

Brockway Engineering
MEMO TO FILE

PROJECT: 052-05-2005

SUBJECT: Fish Creek aquifer recharge plan – meeting summary
DATE: April 1, 2010
FROM: C. G. Brockway

A meeting was held on January 7, 2010 at the IDWR state office regarding the proposed aquifer recharge plan for the Fish Creek Reservoir Company. Present were Gary Spackman, Jeff Peppersack, Mat Weaver, Charles G. Brockway, Doug Surerus, Lawrence Kimball, and Jerry Cennarusa.

The primary outstanding issues pertained to the magnitude of historic irrigation recharge (which cannot be credited toward recharge), and the calculation of seepage in Fish Creek beyond that which would normally have occurred.

Consensus was reached as follows:

1. Relative to the seepage issue, use historic data to determine the average or median day that the “first water” is in the creek, either due to spill or manual releases of storage. Beyond this day, seepage cannot be credited. Prior to this day, seepage is assumed to be “new” recharge and can be credited.
2. Bill Kramber will do a METRIC analysis for 2000, 2002, and 2006 to estimate actual ET for the main irrigated area, which will then be compared to actual deliveries to estimate irrigation recharge. Use average historic recharge as a constant factor that cannot be credited.
3. Evaporation reduction due to decrease in the reservoir surface area can be treated as a constant value.

The ultimate goal is to arrive at a simple yet scientifically sound procedure that can be used by Fish Creek each year to adjust the gross recharge volume measured at the weir just downstream of the Hot Springs Ditch diversion. Brockway will revise the proposed methodology once the above analyses have been done.

METRIC ET for Fish Creek Reservoir Company

METRIC evapotranspiration (ET) data was available at IDWR for the years 2000, 2002, and 2006; this data was developed for the Eastern Snake Plain Aquifer (ESPA) groundwater model. The ESPA ET data covers the land in the Fish Creek Reservoir Company. A shapefile of the Fish Creek Reservoir Company supplied by Brockway Engineering was used to analyze the ET data in ArcGIS. The ET data is shown in Table 1 and Figures 1 to 3.

Table 1. METRIC ET for Fish Creek Reservoir Company

Year	Acres	ET mm					ET ac-ft
		Min	Max	Range	Mean	STD	
2000	6,991.7	0	1,066	1,066	501	230	11,495
2002	6,991.7	18	1,014	996	378	214	8,665
2006	6,991.7	70	1,144	1,074	563	234	12,924

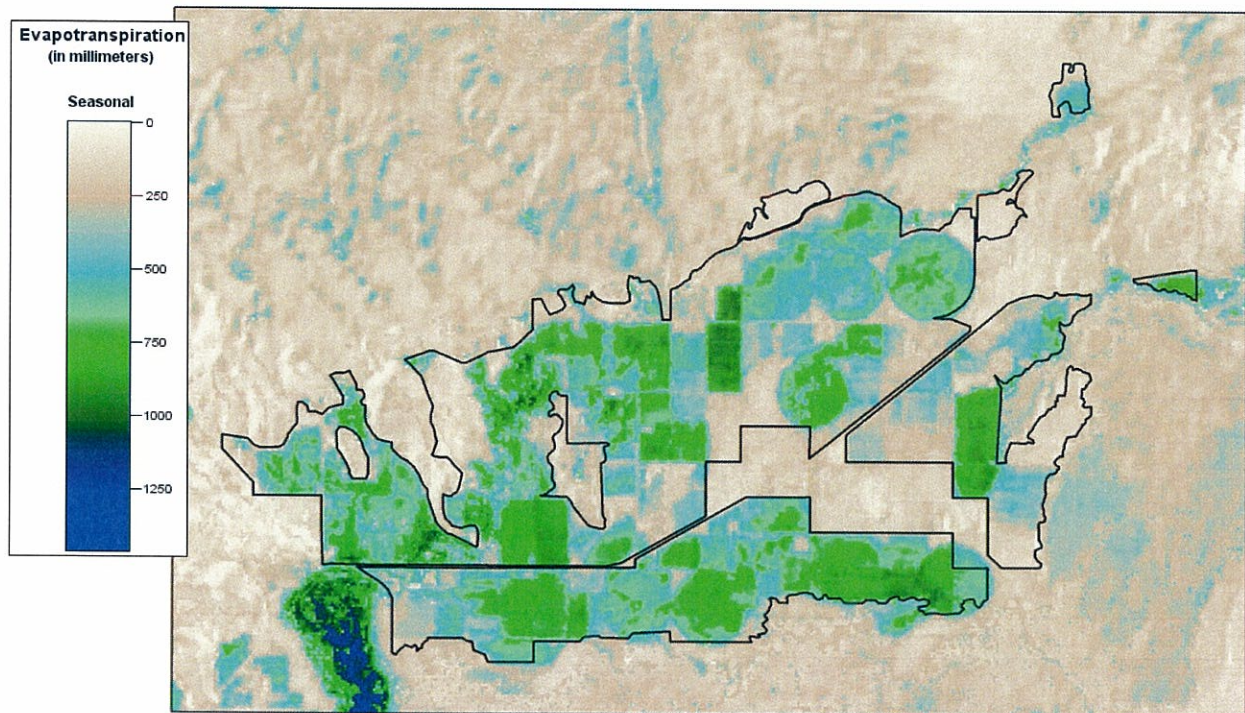


Figure 1. METRIC evapotranspiration for April 1 to October 31, 2000.

