APPENDIX F

Demand Management Measure Economic Analysis

DMM 1 – Water Survey Programs for Single-Family Residential and Multi-Family Residential Customers

Description: Conduct water surveys that include both indoor and outdoor components. Provide recommendations and install plumbing retrofit devices where needed.

Assumptions:

1. The implementation schedule is assumed to be as defined for agencies signing the MOU in the year 2005.

2. Number of surveys necessary to complete is 15% of the baseline number of housing units in 2005. 15% of single-family units and 15% of multi-family units will be surveyed within 10 years of the date implementation is to commence. Surveys will be conducted according to the following schedule: 1.5% by end of the first reporting period, 3.6% by end of second reporting period, 6.3% by end of third reporting period, 9.6% by end of fourth reporting period, and 15% by end of the fifth reporting period.

MOU, page 16 and page 17 Section E.d. California legislation requires that plumbing fixtures manufactured, sold or installed after early 1992 be low-water-use fixtures. Therefore, the greatest water savings can be achieved in pre-1992 homes.

3. Single-family water usage = 391 gpd/unit (60% is outdoor use)

Single-family water usage was calculated based on historical water use per connection, and the projected number of ¾" connections in 2005 (based on Rate Study report that 87% of connections are ¾"). It was assumed that the ¾" connections were primarily single and multi-family units. Based on the General Plan for the City, 64% of the ¾" connections were assumed to be single-family and 36% multi-family. The single and multi-family water usages were based on the assumption that the multi-family units use 40% of the water that the single family units use. Outdoor use is based on engineering judgment.

4. Multi-family water usage = 156 gpd/unit (40% is outdoor use)

See assumptions for single-family water usage.

5. Water savings from indoor leak detection, not including toilet leaks = 0.5 gpd per residence

A & N Technical Services report (2000, page 2-20) (12.4 gpd per household repair; 4 percent of households audited have leaks).

6. Water surveys decrease outdoor water use by 10%

MOU estimate is 10% (page 18, Section F).

7. Each water survey costs $55.00

This cost estimate is based on the Southern California Water Company (SCWC) pilot exemption request filed with the CUWCC and dated June 29, 1999. The estimate includes marketing, contract labor, SCWC labor, overhead and materials. It is assumed that the City's cost would be similar to SCWC's. It is assumed that this DMM is done in conjunction with DMM 2.

8. The life span of a water survey is four years.

A & N Technical Services report (2000, page 2-20) gives life spans for various components of a water survey. Four years was selected as a reasonable average value based on that information.

9. Water savings from indoor plumbing retrofits are tracked under DMM 2. Only water savings from a decrease in outdoor water use and water savings from indoor leak detection are tracked in DMM 1 to avoid double counting of water savings.

DMM 2 – Residential Plumbing Retrofit

Description: Install plumbing retrofit devices in single- and multi- family residences.

Assumptions:

1. Plumbing retrofit devices will be installed at a minimum of 10% of residences per reporting period until it can be demonstrated that 75% of pre-1992 single-family residences and 75% of pre-1992 multi-family residences have low flow showerheads (LFSHs). Based on the low growth rate, it is assumed that the current residences were all built prior to 1992.

MOU, page 19.

2. 22.5% of residences have low-water-use fixtures.

We estimate, based on professional judgement, that 45% of plumbing fixtures in pre-1992 residences have been replaced with low-water-use fixtures due to natural attrition. Assuming that one-half of these plumbing fixtures have replaced all fixtures in some pre-1992 residences and one-half of these plumbing fixtures are spread out, replacing only a portion of the fixtures in some pre-1992 residences, then 22.5 percent of pre-1992 residences already have low-water-use fixtures.

3. It will take approximately 15 years to demonstrate that 75% of residences have LFSHs.

We are assuming that two LFSHs in a residence must be replaced to meet MOU requirements. If 22.5% of the residences have low-water-use fixtures, then 52.5% of the pre-1992 residences must still be replaced. At 5% of the residences replaced per year (10% replaced per reporting period) it would take 15 years to demonstrate that a total of 75% of residences have LFSHs.

4. There are an average of 1.1 showers, 1.6 toilets, and 2.4 faucets (1 kitchen faucet and 1.4 other faucets) per residence.

For DMM 14, we determined that there is an average of 1.6 toilets per residence (see DMM 14 for details). Based on professional judgement, we assumed there are two-thirds the number of showers as toilets, and 1.5 times the number of faucets as toilets. This assumption will be modified based upon updated data gathered in the future.

5. Water savings from one low-flow showerhead = 5.5 gpd

A & N Technical Services report (2000, page 2-16).

6. Water savings from one faucet aerator = 1.5 gpd

A & N Technical Services report (2000, page 2-16).

7. Water savings from one toilet flapper = 8 gpd; assume 20 percent of toilets leak.

A & N Technical Services report (2000, page 2-16). Percentage of toilets with leaks based on SCWC data.

8. Water savings from kitchen "flip" faucet aerator = 3.0 gpd.

Based on SCWC data. Kitchen faucet water savings are due to the intermittent use of the flip feature during the rinse cycle.

9. Indoor water savings = 13.7 gpd/unit.

We used the following equation to calculate indoor water savings, based on assumptions 4 through 8:

$$[(1.1*5.5) + (1.0*3.0+1.4*1.5) + (1.6*8*0.20)]$$

10. The DMM will cost an average of $20.00 per residence.

We based this cost estimate on information provided by SCWC. It is assumed that this DMM is done in conjunction with DMM 1.

11. The life span of the retrofit devices is four years.

A & N Technical Services report (2000, page 2-16) gives life spans for various components of a water survey. We selected four years as a reasonable average value based on that information.

DMM 6 – High-Efficiency Washing Machine Rebate Programs
Description: Provide rebates to single-family residences for high-efficiency washing machines.
Assumptions 1. Each rebate will cost $75. *The MOU does not require implementation of this DMM if the maximum cost-effective rebate is less than $50 (MOU, page 31). A $50 rebate plus an additional $25 per rebate for program administration and overhead was assumed.* 2. Each high efficiency washing machine will reduce water usage by 1,170 gallons per year. *MOU, Section F, page 38.* 3. Rebates will be accepted by one percent of single-family residences per year for 20 years. *Estimate based on professional judgment.* 4. The life span of a high efficiency washing machine is 12 years. *Pekelney, D.M., T.W. Chesnutt, and W.M. Hanemann. 1996. Guidelines for Preparing Cost Effective Analysis of Urban Water Conservation Best Management Practices. Prepared for the California Urban Water Conservation Council. September 1996.*

DMM 14 – Residential ULFT Replacement Programs
Description: Implement a program to replace existing high-water-using toilets with ultra-low-flush toilets (ULFT) in single- and multi-family residences.

Assumptions:

1. There are an average of 2.5 people per single-family residence and 2.5 people per multi-family residence.

Based on information in the General Plan for the City.

2. There are an average of 1.6 toilets per single-family residence and 1.5 toilets per multi-family residence.

Based on professional judgment, it was assumed a one bedroom unit has 1 toilet, a two bedroom unit has 1.5 toilets, a three bedroom unit has 2 toilets, a four bedroom unit has 2.5 toilets and a five bedroom unit has 3 toilets. Because multi-family units tend to have fewer toilets on average than single-family units, it was assumed 1.5 toilets per multi-family residence and calculated that the single-family units would need to have 1.6 toilets per unit to achieve an overall average of 1.58 toilets per dwelling unit.

3. Water savings from ULFTs are 36.5 gpd/unit for single-family residences and 49.0 gpd/unit for multi-family residences.

MOU, Exhibit 6, Table 1 and Table 2.

4. Homes constructed after 1991 already have ULFTs. Based on the low growth rate, it is assumed that no residences were built after 1991.

As of January 1992, California legislation requires that ULFTs be installed in all newly constructed homes.

5. The life span of the new ULFTs is 20 years.

MOU, page 70.

6. Natural toilet replacement rate is 4% per year.

MOU, page 70.

7. Average resale rate for single-family units in Mendocino County is 2.56%

Assumption based on the 1996 single-family average resale rate for Mendocino County. This rate was obtained from the CUWCC Website, www.cuwcc.org, December 2005.

8. Average resale rate for multi-family units in Mendocino County is 1.2%

Assumption based on the 1998 multi-family average resale rate for Mendocino County. This rate was obtained from the CUWCC Website, www.cuwcc.org, December 2005.

9. The cost of toilets, advertising, administration, overhead, and toilet recycling is $150 per ULFT. The cost does not include installation, which will be covered by the customer.

City of Ukiah
Economic Analysis Worksheets
BMP 1. Water Survey Programs for Single-Family and Multi-Family Residential Customers

													Benefits ($)					Costs ($)					
Calendar Year	**Single Family Interventions**	**Multi Family Interventions**	**Percent Units Surveyed[a]**	**Single-Family Outdoor Savings (AF/yr)**	**Multi-Family Outdoor Savings (AF/yr)**	**Total Outdoor Savings (AF/yr)**	**Total Indoor Savings (AF/yr)**	**Annual Water Savings (AF/yr)**	**1**	**2**	**3**	**4**	**Avoided Capital Costs**	**Avoided Variable Costs**	**Avoided Purchase Costs**	**Total Undiscounted Benefits**	**Total Discounted Benefits**	**Capital Costs**	**Financial Incentives**	**Operating Expenses**	**Total Undiscounted Costs**	**Total Discounted Costs**	**Net Present Value ($)**
Pre-2006	0	0	0.0%	0	0.0	0	0.00	0	0.0				0	0	0	0	0	0	0	0	0	0	0
2006	24	13	0.8%	1.05	0.2	1.28	0.02	1.30	1.3	0.0			0	744	0	744	701	0	0	2,054	2,054	1,935	-1,234
2007	24	13	0.8%	1.05	0.2	1.28	0.02	2.61	1.3	1.3	0.0		0	1,487	0	1,487	1,320	0	0	2,054	2,054	1,823	-503
2008	33	19	1.1%	1.47	0.3	1.79	0.03	4.43	1.8	1.3	1.3	0.0	0	2,529	0	2,529	2,114	0	0	2,875	2,875	2,404	-290
2009	33	19	1.1%	1.47	0.3	1.79	0.03	6.25	1.8	1.8	1.3	1.3	0	3,570	0	3,570	2,812	0	0	2,875	2,875	2,265	547
2010	43	24	1.4%	1.88	0.4	2.31	0.04	7.30	2.3	1.8	1.8	1.3	0	4,165	0	4,165	3,090	0	0	3,697	3,697	2,743	347
2011	43	24	1.4%	1.88	0.4	2.31	0.04	8.34	2.3	2.3	1.8	1.8	0	4,760	0	4,760	3,327	0	0	3,697	3,697	2,584	743
2012	53	30	1.7%	2.30	0.5	2.82	0.05	9.38	2.9	2.3	2.3	1.8	0	5,355	0	5,355	3,526	0	0	4,518	4,518	2,975	551
2013	53	30	1.7%	2.30	0.5	2.82	0.05	10.42	2.9	2.9	2.3	2.3	0	5,950	0	5,950	3,691	0	0	4,518	4,518	2,803	888
2014	86	48	2.7%	3.77	0.8	4.61	0.08	12.77	4.7	2.9	2.9	2.3	0	7,289	0	7,289	4,260	0	0	7,394	7,394	4,321	-61
2015	86	48	2.7%	3.77	0.8	4.61	0.08	15.11	4.7	4.7	2.9	2.9	0	8,627	0	8,627	4,750	0	0	7,394	7,394	4,071	679
2016								12.25		4.7	4.7	2.9	0	6,991	0	6,991	3,626						3,626
2017								9.38			4.7	4.7	0	5,355	0	5,355	2,616						2,616
2018								4.69				4.7	0	2,677	0	2,677	1,232						1,232
2019																							
2020																							
2021																							
2022																							
2023																							
2024																							
2025																							
Totals:	478	269	15%	--	--	--	--	104					0	59,499	0	59,499	37,066	0	0	41,077	41,077	27,924	9,142

Note: Economic analysis performed in 2005 dollars.

[a]Percent surveyed from MOU, Exhibit 1,1.E(d)

Value of conserved water ($/AF) =	$1,206
Discount rate (real) =	6.15%
Indoor water savings (gpd/unit) =	0.50
Outdoor water savings =	10%
Single-family outdoor water usage (gpd/unit) =	391
Multi-family outdoor water usage (gpd/unit) =	156
Conservation measure unit cost ($) =	55.00
2005 single family units =	3,187
2005 multi-family units =	1,792
Year signed MOU =	2005
Year implement BMP =	2006

Benefit to cost ratio:	**1.33**
Simple pay-back period (years):	**9.8**
Discounted cost / water saved ($/acre-feet):	**268**
NPV / water saved ($/acre-feet):	**88**

Credit Table for Previously Performed Surveys

Year	Single family units surveys	Multi-family units surveys	% Credit	Single family credits	Multi-family credits
Pre-1990			0.0%	0	0
1990			12.5%	0	0
1991			25.0%	0	0
1992			37.5%	0	0
1993			50.0%	0	0
1994			62.5%	0	0
1995			75.0%	0	0
1996			87.5%	0	0
1997			100.0%	0	0
1998			100.0%	0	0
1999			100.0%	0	0
2000			100.0%	0	0
2001			100.0%	0	0
2002			100.0%	0	0
2003			100.0%	0	0
2004			100.0%	0	0
2005			100.0%	0	0
				0	0

Implementation schedule (MOU Exhibit 1.E.d, page 17)

On track if the percent of single family and multi-family accounts receiving surveys equals or exceeds:

1.5%	by end of first reporting period
3.6%	by end of second reporting period
6.3%	by end of third reporting period
9.6%	by end of fourth reporting period
13.5%	by end of fifth reporting period
15%	Single family surveys within 10 years
15%	Single family surveys within 10 years

City of Ukiah
Economic Analysis Worksheets
BMP 2. ***Residential Plumbing Retrofit***

						Benefits ($)					Costs ($)					
Calendar Year	**Single Family Interventions**	**Multi Family Interventions**	**Percent Units Receiving Retrofits**	**Incremental Water Savings (AF/yr)**	**Annual Water Savings (AF/yr)**	**Avoided Capital Costs**	**Avoided Variable Costs**	**Avoided Purchase Costs**	**Total Undiscounted Benefits**	**Total Discounted Benefits**	**Capital Costs**	**Financial Incentives**	**Operating Expenses**	**Total Undiscounted Costs**	**Total Discounted Costs**	**Net Present Value ($)**
2006	159	90	5.0%	3.8	4	0	4,608	0	4,608	4,341	0	0	4,979	4,979	4,691	-350
2007	159	90	5.0%	3.8	8	0	9,215	0	9,215	8,178	0	0	4,979	4,979	4,419	3,759
2008	159	90	5.0%	3.8	11	0	13,823	0	13,823	11,557	0	0	4,979	4,979	4,163	7,394
2009	159	90	5.0%	3.8	15	0	18,430	0	18,430	14,516	0	0	4,979	4,979	3,922	10,595
2010	159	90	5.0%	3.8	15	0	18,430	0	18,430	13,675	0	0	4,979	4,979	3,694	9,981
2011	159	90	5.0%	3.8	15	0	18,430	0	18,430	12,883	0	0	4,979	4,979	3,480	9,402
2012	159	90	5.0%	3.8	15	0	18,430	0	18,430	12,136	0	0	4,979	4,979	3,279	8,858
2013	159	90	5.0%	3.8	15	0	18,430	0	18,430	11,433	0	0	4,979	4,979	3,089	8,345
2014	159	90	5.0%	3.8	15	0	18,430	0	18,430	10,771	0	0	4,979	4,979	2,910	7,861
2015	159	90	5.0%	3.8	15	0	18,430	0	18,430	10,147	0	0	4,979	4,979	2,741	7,406
2016	159	90	5.0%	3.8	15	0	18,430	0	18,430	9,559	0	0	4,979	4,979	2,582	6,977
2017	159	90	5.0%	3.8	15	0	18,430	0	18,430	9,005	0	0	4,979	4,979	2,433	6,572
2018	159	90	5.0%	3.8	15	0	18,430	0	18,430	8,483	0	0	4,979	4,979	2,292	6,192
2019	159	90	5.0%	3.8	15	0	18,430	0	18,430	7,992	0	0	4,979	4,979	2,159	5,833
2020	159	90	5.0%	3.8	15	1	18,430	1	18,432	7,530	0	0	4,979	4,979	2,034	5,496
2021				0	11	2	13,823	2	13,827	5,321						
2022				0	8	3	9,215	3	9,221	3,343						
2023				0	4	4	4,608	4	4,616	1,576						
2024																
2025																
Totals:	2,390	1,344	--	--	229	10	276,453	10	276,473	162,446	0	0	74,685	74,685	47,887	104,319

Note: Economic analysis performed in 2005 dollars.	Value of conserved water ($/AF) =	$1,206	Benefit to cost ratio: **3.4**
	Discount rate (real) =	6.15%	Simple pay-back period (years): **4**
	Water savings (gpd/unit) =	13.7	Discounted cost / water saved ($/acre-feet): **209**
	Conservation measure unit cost ($) =	20.00	NPV / water saved ($/acre-feet): **455**
	Percent units receiving retrofits =	5%	
	1991 single family units =	3,187	
	1991 multi-family units =	1,792	
	Year signed MOU =	2005	
	Year implement BMP =	2006	

City of Ukiah
Economic Analysis Worksheets
BMP 6. High-Efficiency Washing Machine Rebate Programs

					Benefits ($)					Costs ($)					
Calendar Year	**Total Single-Family Units**	**Number of Units Accepting Rebates**	**Incremental Water Savings (AF/yr)**	**Annual Water Savings (AF/yr)**	**Avoided Capital Costs**	**Avoided Variable Costs**	**Avoided Purchase Costs**	**Total Undiscounted Benefits**	**Total Discounted Benefits**	**Capital Costs**	**Financial Incentives**	**Operating Expenses**	**Total Undiscounted Costs**	**Total Discounted Costs**	**Net Present Value ($)**
2006	3316	33	0.1	0	0	144	0	144	135	0	1,658	829	2,487	2,343	-2,207
2007	3445	34	0.1	0	0	293	0	293	260	0	1,722	861	2,583	2,293	-2,033
2008	3574	36	0.1	0	0	447	0	447	374	0	1,787	893	2,680	2,241	-1,867
2009	3703	37	0.1	1	0	608	0	608	479	0	1,851	926	2,777	2,187	-1,708
2010	3832	38	0.1	1	0	774	0	774	574	0	1,916	958	2,874	2,132	-1,558
2011	3871	39	0.1	1	0	941	0	941	658	0	1,935	968	2,903	2,029	-1,371
2012	3910	39	0.1	1	0	1,111	0	1,111	731	0	1,955	977	2,932	1,931	-1,200
2013	3949	39	0.1	1	0	1,282	0	1,282	795	0	1,974	987	2,962	1,837	-1,042
2014	3988	40	0.1	1	0	1,454	0	1,454	850	0	1,994	997	2,991	1,748	-898
2015	4027	40	0.1	1	0	1,629	0	1,629	897	0	2,014	1,007	3,020	1,663	-766
2016	4027	40	0.1	1	0	1,803	0	1,803	935	0	2,014	1,007	3,020	1,567	-631
2017	4027	40	0.1	2	0	1,978	0	1,978	966	0	2,014	1,007	3,020	1,476	-510
2018	4027	40	0.1	2	0	2,008	0	2,008	924	0	2,014	1,007	3,020	1,390	-466
2019	4027	40	0.1	2	0	2,034	0	2,034	882	0	2,014	1,007	3,020	1,310	-428
2020	4027	40	0.1	2	0	2,053	0	2,053	839	0	2,014	1,007	3,020	1,234	-395
2021	4027	40	0.1	2	0	2,067	0	2,067	796	0	2,014	1,007	3,020	1,162	-367
2022	4027	40	0.1	2	0	2,076	0	2,076	753	0	2,014	1,007	3,020	1,095	-342
2023	4027	40	0.1	2	0	2,083	0	2,083	711	0	2,014	1,007	3,020	1,032	-320
2024	4027	40	0.1	2	0	2,088	0	2,088	672	0	2,014	1,007	3,020	972	-300
2025	4027	40	0.1	2	0	2,091	0	2,091	634	0	2,014	1,007	3,020	916	-282
Totals:		779	--	24	0	28,963	0	28,963	13,865	38,942	38,942	19,471	58,413	32,557	-18,692

Note: Economic analysis performed in 2005 dollars.	Value of conserved water ($/AF) =	$1,206	Benefit to cost ratio: **0.4**
	Discount rate (real) =	6.15%	Simple pay-back period (years): **47**
	Water savings (gpy/unit) =	1,170	Discounted cost / water saved ($/acre-feet): **1356**
	Amount of rebate ($) =	50	NPV / water saved ($/acre-feet): **-778**
	Cost to administer rebate ($) =	25	
	Percent accepting rebates =	1.0%	
	Single family units in 2005 =	3,187	
	Single family units in 2010 =	3,832	
	Single family units in 2015 =	4,027	
	Single family units in 2020 =	4,027	
	Single family units in 2025 =	4,027	
	Year signed MOU =	2005	
	Year implement BMP =	2006	

City of Ukiah
Economic Analysis Worksheets (3 pages)
BMP 14. Residential ULFT Replacement Programs

	Determination of Water Conservation Goal: Single-Family Units										
Calendar Year	**Single-Family Units**	**SF Units Naturally Retrofitted**	**SF Toilets Naturally Retrofitted**	**Water Savings from Natural Replacement SF (AF/yr)**	**Single-Family Units**	**SF Units Naturally Retrofitted**	**Single-Family Turnover**	**Combined SF Homes Retrofitted**	**Combined SF Toilets Retrofitted**	**Water Savings from Natural Replacement and Turnover SF (AF/yr)**	**Water Savings from Turnover SF (AF/yr)**
First year program is implemented.											
2006	1,728	69	111	3	1,728	69	44	113	181	5	2
2007	1,659	66	106	3	1,614	65	41	106	169	4	2
2008	1,592	64	102	3	1,508	60	39	99	158	4	1
2009	1,528	61	98	2	1,409	56	36	92	148	4	1
2010	1,467	59	94	2	1,317	53	34	86	138	4	1
2011	1,409	56	90	2	1,231	49	32	81	129	3	1
2012	1,352	54	87	2	1,150	46	29	75	121	3	1
2013	1,298	52	83	2	1,074	43	28	70	113	3	1
2014	1,246	50	80	2	1,004	40	26	66	105	3	1
2015	1,196	48	77	2	938	38	24	62	98	3	1
2016	1,149	46	74	2	877	35	22	58	92	2	0
2017	1,103	44	71	2	819	33	21	54	86	2	0
2018	1,059	42	68	2	765	31	20	50	80	2	0
2019	1,016	41	65	2	715	29	18	47	75	2	0
2020	976	39	62	2	668	27	17	44	70	2	0
2021	937	37	60	2	624	25	16	41	66	2	0
2022	899	36	58	1	583	23	15	38	61	2	0
2023	863	35	55	1	545	22	14	36	57	1	0
2024	829	33	53	1	509	20	13	33	53	1	0
2025	795	32	51	1	476	19	12	31	50	1	0
Totals:		**964**	**1,542**	**39**	**19,556**	**782**	**501**	**1,283**	**2,053**	**52**	**13**

Credit Table for Previously Installed ULF Toilets

Year	Avg. # of Installed Toilets: Single Family	Avg. # of Installed Toilets: Multi-family	Incremental Water Savings (Ac-ft/yr)	Annual Water Savings (Ac-ft/yr)
1991			0	0
1992			0	0
1993			0	0
1994			0	0
1995			0	0
1996			0	0
1997			0	0
1998			0	0
1999			0	0
2000			0	0
	0	0		0

City of Ukiah
Economic Analysis Worksheets (3 pages)
BMP 14. Residential ULFT Replacement Programs

	Determination of Water Conservation Goal: Multi-Family Units											Conservation Goal - Combined	
Calendar Year	Multi-Family Units	MF Units Naturally Retrofitted	MF Toilets Naturally Retrofitted	Water Savings from Natural Replacement MF (AF/yr)	Multi-Family Units	MF Units Naturally Retrofitted	Multi-Family Turnover	Combined MF Homes Retrofitted	Combined MF Toilets Retrofitted	Water Savings from Natural Replacement and Turnover MF (AF/yr)	Water Savings from Turnover MF (AF/yr)	Annual Water Savings from Turnover (AF/yr)	Cumulative Water Savings from Turnover (AF/yr)
2006	971	39	58	2.1	971	39	12	51	76	3	1	2	2
2007	933	37	56	2.0	921	37	11	48	72	3	1	5	7
2008	895	36	54	2.0	873	35	10	45	68	2	1	7	14
2009	859	34	52	1.9	828	33	10	43	65	2	0	8	22
2010	825	33	50	1.8	785	31	9	41	61	2	0	10	32
2011	792	32	48	1.7	744	30	9	39	58	2	0	11	43
2012	760	30	46	1.7	705	28	8	37	55	2	0	13	56
2013	730	29	44	1.6	668	27	8	35	52	2	0	14	69
2014	701	28	42	1.5	634	25	8	33	49	2	0	15	84
2015	673	27	40	1.5	601	24	7	31	47	2	0	15	99
2016	646	26	39	1.4	569	23	7	30	44	2	0	16	115
2017	620	25	37	1.4	540	22	6	28	42	2	0	17	132
2018	595	24	36	1.3	512	20	6	27	40	1	0	17	149
2019	571	23	34	1.3	485	19	6	25	38	1	0	17	166
2020	549	22	33	1.2	460	18	6	24	36	1	0	18	184
2021	527	21	32	1.2	436	17	5	23	34	1	0	18	202
2022	506	20	30	1.1	413	17	5	21	32	1	0	18	220
2023	485	19	29	1.1	392	16	5	20	31	1	0	18	238
2024	466	19	28	1.0	371	15	4	19	29	1	0	18	257
2025	447	18	27	1.0	352	14	4	18	27	1	0	18	275
	13,551	**542**	**813**	**30**	**12,261**	**490**	**147**	**638**	**956**	**35**	**5**	**275**	

Value of conserved water ($/AF) =	$1,206
Discount rate (real) =	6.15%
Natural toilet replacement rate =	4.0%
Annual single-family housing turnover rate =	2.56%
Annual multi-family housing turnover rate =	1.20%
Water savings due to toilet replacement at SF homes (gal/dwelling unit/day) =	36.5
Water savings due to toilet replacement at MF homes (gal/dwelling unit/day) =	49.0
Number of toilets per SF home =	1.6
Number of toilets per MF home =	1.5
Cost of conservation measure ($) =	140
1991 single family units =	3,187
1991 multi-family units =	1,792
Year signed MOU =	2005
Year implement BMP =	2006

City of Ukiah
Economic Analysis Worksheets (3 pages)
BMP 14. Residential ULFT Replacement Programs

	Water Savings from ULFT Replacement Program						Benefits ($)					Costs ($)					
Calendar Year	No. of SF Toilets Required to be Replaced	Incremental[a] Water Savings SF (AF/yr)	No. of MF Toilets Required to be Replaced	Incremental[a] Water Savings MF (AF/yr)	Annual[b] Water Savings (AF/yr)	Cummulative[c] Water Savings (AF/yr)	Avoided Capital Costs	Avoided Variable Costs	Avoided Purchase Costs	Total Undiscounted Benefits	Total Discounted Benefits	Capital Costs	Financial Incentives	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs	Net Present Value ($)
10-year toilet replacement program.																	
Pre-2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	320	8	320	12	20	20	0	23,984	0	23,984	22,594	0	0	89,600	89,600	84,409	-61,815
2007	280	7	280	10	37	57	0	44,970	0	44,970	39,910	0	0	78,400	78,400	69,579	-29,669
2008	270	7	270	10	54	111	0	65,206	0	65,206	54,516	0	0	75,600	75,600	63,207	-8,690
2009	200	5	200	7	66	178	0	80,196	0	80,196	63,164	0	0	56,000	56,000	44,107	19,057
2010	175	4	175	6	77	255	0	93,312	0	93,312	69,237	0	0	49,000	49,000	36,358	32,879
2011	170	4	170	6	88	343	0	106,053	0	106,053	74,132	0	0	47,600	47,600	33,273	40,859
2012	130	3	130	5	96	439	0	115,797	0	115,797	76,253	0	0	36,400	36,400	23,970	52,283
2013	100	3	100	4	102	541	0	123,291	0	123,291	76,484	0	0	28,000	28,000	17,370	59,114
2014	120	3	120	4	110	651	0	132,285	0	132,285	77,309	0	0	33,600	33,600	19,636	57,673
2015	55	1	55	2	113	764	0	136,408	0	136,408	75,100	0	0	15,400	15,400	8,479	66,621
2016	60	2	60	2	117	881	0	140,904	0	140,904	73,081	0	0	16,800	16,800	8,713	64,368
2017					117	998	0	140,904	0	140,904	68,847	0	0	0	0	0	68,847
2018					117	1,115	0	140,904	0	140,904	64,858	0	0	0	0	0	64,858
2019					117	1,231	0	140,904	0	140,904	61,101	0	0	0	0	0	61,101
2020					117	1,348	0	140,904	0	140,904	57,561	0	0	0	0	0	57,561
2021					117	1,465	0	140,904	0	140,904	54,226	0	0	0	0	0	54,226
2022					117	1,582	0	140,904	0	140,904	51,084	0	0	0	0	0	51,084
2023					117	1,699	0	140,904	0	140,904	48,124	0	0	0	0	0	48,124
2024					117	1,816	0	140,904	0	140,904	45,336	0	0	0	0	0	45,336
2025					117	1,932	0	140,904	0	140,904	42,710	0	0	0	0	0	42,710
	1,880		**1,880**		**1,932**		**0**	**2,330,545**	**0**	**2,330,545**	**1,195,626**	**0**	**0**	**526,400**	**526,400**	**409,099**	**786,527**

[a]Incremental Water Savings is water savings from replaced toilets during corresponding year only.

