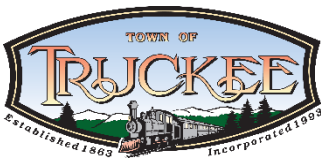


Annual Report for the Martis Valley Groundwater Basin Sustainable Groundwater Management Act Alternative Submittal

Water Years 2016 and 2017

March 2018





Consulting
Engineers and
Scientists

Annual Report for the Martis Valley Groundwater Basin Sustainable Groundwater Management Act Alternative Submittal

Water Years 2016 and 2017

Prepared for:

Truckee Donner Public Utility District (TDPUD)

On behalf of Truckee Donner Public Utility District (TDPUD), Northstar Community Service District (NCSD), Placer County Water Agency (PCWA), Town of Truckee, Nevada County, and Placer County

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March 30, 2018

TRUCKEE DONNER PUBLIC UTILITY DISTRICT
ANNUAL REPORT FOR ALTERNATIVE SUBMITTAL TO A
GROUNDWATER SUSTAINABILITY PLAN
FOR THE MARTIS VALLEY GROUNDWATER BASIN

WATER YEARS 2016 AND 2017

Certifications and Seals


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Table of Contents

Table of Contents	ii
Executive Summary.....	4
1. Introduction	5
1.1 Martis Valley Groundwater Basin	5
1.2 Climatic Conditions.....	6
1.3 Surface Water Conditions.....	6
2. Groundwater Levels	8
2.1 Groundwater Level Hydrographs	8
2.2 Groundwater Level Contours.....	8
3. Groundwater Extraction	9
4. Surface Water	13
4.1 Surface Water Supply.....	13
4.2 Surface Water Imports.....	16
5. Total Water Use	17
6. Change in Groundwater Storage	18
7. Alternative Implementation Progress	19
8. References	21

Figures

Attachment A. Monitoring Well Hydrographs

Figures

Figure 1	Martis Valley Groundwater Basin Location
Figure 2	Annual Precipitation Deviation from Mean: Truckee Ranger Station No. 049343
Figure 3	Surface Water Stream Gage Flows for Water Years 2016-2017
Figure 4	Martis Valley Groundwater Basin Surface Water Pertinent Features
Figure 5	Truckee River Net Surface Water Outflows
Figure 6	Martis Valley Groundwater Basin Monitoring Well Locations
Figure 7	Martis Valley Historic Groundwater Level Elevations
Figure 8	Martis Valley Historic Groundwater Level Elevations, Water Years 2015-2017
Figure 9	Martis Valley Groundwater Basin Spring 2015 Groundwater Elevation Contours
Figure 10	Martis Valley Groundwater Basin Fall 2015 Groundwater Elevation Contours
Figure 11	Martis Valley Groundwater Basin Spring 2016 Groundwater Elevation Contours
Figure 12	Martis Valley Groundwater Basin Fall 2016 Groundwater Elevation Contours
Figure 13	Martis Valley Groundwater Basin Spring 2017 Groundwater Elevation Contours
Figure 14	Martis Valley Groundwater Basin Fall 2017 Groundwater Elevation Contours
Figure 15	Martis Valley Groundwater Basin Monthly Pumping Totals
Figure 16	Martis Valley Groundwater Basin Locations of Groundwater Extractions
Figure 17	Martis Valley Groundwater Basin Change in Groundwater Elevation, Spring 2015-Spring 2016

Figure 18 Martis Valley Groundwater Basin Change in Groundwater Elevation, Spring 2016-Spring 2017
Figure 19 Change in Storage and Groundwater Use

Tables

Table 1	Groundwater Extractions for Water Year 2015-2016 (values in acre-feet)
Table 2	Groundwater Extractions for Water Year 2016-2017 (values in acre-feet)
Table 3	Surface Water Usage Reported for Water Year 2015-2016 (values in acre-feet)
Table 4	Surface Water Usage Reported for Water Year 2016-2017 (values in acre-feet)
Table 5	Estimated Groundwater Recharge from T-TSA for Water Years 2015-2016 (acre-feet)
Table 6	Estimated Groundwater Recharge from T-TSA for Water Years 2016-2017 (acre-feet)
Table 7	Total Water Use for Water Years 2016-2017 (acre-feet)
Table 8	Estimated Change in Storage from Groundwater Level Difference Contour Surfaces

Executive Summary

This document provides annual monitoring data and presentation of Martis Valley Groundwater Basin (MVGB or Basin) conditions that are functionally equivalent to the requirements and regulations for a Groundwater Sustainability Plan (GSP) under the Sustainable Groundwater Management Act (SGMA) by the California Department of Water Resources (DWR). This annual report complies with the components specified in Section 356.2 (Annual Reports) of the regulations for a GSP. The content of this report is consistent with and complementary to the Alternative Submittal to a Groundwater Sustainability Plan for the MVGB (Alternative), submitted to DWR in December 2016. This report contains monitoring data for water years 2016 and 2017, defined as October through September, as well as an assessment of sustainable groundwater conditions as defined by the Alternative. DWR previously postponed the water year 2016 annual reporting requirement.

Water levels, groundwater extractions, surface water conditions, groundwater recharge from imported wastewater, measured and estimated total water use and groundwater storage change estimates were compiled and presented. All wells remained above their respective minimum groundwater elevation thresholds in 2016 and 2017. Surface water flows increased throughout the Basin and at the outflow point along the Truckee River at the eastern Basin boundary. Groundwater level elevations for the monitoring well network exhibited either increases or stable water conditions. Change in groundwater storage values were positive for both years, consistent with a sustainably managed groundwater basin and the climatic conditions over the last two water years.

The use of groundwater resources within the Basin remains well below sustainable yield. Given the above normal and wet climatic conditions for water years 2016 and 2017, respectively, groundwater and surface water reserves have increased accordingly. By the standards set forth by the Alternative, groundwater conditions within the MVGB continue to be sustainable.

1. Introduction

In December 2016, Truckee Donner Public Utility District (TDPUD) provided an Alternative Submittal to a Groundwater Sustainability Plan (Alternative) for approval by the California Department of Water Resources (DWR). The Alternative was submitted in accordance with the Sustainable Groundwater Management Act of 2014 (SGMA). The Martis Valley Groundwater Basin Sustainable Groundwater Management Act Alternative Submittal (TDPUD, 2016) was submitted by the Truckee Donner Public Utility District (TDPUD) on behalf of the Martis Valley Groundwater Basin (MVGB or Basin) and its local MVGB SGMA Agencies (MVGB Agencies), including: TDPUD, Northstar Community Services District (NCSD), Placer County Water Agency (PCWA), the City of Truckee, Nevada County, and Placer County. The MVGB Alternative complied with the DWR's Groundwater Sustainability Plan (GSP) Regulations' Article 9, which allows basins that have operated sustainably for at least 10 years to submit an alternative plan that is functionally equivalent to a GSP. As referenced in the MVGB Alternative, scientific analyses show that there has been at least a 25-year history of sustainable groundwater operations and conditions within the MVGB, despite several periods of drought. This document provides annual monitoring data consistent with the Alternative and functionally equivalent to the Annual Report required for Groundwater Sustainability Plans (GSP's) per Article 7 §356.2 of the Regulations. DWR postponed the annual reporting requirement for 2016; thus, this is the first Annual Report of the Alternative for the MVGB, covering water years (WY's) 2016 and 2017.

1.1 Martis Valley Groundwater Basin

The MVGB, Basin No. 6-67 as defined by DWR in Bulletin 118 Interim Update (2016), is a 35,600 acre (57 square mile) intermontane, fault-bounded basin east of the Sierra Nevada crest. **Figure 1** shows the location of the MVGB and pertinent geographic features.

The MVGB uses groundwater almost exclusively for water demands, although several major surface water bodies are present within its boundaries. The Truckee River traverses the Basin from the southwest to the northeast in a shallow, incised channel. Principal tributaries to the Truckee River within the MVGB are Donner Creek, Martis Creek, and Prosser Creek; as well as discharge from Boca Reservoir slightly before the Truckee River leaves the Basin. Major surface water storage reservoirs inside MVGB include Martis Lake and Prosser Reservoir. Donner Lake and Boca Reservoir lie just outside the MVGB boundaries, but release surface water into the MVGB. Although surface water released from reservoirs is not used to satisfy local demands, it is a major, and highly regulated, component of the Basin's hydrologic system. Surface water usage within the MVGB is under the purview of the Truckee River Operating Agreement (TROA), which sets limits on the consumptive use of both groundwater and surface water in the Basin. More information on the relationship of TROA water usage constraints and those proposed for SGMA compliance are described in the MVGB Alternative and supporting documentation.

Wastewater is generated within the MVGB, within the Truckee River watershed, and outside the watershed (Lake Tahoe area) and sent to a treatment facility operated by the Tahoe-Truckee Sanitary

Agency (T-TSA). The treated water is recharged into the groundwater system via two leach fields (**Figure 1**), increasing the groundwater contribution to downstream Truckee River flows.

1.2 Climatic Conditions

The MVGB is not part of the Sacramento Valley where the Sacramento River Index (SRI) is commonly used to define water year types. Thus, water year types were developed for the MVGB using local precipitation data from Truckee Ranger Station no. 049043, located on **Figure 1**. The deviation of annual water year precipitation from the mean, including the base precipitation period of 1989-2009, is shown on **Figure 2**. Wet conditions were set at more than one standard deviation above the mean annual water year precipitation total. Above normal conditions were defined as annual precipitation between the mean value and one standard deviation above it. Likewise, below normal conditions were defined as an annual precipitation between the mean value and one standard deviation below it. Dry conditions were defined as an annual precipitation total more than one standard deviation below the mean. Water years 2016 and 2017 are classified as above normal and wet water years, respectively. This corresponds with increases observed in both groundwater elevations and surface water flows over the same period.

1.3 Surface Water Conditions

River and stream flows for the past two water years were compiled for local streamflow gages and are presented on **Figure 3** to show monthly variations over the past two water years. Pertinent USGS streamflow gages used for this analysis are shown on **Figure 4**. The gages are color coded to represent surface water flows that enter and exit the MVGB, augment the Truckee River or are also recorded by other nearby gages (“neutral gage”). Gage #10344505 represents the outflow from the Basin along the Truckee River and dominates the total hydrologic outflow for the MVGB. It has continuously demonstrated a greater magnitude of streamflow than all the other measured flows from tributaries or upstream locations.

Figure 5 shows the total surface water outflow from the Basin minus the sum of the inflow volumes from the various MVGB tributary gages. For the past two water years, net outflows from the Basin are consistently positive, even during periods of little to no precipitation, demonstrating that groundwater contribution to the Truckee River has supplemented flows every month. Flows from Martis Creek are also included in this net surplus, but there is no gage to quantify them independently. Regardless, the total annual year surface water outflow for the Basin remains substantially greater than surface water inflows for the MVGB. This analysis further supports the overall conceptualization that sustainable conditions have further improved over the period covered by this annual report. The Truckee River is the dominant hydrologic feature in the MVGB. It conveys hundreds of thousands of acre-feet of surface water through the Basin and flows along the lowest portions of the valley floor. For the most part, groundwater consistently discharges to the River throughout the Basin. As shown on **Figure 5**, early in October of water year 2016, near the end of the recent drought, water was still present in the river, even

though there were no significant releases from Lake Tahoe Dam. This indicates that groundwater was discharging to the Truckee River. These apparent groundwater discharges have continued, as observed by the positive net flow data for the fall months of water year 2017.

2. Groundwater Levels

Wells used for groundwater level monitoring are shown on **Figure 6** and listed in the MVGB Alternative. Water levels at these wells are monitored as part of the California Statewide Groundwater Elevation Monitoring (CASGEM) program and are reported on DWR's CASGEM website: <https://www.casgem.water.ca.gov/>. These wells are used to assess the sustainability of the MVGB, and each have an established minimum threshold and measurable objective developed in the Alternative. Data from the CASGEM wells were used to generate hydrographs to show groundwater level elevation trends over time at each monitoring location.

2.1 Groundwater Level Hydrographs

Long-term hydrographs for the Alternative monitoring wells are presented on **Figure 7** along with the water year type. Additional information on water year types, classified by annual precipitation, is included in Section 4.3. Groundwater elevation hydrographs for water years 2015 through 2017 are presented on **Figure 8** to show groundwater trends since the beginning of 2015. As a management action to support their Alternative, the MVGB Agencies began monthly monitoring of accessible monitoring wells beginning in Spring 2017. This data is included on **Figures 7 and 8** and shows recent, monthly changes in groundwater levels for the summer months when groundwater use typically increases. For all monitoring wells, measured groundwater elevations have either increased or remained stable since 2015, although seasonal fluctuations due to climate and pumping patterns is apparent.

Hydrographs for each individual monitoring well are presented in **Appendix A**. These hydrographs contain the full historical record of measurements extending to the end of water year 2017, along with minimum thresholds and measurable objectives. Groundwater elevations in the Basin's SGMA monitoring wells remained above minimum thresholds and measurable objectives throughout water years 2016 and 2017.

2.2 Groundwater Level Contours

Seasonal groundwater level elevation contours for Spring and Fall conditions for 2015 through 2017 are shown on **Figure 9** through **Figure 14**. These contours reflect pumping, recharge, geologic conditions, and gaining reaches along the Truckee River and its tributaries. Monitoring well groundwater levels, static water levels from municipal and community district pumping wells, and bed elevations of gaining surface water reaches were used to develop the groundwater elevation contour maps. Observed trends remain the same as those presented in the Alternative Submittal; flow continues to proceed from the perimeter of the MVGB towards the Truckee River. Fall season contours exhibit lower groundwater level elevations in significant portions of the Basin, relative to Spring conditions, due to increased pumping and less natural recharge. Likewise, Spring conditions represent a more stabilized and less stressed groundwater system, during or near the end of the primary groundwater recharge timeframe. In general, Spring groundwater levels have increased from 2015 to 2016 and again from 2016 to 2017 in response to wetter water years. This trend is also demonstrated in the monitoring well hydrographs and storage change estimates in Section 6.

3. Groundwater Extraction

Groundwater extractions for various water use sectors are presented in **Tables 1 and 2** for water years 2016 and 2017, respectively. The methods used to measure extraction data are noted along with water use sector totals. Total groundwater extraction in the MVGB is estimated to be approximately 6,600 and 6,400 acre-feet for water years 2016 and 2017, respectively. Municipal groundwater extractions, which are metered, account for approximately 80% of the total extractions; therefore, total estimated extraction is well qualified. Best available groundwater extraction information for non-community, golf course irrigation, and other water users are annual, calendar year estimates, which are reported annually to the DWR State Board and TROA program. The calendar year extraction data is approximately equal to water year estimates due to the annual cycle of climatic conditions, including freezing temperatures and significant amounts of snow and other precipitation, which limit the need to pump groundwater in the spring and summer months of each water year. A full reporting of annual 2017 estimates will be available later this year via required TROA reporting.

Table 1 Groundwater Extractions for Water Year 2015-2016 (values in acre-feet)

Agency	Metered/ Estimated	2015			2016									Summary		
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Percent	
Public Utility Water Purveyors ¹																
Truckee-Donner PUD																
Potable																
	1. Airport Well	Metered	43	18	31	14	10	13	7	5	14	54	125	103	437	
	2. Martis Valley Well	Metered	167	136	147	172	163	164	154	173	201	209	205	198	2,088	
	3. South Side Well	Metered	0	0	0	0	0	0	0	0	0	0	0	0		
	4. Glenshire Dr Well	Metered	2	0	0	0	0	0	0	2	20	36	19	16	95	
	5. Hirschdale Well	Metered	1	0	0	0	0	0	0	1	1	1	1	8		
	6. Prosser Annex Well	Metered	12	5	0	0	0	0	1	11	16	22	21	17	106	
	7. Prosser Heights Well	Metered	10	4	0	0	0	0	1	9	11	13	13	11	71	
	8. Sanders Well	Metered	0	0	0	0	0	0	12	11	37	39	38	7	144	
	9. Prosser Village Well	Metered	48	34	11	2	2	0	0	36	94	102	89	80	498	
	10. Northside Well	Metered	0	0	0	0	0	0	0	0	11	19	19	4	52	
	11. Old Greenwood Well	Metered	13	7	45	50	43	40	33	15	53	81	43	29	452	
	12. Well 20	Metered	0	0	0	0	0	0	0	0	2	7	5	3	18	
	13. "A" Well	Metered	0	0	0	0	0	0	0	0	11	21	21	5	58	
Non Potable																
	14. Fibreboard Well	Metered	17	0	0	0	0	0	7	31	86	114	99	78	431	
	15. Donner Creek Well	Metered	4	0	0	0	0	0	0	12	49	60	47	34	205	
	16. Southside well #1	Metered	0	0	0	0	0	0	0	0	1	2	2	1	6	
	Subtotal		316	204	235	239	218	219	214	305	607	779	746	586	4,668	71%
Community Water Purveyors ²																
Northstar C.S.D.																
	TH-1	Metered	8	4	5	3	4	3	3	6	10	10	20	11	87	
	TH-2	Metered	7	4	4	3	7	4	2	8	20	25	20	13	118	
	Well 1	Metered	13	5	5	4	5	7	3	6	21	27	26	25	147	
	Well 2	Metered	15	4	5	3	0	0	4	8	23	26	31	29	148	
	Well 3	Metered	1	1	1	1	1	1	1	2	4	4	3	2	22	
	Subtotal		44	18	20	15	18	15	13	30	77	92	100	80	522	8%
Non-Community Water Purveyors ^{2,3} (for 2016 calendar year)																
	Tahoe Timber Trails Water System	Estimated													17	
	Eastern Regional Materials Recovery Facility/TART	Estimated													16	
	Hobart Work Center	Estimated													3	
	Silver Creek Camp Ground	Estimated													4	
	Aggregates Martis Valley	Estimated													374	
	Fir Craggs Summer Home Tract	Estimated													3	
	TNF- Logger & Stampeded RC	Estimated													3	
	Zephyr Lodge, Northstar	Estimated													5	
	George Gardai	Estimated													3	
	UC Sagehen Creek Field Station	Estimated													5	
	Subtotal														433	7%
Golf Courses ^{2,3,4} (for 2016 calendar year)																
	Gray's Crossing/Old Greenwood ⁴	Estimated	(Served by TDPUD and included in their reported pumping)												-	
	Coyote Moon ⁴	Estimated	(Served by TDPUD and included in their reported pumping)												-	
	Schaffer's Mill	Estimated													144	
	Lahontan	Estimated													284	
	Northstar	Estimated	(Additional 82 AF served by NCS D and included in their reported pumping)												90	
	Martis Camp	Estimated													287	
	Tahoe Donner	Estimated	(Additional 61 AF served by TDPUD and included in their reported pumping)												181	
	Subtotal														985	15%
															Total	6,607

¹ Values reported in gallons and converted to acre-feet

² Values reported in million gallons and converted to acre-feet

³ Estimated and obtained from Annual Inventory of Water Use Lake Tahoe & Truckee River Basins Calendar Year 2016 (DWR/TROA annual report 2016)

⁴ Groundwater use already accounted for in TDPUD reported pumping and not included in golf course demand subtotal

Table 2 Groundwater Extractions for Water Year 2016-2017 (values in acre-feet)

