

## PUMPING MANAGEMENT AND GROUNDWATER CONDITIONS

LADWP issued a final pumping plan on May 16, 2011 for the 2011-12 runoff year. LADWP'S planned pumping is shown in Table 2, below. LADWP'S 2011-12 pumping plan complies with the on-off provisions of the Agreement. Inyo County, in comments to the LADWP plan on April 28, 2011, recommended a lesser amount of pumping, shown in column 3 in Table 2, below. On June 29, 2011, Inyo County raised objections to the amount of pumping planned in the Taboose-Aberdeen and Thibaut-Sawmill Wellfields and is seeking resolution through the Technical Group and Standing Committee process, and potentially, through the dispute resolution process contained in the Agreement.

Owens Valley Runoff during the 2010-11 runoff-year was 101% of normal. This was the first year of runoff at or above normal in the last four runoff years. In the runoff-year 2010-11, 78,248 acre-feet of groundwater were pumped from Agreement controlled LADWP wells in the Owens Valley. Table 2 shows pumping for the runoff-year 2010-11 by wellfield within the Owens Valley. This amount was well below the 86,000 acre-feet planned for the 2010-11 runoff-year. Modest pumping and slightly above normal runoff combined to produce a relatively stable shallow water table with small increases and decreases in the water table in the indicator test holes (See Table 1). Water levels generally remain below the levels of the mid-1980's baseline vegetation mapping period with a few exceptions (See Table 1, last column). Of the 35 test holes in Table 1, 4 were above or at the baseline in April 2011. Note that all test holes (two) in the Bairs-Georges Wellfield are above baseline levels. One test hole in Independence-Oak is above baseline and one test hole in Thibaut-Sawmill is also above baseline level.

Table 1. Depth to water (DTW) from Shallow Test Hole Reference Point (R.P.) at Indicator Wells, April 4-5, 2011. All data are in feet. Baseline is the average of 1985, 1986, and 1987 April DTW (given available data). Negative change from April 2010 to April 2011 indicates a declining water table; negative deviation from baseline indicates the water table is below baseline.

Wellfield and Shallow Test Hole Number	DTW, April 2010	DTW, April 2011	Change from April 2010 to April 2011	Baseline DTW from R.P.	Deviation from Baseline, April 2011
<b>Bairs-Georges</b>					
T398	4.35	4.11	0.24	6.4	2.3
T400	6.05	5.59	0.46	6.3	0.7
<b>Symmes-Shepherd</b>					
T402	10.31	9.97	0.34	8.0	-2.0
T510	6.47	6.28	0.19	5.0	-1.3
T403	6.10	7.23	-1.13	5.3	-1.9
T404	4.84	4.85	-0.01	3.6	-1.3
T511	6.51	6.35	0.16	4.6	-1.8
T447	34.03	35.75	-1.72	21.9	-13.9
<b>Independence-Oak</b>					
T407	9.65	9.81	-0.16	7.3	-2.5
T406	4.12	3.36	0.76	1.6	-1.8
T408	2.69	2.73	-0.04	3.1	0.4
T409	4.58	4.27	0.31	1.6	-2.7
T546	7.54	5.69	1.85	3.4	-2.3
T412	8.44	4.63	3.81	3.6	-1.0
T453	8.77	7.75	1.02	5.5	-2.3
<b>Thibaut-Sawmill</b>					
T413	14.37	14.32	0.05	9.3	-5.0
T414	12.70	12.55	0.15	7.1	-5.5

<b>T415</b>	22.96	21.79	<b>1.17</b>	18.5	<b>-3.3</b>
<b>T507</b>	5.21	4.62	<b>0.59</b>	4.7	<b>0.1</b>
<b>Taboose-Aberdeen</b>					
<b>T417</b>	31.58	31.62	<b>-0.04</b>	27.0	<b>-4.6</b>
<b>T418</b>	8.70	9.72	<b>-1.02</b>	8.2	<b>-1.5</b>
<b>T419</b>	6.80	7.88	<b>-1.08</b>	6.6	<b>-1.3</b>
<b>T421</b>	33.68	35.53	<b>-1.85</b>	34.0	<b>-1.5</b>
<b>T502</b>	8.02	9.23	<b>-1.21</b>	7.5	<b>-1.7</b>
<b>T504</b>	10.09	11.39	<b>-1.30</b>	10.8	<b>-0.6</b>
<b>T505</b>	23.19	23.29	<b>-0.10</b>	18.6	<b>-4.7</b>
<b>Big Pine</b>					
<b>T425</b>	17.56	17.58	<b>-0.02</b>	14.9	<b>-2.7</b>
<b>T426</b>	13.71	13.33	<b>0.38</b>	11.6	<b>-1.7</b>
<b>T469</b>	23.18	22.94	<b>0.24</b>	21.7	<b>-1.2</b>
<b>T572</b>	14.51	13.82	<b>0.69</b>	12.1	<b>-1.7</b>
<b>Laws</b>					
<b>T107</b>	31.40	32.48	<b>-1.08</b>	24.0	<b>-8.5</b>
<b>T436</b>	10.69	10.79	<b>-0.10</b>	8.1	<b>-2.7</b>
<b>T438</b>	14.62	11.87	<b>2.75</b>	9.6	<b>-2.3</b>
<b>T490</b>	15.14	14.85	<b>0.29</b>	13.1	<b>-1.8</b>
<b>T492</b>	32.69	33.37	<b>-0.68</b>	32.8	<b>-0.6</b>

The groundwater recharge estimation methods used for the groundwater mining calculations mandated by the Green Book show approximately 141,000 acre-feet of estimated recharge for the 2010 water-year (October 2009 through September 2010) for the Owens Valley. In contrast, pumping for the 2010 water-year was 73,350 acre-feet (LADWP's Table 4, 2011-12 final operations plan).

Table 2. LADWP Actual pumping by wellfield for the 2010-11 runoff-year and LADWP Planned pumping for the 2011-12 runoff-year.

<b>Wellfield</b>	<b>Actual Pumping in Acre-Feet for the 2010-11 Runoff Year</b>	<b>LADWP Planned Pumping in Acre-Feet for the 2011-12 Runoff Year</b>	<b>Inyo County Recommendation (Acre-Feet)</b>
<b>Lone Pine</b>	647	960	960
<b>Bairs-Georges</b>	1,350	950	950
<b>Symmes-Shepherd</b>	6,734	6,900	1,200
<b>Independence-Oak</b>	6,481	7,540	6,500
<b>Thibaut-Sawmill</b>	13,316	17,200	12,800
<b>Taboose-Aberdeen</b>	10,069	14,000	10,000
<b>Big Pine</b>	23,392	28,850	21,500
<b>Bishop</b>	9,828	8,400	8,400
<b>Laws</b>	6,431	6,200	6,200
<b>Total</b>	<b>78,248</b>	<b>91,000</b>	<b>68,510</b>



## Review of Conditions by Area

### Laws Wellfield

In the Laws Wellfield, located north and east of Bishop, the water table responds dramatically to pumping and recharge (e.g. hydrograph for T492 in Figure 1). Shallow water table hydrographs for test holes T107, T436, T438, T490 and T492 are shown in Figure 1. Pumping in the 2010-11 runoff-year was 6,431 acre-feet, all of which was used in the Laws area. Approximately 2,000 acre-feet of water was diverted from the Owens River into the McNally Canals during the 2010-11 runoff year. Groundwater levels declined in 3 out of 5 test holes and all test holes are below baseline water levels (See Table 1). Declines were due to pumping for uses in the wellfield and evapotranspiration. Please note that all the following wellfield pumping bar charts have an estimated data set for the runoff year 2010-11.

