Kimberly R. Parks (Bar No. 032828)
Arizona Department of Water Resources
Legal Division
P.O. Box 36020
Phoenix, Arizona 85067
Telephone: 602-771-8472
Fax: 602-771-8687
krparks@azwater.gov

IN THE SUPERIOR COURT OF THE STATE OF ARIZONA
IN AND FOR THE COUNTY OF MARICOPA

IN RE THE GENERAL ADJUDICATION OF ALL RIGHTS TO USE WATER IN THE GILA RIVER SYSTEM AND SOURCE	W-1 (Salt) W-2 (Verde) W-3 (Upper Gila) W-4 (San Pedro) (Consolidated) Contested Case No. W1-103 **ARIZONA DEPARTMENT OF WATER RESOURCES' NOTICE OF ERRATA CONCERNING DECEMBER 6, 2019 REPORT** Special Master Susan Ward Harris

DESCRIPTIVE SUMMARY: The Arizona Department of Water Resources hereby provides the appendix that was inadvertently omitted from its report filed December 6, 2019.

NUMBER OF PAGES: Two and twelve-page attachment

DATE OF FILING: December 9, 2019

On December 6, 2019, the Arizona Department of Water Resources (ADWR) submitted its report on the Salt River Project's Demonstration Project and ADWR's progress on the depletion model. The appendix was inadvertently omitted from the report

and is being attached to the original of this Notice being filed with the Clerk (Attachment). ADWR's report, including the previously omitted appendix, will also be posted on ADWR's web site at: https://new.azwater.gov/adjudications.

DATED this 9th day of December, 2019.

ARIZONA DEPARTMENT OF WATER RESOURCES

Kimberly R. Parks, Deputy Counsel

ORIGINAL of the foregoing sent by first-class mail on December 9, 2019 to:

Clerk of the Maricopa Superior Court
Attn: Water Case
601 W. Jackson Street
Phoenix, Arizona 85003

COPIES of the foregoing sent by first-class mail on December 9, 2019 to:

Special Master Susan Ward-Harris
Maricopa County Superior Court
Central Court Building
201 West Jefferson Street, Suite 3A
Phoenix, AZ 85003-2205

COPIES of the foregoing sent by first-class mail on December 9, 2019 to all parties on the court-approved mailing list for Contested Case No. W1-103.

ATTACHMENT

APPENDIX A

to ADWR December 6, 2019 Report

APPENDIX A

Review of SRP – Leonard Rice Subflow Depletion Demonstration Project Report (Nov. 1, 2019).

Background

The Leonard-Rice (LR) Subflow Depletion Demonstration Project Report (the LR SDDP report) presented results from several simple models developed to evaluate the theoretical impacts of pumping "test" wells at relatively close distances to a simulated subflow zone (SFZ). Two basic MODFLOW models were constructed, one model consisting of 2 layers, 10 rows and 10 columns with a 5,000 ft^2 horizontal grid spacing; the second model consisting of 2 layers, 90 rows and 90 columns with a 555 ft^2 horizontal grid spacing. Layer 1 of both models simulated a centrally located SFZ zone with a perennial stream bounded laterally by basin-fill deposits. Layer 2 of both models simulated basin-fill deposits.

Multiple steady-state and transient model simulations were run, with and without well pumpage, to evaluate the theoretical depletion of subflow. SFZ depletion was evaluated using the USGS Zonebudget program.

ADWR Review

General Comments

The LR SDDP report presents theoretical pumping wells that are located approximately 2,500 feet from an adjacent SFZ. In all transient examples presented, the pumping wells simulate substantial SFZ depletion within 100 years after the beginning of pumping (Tables 1 and 2, Figure 8; LR SDDP report).

ADWR believes the examples presented in the LR SDDP report are generally non-representative of distances between the SFZ boundary and most wells located outside the SFZ in the Sierra Vista Sub-Watershed (see **Figures 1-5**). ADWR's review of the 2006 USGS Sierra Vista Sub-watershed Groundwater Flow Model (the SVS model) indicates that the vast majority of pumping wells in the SVS model area are located substantially farther from the SFZ than 2,500 feet (see **Tables 1-4**). The consequence of most wells being located much farther away from the SFZ than the examples provided in the LR SDDP report were clearly shown in ADWR's 2018 Initial Report on Subflow Depletion Testing (ADWR, 2018). The results reported in the 2018 ADWR report showed that there was

essentially no change in the volume of flow from the SFZ to the regional aquifer after 200 years of historic and projected future pumping by hundreds of wells (ADWR, 2018, Figures 5, 6, 7). ADWR believes the LR SDDP report examples are very non-representative of current and future subflow depletion conditions for the vast majority of wells located outside the SFZ in the SVS model area.

Specific Comment

The LR SDDP report model dataset files include Excel spreadsheets listing Zonebudget output for various model runs. The rates reported for Zone 1 on the line labeled "Stream Flow Out" on the IN portion of the budget listing are incorrect. The rates listed on that line are the rates reported by Zonebudget. However, the stream flow out should be 921,500 cubic feet day (CFD) for the Base SS model with no pumping, and 876,500 CFD for the Base SS model with pumping (**Figures 6 and 7**). As setup in the LR SDDP Zonebudget zone input file, the Zonebudget program calculates the "Stream Flow Out" component by summing the stream flow out for each stream reach (stream cell); for example multiplying 864,000 times the 14 stream cells in the 10x10 model equals 1.209E07 CFD and multiplying 864,000 times 126 stream cells in the 90x90 model equals 1.088E08 CFD, which are approximately equal to the "Stream Flow Out" values reported for the Base SS and Test1 SS models.

Although this budget item doesn't actually enter into the flow process used by SRP/LR to calculate SFZ depletion (**Figure 8**), it should be corrected or deleted to avoid confusion.

References:

ADWR, 2018. Initial Report on Subflow Depletion Testing.