[b]Annual Water Savings is water savings from all replaced toilets through corresponding year.

[c]Cummulative Water Savings is running total of water saved through corresponding year. "Cummulative Water Savings" must match "Cummulative Water Savings from Turnover" within 10% each reporting period through 2008.

Note: Economic analysis performed in 2005 dollars.

Benefit to cost ratio: **2.9**

Simple pay-back period (years): **7**

Discounted cost / water saved ($/acre-feet): **212**

NPV / water saved ($/acre-feet): **407**

APPENDIX G

Resolution to Adopt the Urban Water Management Plan

RESOLUTION NO. 2007-43

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF UKIAH ADOPTING UPDATED URBAN WATER MANAGEMENT PLAN

WHEREAS,

1. The City last updated its Urban Water Management Plan ("UWMP") on October 13, 2002; and

2. Water Code Section 10621 the City is required to update its plan every five years in years ending in 0 and 5; and

3. The City has circulated the draft among diverse agencies, persons and organizations within and without the City of Ukiah; and

4. The City has considered and responded to all comments received on the draft plan; and

5. The City published in a newspaper of general circulation notice of the hearing and mailed notice of the hearing to Mendocino County all as required by law; and

6. The City Council conducted a hearing on the proposed UWMP update and considered the proposed plan and all comments received prior to and at the hearing;

NOW, THEREFORE, BE IT RESOLVED that:

1. the City Council of the City of Ukiah hereby adopts the updated Urban Water Management Plan as proposed and revised prior to the adoption of this resolution, which final document is attached hereto as Exhibit A; and

2. The City Clerk is directed to submit to the Department of Water Resources, the California State Library, and Mendocino County a copy of the UWMP attached hereto as Exhibit A within 30 days of the adoption of this resolution.

PASSED AND ADOPTED on November 26, 2007, by the following roll call vote:

AYES: Councilmember Thomas, Crane, McCowen, and Mayor Rodin
NOES: Councilmember Baldwin
ABSENT: None

Mari Rodin, Mayor

ATTEST:

Linda Brown, City Clerk

APPENDIX H

Effect of Reduced Eel River Imports on Future Water Supply for City of Ukiah Urban Water Management Plan – Prepared by Wagner and Bonsignore

Effect of Reduced Eel River Imports on Future Water Supply for City of Ukiah Urban Water Management Plan

This report documents analyses conducted to evaluate water supply reliability for the City of Ukiah Urban Water Management Plan. The City holds, among other water rights, a 1954 appropriative water right permit for 20 cfs from Russian River Underflow. This amount corresponds to approximately double the current water use. Physical water availability is expected to be affected by significant reductions in Eel River imports to the Russian River basin. Analyses were conducted to assess impacts to Lake Mendocino operations in response to reduced Eel River imports and to determine the effect on future water supply downstream of Lake Mendocino. The results show sufficient water supply available for the City and that increased diversions by the City will have only minor effects on Lake Mendocino operations.

The City does not control Lake Mendocino and can not cause changes to the release requirements or the amount of Eel River imports. Those decisions are controlled by other agencies. The following analysis shows that under a given set of assumptions there is sufficient water to mimic past releases during the summer months with the result that the reduced imports from the Eel River that are expected will not substantially affect the flow in the River. Lake Mendocino may experience significant changes in seasonal water surface due to reductions in imports, but since the City does not take water out of the lake directly it does not directly affect water levels or storage.

It is important to note that the source of the City's water right is Russian River Underflow which has several components including, Russian River (West Fork), ungauged tributary inflow, groundwater accretion, return flow, percolation of direct precipitation and natural flow from the East Fork Russian River and Eel River imports. In addition the City pumps percolating groundwater from at least one of its wells. The following analyses treats all water supplies and all water diversions as having an equal effect on the system. This particular assumption as explained in more detail below is a simplifying and conservative assumption; the actual impacts are very likely to be less than the modeled impacts attributable to the City.

The first part of the analysis estimates the rate and timing of increased depletions to the Russian River attributable to future City of Ukiah diversions. This is described in Section 1. The second part of the analysis establishes a future baseline condition for Lake Mendocino and the Russian River. This was necessary because hydrological conditions in the Russian River basin have changed over time; future water supply and management will not be the same as historical. Two future baseline scenarios were developed because of uncertainty regarding future water resource management. Because the City has no control over the water supply to Lake Mendocino or Lake operations, the City cannot predict how the system will be operated. Section 2 describes the future baseline scenarios. The third part of the analysis applied the estimated increased City of Ukiah river depletions onto the baseline scenarios to see how streamflows and/or reservoir operations may be affected. This is presented in Section 3.

SECTION 1 – Projected Increased Diversions by City of Ukiah

City of Ukiah annual treated water production has increased from about 2,200 acre-feet in 1960 to about 4,000 acre-feet in recent years, as shown in Figure 1. Peak water use in the City typically occurs in July. The recent monthly water use pattern by the City was used to project annual water use corresponding to 20 cfs in July. State Water Right's Board (predecessor to the State Water Board) issued a permit pursuant to Application 15704 to the City's to divert up to 20 cfs. Based on 20 cfs use in July and the average monthly water use pattern, the annual use would be 8,394 acre-feet. Though the City has a pre-1949 water right for 2.8 cfs and also pumps percolating groundwater, the analysis conducted assumed an ultimate demand of 20 cfs.

Historical water use by the City of Ukiah is already reflected in historical Russian River flows. To evaluate future conditions with the City of Ukiah diverting 8,394 acre-feet per year, it was necessary to model an increase in water use corresponding to the difference between the historical use and the projected level of 8,394 acre-feet.

A portion of the water diverted by the City for municipal use returns to the groundwater system directly via percolation ponds at the wastewater treatment plant. Essentially all of the water used indoors returns to the groundwater system within the same month as diverted. It was estimated that 15 percent of the outdoor water use returns to the river system (also assumed to be within the same month as diverted). Water use during the winter months was taken to be a good estimate of indoor water use during the rest of the year. For each month, an estimate was made of the fraction of diversion that resulted in depletion to the River system. Figure 2 shows the average monthly water diversion and depletion corresponding to a 20 cfs peak diversion.

The annual increase in water use from historical levels up to 8,394 acre-feet per year (corresponding to 20 cfs in the peak month) was distributed by the average monthly pattern of water use and then multiplied by the depletion fraction of diversion for that respective month to estimate the increased draft on the river system corresponding to full use of the City's appropriative right. This increased draft (depletion) was then imposed on the model of Lake Mendocino and the Russian River to evaluate releases or streamflow.

SECTION 2 – Future Baseline Scenarios for Russian River

In this part of the analysis, models of Potter Valley imports, Lake Mendocino operations and Russian River flows were developed and used to establish a future baseline condition upon which the City's diversions were evaluated. The historical hydrology was used to establish a baseline condition. However, historical events will not be repeated because of two significant resource management changes. In 1986, State Water Resources Control Board Decision 1610 (D-1610) was issued setting forth minimum required streamflows on the Russian River below Lake Mendocino. Operations prior to that time did not need to meet D-1610 requirements. Then in 2004, the Federal Energy Regulatory Commission (FERC) amended the hydroelectric license for the Potter Valley Project. The amended license is expected to significantly reduce imports from the Eel River.

In the analysis of future baseline conditions, future Eel River imports were projected by applying the amended FERC license to the hydrology of 1961 through 2006. This resulted in less imports than occurred historically. Lake Mendocino operations were modeled to reflect flood control operations and release of water to meet downstream demands. Downstream demands were projected in two different fashions, creating a Scenario A and Scenario B. In both scenarios, the downstream demand was based on historical irrigation and municipal use and included a projection of the D-1610 requirements to the full 1961 through 2006 study period.

Eel River Imports

The East Fork of the Russian River receives significant imports from the Eel River via the Potter Valley Project operated by PG&E. The historical imports, excluding the portion delivered to the East and West canals of the Potter Valley Irrigation District, averaged about 141,500 acre-feet per year, as shown in Table 1. This represented about 57 percent of the inflow to Lake Mendocino. Table 2 summarizes the monthly inflow to Lake Mendocino as reported by the US Army Corps of Engineers (USACE) and shows that it averaged about 250,100 acre-feet per year.

On January 28, 2004, FERC amended the license for the Potter Valley Project (Proj. 77-110). This license specifies minimum flows for both the Eel River and diversions to the East Fork of the Russian River. The minimum diversion to the East Fork of the Russian River is conditioned on time of year and hydrological classification, as follows.

Minimum Diversion to the East Fork Russian River				
Period		Classification		
From	Through	Normal	Dry	Critical
Sep 16	Apr 14	35 cfs	35 cfs	5 cfs
Apr 15	May 14	35 cfs	25 cfs	5 cfs
May 15	Sep 15	75 cfs	25 cfs	5 cfs

The hydrological classification is determined from unimpaired inflow to Lake Pillsbury (located in the Eel River basin). Table 3 summarizes the classification determined in this analysis.

The FERC license also includes a condition (paragraph E5 on page 63) that disallows diversions to the East Fork Russian River in excess of the specified minimum flows, whenever the storage in Lake Pillsbury is less than Target Storage Curves included in the license. Figure 3 shows the Target Storage Curves. Figure 3 also shows the maximum storage in Lake Pillsbury corresponding to the Certificate of Approval (attached) issued by Division of Safety of Dams on December 4, 1978. The Certificate states that water may be impounded to elevation 1910.0 but the spillway gates must be open from November 1 to April 1. The capacity table for Lake Pillsbury (attached), made by PG&E and dated October 2006, shows the top of spillway gates at 1910.0 feet, which corresponds to 74,993 acre-feet of storage. The spill gates are 10 feet tall. The 2006 capacity table shows the spill crest at 1900.0 feet which corresponds to 54,338 acre-feet of storage. These capacities, 54,338 acre-feet from November through March, and 74,993 acre-feet from April through October, are shown as Maximum Storage in Figure 3.

Because the Target Storage Curves are above the Maximum Storage levels, Condition E5 results in a severe restriction on imports of water through the Potter Valley Project from March 5 to July 17.

In an October 16, 2006, letter (attached) from John Keenan, Sr. Vice President, PG&E to Magalie Salas, Secretary, FERC, Mr. Keenan explained that computer modeling conducted in development of the flow proposal incorporated in the FERC license allowed maximum diversions through the Potter Valley Project tunnel during times of spill at Cape Horn Dam (located on the Eel River immediately downstream of the tunnel diversion). Mr. Keenan further explains that the final language of the license did not incorporate that allowance. We do not know why that allowance was not included in the final language. The diversions to the Russian River through the Potter Valley Project during the spring months will be severely restricted by the existing language unless the condition is modified.

An estimate was made of future inflows to Lake Mendocino based on Eel River imports being restricted to the specified minimum diversion from March 5 to July 17. While the E5 condition would not affect the balance of the year, other requirements of the amended FERC license could affect Potter Valley Project diversions during the balance of the water year. Considerable additional computer modeling would be required to simulate operations in the Eel River basin and even with such a tool, considerable discretion for diversions remains to PG&E.[1] Based on the assumption that PG&E would be able and willing to maximize flow through the Potter Valley Project tunnel for power generation, it was decided that using historical imports for the July 18 through March 4 period would be a reasonable assumption in this analysis.

Table 4 summarizes the Potter Valley Project import to East Fork Russian River as affected by the E5 license condition. Note that (between Table 1 and Table 4) average annual imports drop 37,300 acre-feet or 26 percent. It was assumed for this analysis that an acre-foot less import translated into an acre-foot less inflow to Lake Mendocino on the same day.

Downstream Demands on Russian River

The historical record of outflow from Lake Mendocino provides an indication of water demand from Lake Mendocino downstream on the Russian River from the East Fork Russian River to Dry Creek. A USACE database provided a daily record of outflow from the lake for water years 1961 through 2006. A monthly summary of Lake Mendocino historical outflow is provided in Table 5. Note that releases from the lake were much higher in the wet season of December through April. These high flows were not intended to meet downstream demand but rather resulted from flood control operations in Lake Mendocino. Downstream demands on the Russian River to Dry Creek during the wet season of December through April were estimated

[1] In a June 8, 2007, letter (attached) from Randy Poole (General Manager, SCWA) to David Moller (Manager of Relicensing, PG&E), Mr. Poole states, "The Agency and the County still do not know how PG&E is operating the Project, or whether operating the project using other criterion that is also consistent with the existing Federal Energy Regulatory Commission (FERC) license could have resulted in higher Lake Mendocino storage." Mr. Moller responded to Mr. Poole in a June 22, 2007 letter (attached) and acknowledged that "the reduction in diversions from the Eel River into the EBRR [East Branch Russian River] required by the license amendment was considerably greater than what had been anticipated during the amendment proceeding" but did not provide an explanation of how PG&E is operating the Potter Valley Project.

based on application of the D-1610 minimum streamflow requirements to the period of record, 1961 through 2006.

Downstream demands on the Russian River to Dry Creek for instream flow, recreation, agricultural use and municipal use during the dry season of May through November were estimated in two different ways, leading to two Scenarios. In both scenarios, historical Lake releases during the dry season were used as a guide. Table 5 shows historical lake releases in the period May through November were typically in the range of 12,000 to 18,000 acre-feet per month. That corresponds to a rate of 200 to 250 cfs. Figure 4 shows the distribution of historical daily releases from Lake Mendocino during the months of May through November. This figure shows the percent of days during May through November that the Lake release exceeded the given value. The median flow was 230 cfs. Only 27 percent of the daily releases were greater than 275 cfs. The higher release rates suggest that there were surplus releases and thus were not considered to represent demands on the Russian River.

Scenario A estimated downstream demands on the Russian River for release from Lake Mendocino as the historical daily release capped at 275 cfs. In other words, historical daily releases less than 275 cfs during the dry season of May through November were assumed to be the measure of downstream demand for fisheries, recreation, agricultural and municipal uses. On days when the May though November release exceeded 275 cfs, the downstream demand was assumed to be 275 cfs.

D-1610 specifies a minimum instream flow from the East Fork Russian River to Dry Creek for all months of the year. If any of the historical Lake releases during May through November were insufficient to meet the D-1610 minimum requirement, the downstream demand in Scenario A was adjusted to satisfy the D-1610 requirement.

The D-1610 minimum streamflow requirement was instrumental in estimating downstream demands in Scenario B. Review of historical gage records on the Russian River between Lake Mendocino and Dry Creek show river flow in excess of the D-1610 requirement. Scenario B downstream demand for release from Lake Mendocino was estimated as the historical Lake release minus the amount that the minimum gaged flow in the river exceeded the D-1610 requirement.

Both estimates (Scenarios) of downstream demand on the Russian River were based on historical Lake releases rather than a cataloguing of water rights or water diversions on the Russian River. In Scenario A, the assumption was that historical Lake releases (up to 275 cfs) were necessary to meet demands. In Scenario B, the assumption was that if the historical Lake release, after providing for all diversions and river channel losses, resulted in river flow in excess of the D-1610 requirement, then the Lake release could be scaled back. Scenario B is an inquiry into whether or not there had been historical releases greater than needed. A further inquiry into the actual historical demand would be necessary to confirm this assumption.

Lake Mendocino Operational Analysis

A spreadsheet model was constructed to simulate Lake Mendocino operations. A daily time step over the 46-year period of record (water years 1961 through 2006) was modeled. A daily record of historical storage content in Lake Mendocino was provided from a US Army Corps of Engineers database.

In the operational analysis during the wet season of December through April, releases were made for flood control and to maintain the D-1610 minimum streamflow. Rather than trying to incorporate in the model all the factors involved in flood routing, including discretionary encroachments into the flood reservation, the modeled reservoir content was required to be no greater than the historical content during the months of December through April.

During the May through November dry season, the downstream demand corresponding to the respective Scenario (A or B) was released from the reservoir. Also, to reflect the flood rule curve, releases were made during the dry season as necessary to keep the Lake below 91,000 acre-feet of storage.

Future Baseline Operations

Figure 5 shows the average monthly outflow from Lake Mendocino under historical and projected future conditions. Outflows during the dry season are greater in Scenario A than in Scenario B. In Scenario A, outflows replicated historical releases up to 275 cfs. In Scenario B, outflows were reduced to the minimum rate needed to satisfy the D-1610 required flow down to Dry Creek. The lesser Lake release during the dry season in Scenario B supports higher Lake levels, shown in Figure 6. Compared to average historical Lake levels, Scenario A Lake levels in July and August are approximately 11 feet lower and Scenario B Lake levels are approximately 6 feet lower.

SECTION 3 – Modeling of Increased City of Ukiah Diversions in Russian River Future Baseline

The effect of the City of Ukiah's increased diversions was then modeled as a change to Future Baseline Scenarios A and B. In Scenario A, it was assumed that the increased depletion to the river system attributable to Ukiah's diversion would necessitate an increased release from Lake Mendocino. In Scenario B, it was assumed that Ukiah's increased depletion to the river would necessitate an increased release from Lake Mendocino whenever that depletion would cause the river flow to drop below the D-1610 minimum flow requirement. Because the City's depletion would affect the river below the confluence of the West and East Forks, there would be times when the increased depletion would not necessitate increased Lake release. If the minimum historical gage flow was at Hopland, Cloverdale or Healdsburg, the increased depletion by Ukiah would necessitate additional release from Lake Mendocino. If the minimum gauged flow occurred at the confluence of the Forks, no additional release would be required. Note that the minimum flow requirement in D-1610 affects the river from the Forks to Dry Creek and is assumed to apply along this entire reach. It would be possible that the flow could be below the

minimum at the Forks, and higher than the minimum at Hopland, Cloverdale and Healdsburg, in which case a release of stored water to maintain the minimum flow would not be required.

Figure 7 shows the average outflows modeled for Scenario A, with and without the increased diversion by City of Ukiah. Figure 8 shows the effect on Lake levels due to Ukiah's increased diversion under Scenario A. Slightly greater outflows are required in the dry season, resulting in slightly lower Lake levels. During the wet season, outflows for flood control are reduced, allowing the Lake levels to rebound to baseline conditions.

Figure 9 shows the modeled Lake outflows for Scenario B, with and without Ukiah's increased diversion. Figure 10 shows the effect on Lake levels due to Ukiah's increased diversions in Scenario B. Again, slightly greater outflows are required in the dry season, resulting in slightly lower Lake levels, which then rebound to baseline levels during the wet season.

Ukiah Valley Groundwater Basin

The Ukiah Valley groundwater basin (aquifer) underlies Ukiah Valley and Redwood Valley. Geologic and groundwater characteristics underlying Sanel Valley are similar, however, bedrock effectively separates the Sanel aquifer from the Ukiah aquifer.

The Ukiah Valley is the largest of several interior valleys in Mendocino County that fall along the north-northwest trending Maacama Fault Zone. The basement rock is of the Franciscan Complex, of variable but minor water yielding capacity. The valley is filled up to 2000 feet deep with unconsolidated or loosely cemented gravel, sand, silt, and clay deposited through eons of erosion, transport and sedimentation.

The valley fill is categorized as three separate deposits. The oldest and lowest unit is the continental basin deposits. It is estimated to be up to 2000 feet in depth near the axis of the valley. Wells completed in the continental basin deposits produce water slowly because of consolidated, fine-grained material and low permeability. Well yield ranges from 1 – 50 gallons per minute (gpm).

The second unit is the continental terrace deposits, situated mostly on the periphery of the valley. These deposits are relatively thin (up to 25 feet), have a low permeability and are not a significant groundwater source.

The third valley fill unit is the Holocene alluvium, consisting of uncemented gravel, sand, silt and clay deposited in the last 10,000 years. The Holocene alluvium covers approximately 30 square miles throughout broad areas of the flood plain and more narrow bands along the Russian River north of the Forks and along tributary streams. It is generally less than 100 feet thick but extends up to 200 feet in depth. Consisting of coarse and uncemented sediments, the alluvium exhibits high porosity and permeability, thereby holding a significant quantity of water and transmitting water rapidly. Well yields range from 100 to 1000 gpm.

The volume of water available from pumping from upper 100 feet of the most productive portion of the aquifer is estimated at 90,000 acre-feet.

Groundwater in the alluvium is hydraulically connected to and interacts with surface flows. The principal source of groundwater is infiltration of precipitation. Other sources contributing to Ukiah valley groundwater are streamflow leakage, deep percolation from irrigation and treated effluent discharged via the City of Ukiah percolation ponds.

Water Level in the Ukiah Valley

The groundwater table (the underground water surface) fluctuates seasonally, being at its highest level in March or April at the end of the wet season, and at its lowest in October, at the end of the dry season. Seasonal fluctuations range on the order of 5 to 20 feet.

Measurements have been taken and recorded over a long time period at a few wells in the valley. Measurements were generally taken twice a year, at the end of the wet season and at the end of the dry season. The groundwater measurements show the water table rebounds during the wet season to about the same elevation in all but abnormally dry years such as 1977. The water table rebounded completely in one year of normal precipitation. Water surface measurements over the long-term show no trend in groundwater levels.

A 1986 USGS investigation of groundwater levels in the Ukiah Valley (Ground-water Resources in Mendocino County, California; U.S. Geological Survey Water-Resources Investigations Report 85-4258; July 1986) found that, "None of the hydrographs show any prominent long-term declines. Water levels measured during the 1980's are remarkably similar to those measured during the 1960's and 1970's." Bulletin 118 of the California Department of Water Resources, updated 2/27/04, in its section on the Ukiah Valley Groundwater Basin (referenced below and attached) states, "Based on hydrographs from DWR monitored wells, groundwater levels in the past 30 years have remained relatively stable. During drought conditions there is increased drawdown during summer months and less recovery in winter months. Post-drought conditions rebound to approximately the same levels as pre-drought conditions." (A third reference regarding Ukiah valley groundwater is: Cardwell, G. T.; Geology and Ground Water in Russian River Valley Areas and in Round, Laytonville and Little Lake Valleys Sonoma and Mendocino Counties, California; Geological Survey Water Supply Paper 1548; 1965.)

Wagner & Bonsignore prepared Figures 11 through 14 which show water table hydrographs through 2007 from the available record of long-term monitoring of wells in Ukiah Valley. Figure 15 shows the location of those wells. The hydrographs show the seasonal fluctuation due to the precipitation, the effect of drought in 1977, and the absence of a long-term trend in water surface elevation.

Because the alluvium contains and transmits water easily, there is significant interaction between the Ukiah basin aquifer and the Russian River. Water level measurements show that in most years in spring the aquifer is full and spills to the river. At the southern end of the Ukiah groundwater basin, the bedrock rises toward the surface and groundwater must move to the surface stream (Russian River) to move downstream. The predominant movement of water is

from the Ukiah groundwater basin to the Russian River. However, conditions fluctuate and occasionally result in some water moving from the river to the aquifer.

When the river stage is high, water moves from the river into bank storage, where it is temporarily held until the river stage falls and water drains back to the river. When the aquifer water table is low, as happens toward the end of the dry season, water moves from the river to the aquifer. This is compounded by the effect of phreatophytes (water-loving plants) drawing water from the aquifer. Finally, pumping of wells may cause a localized drawdown of the water table, which may result in flow moving from the river to the aquifer.

CONCLUSIONS

The foregoing analysis demonstrated that there is sufficient water supply in the Russian River system for City of Ukiah water diversions to approximately double from current levels up to 20 cfs in July. This water supply was projected to be available despite an estimated 26 percent decline in Eel River imports. Impacts on Lake Mendocino water elevations due to increased City of Ukiah diversions were estimated, on average, to be about one foot in September. (Figures 8 and 10).

It is likely that the simplifying assumptions made have overstated the potential impact of increased City diversions. The model assumes that an increase in diversion by the City, less an allowance for return flow, necessarily results in an effect on the Russian River. This is not the case. The future diversions are likely to be groundwater extractions with a corresponding lag time between extraction and the resulting streamflow depletion. The timing is important because if the actual depletion takes place in the winter, sufficient water will be available from sources other than lake releases to replace the extracted groundwater. While there will still be a stream depletion it will be less than the already small impact predicted by the model.