Agency	Metered/ Estimated	2016			2017									Summary	
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Percent
Public Utility Water Purveyors ¹															
Truckee-Donner PUD															
Potable															
1. Airport Well	Metered	22	6	7	12	9	16	5	10	14	36	17	10	163	
2. Martis Valley Well	Metered	175	156	176	176	162	104	174	184	201	208	207	198	2,122	
3. South Side Well	Metered	0	0	0	0	0	0	0	0	0	0	0	0	0	
4. Glenshire Dr Well	Metered	1	0	0	0	0	0	0	6	29	67	39	25	167	
5. Hirschdale Well	Metered	0	0	0	0	0	0	0	1	1	1	1	1	6	
6. Prosser Annex Well	Metered	11	0	0	0	0	0	0	10	19	23	19	15	98	
7. Prosser Heights Well	Metered	8	0	0	0	0	0	0	8	13	18	15	11	72	
8. Sanders Well	Metered	0	0	0	0	0	0	0	35	41	42	41	17	175	
9. Prosser Village Well	Metered	41	18	22	23	23	61	32	40	89	101	95	76	621	
10. Northside Well	Metered	0	0	0	0	0	0	0	0	9	17	19	10	55	
11. Old Greenwood Well	Metered	6	15	23	21	15	51	6	11	50	80	60	30	367	
12. Well 20	Metered	2	0	0	0	0	0	0	3	15	17	14	10	62	
13. "A" Well	Metered	0	0	0	0	0	0	0	0	8	29	13	0	50	
Non Potable															
14. Fibreboard Well	Metered	17	0	0	0	0	0	0	58	88	115	61	43	382	
15. Donner Creek Well	Metered	1	0	0	0	0	0	0	11	46	60	40	14	171	
16. Southside well #1	Metered	0	0	0	0	0	0	0	0	0	2	3	2	7	
Subtotal		285	195	229	232	210	231	217	376	623	816	643	461	4,519	71%
Community Water Purveyors ²															
Northstar C.S.D.															
TH-1	Metered	5	3	3	3	5	2	0	6	11	12	8	6	65	
TH-2	Metered	3	3	4	5	3	2	0	3	14	14	7	10	67	
Well 1	Metered	18	5	4	5	4	3	3	9	22	29	27	23	152	
Well 2	Metered	10	3	4	5	3	3	3	10	21	31	31	23	148	
Well 3	Metered	2	1	1	1	1	1	1	1	3	5	4	3	24	
Subtotal		8	6	7	9	8	4	0	10	25	25	15	16	455	7%
Non-Community Water Purveyors ^{2,3} <i>(Estimated using 2016 calendar year values. New values will be released later in 2018)</i>															
Tahoe Timber Trails Water System	Estimated													17	
Eastern Regional Materials Recovery Facility/TART	Estimated													16	
Hobart Work Center	Estimated													3	
Silver Creek Camp Ground	Estimated													4	
Aggregates Martis Valley	Estimated													374	
Fir Craggs Summer Home Tract	Estimated													3	
TNF- Logger & Stampeded RC	Estimated													3	
Zephyr Lodge, Northstar	Estimated													5	
George Gardai	Estimated													3	
UC Sagehen Creek Field Station	Estimated													5	
Subtotal														433	7%
Golf Courses ^{2,3,4} <i>(Estimated using 2016 calendar year values. New values will be released later in 2018)</i>															
Gray's Crossing/Old Greenwood ⁴	Estimated	(Served by TDPUD and included in their total reported pumping)												-	
Coyote Moon ⁴	Estimated	(Served by TDPUD and included in their total reported pumping)												-	
Schaffer's Mill	Estimated													144	
Lahontan	Estimated													284	
Northstar	Estimated	(Additional 82 AF served by NCSD and included in their reported pumping)												90	
Martis Camp	Estimated													287	
Tahoe Donner	Estimated	(Additional 61 AF served by TDPUD and included in their reported pumping)												181	
Subtotal														985	15%
													Total	6,392	

¹ Values reported in gallons and converted to acre-feet

² Values reported in million gallons and converted to acre-feet

³ Estimated and obtained from Annual Inventory of Water Use Lake Tahoe & Truckee River Basins Calendar Year 2016

⁴ Groundwater use already accounted for in TDPUD reported pumping and not included in golf course demand subtotal

A graphical representation of monthly pumping for the two largest, metered pumpers in the MVGB (TDPUD and NCS D in **Tables 1 and 2**) are presented on **Figure 15** along with their totals of annual pumping. This figure generally shows the monthly and seasonal trends in groundwater usage from January 2015 to October 2017 for metered pumping and is representative of total pumping trends Basin-wide. Groundwater demand peaks in the summer and declines to approximately one-third to one-quarter of that amount during the mid-winter and early spring. This distribution suggests that calendar and water year pumping estimates are typically similar in magnitude for this basin, hence the tabulated totals in **Tables 1 and 2** are likely defensible surrogates for total water year pumping estimates. **Figure 15** also shows that the overall pumping volume per water year has continued to decline, although monthly pumping magnitudes fluctuate from year to year. This trend matches that presented in the MVGB Alternative.

The general locations of wells for the various municipal, community, and golf course entities, which extract approximately 93% of the groundwater in the MVGB, are shown on **Figure 16**. The distribution of groundwater extractions for the wells are illustrated by the size of the symbol (magnitude) and color (pumping entity). This figure is useful for comparison with the groundwater contours (presented in Section 2.2).

4. Surface Water

Although the Truckee River and multiple tributaries course throughout the MVGB, they constitute less than one percent of Basin water uses. A general assessment of surface water supply and use in the MVGB is provided below.

4.1 Surface Water Supply

Only three minor surface water users have been identified over the past two water years. The total water diverted for use is 158 acre-feet but not all was diverted within the MVGB. Estimated surface water diversions are listed in **Tables 3 and 4** for water years 2016 and 2017, respectively.

A source for two of these users is Big Springs, located outside the groundwater Basin in the Northstar Resort within the watershed. Both Northstar Resort and the NCSD use water from the spring, primarily for snowmaking. Although the spring is outside the MVGB, a portion of its supply recharges the Basin aquifer by storing water as snow, which later melts, becomes runoff, and infiltrates. The fraction used for municipal and commercial purposes is also sent to the T-TSA water treatment plant and recharged to groundwater at their leach fields. However, the amount of groundwater recharge attributable to surface water from Big Springs cannot be quantified at this time. A second surface water source is used for the Ponderosa Golf Course, but its diversion point is unidentified. Some deep percolation from turf irrigation also provides some groundwater recharge within the MVGB.

Table 3 Surface Water Usage Reported for Water Year 2015-2016 (values in acre-feet)

Agency	Actual/ Estimated	2015			2016									Annual
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Public Utility Water Purveyors														
Truckee-Donner PUD ¹	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal														0
Community Water Purveyors														
Northstar C.S.D. ^{2,3} (M&I)	Estimated	<i>(From Big Springs)</i>												83
Subtotal														83
Non-Community Water Purveyors ⁴ (for 2016 calendar year)														
Tahoe Timber Trails Water System	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Eastern Regional Materials Recovery Facility/TART	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Hobart Work Center	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver Creek Camp Ground	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Aggregates Martis Valley	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Fir Craggs Summer Home Tract	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
TNF- Logger & Stampeded RC	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Zephyr Lodge, Northstar	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
George Gardai	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
UC Sagehen Creek Field Station	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal														0
Golf Courses ⁴ (for 2016 calendar year)														
Ponderosa Golf Course	Estimated	<i>(Source unknown)</i>												27
Northstar ^{2,3}	Estimated	<i>(From Big Springs)</i>												48
Subtotal														75
													Total	158

¹ TDPUD has an allocation of Truckee River flows per TROA, but it has not been utilized and there are no infrastructure nor plans to use it.

² NCSD holds riparian water rights for use of Big Springs, which is outside of the MVGB. A portion of this water is used for limited M&I use within the MVGB and Northstar Golf Course.

³ 2017 values not reported at this time.

⁴ Estimated and obtained from Annual Inventory of Water Use Lake Tahoe & Truckee River Basins Calendar Year 2016 (DWR/TROA annual report 2016)

Table 4 Surface Water Usage Reported for Water Year 2016-2017 (values in acre-feet)

Agency	Actual/ Estimated	2016			2017									Annual
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Public Utility Water Purveyors														
Truckee-Donner PUD ¹	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal														0
Community Water Purveyors <i>(Estimated using 2016 calendar year values. New values will be released later in 2018)</i>														
Northstar C.S.D. ^{2,3} (M&I)	Estimated	<i>(From Big Springs)</i>											83	
Subtotal														83
Non-Community Water Purveyors ⁴ <i>(Estimated using 2016 calendar year values from TROA/DWR report. New values will be released later in 2018)</i>														
Tahoe Timber Trails Water System	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Eastern Regional Materials Recovery Facility,	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Hobart Work Center	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver Creek Camp Ground	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Aggregates Martis Valley	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Fir Craggs Summer Home Tract	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
TNF- Logger & Stamped RC	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Zephyr Lodge, Northstar	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
George Gardai	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
UC Sagehen Creek Field Station	n/a	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal														0
Golf Courses ⁴ <i>(Estimated using 2016 calendar year values from TROA/DWR report. New values will be released later in 2018)</i>														
Ponderosa Golf Course	Estimated	<i>(Source unknown)</i>											27	
Northstar ^{2,3}	Estimated	<i>(From Big Springs)</i>											48	
Subtotal														75
													Total	158

¹ TDPUD has an allocation of Truckee River flows but does not use it, has no infrastructure to access it, and has no plans to use it.

² NCS D holds riparian water rights for use of Big Springs, which is outside of the MVGB. A portion of this water is used for limited M&I use within the MVGB and Northstar Golf Course.

³ 2015 and 2017 values not reported at this time.

⁴ Estimated and obtained from Annual Inventory of Water Use Lake Tahoe & Truckee River Basins Calendar Year 2016 (DWR/TROA annual report 2016)

4.2 Surface Water Imports

The only surface water imports to the MVGB that provide additional recharge to groundwater are wastewater inflows from the Lake Tahoe area. These inflows are sent to the Tahoe-Truckee Sanitary Agency (T-TSA) water treatment plant. Total estimated monthly wastewater imports to the MVGB from areas outside the Basin for the past two water years, as well as wastewater derived from within the MVGB, were provided by T-TSA and are listed in **Tables 5 and 6** for water years 2016 and 2017, respectively. The treated water is recharged into the MVGB groundwater system through leach fields under permit with the Lahontan RWQCB. The locations of the leach fields are shown on **Figure 1**.

Approximately 1,880 AF and 2,760 AF of imported water are estimated to recharge groundwater in water years 2016 and 2017, respectively. Wastewater flows from the Truckee Sanitary District (TSD) are also treated by the T-TSA and comprise approximately 2,580 AF and 3,150 AF of groundwater recharge from the T-TSA facility in water years 2016 and 2017, respectively. These return flows from TSD are derived from pumping within the MVGB and partially offset impacts of local pumping near the Truckee River.

Table 5 Estimated Groundwater Recharge from T-TSA for Water Years 2015-2016 (acre-feet)

Tahoe-Truckee Sanitary Agency (T-TSA) Sources of Inflows ¹	Actual/ Estimated	2015			2016									Annual
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Lake Tahoe Area (Imported water)	Estimated	95	94	149	170	188	249	184	153	143	186	154	119	1,884
Truckee Sanitary District (TSD)	Actual	172	165	216	234	237	278	215	201	203	244	220	190	2,575
Total													4,459	

¹ Deliveries to treatment facility from outside the MVGB provided by T-TSA and are converted from million gallons to acre-feet

² Metered readings from Granite Flats used to calculate imported wastewater from Lake Tahoe area

Table 6 Estimated Groundwater Recharge from T-TSA for Water Years 2016-2017 (acre-feet)

Tahoe-Truckee Sanitary Agency (T-TSA) Sources of Inflows ¹	Actual/ Estimated	2016			2017									Annual
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Lake Tahoe Area (Imported water)	Estimated	112	110	193	257	361	346	365	277	194	220	180	141	2,757
Truckee Sanitary District (TSD)	Actual	184	176	255	312	342	342	331	277	228	265	236	201	3,149
Total													5,905	

¹ Deliveries to treatment facility from outside the MVGB provided by T-TSA and are converted from million gallons to acre-feet

² Metered readings from Granite Flats used to calculate imported wastewater from Lake Tahoe area

5. Total Water Use

The total estimated groundwater and surface water use in the MVGB by sector is summarized in **Table 7**.

<u>Water Use Sector</u>	2016	2017
Municipal and Industrial (M&I)	5,623	5,407
Groundwater Metered	5,190	4,974
Groundwater Estimated	433	433
Golf Courses	1,012	1,012
Groundwater Estimated	985	985
Surface Water Estimated ¹	27	27
Total	6,635	6,419

¹ Only includes water sources in MVGB. Use and recharge of water from outside the basin presented in Section 4.2

6. Change in Groundwater Storage

An empirical approach was used to calculate change in storage by generating groundwater elevation change contours. After the development of Spring groundwater elevation contours for 2015, 2016, and 2017, interpolated groundwater elevation surfaces were developed that incorporated gaining surface water features, springs, and static water levels at production wells during down periods. The spring contour surfaces were then subtracted to produce water level change distributions for the two previous water years. The use of spring to spring water level differences was deemed to be the most appropriate when assessing ambient groundwater conditions, because it has less influence of temporal, localized changes due to pumping adjacent to monitoring wells.

Figure 17 and **Figure 18** spatially show the estimated groundwater elevation changes. Portions of the Basin with poor or no data controls on the groundwater or water table surface were “cropped”, or removed, from the final distribution to eliminate numerical kriging error in estimates. However, it is apparent that most changes in groundwater storage are near the highest density of pumping, shown on **Figure 16**.

Actual storage change estimates are dependent upon the assumed specific yield or storage coefficient of the aquifer formation. Given the complex and often interbedded nature of the MVGB aquifer system, a range of storage coefficients (specific yield values) were used for the analysis. The results and input values are presented in **Table 8**. Groundwater in storage in the MVGB increased during both water year 2016 and 2017, corresponding to the wetter climatic conditions.

Time Periods for Groundwater Level Elevation Comparisons	Basin Area Used in Analysis ¹ (acres)	Groundwater Level Change (feet)	Range of Storage Coefficients	Estimated Change in Storage (AF)
Spring 2015 - Spring 2016	24,500	2.77	0.10	6,809
			0.075	5,107
			0.05	3,404
Spring 2016 - Spring 2017	24,500	2.99	0.10	7,333
			0.075	5,499
			0.05	3,666

¹ Basin Area limited to extent of MVGB with groundwater elevation data to limit interpolation error

Historic trends in the estimated annual and cumulative change of groundwater in storage, along with water year type and annual groundwater use are shown on **Figure 19**. Storage change and groundwater use estimates prior to water year 2016 are derived from the analyses presented in the Alternative and are presented from 2002, when the historic cumulative storage change was last estimated to be zero.

7. Alternative Implementation Progress

Historically groundwater levels have remained stable in the MVGB, as demonstrated in the Alternative Submittal. The long-term hydrographs in **Attachment A** indicate that groundwater level elevations continue to be stable or have increased, and they have remained above their respective threshold values. Per the findings of the Alternative, this is consistent with a sustainably managed basin. Surface water flows have also increased during the past two water years, with continued groundwater contribution to Truckee River flows. Undesirable results have not been detected for any other sustainability indicators during water years 2016 and 2017.

The local MVGB SGMA Agencies continue to invest in the stewardship of the Basin and practicing of adaptive management to proactively ensure that the Basin operates within its sustainable yield with no significant or unreasonable undesirable effects. This includes more frequent monitoring of key data points, interactions with local environmental stakeholders, and regular meetings/calls with the MVGB Agencies.

The most significant management action since the end of 2016, when the MVGB SGMA Alternative Submittal was presented to DWR, has been the implementation of monthly monitoring of groundwater levels for all wells in the CASGEM program. This move to monthly monitoring was, in part, to investigate and address uncertainties in seasonal variations. The results and trends from this improved monitoring program are presented in this report, and both Truckee Donner PUD and Northstar CSD, who are responsible for the monitoring, intend to continue this monthly monitoring going forward as an MVGB adaptive management activity, per the stipulations in the Alternative.

The MVGB Agencies continue to interact with local environmental interests and MVGB stakeholders to provide information and hear concerns. Primarily, this has been done by the participation of the MVGB's Designated SGMA Representatives - Steven Poncelet of TDPUD, and Northstar CSD's General Manager - Mike Staudenmayer in the Truckee River Basin Working Group (TRBWG). The TRBWG was formed with the passage of the Truckee River Operating Agreement (TROA) twenty years ago and has been re-convened with the support of the newly formed DWR-TROA division. The TRBWG is comprised of the California stakeholders in the river watershed including: water purveyors, local governments, environmental interests, recreational interests, DWR, California Department of Fish and Wildlife, United States Forest Service, and others. This group meets regularly and the subject of SGMA and the MVGB SGMA Alternative Submittal has been discussed.

The MVGB Agencies have also reviewed and utilized numerous, local hydrologic and hydrogeologic studies and data that were generated in support of TROA and the other local environmental and governmental considerations. This includes formal USGS stream flow data along the Truckee River and major tributaries and other streamflow and shallow groundwater monitoring conducted for environmental restoration purposes. The engagement of the MVGB Agencies with the groups developing these ongoing studies and programs has served to further the understanding of MVGB hydrogeology as well as augment the information used: 1) to quantify the ongoing sustainability of the

Basin, 2) to guide future adaptive management, and 3) to augment the data and analyses presented in future iterations of the Alternative.

In addition to interacting with local MVGB stakeholders, the MVGB Agencies have also invested time and staff resources to continue to follow the evolution of the SGMA regulations and to educate themselves on key SGMA issues. This includes participation by the MVGB's Designated SGMA Representative in DWR's workshop in Sacramento on August 29, 2017 titled *Stream Depletions Through the SGMA Lens* and on December 11, 2017 titled *SGMA Sustainable Management Criteria*.

The six MVGB SGMA Agencies have been meeting regularly to continue management of the Basin and to continue our compliance efforts with SGMA. For example, in just 2017, six SGMA meetings were convened. A list of the dates for these teleconferences or meetings are listed below:

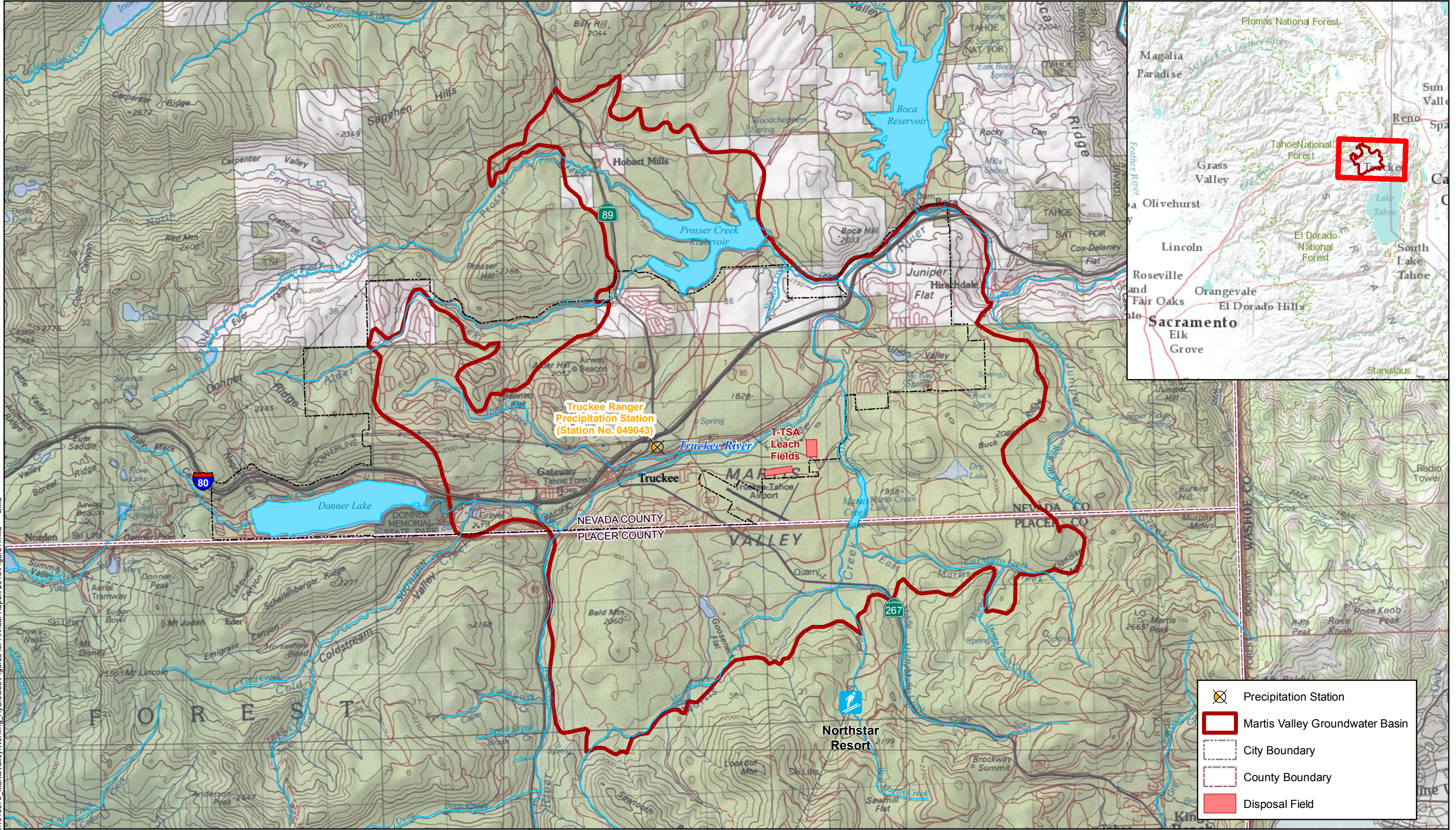
- March 1, 2017
- April 5, 2017
- April 27, 2017
- May 26, 2017
- August 25, 2017
- October 6, 2017
- February 14, 2018

8. References

California Department of Water Resources (DWR), 2018. Annual Inventory of Water Use, Lake Tahoe and Truckee River Basins, Calendar Year 2016.