Leonard Rice Subflow Depletion Demonstration Project Report, 2019. Memo to Mark McGinnis from Jon Ford and others, dated November 1, 2019.

USGS, 2007. Ground-water flow model of the Sierra Vista Subwatershed and Sonoran portions of the Upper San Pedro Basin, southeastern Arizona, United States, and northern Sonora, Mexico. USGS Scientific Investigations report 2006-5228.

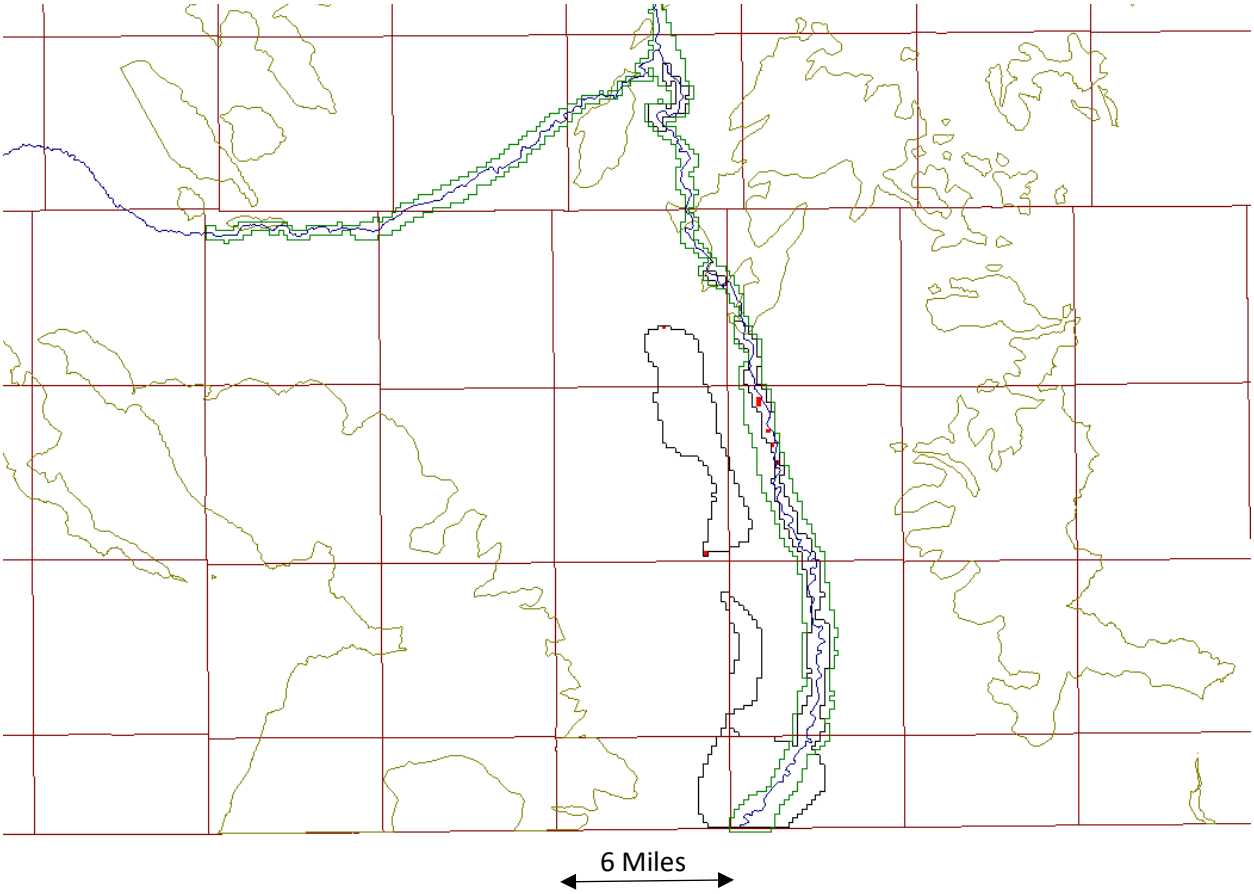

Figure 1: Locations of wells listed for Model Layer 1 in USGS SVS Groundwater Flow Model Well Package

(Note: Many wells listed in well package do not have assigned pumping volumes for any given stress period, or may have assigned recharge volumes)