The foregoing analysis also evaluated how Lake Mendocino and Russian River operations may be affected by the reduced Eel River imports. The analysis showed that demands downstream in the Russian River basin can be satisfied at historical rates (Scenario A), but at the expense of lower levels in Lake Mendocino during the dry season. Alternatively, it may be that historical Lake releases during the dry season were greater than necessary and can be reduced (Scenario B), resulting in less dry season impact to Lake levels. Figures 5 and 6 summarize the change from historical conditions attributable to reduced imports. This impact is the result of regulatory changes and is not the result of any action by the City.

This report identified the assumptions necessary to predict the impact of changes in Eel River imports. These are preliminary determinations for planning purposes based on the best information and analysis currently available. As additional, more accurate information becomes available, this report as well as the Urban Water Management plan it supports may be revised. The City has formally requested Sonoma County Water Agency to assist the City in developing computer models that will more accurately predict the impact of reduced Eel River diversions on the City's water supply and the water supply of upstream and downstream water users. It will take time to develop this additional analysis. The UWMP will be revised as additional and more accurate information becomes available.

TABLE 1

Eel River Imports to East Fork Russian River (acre-feet)

Excluding Imports to Potter Valley Irrigation District Canals

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1961	15,126	17,843	18,471	18,110	16,274	18,402	17,514	16,886	10,048	5,998	6,074	15,430	176,176
1962	17,646	13,349	18,362	18,801	16,628	18,402	16,376	7,533	8,331	10,421	10,600	9,333	165,781
1963	16,168	18,155	18,319	18,330	16,693	16,024	17,211	16,657	10,689	9,684	10,298	10,233	178,462
1964	12,439	16,051	17,930	18,500	17,034	14,699	3,926	3,665	3,120	6,363	6,928	8,532	129,186
1965	15,760	17,985	15,472	18,429	16,811	9,366	16,997	16,995	10,129	10,392	10,746	14,049	173,133
1966	16,590	10,740	13,571	18,439	16,746	17,736	17,642	12,918	6,276	9,678	10,497	14,440	165,273
1967	17,902	17,171	18,693	18,755	16,841	17,739	17,405	17,211	14,729	14,455	14,702	15,484	201,088
1968	15,045	10,391	17,744	18,553	17,351	18,410	11,005	4,146	5,421	10,010	10,092	10,470	148,637
1969	15,907	17,487	17,817	17,683	15,959	17,712	16,526	16,826	12,256	10,057	10,249	14,273	182,751
1970	16,976	14,798	12,907	17,780	16,300	17,627	6,124	5,163	6,490	6,391	6,848	13,174	140,577
1971	16,084	15,834	18,671	18,618	17,042	18,673	16,290	17,207	12,325	4,867	3,095	6,680	165,386
1972	9,356	10,480	15,122	18,411	13,179	17,910	15,295	13,541	4,628	11,640	8,634	14,186	152,382
1973	15,971	17,633	12,242	16,757	16,731	16,820	17,817	13,415	6,897	7,042	6,958	13,401	161,684
1974	6,315	1,580	18,728	15,655	13,558	17,661	17,533	17,187	13,294	4,983	4,253	12,309	143,057
1975	16,444	17,015	16,246	15,486	14,201	17,048	16,029	15,667	10,613	6,758	6,367	14,299	166,172
1976	18,113	17,627	17,604	8,255	5,588	7,242	6,555	2,339	2,991	4,050	4,685	10,919	105,968
1977	15,945	15,654	7,270	3,285	512	1,436	253	838	1,201	1,583	1,450	577	50,005
1978	804	2,233	9,402	17,147	16,138	17,717	17,752	18,482	16,328	8,896	8,813	11,859	145,572
1979	14,530	17,423	7,186	12,210	16,626	18,240	17,112	18,538	9,418	8,466	8,432	16,415	164,595
1980	16,897	16,763	18,443	18,062	17,379	18,286	17,957	16,009	10,987	6,056	3,348	15,154	175,339
1981	17,421	13,184	14,273	11,379	16,636	17,653	11,703	7,962	7,835	6,700	5,169	11,342	141,257
1982	19,579	16,548	19,117	19,434	18,052	19,698	19,270	19,593	18,456	8,281	8,791	15,039	201,859
1983	9,616	13,018	17,354	19,282	17,649	19,482	18,806	18,667	15,931	15,374	14,876	3,420	183,474
1984	4,641	10,940	16,207	19,133	18,115	19,373	15,041	6,293	3,828	5,087	8,992	7,110	134,760
1985	17,854	17,966	18,340	18,791	17,158	19,341	12,014	3,377	5,964	8,417	7,309	14,990	161,520
1986	17,596	9,656	15,591	14,258	13,901	19,168	10,568	6,040	6,166	6,004	5,723	8,571	133,245
1987	17,933	7,591	5,248	5,383	12,044	17,929	6,952	5,568	4,800	5,578	4,544	4,017	97,586
1988	6,064	5,359	15,759	17,500	17,020	8,392	4,854	5,966	5,891	5,389	5,009	4,883	102,087
1989	4,877	8,333	17,933	17,867	12,758	17,963	17,971	11,964	5,401	6,030	5,893	6,311	133,301
1990	16,144	11,492	9,142	16,390	16,644	16,685	3,193	6,788	13,151	4,594	6,060	16,786	137,068
1991	19,123	14,587	4,897	2,202	2,497	16,203	18,248	15,069	8,382	8,210	5,667	7,363	122,447
1992	15,743	11,681	5,002	8,366	12,879	19,772	15,192	11,193	6,024	7,075	6,284	5,816	125,026
1993	8,406	8,589	13,734	16,806	16,423	19,835	19,055	19,420	17,322	9,812	6,897	14,658	170,958
1994	18,335	12,049	10,885	8,513	11,546	13,990	5,597	5,978	3,513	3,695	7,168	3,949	105,220
1995	5,092	5,568	3,721	3,557	5,308	3,160	5,770	6,460	5,320	5,336	5,135	5,486	59,913
1996	5,439	7,672	12,522	16,070	18,333	19,569	19,295	18,601	11,929	8,571	9,285	17,036	164,323
1997	17,201	11,621	16,465	13,113	11,429	9,969	6,936	6,357	6,676	6,308	8,118	9,648	123,842
1998	9,557	17,338	16,263	18,084	14,737	20,236	19,464	18,157	18,292	8,303	7,293	12,012	179,735
1999	17,746	17,058	17,433	11,586	9,894	18,000	12,072	12,054	7,496	6,601	6,631	8,113	144,683
2000	10,127	12,750	11,711	13,002	16,657	17,877	10,441	10,251	6,867	6,857	6,986	7,807	131,333
2001	9,527	11,054	2,862	3,933	3,293	7,094	11,582	6,250	4,717	3,106	2,916	3,437	69,770
2002	5,486	11,709	18,183	17,128	17,276	18,335	6,990	5,371	4,199	4,227	4,425	4,292	117,622
2003	5,159	6,189	7,917	7,914	13,960	16,225	15,297	17,405	9,318	7,686	7,946	13,331	128,347
2004	10,292	9,352	16,828	18,250	14,620	16,860	10,401	6,454	5,227	5,256	5,540	5,879	124,961
2005	6,292	6,827	11,766	16,092	14,420	14,419	12,972	9,555	8,688	7,337	6,952	6,738	122,058
2006	6,770	5,590	3,464	11,006	12,333	9,156	12,240	13,337	7,045	6,861	6,690	7,097	101,590
Average	**12,870**	**12,390**	**13,757**	**14,615**	**14,199**	**15,946**	**13,157**	**11,421**	**8,578**	**7,271**	**7,160**	**10,138**	**141,505**
(cfs)	209	208	224	238	256	259	221	186	144	118	116	170	195

Source: 1976-83 & 1987-2006: per USGS gage #11471099;
1961-75, 1984-86: USGS gage #11471000 reduced to reflect portion to PVID.

TABLE 2
Lake Mendocino Historical Inflows (acre-feet)

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1961	15,291	19,353	35,969	21,350	41,842	42,435	22,203	20,265	9,826	4,320	4,985	16,132	253,971
1962	17,572	14,573	26,744	23,752	47,408	43,770	20,896	7,835	7,942	10,217	10,630	8,803	240,140
1963	22,237	19,067	30,506	23,463	37,885	29,104	52,604	21,930	12,282	10,933	10,949	10,332	281,292
1964	12,984	26,918	19,950	37,988	20,182	17,477	5,252	3,437	1,478	4,538	5,865	8,172	164,242
1965	14,775	25,337	96,216	65,525	21,509	12,845	28,620	19,012	10,225	10,374	10,505	12,881	327,823
1966	15,652	15,517	19,055	53,211	32,595	24,258	19,752	12,554	5,106	10,253	11,421	15,894	235,267
1967	17,727	20,591	36,072	57,537	25,587	32,930	38,662	22,011	17,610	15,511	15,628	16,052	315,918
1968	14,920	10,306	19,006	38,010	36,419	29,417	14,027	4,923	3,354	10,824	12,266	11,782	205,255
1969	16,231	17,939	51,030	74,429	59,079	31,016	21,626	17,897	13,859	10,568	10,459	15,021	339,153
1970	17,677	15,279	35,955	110,638	33,783	27,946	9,350	5,778	5,816	5,651	6,651	14,093	288,615
1971	17,617	23,457	60,891	57,085	20,704	39,662	21,479	20,543	14,309	3,981	1,587	6,210	287,526
1972	9,243	11,687	23,838	28,255	23,586	26,599	19,936	14,519	3,677	10,780	9,755	14,694	196,569
1973	17,852	21,680	26,997	64,563	46,509	35,636	21,908	13,198	8,333	7,238	7,404	15,172	286,489
1974	7,525	21,212	51,285	58,690	30,369	58,767	43,072	22,183	16,003	5,960	4,259	15,079	334,404
1975	19,248	18,391	19,371	23,157	65,981	76,351	24,675	19,777	12,974	8,608	9,136	16,429	314,099
1976	18,938	19,262	19,958	10,469	14,061	16,023	11,157	3,586	2,660	3,447	5,709	11,171	136,441
1977	17,312	17,124	8,817	4,697	1,654	3,104	811	1,819	1,412	547	1,222	2,093	60,612
1978	1,785	4,659	25,052	84,933	57,155	44,674	36,534	22,035	16,386	7,625	7,988	11,738	320,563
1979	15,253	17,885	8,303	25,867	54,269	38,585	19,785	20,375	9,247	7,381	7,097	15,505	239,551
1980	19,688	29,925	34,350	67,522	55,677	38,063	24,560	19,200	12,312	7,684	5,417	16,082	330,481
1981	18,147	14,025	16,782	31,528	28,459	29,889	15,959	9,207	7,454	6,028	3,612	10,320	191,412
1982	19,482	47,749	61,721	52,842	50,875	43,841	67,869	20,926	17,913	8,398	8,797	15,781	416,194
1983	10,818	25,510	51,563	53,134	62,724	112,129	44,202	28,049	18,560	15,787	15,144	4,167	441,787
1984	6,042	36,889	64,059	25,595	31,587	30,199	20,140	8,583	8,053	4,637	9,634	6,843	252,262
1985	20,361	35,788	25,143	20,793	28,660	30,308	16,661	3,913	4,126	7,391	7,301	17,423	217,868
1986	19,488	13,266	22,340	33,747	107,186	56,230	15,327	6,968	5,590	5,375	4,871	9,529	299,917
1987	19,393	9,443	6,684	13,301	23,901	37,827	10,622	6,891	4,380	4,810	5,970	6,724	149,947
1988	9,021	7,859	36,899	51,859	20,886	9,503	7,295	8,426	7,260	6,357	5,808	5,314	176,486
1989	4,864	13,831	26,738	28,626	16,102	59,287	24,445	14,864	9,067	9,285	7,849	6,327	221,283
1990	17,756	12,302	10,148	26,232	28,398	23,824	3,719	8,287	13,644	2,860	4,314	16,465	167,949
1991	19,411	15,081	5,377	3,229	3,747	41,665	20,295	15,499	7,565	7,032	4,267	6,008	149,175
1992	15,912	13,387	5,937	10,407	37,181	29,397	17,415	13,091	6,895	8,301	7,099	6,835	171,856
1993	9,352	8,878	32,045	76,972	40,537	31,226	26,325	23,413	22,086	9,852	7,404	14,515	302,607
1994	17,483	11,377	12,708	13,240	24,540	15,761	6,891	6,661	3,382	3,765	7,170	3,642	126,619
1995	4,933	7,730	10,606	87,312	12,325	68,423	19,018	17,959	7,123	5,363	5,709	5,488	251,988
1996	6,672	8,868	27,981	56,439	43,506	38,539	26,529	22,209	13,238	10,419	10,084	16,866	281,352
1997	16,671	12,802	40,755	68,111	19,589	17,147	8,432	7,313	6,496	5,395	8,430	9,689	220,831
1998	9,560	20,743	27,412	77,942	112,566	41,776	38,403	27,251	24,105	12,803	13,117	12,921	418,600
1999	17,941	17,504	23,477	20,987	59,025	48,780	25,165	13,877	8,220	7,724	8,959	11,272	262,931
2000	13,496	13,922	10,929	22,784	56,849	35,179	13,567	12,442	8,575	7,851	8,789	7,115	211,499
2001	9,695	14,023	5,256	9,225	21,251	19,240	13,161	7,488	5,687	4,364	3,939	4,223	117,552
2002	2,231	19,670	53,382	43,203	27,640	25,024	8,957	6,795	5,794	5,209	5,635	5,427	208,968
2003	5,917	5,911	45,152	37,637	23,310	27,872	41,390	31,423	11,318	9,842	8,723	13,990	262,484
2004	11,084	9,069	44,426	38,623	62,514	25,807	12,944	8,715	8,414	8,210	6,200	4,899	240,906
2005	8,737	6,647	28,723	39,394	24,137	34,108	26,164	23,491	14,232	9,209	6,811	7,024	228,678
2006	7,736	8,662	76,141	63,188	35,447	59,848	53,910	20,434	10,261	6,938	6,343	6,803	355,711
Average	**13,733**	**16,980**	**30,908**	**42,119**	**37,591**	**36,119**	**22,646**	**14,501**	**9,657**	**7,601**	**7,628**	**10,629**	**250,115**
(cfs)	223	285	503	685	677	587	381	236	162	124	124	179	346

Source: USACE.

TABLE 3

Projected Hydrological Classification for Inflows to Lake Pillsbury
Potter Valley Project (FERC 77-110)

	JAN	FEB	MAR	APR	MAY	JUN - DEC
1961	Normal	Normal	Normal	Normal	Normal	Normal
1962	Normal	Normal	Normal	Normal	Normal	Normal
1963	Normal	Normal	Normal	Normal	Normal	Normal
1964	Normal	Normal	Normal	Normal	Normal	Normal
1965	Normal	Normal	Normal	Normal	Normal	Normal
1966	Normal	Normal	Normal	Normal	Normal	Normal
1967	Normal	Normal	Normal	Normal	Normal	Normal
1968	Normal	Normal	Normal	Normal	Normal	Normal
1969	Normal	Normal	Normal	Normal	Normal	Normal
1970	Normal	Normal	Normal	Normal	Normal	Normal
1971	Normal	Normal	Normal	Normal	Normal	Normal
1972	Normal	Normal	Normal	Normal	Normal	Normal
1973	Normal	Normal	Normal	Normal	Normal	Normal
1974	Normal	Normal	Normal	Normal	Normal	Normal
1975	Normal	Normal	Normal	Normal	Normal	Normal
1976	Dry	Critical	Dry	Dry	Dry	Dry
1977	Dry	Critical	Critical	Critical	Critical	Critical
1978	Normal	Normal	Normal	Normal	Normal	Normal
1979	Normal	Dry	Normal	Normal	Normal	Normal
1980	Normal	Normal	Normal	Normal	Normal	Normal
1981	Normal	Normal	Normal	Normal	Normal	Normal
1982	Normal	Normal	Normal	Normal	Normal	Normal
1983	Normal	Normal	Normal	Normal	Normal	Normal
1984	Normal	Normal	Normal	Normal	Normal	Normal
1985	Normal	Normal	Normal	Normal	Normal	Normal
1986	Normal	Normal	Normal	Normal	Normal	Normal
1987	Dry	Dry	Normal	Normal	Normal	Normal
1988	Normal	Normal	Normal	Normal	Normal	Normal
1989	Normal	Normal	Normal	Normal	Normal	Normal
1990	Normal	Normal	Normal	Normal	Dry	Dry
1991	Dry	Critical	Critical	Dry	Dry	Dry
1992	Critical	Dry	Normal	Normal	Normal	Normal
1993	Normal	Normal	Normal	Normal	Normal	Normal
1994	Normal	Normal	Normal	Dry	Dry	Dry
1995	Dry	Normal	Normal	Normal	Normal	Normal
1996	Normal	Normal	Normal	Normal	Normal	Normal
1997	Normal	Normal	Normal	Normal	Normal	Normal
1998	Normal	Normal	Normal	Normal	Normal	Normal
1999	Normal	Normal	Normal	Normal	Normal	Normal
2000	Normal	Normal	Normal	Normal	Normal	Normal
2001	Dry	Critical	Dry	Dry	Dry	Dry
2002	Normal	Normal	Normal	Normal	Normal	Normal
2003	Normal	Normal	Normal	Normal	Normal	Normal
2004	Normal	Normal	Normal	Normal	Normal	Normal
2005	Normal	Normal	Normal	Normal	Normal	Normal
2006	Normal	Normal	Normal	Normal	Normal	Normal

TABLE 4
Estimated Future Imports to East Fork Russian River (ac-ft)

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1961	15,126	17,843	18,471	18,110	16,274	4,788	2,083	3,501	4,463	5,169	6,074	15,430	127,332
1962	17,646	13,349	18,362	18,801	16,628	4,796	2,083	3,501	4,463	7,462	10,600	9,333	127,024
1963	16,168	18,155	18,319	18,330	16,693	4,768	2,083	3,501	4,463	6,909	10,298	10,233	129,920
1964	12,439	16,051	17,930	18,500	17,034	4,763	2,083	3,501	2,380	4,610	6,928	8,532	114,750
1965	15,760	17,985	15,472	18,429	16,811	4,320	2,083	3,501	4,463	7,528	10,746	14,049	131,149
1966	16,590	10,740	13,571	18,439	16,746	4,782	2,083	3,501	4,463	7,346	10,497	14,440	123,198
1967	17,902	17,171	18,693	18,755	16,841	4,639	2,083	3,501	4,463	9,383	14,702	15,484	143,616
1968	15,045	10,391	17,744	18,553	17,351	4,788	2,083	3,501	4,463	7,308	10,092	10,470	121,788
1969	15,907	17,487	17,817	17,683	15,959	4,702	2,083	3,501	4,463	7,230	10,249	14,273	131,351
1970	16,976	14,798	12,907	17,780	16,300	4,686	2,083	3,501	2,380	4,373	6,848	13,174	115,805
1971	16,084	15,834	18,671	18,618	17,042	4,857	2,083	3,501	4,463	4,943	3,095	6,680	115,871
1972	9,356	10,480	15,122	18,411	13,179	4,248	2,083	3,501	4,463	9,721	8,634	14,186	113,383
1973	15,971	17,633	12,242	16,757	16,731	4,183	2,083	3,501	4,463	5,713	6,958	13,401	119,634
1974	6,315	1,580	18,728	15,655	13,558	4,763	2,083	3,501	4,463	4,453	4,253	12,309	91,661
1975	16,444	17,015	16,246	15,486	14,201	4,584	2,083	3,501	4,463	5,663	6,367	14,299	120,351
1976	18,113	17,627	17,604	8,255	5,588	4,467	1,765	1,537	1,488	2,700	4,685	10,919	94,748
1977	15,945	15,654	7,270	3,285	512	321	298	307	298	964	1,450	577	46,881
1978	804	2,233	9,402	17,147	16,138	4,616	2,083	3,501	4,463	6,605	8,813	11,859	87,663
1979	14,530	17,423	7,186	12,210	16,626	4,723	2,083	3,501	4,463	6,478	8,432	16,415	114,070
1980	16,897	16,763	18,443	18,062	17,379	4,786	2,083	3,501	4,463	5,151	3,348	15,154	126,030
1981	17,421	13,184	14,273	11,379	16,636	4,770	2,083	3,501	4,463	5,000	5,169	11,342	109,221
1982	19,579	16,548	19,117	19,434	18,052	5,004	2,083	3,501	4,463	6,385	8,791	15,039	137,996
1983	9,616	13,018	17,354	19,282	17,649	4,893	2,083	3,501	4,463	10,905	14,876	3,420	121,059
1984	4,641	10,940	16,207	19,133	18,115	4,930	2,083	3,501	4,463	5,606	8,992	7,110	105,721
1985	17,854	17,966	18,340	18,791	17,158	4,898	2,083	3,501	4,463	6,825	7,309	14,990	134,177
1986	17,596	9,656	15,591	14,258	13,901	4,873	2,083	3,501	4,463	5,284	5,723	8,571	105,501
1987	17,933	7,591	5,248	5,383	12,044	4,745	2,083	3,501	2,380	4,015	4,544	4,017	73,483
1988	6,064	5,359	15,759	17,500	17,020	4,717	2,083	3,501	2,380	4,058	5,009	4,883	88,334
1989	4,877	8,333	17,933	17,867	12,758	4,344	2,083	3,501	4,463	5,328	5,893	6,311	93,691
1990	16,144	11,492	9,142	16,390	16,644	4,879	2,083	1,537	1,488	2,452	6,060	16,786	105,096
1991	19,123	14,587	4,897	2,202	2,497	2,083	1,765	1,537	1,488	4,596	5,667	7,363	67,804
1992	15,743	11,681	5,002	8,366	12,879	4,990	2,083	3,501	4,463	5,601	6,284	5,816	86,409
1993	8,406	8,589	13,734	16,806	16,423	4,994	2,083	3,501	4,463	5,897	6,897	14,658	106,450
1994	18,335	12,049	10,885	8,513	11,546	4,897	1,765	1,537	1,488	2,761	7,168	3,949	84,895
1995	5,092	5,568	3,721	3,557	5,308	2,765	2,083	3,501	4,463	4,842	5,135	5,486	51,521
1996	5,439	7,672	12,522	16,070	18,333	5,006	2,083	3,501	4,463	6,712	9,285	17,036	108,122
1997	17,201	11,621	16,465	13,113	11,429	3,491	2,083	3,501	4,463	5,369	8,118	9,648	106,502
1998	9,557	17,338	16,263	18,084	14,737	5,056	2,083	3,501	4,463	5,885	7,293	12,012	116,271
1999	17,746	17,058	17,433	11,586	9,894	3,084	2,083	3,501	4,463	5,627	6,631	8,113	107,219
2000	10,127	12,750	11,711	13,002	16,657	4,875	2,083	3,501	4,463	5,544	6,986	7,807	99,505
2001	9,527	11,054	2,862	3,933	3,293	1,806	1,765	1,537	1,488	2,241	2,916	3,437	45,859
2002	5,486	11,709	18,183	17,128	17,276	4,897	2,083	3,501	4,463	4,461	4,425	4,292	97,904
2003	5,159	6,189	7,917	7,914	13,960	4,556	2,083	3,501	4,463	6,171	7,946	13,331	83,189
2004	10,292	9,352	16,828	18,250	14,620	4,760	2,083	3,501	4,463	4,994	5,540	5,879	100,563
2005	6,292	6,827	11,766	16,092	14,420	4,374	2,083	3,501	4,463	5,603	6,952	6,738	89,111
2006	6,770	5,590	3,464	11,006	12,333	4,005	2,083	3,501	4,463	5,588	6,690	7,097	72,589
Average	**12,870**	**12,390**	**13,757**	**14,615**	**14,199**	**4,397**	**2,016**	**3,218**	**3,868**	**5,597**	**7,160**	**10,138**	**104,226**
Avg (cfs)	209	208	224	238	256	72	34	52	65	91	116	170	

TABLE 5
Lake Mendocino Historical Outflows (acre-feet)

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1961	15,081	17,844	3,638	19,496	42,941	41,479	21,049	15,309	14,269	19,988	22,828	22,183	256,104
1962	17,786	8,773	3,736	17,824	46,440	40,140	15,239	6,555	7,869	11,560	12,494	11,705	200,120
1963	9,265	22,900	34,326	15,408	44,944	22,667	49,104	21,186	10,846	9,878	10,574	13,432	264,529
1964	13,246	37,859	13,198	42,423	13,597	13,115	6,918	5,171	8,706	14,140	13,637	12,204	194,214
1965	12,341	6,482	61,137	88,416	18,518	10,275	22,854	15,188	9,100	12,228	14,287	13,577	284,404
1966	15,850	26,123	14,105	42,738	32,460	27,561	10,618	12,758	9,404	14,718	15,202	14,876	236,411
1967	17,171	28,201	28,666	32,860	44,861	27,844	35,538	14,827	16,039	13,912	17,725	19,637	297,280
1968	19,895	13,065	13,845	35,661	37,673	29,193	5,484	4,122	11,260	16,699	15,061	11,639	213,597
1969	11,475	11,217	46,535	83,654	51,839	31,861	9,918	16,704	14,043	16,164	16,628	12,982	323,018
1970	13,789	15,134	37,802	111,624	29,021	25,924	4,985	4,754	13,166	17,245	17,800	13,875	305,119
1971	10,786	5,355	62,160	69,020	11,048	15,075	21,438	17,986	15,539	14,993	17,855	14,206	275,462
1972	12,058	8,626	6,377	21,902	22,725	17,453	12,149	13,964	12,732	17,250	18,125	15,854	179,215
1973	16,909	16,592	22,051	67,617	52,657	20,896	8,581	10,659	15,388	19,934	19,101	14,589	284,974
1974	18,716	3,045	49,586	58,850	17,320	28,061	57,924	21,180	15,287	15,602	20,513	24,621	330,705
1975	23,499	13,097	8,198	13,789	64,999	64,751	17,014	20,210	16,261	15,666	19,065	19,397	295,946
1976	19,666	11,558	16,507	9,800	8,285	16,374	3,370	9,939	15,723	18,397	15,640	13,434	158,694
1977	10,717	9,971	5,687	1,330	994	819	2,884	5,332	9,689	11,845	10,526	5,758	75,553
1978	2,552	865	431	52,658	57,642	37,994	26,333	17,598	16,806	16,086	18,197	12,508	259,670
1979	12,070	14,737	10,981	22,652	52,854	28,549	11,402	19,901	12,006	16,385	17,978	15,397	234,911
1980	12,125	27,778	32,186	69,538	56,064	29,873	15,195	17,043	13,567	16,329	17,993	14,331	322,022
1981	14,255	11,445	15,457	22,254	36,508	25,903	9,500	8,720	13,386	20,869	17,295	13,781	209,371
1982	9,789	20,947	61,537	54,171	52,806	32,310	61,495	18,700	17,209	13,832	19,306	14,402	376,504
1983	9,624	19,553	58,148	42,189	63,799	109,936	40,199	25,603	15,715	15,745	14,299	14,100	428,912
1984	13,983	36,469	54,448	34,235	31,065	15,327	18,109	7,123	11,321	17,571	12,689	12,291	264,630
1985	10,347	32,931	25,120	20,492	33,058	6,956	15,099	8,949	15,705	16,895	13,764	12,379	211,696
1986	10,402	9,311	20,716	32,093	107,801	45,782	10,436	10,617	13,760	17,419	16,497	14,931	309,765
1987	10,805	9,121	9,270	8,413	1,570	26,540	8,218	11,379	12,005	15,759	15,236	14,503	142,818
1988	14,037	9,021	3,370	47,614	17,705	7,976	10,453	11,486	6,934	11,845	10,237	9,818	160,497
1989	9,080	5,121	8,599	28,746	12,732	44,692	22,780	13,259	15,309	18,902	18,780	11,881	209,880
1990	9,870	9,133	9,501	18,628	25,655	11,314	3,675	6,708	9,824	13,417	14,891	11,668	144,284
1991	16,954	15,728	5,149	5,242	2,053	21,232	19,291	14,474	8,770	13,027	13,589	12,819	148,326
1992	12,987	7,163	5,449	11,032	33,322	13,338	15,471	13,514	14,551	15,938	17,323	14,371	174,461
1993	12,927	8,757	8,945	77,647	39,154	15,773	23,002	22,843	20,790	15,721	15,864	13,224	274,646
1994	24,413	11,566	9,441	11,138	23,596	10,259	5,048	4,791	9,623	13,287	12,807	14,048	150,016
1995	7,952	5,125	4,466	58,684	19,770	49,103	17,542	19,545	10,322	13,348	15,999	13,643	235,499
1996	14,006	11,963	7,825	42,751	46,647	26,548	22,115	22,345	13,945	17,927	18,190	14,024	258,284
1997	15,588	13,450	33,169	75,790	19,201	11,155	10,520	12,664	11,778	15,526	15,334	13,625	247,801
1998	11,435	9,739	5,804	74,536	112,459	26,870	35,156	25,021	24,274	15,827	19,619	19,710	380,451
1999	16,105	17,113	23,611	21,063	59,628	28,115	24,507	13,647	12,543	18,685	20,950	19,167	275,133
2000	17,515	12,091	10,107	6,282	43,389	26,345	10,724	12,519	15,432	17,865	19,879	14,221	206,368
2001	13,087	9,539	10,415	7,812	2,199	2,117	4,454	7,542	10,683	11,564	11,504	13,132	104,048
2002	11,295	5,351	43,581	47,783	23,782	7,954	11,761	11,905	14,465	17,089	16,049	15,165	226,181
2003	14,195	6,633	3,286	36,621	22,906	12,775	33,117	34,298	14,903	17,913	17,166	15,492	229,305
2004	14,288	10,579	25,009	45,416	56,932	16,569	11,395	12,619	16,218	17,728	12,909	11,937	251,599
2005	10,755	9,921	10,059	24,638	24,366	18,062	24,272	23,045	13,352	15,664	15,412	13,948	203,493
2006	14,031	10,828	21,835	98,191	31,273	49,240	53,165	19,267	13,252	14,883	15,059	12,492	353,516
Average	**13,581**	**13,648**	**20,988**	**39,798**	**35,875**	**25,915**	**19,120**	**14,412**	**13,343**	**15,723**	**16,128**	**14,282**	**242,814**
(cfs)	221	229	341	647	646	421	321	234	224	256	262	240	336

Source: USACE.

