OWENS VALLEY OPERATIONS PLAN FOR RUNOFF YEAR 2021-22

1.0 Owens Valley Operations Plan for Runoff Year 2021-22

This year's annual operations plan and pumping program is consistent with the management strategy of the Water Agreement between the County of Inyo (County) and the City of Los Angeles (City) dated October 18, 1991. As stated in the Water Agreement:

> *The overall goal of managing the water resources within Inyo County is to avoid certain described decreases and changes in vegetation and to cause no significant effect on the environment which cannot be acceptably mitigated while providing a reliable supply of water for export to Los Angeles and for use in Inyo County.*

The overall goal of the Water Agreement: environmental protections and a reliable water supply are the basis of the Los Angeles Department of Water and Power's (LADWP) operations plans. Groundwater pumping in the Owens Valley is managed in conformance with the provisions of the Water Agreement. The Water Agreement provides:

> *By April 20th of each year, the Department shall prepare and submit to the Inyo County Technical Group a proposed operations plan and pumping program for the twelve (12) month period beginning on April 1st. (In the event of two consecutive dry years when actual and forecasted Owens Valley runoff for the April to September period is below normal and averages less than 75 percent of normal, the Department shall prepare a proposed plan for the six (6) month period beginning on April 1st and October 1st, and submit such plans by April 20th and October 20th.)*

1.1. Eastern Sierra Runoff Forecast

The Eastern Sierra Runoff Forecast, which includes the Owens River Basin and Mono Basin runoffs for the 2021-22 runoff year (Table 1.1) is based on snow surveys of key Eastern Sierra watersheds in Inyo and Mono counties. The Eastern Sierra Runoff Forecast is used for planning aqueduct operations as it is a primary indicator of water supply. The April 1 forecast of the Owens River Basin runoff during the 2021-22 runoff year is 226,800 acre-feet, or about 55% of the 50-year (1966-2015) average annual runoff value of 409,000 acre-feet.

The forecast runoff for the period of April 1, 2021 through September 30, 2021, is 144,900 acre-feet for the Owens River Basin, which is 48% of the 50-year average. The 50-year average Owens River Basin runoff between April 1 and September 30, based on 1966-2015 data is 300,000 acre-feet. The April to September time period is important to distinguish from the overall runoff year because it is the period when runoff and irrigation occur.

Figure 1.1 summarizes Owens River Basin runoff and groundwater pumping by LADWP since the 1972 runoff year. This figure demonstrates this year's forecasted runoff and planned pumping compared to the past runoff in the Owens Valley Basin.

Table 1.1. Eastern Sierra Runoff Forecast for 2021-22 Runoff Year

2021 EASTERN SIERRA RUNOFF FORECAST
April 1, 2021

APRIL THROUGH SEPTEMBER RUNOFF

	MOST PROBABLE VALUE (Acre-feet)	MOST PROBABLE VALUE (% of Avg.)	REASONABLE MAXIMUM (% of Avg.)	REASONABLE MINIMUM (% of Avg.)	LONG-TERM MEAN (1966 - 2015) (Acre-feet)
MONO BASIN:	53,900	53%	66%	41%	100,782
OWENS RIVER BASIN:	144,900	48%	62%	35%	299,885

APRIL THROUGH MARCH RUNOFF

	MOST PROBABLE VALUE (Acre-feet)	MOST PROBABLE VALUE (% of Avg.)	REASONABLE MAXIMUM (% of Avg.)	REASONABLE MINIMUM (% of Avg.)	LONG-TERM MEAN (1966 - 2015) (Acre-feet)
MONO BASIN:	68,800	58%	71%	44%	119,103
OWENS RIVER BASIN:	226,800	55%	68%	43%	409,199

MOST PROBABLE - That runoff which is expected if median precipitation occurs after the forecast date.

REASONABLE MAXIMUM - That runoff which is expected to occur if precipitation subsequent to the forecast is equal to the amount which is exceeded on the average once in 10 years.

REASONABLE MINIMUM - That runoff which is expected to occur if precipitation subsequent to the forecast is equal to the amount which is exceeded on the average 9 out of 10 years.

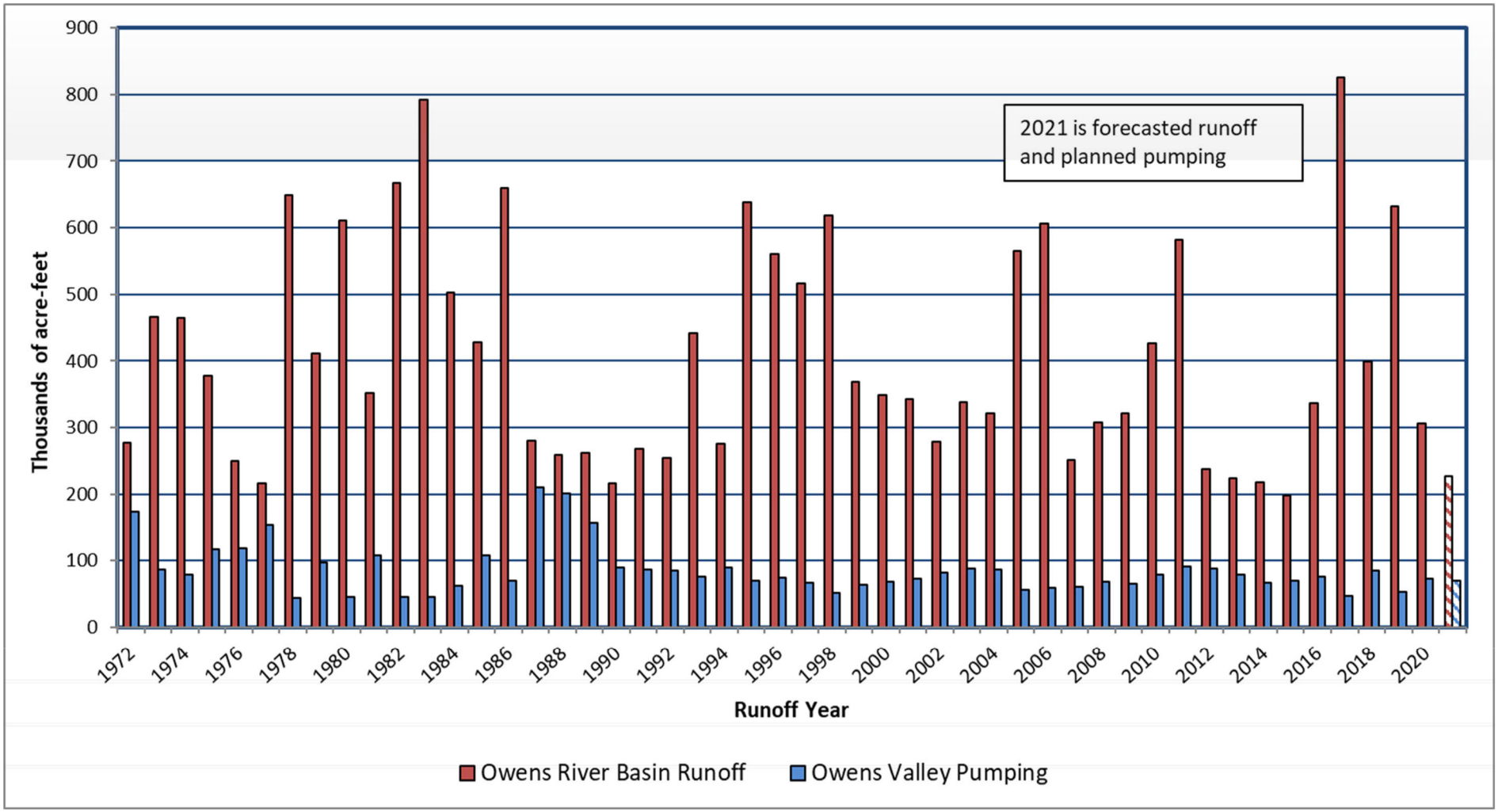


Figure 1.1. Owens River Basin Runoff and Groundwater Pumping

1.2. Owens Valley Groundwater Production

LADWP has prepared its 2021 Annual Owens Valley Operations Plan based on the goals and principles of the Water Agreement. The 2021 Annual Owens Valley Operations Plan is designed to avoid adverse impacts to the environment while providing a reliable supply of water for in-valley uses and export to Los Angeles for municipal use. Given the below normal runoff forecast, LADWP is not considering water spreading activities this year.

Under the terms of the Water Agreement, the allowable amount of groundwater pumping from each Owens Valley wellfield is based on the ON/OFF status of monitoring sites located within each wellfield and the capacity of the wells linked to those sites (see Water Agreement Sections V.B and V.C). Table 1.2 lists the ON/OFF status of the monitoring sites within the Owens Valley as of April 2021. Based on Table 1.2, 14 sites are in ON status and 8 sites are in OFF status. The Water Agreement or Technical Group has designated certain town supply wells, irrigation supply wells, fish hatchery supply wells, enhancement/mitigation (E/M) project supply wells, and other wells determined to not significantly impact areas with groundwater dependent vegetation as exempt from the ON/OFF provisions of the Water Agreement. These exempt wells may be pumped for their intended purpose.

Table 1.3 provides a breakdown of the available annual pumping capacity and planned groundwater pumping for the 2021-22 runoff year by wellfield. Table 1.3 also shows the monitoring sites in ON status as of April 2021, the wells associated with the ON status monitoring sites, and the exempt wells in each wellfield. Accordingly, approximately 191,000 acre-feet of water is available for groundwater pumping from Owens Valley wellfields under the terms of the Water Agreement during the 2021-22 runoff year. LADWP plans to pump between 64,600 acre-feet and 78,980 acre-feet of groundwater during the 2021-22 runoff year, which is between 34 percent and 41 percent of the amount allowed under the terms of Water Agreement. The planned range of groundwater pumping during the 2021-22 runoff year should provide LADWP with the needed operational flexibility to supply water for in-valley uses and export to the City of Los Angeles.

Working independently and with the Inyo/Los Angeles Technical Group, LADWP will monitor Owens River Basin runoff and environmental conditions to assess if further changes to the planned pumping are needed. LADWP's 2021-22 groundwater management approach is more conservative than the environmentally conservative pumping plans advocated by the Standing Committee during the dry years of the early 1990s, given the planned pumping compared with the allowed pumping under terms of Water Agreement.

Figure 1.2 compares the amount of Owens Valley groundwater pumping provided by the provisions of Water Agreement and the actual groundwater pumping by LADWP for each runoff year since 1992 (available pumping was not calculated prior to 1992). LADWP's planned pumping for the 2021-22 runoff year is consistent with its past conservative pumping plans. LADWP is committed to conducting its operations in a conservative, responsible, and environmentally sustainable manner.

In addition to complying with the ON/OFF provisions and the environmental protection goals of the Water Agreement, LADWP's 2021-22 pumping program complies with the groundwater mining provisions of the Green Book. Table 1.4 shows the latest update of the mining calculations based on the procedures described in Section IV.C of the Green Book. As shown in this table, none of the wellfields in the Owens Valley will be in deficit by the end of the first half of the 2021-22 runoff year.

Table 1.5 is a list of Owens Valley wells exempted under the Water Agreement or by approval of the Technical Group from linkage to the ON/OFF provisions of the Water Agreement. This table includes a list of wells by well number, general location of the exempt well, and the reason the well is exempt. This table was revised and approved by the Technical Group at their May 6, 2016 meeting.

Table 1.6 details planned groundwater pumping for the 2021-22 runoff year on a month-to-month basis for each wellfield. Pumping for town water systems, fish hatcheries, and enhancement/mitigation (E/M) projects is included in the pumping distribution. Owens Valley groundwater production for the 2021-22 runoff year is consistent with the provisions of the Water Agreement. While Table 1.6 provides the planned monthly pumping volumes from each wellfield, the actual pumping amounts could vary due to the uncertainty inherent in runoff conditions, operational needs, and safety concerns of the Los Angeles Aqueduct system, which could result in changes in the operation of surface and ground water facilities throughout Eastern Sierra. Any pumping tests will be in addition to the planned pumping for 2021-22. Planned pumping may also be increased to provide freeze protection for the Los Angeles Aqueduct (LAA).

The following is a discussion of the planned pumping program by wellfield. Figures 1.3, and 1.5, followed by figures 1.6 through 1.10 show locations of LADWP's Owens Valley pumping wells by wellfield. These figures show the location of production wells, selected monitoring wells, and vegetation monitoring sites in each area.

Table 1.2. Soil/Vegetation Water Balance Calculations for April 2021 According to Section III of the Green Book

Site	October 2020 Soil AWC (cm)	50% Annual Precip. (cm)	Projected Soil AWC (cm)	October 2020 Vegetation Water Requirement (cm)	October 2020 Required Soil AWC For Turn-ON	October 2020 ON/OFF Status	April 2021 Soil AWC (cm)	April 2021 Required Soil AWC For Turn-ON	April 2021 ON/OFF Status
LW1	31.6	7.9	39.5	8.7	NA	ON	51.0	NA	ON
LW2	42.6	7.9	50.5	6.6	NA	ON	41.7	NA	ON
LW3	16.4	7.9	24.3	24.2	NA	ON	23.5	NA	ON
BP1	28.5	7.9	36.4	14.6	NA	ON	20.1	NA	ON
BP2	1.7	NA	NA	7.0	28.4	OFF	2.5	28.4	OFF (7/98)
BP3	67.2	7.6	74.8	12.4	NA	ON	61.1	NA	ON
BP4	56.0	8.2	64.2	7.5	NA	ON	64.1	NA	ON
TA3	11.8	NA	NA	13.5	28.4	OFF	12.9	28.4	OFF (10/17)
TA4	17.5	7.3	24.8	10.1	NA	ON	20.2	NA	ON
TA5	19.8	8.2	28.0	3.7	NA	ON	20.9	NA	ON
TA6	19.7	7.3	27.0	19.3	NA	ON	21.8	NA	ON
TS1	7.1	NA	NA	22.3	28.9	OFF	8.2	28.9	OFF (7/17)
TS2	13.9	7.3	21.2	14.8	NA	ON	17.5	NA	ON
TS3	17.0	7.3	24.3	8.1	NA	ON	20.4	NA	ON
TS4	36.9	7.3	44.2	30.8	NA	ON	47.4	NA	ON
IO1	22.2	NA	NA	30.1	42.2	OFF	25.4	42.2	OFF (10/98)
IO2	3.3	NA	NA	7.2	NA	OFF	2.8	3.9	OFF (7/20)
SS1	17.9	NA	NA	10.3	34.0	OFF	24.3	34.0	OFF (7/17)
SS2	3.0	NA	NA	5.4	25.6	OFF	2.6	25.6	OFF (7/11)
SS3	25.5	NA	NA	16.7	33.8	OFF	33.9	NA	ON
SS4	6.0	NA	NA	14.3	15.9	OFF	8.3	15.9	OFF (7/05)
BG2	30.3	6.6	36.9	19.1	NA	ON	28.5	NA	ON

Table 1.3. Annual Pumping Capacity According to Monitoring Sites with ON Status and Planned Pumping for 2021-22 Runoff Year

Wellfield	Monitoring	Associated Production Wells	Available Capacity (AF/year)	Planned Pumping (AF)
Laws	L1	398, 247, 248, 249	12,236	
	L2	236, 239, 243, 244	7,240	
	L3	240, 241, 399, 376, 377	9,195	
	L5*	245, 387, 388	8,980	
	Exempt	236, 354, 422, 413	2,100	
	Wellfield Pumpage		**39,751**	**8,900-9,400**
Bishop**	All wells	140, 371, 406, 407, 408, 410, 411, 412	19,400	
	Wellfield Pumpage		**19,400**	**12,000**
Big Pine	BP1	378, 379, 389, 352	10,593	
	BP3	222, 223,232	4,851	
	BP4	331	7,530	
	Exempt	218, 219, 330, 332, 341, 352, 375, 415	25,750	
	Wellfield Pumpage		**48,724**	**20,500-23,000**
Taboose Aberdeen	TA4	342, 347	19,838	
	TA5	349	12,130	
	TA6	109, 370	5,502	
	Exempt	118, 355	2,620	
	Wellfield Pumpage		**40,090**	**5,300-8,880**
Thibaut Sawmill	TS2	155	796	
	TS3	103, 104, 382	2,968	
	TS4	380, 381	4,561	
	Exempt	351, 356	8,000	
	Wellfield Pumpage		**16,325**	**8,000-11,000**
Indep. - Oak				
	Exempt	59, 60, 61, 65, 357, 383EM, 384EM, 401	15,710	
	Wellfield Pumpage		**15,710**	**7,000-8,800**
Symmes Shepherd				
	Exempt	402EM	1,200	
	SS3	W092, W396	5,647	
	Wellfield Pumpage		**6,847**	**1,200-2,900**
Bairs Georges	BG2	76, 343, 348, 403	2,820	
	Exempt	343	500	
	Wellfield Pumpage		**2,820**	**800-2,100**
Lone Pine	Exempt	344, 346, 425	980	
	Wellfield Pumpage		**980**	**900**
	Total Owens Valley		**190,647**	**64,600-78,980**

* Monitoring site has yet to be located.

** Pumping is subject to the Hillside Decree

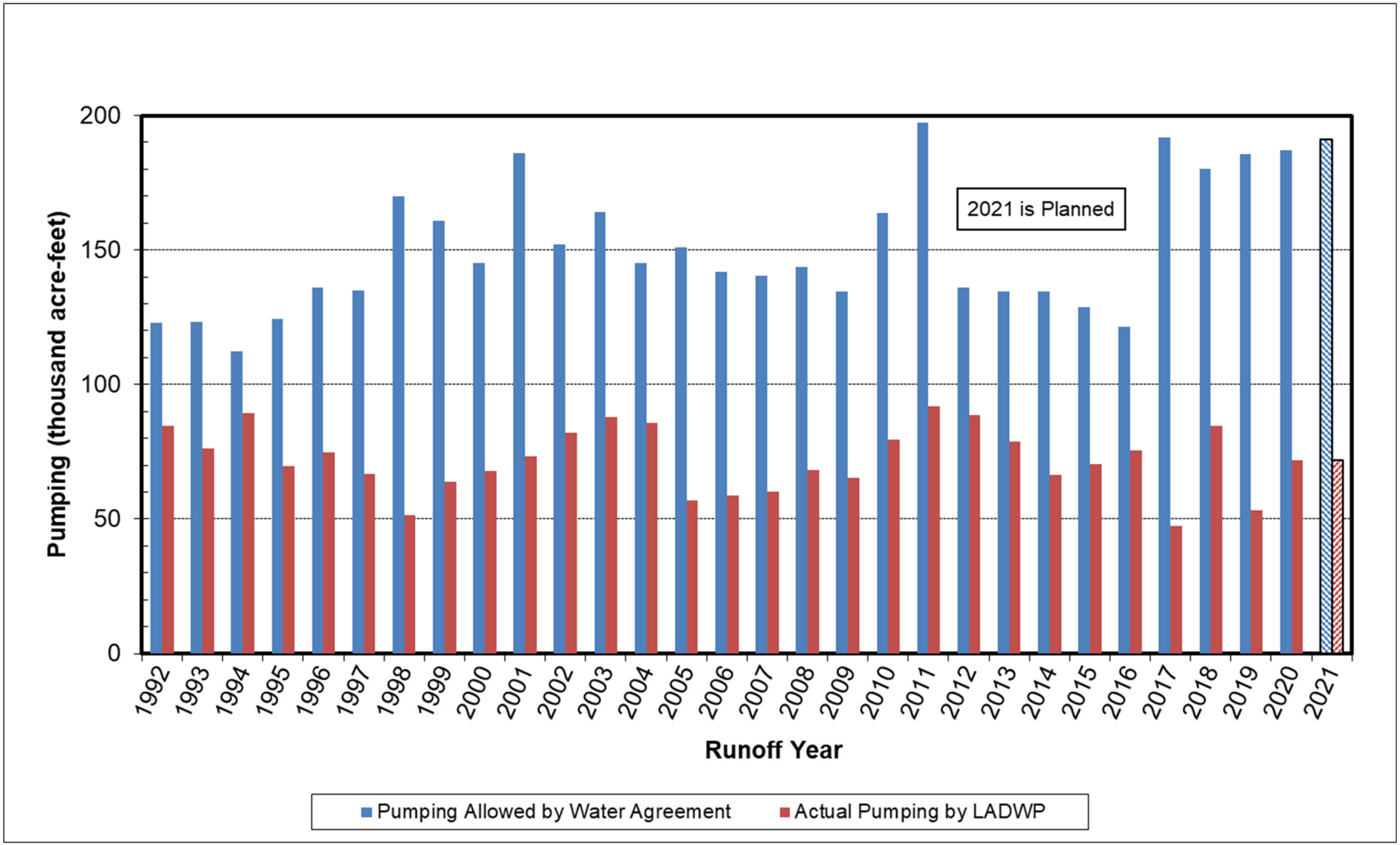


Figure 1.2. Owens Valley Pumping – Provided by Water Agreement and Actual Since Inyo/Los Angeles Water Agreement

Table 1.4. Summary of Recharge and Pumping for Water Year 2002 - 2020 and Estimated Pumping Limit for Apr-Sep 2021 in Acre-Feet

Water	OWENS VALLEY	LAWS		BISHOP		BIG PINE		TABOOSE-THIBAUT		IND-SYM-BAIRS		LONE PINE		OWENS VALLEY	
Year	Runoff Percent (c)	Recharge	Pumping	Recharge	Pumping	Recharge	Pumping	Recharge	Pumping	Recharge	Pumping	Recharge	Pumping	Recharge	Pumping
2002	63%	11,184	3,480	35,514	10,839	19,715	26,885	22,495	25,288	28,820	10,599	12,103	1,345	129,831	78,436
2003	75%	11,454	5,786	38,486	11,407	21,883	25,885	26,166	27,387	32,455	14,294	13,088	1,179	143,532	85,938
2004	71%	11,138	7,412	37,149	11,777	21,126	26,149	25,044	25,159	29,771	15,750	11,357	1,119	135,586	87,366
2005	120%	18,389	3,841	47,471	7,093	32,686	19,423	40,500	18,674	46,441	18,585	17,191	1,128	202,678	68,744
2006	138%	35,336	3,013	54,337	5,667	39,650	20,686	47,757	15,707	53,873	9,944	19,956	1,119	250,911	56,136
2007	64%	10,947	7,840	34,470	10,516	19,757	20,525	25,855	14,578	27,624	10,674	10,454	1,100	129,108	65,233
2008	68%	10,855	7,939	35,850	10,228	20,432	20,243	28,619	18,542	27,759	9,219	11,563	858	135,078	67,029
2009	73%	11,049	6,233	37,416	12,123	21,555	22,891	29,385	14,751	29,359	9,603	12,147	775	140,912	66,376
2010	93%	11,154	6,333	41,987	10,509	26,566	22,514	35,541	20,239	36,863	13,031	14,252	626	166,362	73,252
2011	134%	17,375	7,188	52,182	9,889	35,539	27,089	47,562	21,933	50,619	14,527	19,057	998	222,333	81,624
2012	72%	11,058	9,514	37,315	11,134	21,297	27,220	28,369	26,156	28,905	16,570	11,538	1,048	138,482	91,642
2013	62%	10,644	6,642	34,811	11,536	19,408	26,115	24,795	25,225	24,749	17,907	10,364	721	124,771	88,146
2014	50%	10,393	6,287	31,325	10,849	16,871	22,560	21,241	15,778	20,508	11,347	8,960	946	109,297	67,767
2015	43%	10,103	5,824	30,667	10,521	15,380	19,939	18,671	15,563	18,695	11,873	7,995	925	101,512	64,645
2016	63%	10,392	6,038	34,844	10,842	19,551	22,797	25,634	20,642	25,354	18,829	10,306	984	126,082	80,132
2017	175%	45,270	2,000	67,171	4,399	56,730	22,106	71,201	12,959	66,222	9,243	24,741	915	331,335	51,622
2018	93%	14,351	8,646	41,346	9,588	25,911	23,163	34,601	18,896	35,628	12,050	13,807	973	165,643	73,316
2019	130%	34,481	7,127	53,925	5,670	40,241	21,374	47,748	17,000	49,029	9,994	18,307	973	243,731	62,138
2020	73%	10,986	11,269	37,201	9,437	22,577	18,449	28,626	21,503	28,748	9,949	11,395	985	139,533	71,592
2021 (a)	72%	10,897	1,164	36,376	1,930	21,032	5,282	26,090	13,282	28,459	3,001	11,412	141	134,266	24,800
(b) TOTAL		317,457	123,576	819,840	185,954	517,909	441,295	655,900	389,262	689,882	246,989	269,994	18,858	3,270,983	1,405,934
Estimated Apr-Sep 2021 Pumping Limit			193,881		633,886		76,614		266,638		442,892		251,136		1,865,049

(a) Estimated Recharge for the 2021 Water Year; Approximate Pumping for First Half of Water year 2021 (Oct-Mar).

(b) Estimated 20 Year Total for Recharge; actual 19.5 Year Total for Pumping.

(c) Mining caluculations are based Water Year (October-September) instead of Rrunoff Year (April-March).