**Figure 1. Laws Wellfield Hydrographs of Test Holes T107, T436, T438, T490 and T492**

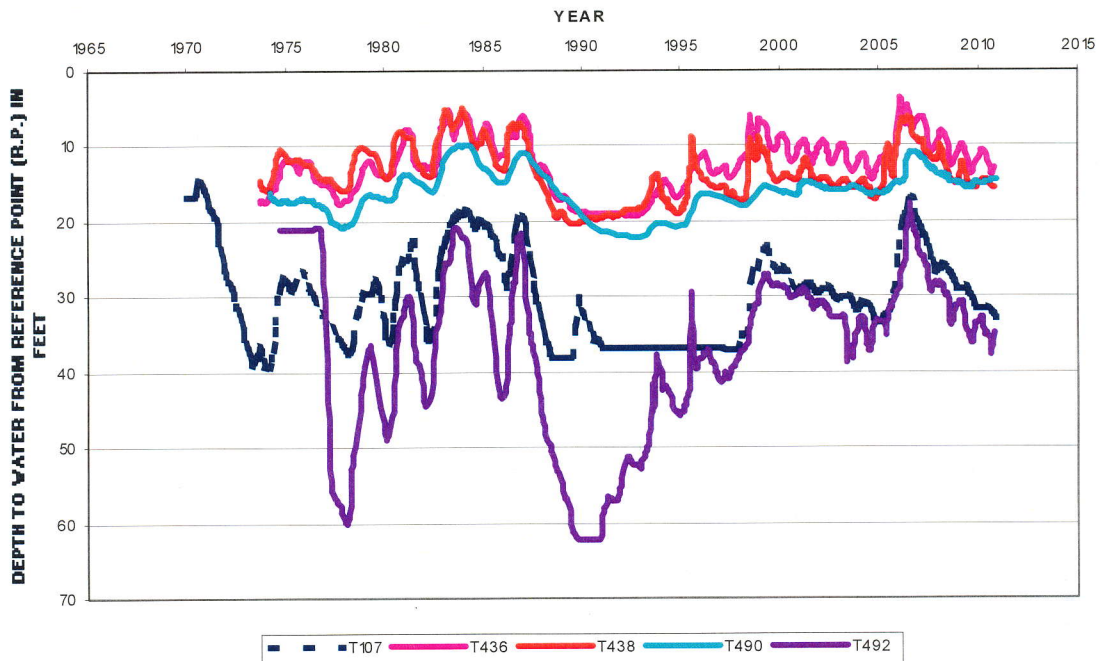
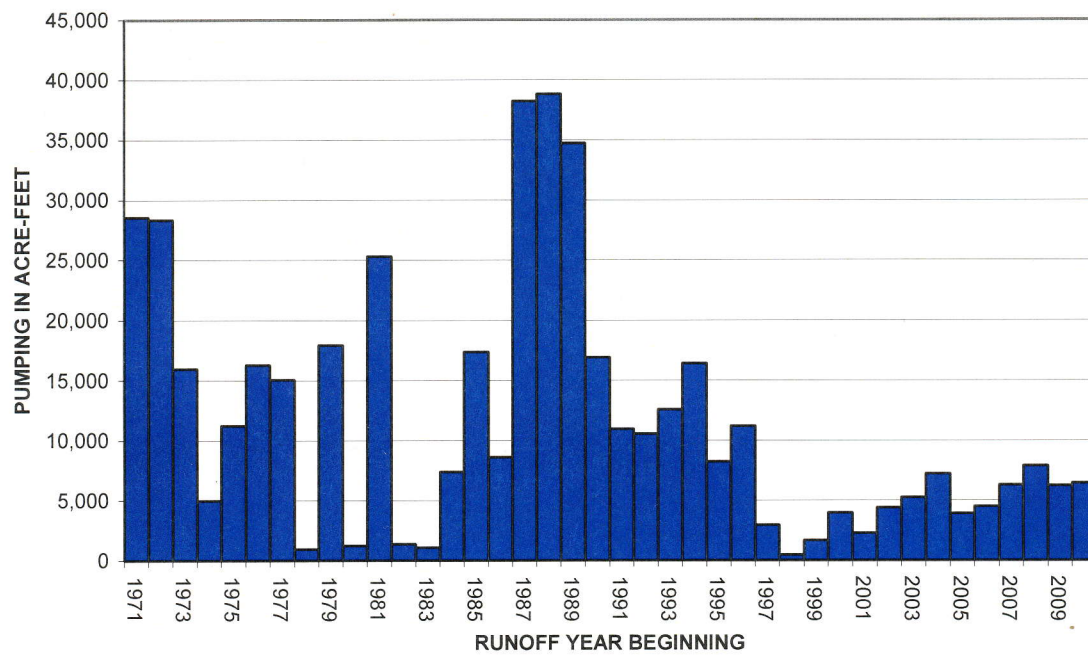


Figure 2. Laws Pumping

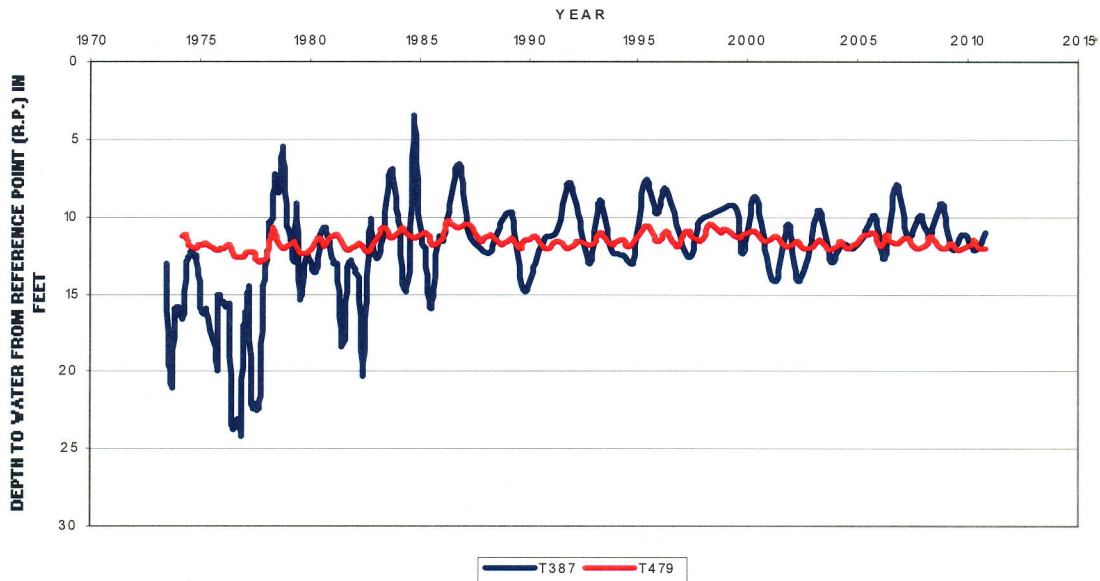




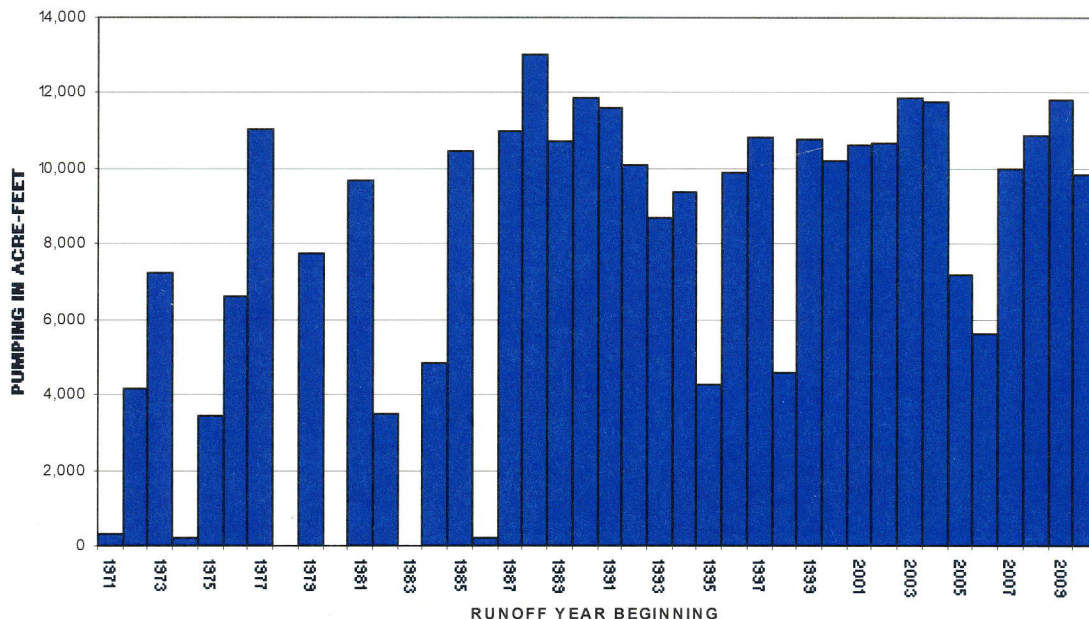
## Bishop Cone Wellfield

Pumping on the Bishop Cone was 9,828 acre-feet for the 2010-11 runoff-year. Shallow water table hydrographs for test holes T387 and T479 are shown in Figure 3. Generally, pumping from wells on the Bishop Cone and recharge from the extensive network of canals, ditches and creeks balance to produce stable water levels. The Bishop Cone Wellfield is managed consistent with the Hillside Decree and the Water Agreement. In the Bishop Cone Audit for the 2009-10 runoff-year measured water use was reported as 22,635.73 acre-feet compared to total groundwater extraction at 16,816 acre-feet which demonstrates that total groundwater extraction did not exceed water usage on Los Angeles-owned land on the Bishop Cone. The Bishop Cone Audit for the 2010-11 runoff year is in process and data have been requested by the Inyo County Water Department. The 2010-11 audit is expected to be finalized by the end of the 2011 calendar year or early in 2012.