Truckee Donner Public Utility District (TDPUD), December 2016. Martis Valley Groundwater Basin Sustainable Groundwater Management Act Alternative Submittal.

Figures



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Nevada and Placer Counties, California

Truckee-Donner Public Utility District



MARTIS VALLEY GROUNDWATER BASIN
LOCATION

MARCH 2018

FIGURE 1






-  Precipitation Station
-  Martis Valley Groundwater Basin
-  City Boundary
-  County Boundary
-  Disposal Field

Figure 2
Annual Precipitation Deviation from Mean: Truckee Ranger Station No. 049043

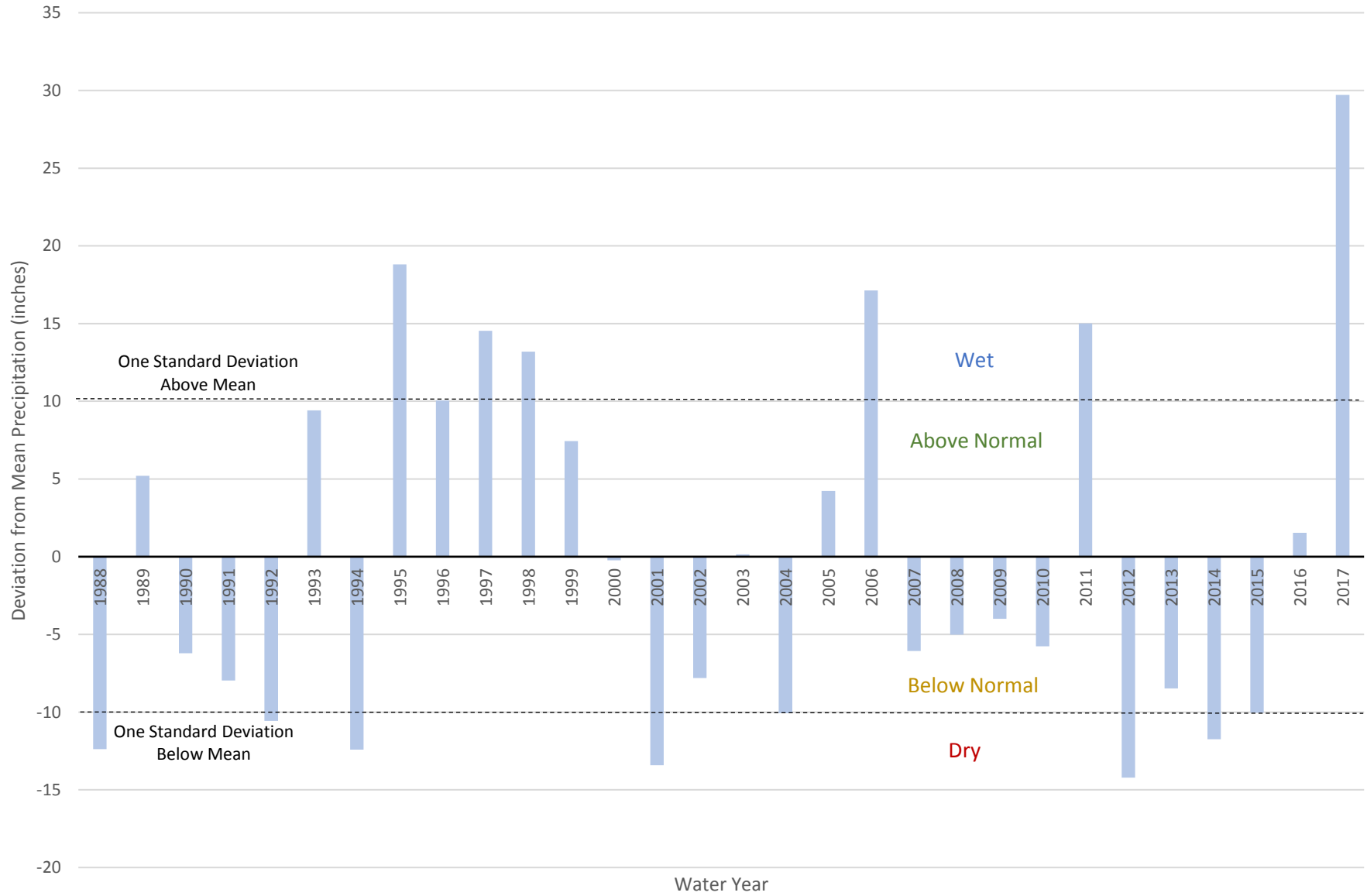
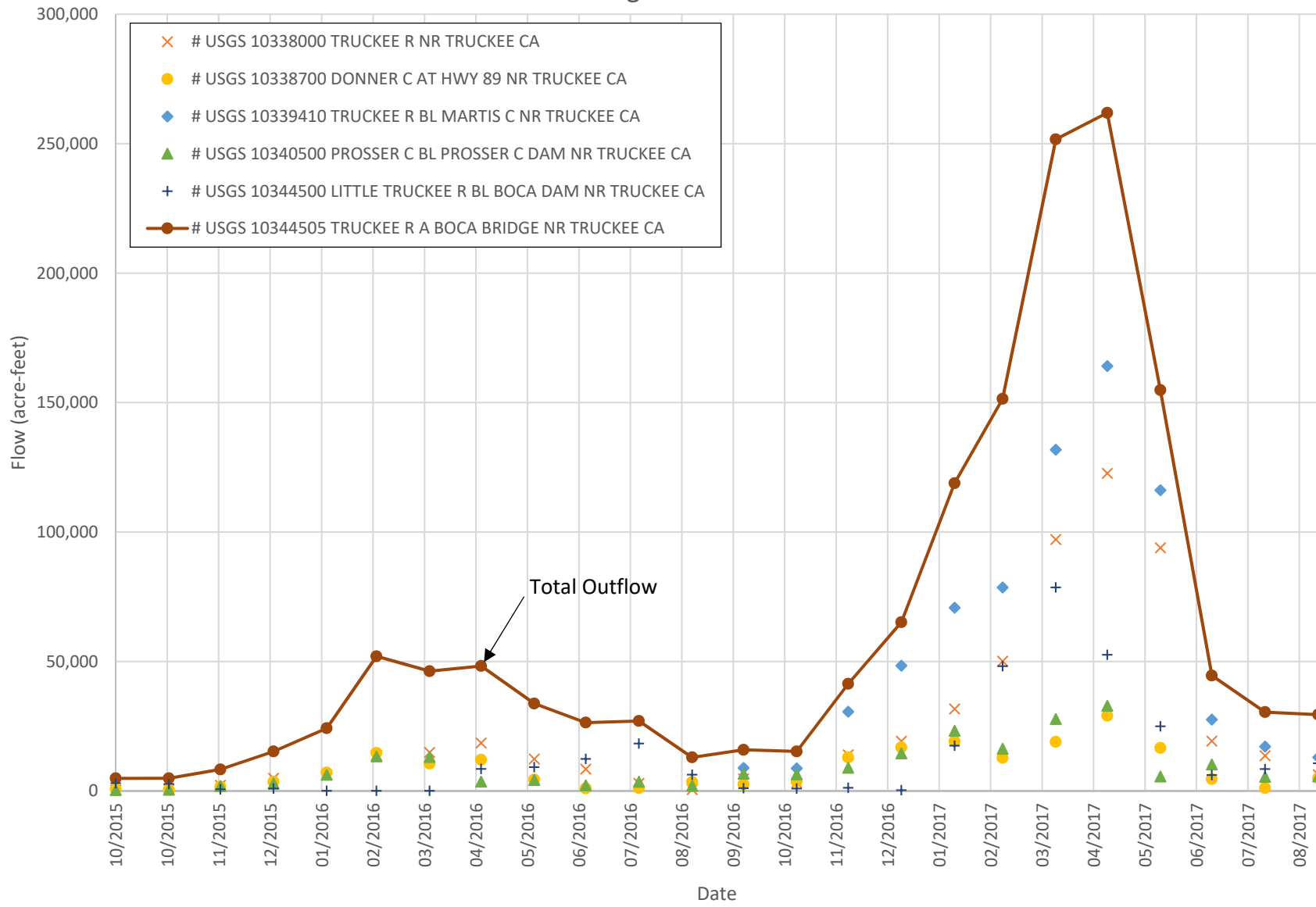
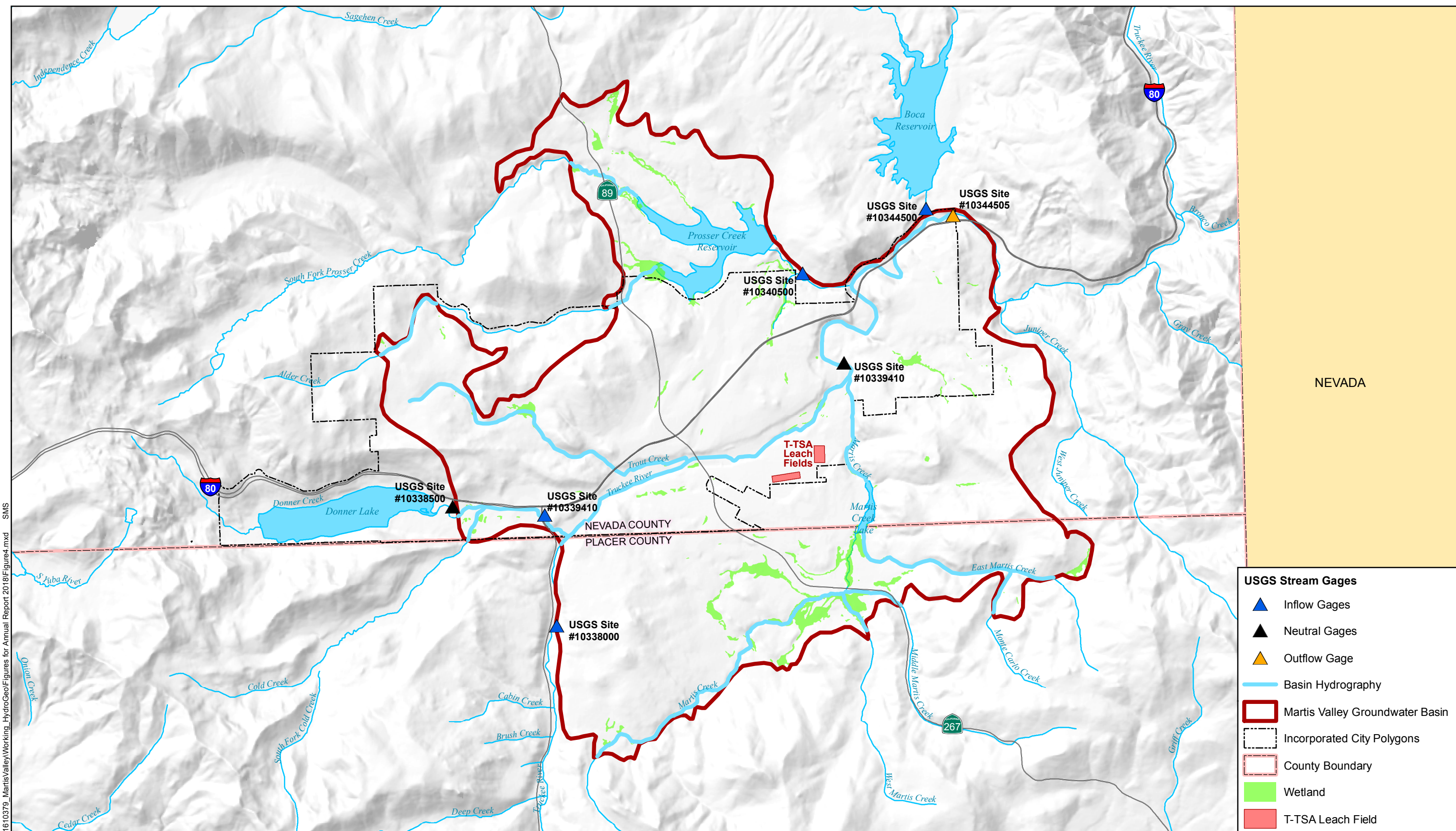


Figure 3
 Surface Water Stream Gage Flows for Water Years 2016-2017



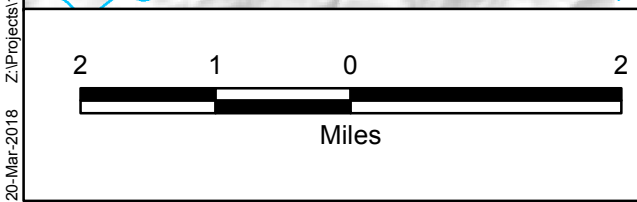
Data collected from <https://waterdata.usgs.gov/nwis>



NEVADA

USGS Stream Gages

- ▲ Inflow Gages
- ▲ Neutral Gages
- ▲ Outflow Gage
- Basin Hydrography
- Martis Valley Groundwater Basin
- Incorporated City Polygons
- County Boundary
- Wetland
- T-TSA Leach Field



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Nevada and Placer Counties, California

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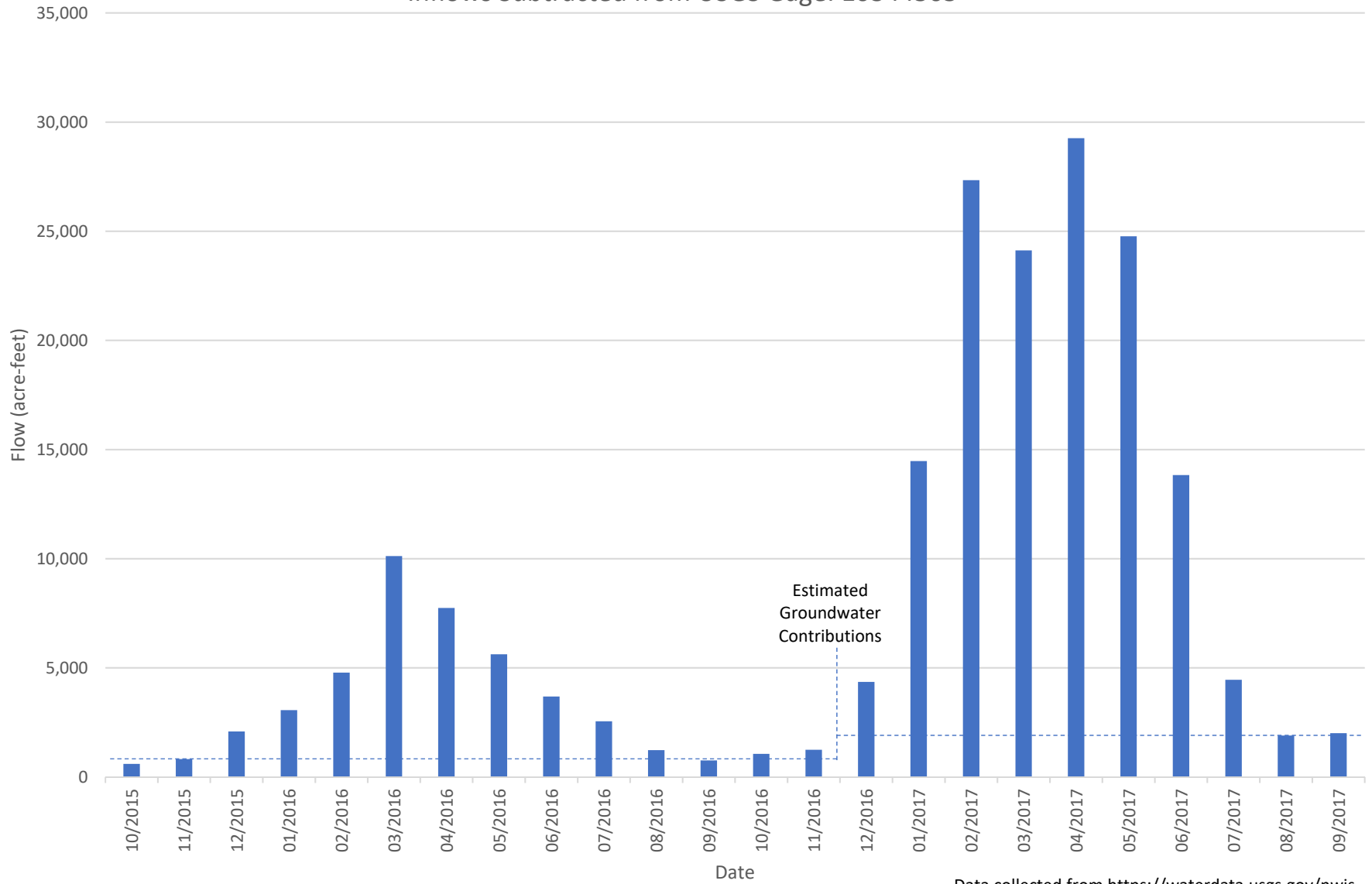
**MARTIS VALLEY GROUNDWATER BASIN
SURFACE WATER PERTINENT FEATURES**

MARCH 2018

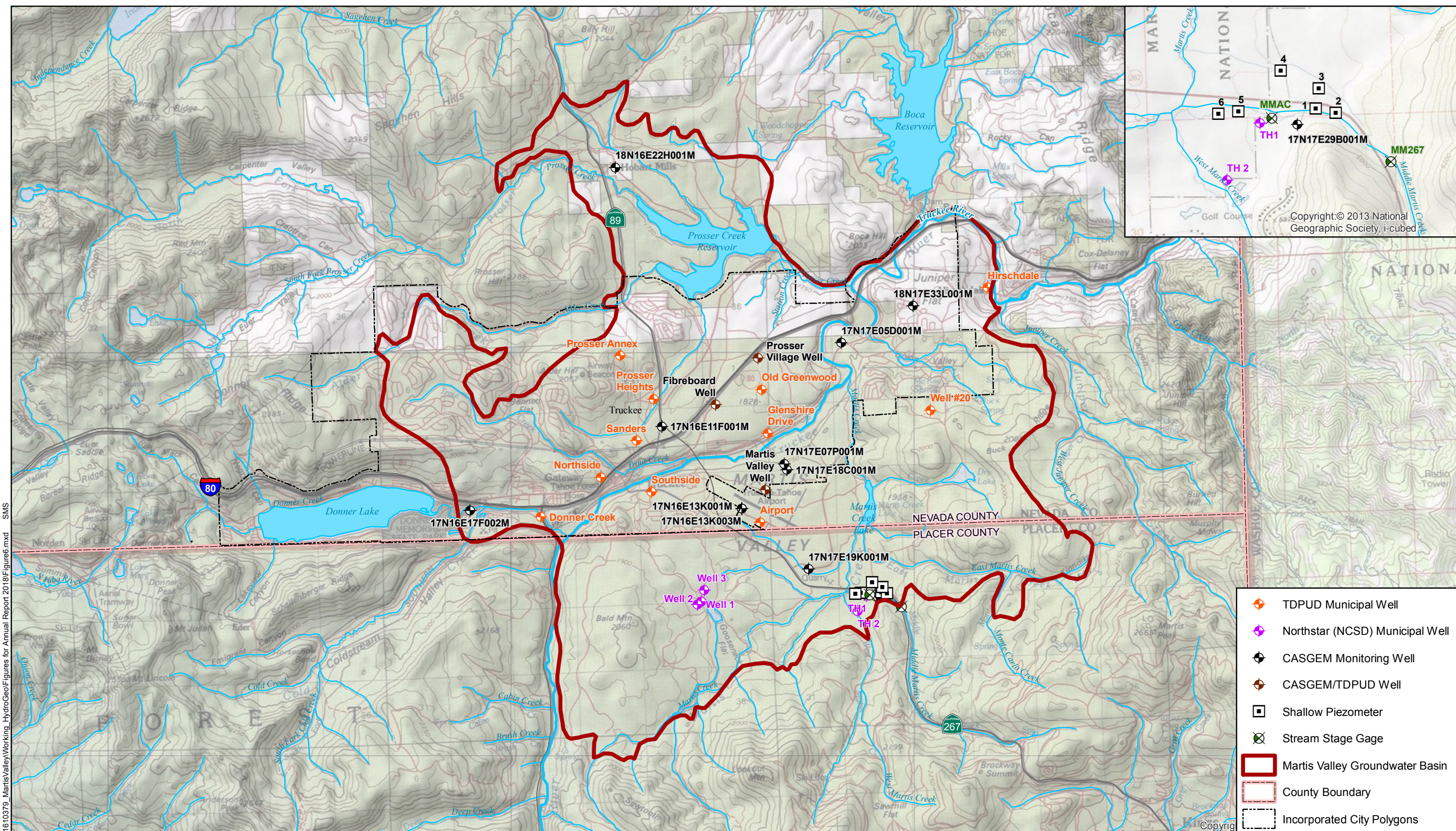
FIGURE 4

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Figure 5
Truckee River Net Surface Water Outflows Sum of
Inflows Subtracted from USGS Gage: 10344505