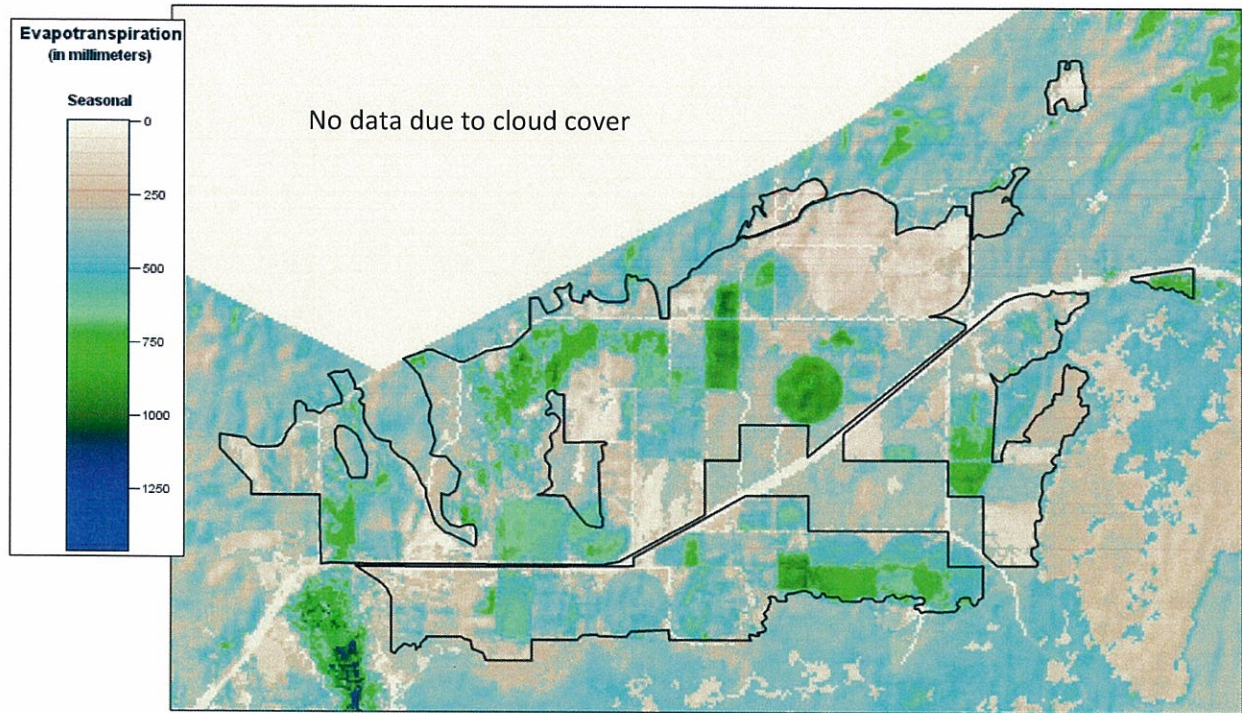


Figure 2. METRIC evapotranspiration for April 1 to October 31, 2002.