Figure 1 - City of Ukiah Water Use

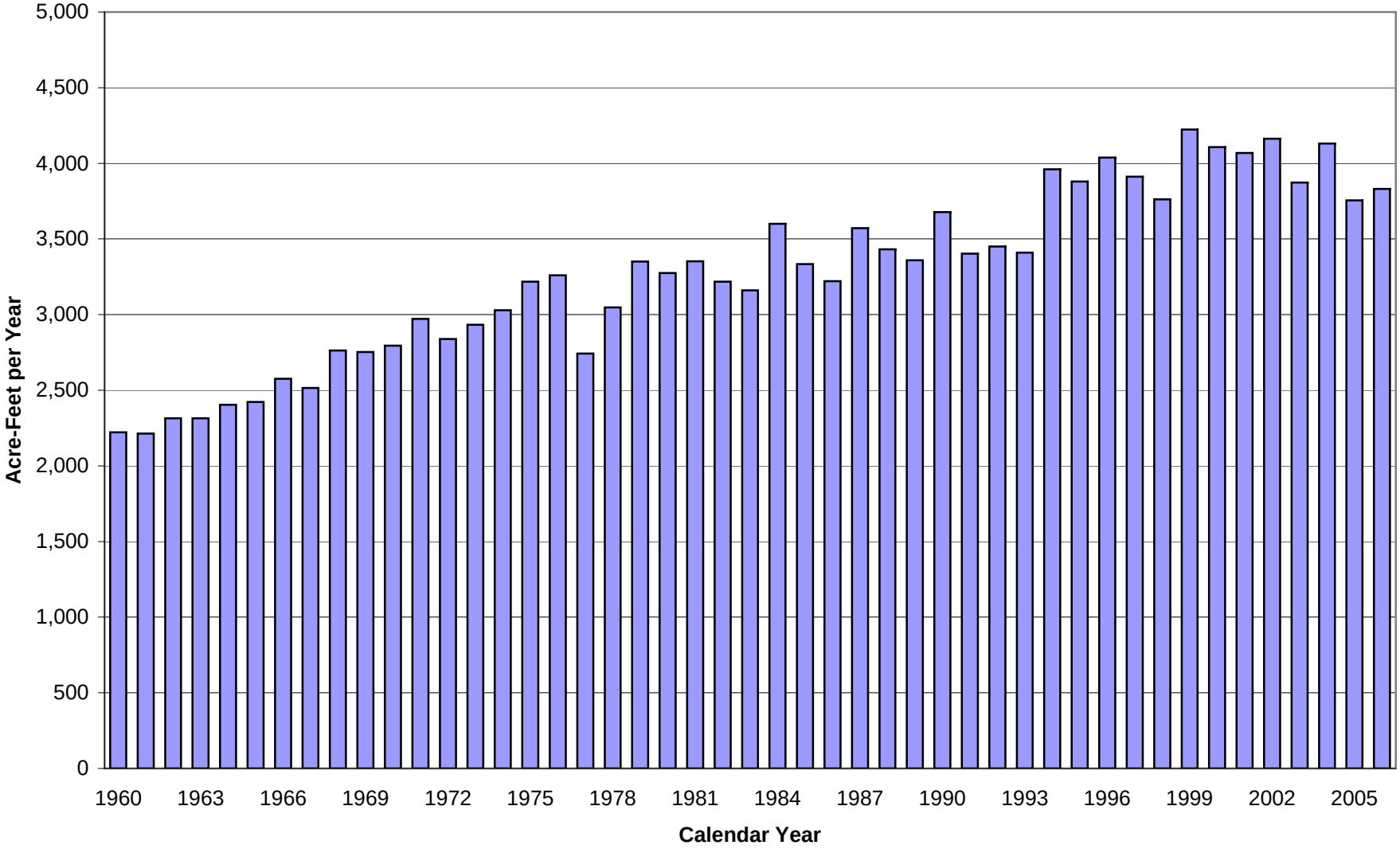


Figure 2 - City of Ukiah Average Water Diversion and Depletion Projected at 20 cfs Peak Use

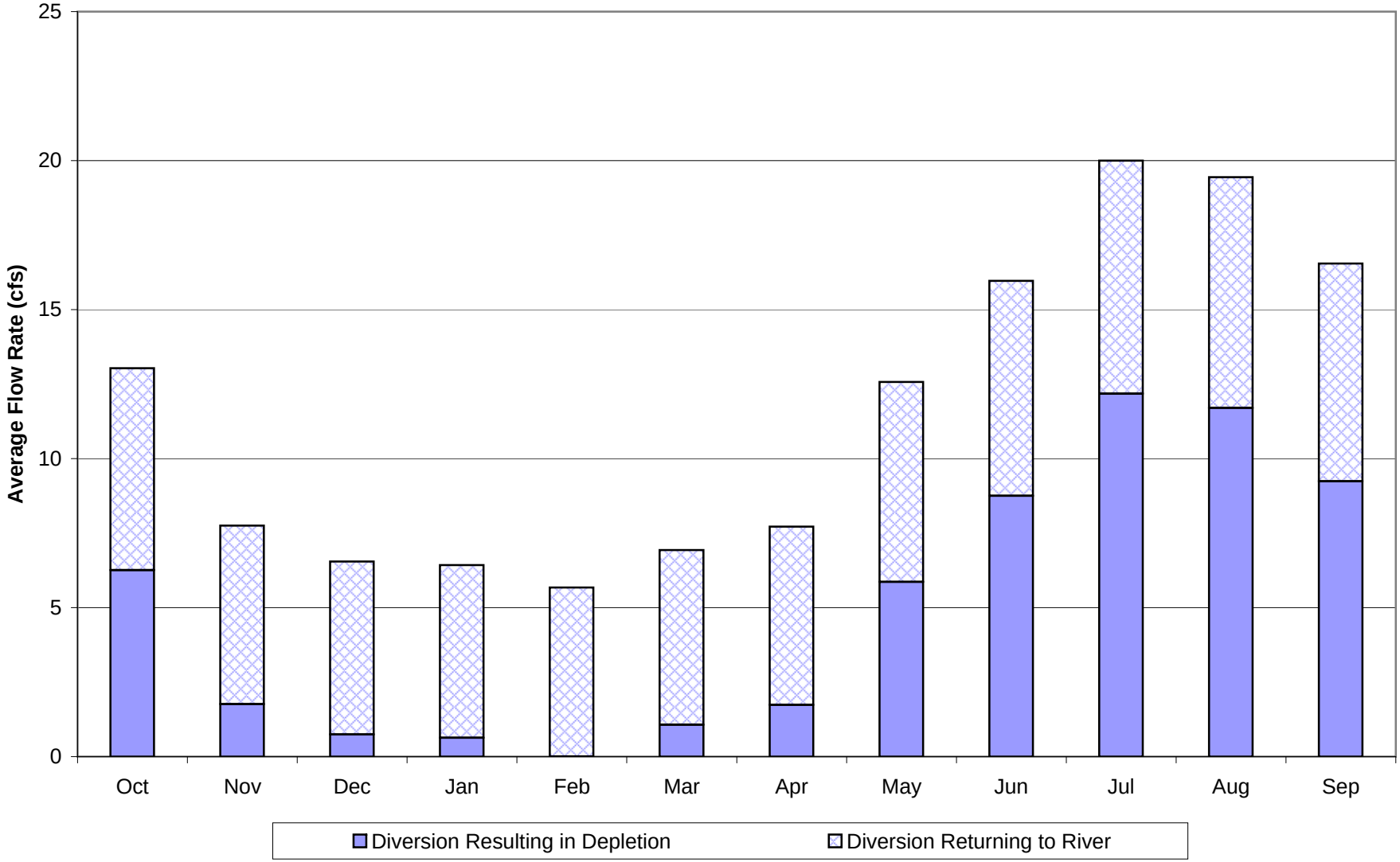


Figure 3 - Lake Pillsbury Target and Maximum Storage

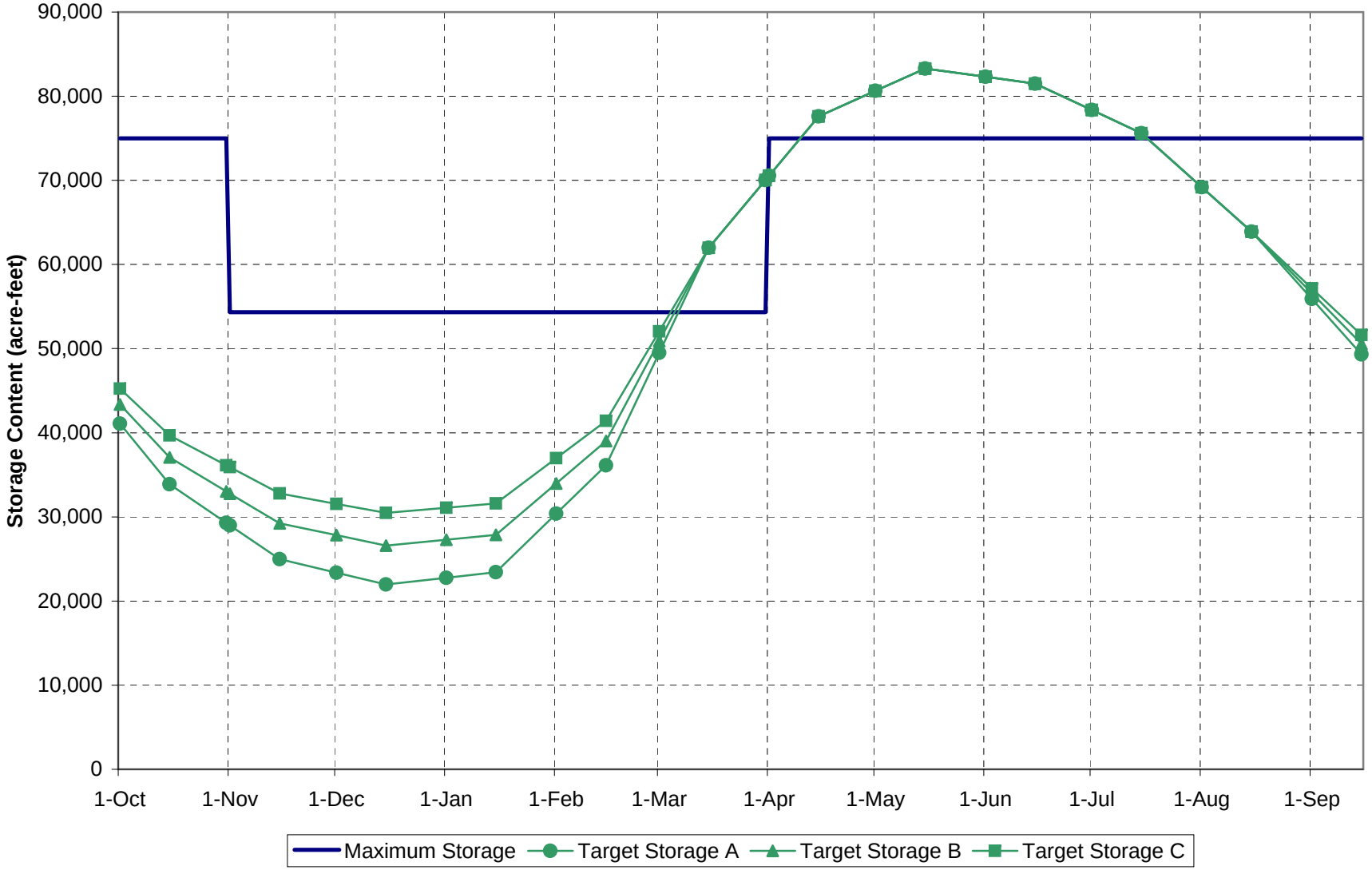


Figure 4 - Lake Mendocino Historical Outflow during May through November
Water Years 1961 - 2006

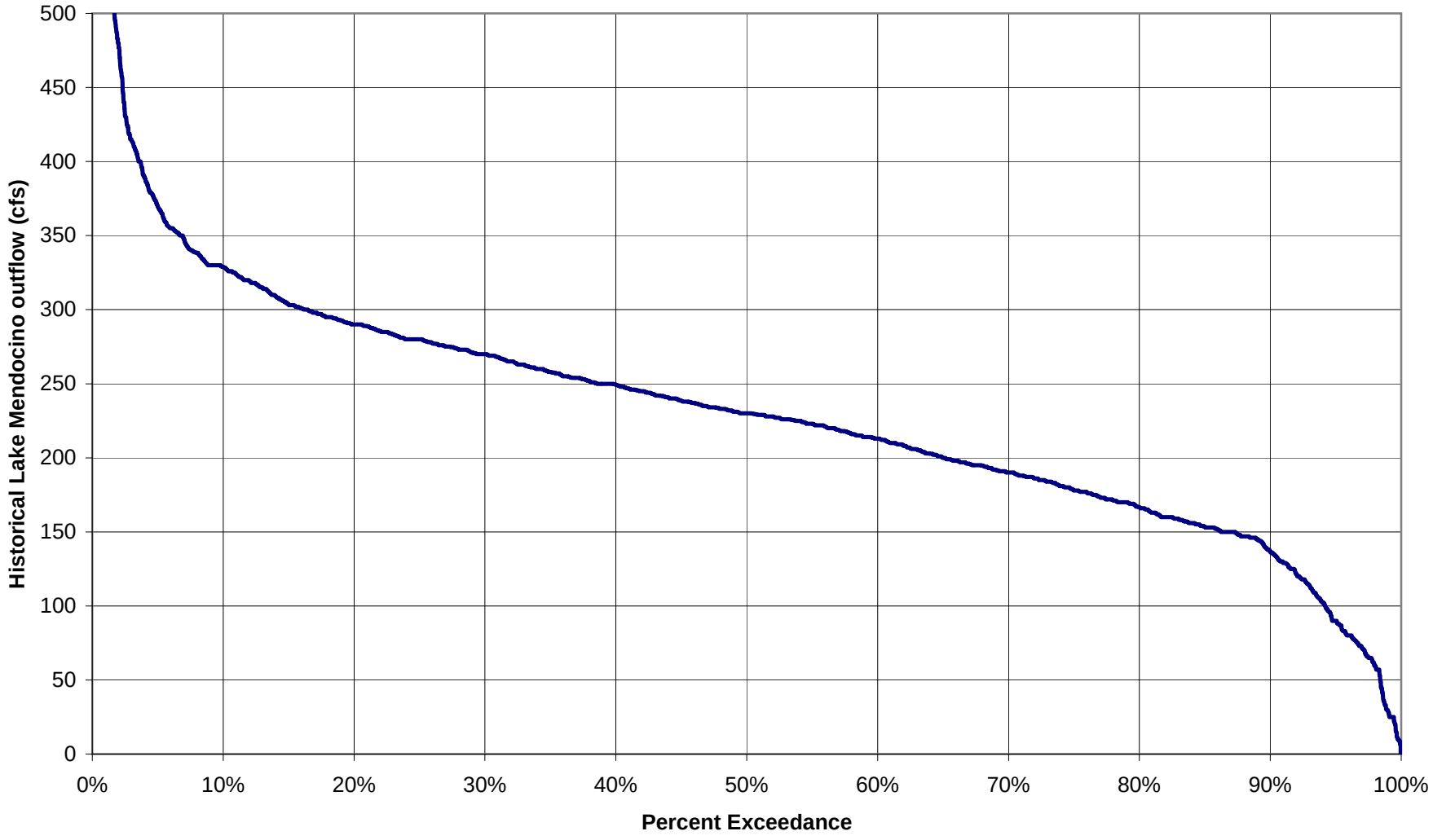
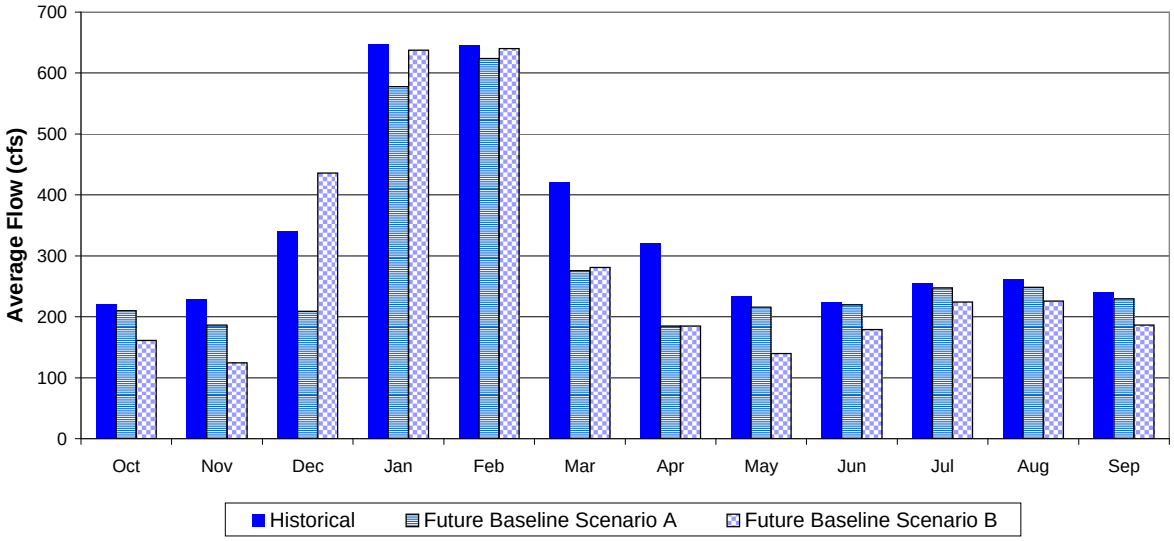


FIGURE 5 - Lake Mendocino Outflows

Average for Water Years 1961 - 2006



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Historical	221	229	341	647	646	421	321	234	224	256	262	240	336
Future Baseline Scenario A	210	186	209	578	624	276	185	216	219	247	249	230	284
Future Baseline Scenario B	161	125	436	637	640	281	185	140	179	224	226	187	284

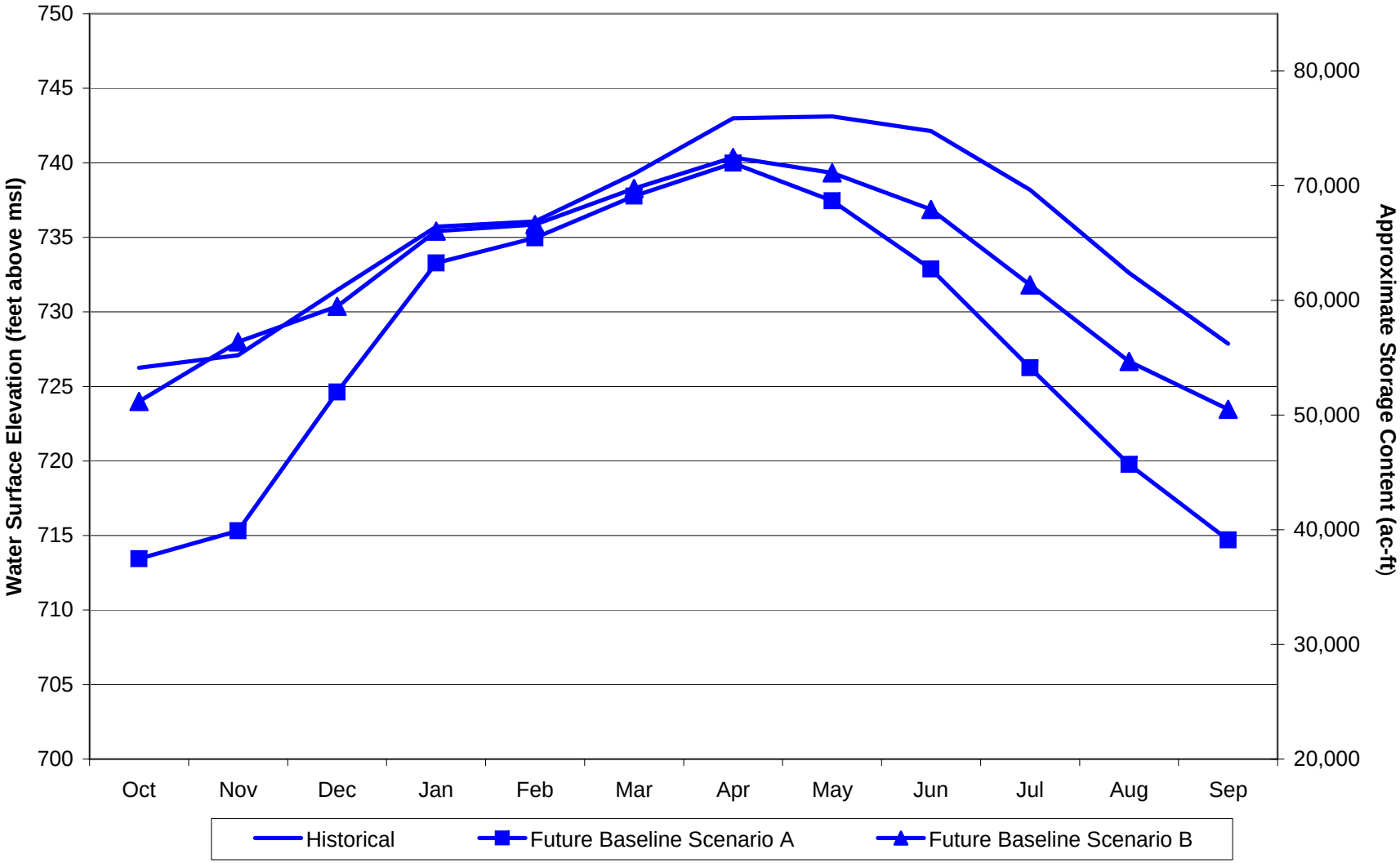
Future Scenarios: Inflow to Lake reduced by FERC license condition E5.

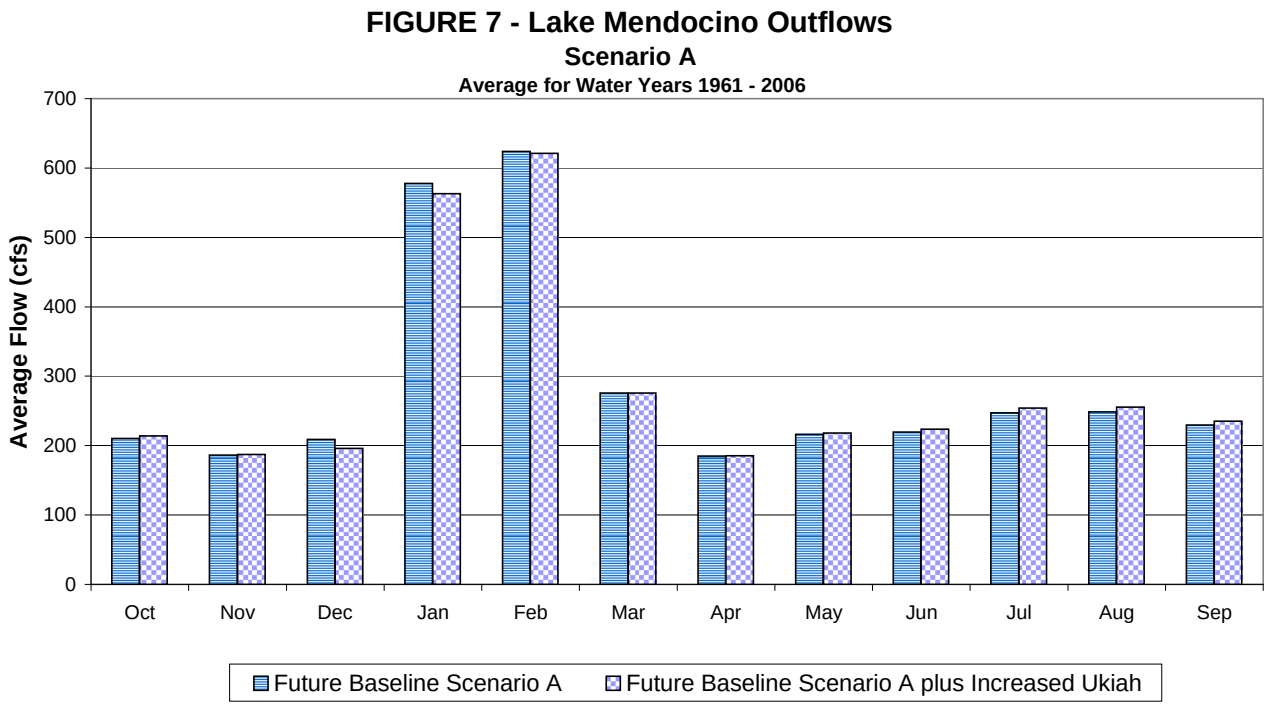
Scenario A: May-Nov downstream demand = historical release capped at 275 cfs.