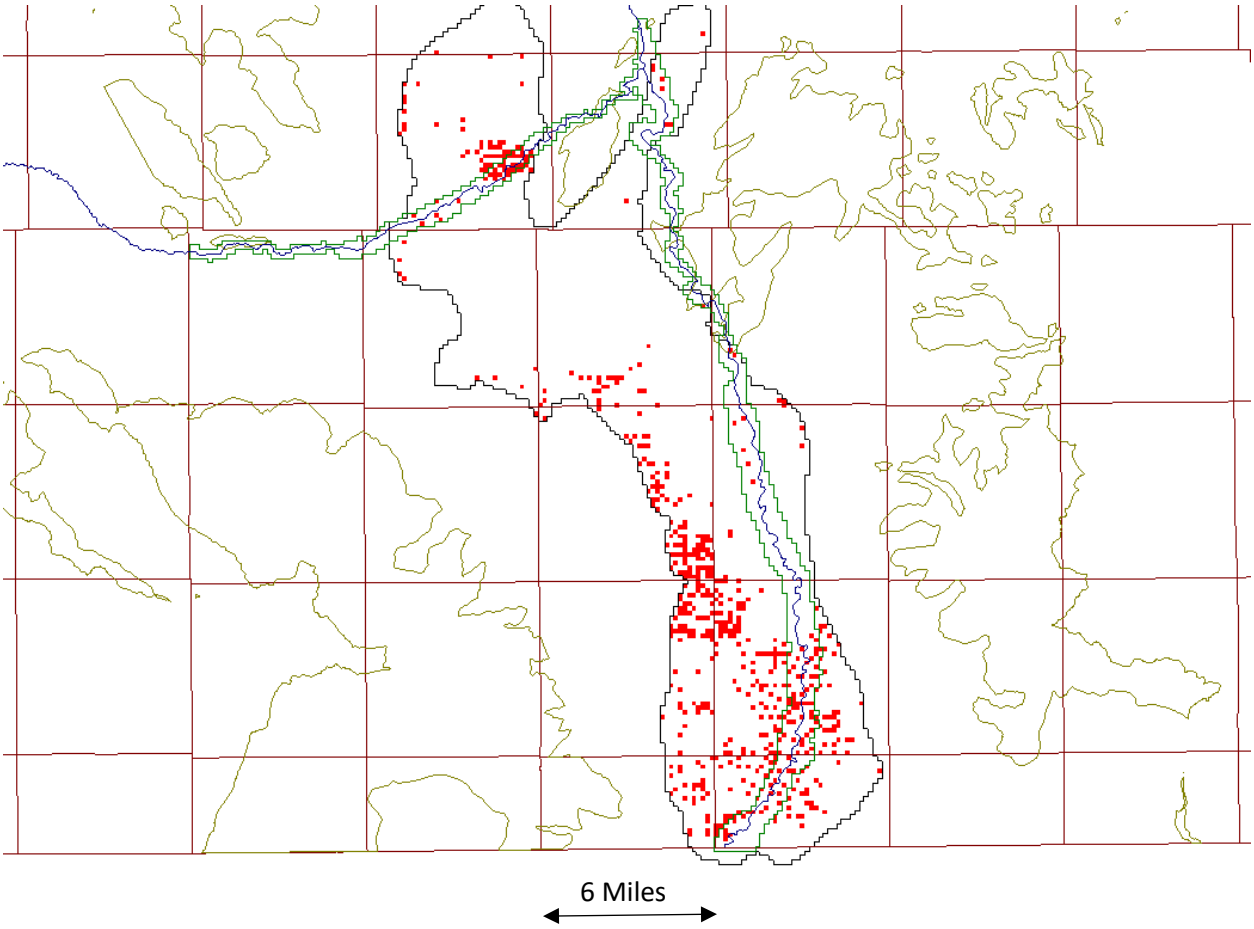

Figure 2: Locations of wells listed for Model Layer 2 in USGS SVS Groundwater Flow Model Well Package

(Note: Many wells listed in well package do not have assigned pumping volumes for any given stress period, or may have assigned recharge volumes)

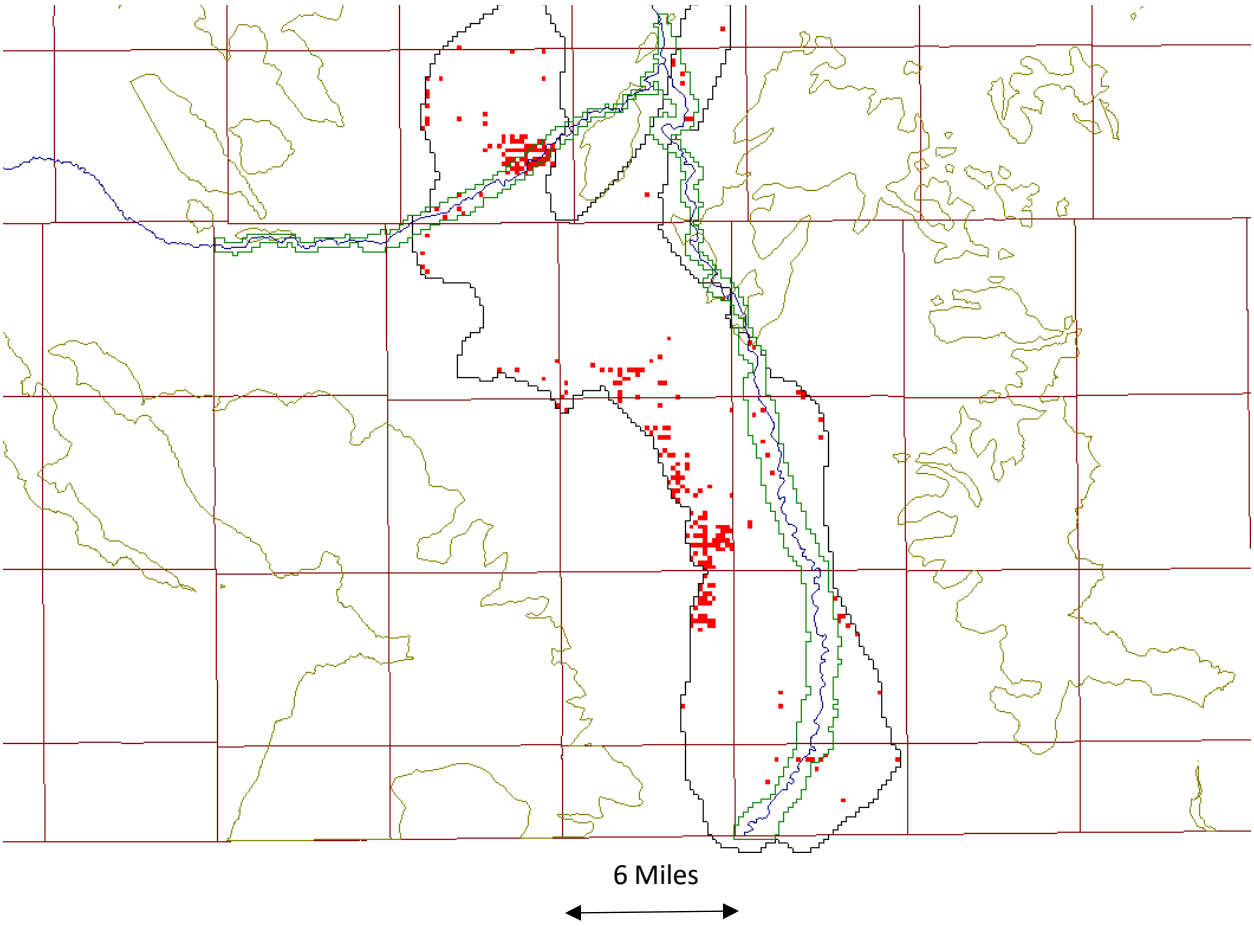

Figure 3: Locations of wells listed for Model Layer 3 in USGS SVS Groundwater Flow Model Well Package