**Figure 3. Bishop Cone Wellfield Hydrographs of Test Holes T387 and T479**



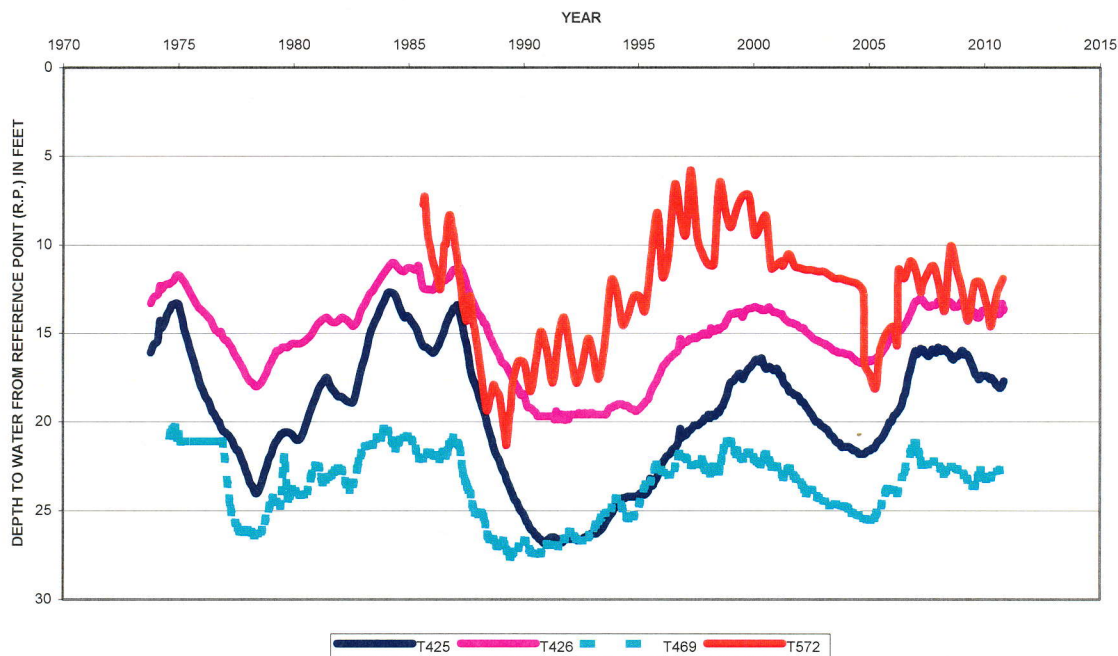
**Figure 4. Bishop Cone Pumping**



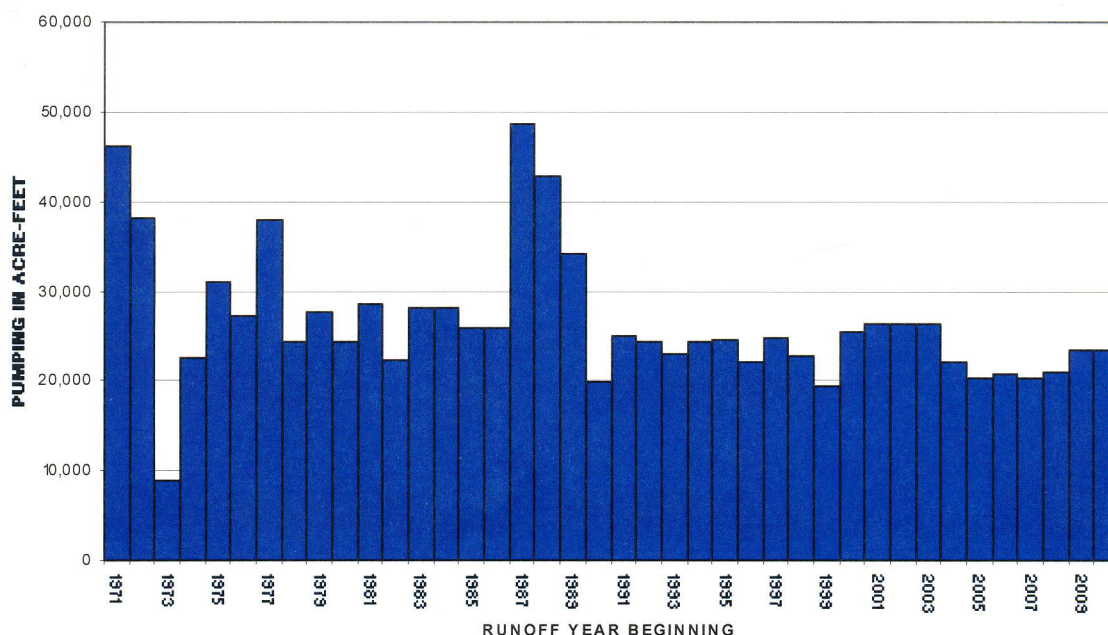
## The Big Pine Wellfield

Pumping in the Big Pine Wellfield for the 2010-11 runoff-year was 23,392 acre-feet. Pumping has been historically relatively high compared to other wellfields to supply the California Department of Fish and Game (CDFG) Fish Springs Fish Hatchery. Shallow water table hydrographs for test holes T425, T426, T469 and T572 are shown in Figure 5. Groundwater levels in April 2011 increased slightly in 3 out of 4 test holes. In all four test holes groundwater water levels remain a foot or more below baseline levels (See Table 1).