Scenario B: May-Nov downstream demand = historical release minus excess River flow above D-1610 reqmt.

FIGURE 6 - Lake Mendocino Average Water Level

Water Years 1961 - 2006





	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Future Baseline Scenario A	210	186	209	578	624	276	185	216	219	247	249	230	284
Future Baseline Scenario A plus Increased Ukiah	214	187	196	563	621	276	185	218	224	254	255	235	284

Future Scenarios: Inflow to Lake reduced by FERC license condition E5.

Scenario A: May-Nov downstream demand = historical release capped at 275 cfs.

Scenario B: May-Nov downstream demand = historical release minus excess River flow above D-1610 reqmt.

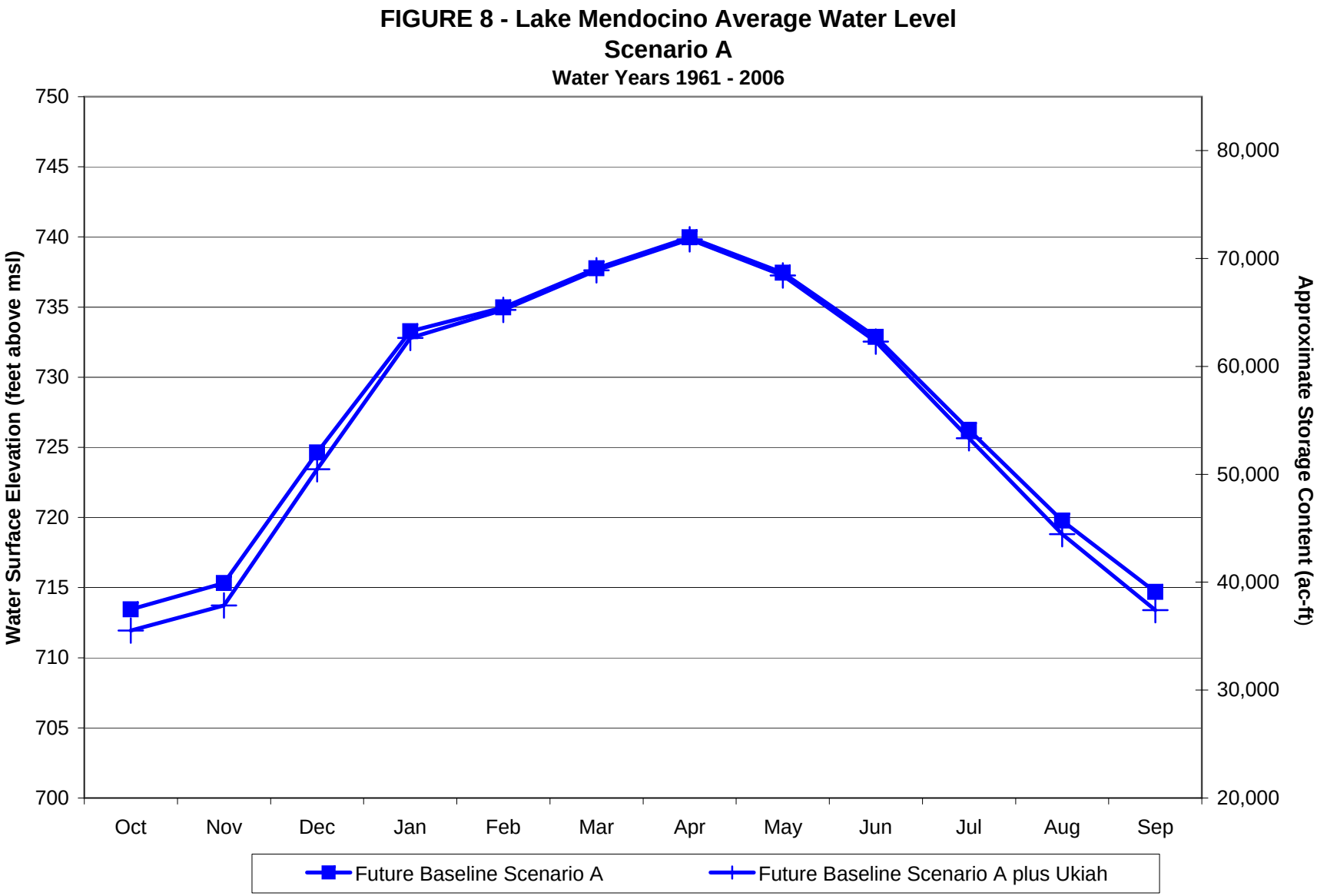
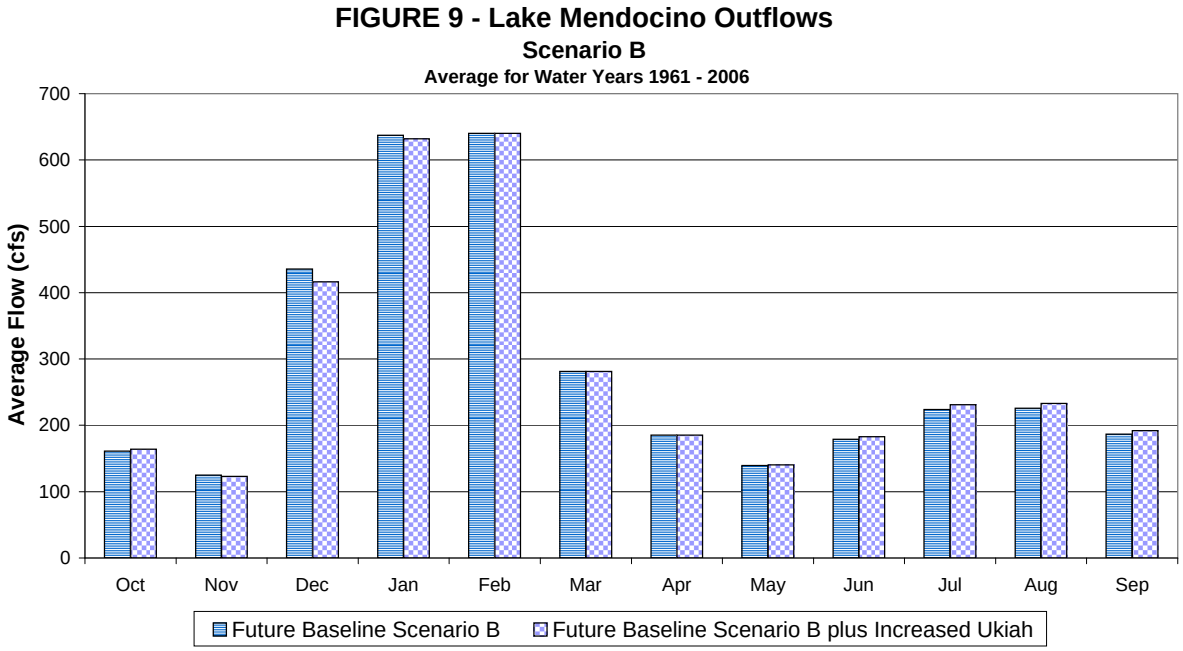


FIGURE 8 - Lake Mendocino Average Water Level
Scenario A
Water Years 1961 - 2006
Water Surface Elevation (feet above msl)
750
745
740
735
730
725
720
715
710
705
700
Approximate Storage Content (ac-ft)
80,000
70,000
60,000
50,000
40,000
30,000
20,000
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Future Baseline Scenario A
Future Baseline Scenario A plus Ukiah



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Future Baseline Scenario B	161	125	436	637	640	281	185	140	179	224	226	187	284
Future Baseline Scenario B plus Increased Ukiah	164	123	416	632	640	281	185	141	183	231	233	192	284

Future Scenarios: Inflow to Lake reduced by FERC license condition E5.

Scenario A: May-Nov downstream demand = historical release capped at 275 cfs.

Scenario B: May-Nov downstream demand = historical release minus excess River flow above D-1610 reqmt.

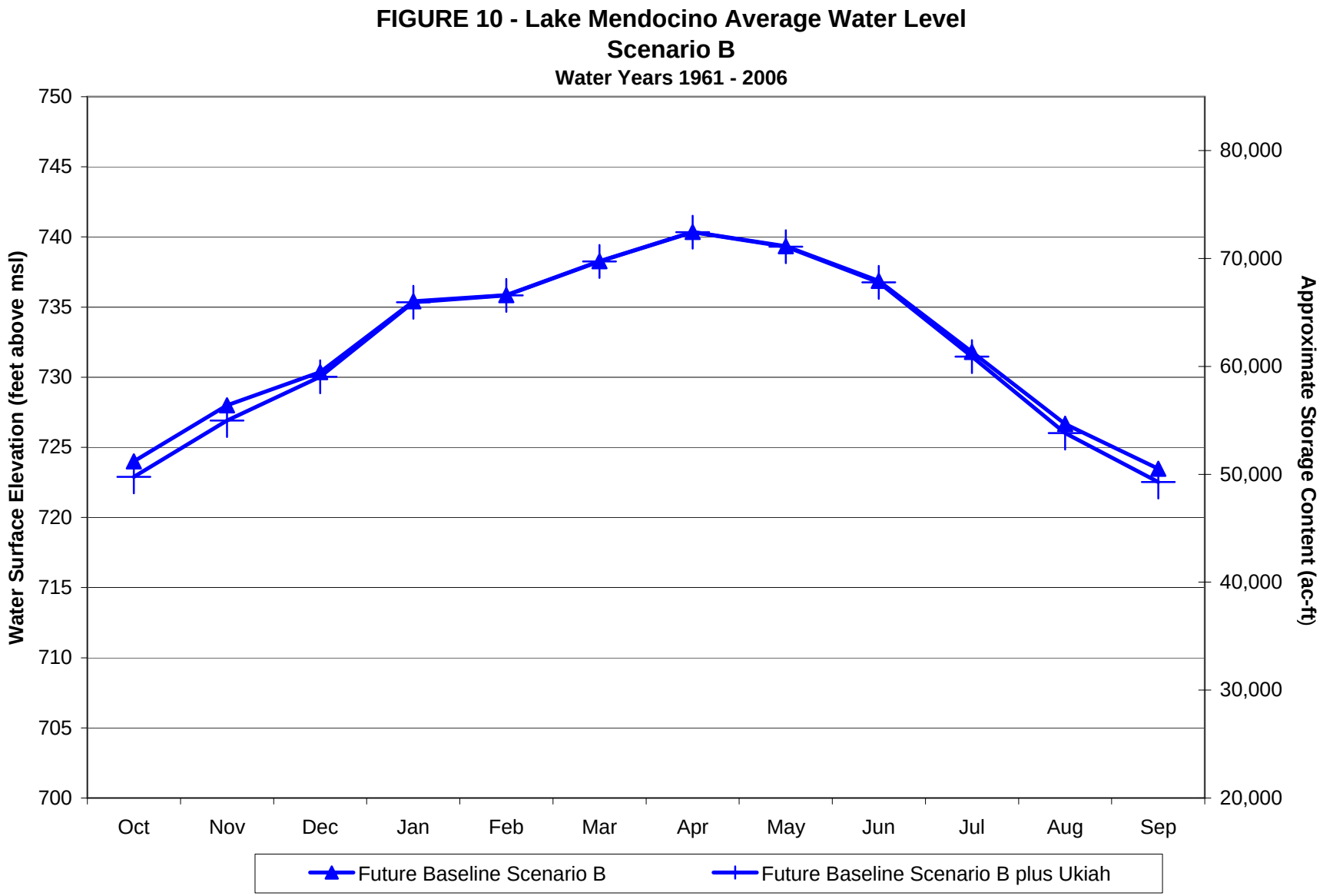
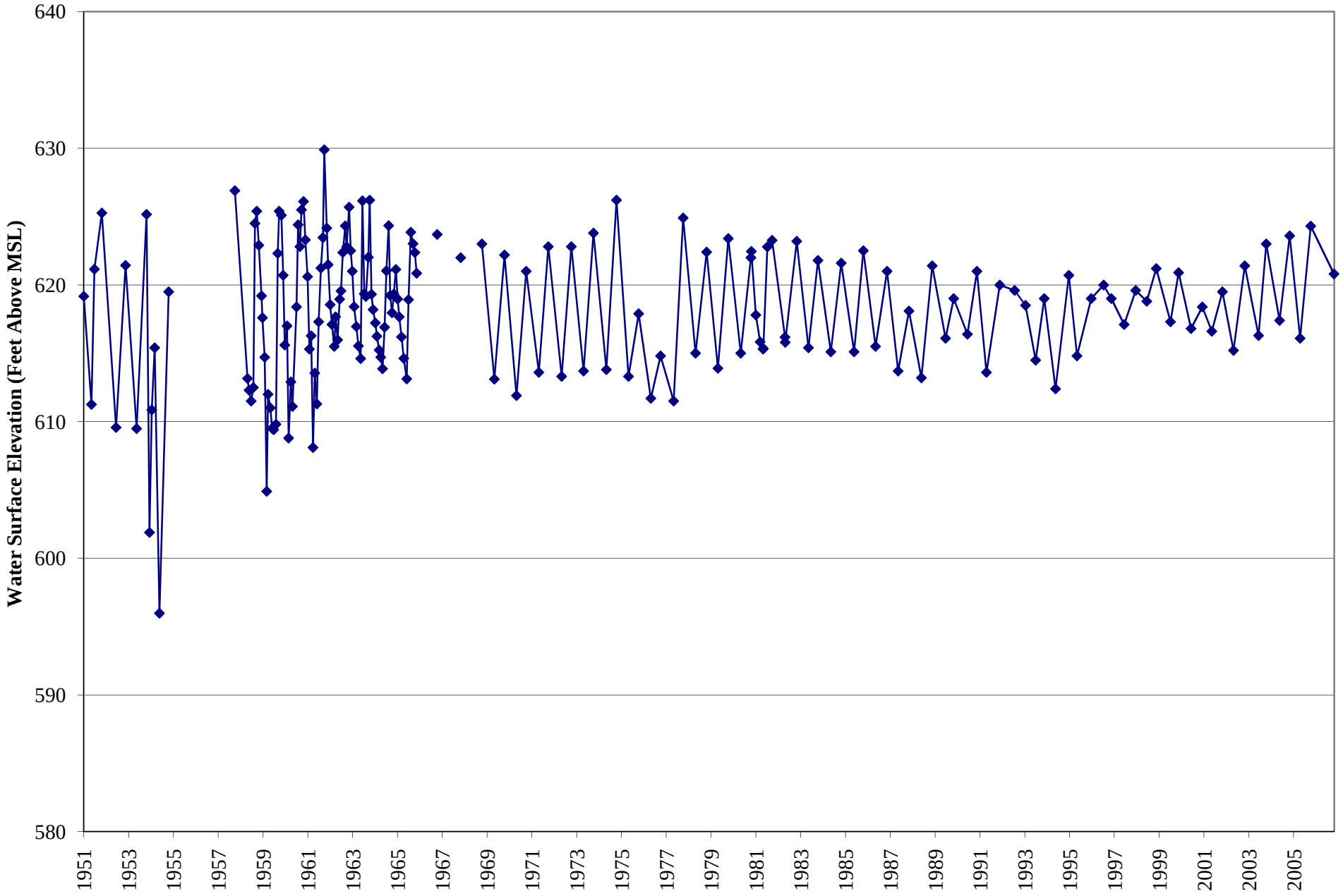


FIGURE 10 - Lake Mendocino Average Water Level
Scenario B
Water Years 1961 - 2006
Water Surface Elevation (feet above msl)
750
745
740
735
730
725
720
715
710
705
700
Approximate Storage Content (ac-ft)
80,000
70,000
60,000
50,000
40,000
30,000
20,000
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Future Baseline Scenario B
Future Baseline Scenario B plus Ukiah

FIGURE 11
Well 15N12W08L001

10/31/2007



G:\City of Ukiah Litigation\, COULP034.xls, GW Well 15N12W08L001 Graph

FIGURE 12
Well 14N12W05K001

10/31/2007

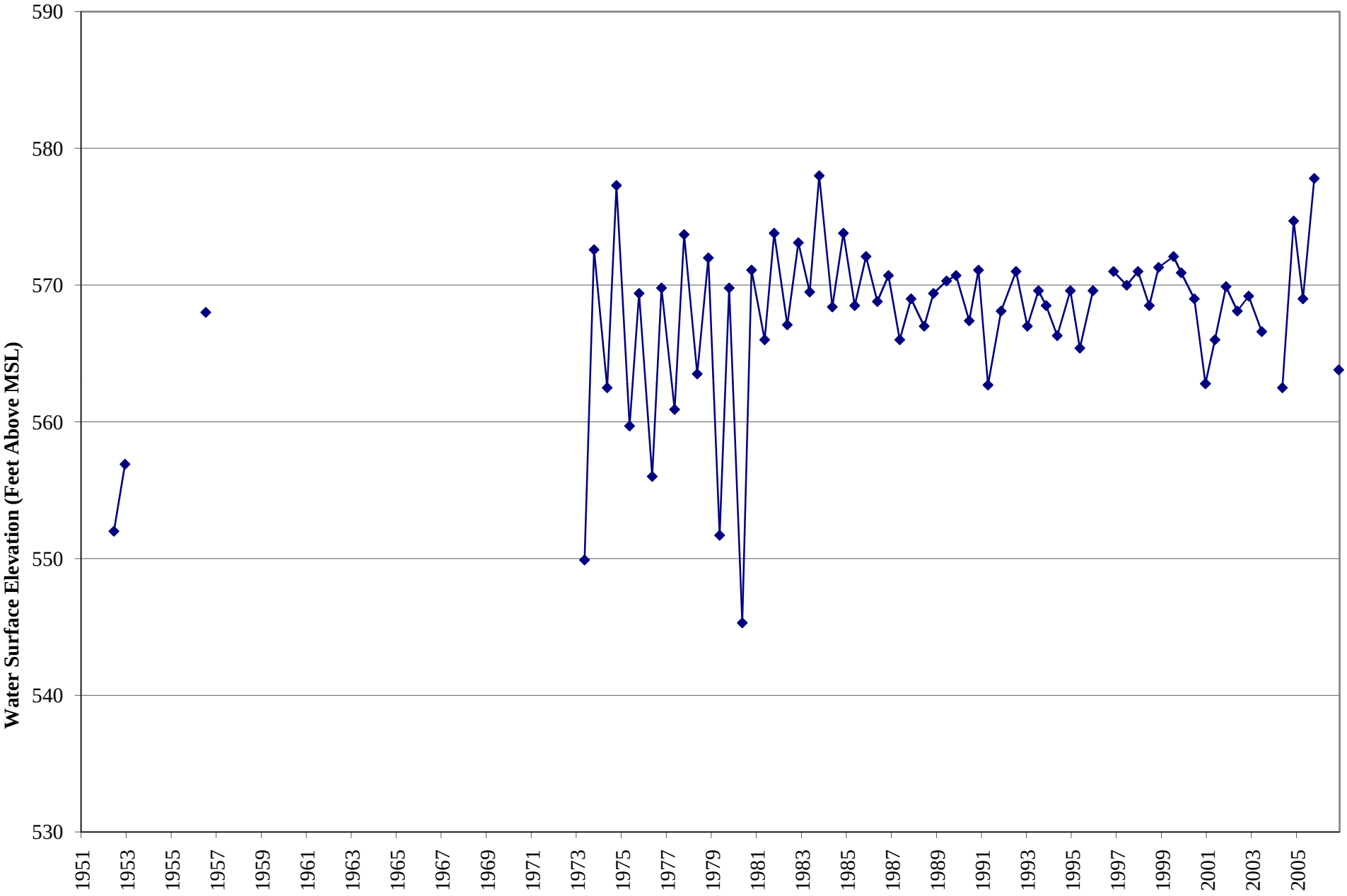


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FIGURE 13
Well 15N12W34Q001

10/31/2007

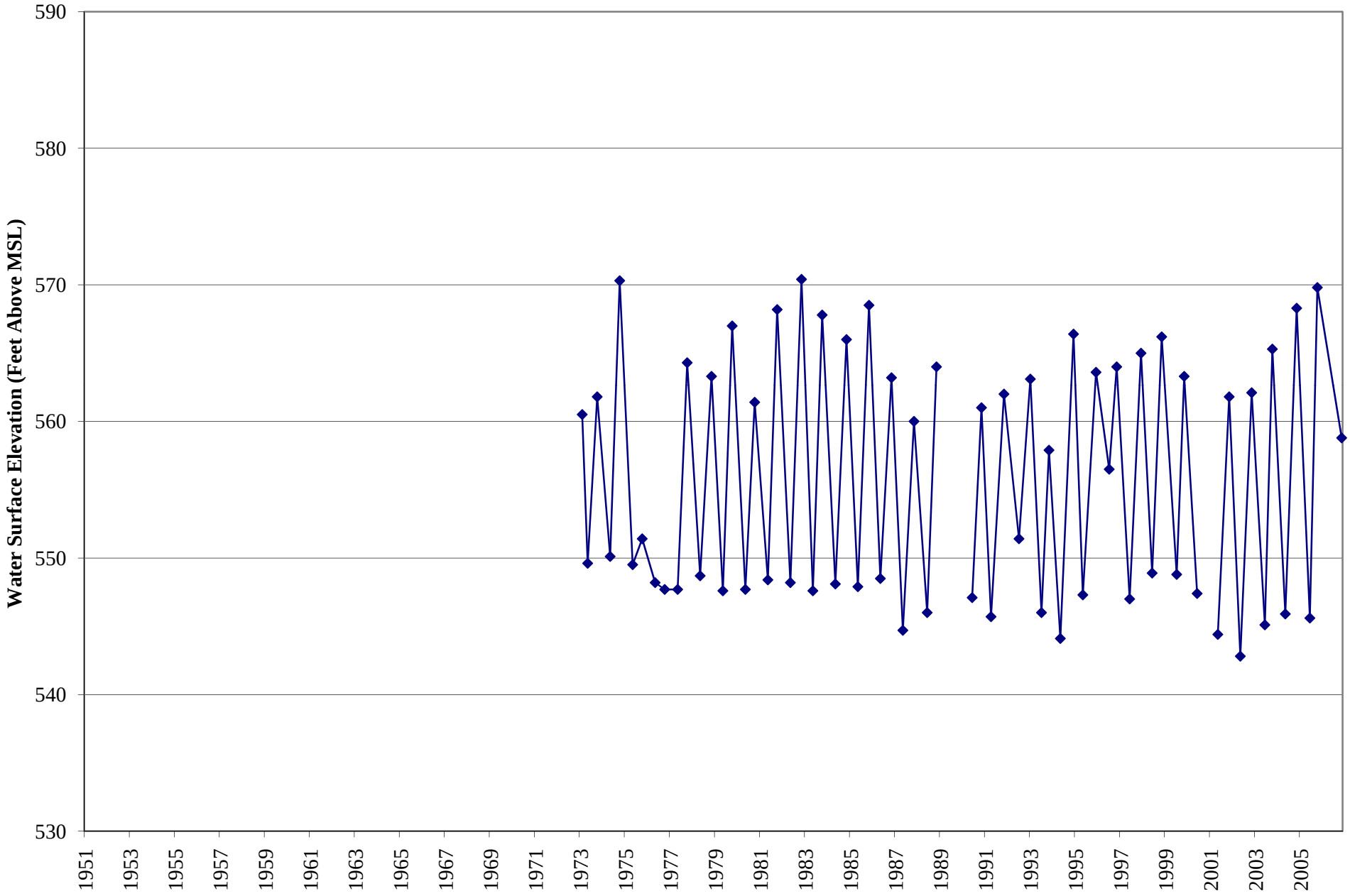

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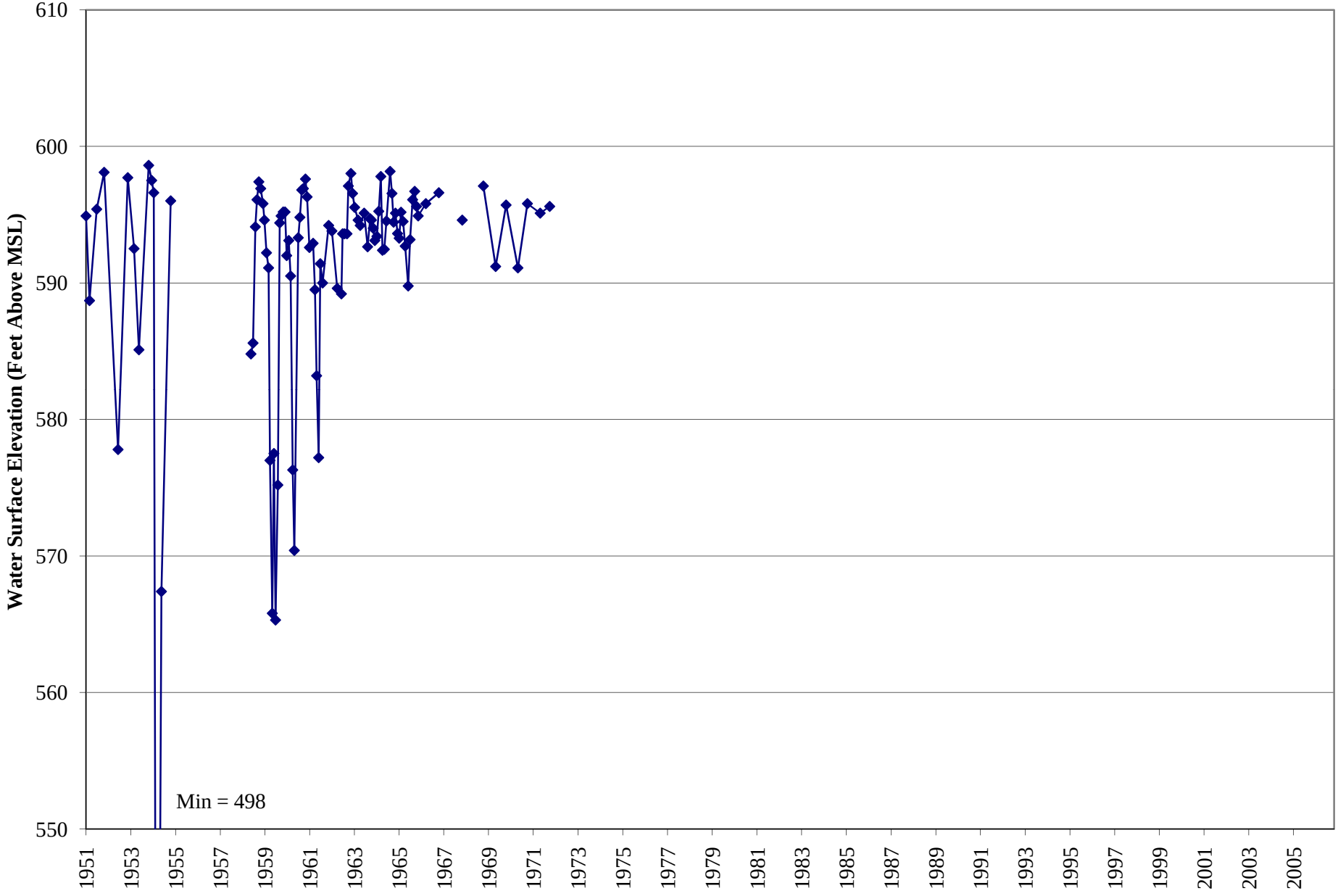
FIGURE 14
Well 15N12W35M001