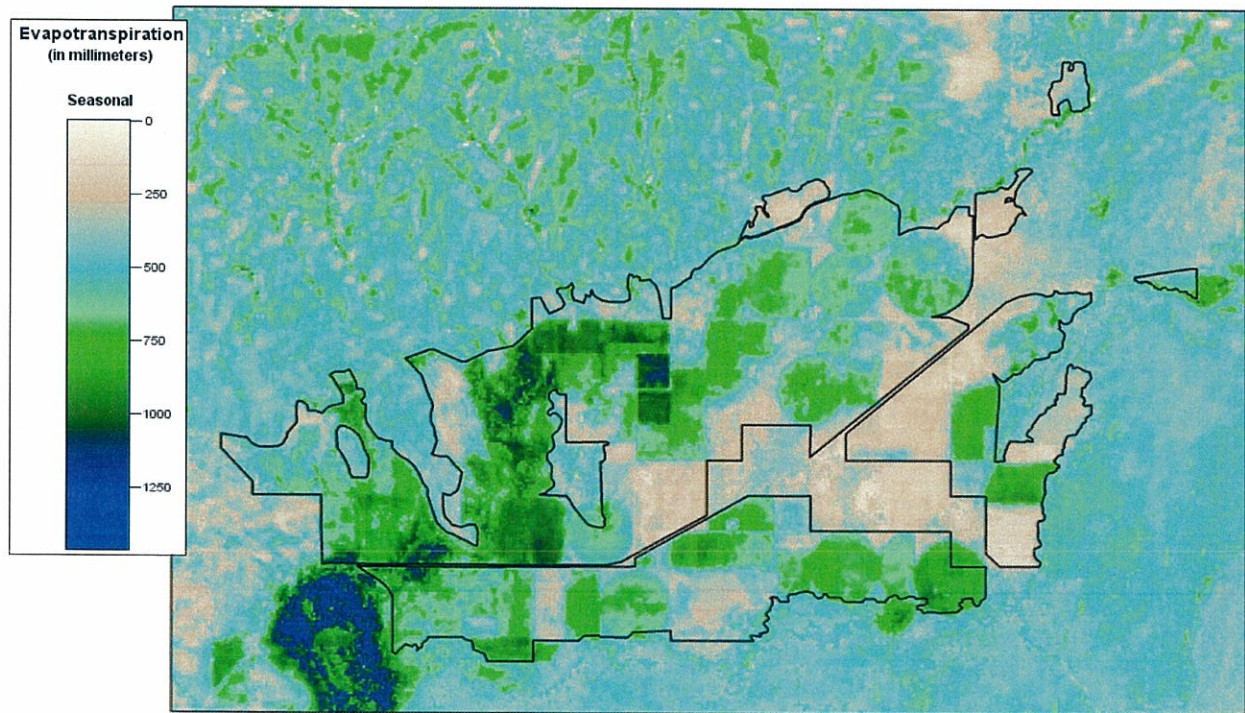
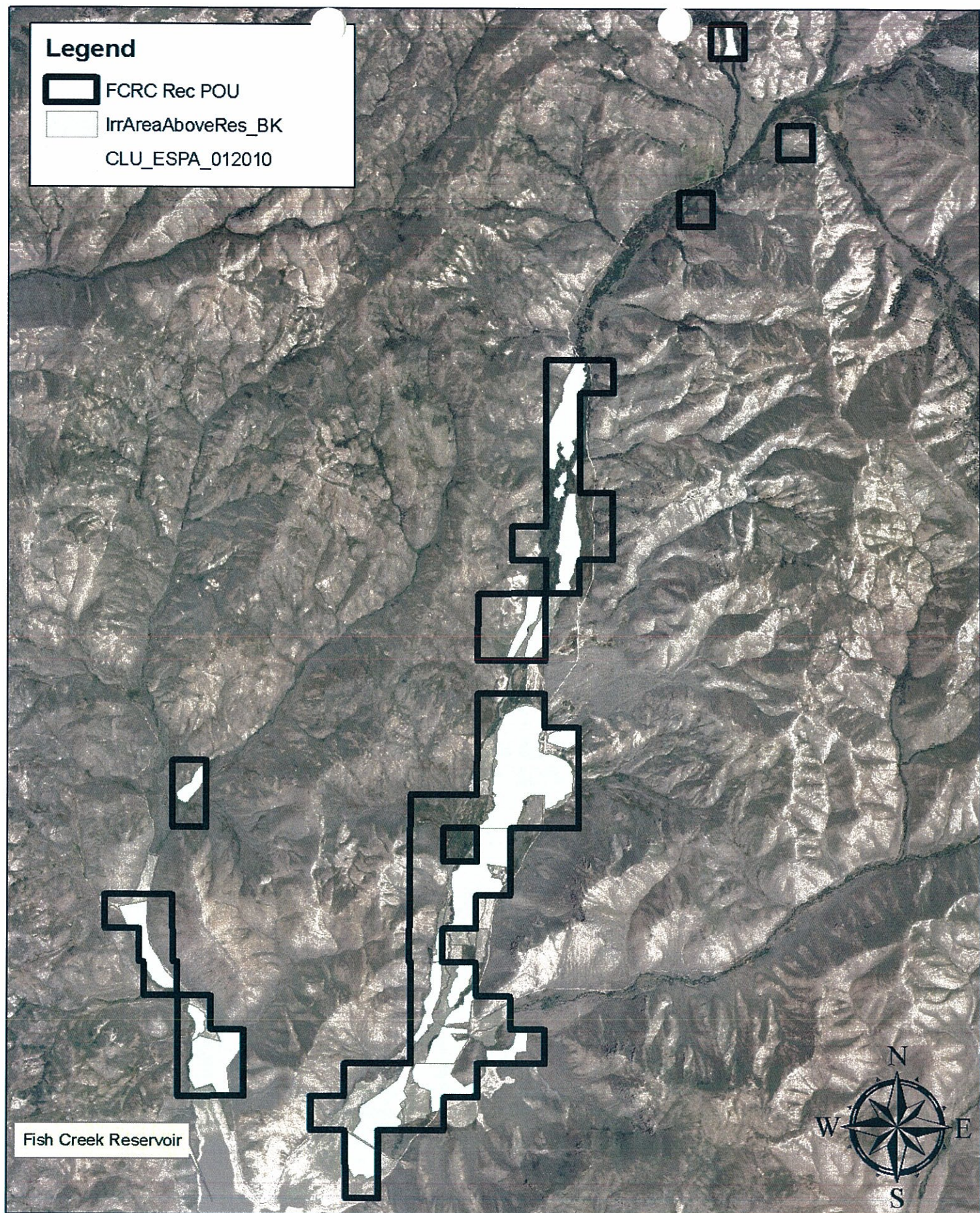


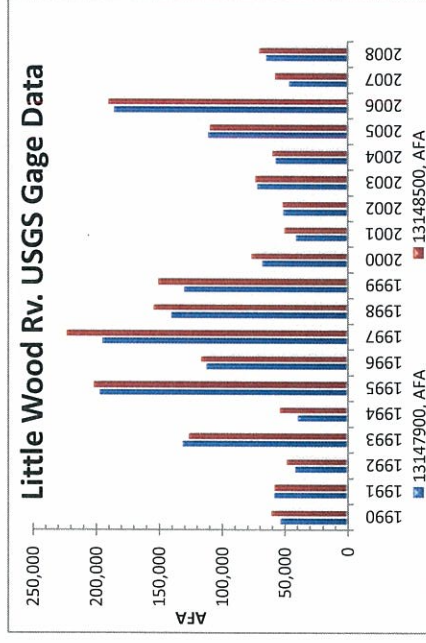
Figure 3. METRIC evapotranspiration for April 1 to October 31, 2006.



Fish Creek Reservoir Area Map Depicting Ground Irrigated with FCRC Water above the Reservoir

Year	Total Diversions		Diversions Below		Diversions Above		Total Diversions		
	(AFA)	Res. (AFA)	Res. (AFA)		Res. (AFA)		(AFA)	131479000, AFA	13148500, AFA
1994	6,811	6,610	201				6,811	38,558	52,766
1995	12,725	11,925	800				12,725	196,484	200,757
1997	13,055	11,469	1,586				13,055	194,440	222,830
1998	12,322	10,820	1,502				12,322	140,003	153,247
1999	11,958	10,871	1,087				11,958	129,349	149,912
2001	4,747	4,522	225				4,747	40,277	49,565
2002	4,748	4,559	189				4,748	50,646	50,802
2003	5,246	4,846	400				5,246	70,999	72,519
2004	5,160	4,525	635				5,160	56,966	59,036
2005	5,309	5,148	161				5,309	110,579	109,352
2006	6,815	6,360	456				6,815	184,901	189,844
2007	3,504	3,365	139				3,504	45,616	57,356
2008	5,695	5,431	264				5,695	64,076	69,928
2009	5,658	5,390	268				5,658	64,076	69,928