Data collected from <https://waterdata.usgs.gov/nwis>



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Truckee-Donner Public Utility District



MARTIS VALLEY GROUNDWATER BASIN
MONITORING WELL LOCATIONS

MARCH 2018

FIGURE 6

- TDPUD Municipal Well
- Northstar (NCSD) Municipal Well
- CASGEM Monitoring Well
- CASGEM/TDPUD Well
- Shallow Piezometer
- Stream Stage Gage
- Martis Valley Groundwater Basin
- County Boundary
- Incorporated City Polygons

Figure 7: Martis Valley Historic Groundwater Level Elevation

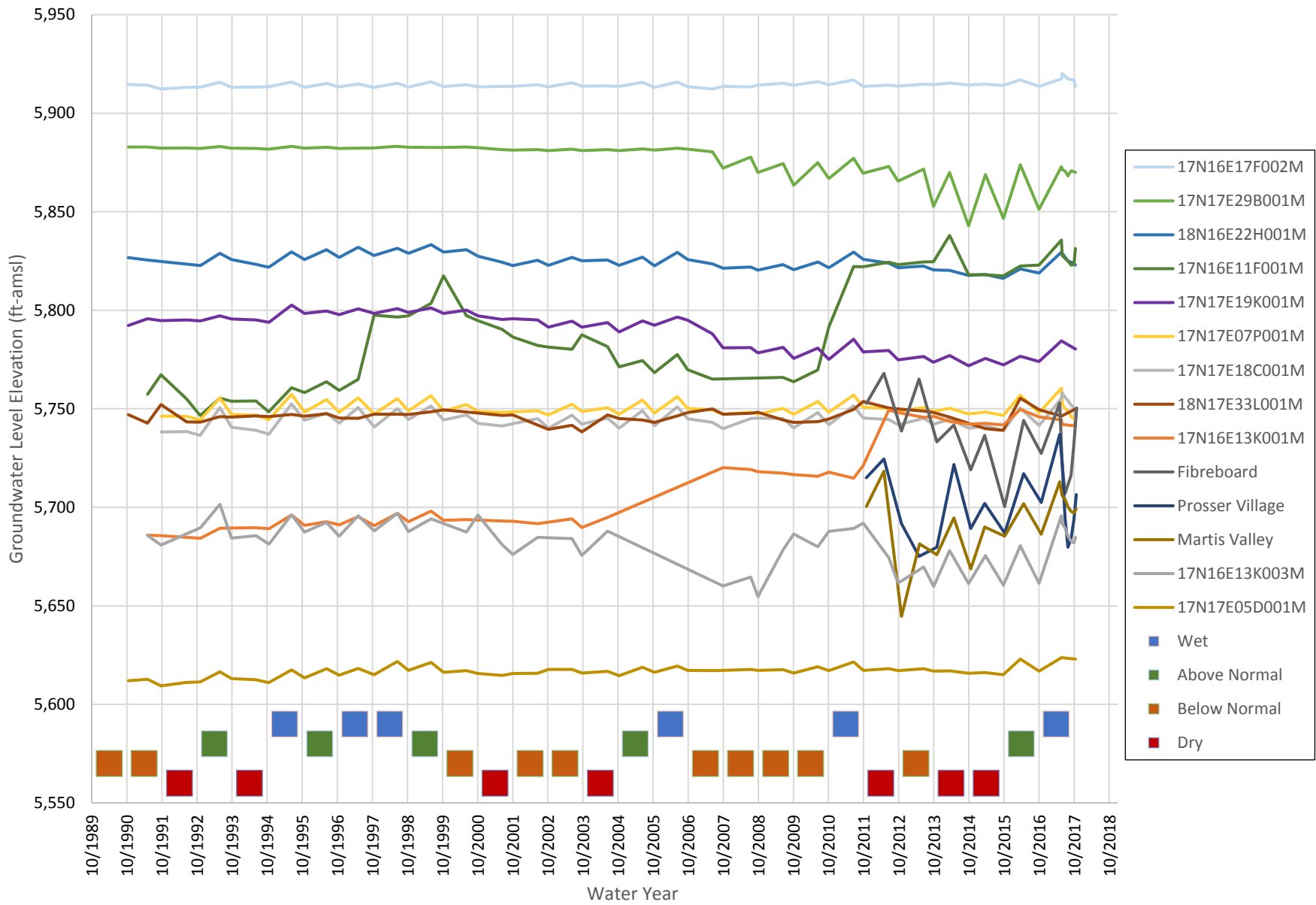
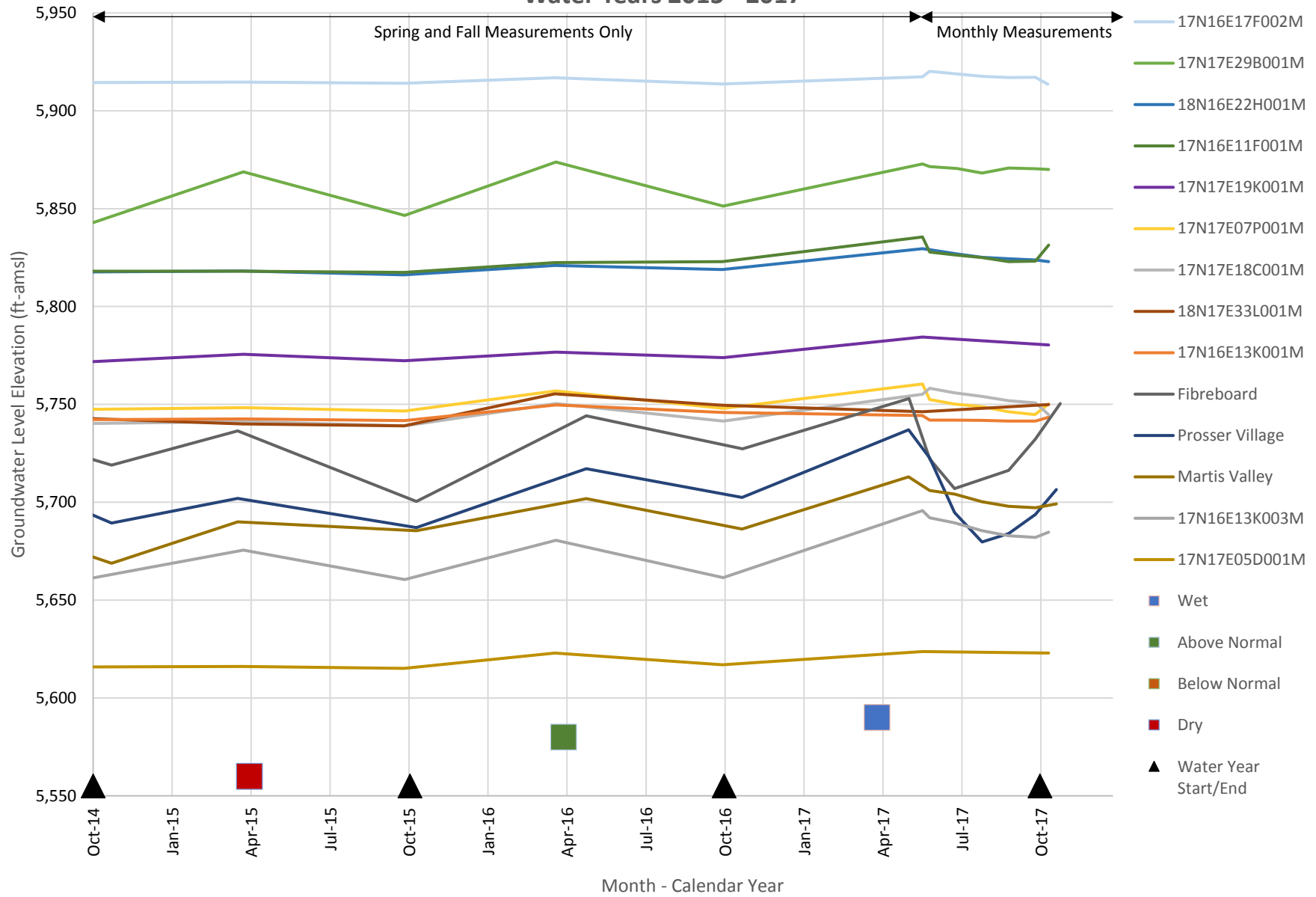
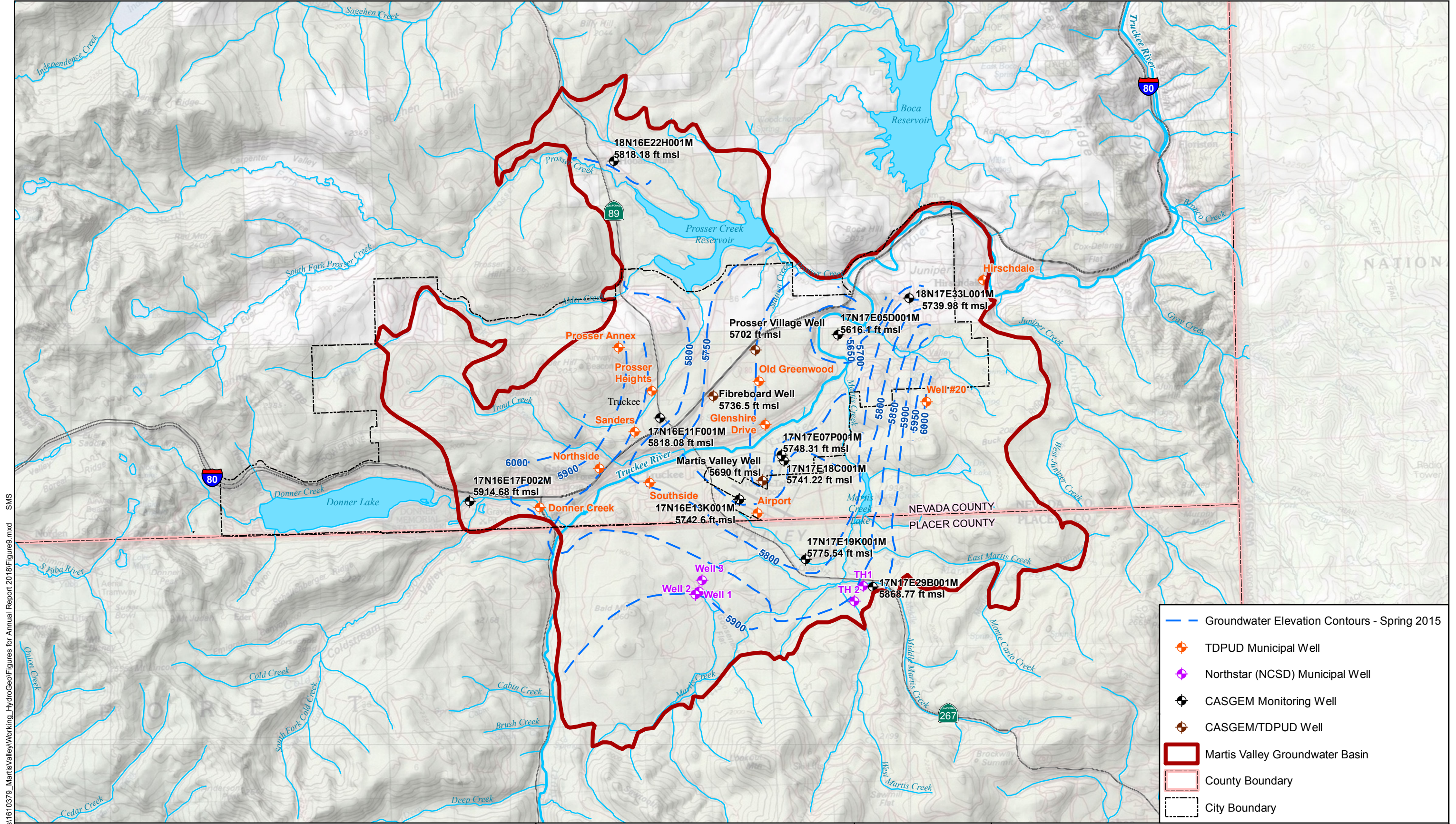


Figure 8: Martis Valley Historic Groundwater Level Elevation
Water Years 2015 - 2017





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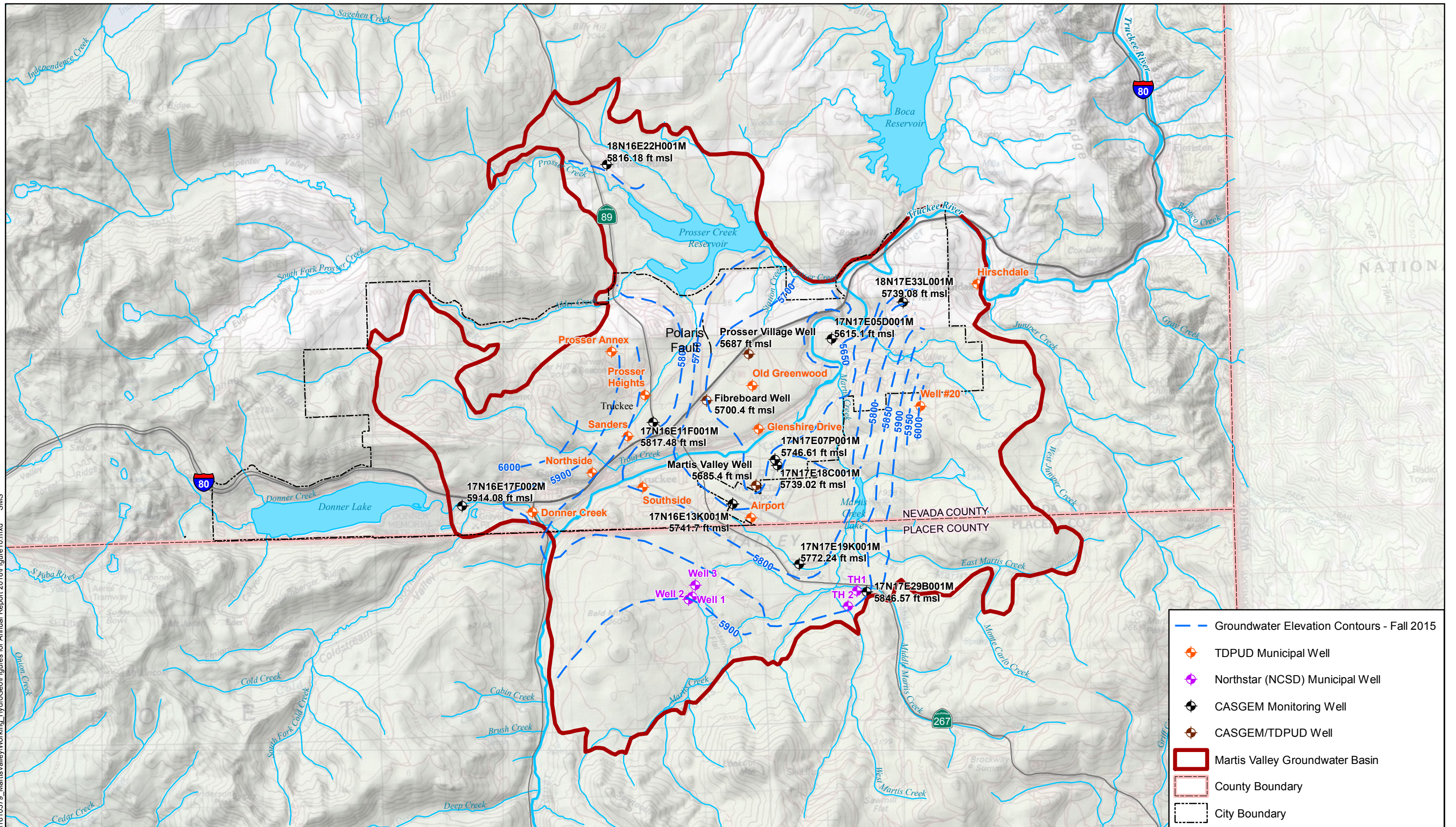
Truckee-Donner Public Utility District



MARTIS VALLEY GROUNDWATER BASIN
SPRING 2015 GROUNDWATER ELEVATION CONTOURS

MARCH 2018

FIGURE 9



- Groundwater Elevation Contours - Fall 2015
- ◆ TDPUD Municipal Well
- ◆ Northstar (NCSD) Municipal Well
- ◆ CASGEM Monitoring Well
- ◆ CASGEM/TDPUD Well
- Martis Valley Groundwater Basin
- County Boundary
- City Boundary



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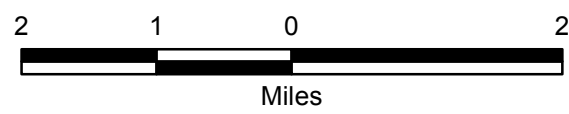
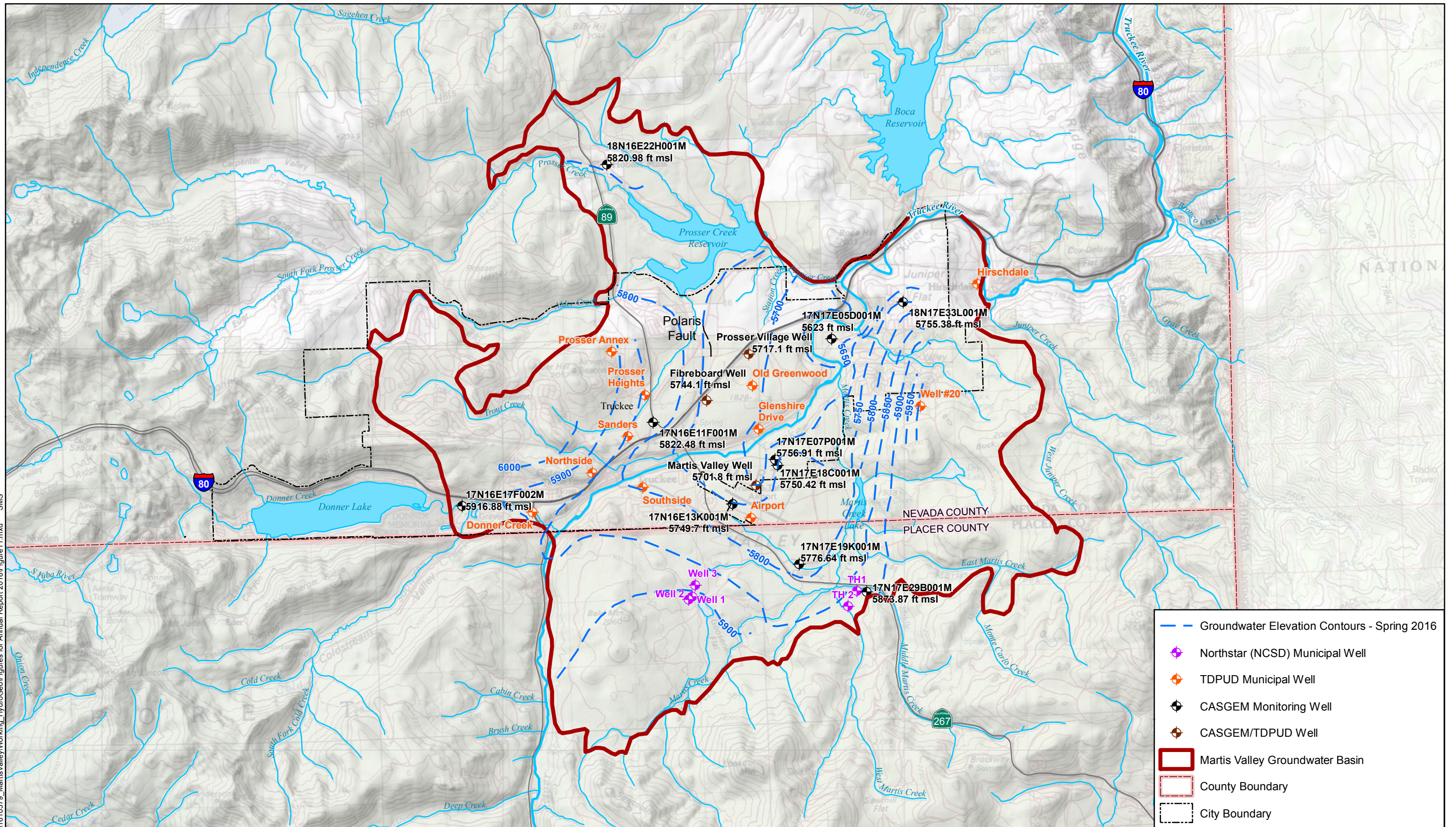
Truckee-Donner Public Utility District