(Note: Many wells listed in well package do not have assigned pumping volumes for any given stress period, or may have assigned recharge volumes)

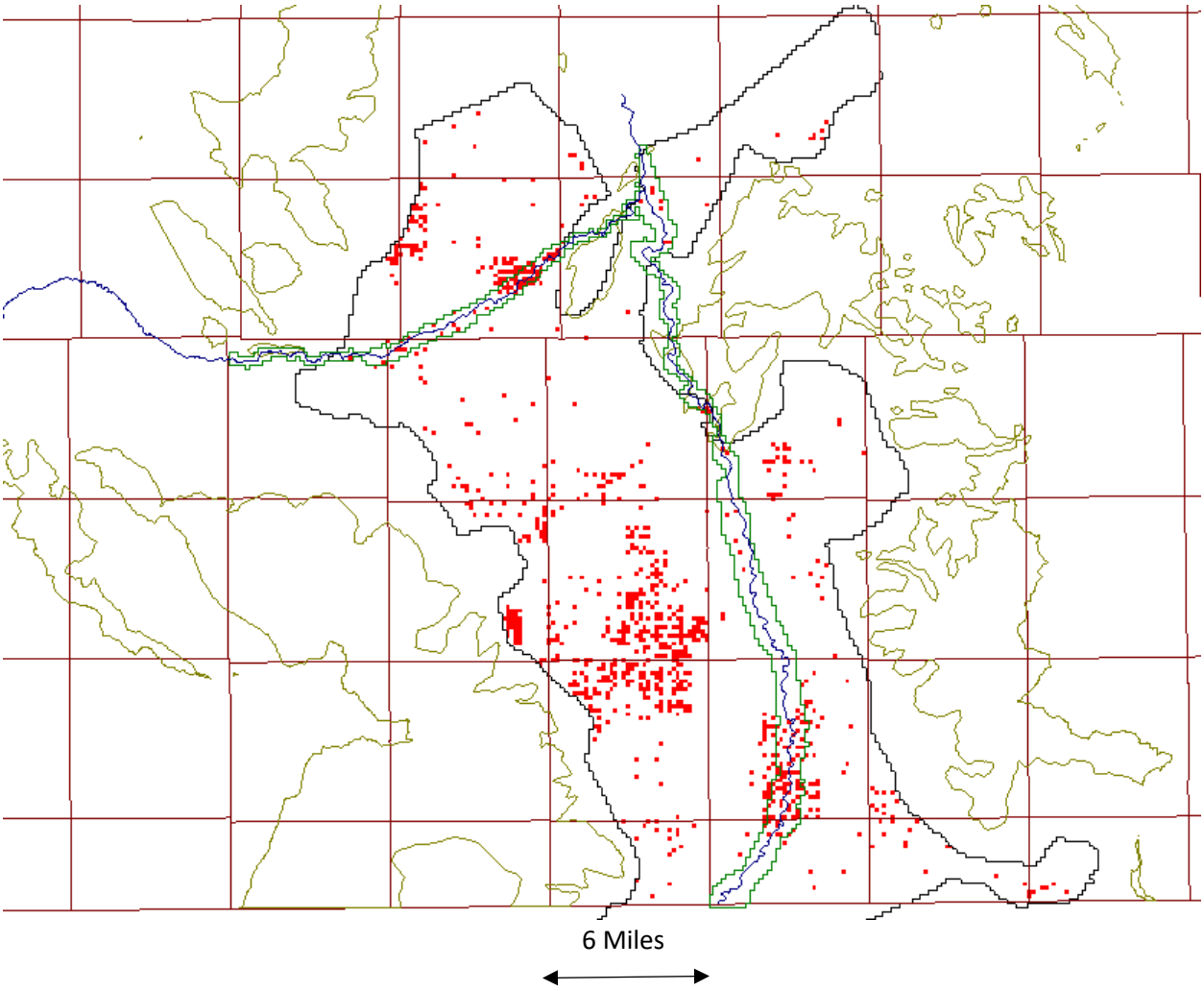

Figure 4: Locations of wells listed for Model Layer 4 in USGS SVS Groundwater Flow Model Well Package

(Note: Many wells listed in well package do not have assigned pumping volumes for any given stress period, or may have assigned recharge volumes)