10/31/2007



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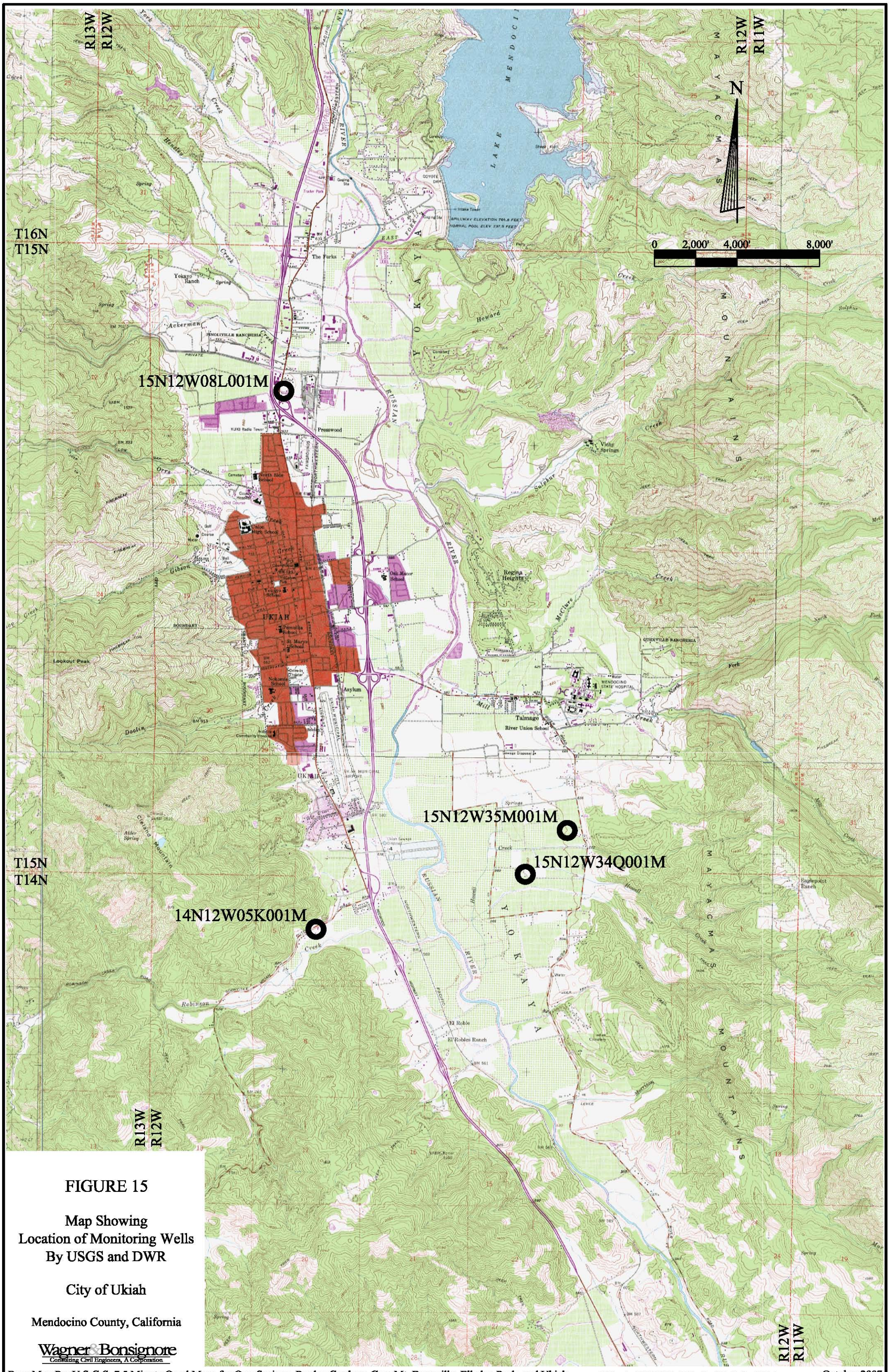

FIGURE 15

Map Showing
Location of Monitoring Wells
By USGS and DWR

City of Ukiah

Mendocino County, California

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation

Base Map Per U.S.G.S. 7.5 Minute Quad Maps for Orrs Springs, Purdys Gardens, Cow Mt, Boonville, Elledge Peak, and Ukiah

Q:\Drawings\Ukiah\Ukiah-Petition\dwg\Monitoring Wells.dwg

October 2007

McLean

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Safety of Dams

Certificate of Approval

This Is To Certify That, pursuant to Part 1 of Division 3 of the California Water Code, the Department of Water Resources of the State of California has found that the Scott Dam and Reservoir, State Application Number 97-101, located in Sec. 14, Tp. 18 N, R. 10 W, M.D.B. & M., Lake County, State of California, are safe to impound water; and the use of said dam and reservoir to impound water in accordance with and subject to the following terms and conditions is hereby authorized: 1. Water may be impounded to Elevation 1910.00, assumed datum as shown on Pacific Gas and Electric Company Drawing No. 46975, revised September 25, 1936.

2. Spillway gates shall be held in the full-open position every season between November 1 and April 1, both dates inclusive except slide gates 1, 2, 3, 4, 21, 24, 25, and 26 which shall be in the full-closed position and slide gate 20 which shall be held in the half-open position.

This certificate of approval supersedes every previous certificate of approval or written consent for use issued by the State of California relative to said dam and reservoir.

Witness my hand and the Seal of the Department of Water Resources of the State of California

this 4th day of December 19 78

J. Deady

Division Engineer, Reg. C. E. No. 6500

Pacific Gas and Electric Company
Hydro Generation

E-1

Lake Pillsbury

Capacity Table 3.01

	U.S.G.S. Elevation (Ft.)	PG&E Elevation (Ft.)	Gross Storage Acre Feet
Zero Capacity	1736.00	1817.7	0
Outlet Sill	1740.70	1822.40	22.6
Spill Crest	1818.30	1900.00	54,338
Top of Spillway Gates	1828.30	1910.00	74,993
Crest of Dam	1838.30	1920.00	

PG&E datum = U.S.G.S. datum + 81.70 ft.

Note: The original topographic survey of Lake Pillsbury was made by the Snow Mountain Power Company in 1921. The potential gross capacity of the reservoir was then calculated to be 94,863 acre feet

In order to determine the loss of capacity, due to deposition of sediments, the U.S. Geological Survey performed a survey in 1959 using a recording fathometer and careful triangulation controls. A new gross capacity was found to be 86,785 acre feet

In April of 1984 U.S.G.S. performed another survey and found the gross capacity of 80,643 acre feet at PG&E elevation of 1910.00

This new capacity table was developed by PG&E using Omnistar satellite based position and an Odom Hydrotrac Survey Echo Sounder with a depth accuracy of 0.1%. The Hypack navigation software and Surfer software where used to produce 96 skeletal rating points at 1.00 foot intervals. Hydstra surface water package was used to extrapolate the points logarithmically to produce the final table to 0.01 feet resolution. Maximum Storage at 1910.00 feet = 74,993 acre feet.

This table supersedes all previous tables.
Made by: Frank Lynch, October 26, 2006 and applied back to October 01, 2005

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ORIGINAL

Pacific Gas and Electric Company

John S. Keenan
Senior Vice President
Generation & Chief Nuclear Officer

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October 16, 2006

Honorable Magalie R. Salas, Secretary
Federal Energy Regulatory Commission
OEP/Division of Hydropower Administration and Compliance
888 First Street, NE
Washington, DC 20426

Re: Potter Valley Project, FERC No. 77
Response to Resource Agency Letter Re Operating Rule Compliance

Dear Secretary Salas:

On August 3, 2006 and August 15, 2006, respectively, the California Department of Fish and Game (CDFG) and the National Marine Fisheries Service (NMFS) filed letters with FERC raising concerns regarding PG&E's implementation of the new flow regime under the amended license for the Potter Valley Project (Project). In response to those letters, PG&E notified FERC staff at the Regional Office of its intent to consult with both CDFG and NMFS to better understand their concerns. PG&E met with representatives of CDFG, NMFS, and the Round Valley Indian Tribes (RVIT) on September 7 and October 5, 2006 to discuss the new flow regime for the Project. After these meetings, PG&E reviewed all flow records for the Project since the new flow regime was implemented in June of 2004. Based on that review, PG&E discovered that CDFG and NMFS were correct in their assertions, and also that additional errors had occurred in implementing the flow releases.

As the Senior Vice President of Generation for PG&E, I want to assure you that PG&E takes these implementation errors very seriously. PG&E already has taken a number of specific actions to ensure its operations are in full compliance with the new flow regime, including providing additional operator training and instructions. Within the next 30 days, PG&E will provide FERC with a list of any additional corrective actions that may be appropriate.

In total, there have been three types of errors: (1) overreleases in 2005 and 2006 that occurred during times when Cape Horn Dam was spilling water, due to the mistaken application of NMFS' Reasonable and Prudent Alternative (RPA); (2) overreleases that occurred in 2004, 2005 and 2006 as a result of PG&E's efforts to comply with the East Branch Russian River (EBRR) minimum flow requirements set forth in RPA Section E.3; and (3) overreleases that occurred in the fall of 2004 as a result of PG&E's failure to make the required seasonal adjustments required by the RPA. Each of these scenarios is discussed in turn below. A summary of the RPA Flow Requirements is included for reference in Attachment A.

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A. Overreleases When Cape Horn Dam Was Spilling

PG&E has determined that during periods when Cape Horn Dam was spilling in 2005 and 2006, PG&E misapplied the limitations set forth in Section E.5 and instead diverted water to the EBRR up to the maximum available tunnel capacity. The specific dates and amounts of the overreleases are set forth in Attachment B to this letter.

PG&E's misapplication of the Section E.5 limitations during times of spill was wholly unintentional and stemmed from PG&E's erroneous reliance on the modeling developed by the Department of the Interior (DOI) during the license amendment proceeding. Although the DOI modeling was initially developed to support the flow proposal recommended by DOI and NMFS in response to FERC's draft environmental impact statement, NMFS also relied upon this modeling to develop its RPA. Thus, the assumptions of the DOI modeling are reflected in the final environmental impact statement prepared by FERC as well as the final biological opinion prepared by NMFS.

The DOI modeling assumed that diversions to the EBRR during times of spill at Cape Horn Dam would be maximized to the full tunnel capacity. Specifically, the instructions for the modeling described the assumptions as follows:

> If the sum of the accretion [between the Cape Horn and Scott dams] and the Lake Pillsbury release is greater than the sum of the Cape Horn Dam release and the tunnel diversion then sufficient flow is reaching Cape Horn Dam to meet the minimum flow requirements both for the Eel River below Cape Horn Dam and in the diversion tunnel. In this case, there is no need for additional flow releases from Lake Pillsbury and the excess accretion is *used to fill the diversion tunnel up to its capacity.* The accretion flow above the tunnel capacity is released at Cape Horn Dam.

See Attachment C, "Generalized Hydrologic/Operational Model of the Upper Eel River Basin/Potter Valley Project," prepared for DOI by the National Resources Consulting Engineers, Inc. at p. 13 (emphasis added).

Although the modeling assumed that diversions to the EBRR would be maximized when Cape Horn Dam was spilling, the final language in RPA Section E.5 specifying maximum diversions to the EBRR did not incorporate an exception for spill conditions. Unfortunately, when PG&E began implementing the RPA flows, personnel who had been involved in the license amendment proceeding and familiar with the DOI modeling erroneously applied the modeling logic during periods of spill at Cape Horn Dam rather than follow the limitations specifically set forth in Section E.5. The result is that PG&E overreleased to the EBRR during times of spill in both 2005 and 2006.

Based on its meetings with the resource agencies and RVIT, PG&E recognizes its error and has taken steps to ensure that operational personnel are fully informed of the

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apparent discrepancy between the modeling and the language RPA in Section E.5. PG&E will strictly adhere to the diversion limitations set forth in Section E.5 unless and until FERC and NMFS determine some modification is appropriate.

B. Overreleases Resulting From PG&E's Efforts To Ensure Compliance With EBRR Minimum Flow Requirements

In addition to the overreleases that occurred in 2005 and 2006 during times of spill, PG&E's recent review of its flow records has revealed numerous instances where the actual diversions to the EBRR exceeded the maximum diversions set forth in RPA Section E.5, as a result of PG&E's addition of a small buffer to its EBRR releases to ensure that it fully met the minimum flow requirements set forth in RPA Section E.3. The specific dates and amounts of these overreleases are set forth in Attachment D.

Whenever a license condition requires a minimum instream flow release, it is standard industry practice to release a small amount above the required minimum to ensure that the release does not fall below the minimum requirement. Following this standard industry practice, PG&E added a small buffer to the EBRR diversions (typically in the range of 10 cfs) in order to ensure compliance with the minimum instream flow requirements set forth in RPA Section E.3. However, because the minimum release requirements in Section E.3 are defined in the same way as the maximum diversion limits set forth in Section E.5 (i.e., the EBRR releases set forth in Section C.1 plus the PVID releases), this practice of including a buffer in the EBRR diversions resulted in slight overreleases to the EBRR when the limitations of RPA Section E.5 applied (i.e. when Lake Pillsbury was below the Target Storage Curve). For example, if the maximum release under Section E.5 was 125 cfs, PG&E would release approximately 135 cfs in order to ensure it met the minimum flow requirement set forth in Section E.3. Had PG&E not applied this buffer, it would have run the risk of falling below the minimum flow requirements.

In order to ensure that PG&E's future operations comply with the new flow regime, PG&E is seeking guidance from the Commission regarding which release obligation should take priority when Lake Pillsbury is below the Target Storage Curve – the minimum requirements set forth in RPA Section E.3 or the maximum limitation set forth in RPA Section E.5. PG&E also plans to consult with NMFS regarding the issue and will provide the Commission with any response it receives.

C. Overreleases Resulting From PG&E's Failure To Make The Seasonal Adjustments Required By The RPA

PG&E's review of its records also revealed that in the first year of implementing the new flow regime, PG&E failed to take into account the seasonal adjustments to the maximum flows to the EBRR required by Section E.5. The specific dates and amounts of the overreleases are set forth in Attachment E.

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Under RPA Section E.5, the maximum release to the EBRR when Lake Pillsbury is below the Target Storage Curve varies by season. From May 15 through September 15 the maximum release is 125 cfs; from September 16 through October 15 the maximum release decreases to 85 cfs; from October 16 through April 14 the maximum release decreases again to 40 cfs; and from April 15 through May 14 the maximum release increases again to 85 cfs.

Based on the flow records, PG&E failed to implement these seasonal adjustments in the fall of 2004. Accordingly, although the maximum release to the EBRR should have decreased from 125 cfs to 85 cfs on September 16, 2004, PG&E appears to have continued to release the 125 cfs maximum, while applying the approximately 10 cfs buffer described in the preceding section. PG&E did not repeat this error in 2005 or 2006. PG&E has retrained its operators on the seasonal variations and provided them with clear written instructions on how to implement them.

Because of the wet winter that occurred in the winter of 2004/2005, PG&E does not believe the error in storage regulation in 2004 resulted in any negative environmental impacts. Lake storage began to exceed the Target Storage Curve on December 9, 2004, and remained above Target Storage Curve through March 14, 2005. Conditions after March 14, 2005 are discussed earlier in this letter and in Attachment B.

PG&E acknowledges its compliance failure in relation to the issues described above and is committed to fully and accurately implementing the RPA. PG&E also acknowledges the important role that CDFG and NMFS played in bringing this issue to our attention. Although the RPA sets forth a technically complex and challenging flow schedule to implement, PG&E takes responsibility and is accountable for these errors. PG&E prides itself on its hydroelectric compliance record; the performance here simply fails to live up to PG&E standards.

If you have any questions or concerns, please contact Randy Livingston, Sr. director – Power Generation at (415) 973-6950.

Sincerely,

John S. Keenan

TCandelario:msp

Attachments

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cc:

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Northern California Supervisor
National Marine Fisheries Service
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ATTACHMENT A

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ATTACHMENT A. Summary of RPA Flow Requirements

On January 28, 2004, FERC issued its Order Amending License for the Potter Valley Project. *In re Pacific Gas and Electric Company*, 106 FERC ¶ 61,065. FERC's order adopted NMFS' Reasonable and Prudent Alternative (RPA), which contained several provisions for a new flow regime at Potter Valley. Appendix A of the Order Amending License contained numerous operating rules for Project flows, including prescribed minimum and maximum flows to the EBRR under varying circumstances. Specifically, the RPA provided:

> C.1. Minimum flows of the East Branch of the Russian River, *MF16,* measured at the PG&E gauge E-16, but excluding flows released for the Potter Valley Irrigation District, shall be computed as shown in the following table:

Minimum Flow of the East Branch Russian River				
Period		Classification		
From	Through	Normal	Dry	Critical
Sep 16	Apr 14	35 cfs	35 cfs	5 cfs
Apr 15	May 14	35 cfs	25 cfs	5 cfs
May 15	Sep 15	75 cfs	25 cfs	5 cfs

> * * * * *

> E.3. Release to the East Branch Russian River shall be greater than or equal to the minimum flow MF16 specified in Section C plus the release for the Potter Valley Irrigation District.

> * * * * *

> E.4. Release for the Potter Valley Irrigation District shall not exceed 5 cfs from October 16-April 14 and 50 cfs from April 15 to October 15. If CLP (April 1) is less than 25,000 ac-ft, this release shall not exceed 25 cfs during the following period from April 15 through October 15.

> * * * * *

> E.5. Diversions in excess of the sum of the minimum flow MF16 specified in Section C and the release to the Potter Valley Irrigation District specified in Section E.4 acan [sic] only be made when the Lake Pillsbury Storage is above the Target Storage Curve. Exceptions to the rule can occur only due to rate [sic] and brief emergency power and water demands.

Thus, RPA Section E.3 defines the minimum flows to the EBRR that must be met throughout the year as the sum of the minimum flows set forth in RPA Section C.1 plus the releases to PVID. RPA Section E.5 defines the maximum flows to the EBRR when Lake Pillsbury is below the Target Storage Curve in the same way. Thus, based on the

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flow schedules set forth in sections E.3 and E.4, in normal water years[1] the maximum diversions to the EBRR when Lake Pillsbury was below the Target Storage Curve should have been as follows:

October 16 – April 14	40 cfs
April 15 – May 14	85 cfs
May 15 – September 15	125 cfs
September 16 – October 15	85 cfs

[1] The years 2004, 2005 and 2006 were all classified as normal water years.

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ATTACHMENT B

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Attachment B. Over-releases at Potter Valley PH During Times of Spill at Cape Horn Dam

	Lake Pillsbury	Potter Valley PH				Eel River at CHD	
Date	Comparison to Target Storage Curve (TSC)	E-16	RPA E-16 Allowance	Over-release (cfs)		E-11	RPA E-11 Minimum
3/15/2005	<TSC	260	40	220		471	110
3/16/2005	<TSC	254	40	214		215	110
3/17/2005	<TSC	256	40	216		168	110
3/18/2005	<TSC	264	40	224		109	110
3/19/2005	<TSC	263	40	223		227	110
3/20/2005	<TSC	187	40	147		1260	110
3/21/2005	<TSC	97	40	57		4420	110
3/23/2005	<TSC	75	40	35		4870	110
3/24/2005	<TSC	160	40	120		3360	110
3/25/2005	<TSC	260	40	220		2170	110
3/26/2005	<TSC	262	40	222		1390	110
3/27/2005	<TSC	262	40	222		1590	110
3/28/2005	<TSC	263	40	223		3290	110
3/29/2005	<TSC	260	40	220		2820	110
3/30/2005	<TSC	259	40	219		2020	110
3/31/2005	<TSC	262	40	222		1720	110
4/1/2005	<TSC	262	40	222		1460	110
4/2/2005	<TSC	263	40	223		1240	110
4/3/2005	<TSC	262	40	222		1310	110
4/4/2005	<TSC	262	40	222		1340	110
4/5/2005	<TSC	262	40	222		1100	110
4/6/2005	<TSC	261	40	221		456	110
4/15/2005	<TSC	163	85	78		718	110
4/16/2005	<TSC	163	85	78		699	110
4/17/2005	<TSC	163	85	78		682	110
4/18/2005	<TSC	116	85	31		662	110
4/19/2005	<TSC	105	85	20		641	110
4/20/2005	<TSC	114	85	29		520	110
4/21/2005	<TSC	114	85	29		322	110
4/22/2005	<TSC	171	85	86		262	110
4/23/2005	<TSC	264	85	179		107	110
4/24/2005	<TSC	264	85	179		110	110
4/25/2005	<TSC	264	85	179		111	110
4/26/2005	<TSC	264	85	179		109	110
4/27/2005	<TSC	264	85	179		114	110
4/28/2005	<TSC	264	85	179		111	110
4/29/2005	<TSC	264	85	179		152	110
4/30/2005	<TSC	244	85	159		285	110
5/1/2005	<TSC	166	85	81		355	110
5/2/2005	<TSC	165	85	80		385	110
5/3/2005	<TSC	164	85	79		380	110
5/4/2005	<TSC	164	85	79		397	110
5/5/2005	<TSC	164	85	79		777	110
5/6/2005	<TSC	164	85	79		764	110

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Attachment B. Over-releases at Potter Valley PH During Times of Spill at Cape Horn Dam

	Lake Pillsbury	Potter Valley PH				Eel River at CHD	
Date	Comparison to Target Storage Curve (TSC)	E-16	RPA E-16 Allowance	Over-release (cfs)		E-11	RPA E-11 Minimum
5/7/2005	<TSC	164	85	79		754	110
5/8/2005	<TSC	164	85	79		875	110
5/9/2005	<TSC	163	85	78		2560	110
5/10/2005	<TSC	163	85	78		2120	110
5/11/2005	<TSC	162	85	77		873	110
5/12/2005	<TSC	163	85	78		869	110
5/13/2005	<TSC	162	85	77		948	110
5/14/2005	<TSC	162	85	77		1200	110
5/15/2005	<TSC	162	125	37		1160	110
5/16/2005	<TSC	162	125	37		1040	110
5/17/2005	<TSC	162	125	37		737	110
5/20/2005	<TSC	162	125	37		2170	110
5/21/2005	<TSC	161	125	36		1070	110
5/22/2005	<TSC	161	125	36		1270	110
5/23/2005	<TSC	161	125	36		1220	110
5/24/2005	<TSC	161	125	36		1190	110
5/25/2005	<TSC	161	125	36		992	110
5/26/2005	<TSC	161	125	36		663	110
5/27/2005	<TSC	161	125	36		419	110
5/28/2005	<TSC	161	125	36		412	110
5/29/2005	<TSC	160	125	35		431	110
5/30/2005	<TSC	160	125	35		639	110
5/31/2005	<TSC	160	125	35		629	110
6/1/2005	<TSC	165	125	40		570	110
6/2/2005	<TSC	165	125	40		479	110
6/3/2005	<TSC	165	125	40		337	110
6/4/2005	<TSC	165	125	40		197	110
6/5/2005	<TSC	165	125	40		191	106
6/6/2005	<TSC	165	125	40		188	94
6/7/2005	<TSC	164	125	39		188	83
6/8/2005	<TSC	164	125	39		238	74
6/9/2005	<TSC	159	125	34		750	66
6/10/2005	<TSC	152	125	27		382	59
6/11/2005	<TSC	152	125	27		147	53
6/12/2005	<TSC	152	125	27		139	48
6/13/2005	<TSC	152	125	27		133	44
6/14/2005	<TSC	152	125	27		130	40
6/15/2005	<TSC	152	125	27		127	37
6/16/2005	<TSC	152	125	27		439	34
6/17/2005	<TSC	152	125	27		823	31
6/18/2005	<TSC	150	125	25		280	29
6/19/2005	<TSC	150	125	25		268	27
6/20/2005	<TSC	150	125	25		234	26
6/21/2005	<TSC	150	125	25		222	24
6/22/2005	<TSC	150	125	25		215	23

SONOMA COUNTY WATER AGENCY

FILE:WC/40-6.1-1 PG&E POTTER VALLEY
PROJECT OPERATIONS

June 8, 2007

Mr. David Moller
Manager of Relicensing
Pacific Gas & Electric Company
245 Market Street - Mail Code N11C
San Francisco, CA 94105

Dear Mr. Moller:

Thank you for meeting with Sonoma County Supervisors Mike Reilly and Paul Kelley and myself on May 17, 2007, to discuss PG&E's recent changes to Potter Valley Project operations.. As we discussed in our meeting, the Sonoma County Water Agency (Agency) and the County of Sonoma are very concerned about the changes in flows into the Russian River watershed from the Potter Valley Project instituted by PG&E beginning in the fall of 2006. These flow changes have adversely affected water storage levels in Lake Mendocino, to the point where predicted storage in Lake Mendocino may fall to unprecedented low levels in late summer and early fall, with potentially catastrophic impacts to threatened Chinook salmon within the Russian River.

The Agency is taking action to attempt to mitigate the impacts of PG&E's changes in Potter Valley Project operations and preserve fall storage in Lake Mendocino. These actions include requesting and receiving authority from the State Water Resource Control Board to temporarily reduce Russian River minimum instream flow requirements, and working with the Agency's customers and other water users to implement additional water conservation measures.

As discussed in our meeting, PG&E implemented the changes in Potter Valley Project operations, which critically reduced Lake Mendocino storage, without consulting with or informing the Agency or the County. The Agency and the County still do not know how PG&E is operating the Project, or whether operating the project using other criterion that is also consistent with the existing Federal Energy Regulatory Commission (FERC) license could have resulted in higher Lake Mendocino storage. Although Potter Valley Project diversions to the Russian River watershed are critical to the Russian River fishery and to the region's water supply, PG&E changed those diversions without analyzing the impact of the changes on these interests, and without notifying or discussing the impact of the changes with those impacted by the changes.

We were encouraged to hear at the May 17, 2007 meeting that PG&E is now willing to provide information about Project operations to the Agency, and to include the Agency in future meetings regarding project operations. At the May 17, 2007 meeting, you requested, and we agreed to provide, specific detail about the types of information and arrangements requested by the Agency. Those details are attached.