MARTIS VALLEY GROUNDWATER BASIN
FALL 2015 GROUNDWATER ELEVATION CONTOURS

MARCH 2018

FIGURE 10



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Nevada and Placer Counties, California

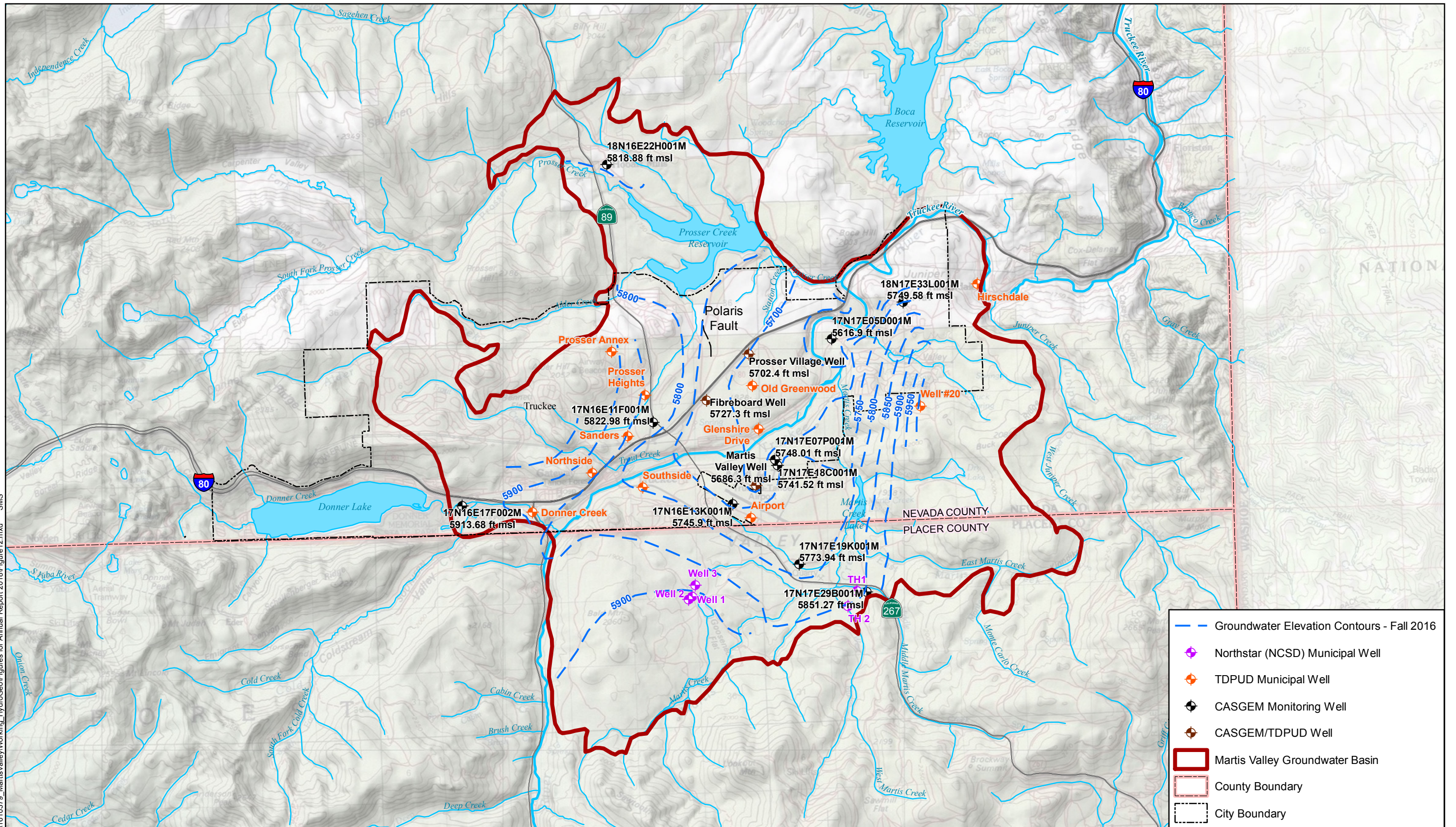
Truckee-Donner Public Utility District



MARTIS VALLEY GROUNDWATER BASIN
SPRING 2016 GROUNDWATER ELEVATION CONTOURS

MARCH 2018

FIGURE 11



- Groundwater Elevation Contours - Fall 2016
- ◆ Northstar (NCSD) Municipal Well
- ◆ TDPUD Municipal Well
- ◆ CASGEM Monitoring Well
- ◆ CASGEM/TDPUD Well
- Martis Valley Groundwater Basin
- County Boundary
- City Boundary



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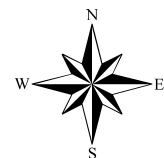
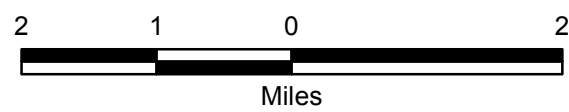
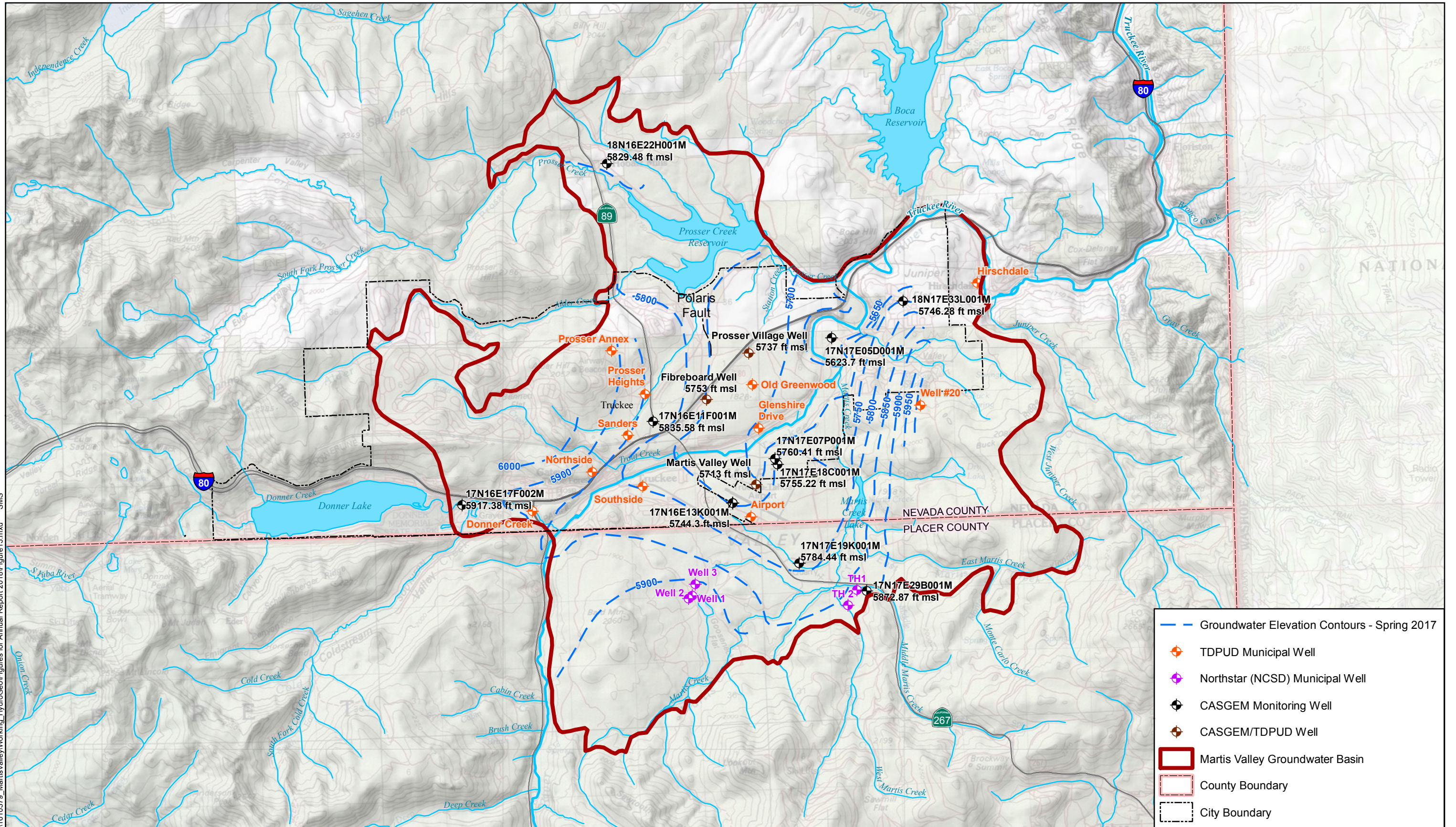
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MARTIS VALLEY GROUNDWATER BASIN
FALL 2016 GROUNDWATER ELEVATION CONTOURS

MARCH 2018

FIGURE 12



Martis Valley Alternative Plan Annual Report 2018
Nevada and Placer Counties, California

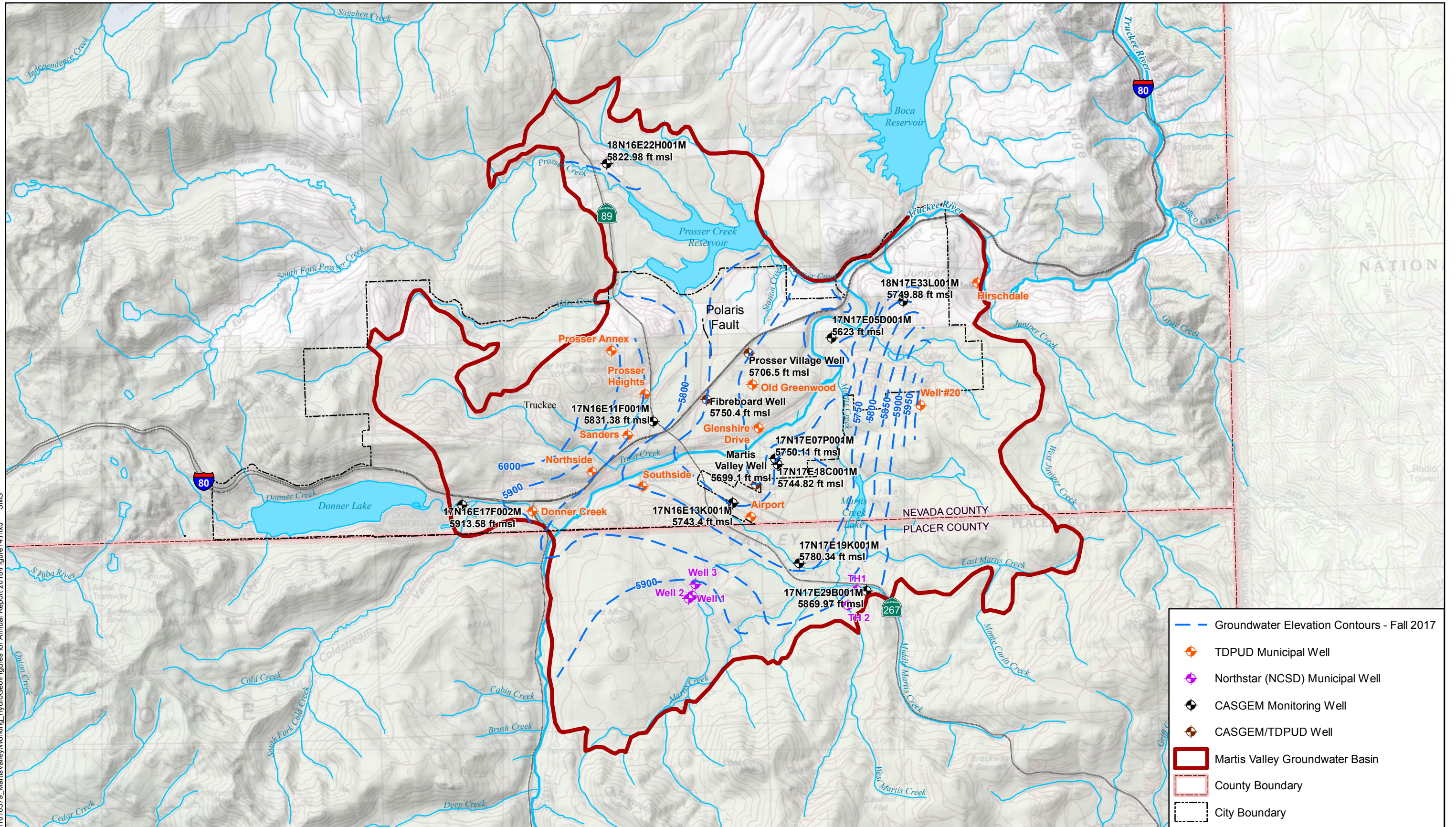
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MARTIS VALLEY GROUNDWATER BASIN
SPRING 2017 GROUNDWATER ELEVATION CONTOURS

MARCH 2018

FIGURE 13



- Groundwater Elevation Contours - Fall 2017
- ◆ TDPUD Municipal Well
- ◆ Northstar (NCSD) Municipal Well
- ◆ CASGEM Monitoring Well
- ◆ CASGEM/TDPUD Well
- Martis Valley Groundwater Basin
- County Boundary
- City Boundary



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Nevada and Placer Counties, California

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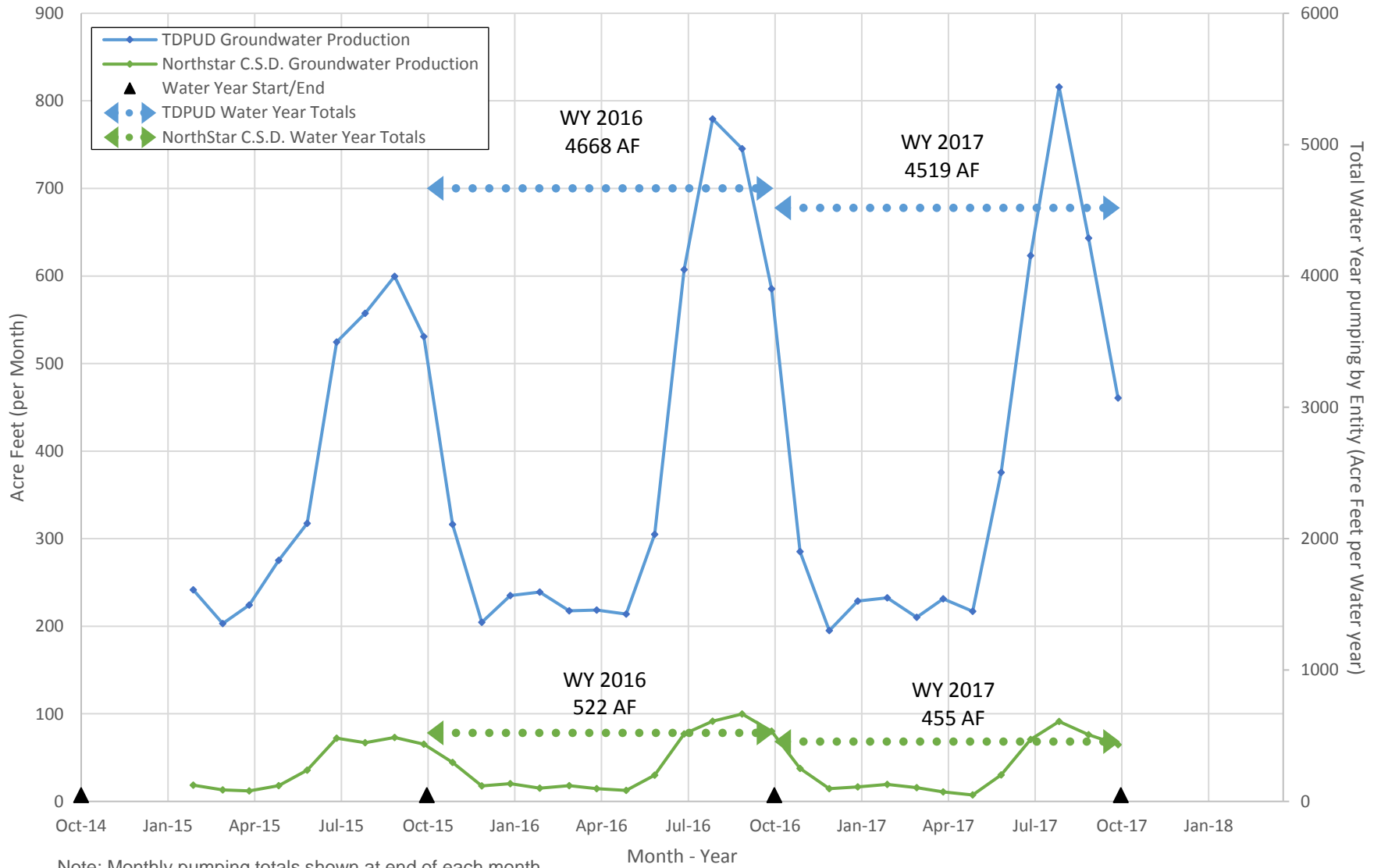


MARTIS VALLEY GROUNDWATER BASIN
FALL 2017 GROUNDWATER ELEVATION CONTOURS

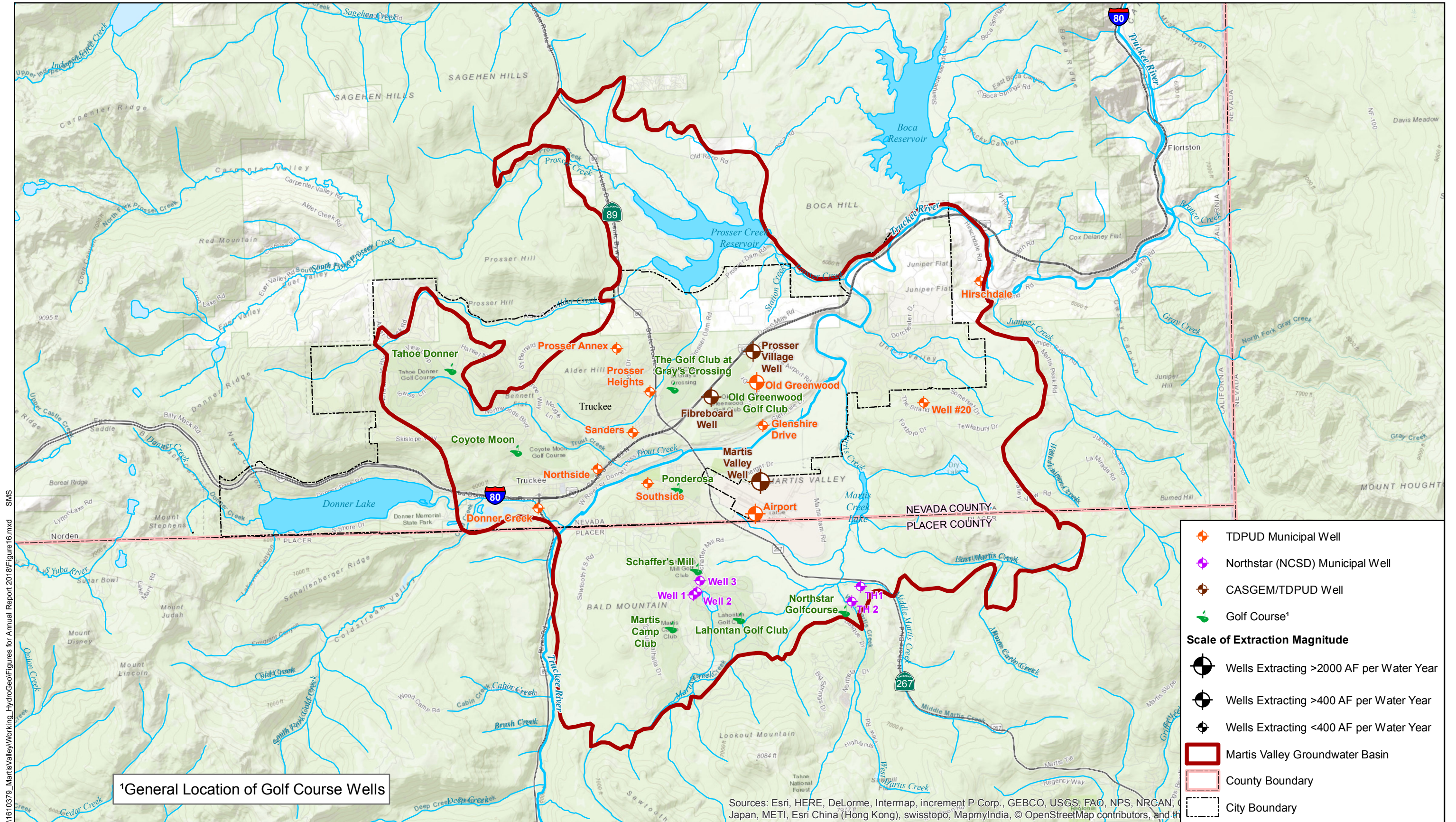
MARCH 2018

FIGURE 14

Figure 15
 Martis Valley Groundwater Basin Monthly Pump Totals
 (based on metered extraction data)



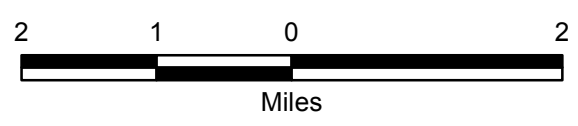
Note: Monthly pumping totals shown at end of each month.