Table 1.5. LADWP Groundwater Pumping Wells Exempt from ON/OFF Provisions of Water Agreement

Revised: May 6, 2016

Well Number	Wellfield	Duration	Reason
354	Laws	Annual	Sole Source-Town Supply
413 (1)	Laws	Annual	Same as above
422(2)	Laws	Annual	Sole Source-Irrigation; no impact on groundwater dependent vegetation
236(2)	Laws	Irrigation Season	Sole Source-Irrigation
413 E/M(1)	Laws	Irrigation Season	Sole Source – Irrigation for Laws Museum irrigation project
415 (3)	Big Pine	Annual	Sole Source-Town Supply
341	Big Pine	Annual	Same as above
352	Big Pine	Annual	Same as above
375 E/M	Big Pine	Annual	Make-up water for Big Pine Regreening Project up to 150 acre-feet per year
330(4)	Big Pine	Annual	Sole Source-Fish Hatchery
332(4)	Big Pine	Annual	Same as above
409(4)	Big Pine	Annual	Same as above
218	Big Pine	Annual	No impact on groundwater dependent vegetation
219	Big Pine	Annual	Same as above
118	Taboose-Aberdeen	Annual	Same as above
355	Taboose-Aberdeen	Annual	Sole Source- supply 1,600 acre project
351	Thibaut-Sawmill	Annual	Sole Source – Fish Hatchery
356	Thibaut-Sawmill	Annual	Same as above
401	Independence-Oak	Annual	No Impact on groundwater dependent vegetation
59	Independence-Oak	Annual	Same as above
60	Independence-Oak	Annual	Same as above
65	Independence-Oak	Annual	Same as above
383 E/M	Independence-Oak	Annual	Same as above
384 E/M(1)	Independence-Oak	Annual	Same as above
61	Independence-Oak	Irrigation season	Sole Source-Irrigation; no impact on groundwater dependent vegetation
423 E/M	Independence-Oak	Irrigation Season	Same as above
357	Independence-Oak	Annual	Sole Source – Town Supply
384 (1)	Independence-Oak	Annual	Same as above
402 E/M	Symmes-Shepherd	Irrigation season	Sole Source-Irrigation; no impact on groundwater dependent vegetation
343(5)	Bairs-Georges	Annual	Sole Source-irrigation and stock water
425 E/M	Lone Pine	Irrigation Season	Sole Source-Irrigation; no impact on groundwater dependent vegetation
344	Lone Pine	Annual	Sole Source – Town Supply
346	Lone Pine	Annual	Same as above

1. Wells 413 in Laws and 384 in Independence are dual purpose wells to supply water for Enhancement/Mitigation (E/M) supply and backup for town domestic supply.
2. Well 422 designated as primary and Well 236 designated as backup irrigation supply.
3. Currently not in operation.
4. Wells 330, 332, and 409 may only be pumped two at a time, unless pumped for testing or emergencies.
5. Well 343 is exempt in below normal runoff years to supplement flow in Georges Creek for irrigation and stock water supply.

Table 1.6. Planned Owens Valley Pumping for the 2021-22 Runoff Year (acre-feet)

Month	Laws	Bishop	Big Pine	Taboose-Aberdeen	Thibaut-Sawmill	Indep.-Oak	Symmes-Shepherd	Bairs-Georges	Lone Pine	TOTAL
April	1,150-1,200	1,620	1,750-1,960	425-450	667-880	980-1,100	200	80-100	120	6,992-7,630
May	1,150-1,200	1,620	1,750-1,960	425-450	667-880	980-1,100	200	80-100	120	6,992-7,630
June	1,200-1,345	1,620	1,750-1,960	425-450	667-880	980-1,100	200	0-150	120	6,962-7,825
July	1,200-1,345	1,620	1,750-1,960	455-450	667-880	980-1,100	200	0-150	120	6,992-7,825
August	1,150-1,200	1,620	1,750-1,960	510-450	667-880	980-1,100	200	80-150	140	7,097-7,700
September	1,150-1,200	1,620	1,750-1,960	510-450	667-880	960-1,100	200	80-230	140	7,077-7,780
October	500	380	1,700-1,960	425-1,100	666-960	190-370	0-285	80-230	30	3,971-5,815
November	490-500	380	1,660-1,960	425-1,100	667-960	190-370	0-285	80-230	30	3,922-5,815
December	430	380	1,660-1,960	425-1,100	666-960	190-370	0-285	80-230	20	3,851-5,735
January	430	380	1,660-1,800	425-1,100	666-960	190-370	0-285	80-230	20	3,851-5,575
February	25	380	1,660-1,800	425-1,100	666-960	190-360	0-280	80-150	20	3,446-5,075
March	25	380	1,660-1,760	425-680	667-920	190-360	0-280	80-150	20	3,447-4,575
TOTAL	8,900-9,400	12,000	20,500-23,000	5,300-8,880	8,000-11,000	7,000-8,800	1,200-2,900	800-2,100	900	64,600-78,980

Groundwater Level Forecasts

LADWP uses statistical models to forecast the approximate changes in groundwater levels in the shallow aquifer. Groundwater pumping for the 2021-22 runoff year will be contingent on environmental conditions, runoff conditions, and water needs assessed during the year. Given the forecasted dry year (55 percent of normal runoff) and corresponding lower recharge to the Owens Valley groundwater aquifers, LADWP forecasts declining groundwater levels during 2021-22 runoff year.

The range of planned LADWP groundwater pumping by wellfield is included in Table 1.3. Based on the planned groundwater pumping in each wellfield during the 2021-22 runoff year, the forecast changes in average groundwater levels between April 1, 2021, and April 1, 2022, in each Owens Valley wellfields and overall in Owens Valley, utilizing selected monitoring wells, are shown in Table 1.7.

Table 1.7. Forecasted Change in Average Wellfield Groundwater Levels Between April 1, 2021 and April 1, 2022

Wellfield	Planned 2021-22 Pumping (af)	Select Monitoring Wells	Forecast Change in Average Groundwater Level from April 1, 2021 to April 1, 2022 (ft)*
Laws	*8,900 TO 9,400*	*T107, T436, T438, T490*	*-3.97 TO -4.13*
Big Pine	*20,500 TO 23,000*	*T425, T426, T469, T470*	*-1.65 TO -2.27*
Taboose-Aberdeen	*5,300 TO 8,880*	*T417, T419, T421, T502*	*-0.15 TO -0.70*
Thibaut-Sawmill	*8,000 TO 11,000*	*T413, T414, T415, T454*	*0.11 TO -1.10*
Independence-Oak	*7,000 TO 8,800*	*T406, T408, T412, T453*	*-0.84 TO -1.79*
Symmes-Shepherd	*1,200 TO 2,900*	*T402, T403, T440, T511*	*-0.10 TO -1.14*
Bairs-George	*800 TO 2,100*	*T398, T400, T444, V087*	*+0.11 TO -0.34*
Owens Valley	*64,600 TO 78,980***	*All Above Monitoring Wells*	*-0.93 TO -1.64*

* Using the forecast Owens Valley runoff and planned pumping

** Including planned pumping in Bishop and Lone Pine

1.2.1. Laws Wellfield (Figure 1.3)

Monitoring sites L1, L2, and L3 are in ON status. Production wells controlled by these monitoring sites have available production capacities of 12,236, 7,240, and 9,195 acre-feet respectively. Wells linked to monitoring site L5 have a capacity of 8,980 acre-feet. Exempt wells within the Laws Wellfield have a capacity of 2,100 acre-feet. The total available pumping capacity in the Laws Wellfield is 39,751 acre-feet. Well 236, associated with monitoring site L2, is used as a backup along with Well 422 as an exempt well irrigation water supply.

LADWP's planned groundwater pumping in the Laws Wellfield for the 2021-22 runoff year ranges between 8,900 acre-feet and 9,400 acre-feet, contingent on runoff and operation conditions, water needs, and environmental conditions. Groundwater pumping is planned to supply water for Owens Valley demands in the wellfield including the town water system, E/M projects, and irrigated land.

LADWP, in cooperation with Inyo County Water Department conducted a two-month operational test of modified well W385 between December of 2019 and February of 2020. Wells W385 and W386 associated with monitoring site L4 were modified in 2014 by sealing the screened zone within the shallow aquifer. The modification resulted in a reduction of pumping capacity in W385 from 10.2 cfs to 2.8 cfs and in W386 from 6.1 cfs to 2.8 cfs based on initial 24-hour pumping test. The goal of the operational test was to document the effect of well modification and to allow comparison with a similar pumping test conducted in 1993-94 based on the effect on nearby shallow groundwater levels both on the north and south of Owens River. Data collected from the pumping test will also be used update and recalibrate the Bishop-Laws Wellfield groundwater flow model. The model can then be used to simulate longer-term operation of W385 and W386 wells.

During the two-month operational test of W385, groundwater levels were monitored at 29 locations. To ensure that nearby groundwater-dependent resources are not affected by the operational test, six wells were designated as trigger wells and trigger levels were assigned to each well by staff from LADWP, ICWD, and CDFW. During the test groundwater levels in none of the trigger wells approached or reached the preset trigger levels. A total 463 acre-feet of water was pumped by W385 during the test. LADWP released the same amount of water to Five Bridges Area during following runoff year from Bishop Creek Canal. Staffs from LADWP and ICWD prepared a joint report that described the operational test and presented the data collected during the test. The ICWD and LADWP prepared separate data analysis reports. The staff from CDFW is also preparing their independent data analysis report.

LADWP in planning to conduct a similar operational test of W386 in the winter of 2021-22 runoff year. LADWP has prepared and submitted a draft testing plan to ICWD and CDFW for review and installed additional monitoring wells to improve hydrologic monitoring during the proposed operational test. The testing plan for W386 includes a similar monitoring plan to that of W385 operational test. The testing plan should be finalized and approved by the Technical Group before the test can be conducted.

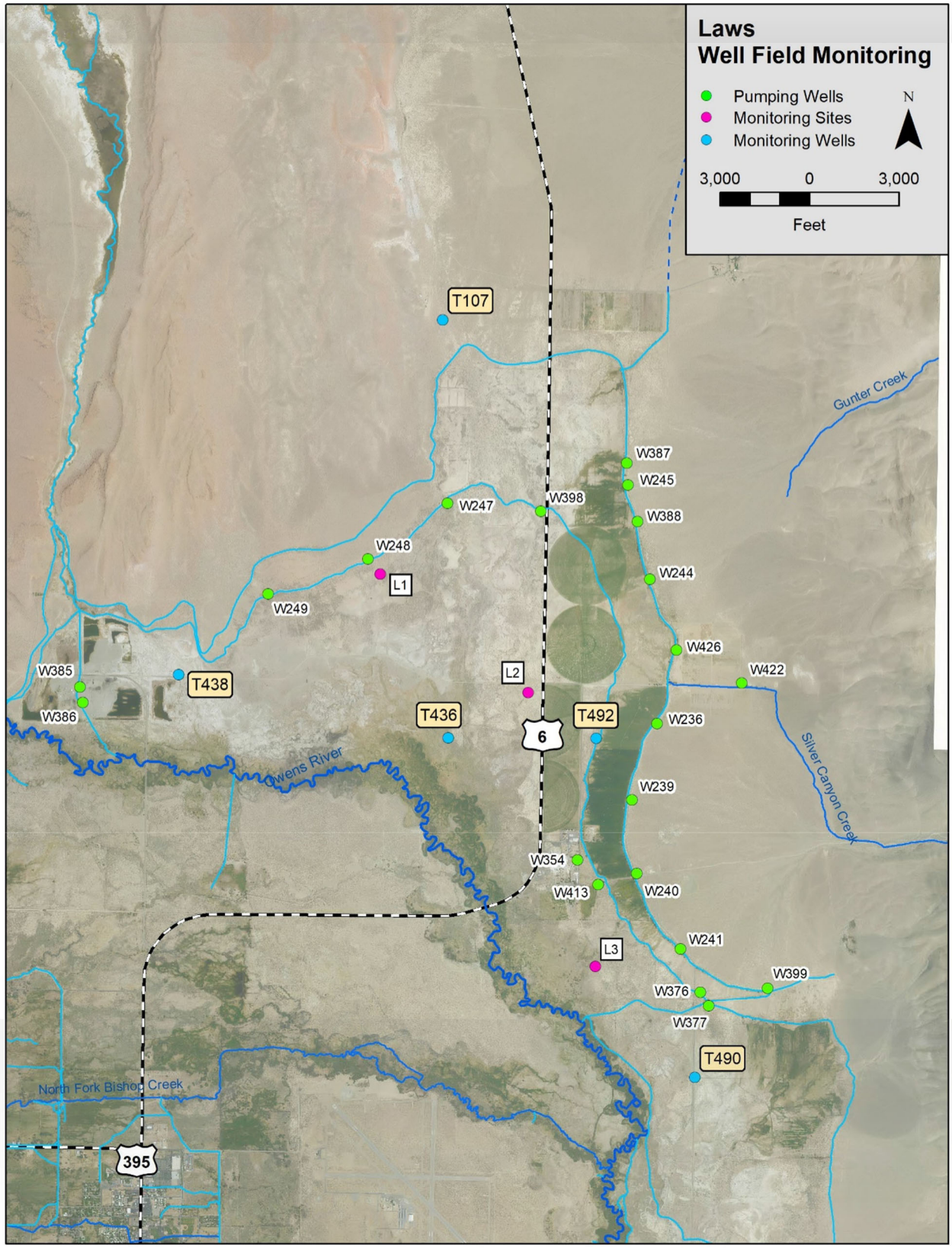
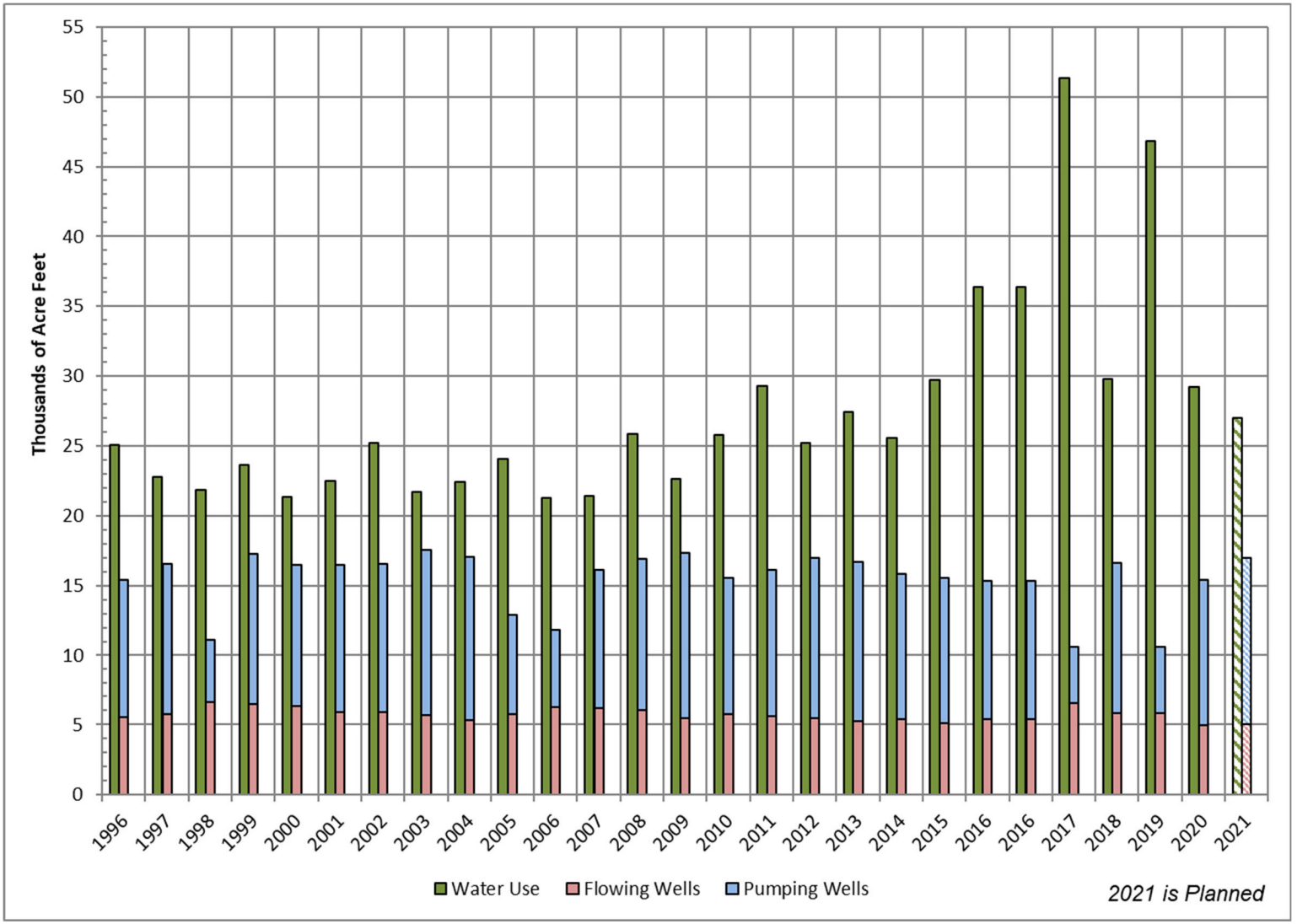


Figure 1.3. Laws Wellfield

1.2.2. Bishop Wellfield (Figure 1.5)

Figure 1.4 illustrates water use on City Lands on Bishop Cone in comparison with groundwater extractions (flowing and pumping wells) for runoff years, 1996 to present.

Pumping in the Bishop Wellfield is governed by the provisions of the Hillside Decree and the Water Agreement, which limit LADWP's annual groundwater extractions (pumping and flowing wells) from the Bishop Cone to an amount commensurate with the total amount of water used on City lands on the Bishop Cone (including conveyance and other losses). Beginning with the 2015-16 Runoff Year the audit water account methods were modified to analyze each areas inflows and outflows to calculate total water use. Under the modified audit protocols, recent total water used on City lands within the Bishop Cone area has been approximately 39,000 acre-feet per year. The total water used during the 2021-22 Runoff Year will be approximately 27,000 acre-feet. The current total available groundwater extraction capacity in the Bishop Wellfield is approximately 19,400 acre-feet. The planned groundwater pumping from the Bishop Wellfield is 12,000 acre-feet for the 2021-22 runoff year, contingent on runoff condition, water needs, and environmental conditions.



**According to the Hillside Decree, total groundwater extraction cannot be more than water use on City-owned land on the Bishop Cone.*

Figure 1.4. Groundwater Extraction (Flowing & Pumping) and Water Use on City of Los Angeles Land in Bishop Cone

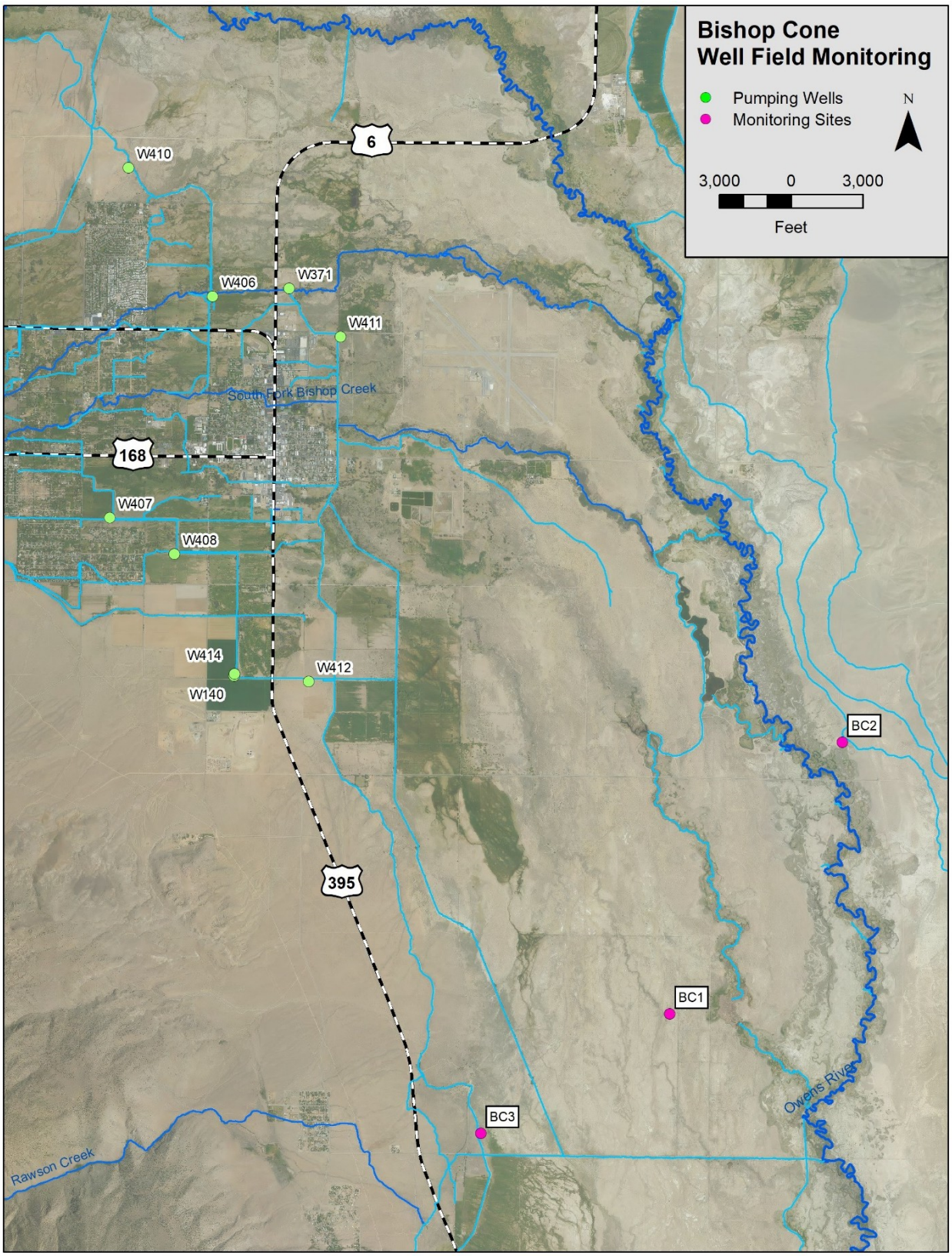


Figure 1.5. Bishop Wellfield

1.2.3. Big Pine Wellfield (Figure 1.6)

Monitoring sites BP1, BP3, and BP4 are in ON status. Production wells controlled by monitoring site BP1 have 10,593 acre-feet pumping capacity, production wells controlled by monitoring site BP3 have 4,851 acre-feet pumping capacity, and production Well 331, controlled by monitoring site BP4, has 7,530 acre-feet pumping capacity. Exempt wells including Well 218, Well 219, town supply wells, and Fish Springs Fish Hatchery wells in the Big Pine Wellfield have a combined 25,750 acre-feet pumping capacity. The total available pumping capacity in the Big Pine Wellfield is 48,724 acre-feet. The total planned pumping in the Big Pine Wellfield for 2021-22 runoff year ranges between 20,500 acre-feet and 23,000 acre-feet, contingent on runoff conditions, water needs, and environmental conditions.

Well W341, located in west Big Pine has been the primary well supplying the town water system. LADWP installed Well W415 in 2002 to replace Well W341 as the primary town water system source and to provide water to the town ditch system. Following the installation of five new monitoring wells in the vicinity of west Big Pine in 2017 and the completion all permitting requirements, LADWP has transferred town water system supply to Well W415 and plans to decommission Well W341 once enough data has been collected to determine Well W415 has sufficient pumping capacity to serve the towns' water supply demand.

A 6-month proposed operational testing W415 has been proposed by ICWD and approved by the Technical Group in order to test the capacity of the well when supplying both the Big Pine water system and the town ditch system. The testing plan includes provision for the protection groundwater-dependent resources, including the Big Pine Paiute Tribe's water supply well.

1.2.4. Taboose-Aberdeen Wellfield (Figure 1.7)

Monitoring sites TA4, TA5, and TA6 in Taboose-Aberdeen Wellfield are in ON status. Production wells controlled by monitoring site TA4 have 19,838 acre-feet pumping capacity, production well W349, controlled by monitoring site TA5 has 12,130 acre-feet pumping capacity, production wells associated with monitoring site TA6 have 5,502 acre-feet pumping capacity, and exempt wells W118 and W355 have an available pumping capacity of 2,620 acre-feet. The total available groundwater pumping capacity in the Taboose-Aberdeen Wellfield is 40,090 acre-feet. The planned groundwater pumping in the Taboose-Aberdeen Wellfield for 2021-22 runoff year ranges between 5,300 acre-feet and 8,880 acre-feet, contingent on runoff conditions, water needs, and environmental conditions.

1.2.5. Thibaut-Sawmill Wellfield (Figure 1.8)

Monitoring sites TS2, TS3, and TS4 in Thibaut-Sawmill Wellfield are in ON status. Production well W155 controlled by vegetation monitoring site TS2 has a pumping capacity of 796 acre-feet. Production wells W103, W104, and W382 controlled by vegetation monitoring site TS3 have 2,968 acre-feet of available pumping capacity, and production wells W380 and W381, controlled by vegetation monitoring site TS4 have 4,561 acre-feet pumping capacity. Exempt Blackrock Fish Hatchery supply wells W351 and W356 are limited to pump 8,000 acre-feet per year combined based on the

resolution of a dispute between Inyo County and LADWP regarding the conditions of the vegetation parcel BLK94. The total available pumping capacity in the Thibaut Sawmill Wellfield for the 2021-22 runoff year is 16,325 acre-feet. Total planned pumping in the Thibaut Sawmill Wellfield for the 2021-22 runoff year ranges between 8,000 acre-feet and 11,000 acre-feet subject to hatchery demands, runoff conditions, water supply needs, and environmental conditions.

1.2.6. Independence-Oak Wellfield (Figure 1.8)

Both monitoring sites in the Independence-Oak Wellfield are in OFF status. Exempt wells in the Independence-Oak Wellfield have a combined capacity of 15,710 acre-feet. The total available pumping capacity from the Independence-Oak Wellfield is 17,710 acre-feet. The planned groundwater pumping in the Independence-Oak Wellfield for the 2021-22 runoff year ranges between 7,000 acre-feet and 8,800 acre-feet, subject to runoff conditions and irrigation, town water system, and E/M projects water demand.