**Figure 5. Big Pine Wellfield Hydrographs of Test Holes T425, T426, T469 and T572**



**Figure 6. Big Pine Wellfield Pumping**

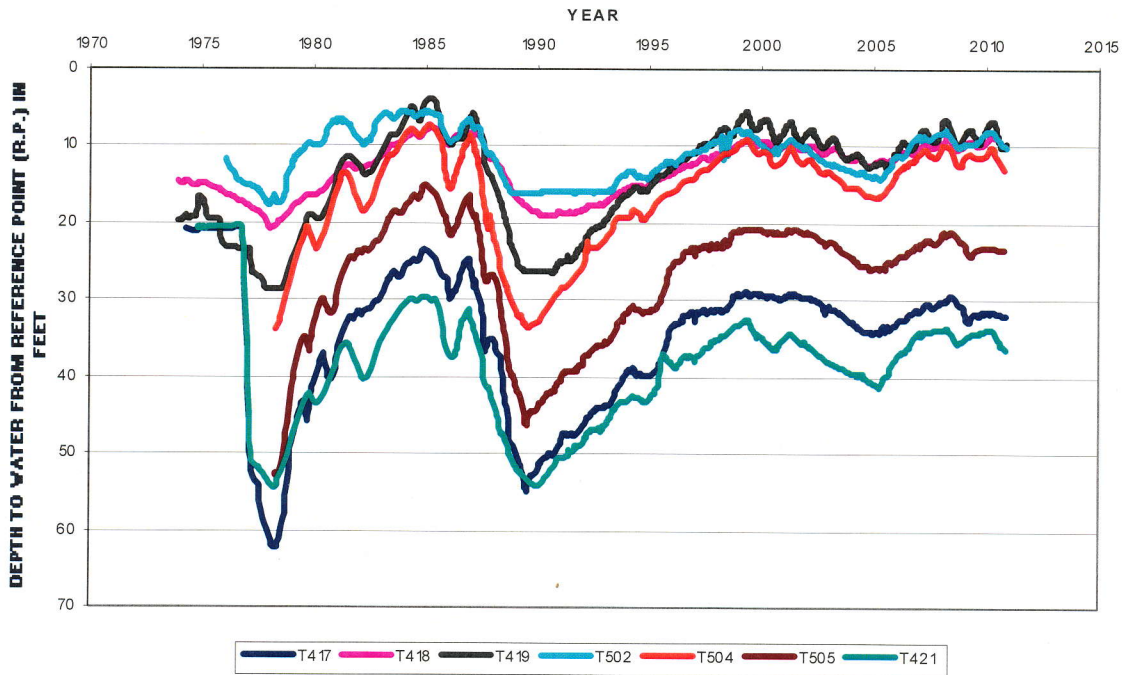




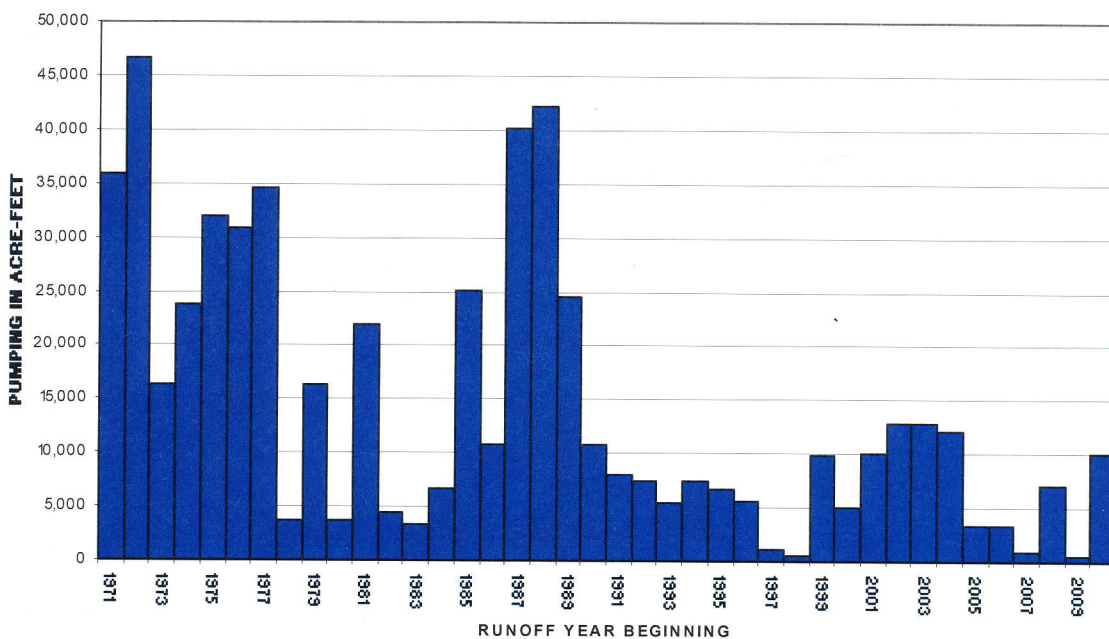
## The Taboose-Aberdeen Wellfield

Pumping in the Taboose-Aberdeen Wellfield for the 2010-11 runoff-year was 10,069 acre-feet. Shallow water table hydrographs for test holes T417, T418, T419, T421, T502, T504 and T505 are shown in Figure 7. Groundwater levels in April 2011 declined in all 7 test holes. In all of the seven test holes in Table 1, groundwater levels are below baseline levels. In the past this wellfield has undergone large pumping induced fluctuations (See Figure 7).

**Figure 7. Taboose-Aberdeen Wellfield Hydrographs of Test Holes T417, T418, T419, T421, T502, T504 and T505**



**Figure 8. Taboose-Aberdeen Wellfield Pumping**

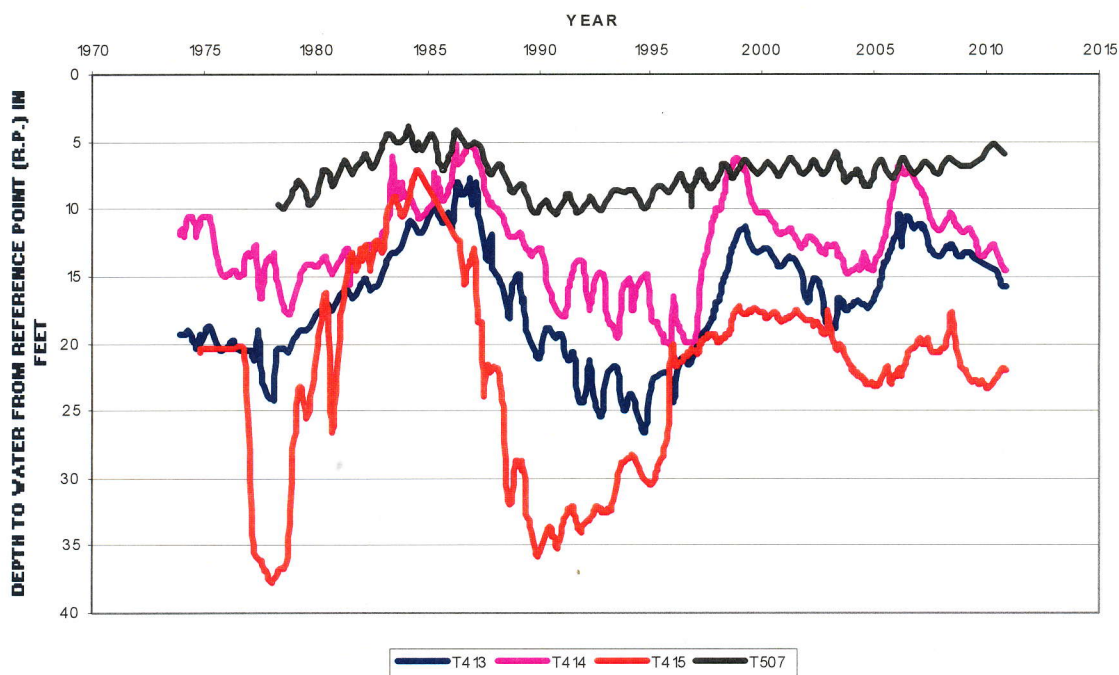




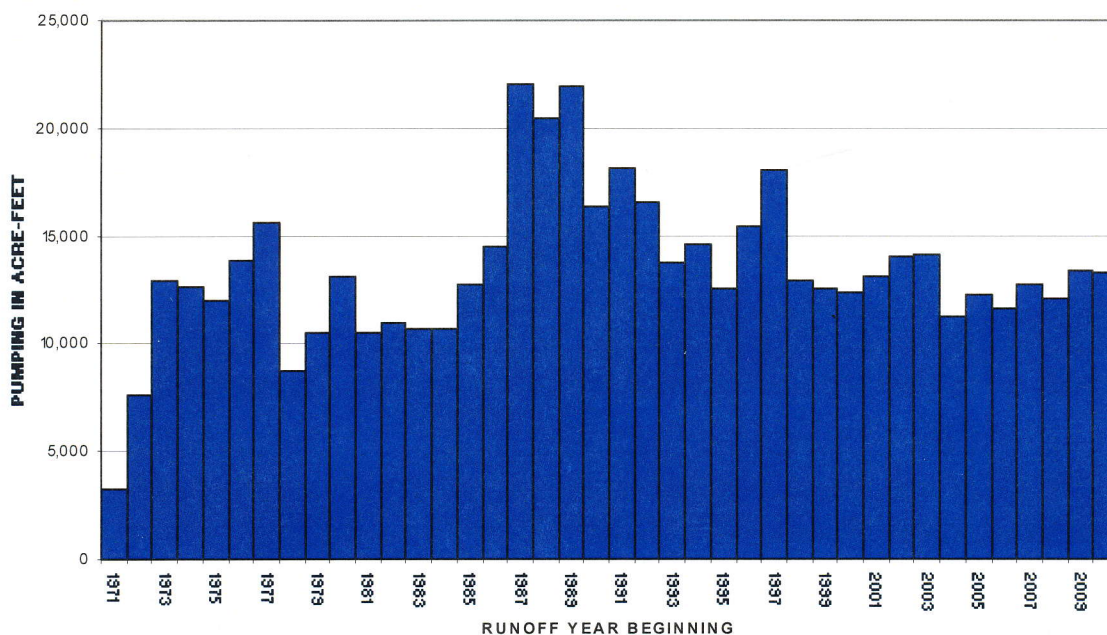
## The Thibaut-Sawmill Wellfield

Pumping in the Thibaut-Sawmill Wellfield for the 2010-11 runoff-year was 13,316 acre-feet. Historically pumping has been approximately this amount or higher for the Blackrock Fish Hatchery of the CDFG. Shallow water table hydrographs for test holes T413, T414, T415 and T507 are shown in Figure 9. Groundwater levels in April 2011 increased in all test holes in this wellfield (See Table 1). In all but one of the indicator test holes in the Thibaut-Sawmill Wellfield water levels remain below the baseline levels (See Table 1). In the past this wellfield has undergone large pumping-induced fluctuations (See Figure 9).