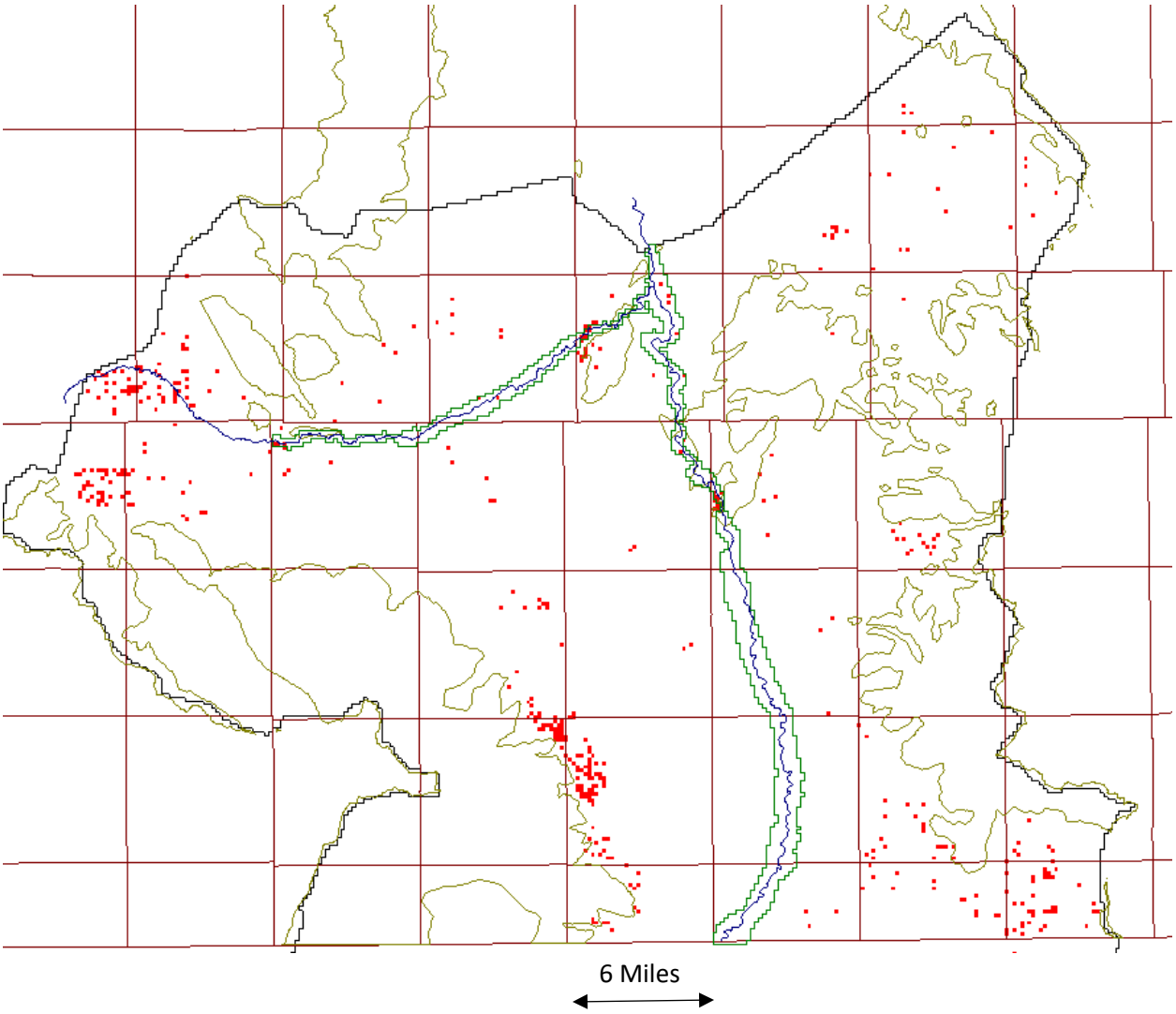

Figure 5: Locations of wells listed for Model Layer 5 in USGS SVS Groundwater Flow Model Well Package

(Note: Many wells listed in well package do not have assigned pumping volumes for any given stress period, or may have assigned recharge volumes)