Production wells W061 in Independence Wellfield is associated with the vegetation monitoring site IO3 but is exempt from ON/OFF provisions of the Green Book during the irrigation season as the sole source for an alfalfa field. However, well W061 has been inoperable for the last few years and LADWP is in the process of replacing W061 with a new well. The new well is W427 and LADWP expects to complete equipping the well this summer.

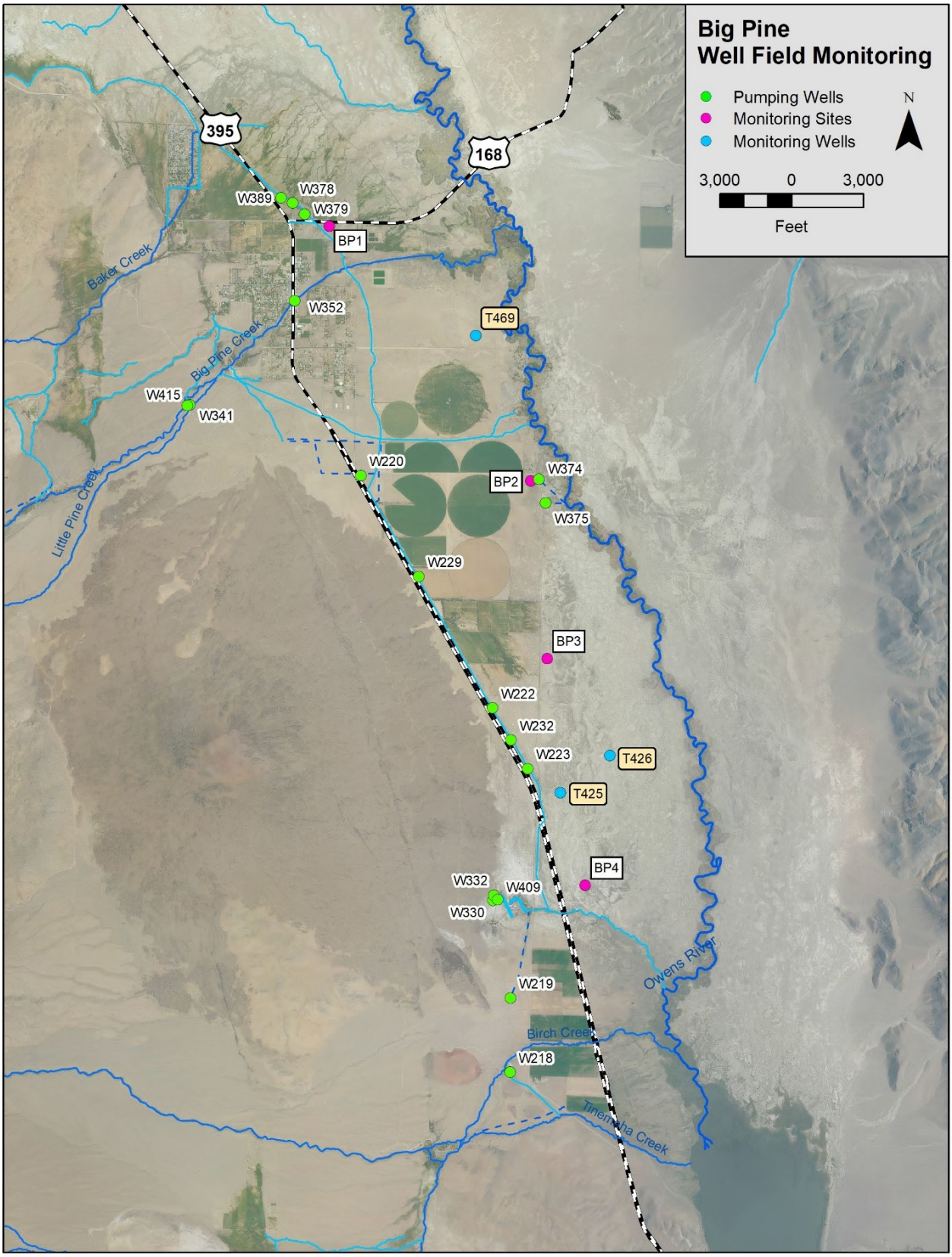


Figure 1.6. Big Pine Wellfield

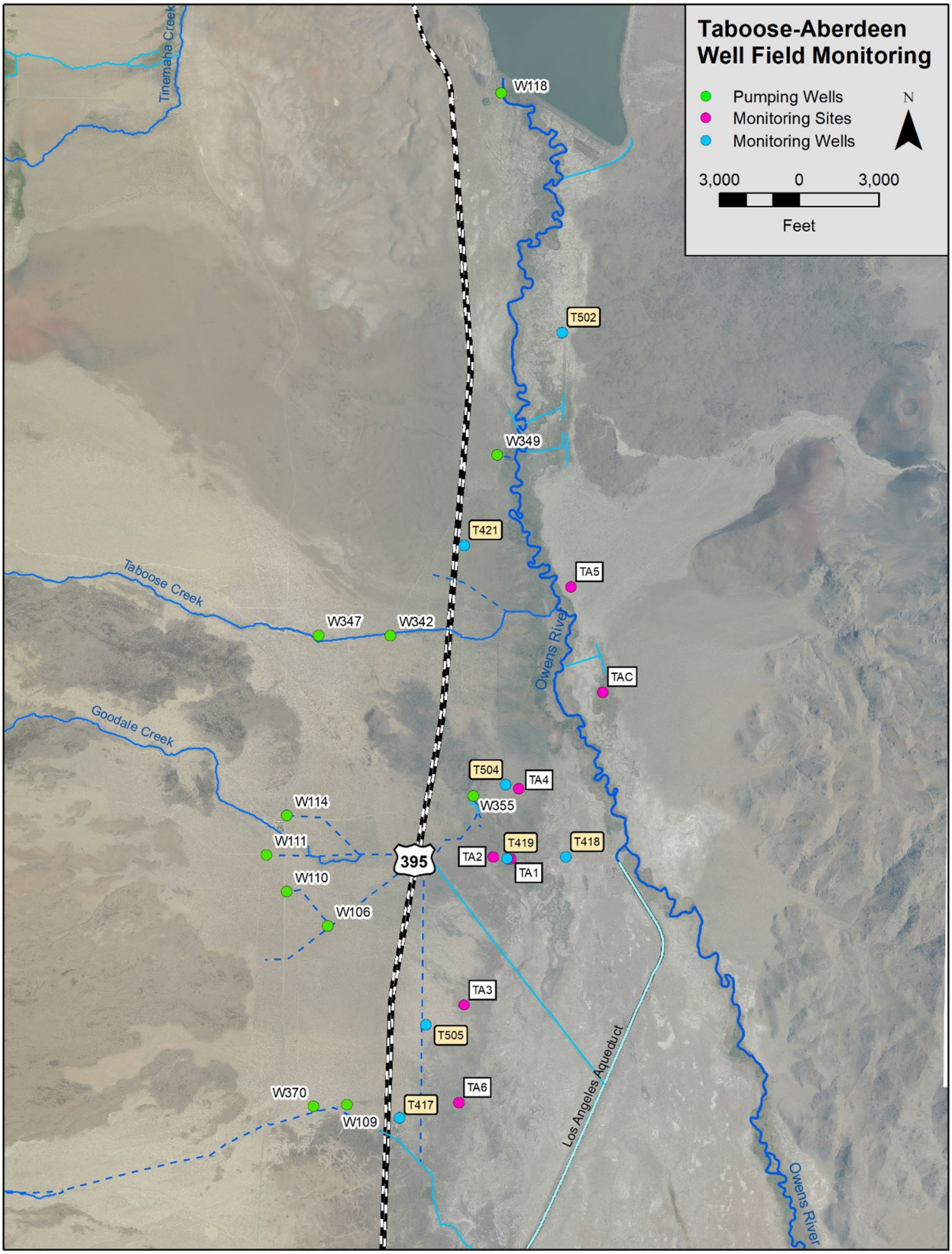


Figure 1.7. Taboose-Aberdeen Wellfield

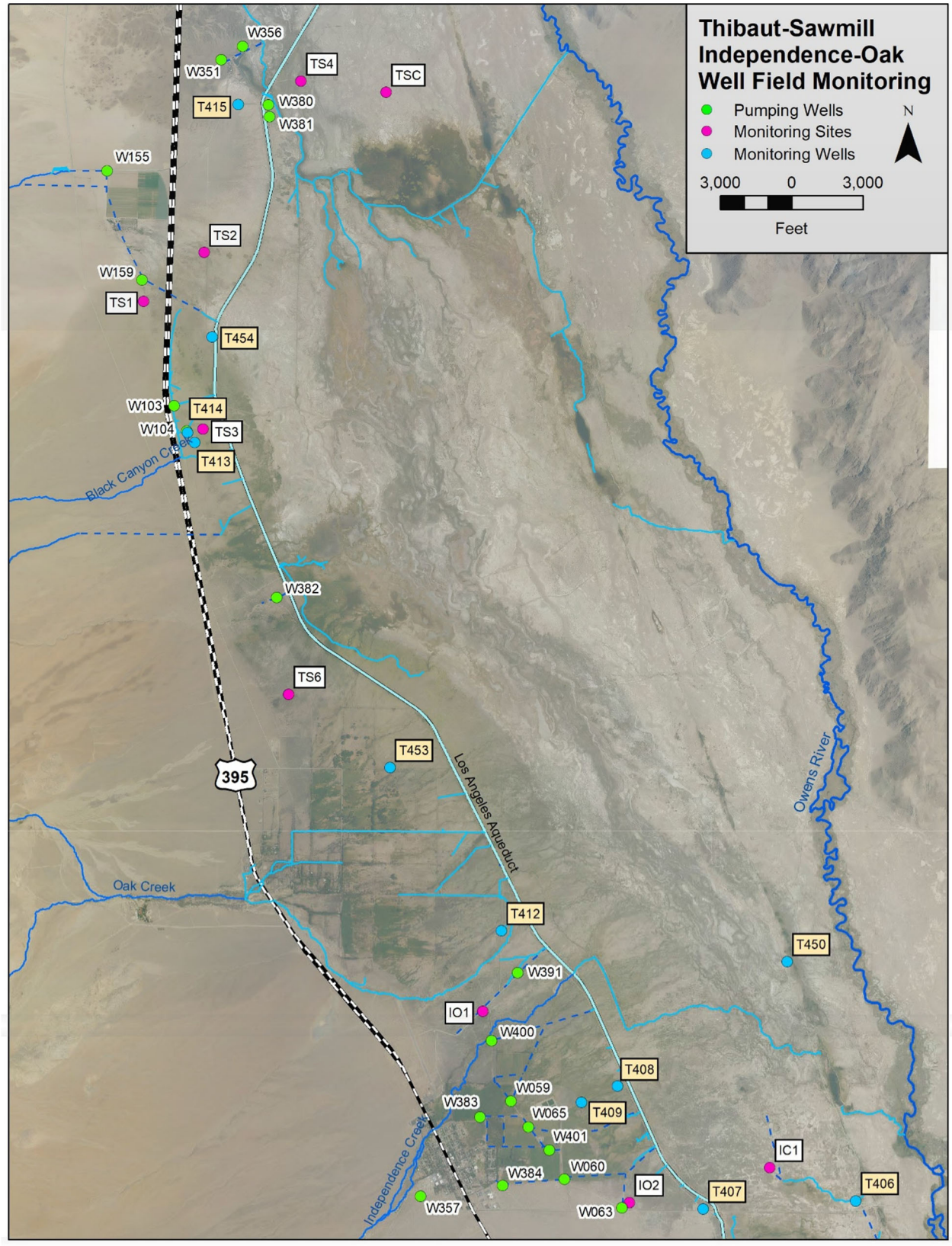


Figure 1.8. Thibaut-Sawmill and Independence-Oak Wellfields

1.2.7. Symmes-Shepherd Wellfield (Figure 1.9)

The vegetation monitoring site SS3 in the Symmes-Shepherd Wellfield has turned to ON status in April 2021. Production wells associated with vegetation monitoring site SS3 have a pumping capacity of 5,647 acre-feet. Exempt Well 402 has a capacity of about 1,200 acre-feet. Total available pumping capacity in the Symmes-Shepherd Wellfield for the 2021-22 runoff year is approximately 6,847 acre-feet. The planned pumping in the Symmes-Shepherd Wellfield for the 2021-22 runoff year range between 1,200 acre-feet and 2,900 acre-feet, contingent on runoff conditions, E/M project water needs, and environmental conditions. LADWP has had difficulty operating well W402 in recent years, specifically during the peak of summer, when water demand for irrigation is the highest. As a result, LADWP installed a new well to replace W402 last summer to meet water demand by the lessee for irrigation. The replacement well is planned to be equipped in the coming runoff year.

1.2.8. Bairs-Georges Wellfield (Figure 1.9)

Vegetation monitoring site BG2 is in ON status. The wells controlled by this monitoring site have a combined 2,880 acre-feet pumping capacity. Well W343 is exempt for pumping approximately 500 acre-feet (based upon a six month exemption period in dry years). The current total available pumping capacity in the Bairs Georges Wellfield for the 2021-22 runoff year is approximately 2,820 acre-feet. Planned groundwater pumping in the Bairs Georges Wellfield for the 2021-22 runoff year ranges between 800 and 2,100 acre-feet, contingent on runoff conditions, water needs, and environmental conditions.

LADWP has submitted a draft pre-construction evaluation report to ICWD for the replacement for well W076, which has been out of operation in past years due to alignment issues. Based on the geology of the area and the lack of productivity of the deeper aquifer, LADWP plans to replace well W076 with a nearly in-kind well. The replacement well will meet California well drilling standards including 50 feet of sanitary seal. The pumping capacity of the replacement well will be determined following construction of the well and conducting a 24-hour pumping test. Operation of the replacement well will be subject to the ON/OFF procedure of the Green Book.

1.2.9. Lone Pine Wellfield (Figure 1.10)

Lone Pine exempt wells are town supply wells W344 and W346, and E/M project supply Well W425. These three wells have an annual available pumping capacity of approximately 900 acre-feet.

The planned groundwater pumping from the Lone Pine Wellfield during the 2021-22 runoff year is approximately 900 acre-feet, contingent on runoff conditions, water supply needs, and environmental conditions.

Well W416 is a production well in the Lone Pine Wellfield, drilled in 2002. An operational pumping test was conducted on Well W416 during the 2009 runoff year. This well was

modified in 2014 to seal the screen portion of the well within the shallow aquifer. LADWP is planning to equip and conduct the initial operation of this well. If initial operation is performed during 2021-22 runoff year, it will be in addition to the currently planned pumping from Lone Pine Wellfield. LADWP has requested the Technical Group to designate a vegetation monitoring site for this well.

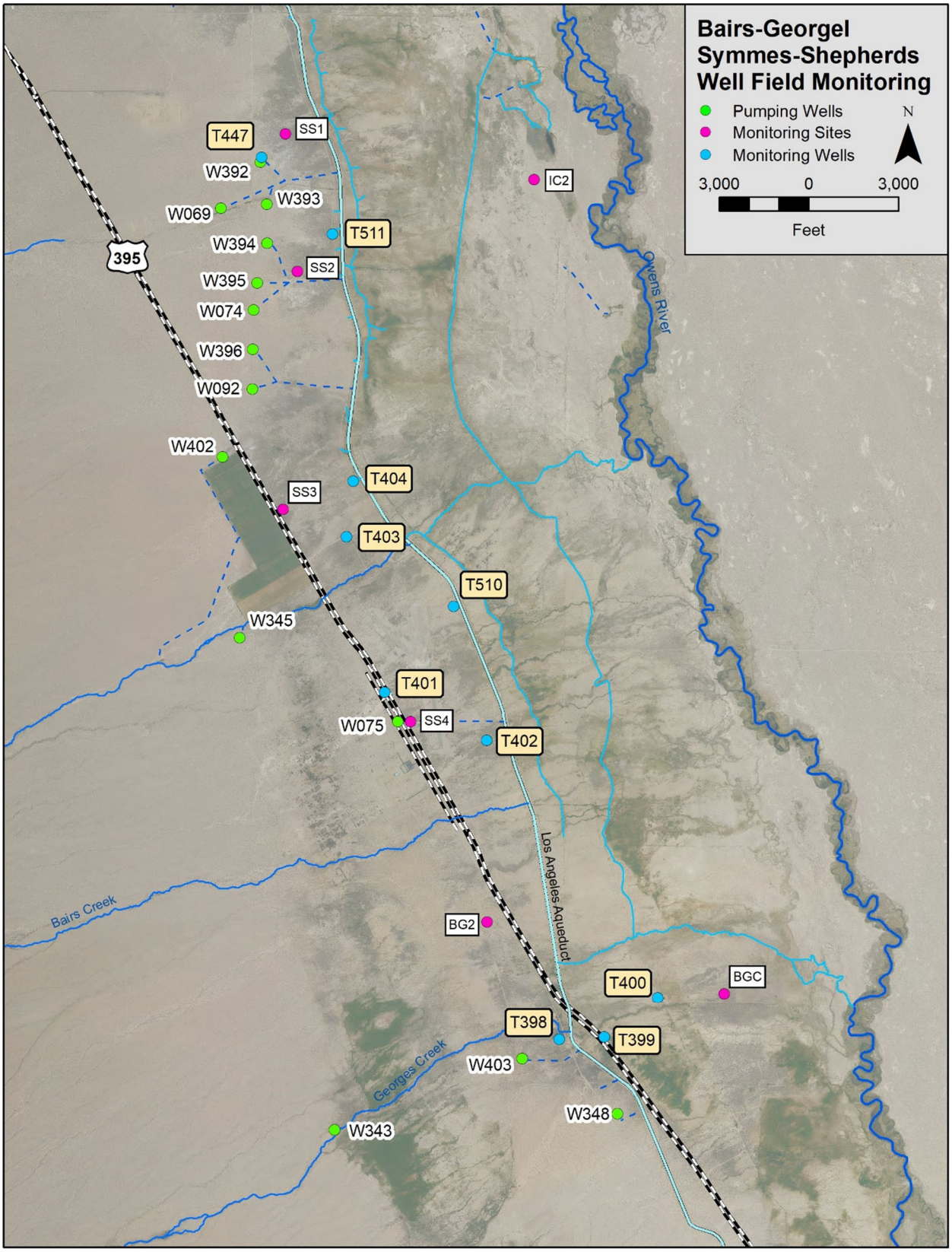


Figure 1.9. Symmes-Sheperds and Bairs-Georges Wellfields

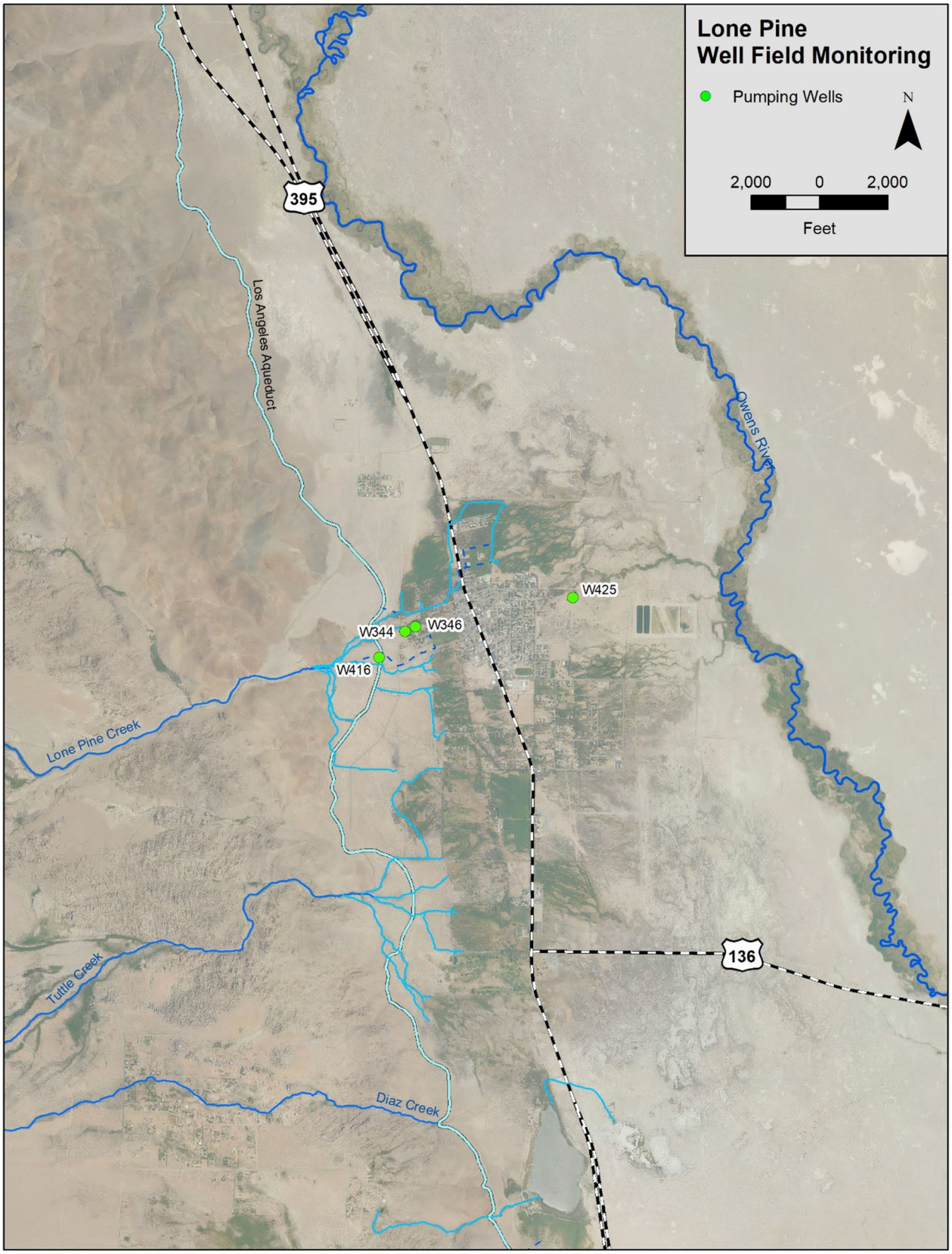


Figure 1.10. Lone Pine Wellfield

1.3. Owens Valley Uses (Including Enhancement/Mitigation Projects)

Table 1.7 shows the historic (1981-82) uses and the planned monthly uses on Los Angeles City owned lands within the Owens Valley for 2021-22. The in valley uses shown on Table 1.7 consist of irrigation, stockwater, recreation and wildlife projects, E/M projects supply, Lower Owens River Project (LORP) usage, and 1600 Acre-feet Projects. As shown in Table 1.7 and Figure 1.11, LADWP plans to provide approximately 85,380 acre-feet for in valley uses on City-owned lands this runoff year.

Releases to the LORP from the LAA Intake facility began on December 6, 2006. An average flow of over 40 cubic feet per second (cfs) is now maintained throughout the entire 62 mile stretch of the Lower Owens River, south of the Intake structure. When needed, the releases at the Intake are augmented through additional releases at the Independence, Blackrock, Georges, Locust, and Alabama Spill Gates to maintain required flows in the river channel. Table 1.7 shows projected 2021-22 water use by the LORP on a monthly basis, totaling 17,500 acre-feet. Total LORP uses include the Lower Owens River, Owens Lake Delta, Blackrock Waterfowl Management Area, and project associated losses.

The Water Agreement provides that "... enhancement/mitigation projects shall continue to be supplied by enhancement/mitigation wells as necessary." Due to the monitoring sites controlling some of the production wells supplying E/M projects being in OFF status, the amount of water supplied to E/M projects has often exceeded the amount of water provided by E/M project supply wells. In the past, LADWP chose to supply certain E/M projects from surface water sources. Future E/M allotments may be influenced by the availability of E/M wells and operational demands. Table 1.8 shows the planned water supply to E/M projects and the forecast imbalance between the E/M project water use and the E/M project groundwater supply through the end of the 2021-22 runoff year. E/M project water demands during the 2021-22 runoff year are expected to be approximately 1,400 acre-feet greater than E/M groundwater pumping. The cumulative E/M water supply shortfall at the end of the 2021-22 runoff year will be approximately 204,000 acre-feet.

The Technical Group is currently evaluating the water supply issues associated with the E/M projects and will provide its findings to the Inyo/Los Angeles Standing Committee. It is expected that the Standing Committee will be requested to take appropriate action necessary to ensure water supplied to E/M projects is in conformance with the provisions of the Water Agreement.