**Figure 9. Thibaut-Sawmill Wellfield Hydrographs of Test Holes T413, T414, T415 and T507**



**Figure 10. Thibaut-Sawmill Wellfield Pumping**



## The Independence-Oak Wellfield

Pumping in the Independence-Oak Wellfield for the 2010-11 runoff-year was 6,481 acre-feet. Shallow water table hydrographs for test holes T407, T406, T408, T409, T546, T412 and T453 are shown in Figures 11 and 12. Groundwater levels in 2 of the 7 test holes decreased while 5 increased in April 2011 (See Table 1). In 6 of the indicator test holes in the Independence-Oak Wellfield water levels remain below the baseline levels (See Table 1). In one test hole water level is above baseline levels. In the past this wellfield has experienced sustained pumping due to the large number of exempt wells for E/M project demand.

Figure 11. Independence-Oak Wellfield Hydrographs of Test Holes T406, T407, T408, and T409

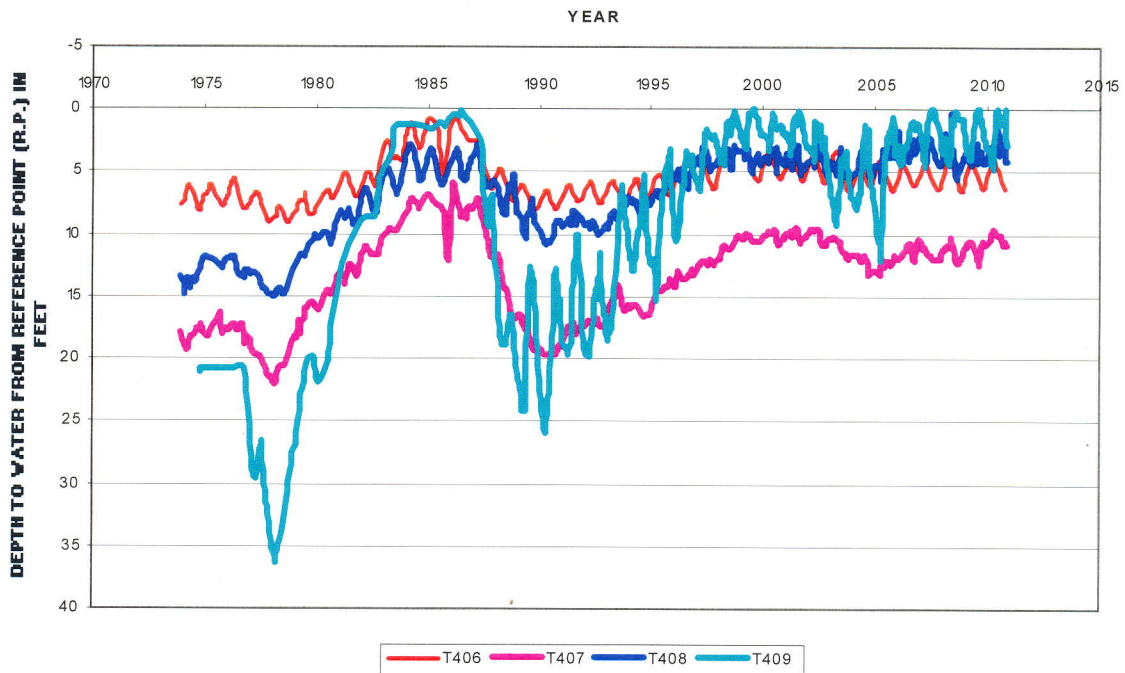


Figure 12. Independence-Oak Wellfield Hydrograph of Test Holes T412, T453, and T546

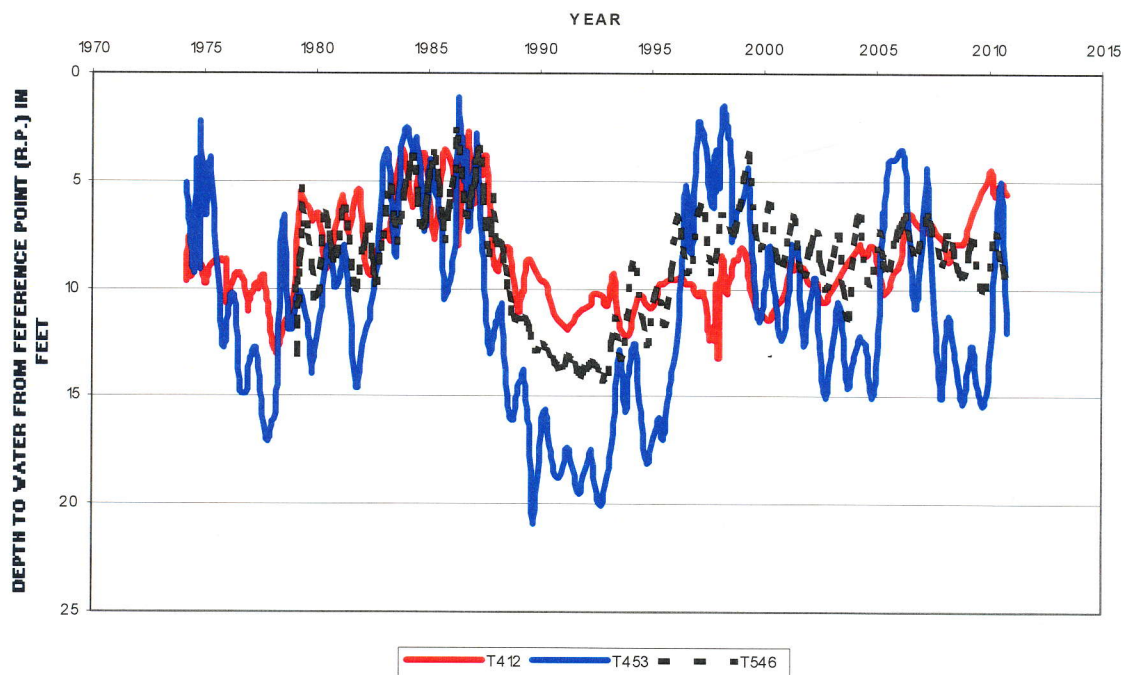
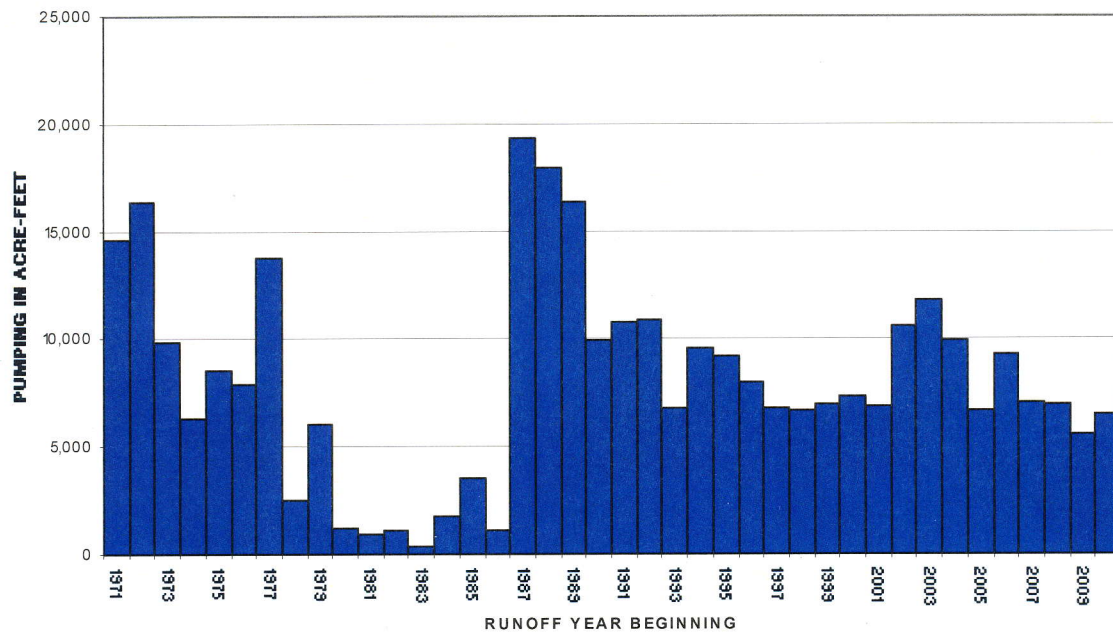