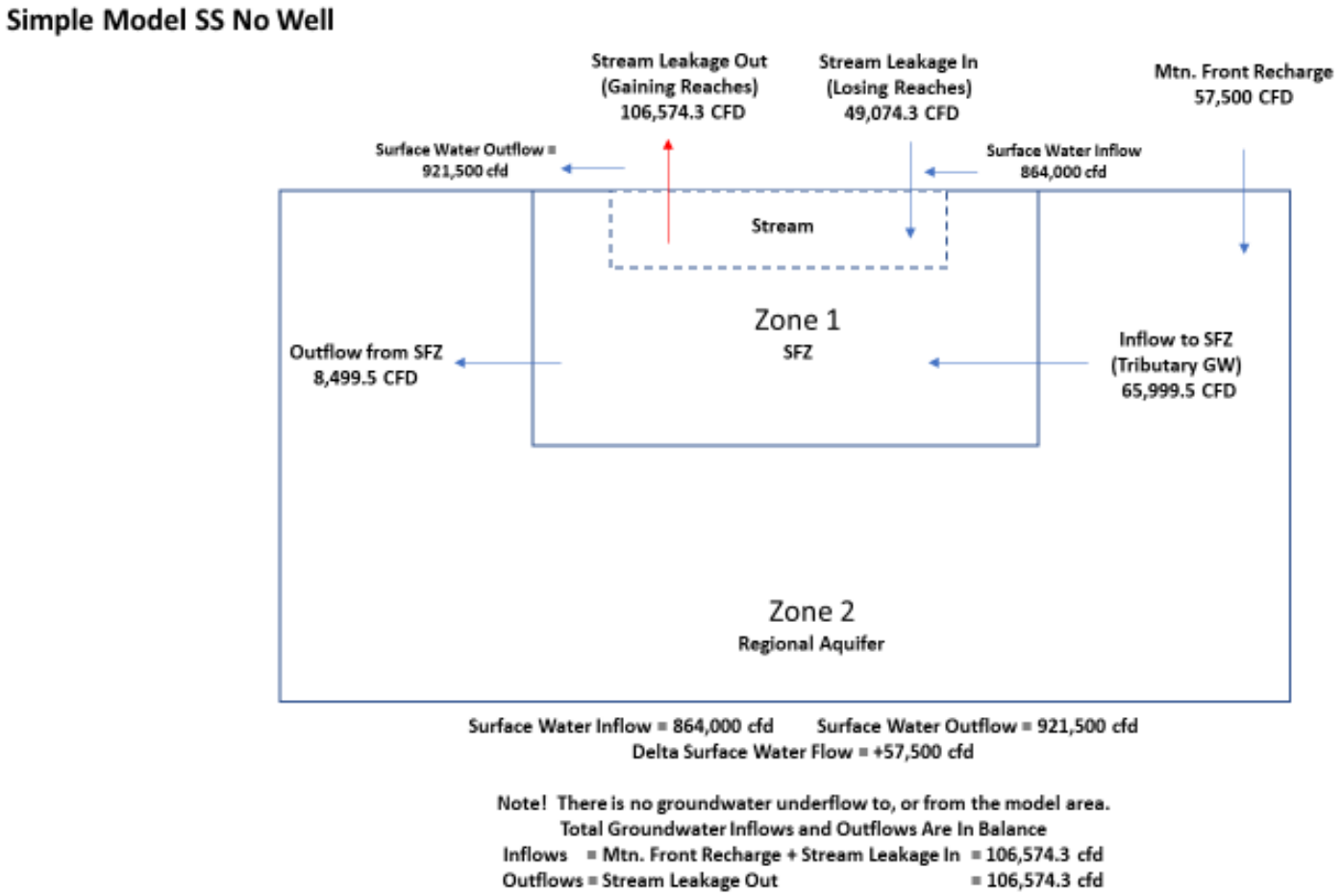

Figure 6: Diagram of Zone Budget Analysis for Base SS Model (No Pumping)

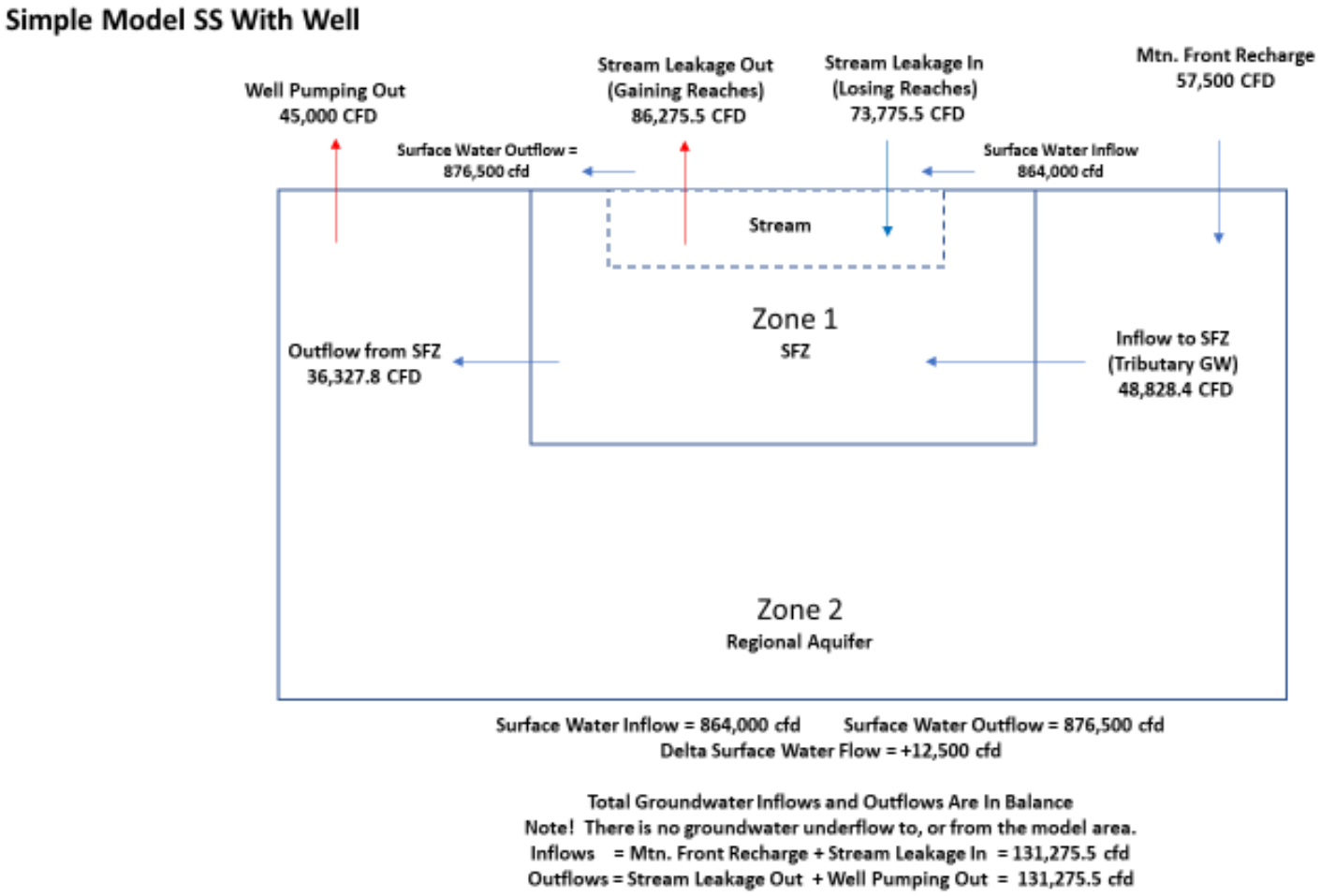

Figure 7: Diagram of Zone Budget Analysis for Base SS Model (With Pumping)