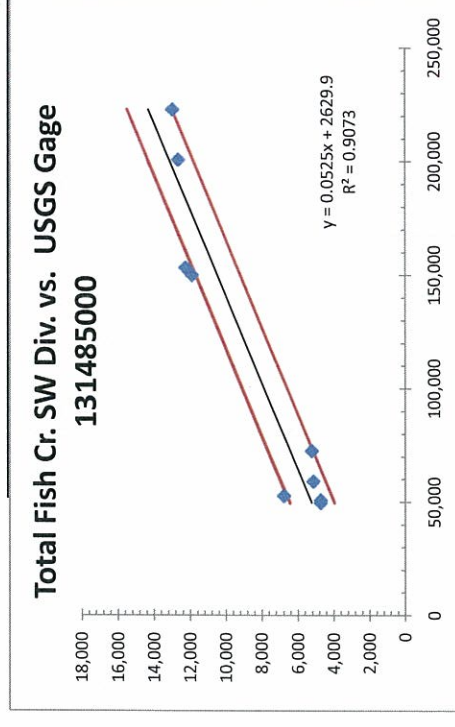
Year	13147900, AFA	13148500, AFA
1990	52,692	59,512
1991	57,726	57,456
1992	41,068	47,188
1993	131,015	125,415
1994	38,558	52,766
1995	196,484	200,757
1996	111,795	115,796
1997	194,440	222,830
1998	140,003	153,247
1999	129,349	149,912
2000	67,291	76,093
2001	40,277	49,565
2002	50,646	50,802
2003	70,999	72,519
2004	56,966	59,036
2005	110,579	109,352
2006	184,901	189,844
2007	45,616	57,356
2008	64,076	69,928
2009	94,386	88,600



Model Parameters		Pred. Div. (AFA)		Pred. Div. - Pred. Div. +	
		Year		€	
Slope, m		1994	5,400	4,151	6,650
		1995	13,170	11,921	14,419
		1997	14,329	13,080	15,578
		1998	10,676	9,426	11,925
		1999	10,501	9,251	11,750
Y Intercept, B		2001	5,232	3,983	6,482
		2002	5,297	4,048	6,547
		2003	6,437	5,188	7,687
Random Error, €		2004	5,729	4,480	6,979

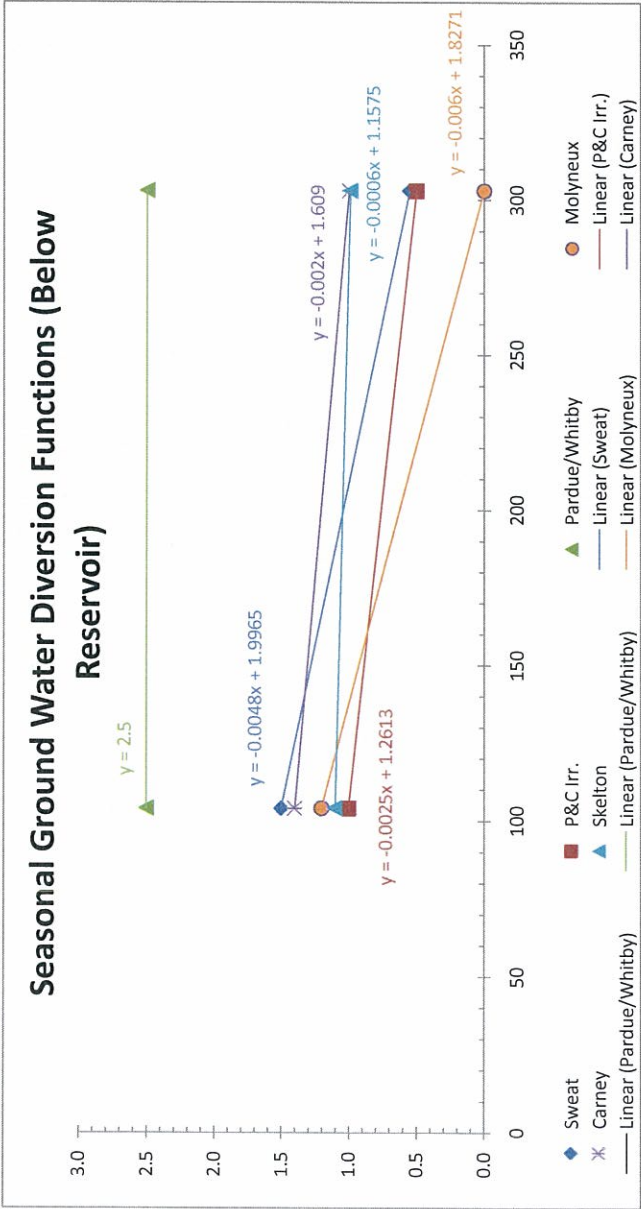
Predicted values

1991	5,646
1992	5,107
1993	9,214
2000	6,625



Ground Water Diversion Trends As Reported by Watermaster to Brockway

	Date	Cum. Days	Sweat		P&C Irr.		Pardue/Whitby		Molyneux		Carney		Skelton	
			Inches	CFS	Inches	CFS	Inches	CFS	Inches	CFS	Inches	CFS	Inches	CFS
Start of Season	15-Apr	104	75	1.5	50	1	125	2.5	60	1.2	70	1.4	55	1.1
End of Season	31-Oct	303	27.5	0.55	25	0.5	125	2.5	0	0	50	1	49.5	0.99