Table 1.8. Water Uses on City of Los Angeles Owned Lands in Owens Valley – Actual Use in 1981-82 and Planned Use in 2021-22 Runoff Year (acre-feet)

Use	April		May		June		July		August		September		TOTAL Apr-Sep	
	1981	2021	1981	2021	1981	2021	1981	2021	1981	2021	1981	2021	1981	2021
Irrigation	3,980	5,100	7,958	7,060	10,373	8,670	9,476	8,330	8,295	7,350	6,321	3,910	**46,403**	40,420
Stockwater	1,141	880	1,319	960	1,244	940	1,245	1,010	1,219	860	1,319	780	**7,487**	5,430
E / M	0	1,090	0	1,210	0	1,290	0	1,260	0	1,100	0	990	**0**	6,940
LORP	0	830	0	1,300	0	2,520	0	3,240	0	3,440	0	2,650	**0**	13,980
Rec. & Wildlife	379	490	804	680	1,160	820	1,455	890	1,381	630	1,406	680	**6,585**	4,190
1600 ACFT Proj.	0	80	0	90	0	80	0	120	0	70	0	70	**0**	510
Total	***5,500***	***8,470***	***10,081***	***11,300***	***12,777***	***14,320***	***12,176***	***14,850***	***10,895***	***13,450***	***9,046***	***9,080***	***60,475***	***71,470***

Use	October		November		December		January		February		March		TOTAL Oct-Mar		TOTAL Apr-Mar	
	1981	2021	1981	2021	1981	2021	1982	2022	1982	2022	1982	2022	81-82	21-22	81-82	21-22
Irrigation	263	160	0	30	0	50	0	0	0	0	14	100	**277**	340	**46,680**	40,760
Stockwater	1,065	940	1,045	960	1,050	880	1,007	770	1,010	670	1,098	840	**6,275**	5,060	**13,762**	10,490
E / M	0	370	0	210	0	160	0	170	0	40	0	30	**0**	980	**0**	7,920
LORP	0	1,250	0	1,020	0	460	0	380	0	310	0	100	**0**	3,520	**0**	17,500
Rec. & Wildlife	781	970	713	570	565	550	478	290	342	270	447	270	**3,326**	2,920	**9,911**	7,110
1600 ACFT Proj.	0	70	0	140	0	220	0	230	0	230	0	200	**0**	1,090	**0**	1,600
Total	***2,109***	***3,760***	***1,758***	***2,930***	***1,615***	***2,320***	***1,485***	***1,840***	***1,352***	***1,520***	***1,559***	***1,540***	***9,878***	***13,910***	***70,353***	***85,380***

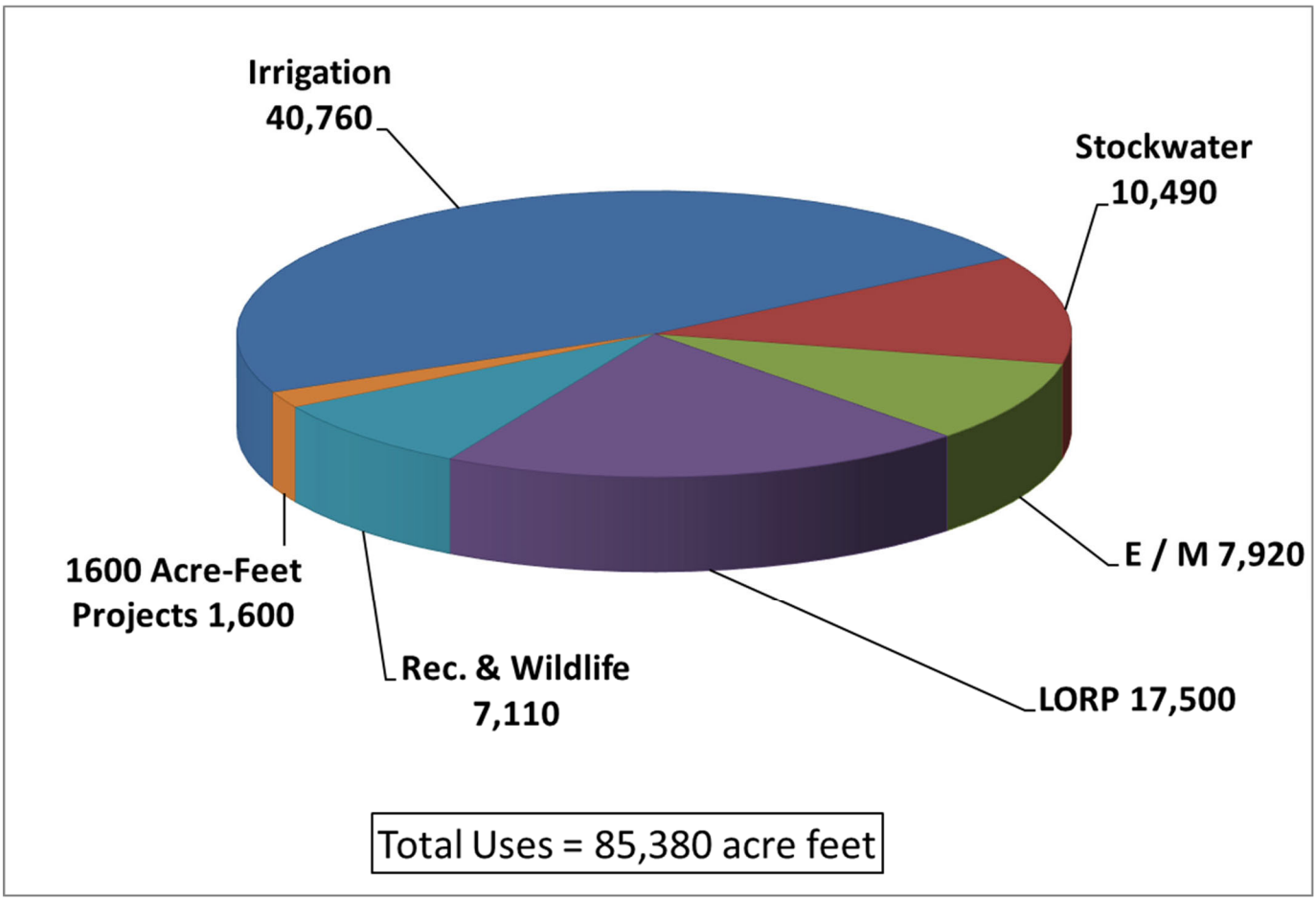


Figure 1.11. Distribution of Planned Owens Valley Water Use on City Owned Lands for 2021-22 Runoff Year

Table 1.9. Owens Valley Groundwater Pumping and E/M Water Use (1992-93 through 2021-22 Runoff Year (acre-feet))

Runoff Year	Owens Valley Runoff (1)	Total Pumping	Non-E/M Pumping	E/M Pumping	E/M Water Uses	E/M Pumping & Use Imbalance	Cumulative E/M Pumping & Use Imbalance
1992-93	62%	84,453	70,688	13,765	18,357	-4,592	-9,319
1993-94	107%	76,329	67,338	8,991	19,310	-10,319	-19,638
1994-95	67%	89,219	78,209	11,010	20,812	-9,802	-29,440
1995-96	155%	69,752	57,180	12,572	22,943	-10,342	-39,782
1996-97	136%	74,904	57,981	16,923	23,949	-7,026	-46,808
1997-98	126%	66,914	52,760	14,154	21,608	-7,346	-54,154
1998-99	151%	51,574	47,353	4,221	19,672	(3)	-54,154
1999-00	90%	63,675	59,342	4,333	24,452	-20,117	-74,271
2000-01	85%	67,795	61,456	6,339	20,782	-14,272	-88,543
2001-02	84%	73,349	70,055	3,294	21,815	-18,521	-107,064
2002-03	68%	81,979	76,059	5,920	21,394	-15,474	-122,538
2003-04	82%	87,732	80,734	6,998	21,116	-14,118	-136,656
2004-05	78%	85,820	78,110	7,710	18,918	-10,617	-147,273
2005-06	138%	56,766	51,695	5,071	20,032	-14,285	-161,558
2006-07	148%	58,621	53,925	4,696	17,357	(3)	-161,558
2007-08	61%	60,338	53,413	6,925	11,565	-4,640	-166,198
2008-09	75%	68,971	61,053	7,918	10,646	-2,728	-168,926
2009-10	78%	64,138	57,946	6,192	10,697	-4,505	-173,431
2010-11	104%	78,248	71,233	7,015	10,407	-3,392	-176,823
2011-12	142%	91,699	84,365	7,334	11,462	-4,128	-180,951
2012-13	58%	*88,689*	*83,034*	*5,655*	*9,257*	*-3,602*	*-184,553*
2013-14	55%	78,809	73,678	5,131	8,222	-3,091	-187,644
2014-15	53%	66,625	60,735	5,890	9,510	-3,620	-191,264
2015-16	48%	70,344	65,220	5,124	8,413	-3,289	*-194,553*
2016-17	82%	76,000	70,730	5,270	11,500	-6,230	-197,494
2017-18	201%	47,511	44,571	2,940	11,525	(3)	-197,494
2018-19	97%	84,774	77,824	6,950	11,545	-4,595	-202,089
2019-20	154%	53,453	49,832	3,621	9,238	(3)	-202,089
2020-21	75%	72,874	64,094	8,780	9,236	-456	-202,545
2021-22	*55%*	*(2)*		*6,500*	*7,920*	*-1,420*	*-203,965*

(1) Based on 1966-2015 average. Includes some runoff contribution to the Laws Wellfield from the White Mountains.

(2) Planned pumping range is 64,600 -78,980 acre-feet

(3) surface water was available

1.4. Aqueduct Operations

Table 1.10 shows planned LAA reservoir storage levels and monthly deliveries to Los Angeles. Based on this plan, approximately 106,800 acre-feet will be exported from Eastern Sierra during the 2021-22 runoff year. None of this export will be from the Owens Valley water supply, as projected water demands and water losses in the Owens Valley are greater than the amount of available water supply coming from the Owens Valley. Figure 1.12 shows historical Owens Valley water supply (made up of flowing groundwater, runoff, and pumping) alongside the amount of this water exported to Los Angeles.

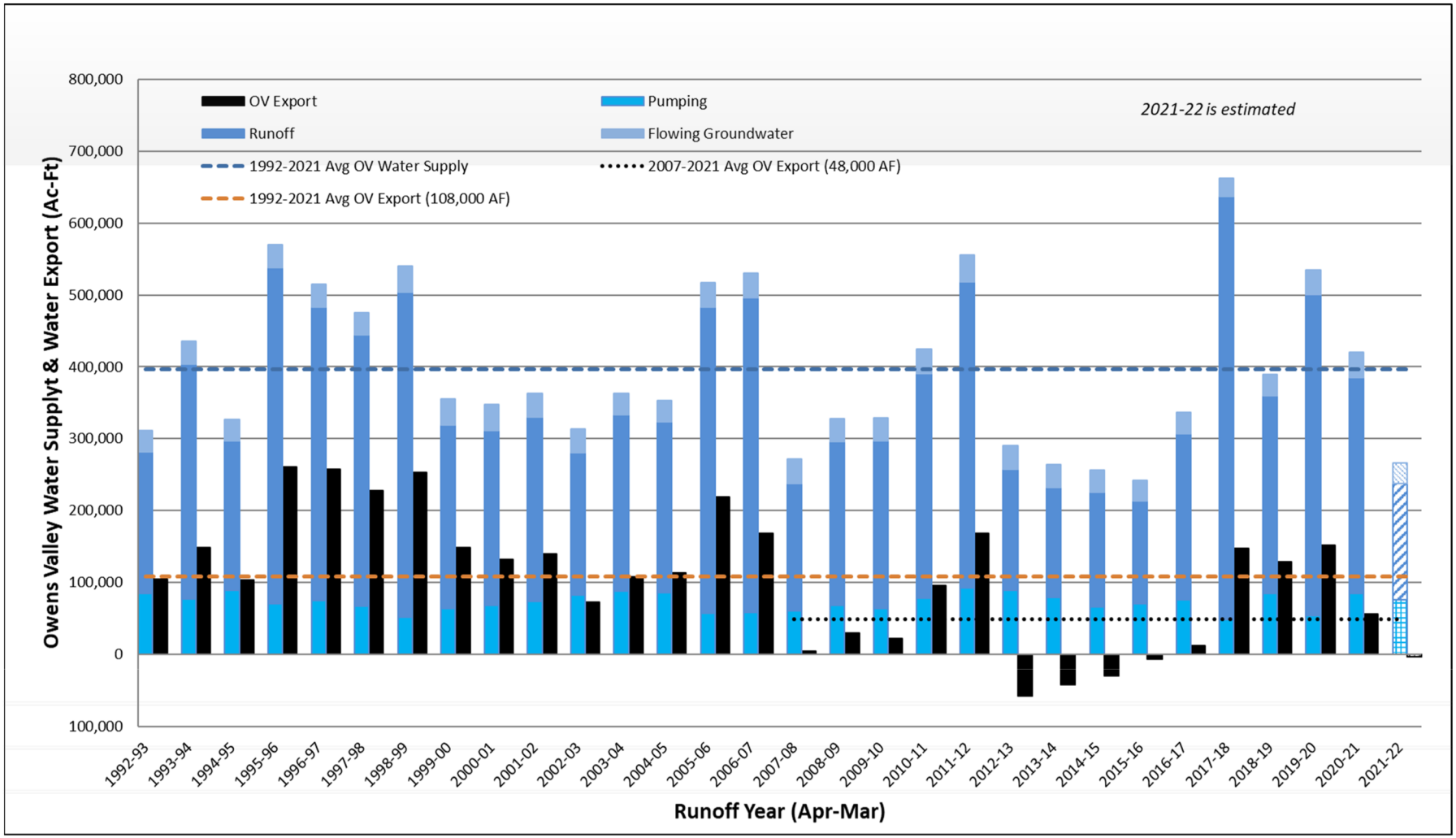
Prior to the building of the second Los Angeles Aqueduct in 1971, 38% of Owens Valley Water Supply was exported to Los Angeles on an annual basis. The Inyo/LA Water Agreement EIR projected 44% of Owens Valley Water Supply being exported to Los Angeles annually. However, since implementation of the Inyo/LA Water Agreement 25% of the Owens Valley water supply has been exported to Los Angeles.

In the 2020-21 runoff year, 56,000 acre-feet was exported from the Owens Valley water supply to Los Angeles, which amounted to 17% of the overall Owens Valley water supply, with the remaining 83% of the supply being used locally in the Owens Valley.

For runoff year 2021-22, all of the Owens Valley water supply will be used locally and, in addition, it will be required to import 4,000 acre-feet of water into Owens Valley from the Mono Basin and Long Valley to supplement the projected Owens Valley water supply in order to meet water demands within the Owens Valley.

Table 1.10. Planned Los Angeles Aqueduct Operations for 2021-22 Runoff Year

Month	Owens Valley-Bouquet Reservoir Storage 1st of month Storage (acre-feet)	Exports from Eastern Sierra (acre-feet)
April, 2021	*199,000*	*5,500*
May	*203,000*	*6,600*
June	*191,000*	*8,300*
July	*179,000*	*10,100*
August	*167,000*	*11,700*
September	*152,000*	*7,100*
October	*133,000*	*3,700*
November	*139,000*	*7,700*
December	*151,000*	*12,000*
January, 2022	*160,000*	*11,400*
February	*169,000*	*11,800*
March	*180,000*	*10,900*
TOTAL	***-19,000***	***106,800***



Note: The blue bar made up of Runoff, Flowing Groundwater, and Pumping is the Owens Valley water supply.
The black bar is the amount of the Owens Valley water supply exported to Los Angeles.
The black bar is below 0 during certain runoff years because the Owens Valley uses exceeded the supply and imported water was used to meet the water demands.

Figure 1.12 Owens Valley Supply and Export

1.5. Water Exports to Los Angeles

Figure 1.13 provides a record of water exports from the Eastern Sierra to Los Angeles since 1970. Figure 1.14 shows the LAA contribution to the City water supply relative to other sources and the total annual water supplied to Los Angeles since 1970. LADWP estimates that Los Angeles will require about 495,000 feet of water during the 2021-22 runoff year. It is anticipated that water from the Owens Valley will contribute nothing to the 2021-22 supply for Los Angeles, while the rest of the Eastern Sierra (Mono Basin and Long Valley) will make up about 19% of the 2021-22 supply. Water purchases from the Metropolitan Water District of Southern California will provide about 62% of the City's supply, groundwater from Los Angeles area aquifers will provide about 17%, and recycled water will supply about 2% of the City's water needs.

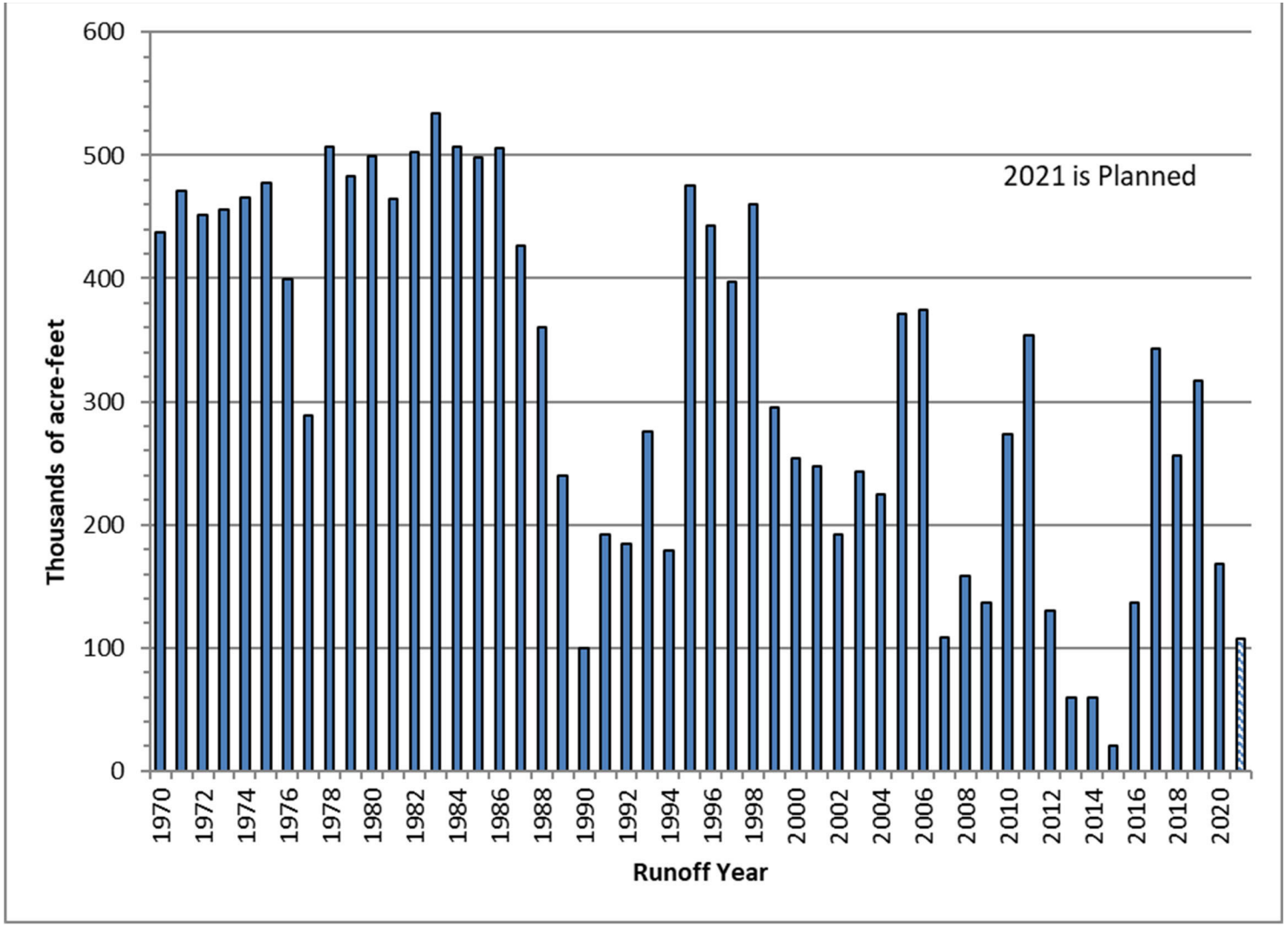


Figure 1.13. Water Export from Eastern Sierra to Los Angeles

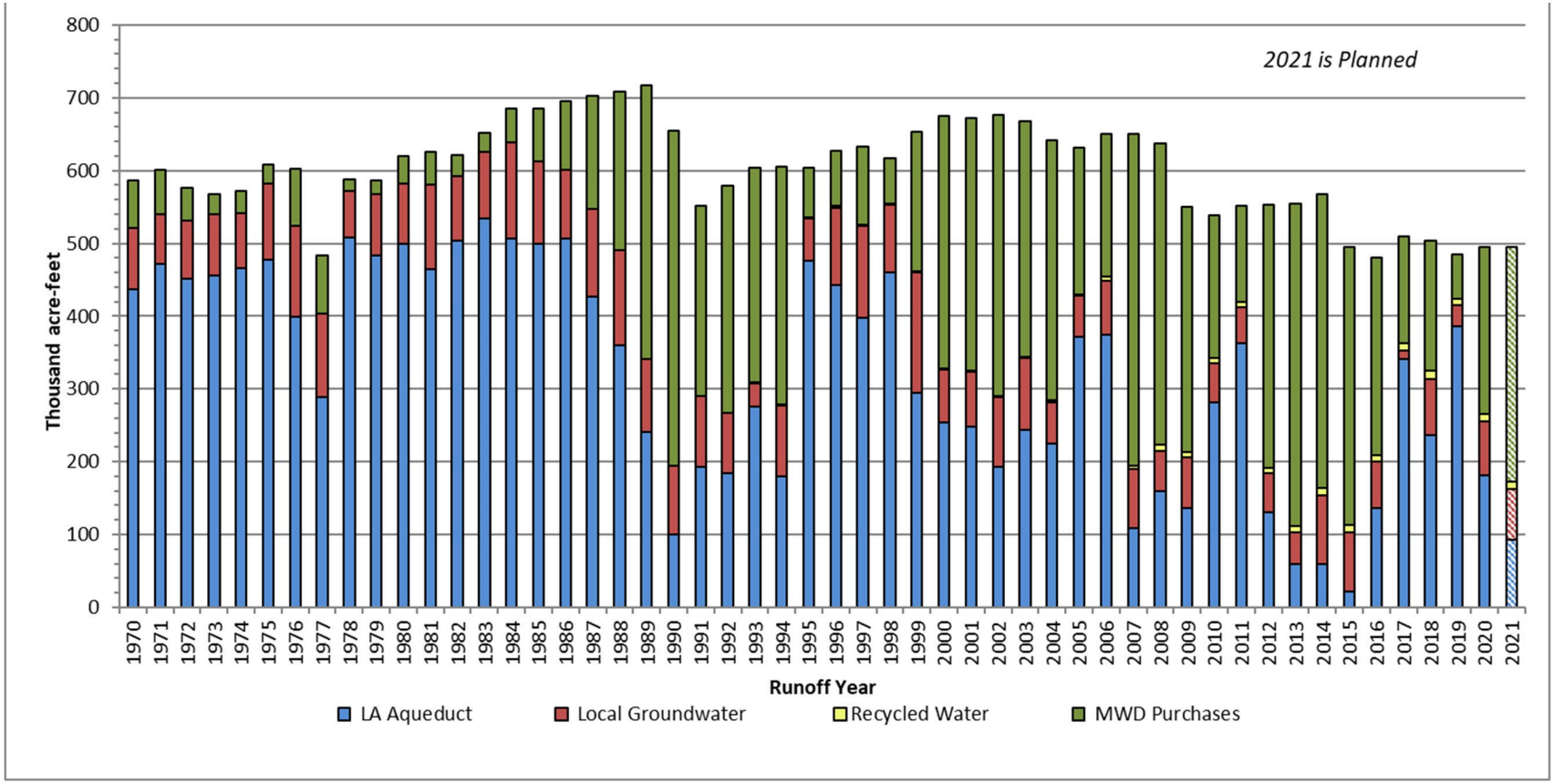


Figure 1.14. Sources of Water for the City of Los Angeles

CONDITIONS IN THE OWENS VALLEY

2.0 CONDITIONS IN THE OWENS VALLEY

As of April 1, 2021, the Eastern Sierra overall snowpack was measured at 46% of normal (Table 2.5). Owens River Basin runoff during the 2021-22 runoff year is forecast to be 226,800 acre-feet or approximately 55% of normal (Section 1, Table 1.1). Owens Valley floor precipitation during the 2020-21 runoff year was about 42% of average (Table 2.6). Overall, vegetation cover in the Owens Valley is comparable to mid-1980s baseline conditions. A graphical summary of Owens Valley conditions is provided in Figure 2.1. The average wellfield and overall Owens Valley groundwater levels are generally stable in most areas of the valley, based on depth to water in selected monitoring wells in each of LADWP's nine wellfields, as shown in figures and tables presented in section 2.2 through 2.11 of this report.

2.1. Well ON/OFF Status

The Water Agreement includes the vegetation protection provisions of linking pumping wells to specific monitoring sites. If the available soil moisture measured at a vegetation monitoring site is not sufficient to meet the estimated demands of the vegetation associated with that monitoring site, the wells linked to that site are designated as being in the OFF status and may not be operated. The wells linked to a monitoring site may be operated if the available soil water is determined to be sufficient to have met the estimated water requirements of the vegetation at the time that the associated wells were designated as being in the OFF status. The Green Book includes the complete well ON/OFF procedures. Table 2.1 provides a listing of Owens Valley monitoring site ON/OFF status as of April 2021, the monitoring wells associated with each monitoring site, and the linked pumping wells.

Some pumping wells in Owens Valley are designated as being exempt from linkage to vegetation monitoring sites and the ON/OFF provisions of the Water Agreement because these wells are in areas that cannot cause significant adverse impacts to the vegetation or because these wells have been determined by Inyo County and the Los Angeles Department of Water and Power (LADWP) to be a necessary source of water. A list of exempt wells and the reasons for exemption are included in Section 1, Table 1.5.