¹General Location of Golf Course Wells

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the

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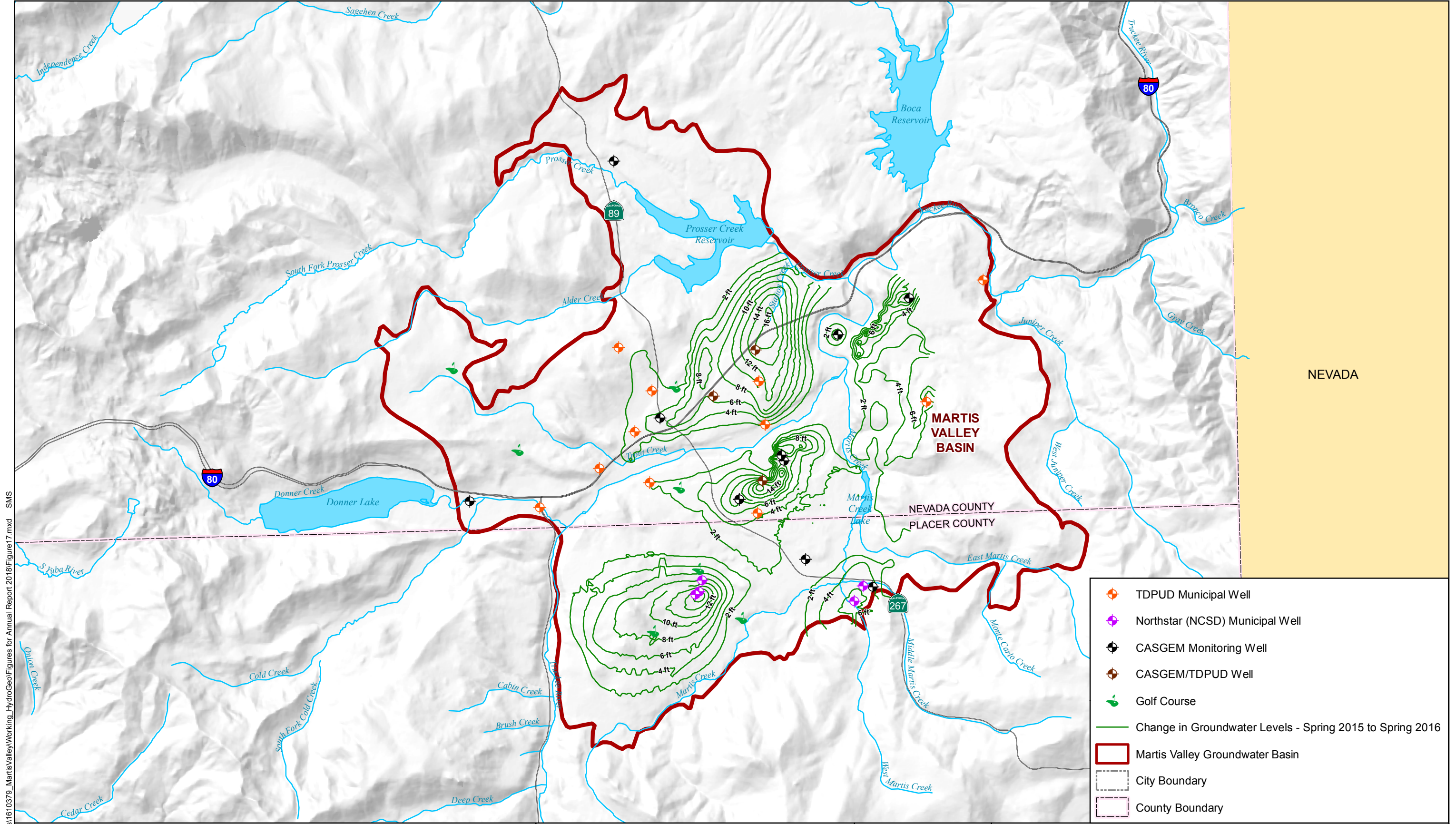
Truckee-Donner Public Utility District



MARTIS VALLEY GROUNDWATER BASIN
LOCATIONS OF GROUNDWATER EXTRactions

MARCH 2018

FIGURE 16



- TDPUD Municipal Well
- Northstar (NCSD) Municipal Well
- CASGEM Monitoring Well
- CASGEM/TDPUD Well
- Golf Course
- Change in Groundwater Levels - Spring 2015 to Spring 2016
- Martis Valley Groundwater Basin
- City Boundary
- County Boundary

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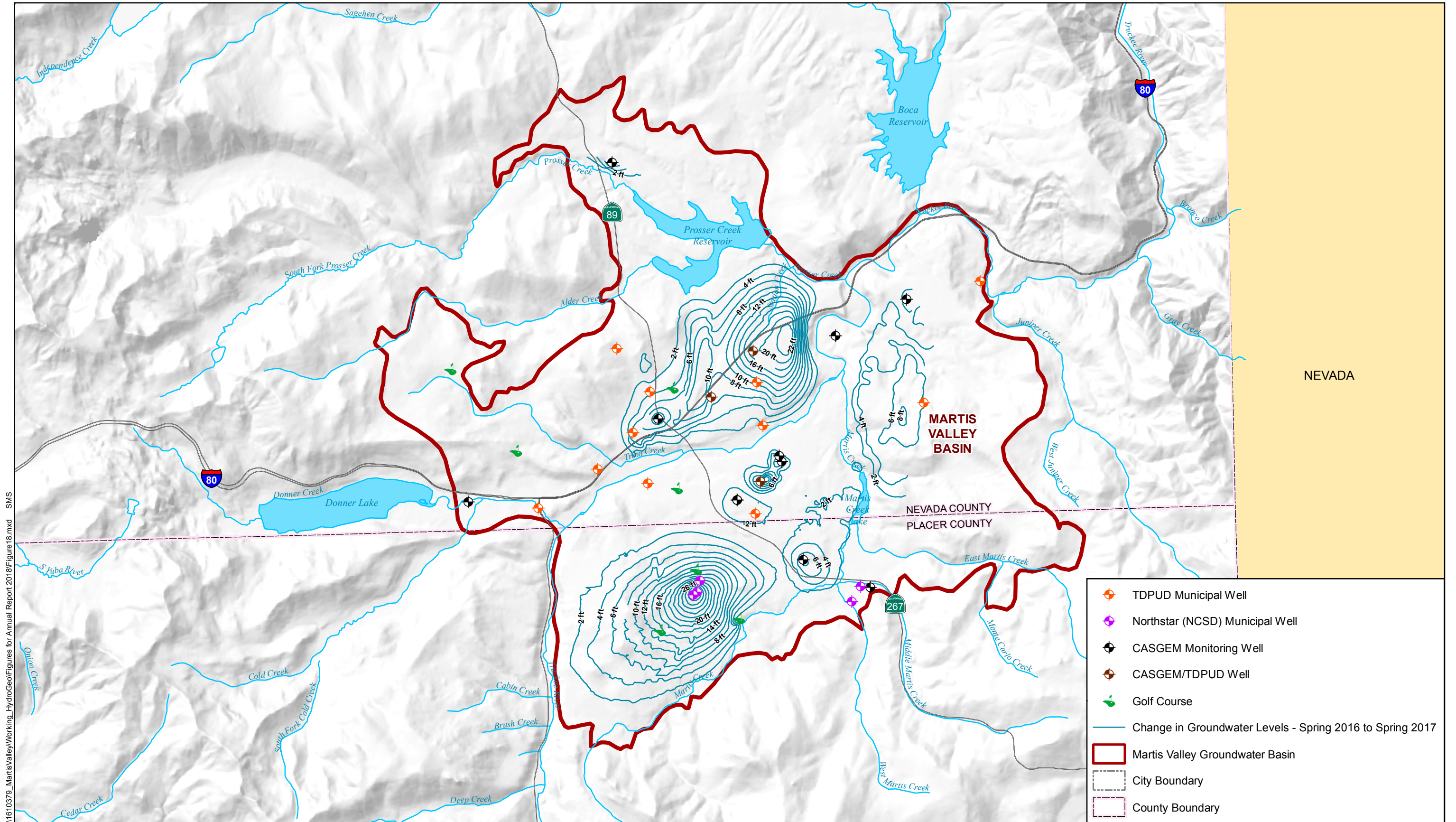
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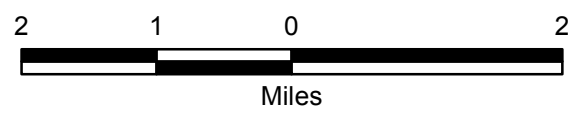
**MARTIS VALLEY GROUNDWATER BASIN
CHANGE IN GROUNDWATER ELEVATION
SPRING 2015 - SPRING 2016**

MARCH 2018

FIGURE 17



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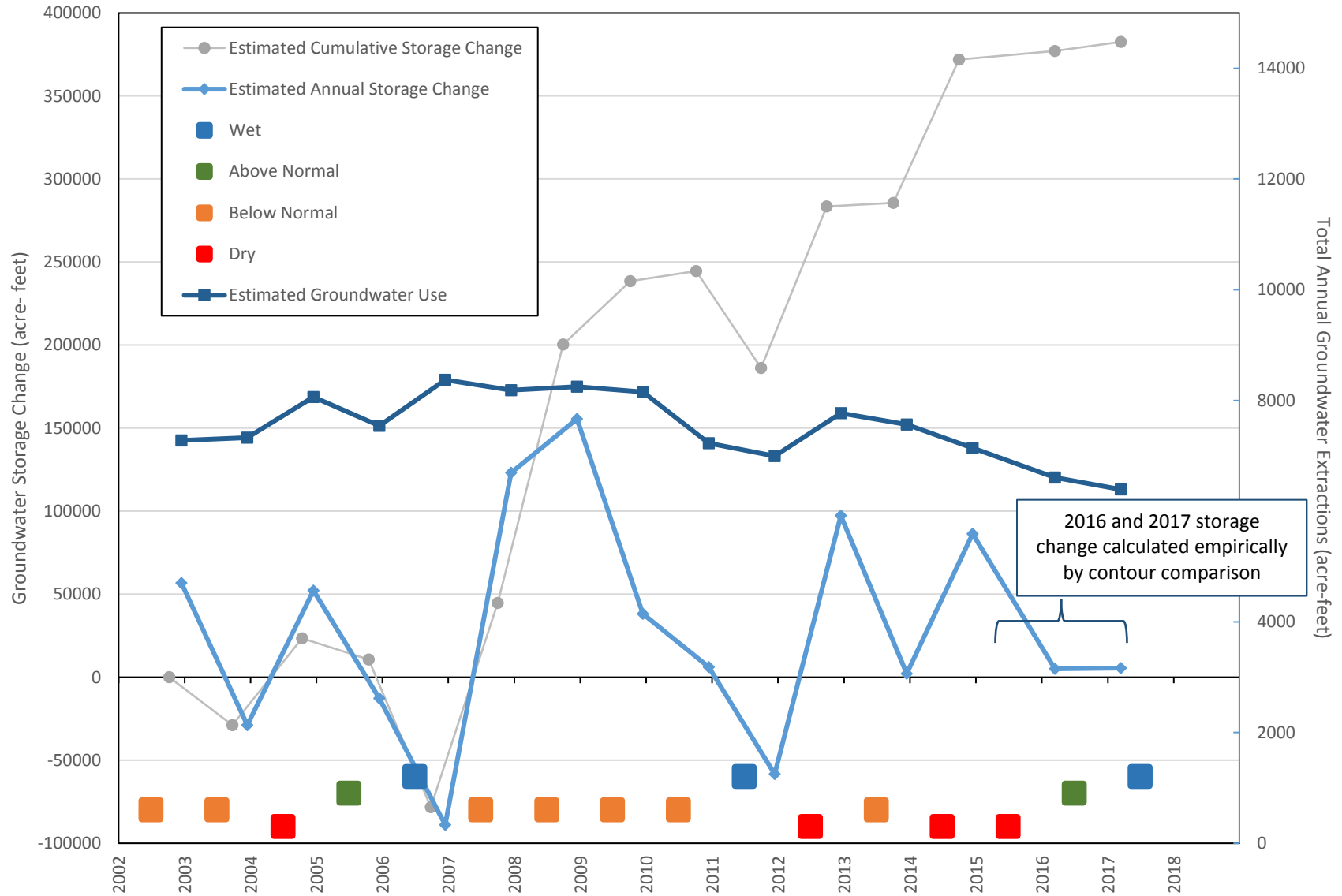