Sweat	$m = -0.0048$ $B = 2.00$	P&C Irr.	$m = -0.0025$ $B = 1.26$	Pardue/Whitby	$m = 0$ $B = 2.50$
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Molyneux	$m = -0.0060$ $B = 1.83$	Carney	$m = -0.0020$ $B = 1.16$	Skelton	$m = -0.0006$ $B = 1.16$
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Season Total Ground Water Diversion Below Reservoir

	Sweat	P&V	Pardue/Whitby	Molyneux	Carney	Skelton	Combined
Season Total (AF)	406.6	498.3	991.8	713.0	456.3	458.7	3524.7

Daily Ground Water Diversion Volumes

Date	Cum. Days	Sweat		P&C Irr.		Pardue/Whitby		Molyneux		Carney		Skelton	
		CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day
4/1/2010	104	1.50	2.98	--	--	2.50	4.96	1.20	2.38	--	--	1.10	2.18
4/2/2010	105	1.50	2.97	--	--	2.50	4.96	1.16	2.30	--	--	1.10	2.18
4/3/2010	106	1.49	2.96	--	--	2.50	4.96	1.12	2.22	--	--	1.10	2.18
4/4/2010	107	1.49	2.95	--	--	2.50	4.96	1.08	2.14	--	--	1.10	2.18
4/5/2010	108	1.48	2.94	--	--	2.50	4.96	1.04	2.06	--	--	1.10	2.18
4/6/2010	109	1.48	2.93	--	--	2.50	4.96	1.00	1.98	--	--	1.10	2.18
4/7/2010	110	1.47	2.92	--	--	2.50	4.96	0.96	1.90	--	--	1.10	2.18
4/8/2010	111	1.47	2.91	--	--	2.50	4.96	0.92	1.82	--	--	1.10	2.17
4/9/2010	112	1.46	2.90	--	--	2.50	4.96	0.88	1.75	--	--	1.10	2.17
4/10/2010	113	1.46	2.90	--	--	2.50	4.96	0.84	1.67	--	--	1.10	2.17
4/11/2010	114	1.46	2.89	--	--	2.50	4.96	0.80	1.59	--	--	1.09	2.17
4/12/2010	115	1.45	2.88	--	--	2.50	4.96	0.76	1.51	--	--	1.09	2.17
4/13/2010	116	1.45	2.87	--	--	2.50	4.96	0.72	1.43	--	--	1.09	2.17
4/14/2010	117	1.44	2.86	--	--	2.50	4.96	0.68	1.35	--	--	1.09	2.17
4/15/2010	118	1.44	2.85	1.00	1.98	2.50	4.96	0.64	1.27	1.40	2.78	1.09	2.17
4/16/2010	119	1.43	2.84	1.00	1.98	2.50	4.96	0.60	1.19	1.40	2.77	1.09	2.17
4/17/2010	120	1.43	2.83	0.99	1.97	2.50	4.96	0.56	1.11	1.40	2.77	1.09	2.17
4/18/2010	121	1.42	2.83	0.99	1.97	2.50	4.96	0.52	1.03	1.39	2.76	1.09	2.16
4/19/2010	122	1.42	2.82	0.99	1.96	2.50	4.96	0.48	0.95	1.39	2.76	1.09	2.16
4/20/2010	123	1.42	2.81	0.99	1.96	2.50	4.96	0.44	0.87	1.39	2.76	1.09	2.16
4/21/2010	124	1.41	2.80	0.98	1.95	2.50	4.96	0.40	0.79	1.39	2.75	1.09	2.16
4/22/2010	125	1.41	2.79	0.98	1.95	2.50	4.96	0.36	0.71	1.39	2.75	1.09	2.16
4/23/2010	126	1.40	2.78	0.98	1.94	2.50	4.96	0.32	0.63	1.38	2.75	1.09	2.16
4/24/2010	127	1.40	2.77	0.98	1.94	2.50	4.96	0.28	0.56	1.38	2.74	1.09	2.16
4/25/2010	128	1.39	2.76	0.97	1.93	2.50	4.96	0.24	0.48	1.38	2.74	1.09	2.16
4/26/2010	129	1.39	2.76	0.97	1.93	2.50	4.96	0.20	0.40	1.38	2.73	1.09	2.16
4/27/2010	130	1.38	2.75	0.97	1.92	2.50	4.96	0.16	0.32	1.38	2.73	1.09	2.16
4/28/2010	131	1.38	2.74	0.97	1.92	2.50	4.96	0.12	0.24	1.37	2.73	1.09	2.15
4/29/2010	132	1.38	2.73	0.96	1.91	2.50	4.96	0.08	0.16	1.37	2.72	1.09	2.15
4/30/2010	133	1.37	2.72	0.96	1.91	2.50	4.96	0.04	0.08	1.37	2.72	1.09	2.15
5/1/2010	134	1.37	2.71	0.96	1.90	2.50	4.96	0.00	0.00	1.37	2.71	1.08	2.15
5/2/2010	135	1.36	2.70	0.96	1.90	2.50	4.96	--	--	1.37	2.71	1.08	2.15