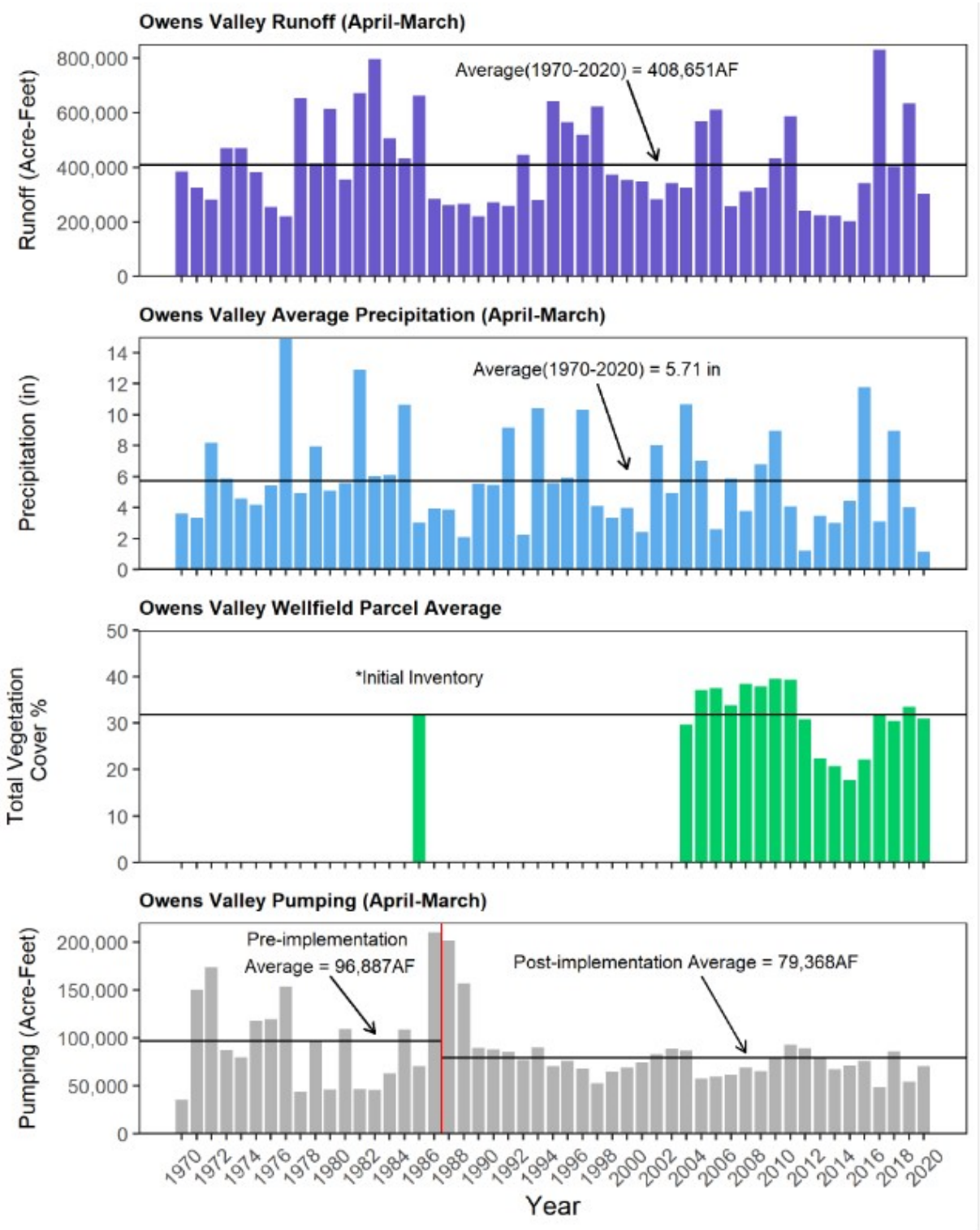


Figure 2.1. Summary of Owens Valley Conditions

Table 2.1. Owens Valley Monitoring Site Status (ON/OFF) as of April 2021

Wellfield	Monitoring Site	Monitoring Well	Pumping Wells	E/M Wells	ON/OFF Status
Laws	L1	795T	247, 248, 249, 398		ON
	L2	USGS 1	236*, 239, 243, 244		ON
	L3		240, 241, 242	376, 377	ON
	L4a, L4b			385, 386	na
	L5**		245	387, 388	na
	Exempt		236*, 354, 422, 413		Exempt
Bishop	All wells		140, 411, 410, 371		na
			406, 407, 408, 412		na
Big Pine	BP1	798T	210, 352	378, 379, 389	ON
	BP2	799T	220, 229, 374		OFF
	BP3	567T	222, 223, 231, 232		ON
	BP4	800T	331		ON
	Exempt		218, 219, 330, 332, 341, 352, 375, 415		Exempt
Taboose-Aberdeen	TA3	505T	106, 110, 111, 114		OFF
	TA4	586T	342, 347		ON
	TA5	801T	349		ON
	TA6	803T	109, 370		ON
	Exempt		118		Exempt
Thibaut-Sawmill	TS1	807T	159		OFF
	TS2	T806	155		ON
	TS3	454T	103, 104	382	ON
	TS4	804T		380, 381	ON
	Exempt		351, 356		Exempt
Independence-Oak	IO1	809T	391, 400		OFF
	IO2	548T	63		OFF
	Exempt		59, 60, 61, 65, 401, 357, 384*	383, 384	Exempt
Symmes-Shepherd	SS1	USGS 9G	69, 392, 393		OFF
	SS2	646T	74, 394, 395		OFF
	SS3	561T	92, 396		ON
	SS4	811T	75, 345		OFF
	Exempt			402	Exempt
Bairs-Georges	BG2	812T	76, 343*, 348, 403		ON
	Exempt		343*		na
Lone Pine	Exempt		344, 346	425	Exempt
	Other		416		na

*dual use

** Monitoring site has not yet been located.

2.2. Groundwater Level Fluctuations

One of the main indicators of the sustainability of a groundwater basin is the changes in groundwater levels.

LADWP hydrographers monitor groundwater levels in over 800 monitoring wells throughout the Owens Valley on a regular basis, which allows evaluation of groundwater levels since early 1970s when LADWP began to utilize groundwater resources on a more consistent basis. This section presents hydrographs of the average groundwater levels in each wellfield and overall in the Owens Valley. Groundwater levels in select monitoring wells were used to calculate the average groundwater level for the wellfield. Four monitoring wells were selected per wellfield, listed in Table 2.2 using the following criteria: 1) be representative of the shallow aquifer that support vegetation, 2) be located in a spatial distribution throughout the wellfield, and 3) have groundwater level measurements back to early 1970s.

Table 2.2. Selected Monitoring Wells in Each Wellfield Used for Hydrographs

Wellfield	Monitoring Wells
Laws	*T107, T436, T438, T490*
Bishop	*T389, T390, T485, T501*
Big Pine	*T425, T426, T469, T470*
Taboose-Aberdeen	*T417, T419, T421, T502*
Thibaut-Sawmill	*T413, T414, T415, T454*
Independence-Oak	*T406, T408, T412, T453*
Symmes-Shepherd	*T402, T403, T440, T511*
Bairs-George	*T398, T400, T444, V087*
Lone-Pine	*T446, V015N, V172, V256*

A summary of the data analyzed is presented in Table 2.3 showing average wellfield pumping, Owens River Basin runoff, and DTW, for the 1991 through 2020 runoff years. The table also shows the correlation coefficient of the average wellfield DTW with both runoff and pumping. The correlation coefficient (r value) represents the statistical relationship between two variables and can vary between 0.0 and 1.0 for positively related variables and between -1.0 and 0.0 for negatively related variables. The closer the correlation coefficient is to 1.0 or -1.0, the stronger relationship between the two variables. The last row of the table shows the same information for the entire Owens Valley based the data from all of the monitoring wells in Table 2.2.

Table 2.3. Average Pumping and Runoff and Correlation Coefficients of Average Groundwater Level with Runoff and Pumping

Wellfield	Average (1991-2020 ROYs)			Correlation Coefficient, r	
	Pumping (AF)	Runoff* (AF)	DTW§ (FT)	Runoff	Pumping
Laws	*6,810*	-	*-16.0*	*0.73*	*-0.53*
Bishop	*9,499*	-	*-12.3*	*0.37*	*-0.27*
Big Pine	*23,001*	-	*-17.2*	*0.63*	*-0.31*
Taboose-Aberdeen	*7,641*	-	*-20.7*	*0.50*	*-0.55*
Thibaut-Sawmill	*11,743*	-	*-12.5*	*0.54*	*-0.46*
Independence-Oak	*8,370*	-	*-5.6*	*0.73*	*-0.55*
Symmes-Shepherd	*3,034*	-	*-6.6*	*0.40*	*-0.46*
Bairs-George	*690*	-	*-6.9*	*0.43*	*-0.64*
Lone Pine	*1,051*	-	*-17.6*	*0.75*	*-0.10*
Owens Valley	***71,840***	***400,186***	***-12.9***	***0.69***	***-0.58***

* Owens Valley Runoff is used for correlation calculations.

§ Average distance to groundwater is calculated using 1992-2021 April 1 values.

The following figures show graphically the change in average groundwater level with Owens River Basin runoff and wellfield pumping for each of the wellfields and for the overall Owens Valley from the early 1970s to the 2020 runoff year. A review of Table 2.3 and the hydrographs shows that since the implementation of Inyo/Los Angeles Water Agreement in 1991:

- Owens River Basin runoff was highly variable with a range of 198,000 af in 2015 to 826,000 af in 2017 and an average of 400,000 af/yr,
- Owens Valley pumping was relatively stable with a range of 47,000 af in 2017 to 91,000 af in 2011 and an average of 72,000 af/yr,
- Average Owens Valley DTW was generally stable with a range of 7 to 17 feet below ground surface with an average of 12.9 ft below ground surface and without any long-term rising or declining trends,
- Average DTW in Owens Valley was positively correlated with runoff with a correlation coefficient of 0.69,
- Average DTW in Owens Valley was negatively correlated with pumping with a correlation coefficient of -0.58.

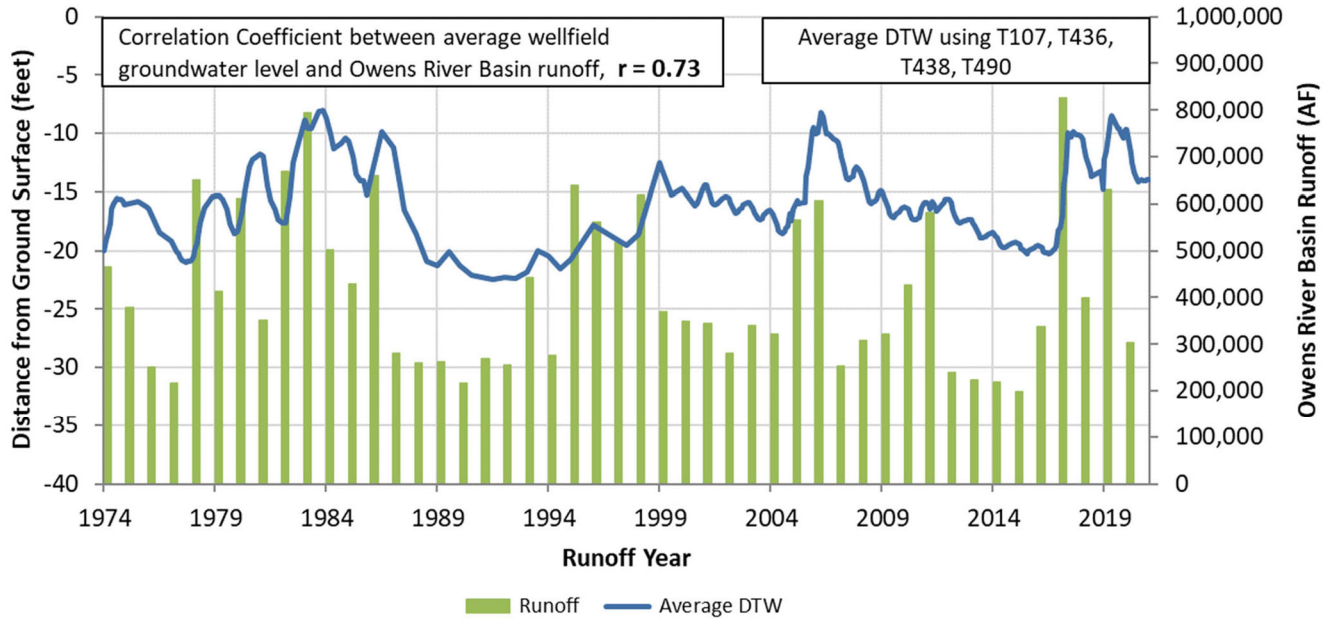


Figure 2.2. Average Laws Wellfield Groundwater Level and Owens River Basin Runoff

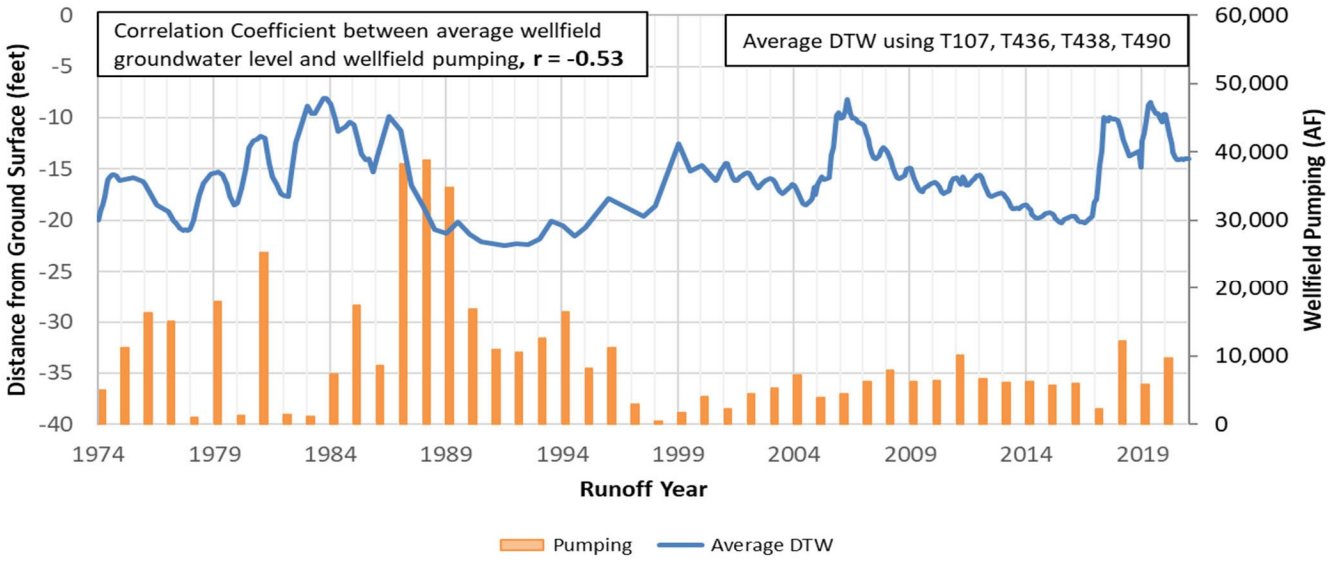


Figure 2.3. Average Laws Wellfield Groundwater Level and Pumping

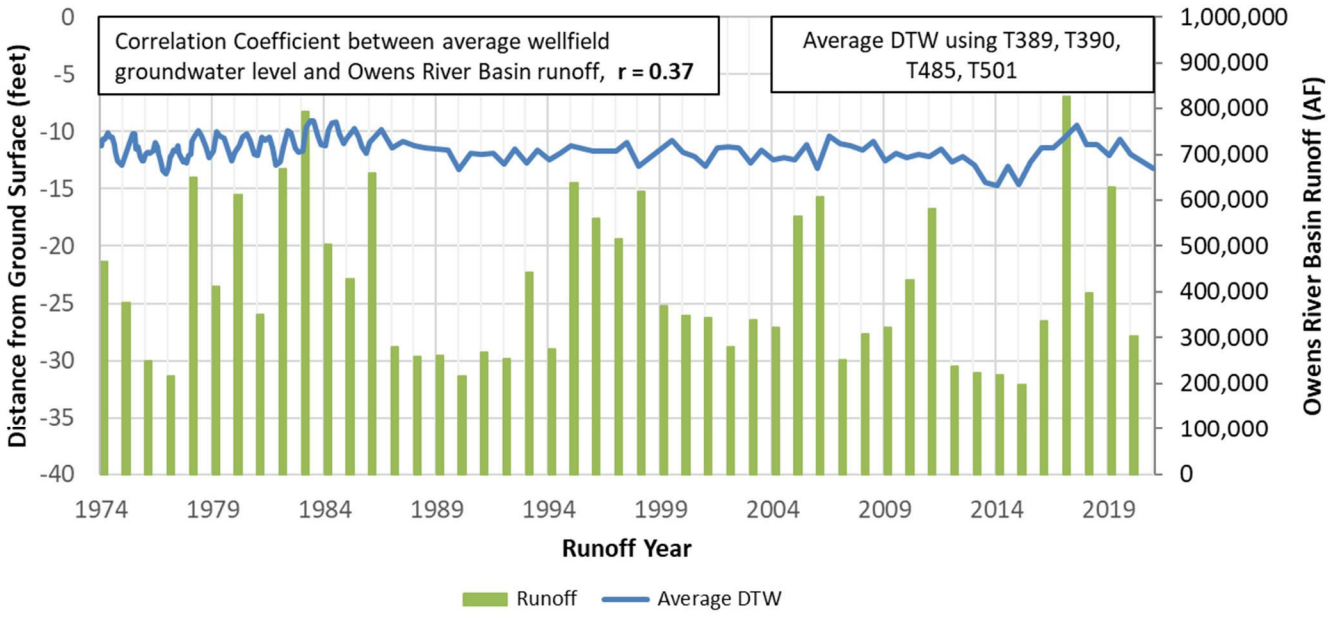


Figure 2.4. Average Bishop Wellfield Groundwater Level and Owens River Basin Runoff

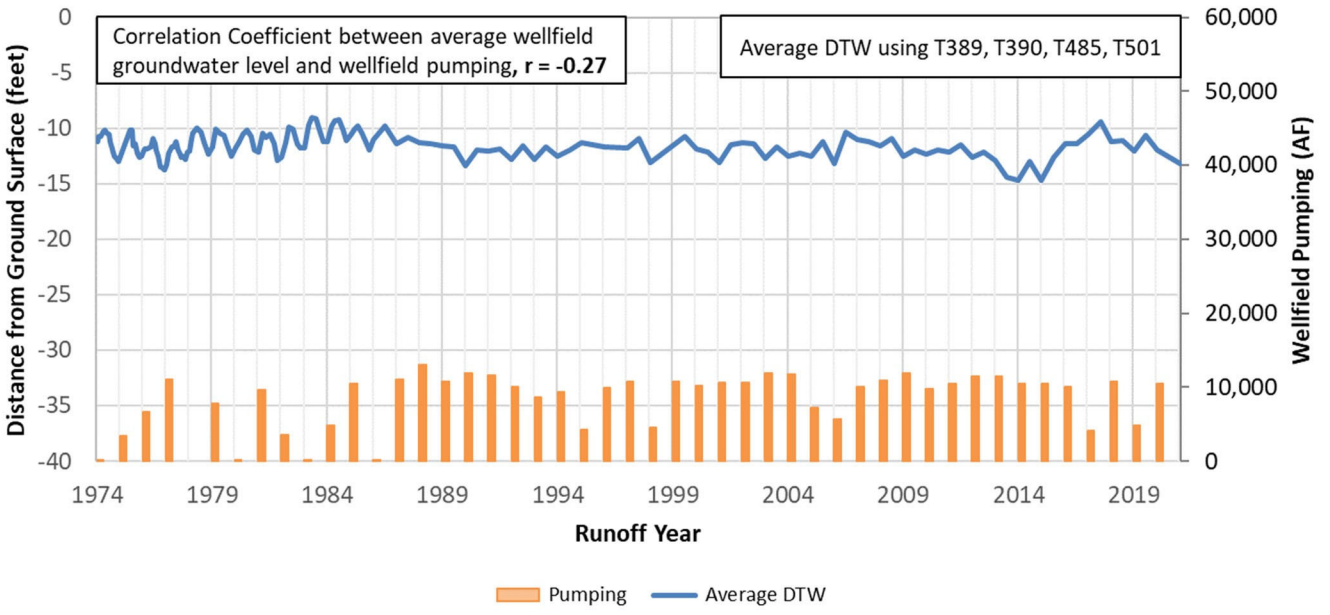


Figure 2.5. Average Bishop Wellfield Groundwater Level and Pumping

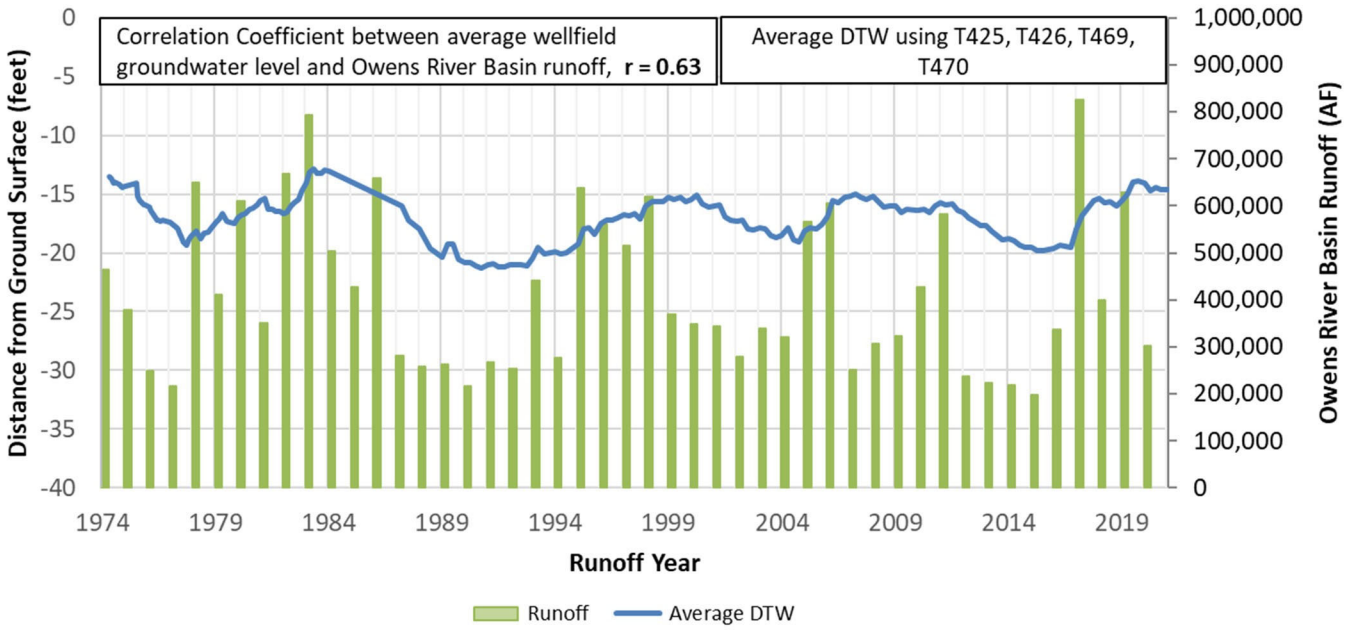


Figure 2.6. Average Big Pine Wellfield Groundwater Level and Owens River Basin Runoff

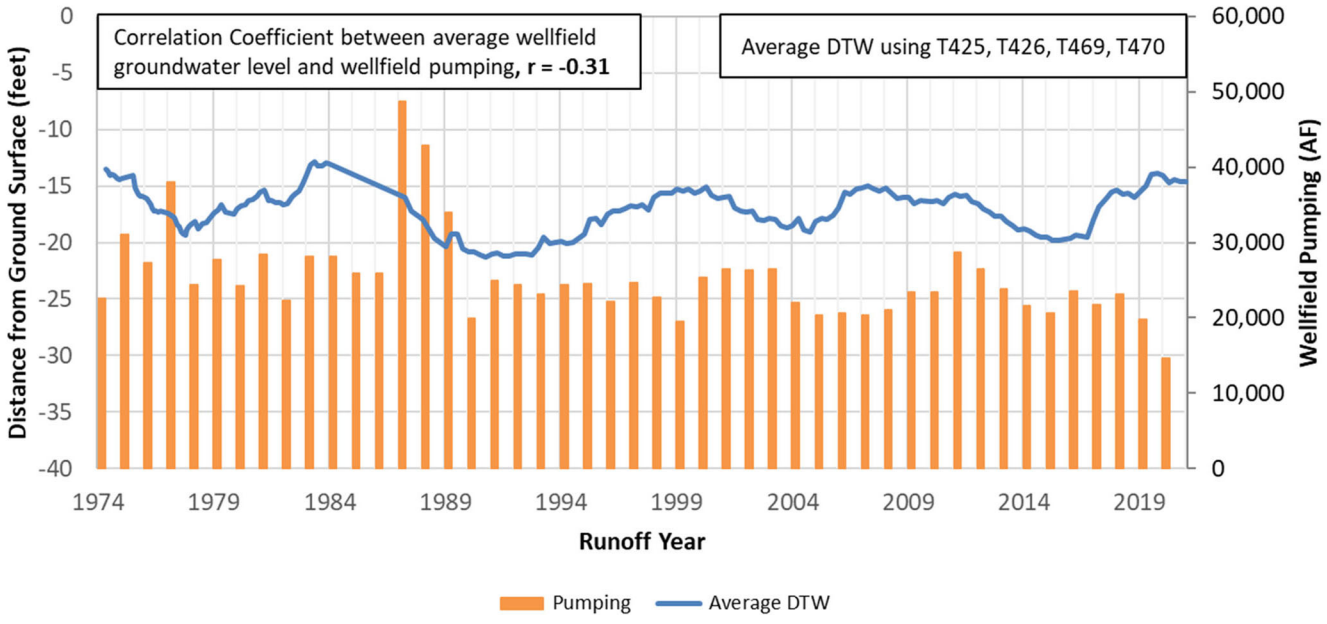


Figure 2.7. Average Big Pine Wellfield Groundwater Level and Pumping

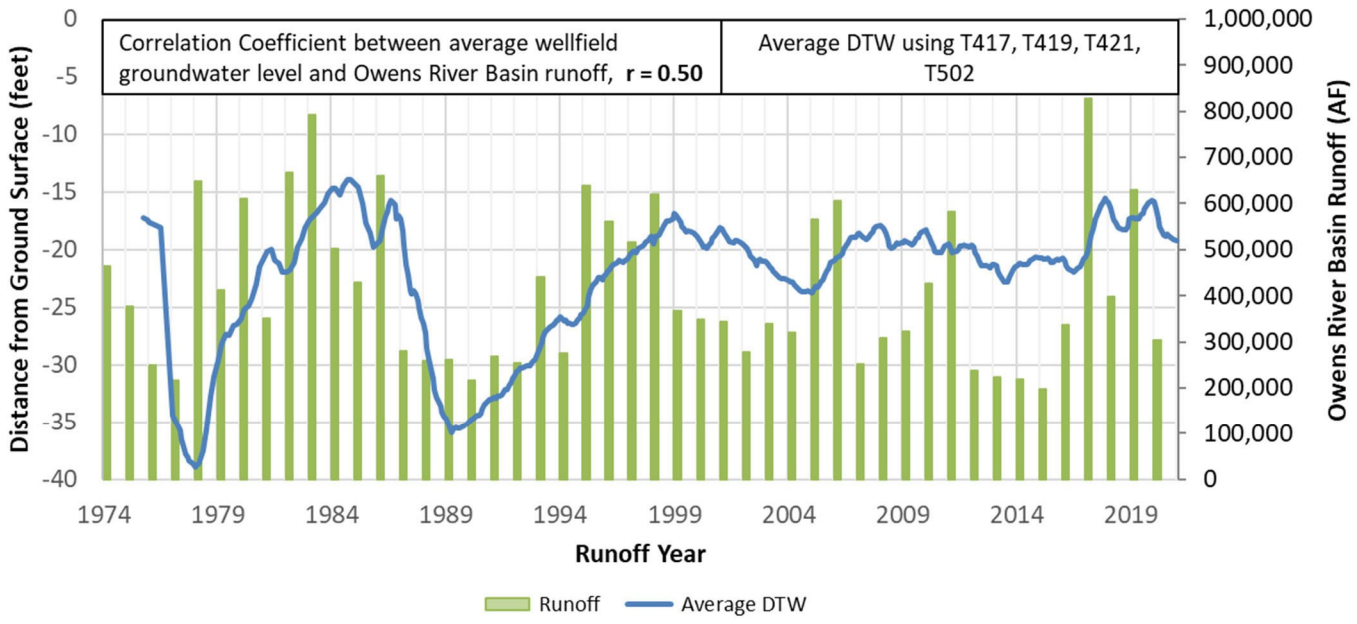


Figure 2.8. Average Taboose-Aberdeen Wellfield Groundwater Level and Owens River Basin Runoff