Figure 13. Independence-Oak Wellfield Pumping

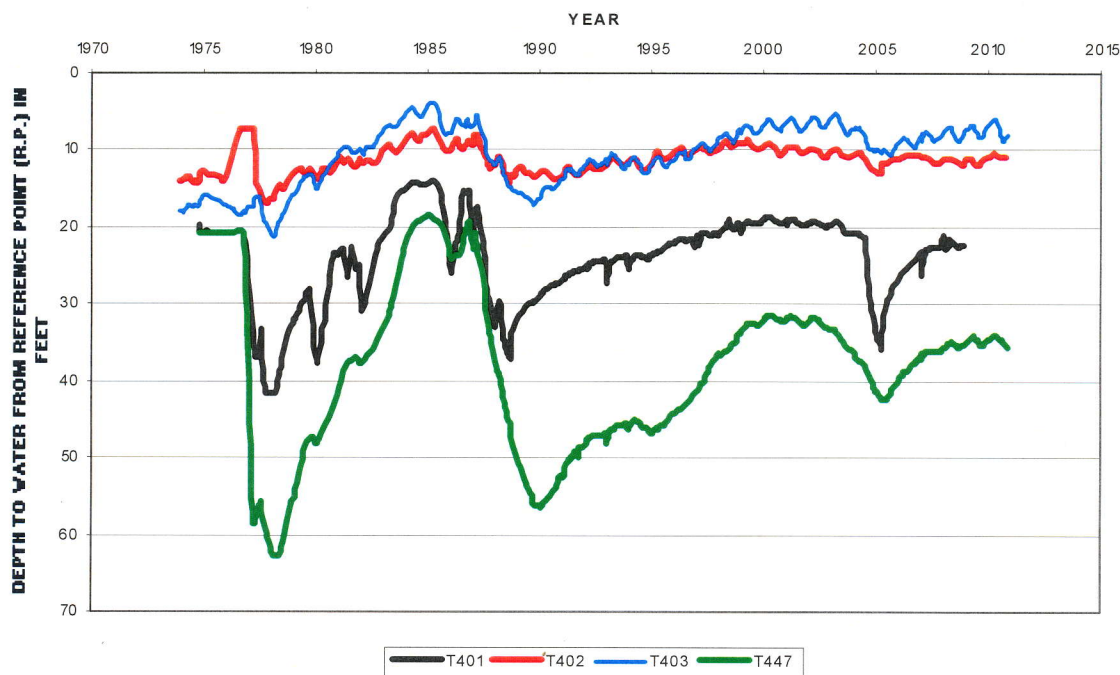




## The Symmes-Shepherd Wellfield

Pumping in the Symmes-Shepherd Wellfield for the 2010-11 runoff-year was 6,734 acre-feet. Shallow water table hydrographs for test holes T401, T402, T403, T404, T510, T447 and T511 are shown in Figures 14 and 15. Groundwater levels in April 2011 had increased in 3 test holes and decreased in 3 test holes (See Table 1). In all of the six indicator test holes in the Symmes-Shepherd Wellfield water levels remain below the baseline levels (See Table 1). Historically, pumping has varied greatly from this wellfield. Note that test hole T401 has been destroyed by road construction.

**Figure 14. Symmes-Shepherd Wellfield Hydrographs of Test Holes T401, T402, T403 and T447**



**Figure 15. Symmes-Shepherd Wellfield Hydrographs of Test Holes T510, T404 and T511**

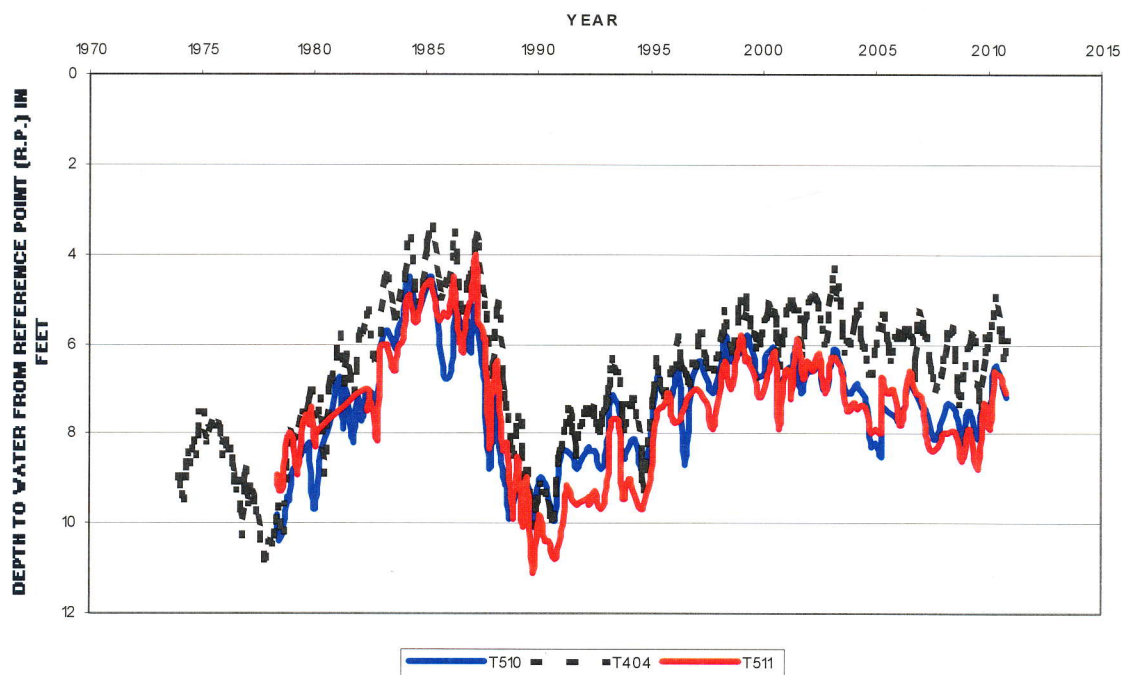
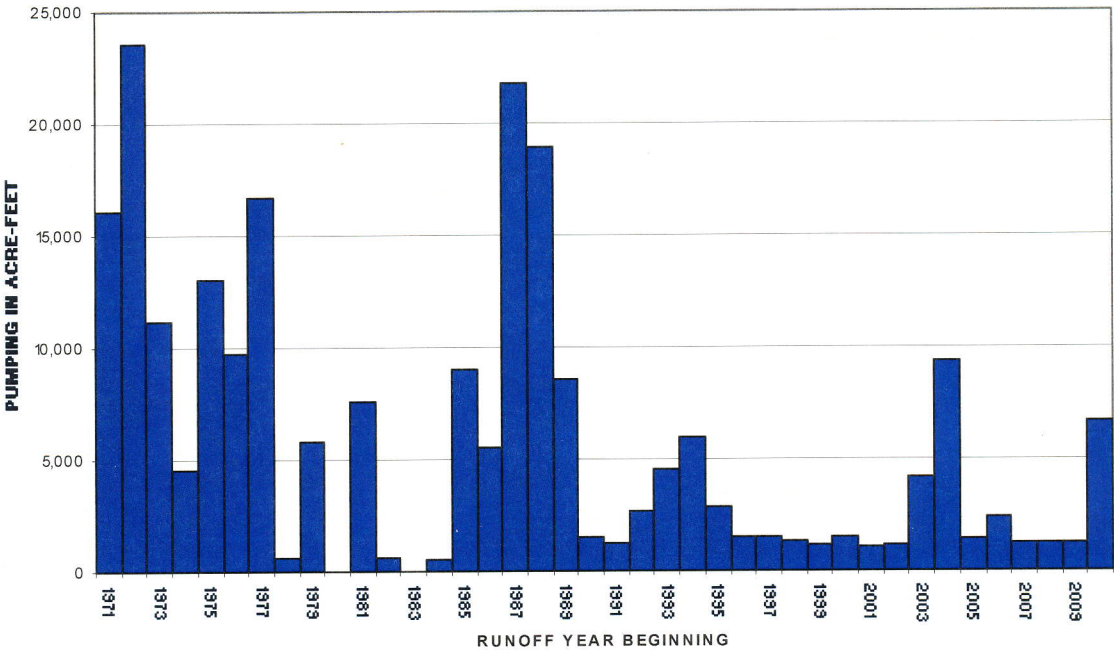