5/3/2010	136	1.36	2.69	0.95	1.89	2.50	4.96	--	--	1.36	2.71	1.08	2.15
5/4/2010	137	1.35	2.68	0.95	1.89	2.50	4.96	--	--	1.36	2.70	1.08	2.15
5/5/2010	138	1.35	2.68	0.95	1.88	2.50	4.96	--	--	1.36	2.70	1.08	2.15
5/6/2010	139	1.34	2.67	0.95	1.88	2.50	4.96	--	--	1.36	2.69	1.08	2.15
5/7/2010	140	1.34	2.66	0.94	1.87	2.50	4.96	--	--	1.36	2.69	1.08	2.15
5/8/2010	141	1.34	2.65	0.94	1.87	2.50	4.96	--	--	1.35	2.69	1.08	2.14
5/9/2010	142	1.33	2.64	0.94	1.86	2.50	4.96	--	--	1.35	2.68	1.08	2.14
5/10/2010	143	1.33	2.63	0.94	1.86	2.50	4.96	--	--	1.35	2.68	1.08	2.14
5/11/2010	144	1.32	2.62	0.93	1.85	2.50	4.96	--	--	1.35	2.67	1.08	2.14
5/12/2010	145	1.32	2.61	0.93	1.85	2.50	4.96	--	--	1.35	2.67	1.08	2.14
5/13/2010	146	1.31	2.61	0.93	1.84	2.50	4.96	--	--	1.34	2.67	1.08	2.14
5/14/2010	147	1.31	2.60	0.93	1.84	2.50	4.96	--	--	1.34	2.66	1.08	2.14
5/15/2010	148	1.30	2.59	0.92	1.83	2.50	4.96	--	--	1.34	2.66	1.08	2.14
5/16/2010	149	1.30	2.58	0.92	1.83	2.50	4.96	--	--	1.34	2.65	1.08	2.14
5/17/2010	150	1.30	2.57	0.92	1.82	2.50	4.96	--	--	1.34	2.65	1.08	2.13
5/18/2010	151	1.29	2.56	0.92	1.82	2.50	4.96	--	--	1.33	2.65	1.08	2.13
5/19/2010	152	1.29	2.55	0.91	1.81	2.50	4.96	--	--	1.33	2.64	1.08	2.13
5/20/2010	153	1.28	2.54	0.91	1.81	2.50	4.96	--	--	1.33	2.64	1.07	2.13
5/21/2010	154	1.28	2.53	0.91	1.80	2.50	4.96	--	--	1.33	2.63	1.07	2.13
5/22/2010	155	1.27	2.53	0.91	1.80	2.50	4.96	--	--	1.33	2.63	1.07	2.13
5/23/2010	156	1.27	2.52	0.90	1.79	2.50	4.96	--	--	1.32	2.63	1.07	2.13
5/24/2010	157	1.26	2.51	0.90	1.79	2.50	4.96	--	--	1.32	2.62	1.07	2.13
5/25/2010	158	1.26	2.50	0.90	1.78	2.50	4.96	--	--	1.32	2.62	1.07	2.13
5/26/2010	159	1.26	2.49	0.90	1.78	2.50	4.96	--	--	1.32	2.61	1.07	2.13
5/27/2010	160	1.25	2.48	0.89	1.77	2.50	4.96	--	--	1.32	2.61	1.07	2.12
5/28/2010	161	1.25	2.47	0.89	1.77	2.50	4.96	--	--	1.31	2.61	1.07	2.12
5/29/2010	162	1.24	2.46	0.89	1.76	2.50	4.96	--	--	1.31	2.60	1.07	2.12
5/30/2010	163	1.24	2.46	0.89	1.76	2.50	4.96	--	--	1.31	2.60	1.07	2.12
5/31/2010	164	1.23	2.45	0.88	1.75	2.50	4.96	--	--	1.31	2.59	1.07	2.12
6/1/2010	165	1.23	2.44	0.88	1.75	2.50	4.96	--	--	1.31	2.59	1.07	2.12
6/2/2010	166	1.22	2.43	0.88	1.74	2.50	4.96	--	--	1.30	2.59	1.07	2.12
6/3/2010	167	1.22	2.42	0.88	1.74	2.50	4.96	--	--	1.30	2.58	1.07	2.12
6/4/2010	168	1.22	2.41	0.87	1.73	2.50	4.96	--	--	1.30	2.58	1.07	2.12
6/5/2010	169	1.21	2.40	0.87	1.73	2.50	4.96	--	--	1.30	2.57	1.07	2.12
6/6/2010	170	1.21	2.39	0.87	1.72	2.50	4.96	--	--	1.30	2.57	1.07	2.11
6/7/2010	171	1.20	2.39	0.87	1.72	2.50	4.96	--	--	1.29	2.57	1.07	2.11
6/8/2010	172	1.20	2.38	0.86	1.71	2.50	4.96	--	--	1.29	2.56	1.07	2.11
6/9/2010	173	1.19	2.37	0.86	1.71	2.50	4.96	--	--	1.29	2.56	1.06	2.11
6/10/2010	174	1.19	2.36	0.86	1.70	2.50	4.96	--	--	1.29	2.55	1.06	2.11
6/11/2010	175	1.18	2.35	0.86	1.70	2.50	4.96	--	--	1.29	2.55	1.06	2.11
6/12/2010	176	1.18	2.34	0.85	1.69	2.50	4.96	--	--	1.28	2.55	1.06	2.11