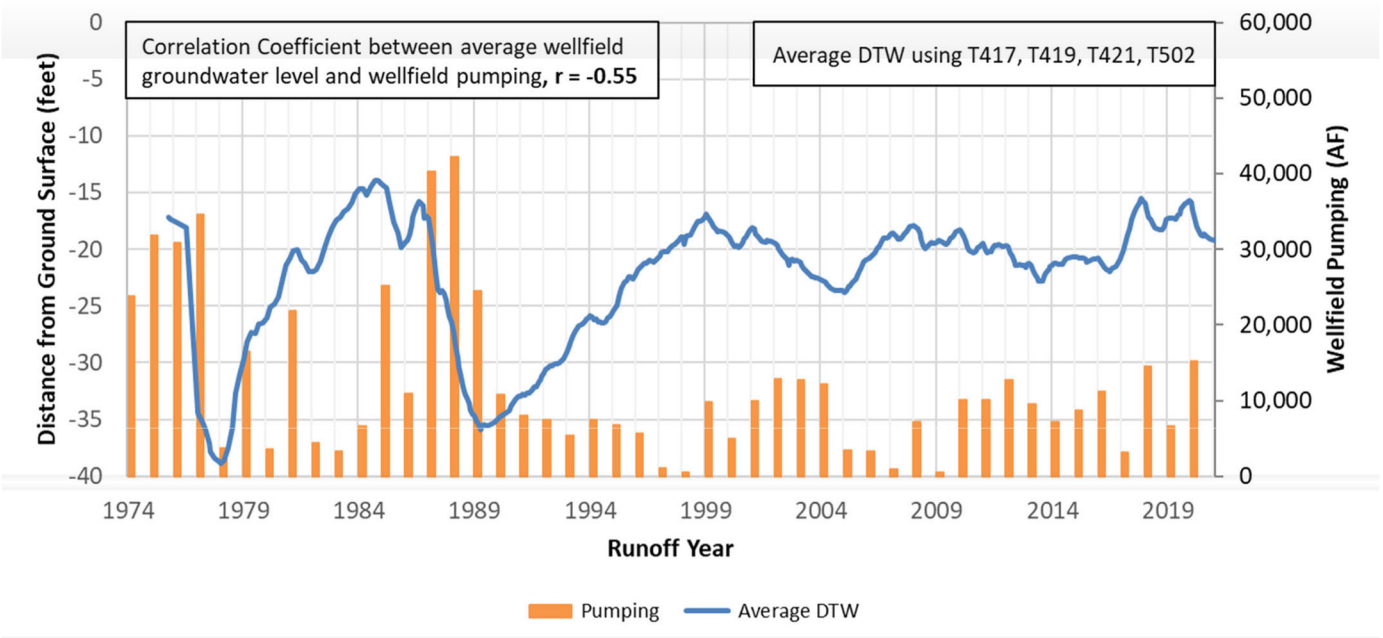


Figure 2.9. Average Taboose-Aberdeen Wellfield Groundwater Level and Pumping

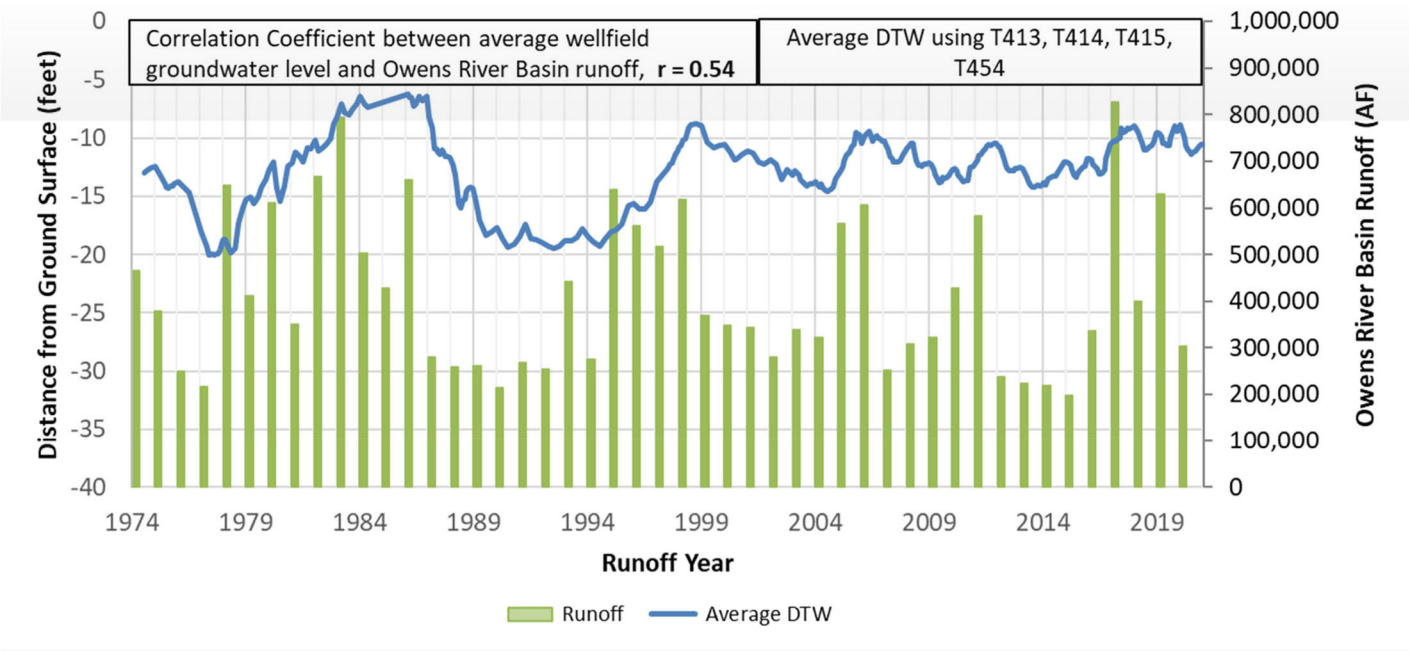


Figure 2.10. Average Thibaut-Sawmill Wellfield Groundwater Level and Owens River Basin Runoff

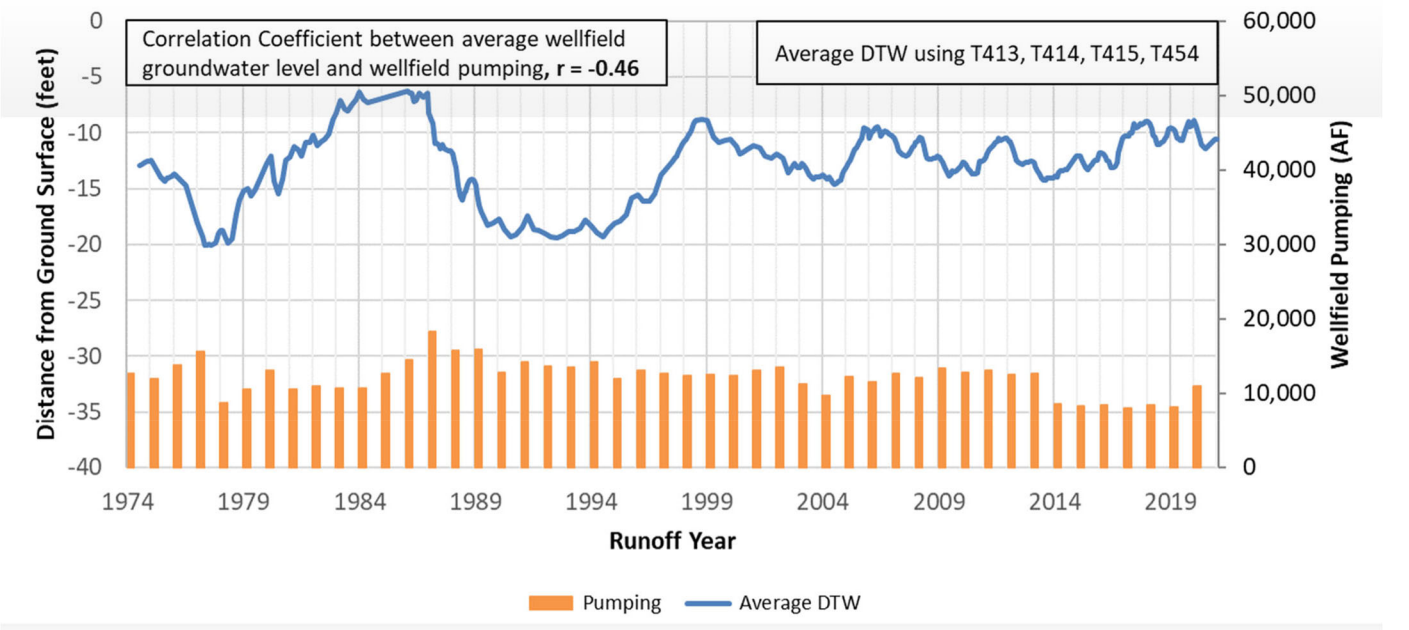


Figure 2.11. Average Thibaut-Sawmill Wellfield Groundwater Level and Pumping

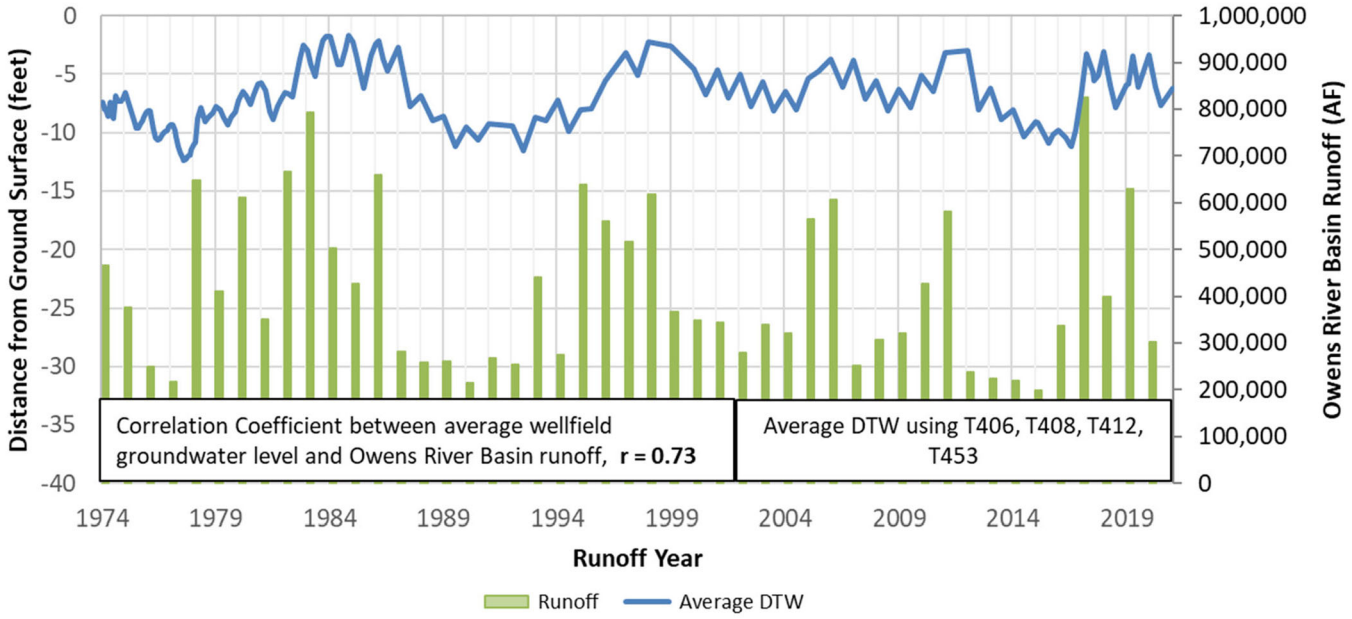


Figure 2.12. Average Independence-Oak Wellfield Groundwater Level and Owens River Basin Runoff

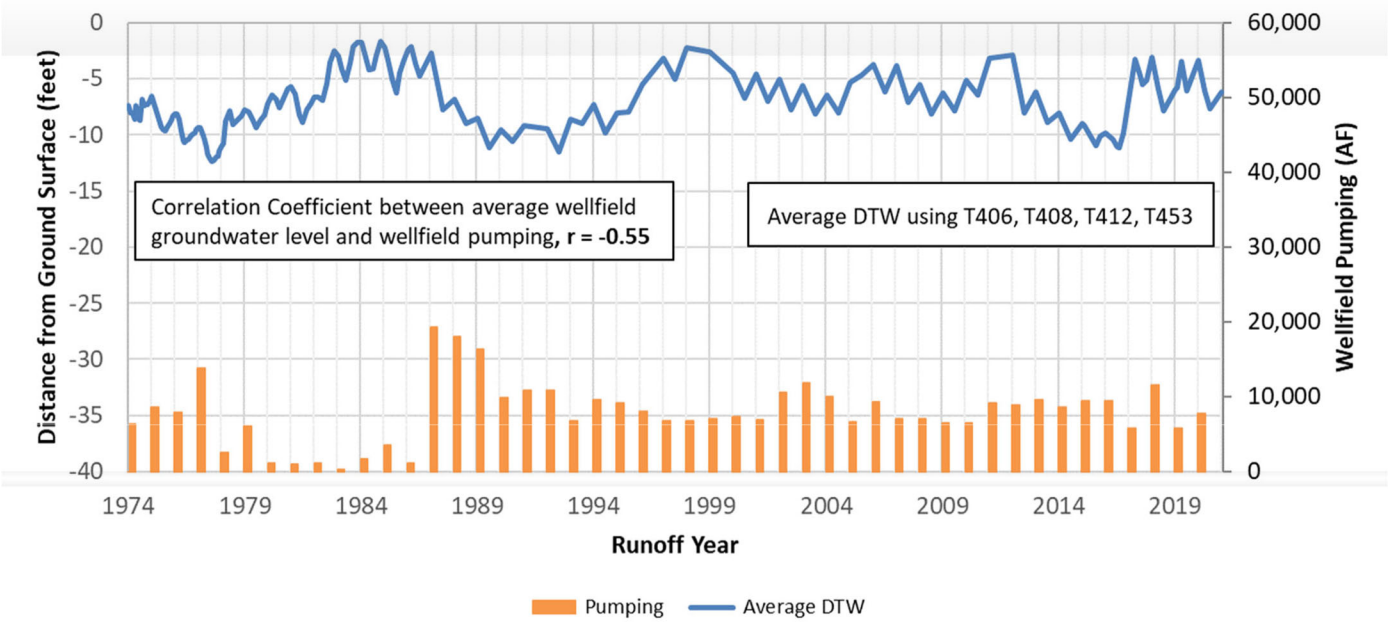


Figure 2.13. Average Independence-Oak Wellfield Groundwater Level and Pumping

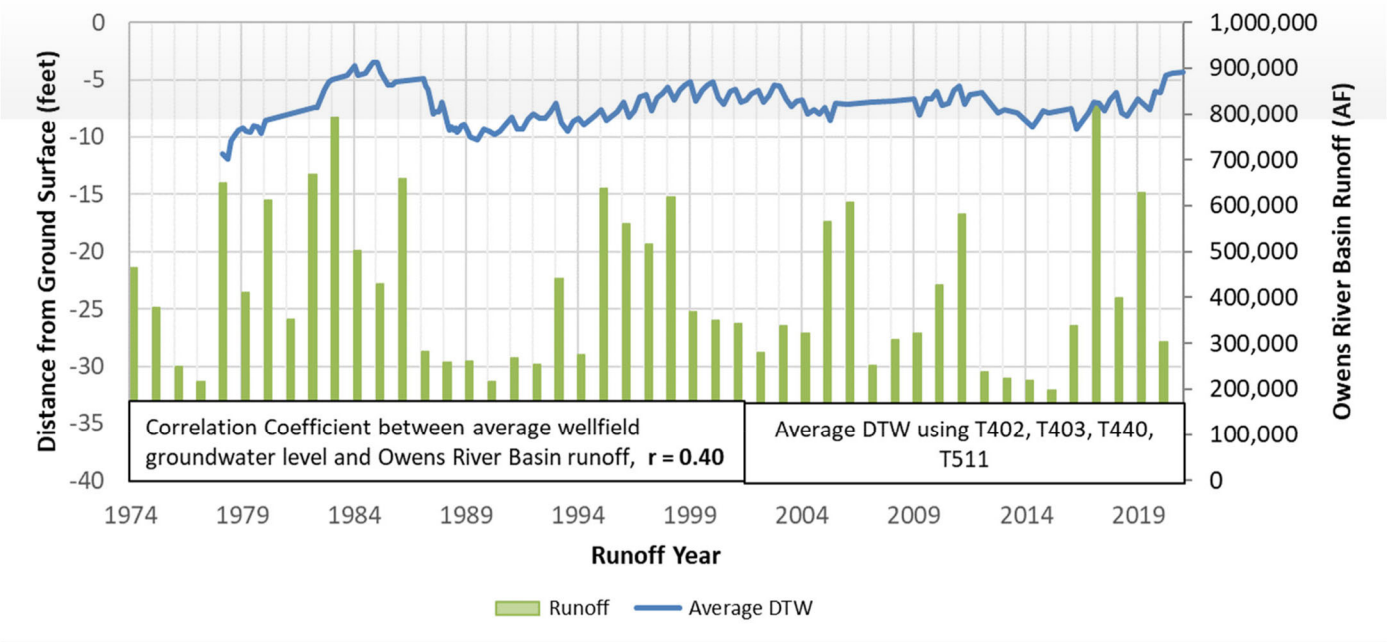


Figure 2.14. Average Symmes-Shepherd Wellfield Groundwater Level and Owens River Basin Runoff

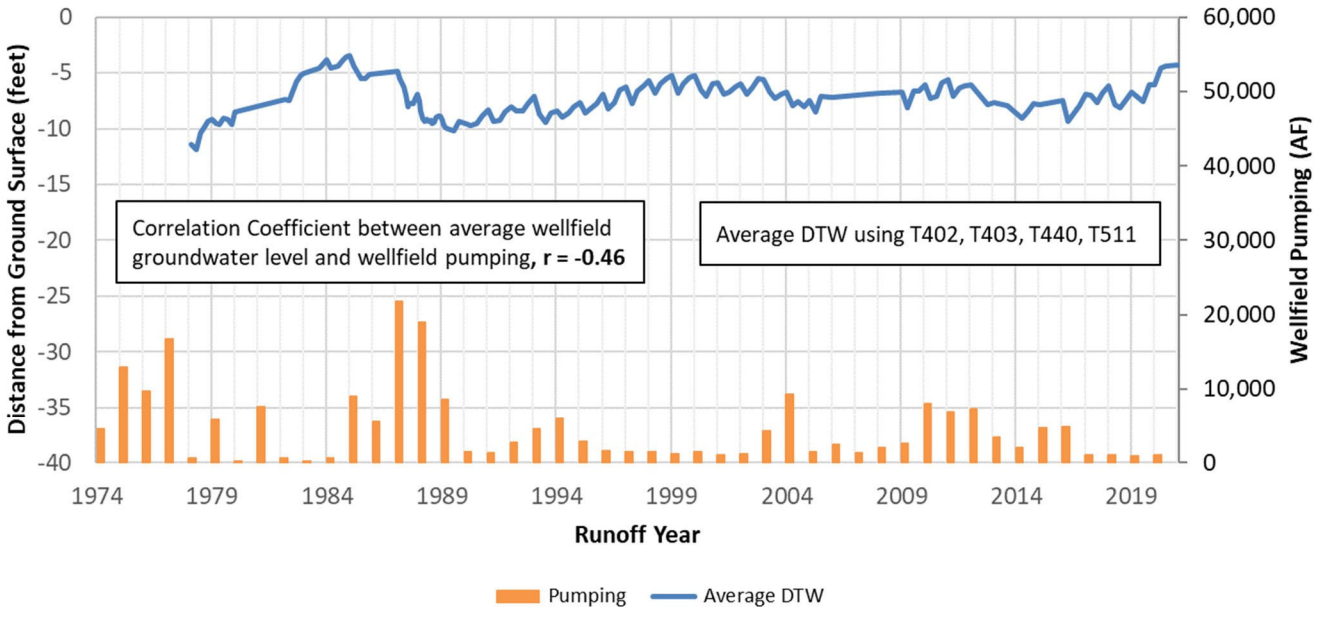


Figure 2.15. Average Symmes-Shepherd Wellfield Groundwater Level and Pumping

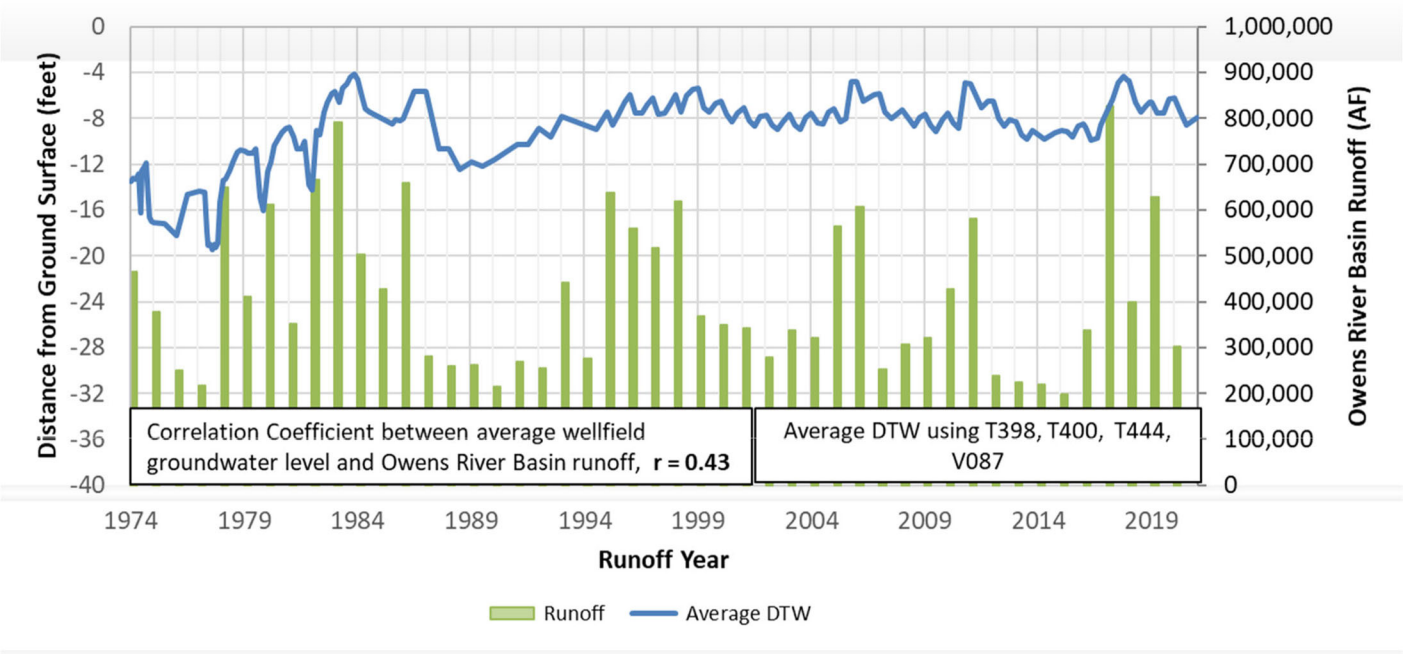


Figure 2.16. Average Bairs-Georges Wellfield Groundwater Level and Owens River Basin Runoff

