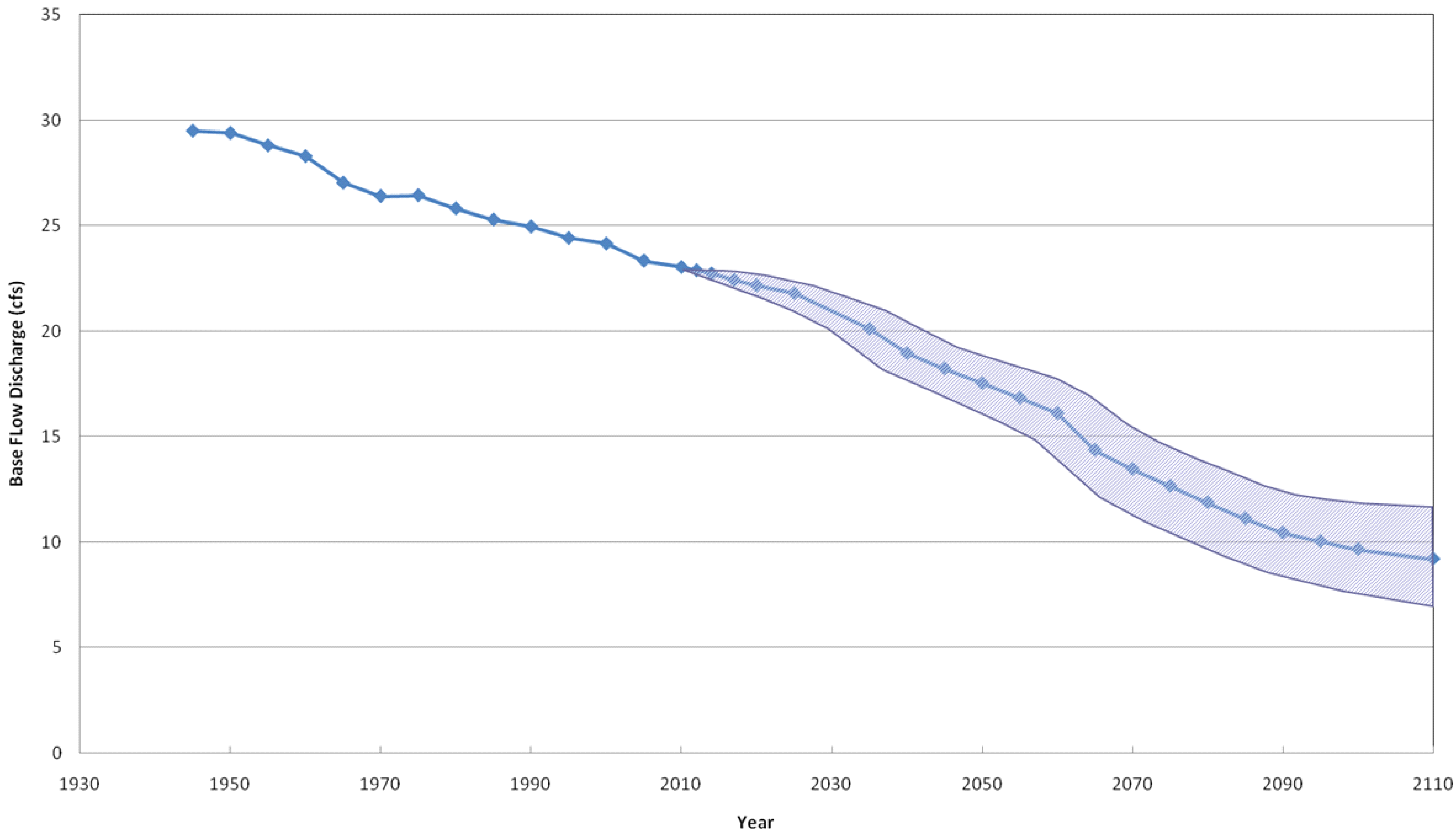
Simulated Verde River Base Flow



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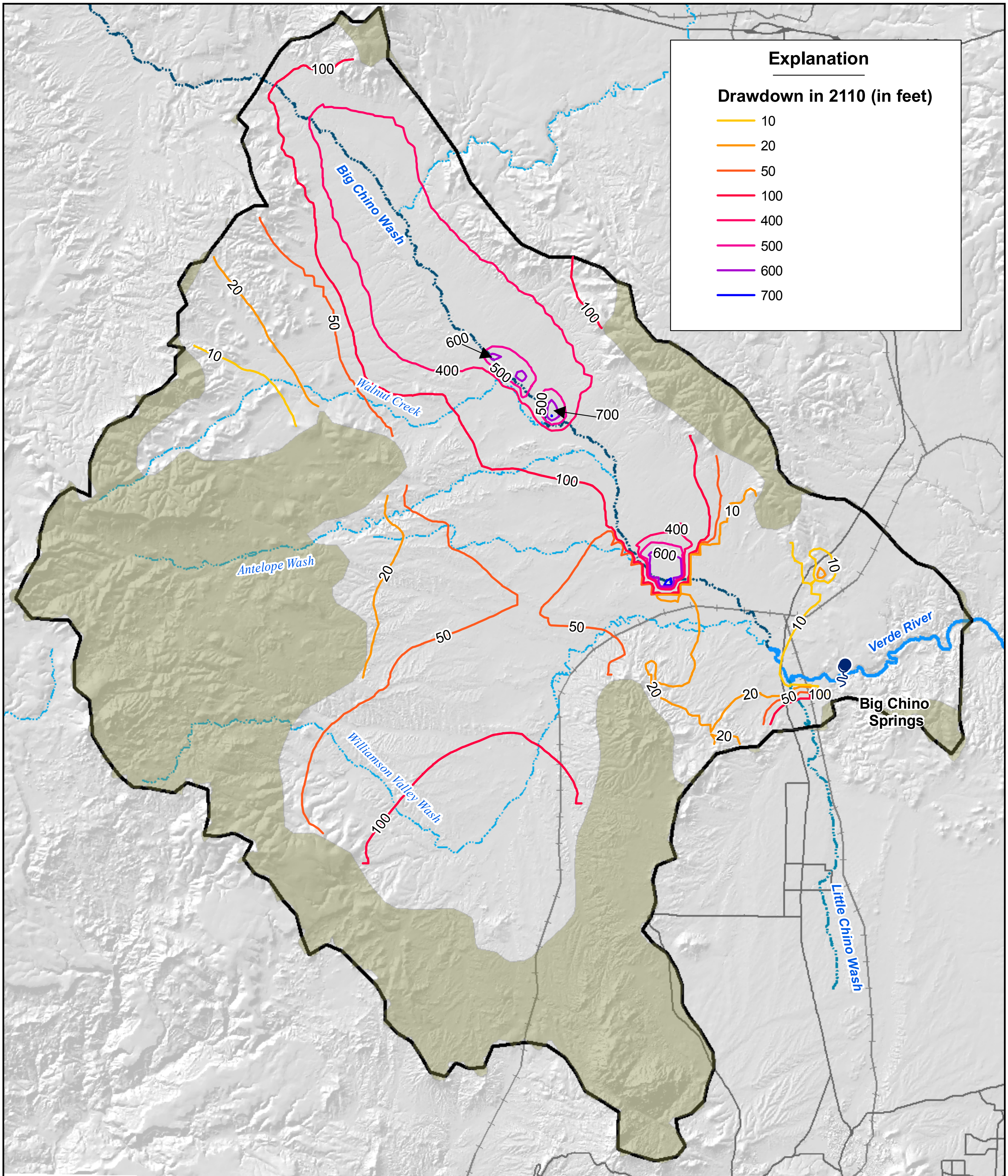
Simulated Verde River Base Flow

Figure 6



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Simulated Drawdown in 2110

Figure 7