Daily Ground Water Diversion Volumes

Date	Cum. Days	Sweat		P&C Irr.		Pardue/Whitby		Molyneux		Carney		Skelton	
		CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day
6/13/2010	177	1.18	2.33	0.85	1.69	2.50	4.96	--	--	1.28	2.54	1.06	2.11
6/14/2010	178	1.17	2.32	0.85	1.68	2.50	4.96	--	--	1.28	2.54	1.06	2.11
6/15/2010	179	1.17	2.31	0.85	1.68	2.50	4.96	--	--	1.28	2.53	1.06	2.11
6/16/2010	180	1.16	2.31	0.84	1.67	2.50	4.96	--	--	1.28	2.53	1.06	2.10
6/17/2010	181	1.16	2.30	0.84	1.67	2.50	4.96	--	--	1.27	2.53	1.06	2.10
6/18/2010	182	1.15	2.29	0.84	1.66	2.50	4.96	--	--	1.27	2.52	1.06	2.10
6/19/2010	183	1.15	2.28	0.84	1.66	2.50	4.96	--	--	1.27	2.52	1.06	2.10
6/20/2010	184	1.14	2.27	0.83	1.65	2.50	4.96	--	--	1.27	2.51	1.06	2.10
6/21/2010	185	1.14	2.26	0.83	1.65	2.50	4.96	--	--	1.27	2.51	1.06	2.10
6/22/2010	186	1.14	2.25	0.83	1.64	2.50	4.96	--	--	1.26	2.51	1.06	2.10
6/23/2010	187	1.13	2.24	0.83	1.64	2.50	4.96	--	--	1.26	2.50	1.06	2.10
6/24/2010	188	1.13	2.24	0.82	1.63	2.50	4.96	--	--	1.26	2.50	1.06	2.10
6/25/2010	189	1.12	2.23	0.82	1.63	2.50	4.96	--	--	1.26	2.49	1.06	2.10
6/26/2010	190	1.12	2.22	0.82	1.62	2.50	4.96	--	--	1.26	2.49	1.06	2.09
6/27/2010	191	1.11	2.21	0.82	1.62	2.50	4.96	--	--	1.25	2.49	1.06	2.09
6/28/2010	192	1.11	2.20	0.81	1.61	2.50	4.96	--	--	1.25	2.48	1.05	2.09
6/29/2010	193	1.10	2.19	0.81	1.61	2.50	4.96	--	--	1.25	2.48	1.05	2.09
6/30/2010	194	1.10	2.18	0.81	1.60	2.50	4.96	--	--	1.25	2.47	1.05	2.09
7/1/2010	195	1.10	2.17	0.81	1.60	2.50	4.96	--	--	1.25	2.47	1.05	2.09
7/2/2010	196	1.09	2.17	0.80	1.59	2.50	4.96	--	--	1.24	2.47	1.05	2.09
7/3/2010	197	1.09	2.16	0.80	1.59	2.50	4.96	--	--	1.24	2.46	1.05	2.09
7/4/2010	198	1.08	2.15	0.80	1.58	2.50	4.96	--	--	1.24	2.46	1.05	2.09
7/5/2010	199	1.08	2.14	0.80	1.58	2.50	4.96	--	--	1.24	2.45	1.05	2.08
7/6/2010	200	1.07	2.13	0.79	1.57	2.50	4.96	--	--	1.24	2.45	1.05	2.08
7/7/2010	201	1.07	2.12	0.79	1.57	2.50	4.96	--	--	1.23	2.45	1.05	2.08
7/8/2010	202	1.06	2.11	0.79	1.56	2.50	4.96	--	--	1.23	2.44	1.05	2.08
7/9/2010	203	1.06	2.10	0.79	1.56	2.50	4.96	--	--	1.23	2.44	1.05	2.08
7/10/2010	204	1.06	2.09	0.78	1.55	2.50	4.96	--	--	1.23	2.43	1.05	2.08
7/11/2010	205	1.05	2.09	0.78	1.55	2.50	4.96	--	--	1.23	2.43	1.05	2.08
7/12/2010	206	1.05	2.08	0.78	1.54	2.50	4.96	--	--	1.22	2.43	1.05	2.08
7/13/2010	207	1.04	2.07	0.78	1.54	2.50	4.96	--	--	1.22	2.42	1.05	2.08
7/14/2010	208	1.04	2.06	0.77	1.53	2.50	4.96	--	--	1.22	2.42	1.05	2.08
7/15/2010	209	1.03	2.05	0.77	1.53	2.50	4.96	--	--	1.22	2.41	1.05	2.07
7/16/2010	210	1.03	2.04	0.77	1.53	2.50	4.96	--	--	1.22	2.41	1.05	2.07
7/17/2010	211	1.03	2.03	0.77	1.52	2.50	4.96	--	--	1.21	2.41	1.05	2.07
7/18/2010	212	1.02	2.02	0.76	1.52	2.50	4.96	--	--	1.21	2.40	1.04	2.07
7/19/2010	213	1.02	2.02	0.76	1.51	2.50	4.96	--	--	1.21	2.40	1.04	2.07
7/20/2010	214	1.01	2.01	0.76	1.51	2.50	4.96	--	--	1.21	2.39	1.04	2.07
7/21/2010	215	1.01	2.00	0.76	1.50	2.50	4.96	--	--	1.21	2.39	1.04	2.07
7/22/2010	216	1.00	1.99	0.75	1.50	2.50	4.96	--	--	1.20	2.39	1.04	2.07
7/23/2010	217	1.00	1.98	0.75	1.49	2.50	4.96	--	--	1.20	2.38	1.04	2.07
7/24/2010	218	0.99	1.97	0.75	1.49	2.50	4.96	--	--	1.20	2.38	1.04	2.07
7/25/2010	219	0.99	1.96	0.75	1.48	2.50	4.96	--	--	1.20	2.37	1.04	2.06
7/26/2010	220	0.99	1.95	0.74	1.48	2.50	4.96	--	--	1.19	2.37	1.04	2.06
7/27/2010	221	0.98	1.95	0.74	1.47	2.50	4.96	--	--	1.19	2.37	1.04	2.06
7/28/2010	222	0.98	1.94	0.74	1.47	2.50	4.96	--	--	1.19	2.36	1.04	2.06
7/29/2010	223	0.97	1.93	0.74	1.46	2.50	4.96	--	--	1.19	2.36	1.04	2.06
7/30/2010	224	0.97	1.92	0.73	1.46	2.50	4.96	--	--	1.19	2.35	1.04	2.06
7/31/2010	225	0.96	1.91	0.73	1.45	2.50	4.96	--	--	1.18	2.35	1.04	2.06
8/1/2010	226	0.96	1.90	0.73	1.45	2.50	4.96	--	--	1.18	2.35	1.04	2.06
8/2/2010	227	0.95	1.89	0.73	1.44	2.50	4.96	--	--	1.18	2.34	1.04	2.06
8/3/2010	228	0.95	1.88	0.72	1.44	2.50	4.96	--	--	1.18	2.34	1.04	2.06
8/4/2010	229	0.95	1.87	0.72	1.43	2.50	4.96	--	--	1.18	2.33	1.04	2.05
8/5/2010	230	0.94	1.87	0.72	1.43	2.50	4.96	--	--	1.17	2.33	1.04	2.05
8/6/2010	231	0.94	1.86	0.72	1.42	2.50	4.96	--	--	1.17	2.33	1.03	2.05
8/7/2010	232	0.93	1.85	0.71	1.42	2.50	4.96	--	--	1.17	2.32	1.03	2.05
8/8/2010	233	0.93	1.84	0.71	1.41	2.50	4.96	--	--	1.17	2.32	1.03	2.05
8/9/2010	234	0.92	1.83	0.71	1.41	2.50	4.96	--	--	1.17	2.31	1.03	2.05
8/10/2010	235	0.92	1.82	0.71	1.40	2.50	4.96	--	--	1.16	2.31	1.03	2.05
8/11/2010	236	0.91	1.81	0.70	1.40	2.50	4.96	--	--	1.16	2.31	1.03	2.05
8/12/2010	237	0.91	1.80	0.70	1.39	2.50	4.96	--	--	1.16	2.30	1.03	2.05
8/13/2010	238	0.91	1.80	0.70	1.39	2.50	4.96	--	--	1.16	2.30	1.03	2.05
8/14/2010	239	0.90	1.79	0.70	1.38	2.50	4.96	--	--	1.16	2.29	1.03	2.04
8/15/2010	240	0.90	1.78	0.69	1.38	2.50	4.96	--	--	1.15	2.29	1.03	2.04
8/16/2010	241	0.89	1.77	0.69	1.37	2.50	4.96	--	--	1.15	2.29	1.03	2.04
8/17/2010	242	0.89	1.76	0.69	1.37	2.50	4.96	--	--	1.15	2.28	1.03	2.04
8/18/2010	243	0.88	1.75	0.69	1.36	2.50	4.96	--	--	1.15	2.28	1.03	2.04
8/19/2010	244	0.88	1.74	0.68	1.36	2.50	4.96	--	--	1.15	2.27	1.03	2.04
8/20/2010	245	0.87	1.73	0.68	1.35	2.50	4.96	--	--	1.14	2.27	1.03	2.04
8/21/2010	246	0.87	1.72	0.68	1.35	2.50	4.96	--	--	1.14	2.27	1.03	2.04
8/22/2010	247	0.87	1.72	0.68	1.34	2.50	4.96	--	--	1.14	2.26	1.03	2.04
8/23/2010	248	0.86	1.71	0.67	1.34	2.50	4.96	--	--	1.14	2.26	1.03	2.04
8/24/2010	249	0.86	1.70	0.67	1.33	2.50	4.96	--	--	1.14	2.25	1.03	2.03