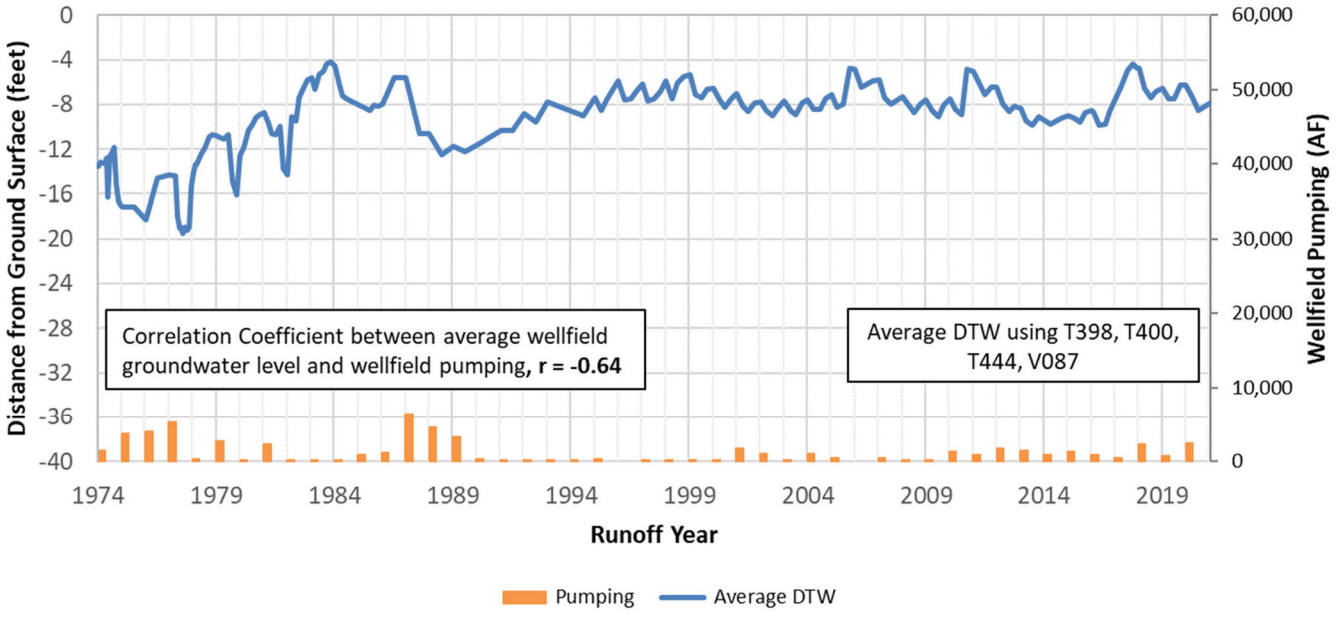


Figure 2.17. Average Bairs-Georges Wellfield Groundwater Level and Pumping

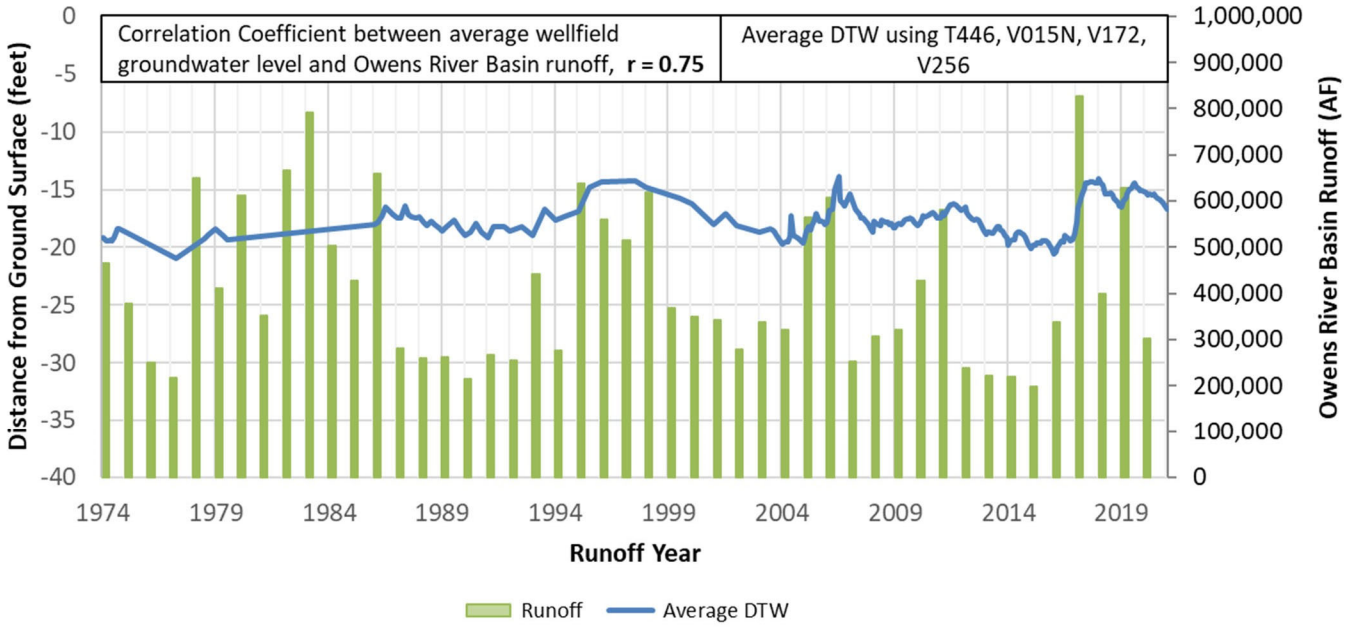


Figure 2.18. Average Lone Pine Wellfield Groundwater Level and Owens River Basin Runoff

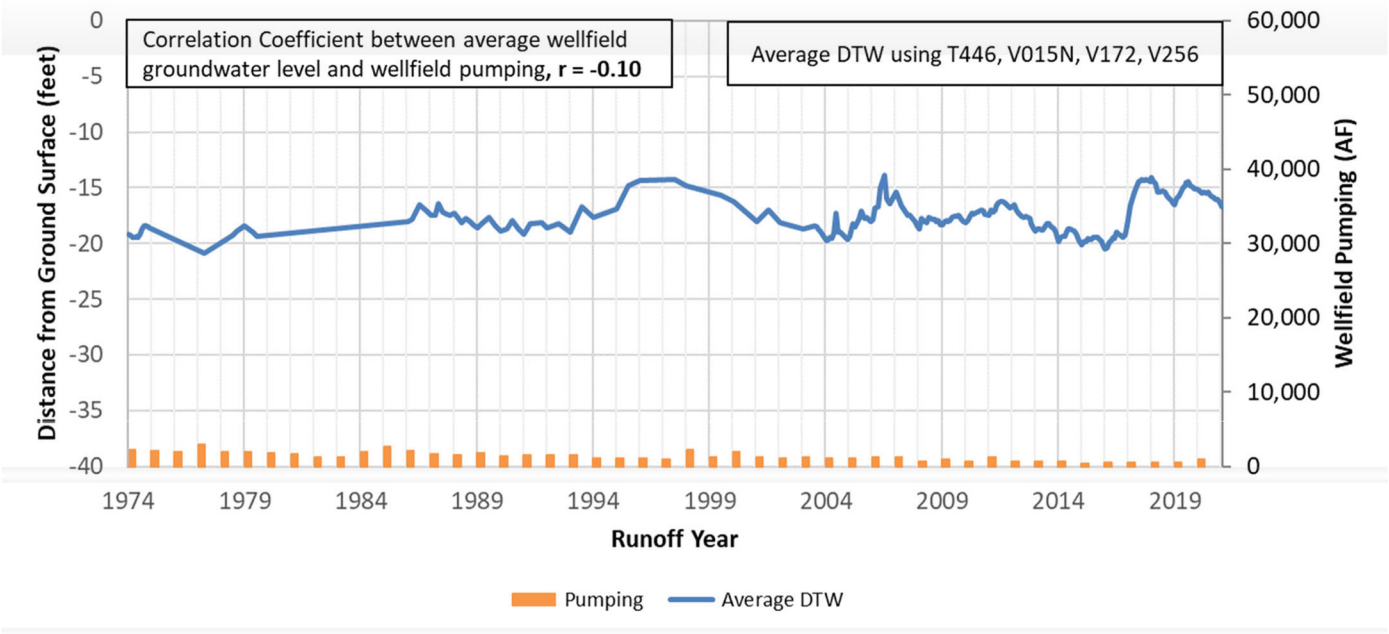


Figure 2.19. Average Lone Pine Wellfield Groundwater Level and Pumping

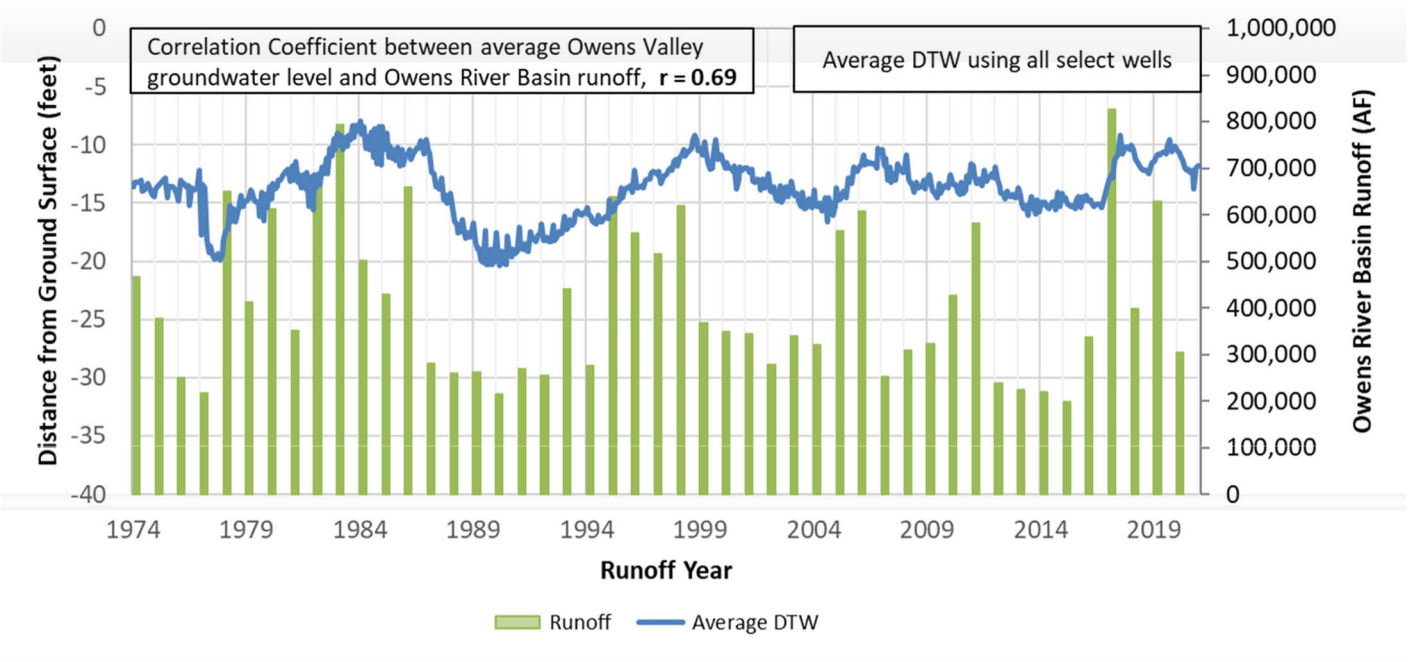


Figure 2.20. Average Owens Valley Groundwater Level and Owens River Basin Runoff

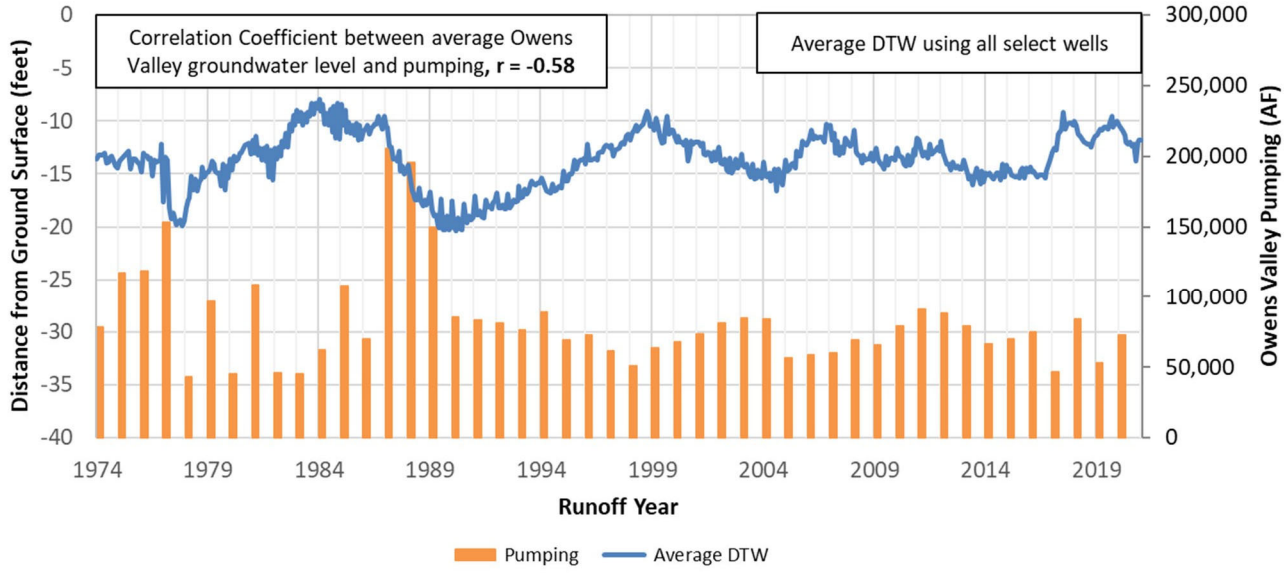


Figure 2.21. Average Owens Valley Groundwater Level and Pumping

Groundwater levels in the shallow aquifer are affected by the runoff induced recharge and pumping. Table 2.4 shows the effect of 2020-21 Owens River Basin runoff and pumping for each wellfield and overall for the entire Owens Valley based on select monitoring wells.

Table 2.4. Change in Average wellfield and Owens Valley Groundwater Levels between April 2020 and April 2021

Wellfield	2020-21 Runoff Year		Groundwater Level Change From April 2020 to April 2021* (ft)
	Pumping (af)	Owens River Basin Runoff** (af)	
Laws	*9,650*	-	*-4.3*
Bishop	*10,460*	-	*-1.2*
Big Pine	*14,573*	-	*-0.6*
Taboose-Aberdeen	*15,422*	-	*-3.4*
Thibaut-Sawmill	*10,961*	-	*-1.7*
Independence-Oak	*7,911*	-	*-2.5*
Symmes-Shepherd	*1,047*	-	*1.8*
Bairs-George	*2,401*	-	*-1.6*
Lone Pine	*985*	-	*-1.6*
Owens Valley	***73,410***	***303,013***	***-1.1***

* Based in select monitoring wells in Table 2.2a

** Owens River Basin including Long Valley and Owens Valley

2.3. Precipitation Record and Runoff Forecast

The Eastern Sierra snowpack as of April 1, 2021 was 54% of normal in the Mammoth Lakes area, 53% of normal in the Rock Creek area, 46% of normal in the Bishop area, 44% of normal in the Big Pine area, and 22% of normal in the Cottonwood Lakes area. The Eastern Sierra overall snowpack, weighted by contribution to Owens River watershed runoff was calculated to be 46% of the 50-year (1966-2015) average snowpack as of April 1, 2021 (Table 2.5).

The Eastern Sierra runoff forecast for the 2021-22 runoff year is 226,800 acre-feet or 55% of 50-year average (Section 1, Table 1.1). Figure 2.22 provides a comparison of the forecasted runoff for the 2021-22 year to actual runoff in previous runoff years.

Average precipitation on the valley floor for the 2020-21 year was 2.4 inches, which is 42% of the 50-year average precipitation of 5.8 inches. Table 2.6 details monthly annual precipitation totals for the 2020-21 runoff year as well as the long-term averages at representative precipitation gauges throughout the Owens Valley.

Table 2.5. Eastern Sierra April 1, 2021 Snow Survey Results

EASTERN SIERRA SNOW SURVEY RESULTS
April 1, 2021

MAMMOTH LAKES AREA (Contributes 27% of Owens River Basin runoff)

Course	Water Content	April 1 Normal	% of April 1 Normal
Mammoth Pass	25.9	42.6	61%
Mammoth Lakes	9.4	20.5	46%
Minarets 2	15.1	29.5	51%
Average:	16.8	30.9	54%

ROCK CREEK AREA (Contributes 16% of Owens River Basin runoff)

Course	Water Content	April 1 Normal	% of April 1 Normal
Rock Creek 1	4.6	7.3	63%
Rock Creek 2	4.4	10.2	43%
Rock Creek 3	7.5	13.7	55%
Average:	5.5	10.4	53%

BISHOP AREA (Contributes 19% of Owens River Basin runoff)

Course	Water Content	April 1 Normal	% of April 1 Normal
Sawmill	8.9	19.3	46%
Average:	8.9	19.3	46%

BIG PINE AREA (Contributes 13% of Owens River Basin runoff)

Course	Water Content	April 1 Normal	% of April 1 Normal
Big Pine Creek 2	4.8	13.3	36%
Big Pine Creek 3	9.1	18.2	50%
Average:	6.9	15.7	44%

COTTONWOOD AREA (Contributes 25% of Owens Basin River runoff)

Course	Water Content	April 1 Normal	% of April 1 Normal
Cottonwood Lakes 1	2.9	12.5	23%
Trailhead*	2.9	13.1	22%
Average:	2.9	12.8	22%

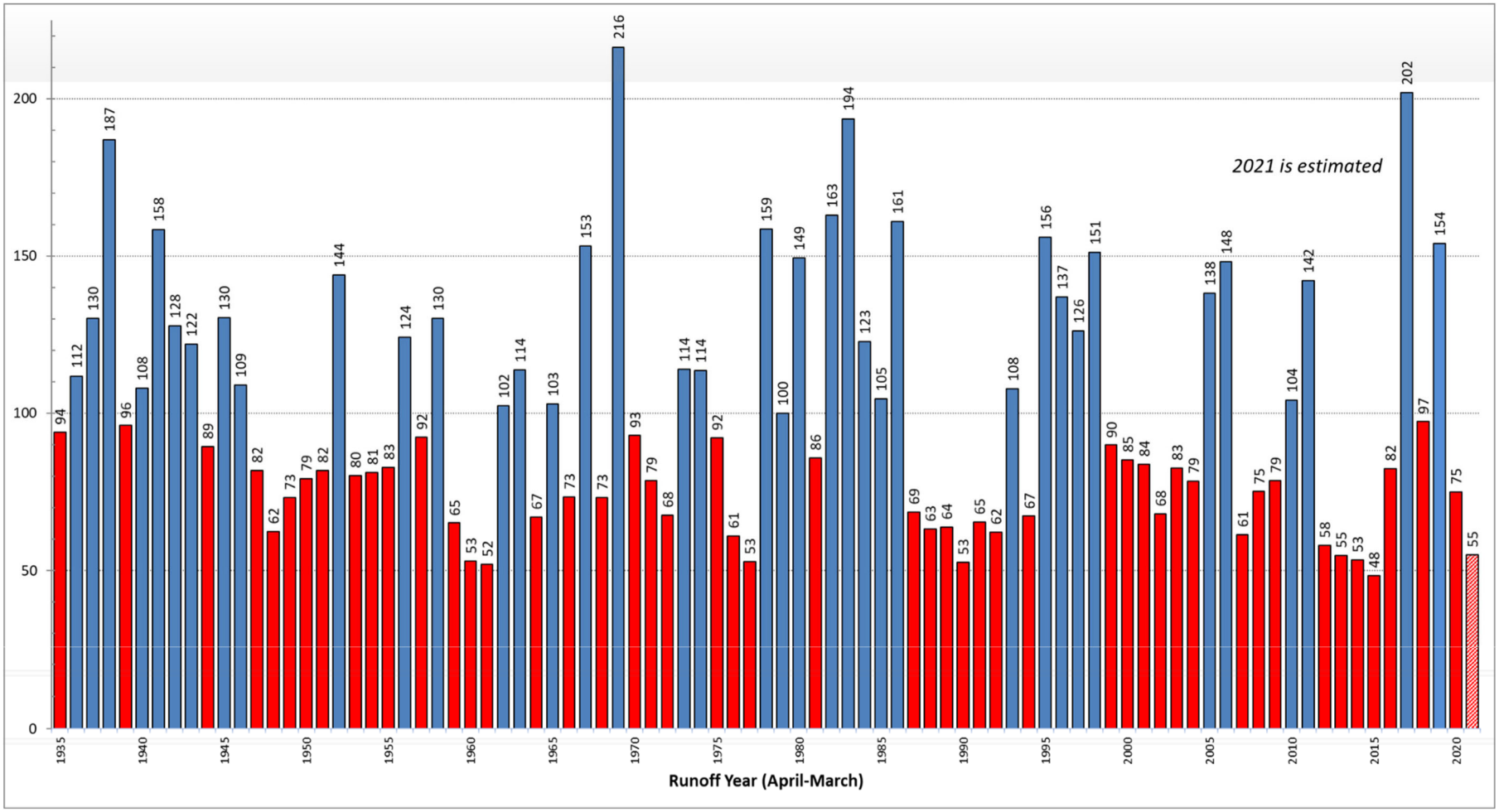
EASTERN SIERRA OVERALL SNOW PACK (Weighted by contribution to Owens River Basin runoff)

	Water Content	April 1 Normal	% of April 1 Normal
Average of all Snow Courses	8.8	19.0	46%

Table 2.6. Owens Valley Precipitation during Runoff Year 2020-21 in Inches

Month	Bishop	Big Pine	Tinemaha Reservoir	LAA Intake	Indep. Yard	Alabama Gates	Lone Pine	Cottonwood	South Haiwee	Average Owens Valley
April, 2020	0.66	0.63	0.72	1.10	1.55	1.37	1.39	1.46	2.65	1.28
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June	0.00	0.00	0.02	0.09	0.02	0.00	0.01	0.12	0.00	0.03
July	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
August	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
September	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
October	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
November	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
December	0.33	0.24	0.39	0.54	0.89	0.53	0.60	0.73	0.47	0.52
January, 2021	0.18	0.74	0.26	0.44	0.13	0.01	0.60	0.36	0.47	0.35
February	0.23	0.22	0.24	0.26	0.16	0.08	0.60	0.20	0.10	0.23
March	*0.00*	*0.00*	*0.01*	*0.07*	*0.03*	*0.01*	*0.01*	*0.05*	*0.04*	*0.02*
2020-21	1.4	1.8	1.6	2.5	2.8	2.0	3.2	2.9	3.7	2.4
Average*	6.2	6.2	6.6	5.6	5.5	4.0	3.9	6.8	7.1	5.8
% of Average	23%	29%	25%	45%	51%	50%	82%	43%	53%	42%

Figure 2.22. Owens River Basin Runoff – Percent of Normal



2.4. Owens Valley Water Supply and Uses

Table 2.7 provides an overview of the Owens Valley water supply, in-valley uses and losses, and Los Angeles Aqueduct (LAA) exports for the post-Water Agreement period (1992-93 through 2020-21 runoff years) as compared to the pre-project average (pre-Second Los Angeles Aqueduct) and projected water supply and uses (based on the Water Agreement, 1991 EIR, and 1997 MOU). Actual water uses in the Owens Valley are generally consistent with the projected values under the 1991 EIR and 1997 MOU.

While Owens Valley water supply (runoff, flowing wells, and pumped groundwater) has remained about the same over the long term average, exports are considerably less than anticipated under the 1991 EIR and 1997 MOU. The fundamental reasons for the reduction in the exports for the municipal water supply in Los Angeles are increased water uses for dust mitigation on Owens Lake, mandated decreases in water exported from the Mono Basin, and less groundwater pumping than anticipated under the Water Agreement.

Current Owens Valley water uses are compared to pre-project uses as well as those uses projected under the Water Agreement and 1997 MOU in Figure 2.12. The components of LADWP's water exports from the Eastern Sierra are compared to pre-project exports as well as those projected under the Water Agreement and 1997 MOU in Figure 2.13.

Table 2.8 provides a breakdown of Owens Valley water uses from 1992 to the present and planned water uses for the 2021-22 runoff year. While much of Table 2.9 is self-explanatory, the following items need additional explanation:

- Enhancement/mitigation (E/M) water supply is the water supplied to E/M projects referenced in the 1991 EIR,
- LORP is water supplied to the Lower Owens River Project,
- Operations is water used for operational reasons.

Table 2.9 lists a breakdown of water supplied to E/M projects during the 2020-21 runoff year.