MARTIS VALLEY GROUNDWATER BASIN
CHANGE IN GROUNDWATER ELEVATION
SPRING 2016 - SPRING 2017

MARCH 2018

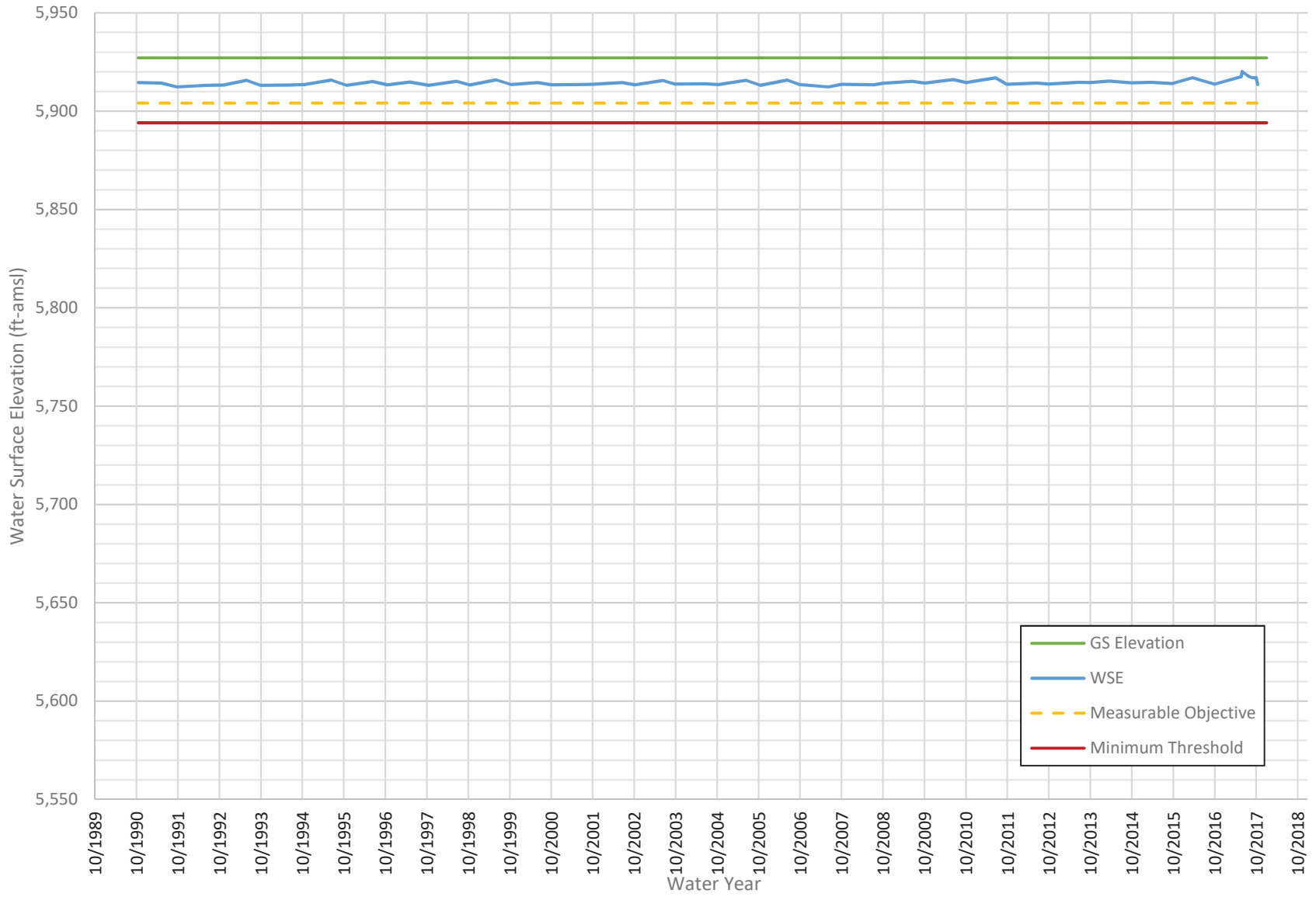
FIGURE 18

Figure 19
Change in Storage and Groundwater Use

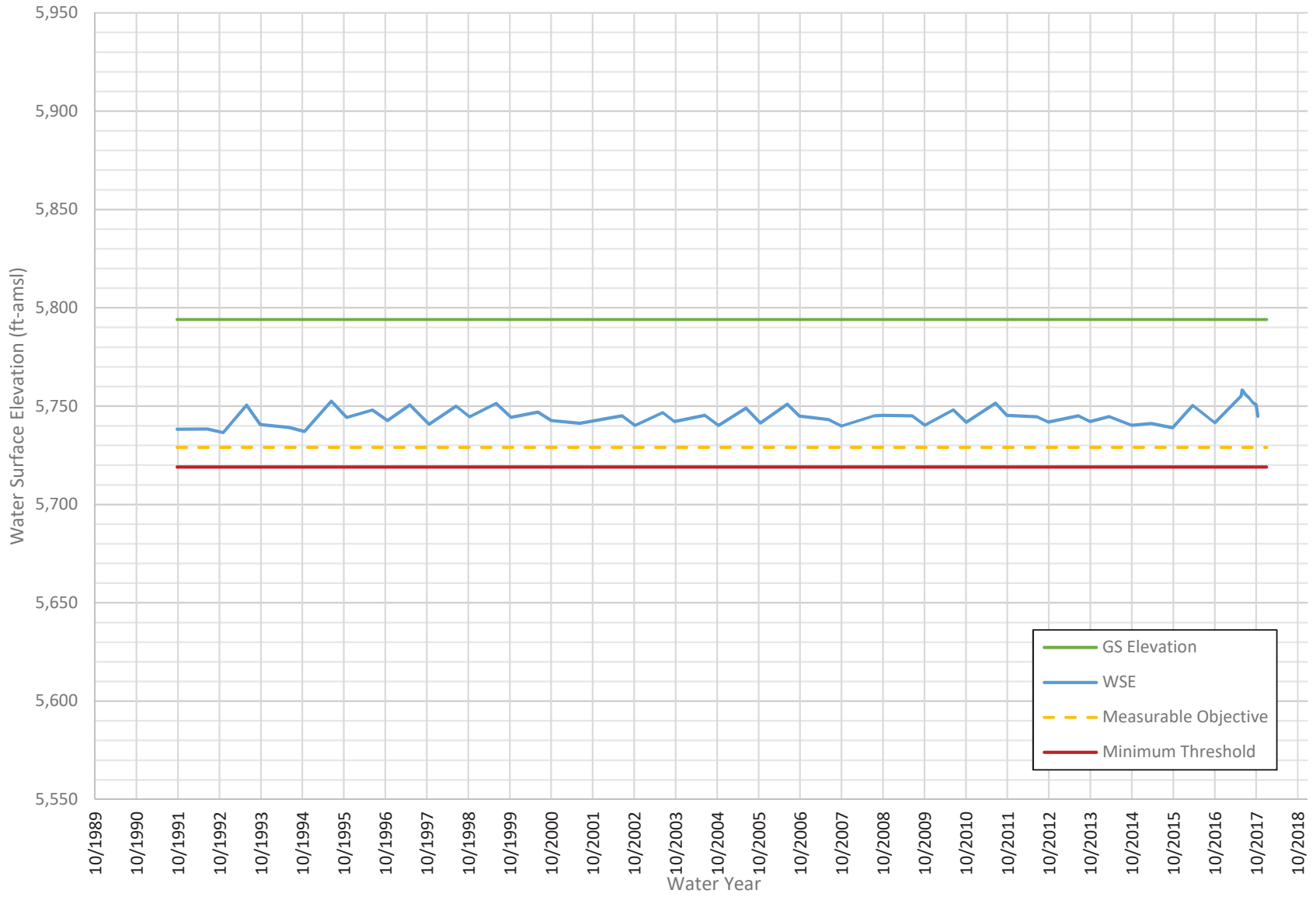


Attachment A. Monitoring Well Hydrographs

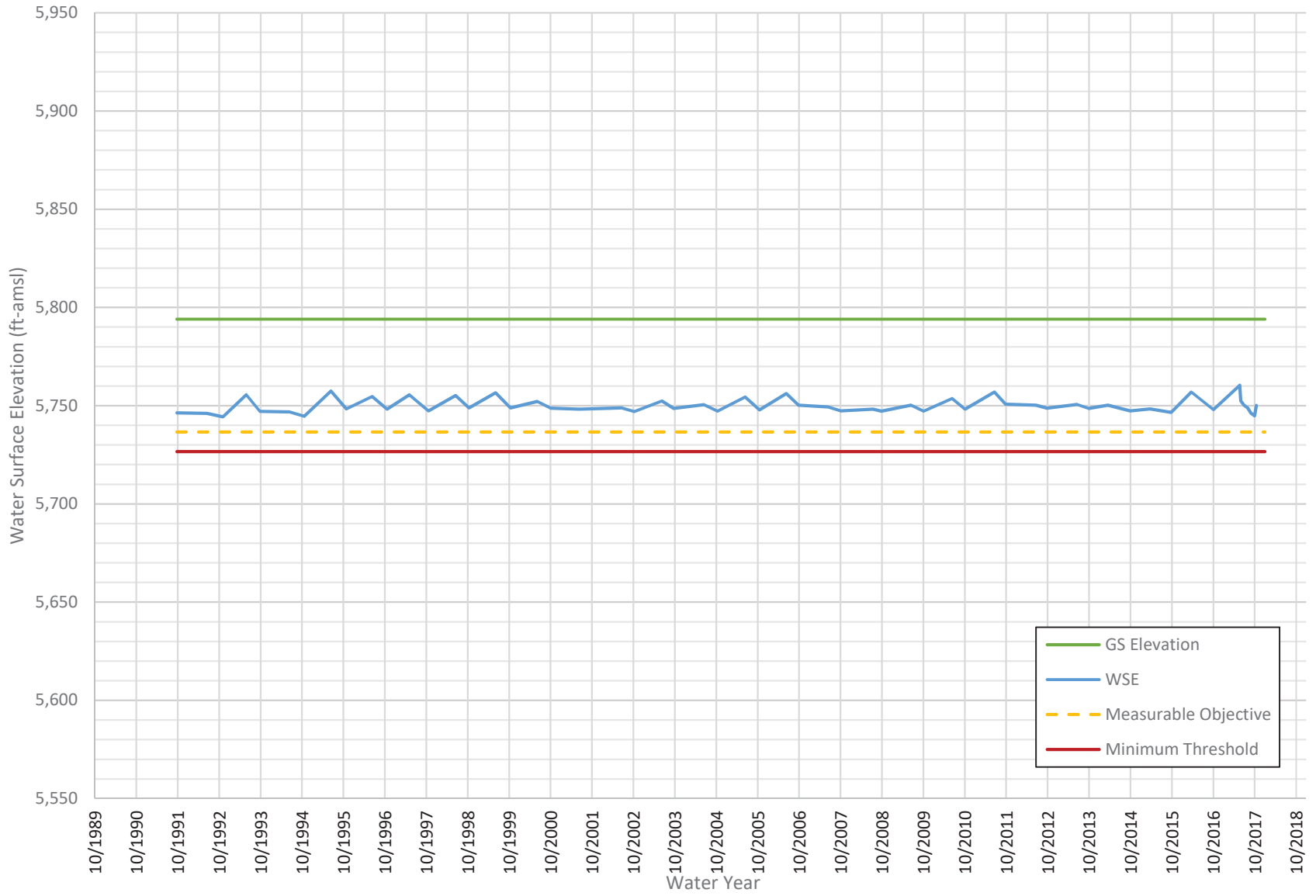
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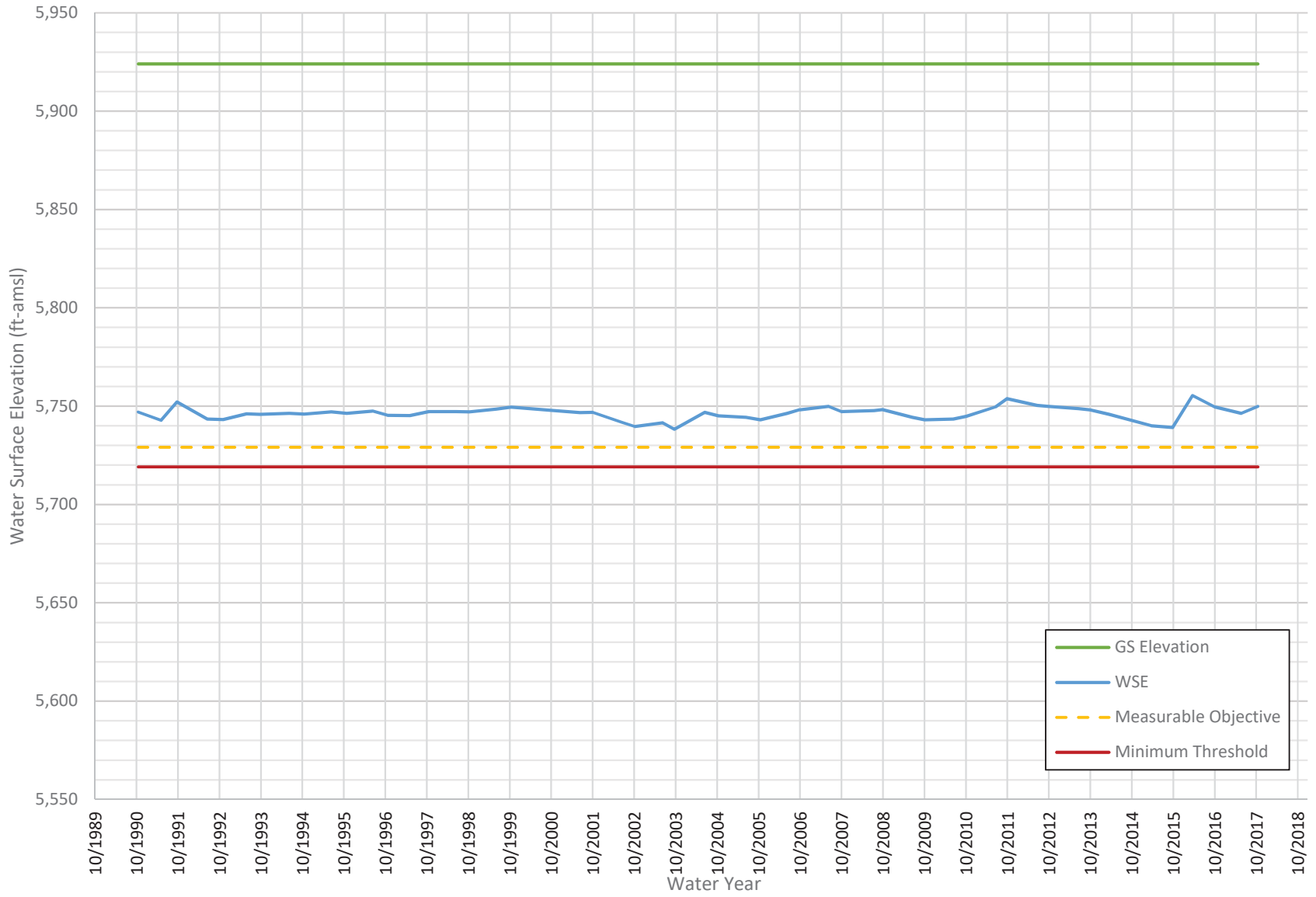
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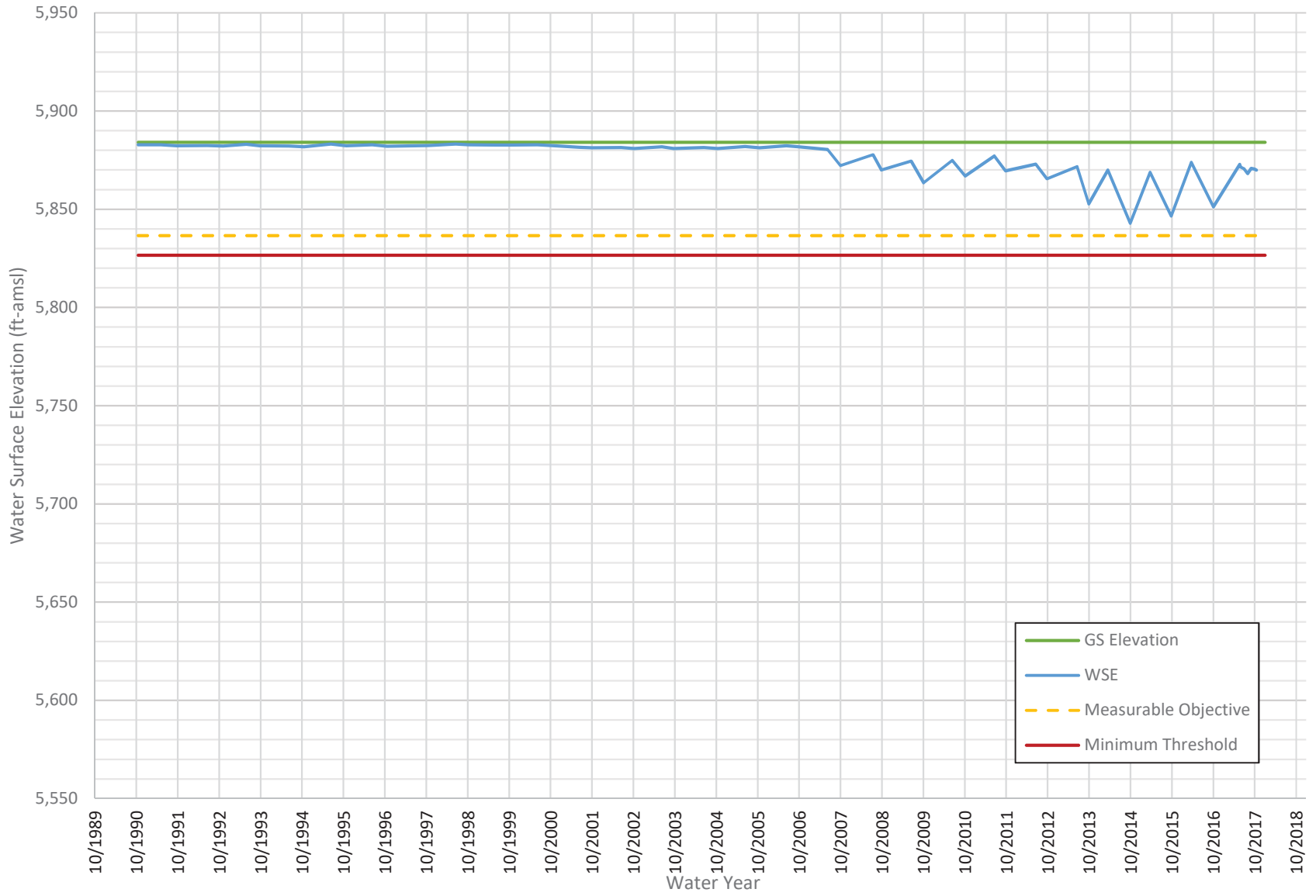
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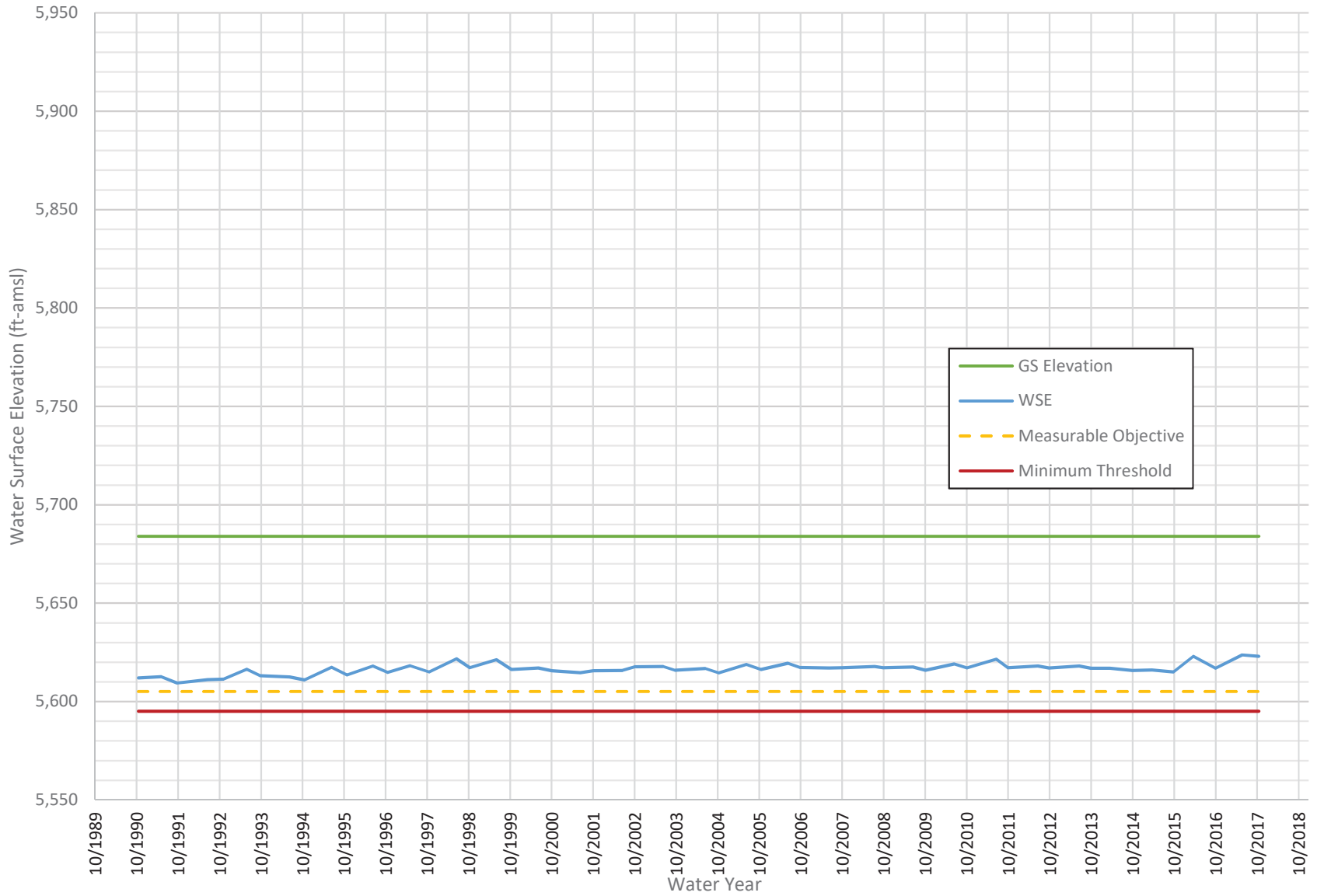