Figure 16. Symmes-Shepherd Wellfield Pumping



## The Bairs-Georges Wellfield

Pumping in the Bairs-Georges Wellfield for the 2010-11 runoff-year was 1,350 acre-feet. Shallow water table hydrographs for test holes T398, T399 and T400 are shown in Figure 17. Groundwater levels in the two remaining indicator test holes in April 2011 had increased (See Table 1). In the two remaining indicator test holes in the Bairs-Georges Wellfield water levels are above the baseline levels (See Table 1). Historically, pumping has varied greatly from this wellfield. Note that test hole T399 has been destroyed by road construction.

Figure 17. Bairs-Georges Wellfield Hydrographs of Test Holes T398, T399 and T400

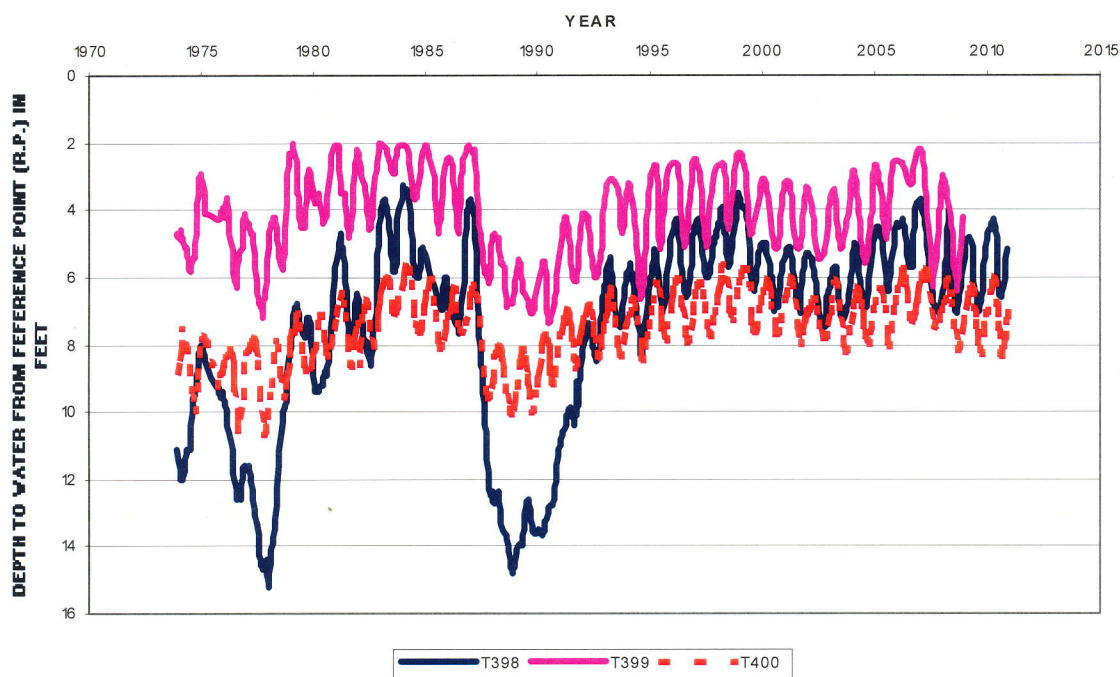
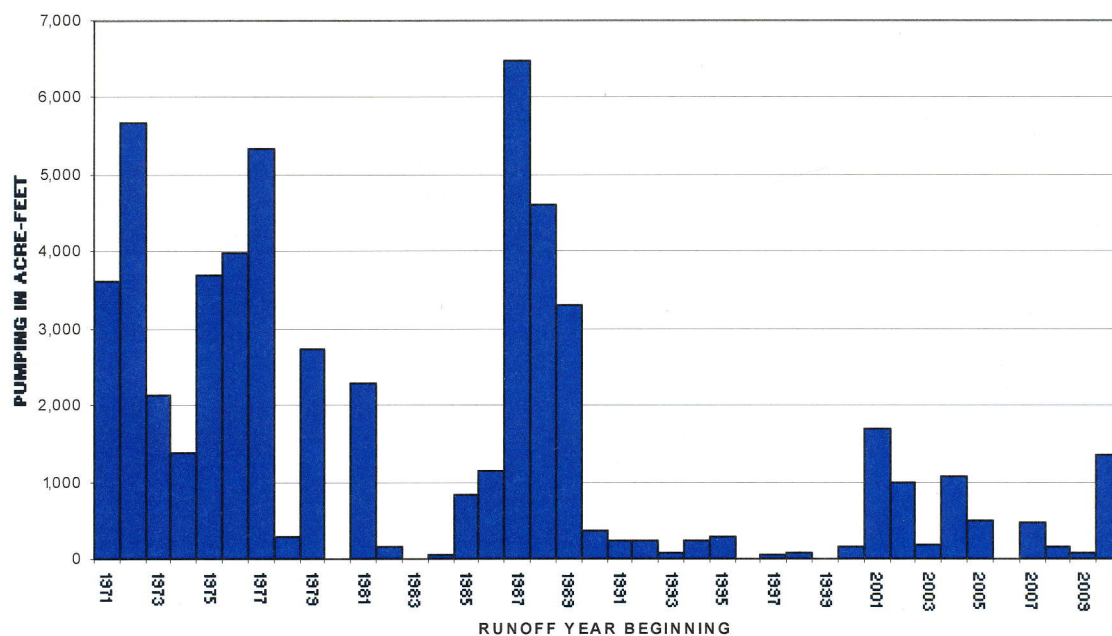