Table 2.7. Owens Valley Water Supply and Uses

(Amounts in Thousands of Acre-Feet/Year)

	Pre-Project (1945-70)	Projected per MOU/ Water Agreement	Actual Data for Runoff Year 2020-21	Actual Post Water Agreement Averages (1992-2021)
Owens Valley Water Supply				
Runoff (Owens Valley & Round Valley)	292	310[1]	220	293
Flowing Wells	44	15	29	32
Pumped Groundwater	10	110[2]	73	72
Total	346	435	322	397
In-Valley Uses & Losses				
Water Used on City Lands in O.V.				
Irrigated Lands [3]	62	46	47	48
Stockwater, Wildlife, and Rec. Uses [4]	20	23	18	21
Post 1985 E/M Projects [5]	0	12	9	10[8]
Lower Owens River [6]	0	27[7]	20	19[8]
Additional Mitigation (1,600 af from MOU)	0	0	2	2[8]
Sub-Total	82	110	97	100
Other O.V. Uses and Losses [9]	134	135	169	189
Total	216	245	*266*	289
Components of Aqueduct Export				
Owens Valley Contribution to Export	130	190	56	108
Long Valley Contribution to Export	134	135	106	137
Mono Basin Contribution to Export [10]	58	30	16	12
Total	322	355	178	257

1. Average runoff for period 1935 to 1988 (Runoff Year)
2. Assumed based on 1991 O.V. Groundwater Pumping EIR
3. Does not include areas receiving water supplies non-tributary to the Owens River/Aqueduct (approx. 7,000 AFY).
4. Includes projects such as the Tule Elk Field, Farmers Ponds implemented after 1970 and before 1985 when E/M projects commenced. Also includes the LORP Off-River Lakes and Ponds uses.
5. Except Lower Owens River Rewatering E/M Project
6. Includes river losses, releases to the Blackrock Waterfowl Habitat Area, and the Delta
7. Assumes: 6,000 AF year-round flow to delta, 1,000 AF to Blackrock, and 19,600 AF for river channel losses.
8. Represents recent history.
9. Includes uses for dust mitigation for Owens Lake, Indian land, private lands, conveyance losses, recharge, evaporation, and operational releases.
10. 1993 Court decision allows approximately 30,000 AFY when lake reaches elevation 6392. Prior to Court decision Mono Basin export averaged 81,000/yr.

Figure 2.23. Owens Valley Water Uses

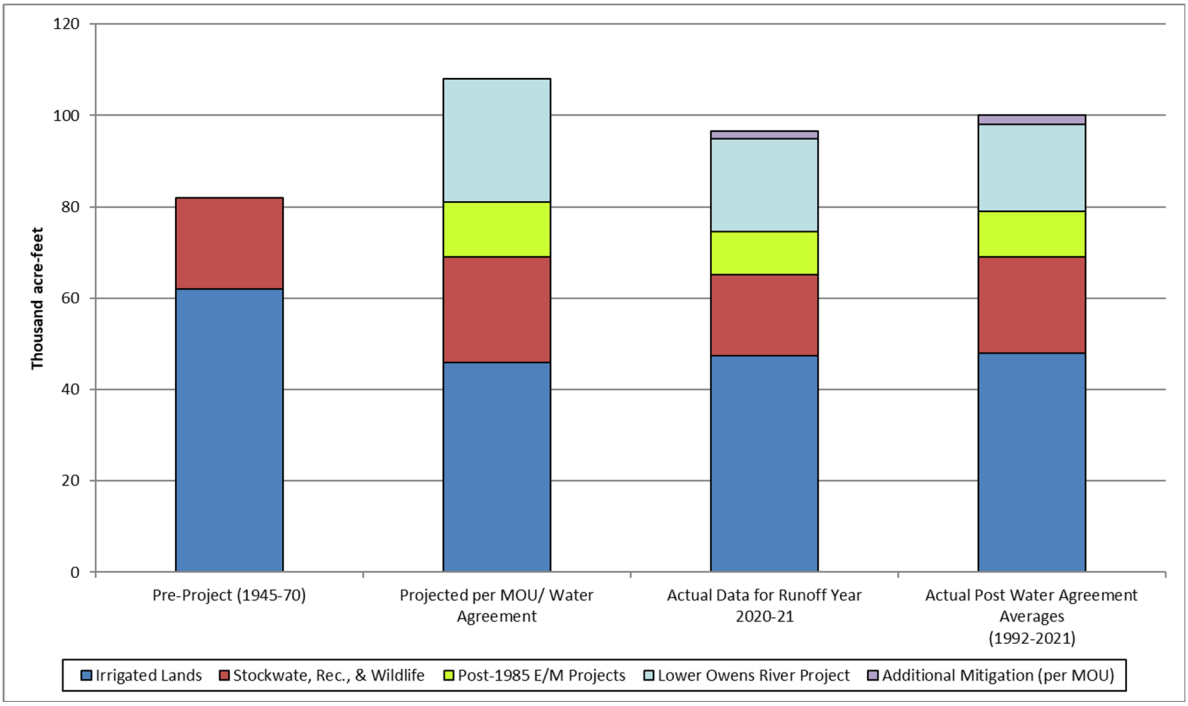


Figure 2.24. Components of the Eastern Sierra Water Exports

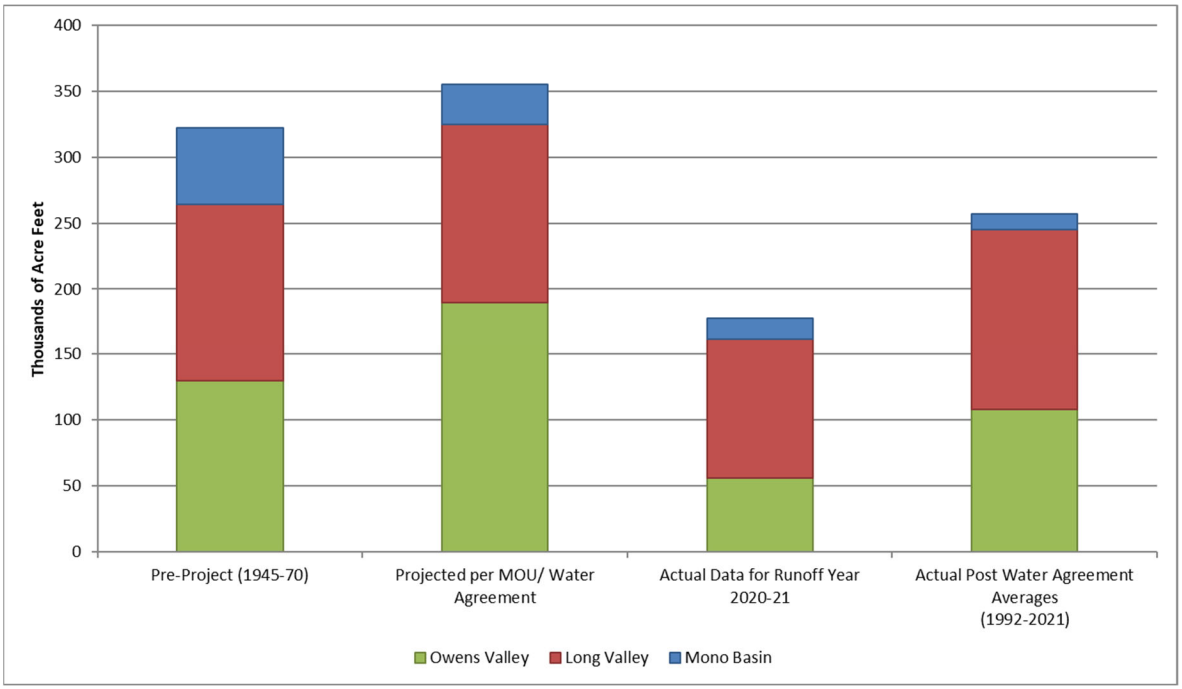


Table 2.8. Water Uses for 1992-93 through 2020-21 and Planned Uses for the 2021-22 Runoff Year (acre-feet)

(1) Runoff Year	(2) Owens Valley Runoff %	(3) Owens Valley Pumping (1000 af)	(4) Irrigation	(5) Stock Water	(6) E/M	(7) Rec. & Wildlife	(8) LORP	(9) 1600 AF Projects	(10) In-Valley Uses (sum of 4+5+6+ 7+8+9)	Groundwater Recharge		(13) Operations	(14) All Uses (sum of 10+11+12+13)
										(11) Big Pine & Independence Spreading	(12) Laws Spreading		
1992-93	62%	84	37,131	17,828	9,088	7,725	9,269		81,041	0	0	12,179	93,220
1993-94	108%	76	47,798	17,230	13,443	8,676	5,867		93,014	14,512	10,640	12,433	130,599
1994-95	68%	89	37,790	17,178	9,132	8,116	11,638		83,854	0	56	12,102	96,012
1995-96	156%	70	57,748	20,919	11,162	12,479	11,636		113,944	30,126	21,148	13,561	178,779
1996-97	137%	75	46,171	19,757	10,989	9,438	13,031		99,386	4,606	0	21,125	125,117
1997-98	126%	67	47,114	16,422	8,114	8,022	13,069		92,741	4,113	4,106	13,874	114,834
1998-99	151%	52	45,445	13,654	9,075	8,691	11,192		88,057	24,970	31,077	23,016	167,120
1999-00	90%	64	49,529	14,461	8,836	7,470	15,973		96,269	0	0	11,263	107,532
2000-01	85%	68	49,327	13,442	7,989	7,263	12,090		90,111	0	790	12,517	103,418
2001-02	84%	73	43,296	12,759	9,401	7,487	12,485		85,428	0	230	12,973	98,631
2002-03	68%	82	43,929	12,291	11,442	7,377	9,690		84,729	0	0	8,431	93,160
2003-04	83%	88	45,974	11,620	10,926	6,853	10,243		85,616	0	0	8,787	94,403
2004-05	79%	86	50,311	11,546	9,915	6,866	8,910		87,548	243	695	9,536	98,022
2005-06	138%	57	53,832	11,355	11,587	7,807	7,566		92,147	16,212	24,187	14,814	147,360
2006-07	148%	59	50,968	12,041	11,551	7,849	11,700		94,109	29,457	16,855	38,937	179,358
2007-08	61%	60	47,699	12,161	11,565	10,122	22,501		104,048	0	0	5,631	109,679
2008-09	75%	69	56,130	11,435	10,646	8,479	20,957		107,647	1,342	0	7,651	116,640
2009-10	79%	65	52,933	11,450	10,695	10,398	15,708		101,184	0	0	8,453	109,637
2010-11	104%	80	52,983	12,275	10,807	12,106	17,020		105,191	2,993	1,973	14,280	124,437
2011-12	142%	92	62,391	11,566	11,847	9,702	19,556		115,062	13,231	4,119	8,785	141,197
2012-13	58%	89	48,763	10,961	9,257	9,254	20,927	1,612	100,774	0	0	4,081	104,855
2013-14	55%	79	44,160	11,161	8,222	8,022	17,845	1,625	91,035	0	0	1,926	92,961
2014-15	53%	66	45,491	11,582	9,520	7,615	12,681	1,604	88,493	8,742	0	1,423	98,658
2015-16	*48%*	70	39,598	11,752	8,412	7,934	16,828	1,614	86,138	434	0	1,255	87,827
2016-17	82%	76	49,219	10,969	10,903	8,199	18,585	1,702	99,577	4,200	7,783	17,770	129,330
2017-18	202%	48	53,864	12,534	11,554	10,313	19,533	1,615	109,413	85,175	38,815	90,407	323,810
2018-19	97%	85	49,836	11,437	9,814	7,742	13,777	1,645	94,251	1,406	2,489	2,640	100,786
2019-20	154%	72	53,981	12,429	11,064	8,336	20,749	1,608	108,167	33,976	26,346	32,002	200,491
2020-21	*75%*	*73*	*47,324*	*11,303*	*9,304*	*6,583*	*20,384*	*1,650*	96,548	*0*	*0*	*1,814*	*98,362*
2021-22	55%		40,760	10,490	7,920	7,110	17,500	1,600	85,380	0	0	720	86,100
AVG.	97%	73	48,383	13,200	10,139	8,468	14,630	1,628	95,363	9,191	6,377	14,146	125,078

NOTES: PLANNED PUMPING FOR THE UPCOMING RUNOFF YEAR IS ON TABLE 1.6

2021-22 REFLECTS CURRENT YEAR OPERATIONS FORECAST

E/M EXCLUDES RELEASES TO THE LORP

LORP IS RECORD OF THE REWATERING E/M (1985-2006) AND THE MITIGATION PROJECTS (STARTED IN DECEMBER 2006)

LORP RECORD INCLUDES RIVERINE LOSS, RELEASES TO BLACKROCK WATERFOWL, AND RELEASES TO DELTA

Table 2.9. Water Supplied to Enhancement/Mitigation Projects During 2020-21

Project	Water Supplied (acre-feet)
McNally Canals Conveyance Losses	*144*
McNally/Laws/Poleta Native Pasture Lands	*1,470*
McNally Ponds	*664*
Laws Historical Museum	*94*
Klondike Lake	*1,649*
Big Pine Regreening	*109*
Lower Owens River Rewatering	--
Independence Pasture Lands	*1,327*
Independence Springfield	*1,288*
Independence Ditch System	*272*
Independence Woodlot	*95*
Independence Regreening	*66*
Shepherd Creek Alfalfa Lands	*918*
Lone Pine Park/Richards Field	*348*
Lone Pine Woodlot	*67*
Lone Pine Van Norman Field	*478*
Lone Pine Regreening	*249*
Total E/M Uses	9,238

2.5. Owens Valley Vegetation Conditions

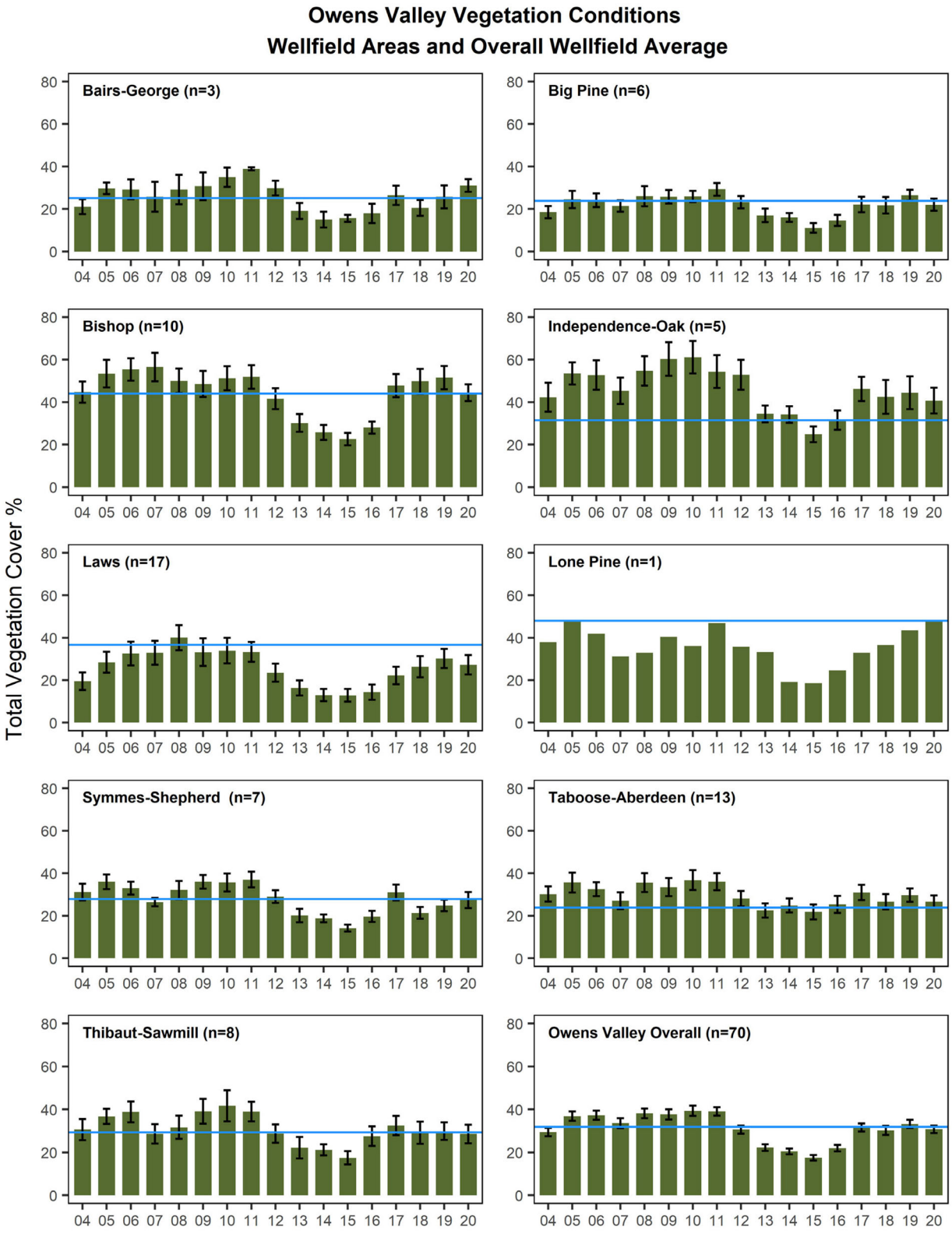
Vegetation conditions within the Owens Valley are monitored using vegetation transects as well as other methods. The Green Book describes the methodology and purposes of vegetation transects. As stated in the Green Book: "Vegetation transects are included within the Green Book to serve two purposes: 1) to estimate transpiration from a monitoring site, and 2) for use in determining whether vegetation has decreased or changed significantly from the previous cover." A reference for comparison of vegetation changes is the 1984-87 vegetation inventory data.

The Green Book requires the 1984-87 vegetation inventory to be used as a baseline when determining whether vegetation cover and/or species composition have changed. The 1984-1987 inventory transects were chosen using aerial photos to aid in determining transect locations. Transects were located visually by choosing lines that appeared to cover the representative units of vegetation within the parcel being measured. Transects were generally run toward the center of the parcels in order to avoid transitional areas at parcel edges. A minimum of five transects were run on each parcel. If the vegetation cover was particularly heterogeneous, a qualitative method was employed in selecting additional transects. The transect data were checked visually and additional transects were run to lessen the degree of variability as necessary.

The Green Book directs that future transects should be performed in a similar manner as the initial inventory to determine whether vegetation has changed, but allows the technique to be modified by the Technical Group to permit statistical comparison by randomly selected transects. The procedures for modifying the Green Book procedures are included under Water Agreement Section XXV. In any case, the Green Book requires the Technical Group to perform a statistical analysis in order to determine the statistical significance of any suspected vegetation changes from the 1984-87 inventory maps.

In 2004, LADWP began running transects annually within parcels located both inside and outside wellfields. Some parcels are evaluated annually, while others are not. Percent total cover is calculated and compared to data collected within parcels during the period of baseline inventory.

Figure 2.25 includes vegetation transect data collected by LADWP and presented in a series of graphs documenting Owens Valley vegetation conditions. LADWP monitors vegetation using established vegetation transects that enable the Technical Group to reliably assess annual changes in vegetation cover and composition.



Notes: ▬ represents a mean cover during the initial inventory. Data were collected by LADWP and ICWD.

Figure 2.25. Owens Valley Vegetation Condition for Wellfields

2.6. Bishop Cone Audit

LADWP's groundwater pumping on the Bishop Cone is governed by the provisions of the Stipulation and Order filed on August 26, 1940, in Inyo County Superior Court in the case of Hillside Water Company, a corporation et al. vs. the City of Los Angeles, a Municipal Corporation et al., (Hillside Decree) as well as the Water Agreement. Annual groundwater extractions from the Bishop Cone are limited to an amount not greater than the total amount of water used on City of Los Angeles (City) lands on the Bishop Cone during that year. Annual groundwater extractions by LADWP on the Bishop Cone are the sum of all groundwater pumped plus the amount of artesian water that has flowed from wells on the Bishop Cone during the year. Water used on City lands on the Bishop Cone are the quantity of water supplied to such lands, including conveyance losses, less any return flow to the aqueduct system.

The Inyo County Water Department (ICWD) performs an annual audit of LADWP water uses and groundwater extractions by LADWP on the Bishop Cone. Section 2 Appendices contain a copy of ICWD's audit for the 2019-20 runoff year, the most recently audited year. As shown in Figure 1.4, LADWP has historically pumped much less than allowed under the terms of the Hillside Decree. Beginning in the 2015-16 runoff year, the audit water account methods were modified to analyze each areas inflows and outflows to calculate total water use. In the 2019-20 runoff year LADWP extracted 10,582 acre-feet of water from the Bishop Cone area (4,763 acre-feet pumping, 5,819 acre-feet flowing), about 23 percent of that identified as being allowed using the current audit procedures.

2.7. Reinhackle Spring Monitoring

As required by the 1991 EIR, Owens Valley groundwater pumping is managed to avoid reductions in spring flows that would cause significant decreases or changes in spring-associated vegetation. Groundwater pumping from wells that may affect flow from Reinhackle Spring are managed so that flows from the spring are not significantly reduced compared to flows under prevailing natural conditions. Table 2.10 shows daily flow values for Reinhackle Spring. Over the 2020-21 runoff year, Reinhackle Spring had an average daily flow of about 1.9 cfs.

Analysis of Reinhackle Spring was included in a 2004 cooperative study by LADWP and ICWD on the Owens Valley groundwater geochemistry. During the study, water samples from Reinhackle Spring were chemically analyzed and compared to water sample s from the LAA, nearby pumping wells, samples from the deep aquifer, and samples from shallow monitoring wells. The 2004 study concluded that the water flowing from Reinhackle Spring is similar in composition to aqueduct water and not similar to the deep aquifer samples or up-gradient shallow aquifer wells. Testing to determine the effects of groundwater pumping and LAA seepage on Reinhackle Spring flow was conducted between May 2010 and April 2011. Data and analysis from the 2004 cooperative study and 2010-11 testing have been included in a draft monitoring and operations plan for the Bairs-Georges Wellfield known as the draft Reinhackle Spring Flow Characterization Report and Operations Plan. The draft Reinhackle Spring

Flow Characterization Report and Operations Plan was sent to the Inyo County Water Department for review in November 2012.

Table 2.10. Reinhackle Spring Flow in cfs during 2020-21 Runoff Year

Day of Month	April	May	June	July	August	September	October	November	December	January	February	March	Annual
1	1.84	1.78	2.11	2.14	1.77	2.07	2.12	2.03	1.88	1.69	1.61	*1.57*	
2	1.84	1.76	2.12	2.13	1.79	2.05	2.12	2.03	1.87	1.67	1.61	*1.56*	
3	1.84	1.76	2.12	2.12	1.79	2.04	2.12	2.03	1.84	1.68	1.61	*1.56*	
4	1.82	1.77	2.12	2.11	1.81	2.05	2.12	2.03	1.84	1.66	1.61	*1.56*	
5	1.84	1.77	2.14	2.10	1.81	2.04	2.12	2.03	1.84	1.65	1.61	*1.56*	
6	1.84	1.77	2.17	2.10	1.80	2.07	2.12	2.03	1.84	1.65	1.61	*1.56*	
7	1.84	1.77	2.20	2.09	1.83	2.07	2.12	1.99	1.84	1.65	1.61	*1.56*	
8	1.86	1.77	2.31	2.08	1.84	2.07	2.12	1.98	1.83	1.65	1.61	*1.56*	
9	1.84	1.79	2.32	2.07	1.84	2.07	2.12	1.98	1.79	1.65	1.60	*1.55*	
10	1.84	1.79	2.32	2.06	1.84	2.07	2.12	1.96	1.77	1.65	1.59	*1.55*	
11	1.84	1.79	2.31	2.05	1.84	2.07	2.12	1.93	1.75	1.65	1.56	*1.55*	
12	1.84	1.79	2.31	2.04	1.84	2.12	2.12	1.93	1.74	1.65	1.56	*1.55*	
13	1.84	1.78	2.30	2.03	1.89	2.12	2.12	1.93	1.74	1.65	1.56	*1.55*	
14	1.84	1.78	2.29	1.86	1.98	2.12	2.12	1.93	1.74	1.65	1.56	*1.55*	
15	1.84	1.77	2.28	1.77	1.98	2.12	2.12	1.93	1.74	1.65	1.56	*1.55*	
16	1.84	1.74	2.27	1.79	1.98	2.14	2.10	1.93	1.74	1.65	1.56	*1.55*	
17	1.84	1.75	2.26	1.79	1.93	2.14	2.11	1.90	1.74	1.65	1.56	*1.55*	
18	1.84	1.75	2.25	1.82	1.93	2.12	2.11	1.87	1.73	1.65	1.56	*1.55*	
19	1.84	1.77	2.24	1.86	1.94	2.12	2.10	1.84	1.71	1.65	1.56	*1.55*	
20	1.84	1.79	2.24	1.91	1.94	2.12	2.08	1.85	1.74	1.64	1.56	*1.55*	
21	1.84	1.78	2.23	1.90	1.96	2.12	2.07	1.88	1.74	1.64	1.56	*1.55*	
22	1.84	1.76	2.22	1.84	1.98	2.12	2.07	1.88	1.74	1.64	1.56	*1.55*	
23	1.84	1.78	2.21	1.74	1.98	2.12	2.07	1.87	1.74	1.64	1.56	*1.55*	
24	1.84	1.78	2.20	1.74	1.98	2.12	2.07	1.85	1.74	1.63	1.57	*1.55*	
25	1.84	1.79	2.19	1.74	2.00	2.12	2.07	1.86	1.74	1.61	1.58	*1.55*	
26	1.82	1.79	2.18	1.74	2.03	2.12	2.07	1.87	1.74	1.61	1.59	*1.55*	
27	1.80	1.84	2.17	1.74	2.03	2.12	2.07	1.85	1.73	1.61	1.57	*1.55*	
28	1.79	1.84	2.17	1.74	2.03	2.12	2.03	1.84	1.72	1.61	1.57	*1.55*	
29	1.80	1.84	2.16	1.74	2.03	2.12	2.03	1.86	1.70	1.61		*1.55*	
30	1.79	1.92	2.15	1.74	2.04	2.12	2.03	1.88	1.70	1.61		*1.55*	
31		1.98		1.75	2.06		2.03		1.70	1.61		*1.55*	
Average	1.83	1.79	2.22	1.91	1.92	2.10	2.10	1.92	1.76	1.64	1.58	1.55	1.86

2.8. Water Spreading in the Owens Valley

In years with much greater than normal snowmelt, the volume of runoff may at times exceed the capacity of the LAA system. During periods of high snowpack runoff, LADWP may spread runoff water for operational reasons. In addition, other operational needs may require LADWP to spread water.

LADWP did not spread any water during 2020-21 runoff year and no water spreading is planned in the Owens Valley for the 2021-22 runoff year.