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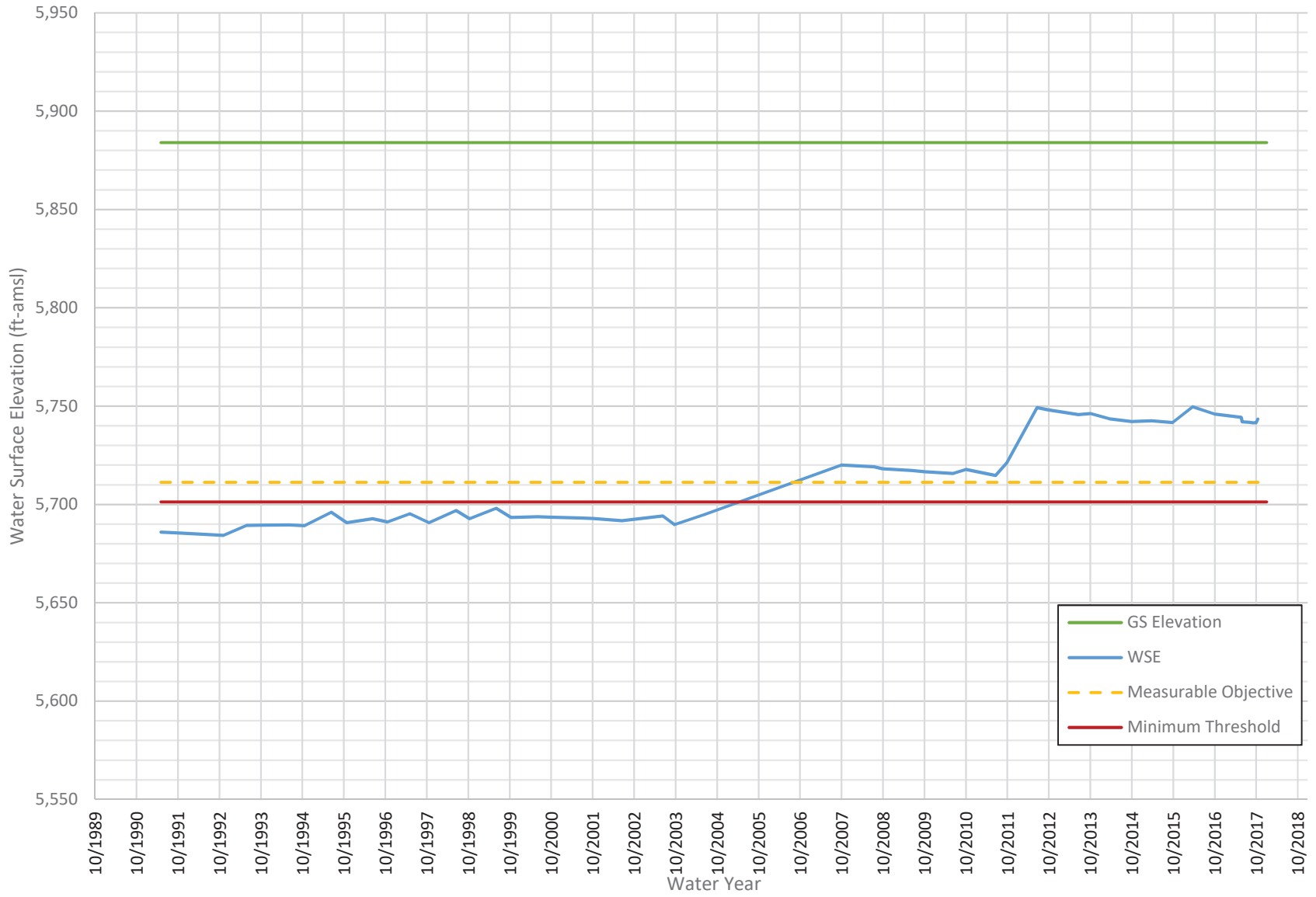
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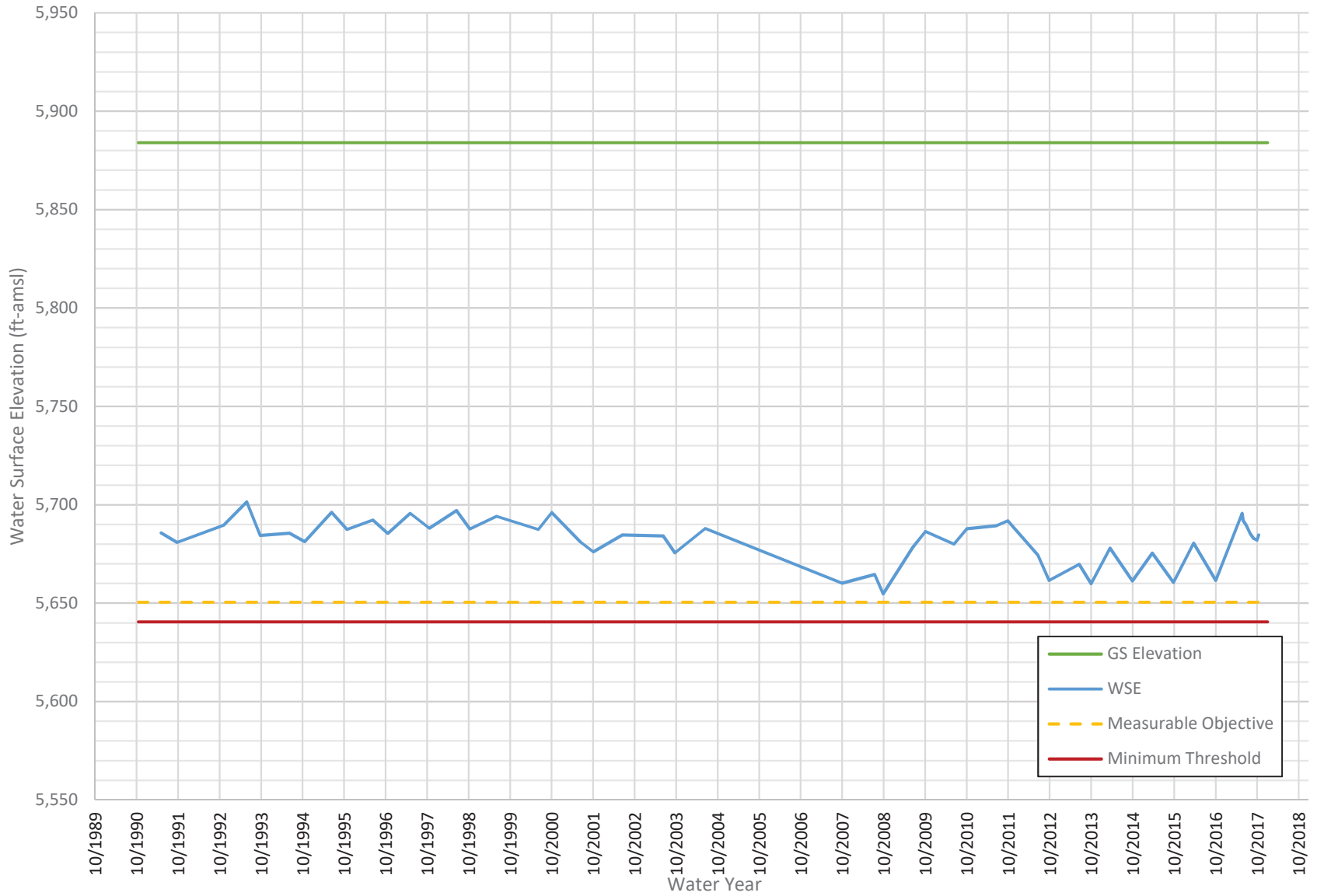
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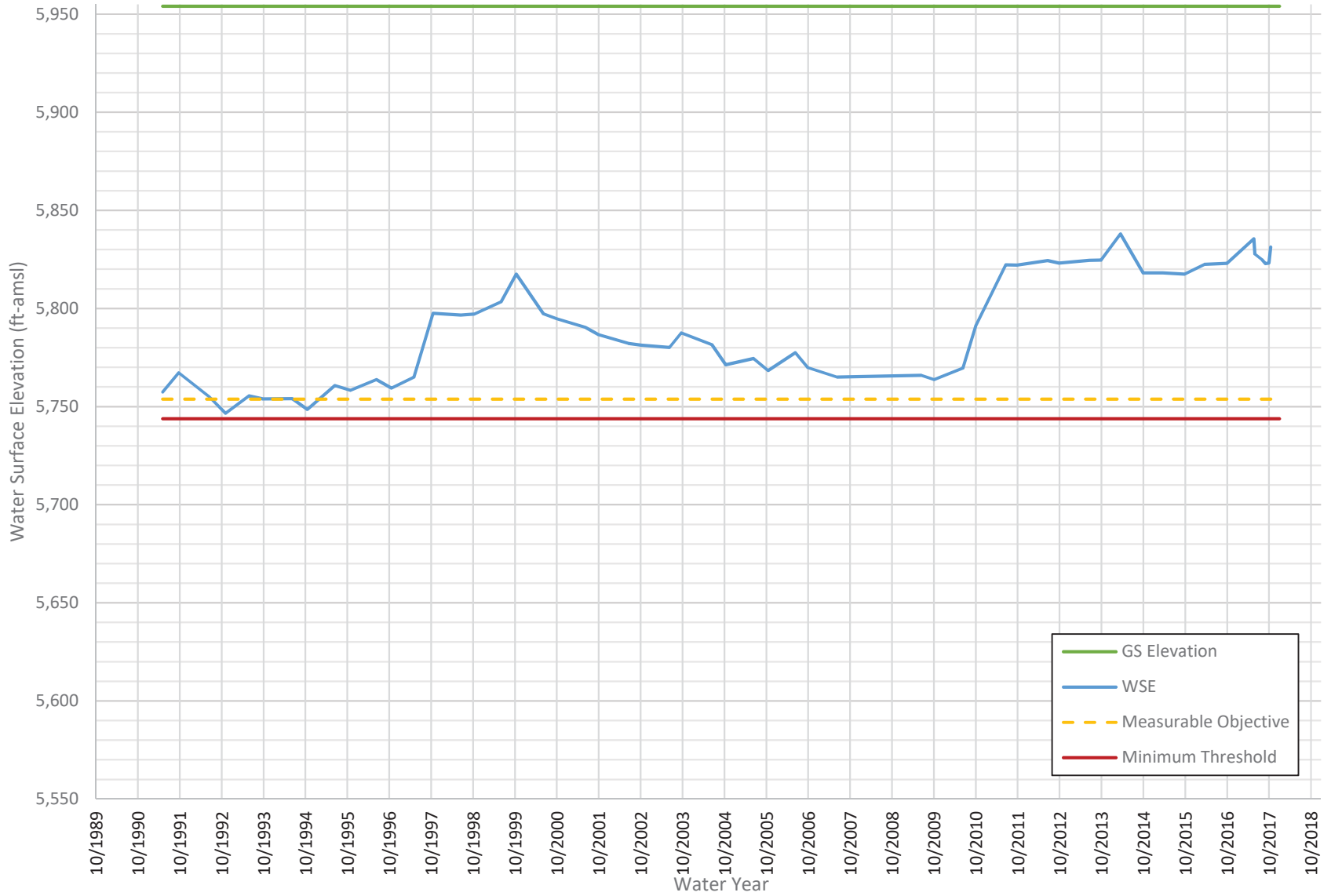
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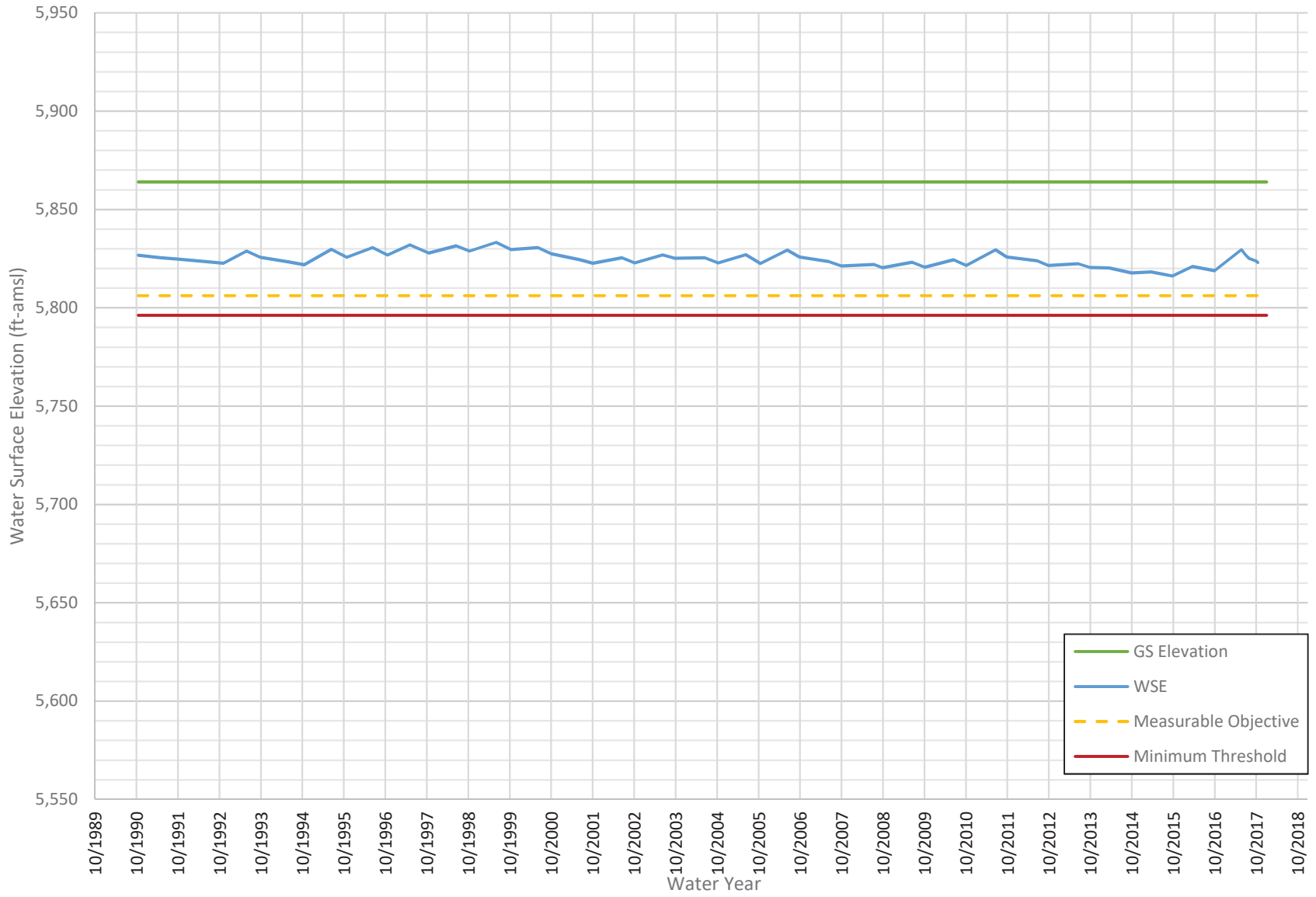
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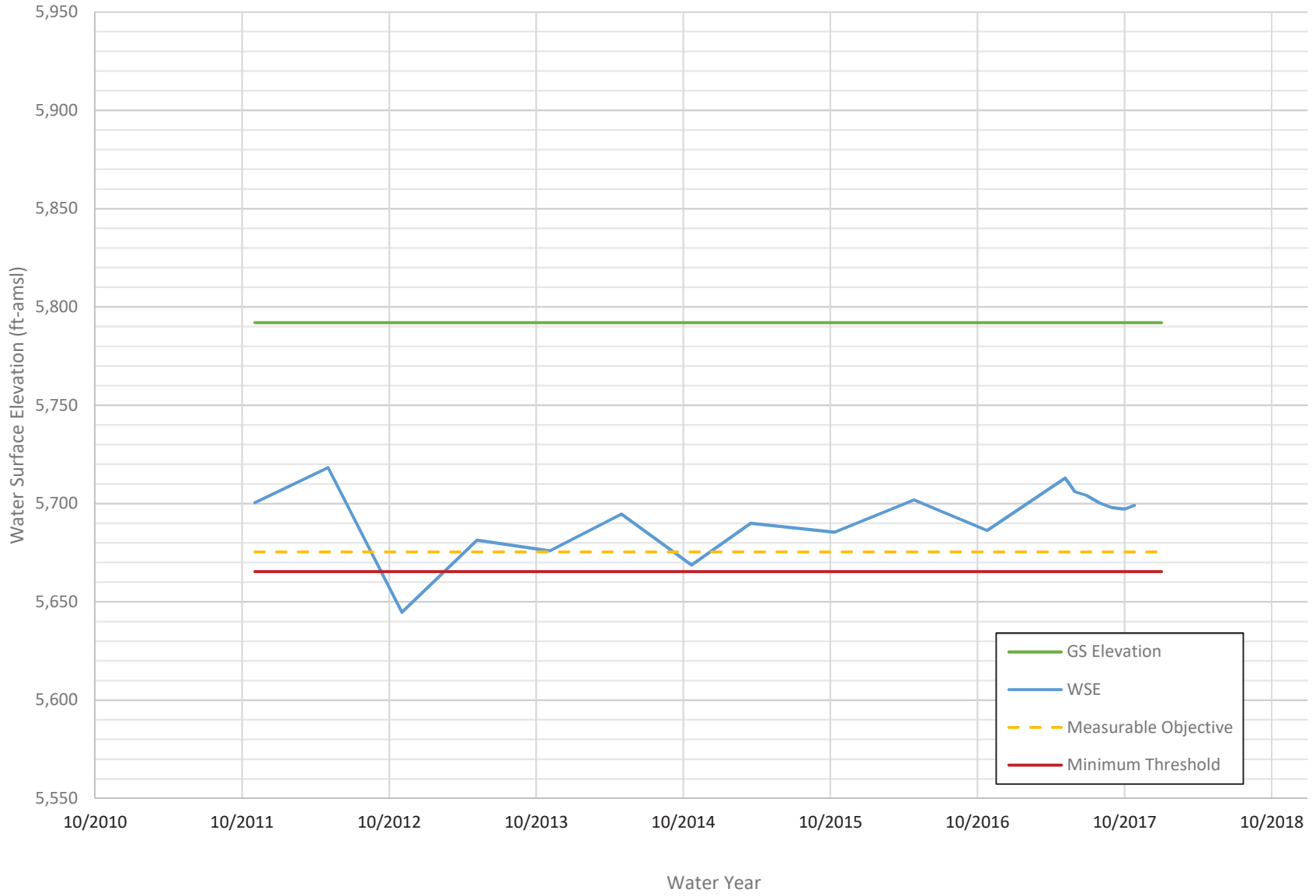
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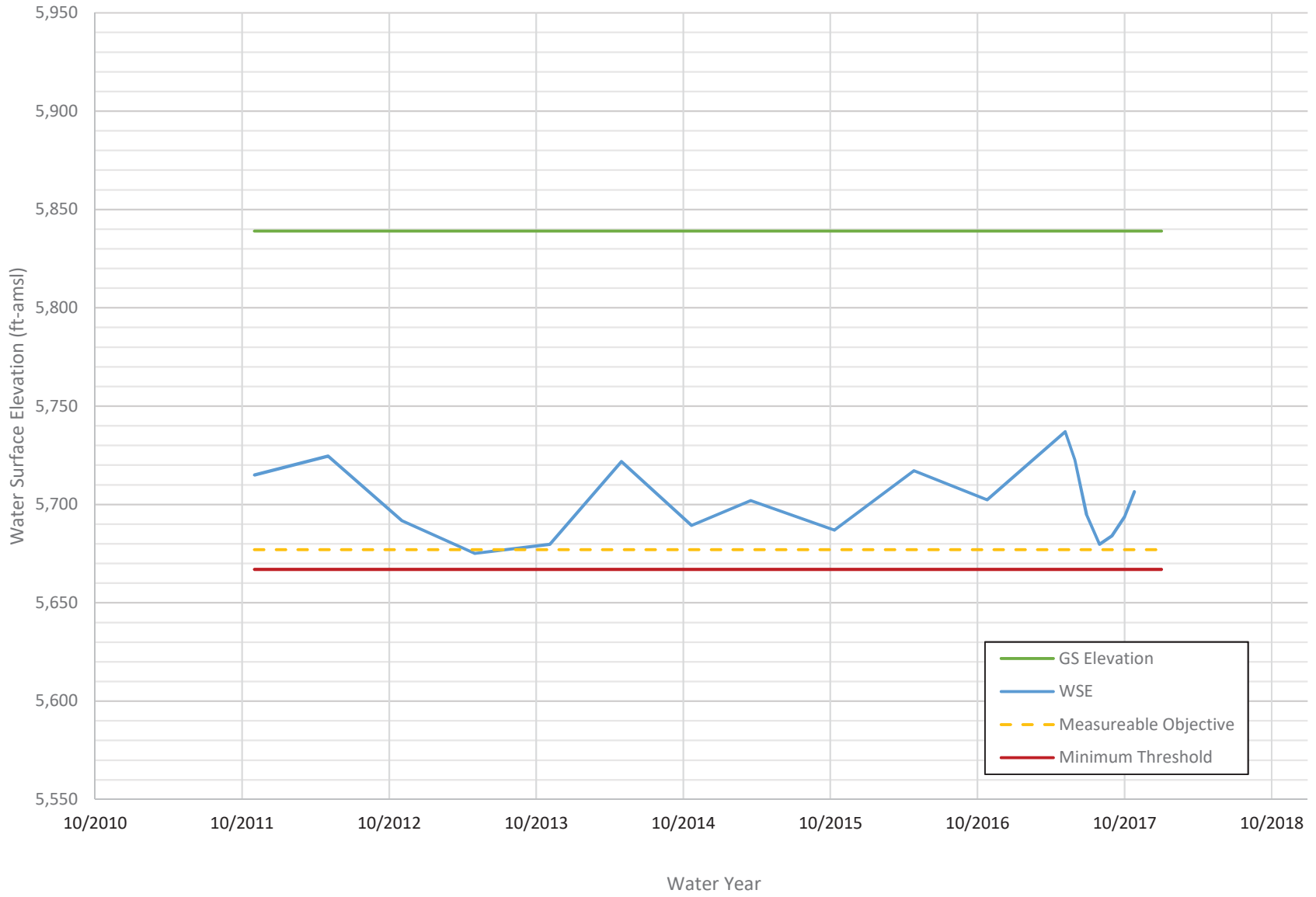
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Martis Valley



Prosser Village



Fibreboard