P.O. Box 11628 - Santa Rosa, CA 95406 - 404 Aviation Boulevard - Santa Rosa, CA 95403 - (707) 526-5370 - Fax (707) 544-6123

As you know, PG&E is obligated under its 1965 agreement with the Agency to operate the Project, consistent with its license and its power production needs to maximize the water supply benefit of the Project to the Agency. We believe that agreement requires a full sharing of information with the Agency, and full participation by the Agency in ongoing discussions about Project operations. Moreover, as noted in our meeting, the Agency has significant expertise in the areas of hydrology, modeling, engineering, and fisheries biology, and is willing to use that expertise to work with PG&E and other stakeholders to maximize the benefit of the Project for both Russian River and Eel River interests.

Since the impact of the 2004 FERC license amendment on flows into the Russian River watershed is in reality much greater than anticipated, we are looking forward to working with PG&E to explore with National Marine Fishery Service what flexibility exists within the current license to correct these issues and, if needed, what the process would be to gain their support for any necessary modifications to the license.

We look forward to a prompt response to our requests. If you have any questions about the requests, please call Chris Murray at (707) 547-1925.

Sincerely,

Randy D. Poole
General Manager/Chief Engineer

Enc

c Supervisor Mike Reilly
Supervisor Paul Kelley
✓ Chris Murray
Steve Shupe

Jb:fileserver/data/cl/jablodow/engr/Scherzinger/draft of letter to pge re pvp information final 6-8-07.doc

Information and Coordination Requests to PG&E

Operations and Maintenance Documentation

1. Reliability criteria for determining scope of maintenance program for all facilities.

2. Maintenance requirements for all facilities and actual maintenance schedules.

3. Actual operating criteria, plans, and instructions to operations staff, including all operating manuals or instructions provided to operations staff regarding operations under or implementation of the reasonable and prudent alternatives contained in the 2004 FERC license.

4. Any alternative or contingency operating criteria, plans, and instructions to operating staff, including description of criteria used to determine when alternative operations would be implemented.

5. Identify and provide any and all computer programs (including modeling programs) currently used to operate the Project or to evaluate the flow impact of different operational scenarios.

6. Identify positions and personnel associated with each operational task.

7. Identify positions and personnel responsible for operations and operations policy decisions throughout the entire chain of command.

8. Identify the annual budget limit associated with Project facilities maintenance and replacement and the priority of maintenance and replacement in the event of budget shortage.

Agency Coordination Requests

1. Provide notification of operation mode changes.

2. Provide notification of any operation difficulties or emergencies.

3. Provide notification of any inspections of facilities.

4. Provide notification of unscheduled shut downs or significant flow reductions in the tunnel.

5. Provide notification and coordination (including providing copies of study reports) on any fishery studies performed.

6. Provide access to all project areas for fisheries studies, operations coordination, and inspection of facilities.

7. Include SCWA in project-related meetings with regulatory agencies and stakeholders, including NOAA Fisheries, Department of Fish and Game, Federal Energy Regulatory Commission, Round Valley Indian Tribes and others.

8. Provide right of first refusal of sale of Project.

9. Identify long and short term goals and plans for the Project

Information and Coordination Requests to PG&E

Long Term Strategies

1. Work with SCWA to develop and communicate PG&E's long term vision/plan for operation of the project.

2. Work with SCWA to develop and communicate salmonid recovery strategies for the Russian River and Eel River watersheds.

3. Work with SCWA to develop and communicate plans and strategies with respect to license renewal.

4. Work with SCWA to develop and coordinate project operations to facilitate and balance Eel River and Russian River basin water supply needs and salmonid recovery goals.

5. Amend 1965 Agreement to incorporate notification and coordination activities described above.

Pacific Gas and Electric Company®

Power Generation

245 Market Street
San Francisco, CA 94105

Mailing Address
Mail Code N11C
P. O. Box 770000
San Francisco, CA 94177

June 22, 2007

Mr. Randy D. Poole
General Manager/Chief Engineer
Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95403

Re: Potter Valley Project, FERC Project No. 77
Response to Sonoma County Water Agency Letter dated June 8, 2007

Dear Mr. Poole:

Thank you for your June 8, 2007 letter concerning Pacific Gas and Electric Company's Potter Valley Project. As we discussed in our May 17, 2007 meeting with you, National Marine Fisheries Service (NMFS) and representatives of the Sonoma County Board of Supervisors, PG&E is committed to working with your agency and other East Branch Russian River (EBRR) water users to try to minimize water supply impacts, while still complying with the mandatory conditions of the Potter Valley Project operating license issued to PG&E by the Federal Energy Regulatory Commission (FERC).

We realize how important the water the Potter Valley Project diverts from the Eel River into the EBRR is to the beneficiaries of this water. That's why, when it was brought to PG&E's attention by the California Department of Fish and Game and the NMFS in 2006 that the water diversions we were making to the EBRR were greater than what is allowed under the license amendment issued by FERC in 2004, and we realized we would need to modify operations to comply with the conditions of the license, we analyzed the impacts and immediately began communications with your agency, other water users, local elected officials, and the media to advise of these changes.

As we reviewed with you and other EBRR water users in November 2006, the reduction in diversions from the Eel River into the EBRR required by the license amendment was considerably greater than what had been anticipated during the amendment proceeding and what was initially implemented by PG&E. As discussed with you and presented in detail at a November 2006 meeting with the Potter Valley Irrigation District attended by members of your staff, the average annual reduction in diverted water resulting from compliance with the license amendment is forecast by PG&E to be approximately 33% rather than the 15% that was anticipated during the amendment proceeding and in the NMFS Biological Opinion used by FERC in its order amending the license.

Your letter included a list of information and coordination requests related to the Potter Valley Project. As you know, Project flow information has been made publicly available on a daily basis via the Internet since March of this year. Additionally, for many years now, PG&E has provided your agency with daily telephone reports regarding key Project operational data such as water elevation and storage in Lake Pillsbury, water releases and spill from Lake Pillsbury and Van Arsdale Reservoir, and water flow through Potter Valley Powerhouse. We will continue to provide your agency with this operational information, plus we will review the list of additional information you have requested and will respond separately. The list of information and coordination requests also asked that PG&E provide Sonoma County Water Agency with a right of first refusal on the sale of the Potter Valley Project. While we appreciate your interest in the future of the Potter Valley Project, PG&E has no current plans to sell the Project and does not see a right of first refusal as feasible.

Again, PG&E fully recognizes the importance of Potter Valley Project water diversions to EBRR water users. We look forward to continuing to work with your agency and others to try to minimize the impact of greater-than-anticipated reductions in these diversions resulting from operating the Potter Valley Project in compliance with the Project license.

Yours truly,

David Moller, Director
Hydro Licensing

DWM/msp

cc: See attached list

cc: Supervisor Mike Reilly
Board of Supervisor
Sonoma County Water Agency
575 Administration Dr., Room 100-A
Santa Rosa, CA 95403

Supervisor Paul Kelley
Board of Supervisor
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Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
Mail Code: DHAC, PJ-12
888 First Street, N.E., Room 1A
Washington, D.C. 20426

Ms. Janet K.F. Pauli, Chairman
Mendocino County Inland Water and Power Commission
425 Talmage Road
Ukiah, CA 95482

APPENDIX I

Response to Comments

The following summarize written comments received and the response to those comments. The actual comment letters are on file with the City Clerk and may be examined during regular City business hours.

Response to comments from Sonoma County Water Agency

Item	Comments	Response
1	Page ES-1 – Second to last paragraph "The City obtains it water supply… " – Missing the s on it.	This will be corrected in the final version
2	Page ES-1 – Last paragraph Why would water be pumped between wells that are no longer used.	The statement referring to Well 6 pumping to Well 2 will be clarified in the final version.
3	Page ES-4 – Five barriers for recycled water program Barrier 1 – Many farmers have storage facilities now. Barrier 2 – Just a perception, or is it a fact. Barrier 3 – Not a barrier, see Water Code Section 1010. Barrier 4 – But do they have rights to the water they are using? Barrier 5 – More expensive, perhaps, but still very cost effective.	The City of Ukiah met with the local farm bureau and farmers to discuss recycled water opportunities. The barriers mentioned in the Urban Water Management Plan (UWMP) were expressed by the local farmers and agriculture industry at this meeting. A statement will be provided in the UWMP indicating that these are barriers perceived by the local farmers and agriculture industry. A public education program will be needed to demonstrate the benefits of a recycled water program.
4	Page ES-5 – Second to paragraph Change application to petition	Application will be changed to petition in the final version
5	Page ES-6 – General comment The City should become a member of CUWCC and the MOU and implement all 14 BMPs	Comment noted.
6	Page 2-1 - First paragraph of Section 2.1, second sentence By What Agency was the water supply permit in 1939	The permit was granted by a predecessor to the Department of Health Services. This will be clarified in the final version.

	granted.	
7	Page 2-1 - First paragraph of Section 2.1, last sentence Is this a DHS number? It is not a water right number.	Yes, it is a DHS number. This will be clarified in the final version.
8	Page 2-1 – Second paragraph of Section 2.2 Are the customers served by the City within its water right place of use	The City has filed a Petition for Extension of Time. This petition includes a change to the City's water right place of use. This will be clarified in the final version.
9	Page 3-9 – First paragraph of Section 3.7.2 What about MCRRFCWCID? 800 AF	The 800 AF that the City can purchase from MCRRFCWCID is listed as project water in this UWMP. No further action will be completed on this comment.
10	Page 3-16 – General Comment The only water available to Ukiah, from the Russian River, is the water flowing into Lake Mendocino and any tributary flows arising downstream from Coyote Dam. The City has no right to pump water that has been stored in lake Mendocino and later released into the East Fork RR.	The City agrees with this comment as it pertains to the East Fork Russian River. The City has no intention of using stored water from Lake Mendocino. No further action will be completed on this comment.
11	Page 3-17 – General Comment This analysis assumes that shortfalls in available supply from natural flow and Potter Valley imported water are made up from Sonoma County Water Agency supplies stored in Lake Mendocino. Ukiah does not have a contract with SCWA	The future Ukiah extractions under its water right permit will come from The Ukiah Valley groundwater basin. SCWA's permit 12947A is limited to water originating in the East Fork Russian River. SCWA comment does not make it clear why it considers the future extractions by the City to be project water. The City's water right permit authorizes diversions from Russian River Underflow, Jan 1 to December 31 without a bypass condition. It is not necessary for Ukiah to enter into a contract with SCWA to extract water from the groundwater basin (or the subterranean stream). During very dry years, some of the City's water use can be made under its contract with the Flood Control District, to the extent that it is necessary. The contract, for 800 acre feet, is roughly 4 cfs during the dry season.
12	Page 3-22 – First full paragraph, reference to 37,300 acre-feet This number should be divided by gross tunnel diversions, not tunnel diversions less PVID diversions.	PVID diversions were accounted for in the analysis of historic and future inflow to Lake Mendocino
13	Page 3-22 – First full paragraph, reference to 26 percent This 26% is calculated by dividing reductions in gross tunnel diversions by net lake inflows….Apples and oranges.	The 26% reduction is determined as stated in the text as the percent change in annual Potter Valley Project imports to the East Fork Russian River due to the E-5.
14	Table 4 in Chapter 3 – General comment Available supply for all Pre-49 and Post 49 water rights from PVID downstream including the City of Ukiah	Yes, 1977 was a very dry year, which followed a dry year in 1976. Of course, there are other sources of water available in the Russian River basin in addition to the Potter Valley Project imports to East Fork Russian River.
15	Page 7-1 – First paragraph of Section 7.1, reference to CUCWCC Sign up.	Comment noted.
16	Page 7-2 – First paragraph of Section 7-2 DMM 7, 8, and 12 are being implemented too.	A statement clarifying this will be added to final version.

Responses to Comments from LAFCO Executive Director, contained in a letter dated October 4, 2007

A general description of the Ukiah groundwater basis is provided, followed by specific responses to the Executive Director's comments. References are to items and page numbers in his letter.

Ukiah groundwater basin.

The Ukiah Valley groundwater basin (aquifer) underlies Ukiah Valley and Redwood Valley. Geologic and groundwater characteristics underlying Sanel Valley are similar, however, bedrock effectively separates the Sanel aquifer from the Ukiah aquifer.

The Ukiah Valley is the largest of several interior valleys in Mendocino County that fall along the north-northwest trending Mayacama Fault Zone. The basement rock is of the Franciscan Complex, of variable but minor water yielding capacity. The valley is filled up to 2000 feet deep with unconsolidated or loosely cemented gravel, sand, silt, and clay deposited through eons of erosion, transport and sedimentation.

The valley fill is categorized as three separate deposits. The oldest and lowest unit is the continental basin deposits. It is estimated to be up to 2000 feet in depth near the axis of the valley. Wells completed in the continental basin deposits produce water slowly because of consolidated, fine-grained material and low permeability. Well yield ranges from 1 – 50 gallons per minute (gpm). The second unit is the continental terrace deposits, situated mostly on the periphery of the valley. These deposits are relatively thin (up to 25 feet), have a low permeability and are not a significant groundwater source.

The third valley fill unit is the Holocene alluvium, consisting of uncemented gravel, sand, silt and clay deposited in the last 10,000 years. The Holocene alluvium covers approximately 30 square miles throughout broad areas of the flood plain and more narrow bands along the Russian River north of the Forks and along tributary streams. It is generally less than 100 feet thick but extends up to 200 feet in depth. Consisting of coarse and uncemented sediments, the alluvium exhibits high porosity and permeability, thereby holding a significant quantity of water and transmitting water rapidly. Well yields range from 100 to 1000 gpm. The volume of water available from pumping from upper 100 feet of the most productive portion of the aquifer is estimated at 90,000 acre-feet.

Groundwater in the alluvium is hydraulically connected to and interacts with surface flows. The principal source of groundwater is infiltration of precipitation. Other sources contributing to Ukiah valley groundwater are streamflow leakage,

deep percolation from irrigation and treated effluent discharged via the City of Ukiah percolation ponds.

The groundwater table (the underground water surface) fluctuates seasonally, being at its highest level in March or April at the end of the wet season, and at its lowest in October, at the end of the dry season. Seasonal fluctuations range on the order of 5 to 20 feet.

Measurements have been taken and recorded over a long time period at a few wells in the valley. Measurements were generally taken twice a year, at the end of the wet season and at the end of the dry season. The groundwater measurements show the water table rebounds during the wet season to about the same elevation in all but abnormally dry years such as 1977. The water table rebounded completely in one year of normal precipitation. Water surface measurements over the long-term show no trend in groundwater levels.

A 1986 USGS investigation (referenced below and attached) of groundwater levels in the Ukiah Valley found that, “None of the hydrographs show any prominent long-term declines. Water levels measured during the 1980’s are remarkably similar to those measured during the 1960’s and 1970’s.” Bulletin 118 of the California Department of Water Resources, updated 2/27/04, in its section on the Ukiah Valley Groundwater Basin (referenced below and attached) states, “Based on hydrographs from DWR monitored wells, groundwater levels in the past 30 years have remained relatively stable. During drought conditions there is increased drawdown during summer months and less recovery in winter months. Post-drought conditions rebound to approximately the same levels as pre-drought conditions.”

Water Level in the Ukiah Valley

Wagner & Bonsignore prepared Figures 1 through 4 (attached) which show water table hydrographs through 2007 from the available record of long-term monitoring of wells in Ukiah Valley. Figure 5 shows the location of those wells. The hydrographs show the seasonal fluctuation due to the precipitation, the effect of drought in 1977, and the absence of a long-term trend in water surface elevation.

Because the alluvium contains and transmits water easily, there is significant interaction between the Ukiah basin aquifer and the Russian River. Water level measurements show that in most years in spring the aquifer is full and spills to the river. At the southern end of the Ukiah groundwater basin, the bedrock rises toward the surface and groundwater must move to the surface stream (Russian River) to move downstream. The predominant movement of water is from the Ukiah groundwater basin to the Russian River. However, conditions fluctuate and occasionally result in some water moving from the river to the aquifer.

When the river stage is high, water moves from the river into bank storage, where it is temporarily held until the river stage falls and water drains back to the river. When the aquifer water table is low, as happens toward the end of the dry season, water moves from the river to the aquifer. This is compounded by the effect of phreatophytes (water-loving plants) drawing water from the aquifer. Finally, pumping of wells will cause a localized drawdown of the water table, which can result in flow moving from the river to the aquifer.

Specific Responses.

Item 10. page 6: City's Water Right Permit Extension, LAFCO writes that the "City Consumed a total of 4131 acre feet of water in 2004."

The commentor has confused consumptive use with water production. The consumptive use of the City's diversions in 2004 (and proportionally for any other year) is about 43% of the total amount diverted. As described in detail in the above report, return flows make a significant contribution to the hydrologic system.

Items 11, 12, 13 and 14, pp. 7-11: Comments considered together with the following response:

The Executive Director suggests that there exists the need for a groundwater basin study, although the comments do not specifically address the areas of concern, offering instead a general concern that there may be a problem with water supply. He also discounts the USGS and DWR Bulletin as outdated and based on inadequate data.

The hydrographs that were evaluated by USGS in 1985 and by DWR in its Bulletin 118, updated in 2004, clearly show that groundwater conditions in the valley have changed very little, if at all. The wells with the longest record that are readily available and included herein, which include draw-down data up to 2007, show the same response today as they did in the past. The water level data is likely the most reliable information we have indicating the overall water supply health of the groundwater basin. The City may want to begin developing a plan for implementing a groundwater monitoring system to provide more complete and accurate data. This would be a long term project that would have to be implemented over a number of years.

The Executive Director cites a statement by Dr. Sari Sommarstrom, Ph.D. recommending a "specific ground-water study of the Ukiah Valley.., to determine the relative amounts of surface and groundwater currently used, irrigation recharge rates and movement, and the safe yield of the groundwater basin." Such a study as suggested by the Executive Director might prove to be a useful investigation for future planning as part of a comprehensive regional water management program; but it is not necessary at this time in order to conclude

that sufficient water supplies exist to continue the development of the City's water rights.

Runnoff into surface streams represent potential recharge to the Ukiah groundwater aquifer. Those streams include the East Fork Russian River, West Fork Russian River and ungaged tributaries to Ukiah Valley. The ungaged tributaries include Hensley, Ackerman, Orrs, Doolin, Robinson, Howard, Sulphur, McClure Howell, Morrison and 12 unnamed creeks. The drainage area of the ungaged tributaries is 137 percent of the drainage area of the West Fork. Total flow of the ungaged tributaries can be estimated based on 137 percent of the West Fork flow.

To estimate streamflow entering Ukiah Valley from the East Fork in the future, an adjustment was made to account for the effect of the FERC license E5 condition constraint. This adjustment had the effect of reducing future East Fork flows by 37,300 acre-feet per year, on average.

Total surface flow entering the Ukiah Valley in the future, on an average annual basis, can be estimated as follows.

	Thousand Acre-Feet Per Year
Historical Inflow to Lake Mendocino	250.1
Historical Import to East Fork	(141.5)
Future Import to East Fork	104.2
Subtotal (Future East Fork)	212.8
West Fork	129.1
Ungaged Stream (137% of West Fork)	176.9
Total Surface Inflow to Ukiah Valley	518.8

The City's future estimated water production is about 8400 acre feet of which about 57% returns to the system representing a depletion of 3600 acre feet. The amount of available recharge from streamflow is approximately 140 times greater than the City's future net demand (the City's depletion is 0.67% of the average annual surface stream supply to the valley).

The Executive Director suggests that a groundwater management plan is needed to address the questions that it lists as bullet items on pages 9 and 10. The City agrees in principal that a water management program which includes groundwater monitoring, conservation and regional cooperation with other agencies is a good idea. A first step toward comprehensive groundwater management would be the development of a regional groundwater monitoring program that could be implemented over time with cost sharing and cooperation from all of stakeholders in the region.

Response to Comments from Barbara Spazek, Executive Director of Mendocino County Russian River Flood Control and Water Conservation Improvement District, dated October 15, 2007.

The significant points in the comment letter are paraphrased followed by a response. A more general response is also provided.

a) **Assertion:** Lake Mendocino was represented by Wagner & Bonsignore, Consulting Engineers ("WBE") as the source of supply for the City of Ukiah;

Response: The WBE analysis in the UWMP acknowledges that the City has no right to store water in Lake Mendocino and does not rely on "Project Water" as the City's source of supply, except under its water supply contract with the District. The analysis explains how current demand is met without encroaching on the District's or the Sonoma County Water Agency's right to Project Water, and how future demand can be met from groundwater wells without using Project Water.

b) **Assertion:** WBE did not evaluate the effects on water users on the Russian River.

Response: WBE's fundamental assumption is that future demands were met by mimicking historic releases. Those demands included all uses, lawful and unlawful and in-stream flow requirements.

c) **Assertion:** Increased diversions by Ukiah would impact water users downstream on the Russian River.

Response: WBE's analysis shows that downstream demands, including in-stream uses, and lawful and unlawful diversions will be met in the future, if the City fully develops its 20 cfs water right.

d) **Assertion:** Post-1949 water rights have no right to divert imported water.

Response: Post 1949 water users can divert imported water to the extent that it is in excess to the demands of all pre-1949 users and excess to other prior right holders. The WBE analysis only relies on imported water to the extent of the City's right.

e) **Assertion:** Return flows from outdoor water use are zero.

Response: WBE estimated return flow to the groundwater aquifer from outdoor use, assuming that the use was largely irrigation of lawns, gardens, parks, open space etc. Such return flow to the groundwater system is not related to the City's waste discharge requirements ("WDRs") at the Wastewater Treatment Plant. The analysis did include return flows from the City's percolation

ponds which obviously return water to the groundwater aquifer. WBE did not evaluate whether, to what extent or by what means those return flows re-enter the Russian River. Such a determination is not necessary for the water availability analysis. Under its WDRs, the City is required to conduct a study to determine whether and by what means the water which percolates out of its WWTP ponds reaches the Russian River.

General Response to Comments:

The City of Ukiah diverts from groundwater and underflow of the Russian River. The City's right to divert is based on a pre-1914 right, a contract with the District, its water rights permit and a pre-1949 right confirmed in Water Board decision D-1610. The City does not in any way direct the storage to, or release of water from, Lake Mendocino, nor does it regulate diversions on the Russian River downstream of the Lake. The City of Ukiah's diversions may have an indirect effect on Russian River stream flows, and thus Lake Mendocino operations, by virtue of possible induced seepage losses on the Russian River. The manner of groundwater-surface water interaction is complex. WBE modeled the largest reasonably probable impact of Ukiah diversions on Russian River flows. Note, however, that Ukiah is not responsible for, nor authorized to, administer Lake Mendocino or the Russian River.

Contrary to the statements in the District letter, WBE accounted for and modeled all historical river losses and diversions on the Russian River downstream of the Forks to Healdsburg. In WBE Scenario A, downstream demands on the Russian River were set equal to historical releases from Lake Mendocino up to 275 cfs (dry season releases in excess of 275 cfs were considered unnecessary). In WBE Scenario B, downstream demands on the Russian River were set equal to historical releases from Lake Mendocino reduced by the amount that gauged streamflows were in excess of the D-1610 minimum flow. In the WBE modeling, all water uses on the Russian River were included as demands for release from Lake Mendocino and all demands were satisfied – no shortage occurred. Outdoor water use in Ukiah is not collected and routed to the City's wastewater system. Some portion of the outdoor water use returns to the river system as surface runoff and deep percolation beyond the root zone of lawns and landscaping. This was estimated as 15 percent of the outdoor water use based on water use estimates for pasture and a 70%-efficiency for sprinkler application. The resulting 20-30% return flow estimate was reduced to 15% to be conservative.

Note that the storage right for Lake Mendocino is limited to water in the East Fork Russian River.

As the District Exhibit A shows, substantial tributary inflow accrues to the Russian River downstream of Lake Mendocino, that is, drainage area above

Lake Mendocino: 105 square miles, drainage area above Cloverdale: 502 square miles.

The District's Exhibit C has some flaws. First, there is conversion error for all "cfs" values. Second, the exhibit ignores contribution from tributaries downstream of the Forks. Third, Exhibit C ignores groundwater storage and flow as source to water users and to Russian River streamflow. Fourth, Exhibit C provides no basis for the 3,000 acre-feet per month riparian use. It is more likely than not that riparian acreage, the uses which were included in the 8100 af of pre-1949 use recognized in Decision D 1030, has not significantly increased. Fifth, Exhibit C implies that post-1949 water rights could not divert imported water.

Response to comments, dated October 16, 2007, from Pinky Kushner

1. Comment: Figure 2.2 is confusing, because it depicts two different spheres of influence.

Response: The revised plan includes the proposed sphere of influence as described in the City's General Plan adopted in 1995.

2. Comment: What is the future of the Ranney Collector?

Response: In 2001 the Ranney Division of Layne Christensen (now a division of Reynolds, Inc.) was hired to evaluate and rehabilitate the City's Ranney collector well. This work began in June 2001. Initially, Ranney cleaned the existing laterals to increase water production. Ranney estimated the yield of the well would be increased from 4 million gallons per day (MGD) to between 5.5 MGD and 8.0 MGD. Ranney completed the rehabilitation work on the existing laterals in March 2002. Cleaning the laterals did not result in any increase in yield. However, the water quality did improve. There was significantly less turbidity, which reduced plant operations and maintenance (O&M) costs.

Ranney concluded that a significant portion of the loss in capacity of the Ranney well was due to changes in the Russian River water level, flow rate, width, distance from the Ranney and river bottom permeability. These changes resulted in decreased saturated aquifer thickness, decreased aquifer transmissivity and decreased recharge to the aquifer.

Without restoration of the river, Ranney concluded that it would not be possible to restore the Ranney well to its previously higher capacity. However, Ranney did believe that by installing several new laterals, it would be possible to increase the yield by 0.43 to 0.86 MGD under summer conditions of low river flow rates. Ranney completed installation of four new laterals in June 2003, at a cost of over $700,000, which increased the yield from the Ranney well by 0.32 MGD.

Based on consultation with Ranney, the City has concluded that there are no further steps that can be taken to increase the yield of the Ranney Collector. For that reason, the City has opted to explore off river wells to increase its source capacity.

To address the impact of turbidity on the City's ability to use the Ranney Collector in the winter, the City has received a quote of $300,000 per unit, not including related piping and installation costs, for pre-filtration units designed for use with the City's existing Microfloc filtration units at the City's water treatment plant.[1] This is an option that the City may wish to explore further, as it would provide redundant capacity during the winter months. However, in addition to the installation costs, on-going expenses for Operations and Maintenance would be higher than from the City's groundwater wells due to the greater level of treatment required for water derived from the Ranney. The City will explore the financial feasibility of this option in the next two years.

3. Comment: The revised plan refers to percolated groundwater rather than groundwater. What is the evidence that there is percolated groundwater?

Response: The plan was revised to include definitions of groundwater and percolated groundwater and to use those terms consistently. See Plan, p. ES-1, Water System, second paragraph. The term "percolating groundwater" is used primarily in reference to Well No. 4, which has been consistently treated by the City and accepted by the State Water Board as percolating groundwater. But see, generally, the discussion of groundwater in §3.2.1, beginning on p. 3-2, and in §3.2.3, beginning on p. 3-4, and response to comments for LAFCO Executive Director, above.