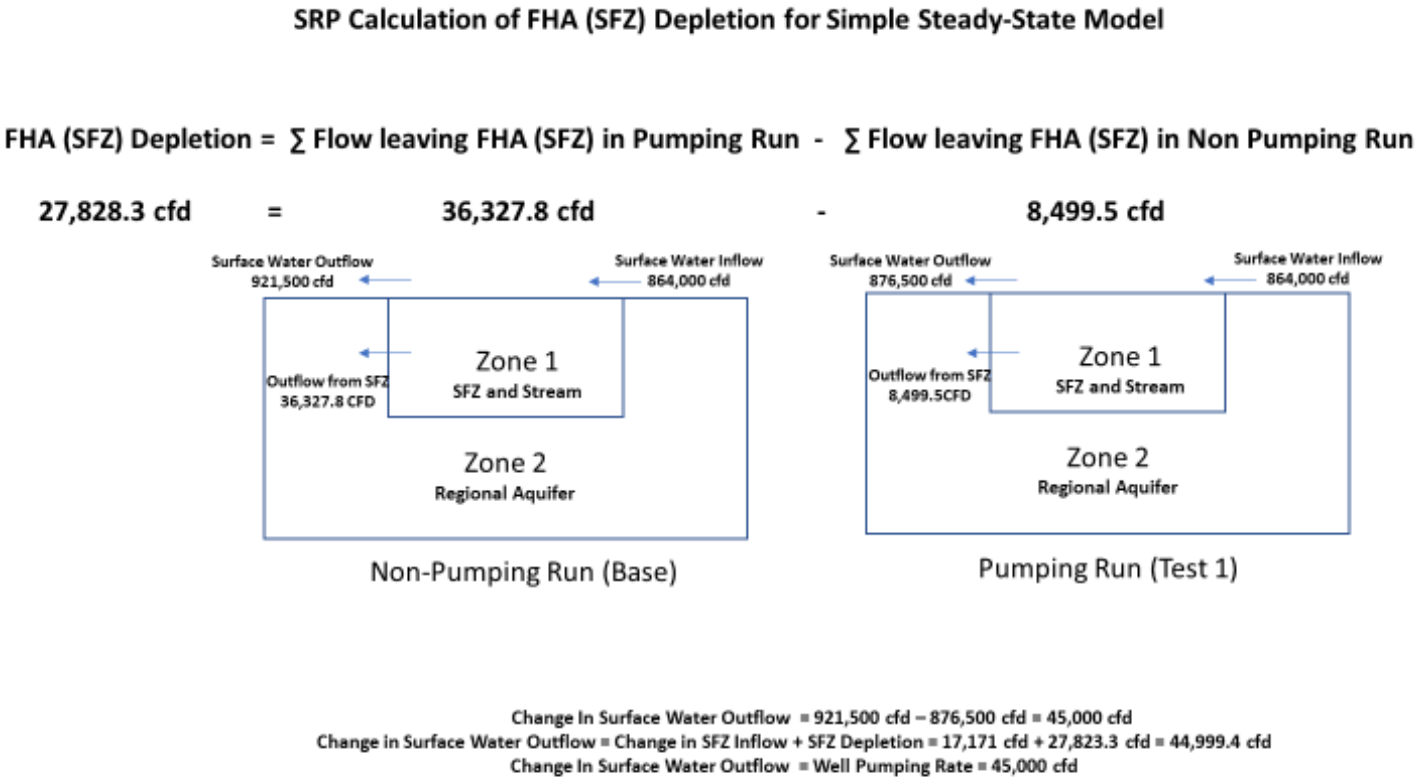

Figure 8: Diagram of Zone Budget Analysis for SFZ Depletion from Base SS Model (No Pumping) to Base SS Model (With Pumping)

Table 1: Pumping Volumes (Acre-Feet) Per Model Cell Vs. Distance (Meters) to the northern Babocomari River SFZ Boundary

Pumping Volumes Per Model Cell In (Acre-Feet) Vs Ranges of Distances From Pumping Cells To SFZ Boundary (Meters)								
Stress Period 33 (217 Days)	Babocomari North							
Distance Cell to SFZ Boundary	0-1000	1001-2500	2501-5000	5001-7500	7501-10000	10001-15000	15001-20000	>20000
Number of Cells In Range	9	80	19	76	42	4	0	0
Average Pumped Volume/Cell In SP	-3.57336	-0.26505	-2.93717	-1.30835	-0.51432	-7.73083	NA	NA
Median Pumped Volume/Cell In SP	-0.41172	-0.04646	-0.32411	-0.40821	-0.40821	-10.17170	NA	NA
Maximum Pumped Volume/Cell in SP	-10.17170	-10.17170	-12.62770	-51.20864	-8.66702	-10.17170	NA	NA
Minimum Pumped Volume/Cell in SP	-0.00665	-0.00025	-0.00007	0.00000	-0.00190	-0.40821	NA	NA
Stress Period 34 (148 Days)	Babocomari North							
Distance Cell to SFZ Boundary	0-1000	1001-2500	2501-5000	5001-7500	7501-10000	10001-15000	15001-20000	>20000
Number of Cells In Range	9	80	19	76	42	4	0	0
Average Pumped Volume/Cell In SP	-2.43713	-0.18077	-2.00323	-0.89233	-0.35078	-5.27264	NA	NA
Median Pumped Volume/Cell In SP	-0.28081	-0.03169	-0.22105	-0.27841	-0.27841	-6.93738	NA	NA
Maximum Pumped Volume/Cell in SP	-6.93738	-6.93738	-8.61244	-34.92571	-5.91115	-6.93738	NA	NA
Minimum Pumped Volume/Cell in SP	-0.00453	-0.00017	-0.00005	0.00000	-0.00130	-0.27841	NA	NA

Table 2: Pumping Volumes (Acre-Feet) Per Model Cell Vs. Distance (Meters) to the southern Babocomari River SFZ Boundary