Figure 18. Bairs-Georges Wellfield Pumping

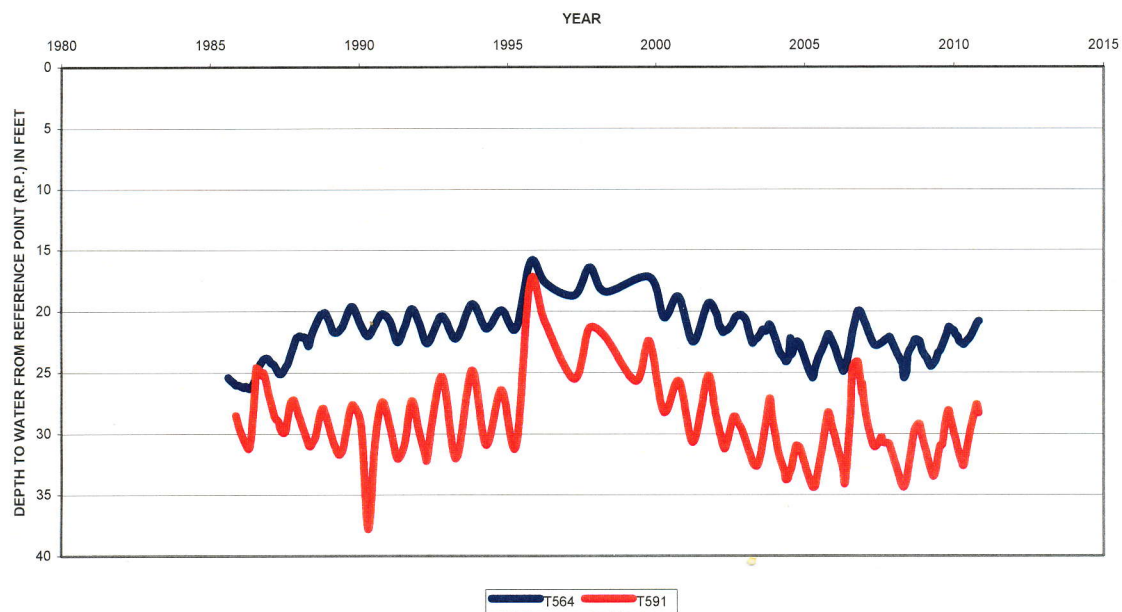




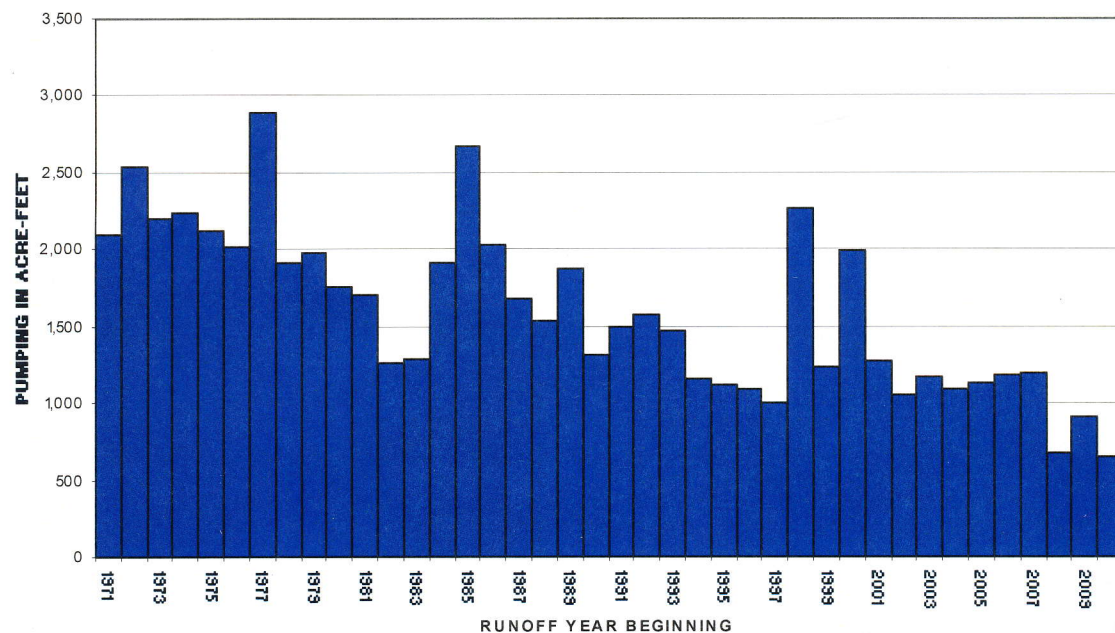
## The Lone Pine Wellfield

Pumping in the Lone Pine Wellfield for the 2010-2011 runoff-year was 647 acre-feet. Shallow water table hydrographs for test holes T564 and T591 are shown in Figure 19 for reference. There are no indicator test holes in this wellfield. Pumping in this wellfield has been principally for town supply, Diaz Lake and an Enhancement /Mitigation irrigation project east of the town. LADWP has constructed a new production well west of the town of Lone Pine to supply the Los Angeles Aqueduct (W416). LADWP and ICWD tested this well in early 2010 and additional testing may be performed during the 2011-12 runoff year, subject to the results of the 2009-10 testing. Any testing of W416 would result in additional groundwater pumping above the planned pumping for the 2011-2012 runoff year. In addition, pumping has occurred and is planned from the Lone Pine town supply well to balance past Diaz Lake water use in the 2011-12 runoff year and this amount of pumping would also result in additional pumping over that currently planned.

**Figure 19. Lone Pine Wellfield Hydrographs of Test Holes T564 and T591**



**Figure 20. Lone Pine Pumping**



## PROJECTIONS CONCERNING THE 2011-12 RUNOFF-YEAR

The April 1, 2011 LADWP Runoff Forecast for the 2011-12 runoff-year was 150% of average. The second year in a row with above average runoff following three consecutive dry years. Using the Inyo County Water Department regression equations, Inyo County measured depth to water in April, 2011 and the planned pumping (Table 2) and planned spreading in the Laws Wellfield (Table 14) in the LADWP 2011-12 Owens Valley Operations Plan, projections concerning April 2012 water levels in the Inyo County Water Department Indicator wells have been made by ICWD Staff. Those projections by ICWD are shown in Table 3 below.

Table 3. Predicted depth to water (DTW) from Shallow Test Hole Reference Point (R.P.) at Indicator Wells, April, 2012. All Data are in Feet. Baseline is the Average of 1985, 1986, and 1987 April DTW (given available data). Negative deviation from baseline Indicates the Water Table is below baseline

<b>Wellfield and Shallow Test Hole Number</b>	<b>DTW, April 2011</b>	<b>Predicted DTW, April 2012</b>	<b>Baseline DTW from R.P.</b>	<b>Predicted Change in DTW, 2011-2012</b>	<b>Deviation from Baseline, April, 2012</b>
<b>Bairs-Georges</b>					
T398	4.11	4.65	6.4	-0.54	1.8
T400	5.59	5.91	6.3	-0.32	0.4
<b>Symmes-Shepherd</b>					
T402	9.97	9.89	8.0	0.08	-1.9
T510	6.28	6.51	5.0	-0.23	-1.5
T403	7.23	7.81	5.3	-0.58	-2.5
T404	4.85	5.11	3.6	-0.26	-1.5
T511	6.35	6.79	4.6	-0.44	-2.2
T447	35.75	34.89	21.9	0.86	-13.0
<b>Independence-Oak</b>					
T407	9.81	9.81	7.3	0.00	-2.5
T406	3.36	3.26	1.6	0.10	-1.7
T408	2.73	2.83	3.1	-0.10	0.3
T409	4.27	2.50	1.6	1.77	-0.9
T546	5.69	5.63	3.4	0.06	-2.2
<b>Thibaut-Sawmill</b>					
T415	21.79	21.19	18.5	0.60	-2.7
T507	4.62	5.51	4.7	-0.89	-0.8
<b>Taboose-Aberdeen</b>					
T417	31.62	31.22	27.0	0.40	-4.2
T418	9.72	9.53	8.2	0.19	-1.3
T419	7.88	7.93	6.6	-0.05	-1.3
T421	35.53	35.55	34.0	-0.02	-1.6
T502	9.23	8.84	7.5	0.39	-1.3
T504	11.39	12.14	10.8	-0.75	-1.3
T505	23.29	22.91	18.6	0.38	-4.3
<b>Big Pine</b>					
T425	17.58	16.68	14.9	0.90	-1.8
T426	13.33	12.72	11.6	0.61	-1.1
T469	22.94	22.66	21.7	0.28	-1.0
T572	13.82	11.90	12.1	1.92	0.2

<b>Laws</b>					
<b>T107</b>	32.48	28.11	24.0	<b>4.37</b>	<b>-4.1</b>
<b>T436</b>	10.79	9.24	8.1	<b>1.55</b>	<b>-1.1</b>
<b>T438</b>	11.87	10.99	9.6	<b>0.88</b>	<b>-1.4</b>
<b>T490</b>	14.85	13.90	13.1	<b>0.95</b>	<b>-0.8</b>
<b>T492</b>	33.37	30.63	32.8	<b>2.74</b>	<b>2.2</b>



## SHALLOW GROUNDWATER ADJACENT TO THE LOWER OWENS RIVER

Base flows of 40 cubic feet per second were established in the Lower Owens River in the 2007-2008 runoff-year. As of this date three habitat flows have also been released down the Owens River channel.

Shallow test holes adjacent to the Lower Owens River have been monitored by LADWP while base flows were established. A selected number of these test holes are listed in Table 4 along with the distance the test hole is located from the Lower Owens River channel. The test holes are identified as being in a wet reach or dry reach before the rewatering of the Lower Owens River Project took place.

Table 4. Selected Shallow Test Holes Adjacent to the Lower Owens River Project.

Test Hole Number	Distance from the River Channel
T467 (Dry Reach)	700 feet
T463 (Dry Reach)	1070 feet
T448 (Wet Reach)	457 feet
T446 (Wet Reach)	142 feet

A composite hydrograph of these test holes for the period of record is shown in Figure 21. Shallow groundwater levels increased in response to the increase in stage associated with the establishment of base flows in the Lower Owens River where the channel was previously dry and wet. The magnitude of the increase can be read from the composite hydrograph. It should also be noted that groundwater levels are near or in one case exceed the highest levels experienced historically in these four hydrographs after base flows were established in the Lower Owens River.

Figure 21. Hydrographs of Selected Test Holes Adjacent to the Lower Owens River Channel