4. Comment: Aren't the ponds at the waste water treatment plant evaporation ponds, not percolation ponds?

Response: The ponds are labeled "percolation ponds" in the Waste Discharge Order approved by the North Coast Regional Water Quality Control Board for the City's Wastewater Treatment Plant. That order requires the City to plan and conduct a hydrologic study of the ponds over the next three years.

Comment: The discussion of recycled water should acknowledge potential pollutants in recycled wastewater, including bioactive pharmaceuticals.

Response: The plan concludes that substantial barriers exist to using recycled water on private property. It proposes developing a plan to determine the feasibility of using recycled water for certain public property applications. Potential pollutants, including pharmaceuticals in treated effluent, would be part of any such feasibility study.

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[1] Alan Jamison, Water Treatment Plant Manager, personal communication with U.S. Filter.

5. Comment: The plan should describe how the City will help preserve water for agriculture in the Ukiah Valley.

Response: Comment noted. The Plan does conclude that all uses of water, including agricultural uses, which have been made historically, can continue to be met, even if the City uses its full entitlement under its water rights permit and taking into account reduced diversions from the Eel River.

6. Comment: The plan should include measures to preserve groundwater recharge, including permeable paving.

Response: Comment noted. The plan notes that the groundwater basin sources of recharge exceed the potential increase in demand by the City over the next 20 years by 140 times, but all measures to preserve recharge are worth considering.

7. Comment: The population projections in Table 5.1 appear unrealistic.

Response: As a result of reducing the planning area to the proposed sphere of influence as described in the1995 General Plan, the population estimates have been revised and reduced. The projections exclude current water users. The growth projections rely on land use designations for that area in the 1995 General Plan, since those areas will only be served by the City, if they are annexed at which point the City, not the County, land use designations will apply. The mixed use designation for the Lovers' Lane property is assumed to be mixed use agriculture. The Masonite Property is designated for industrial use.

Response to comments from Paul Zellman, dated October 16, 2007

1. Comment: The UWMP focuses too much on paper water rights and not enough on deficiencies in the City water system's extraction capacity, particularly the decline in production from the Ranney Collector, and on the use of conservation to address those deficiencies.

Response: The discussion in Section 3.10 of the UWMP concerns the amount of water actually available to meet the City's entitlement under its water rights permit and all other historic diversions from the Russian River below Lake Mendocino.

As to efforts to improve the production of the Ranney Collector, see response to Comment No. 2 from Pinky Kushner, above, at pp. 9-10.

2. Comment: The City should place more reliance on water conservation to address production shortfalls. In that effort, the City should implement DMMs 11 and 5.

a. DMM 11 provides for retail conservation pricing.

Response: The City recently raised its water rates in connection with financing improvements to its water system, including new storage capacity. Water rates have recently been determined to be “property related fees” within the meaning of Proposition 218, which imposes both substantive and procedural requirements on establishing or changing City water rates. In relation to the Proposition 218 requirement that the charge to any property owner must be based on the proportional cost to serve that customer, conservation pricing raises certain legal issues that require evaluation.

For these reasons, the City will evaluate conservation pricing in connection with any future revision to its water rates to the extent such pricing can be lawfully imposed.

b. DMM 5 provides for Large Landscaping Conservation Programs and Incentives.

Response: See response to Comment Nos. 4 and 5, below, at pp. 11-13.

3. Comment: Section 7.3 of the UWMP, addressing Current Water Conservation Programs, makes mathematical errors and commingled indoor and outdoor use in calculating the effectiveness of DMM 1.

Response: The comment points out computational problems in this analysis in the UWMP. On Page 3, the calculation in Appendix F was based on $1.29 per 748 gallons, which is the November 2008 City rate. The value of $1,206 stated in the document is correct. The November 2008 number reflects better the cost of water for BMP 1. The $0.91 per 748 gallons is the November 2005 value. Apparently this did not get updated. This change has been added.

On Page 4, 465 gpd/unit was recomputed based on 0.73 acre feet per year per connection. This equates to 237,873 gallons per year per connection. Dividing this by 365, gallons per day per connection is 652. Taking 60 percent of this for outdoor use, the outdoor use is equal to 391 gallons per day for a single family residence. For a multifamily residence, the outdoor use would be 156 gallons per day. Adjustments have been made in Appendix F to reflect this change. As far as the 0.868 afy usage, the UWMP has been revised using 0.73 afy, which is based on the average from 2000 to 2005. Based on the numbers for 2006, the usage was closer to 0.66 afy. The comment correctly points out that the outdoor usage was commingled with the indoor usage in calculating the Benefit/Cost ratio. The UWMP has been changed to correct this.

4. Comment: The statements regarding Planning Department review of landscape plans is vague. The Model Landscape Conservation Ordinance is more specific and should be adopted.

Response: To elaborate on the shorthand statements in the UWMP regarding landscaping and water conservation, Section 9087(D)(1)(b) of the Ukiah City Code does state that "Landscape plantings shall be those which grow well in Ukiah's climate without extensive irrigation." That subsection goes on to provide a preference for native species. Item (j) in that same Section requires Landscaping Pans to include automatic irrigation systems.

The City has been concerned about water conservation and landscaping for some time now. In August of 1996, the City adopted the Landscaping and Streetscape Design Guidelines. These Guidelines include a number of provisions that strongly encourage water conserving landscaping. If fact, at the bottom of page 1 in the Introduction, it states "The Guidelines emphasize water conservation as it relates to the design of landscaping treatments for new development projects. Guideline directives are included for the application of drip irrigation systems, drought-tolerant plant species, the use of organic mulches, and the reduction of lawn/turf areas in new project design."

The Guidelines also include the following:

Chapter 1 Item (A)(5): "Indigenous and/or drought-tolerant water conserving plants and landscapes should be used.

Chapter 1 Item (C)(4): "Irrigation systems must be designed for efficient conservation of water; examples include drip systems, bubblers, hose bibs, low flow and low flow angle systems."

Chapter 1 Item (C)(8): "Automatic watering systems set to water at night are encouraged."

Chapter 1 Item (E)(5): "Exotic plant materials should be avoided - especially if they require intensive care and/or excessive water."

In practice, the City planning department provides copies of the above statutes/guidelines to potential applicants so they can design their Landscaping Plans accordingly.

The Model Landscape Conversation Ordinance addresses new and existing landscaping. Adopting these requirements in the City will involve significant policy discussion.

This summer, the City undertook a number of water conservation measures. City staff reported those efforts to the City Council at its April 18, 2007, meeting (as

Agenda Item 11.C and at its July 18, 2007, meeting as Agenda item 10.C. With respect to the California Urban Water Conservation Council's memorandum of understanding regarding Urban Water Conservation and implementation of the 14 best management practices, the staff recommended signing the MOU. The staff will place this item on a City Council agenda for consideration in fiscal year 2007-2008.

5. Comment: The commenter could not find a conservation budget of $12,000, as reported under DMMs 7-8 in the UWMP.

Response: In fact, the 2007-2008 budget sets aside $2,000 for Public Education water conservation brochures. The UWMP will be revised to accurately reflect this number. As to the broader comment regarding water conservation, the City has worked extensively to reduce water used for its own landscaping at parks and the golf course. It has also worked with the Ukiah Unified School District and the Russian River Cemetery District to reduce water consumption for landscape irrigation. (See Agenda Summary Report for Item 10c at July 18, 2007, City Council meeting.) As previously stated, the City staff will present the California Urban Water Conservation Council's memorandum of understanding regarding Urban Water Conservation and implementation of the 14 best management practices during the current fiscal year.

FIGURE 1
Well 15N12W08L001

10/11/2007

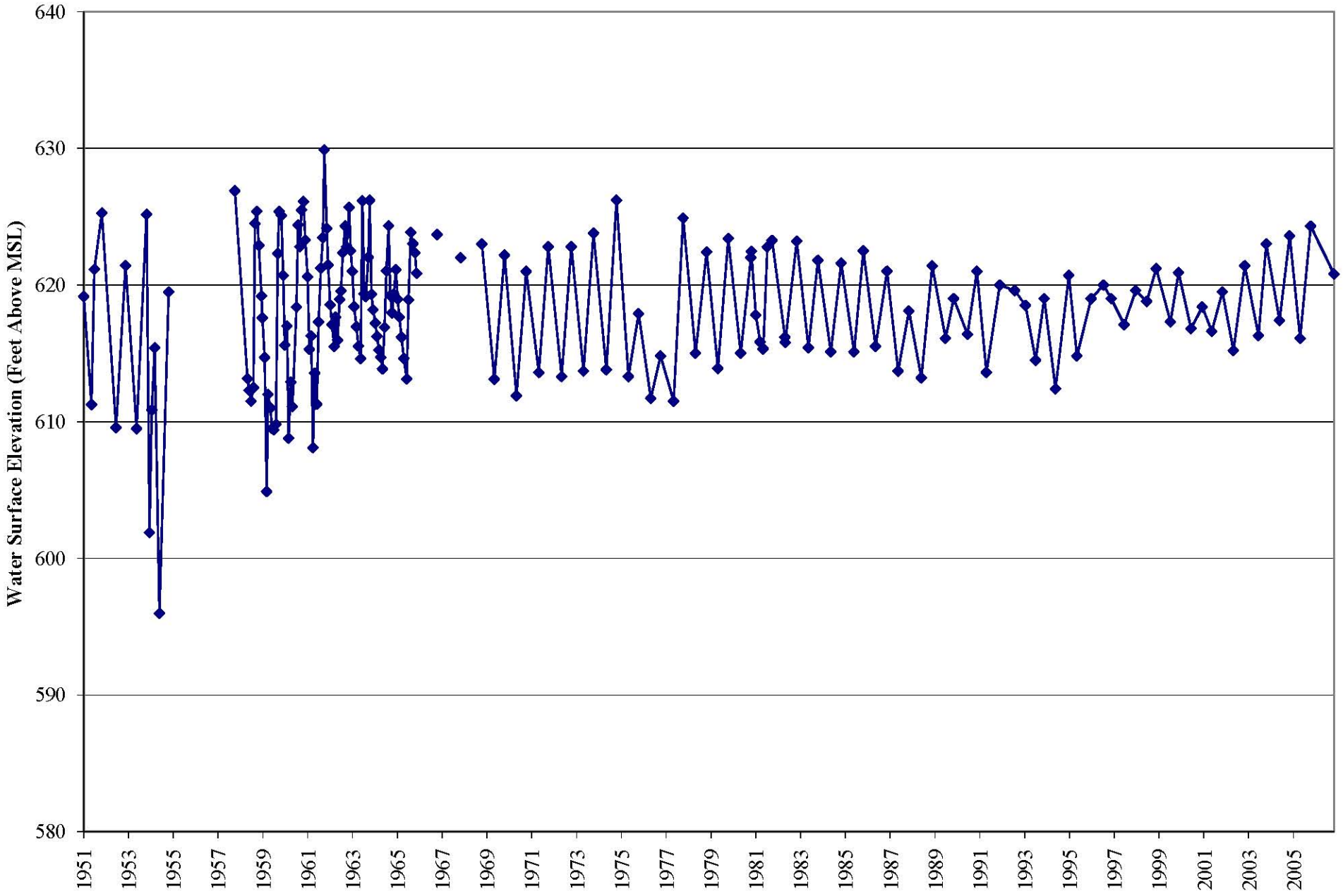

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FIGURE 2
Well 14N12W05K001

10/11/2007

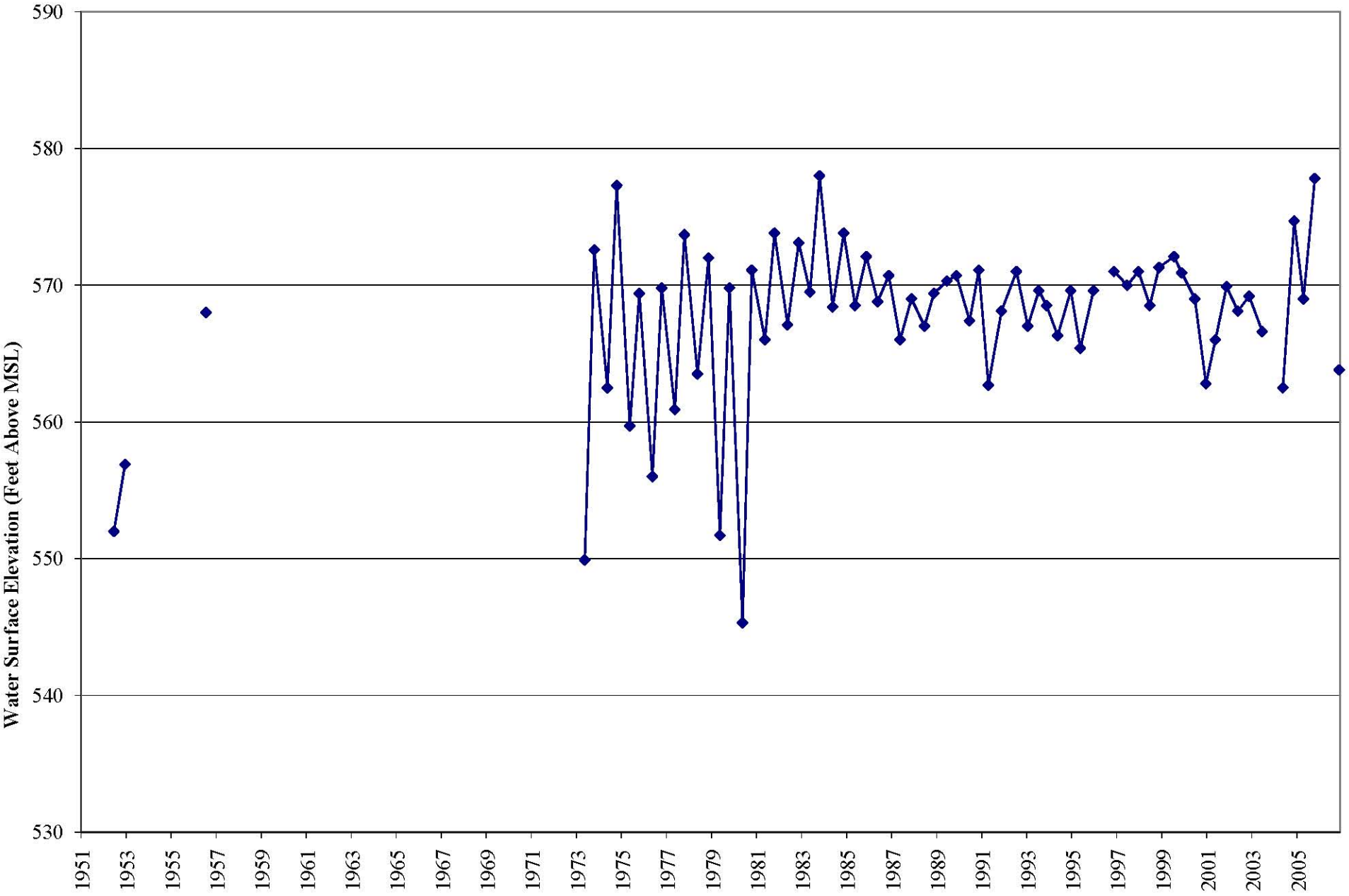

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FIGURE 3
Well 15N12W34Q001

10/11/2007

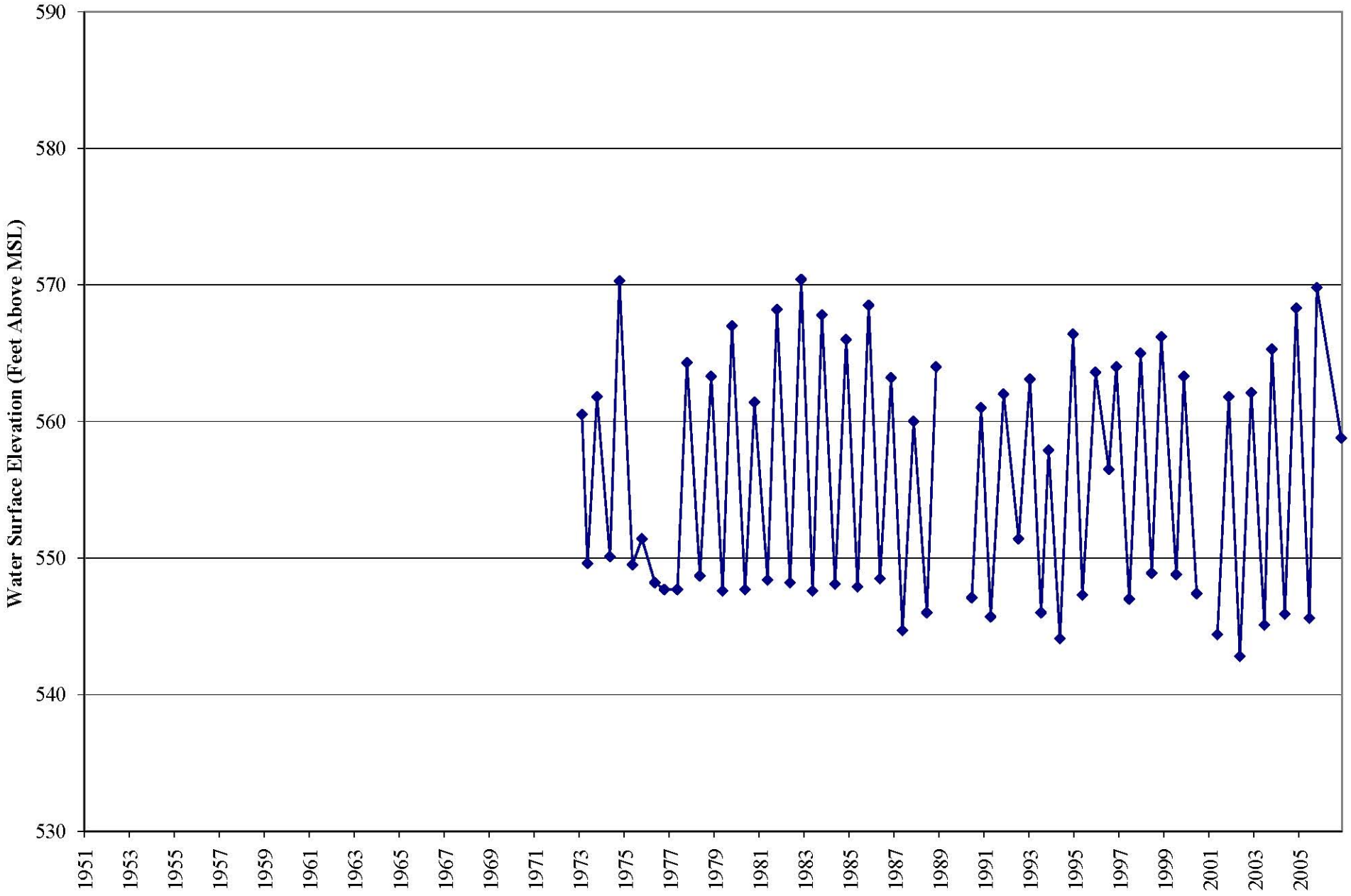

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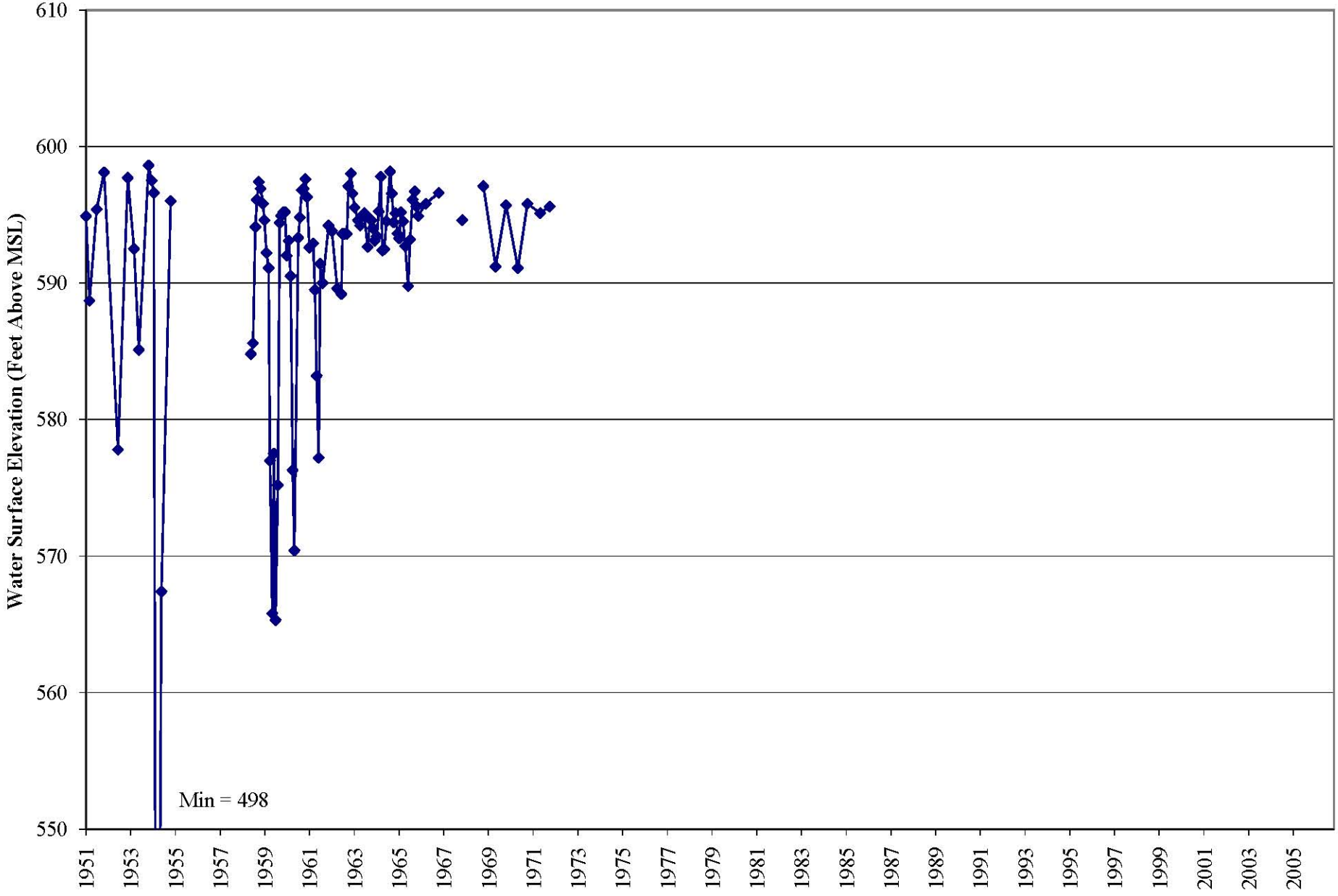
FIGURE 4
Well 115N12W35M001

10/11/2007



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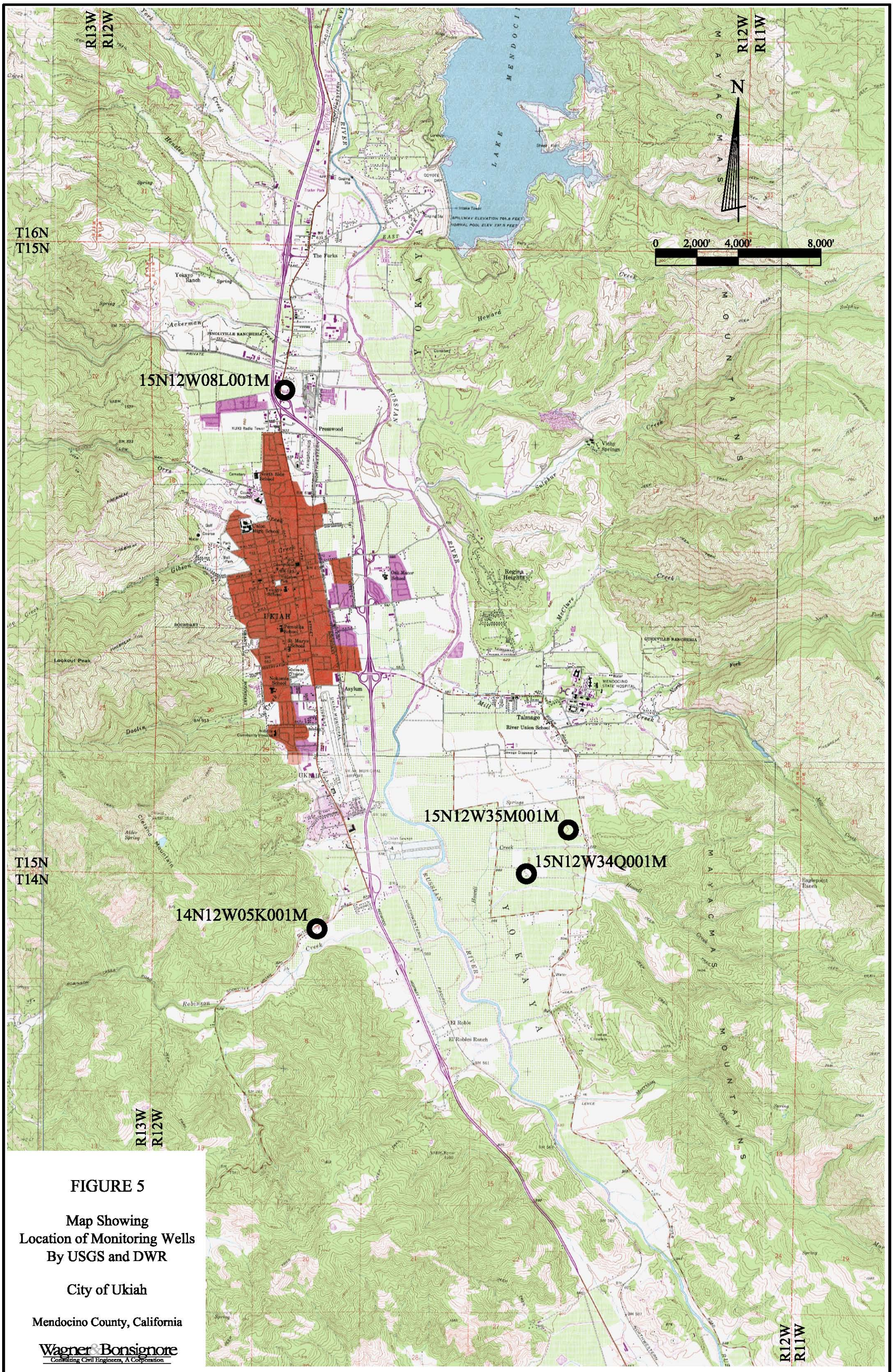

FIGURE 5

Map Showing
Location of Monitoring Wells
By USGS and DWR

City of Ukiah

Mendocino County, California

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation

Base Map Per U.S.G.S. 7.5 Minute Quad Maps for Orrs Springs, Purdys Gardens, Cow Mt, Boonville, Elledge Peak, and Ukiah

Q:\Drawings\Ukiah\Ukiah-Petition\dwg\Monitoring Wells.dwg

October 2007

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