Pumping Volumes Per Model Cell In (Acre-Feet) Vs Ranges of Distances From Pumping Cells To SFZ Boundary (Meters)								
Stress Period 33 (217 Days)	Babocomari South							
Distance Cell to SFZ Boundary	0-1000	1001-2500	2501-5000	5001-7500	7501-10000	10001-15000	15001-20000	>20000
Number of Cells In Range	41	8	2	0	9	37	58	151
Average Pumped Volume/Cell In SP	-0.42782	-4.96730	-3.01801	NA	-93.02992	-35.89392	-13.91890	-4.04687
Median Pumped Volume/Cell In SP	-0.05324	-0.41172	-3.01801	NA	-9.14943	-9.32538	-0.40821	-0.40821
Maximum Pumped Volume/Cell in SP	-10.17170	-18.16337	-5.77175	NA	-384.19035	-266.81489	-259.86132	-248.79743
Minimum Pumped Volume/Cell in SP	-0.00009	-0.03778	-0.26428	NA	-0.31840	-0.03617	-0.00005	-0.25878
Stress Period 34 (148 Days)	Babocomari South							
Distance Cell to SFZ Boundary	0-1000	1001-2500	2501-5000	5001-7500	7501-10000	10001-15000	15001-20000	>20000
Number of Cells In Range	41	8	2	0	9	36	58	150
Average Pumped Volume/Cell In SP	-0.29178	-3.38784	-0.46287	NA	-43.07819	-24.85764	-9.49307	-2.74829
Median Pumped Volume/Cell In SP	-0.03631	-0.28081	-0.46287	NA	-26.51425	-6.51778	-0.27841	-0.27841
Maximum Pumped Volume/Cell in SP	-6.93738	-12.38792	-0.88521	NA	-148.89638	-181.97513	-177.23261	-169.68672
Minimum Pumped Volume/Cell in SP	-0.00006	-0.02576	-0.04053	NA	-0.21716	-0.02467	-0.00003	-0.17649

Note: 1 meter = 3.2808 feet
1 mile = 1,609.36 meters

Table 3: Pumping Volumes (Acre-Feet) Per Model Cell Vs. Distance (Meters) to the western San Pedro River SFZ Boundary

Pumping Volumes Per Model Cell In (Acre-Feet) Vs Ranges of Distances From Pumping Cells To SFZ Boundary (Meters)								
Stress Period 33 (217 Days)	San Pedro West							
Distance Cell to SFZ Boundary	0-1000	1001-2500	2501-5000	5001-7500	7501-10000	10001-15000	15001-20000	>20000
Number of Cells In Range	49	47	408	485	236	447	37	134
Average Pumped Volume/Cell In SP	-0.57432	-52.12347	-0.84263	-1.17168	-2.46251	-6.77603	-32.36431	-4.46354
Median Pumped Volume/Cell In SP	-0.40821	-0.40821	-0.25853	-0.25065	-0.38526	-0.40821	-0.40821	-0.40821
Maximum Pumped Volume/Cell in SP	-10.14189	-725.56591	-77.11735	-206.75509	-146.14802	-266.81489	-384.19035	-84.42458
Minimum Pumped Volume/Cell in SP	-0.01084	-0.00215	0.00000	-0.00010	-0.00007	0.00000	-0.03778	-0.40821
Stress Period 34 (148 Days)	San Pedro West							
Distance Cell to SFZ Boundary	0-1000	1001-2500	2501-5000	5001-7500	7501-10000	10001-15000	15001-20000	>20000
Number of Cells In Range	48	38	408	485	236	445	37	134
Average Pumped Volume/Cell In SP	-0.25576	-0.74557	-0.57470	-0.79912	-1.67950	-4.61988	-16.88339	-3.04426
Median Pumped Volume/Cell In SP	-0.27841	-0.27841	-0.17632	-0.17095	-0.26276	-0.27841	-0.27841	-0.27841
Maximum Pumped Volume/Cell in SP	-0.28081	-6.93738	-52.59617	-141.01269	-99.67699	-181.97513	-148.89638	-57.57990
Minimum Pumped Volume/Cell in SP	-0.00739	-0.00146	0.00000	-0.00007	-0.00005	0.00000	-0.02576	-0.27841

Table 4: Pumping Volumes (Acre-Feet) Per Model Cell Vs. Distance (Meters) to the eastern San Pedro River SFZ Boundary

Pumping Volumes Per Model Cell In (Acre-Feet) Vs Ranges of Distances From Pumping Cells To SFZ Boundary (Meters)								
Stress Period 33 (217 Days)	San Pedro East							
Distance Cell to SFZ Boundary	0-1000	1001-2500	2501-5000	5001-7500	7501-10000	10001-15000	15001-20000	>20000
Number of Cells In Range	14	50	53	25	16	32	46	2
Average Pumped Volume/Cell In SP	-0.35014	-0.57770	-2.41796	-2.94077	-2.21357	-1.69896	-20.55782	-1.16207
Median Pumped Volume/Cell In SP	-0.40821	-0.40821	-0.41172	-0.40820	-0.40821	-0.41172	-0.40821	-1.16207
Maximum Pumped Volume/Cell in SP	-0.41172	-10.17082	-36.53761	-18.16336	-10.17170	-10.17216	-266.81489	-1.91594
Minimum Pumped Volume/Cell in SP	-0.03310	-0.00001	0.00000	0.00000	-0.00013	-0.00041	0.00000	-0.40821
Stress Period 34 (148 Days)	San Pedro East							
Distance Cell to SFZ Boundary	0-1000	1001-2500	2501-5000	5001-7500	7501-10000	10001-15000	15001-20000	>20000
Number of Cells In Range	14	50	53	25	16	32	46	2
Average Pumped Volume/Cell In SP	-0.23881	-0.39401	-1.64911	-2.00568	-1.50971	-1.13889	-13.04981	-0.63380
Median Pumped Volume/Cell In SP	-0.27841	-0.27841	-0.28081	-0.27841	-0.27841	-0.28081	-0.27841	-0.63380
Maximum Pumped Volume/Cell in SP	-0.28081	-6.93678	-24.91966	-12.38791	-6.93738	-6.93770	-181.97513	-0.98919
Minimum Pumped Volume/Cell in SP	-0.02258	-0.00001	0.00000	0.00000	-0.00009	-0.00028	0.00000	-0.27841

Note: 1 meter = 3.2808 feet
1 mile = 1,609.36 meters