Daily Ground Water Diversion Volumes

Date	Cum. Days	Sweat		P&C Irr.		Pardue/Whitby		Molyneux		Carney		Skelton	
		CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day	CFS/24 hrs	AF/Day
8/25/2010	250	0.85	1.69	0.67	1.33	2.50	4.96	--	--	1.13	2.25	1.02	2.03
8/26/2010	251	0.85	1.68	0.67	1.32	2.50	4.96	--	--	1.13	2.25	1.02	2.03
8/27/2010	252	0.84	1.67	0.66	1.32	2.50	4.96	--	--	1.13	2.24	1.02	2.03
8/28/2010	253	0.84	1.66	0.66	1.31	2.50	4.96	--	--	1.13	2.24	1.02	2.03
8/29/2010	254	0.83	1.65	0.66	1.31	2.50	4.96	--	--	1.13	2.23	1.02	2.03
8/30/2010	255	0.83	1.65	0.66	1.30	2.50	4.96	--	--	1.12	2.23	1.02	2.03
8/31/2010	256	0.83	1.64	0.65	1.30	2.50	4.96	--	--	1.12	2.23	1.02	2.03
9/1/2010	257	0.82	1.63	0.65	1.29	2.50	4.96	--	--	1.12	2.22	1.02	2.03
9/2/2010	258	0.82	1.62	0.65	1.29	2.50	4.96	--	--	1.12	2.22	1.02	2.02
9/3/2010	259	0.81	1.61	0.65	1.28	2.50	4.96	--	--	1.12	2.21	1.02	2.02
9/4/2010	260	0.81	1.60	0.64	1.28	2.50	4.96	--	--	1.11	2.21	1.02	2.02
9/5/2010	261	0.80	1.59	0.64	1.27	2.50	4.96	--	--	1.11	2.21	1.02	2.02
9/6/2010	262	0.80	1.58	0.64	1.27	2.50	4.96	--	--	1.11	2.20	1.02	2.02
9/7/2010	263	0.79	1.58	0.64	1.26	2.50	4.96	--	--	1.11	2.20	1.02	2.02
9/8/2010	264	0.79	1.57	0.63	1.26	2.50	4.96	--	--	1.11	2.19	1.02	2.02
9/9/2010	265	0.79	1.56	0.63	1.25	2.50	4.96	--	--	1.10	2.19	1.02	2.02
9/10/2010	266	0.78	1.55	0.63	1.25	2.50	4.96	--	--	1.10	2.19	1.02	2.02
9/11/2010	267	0.78	1.54	0.63	1.24	2.50	4.96	--	--	1.10	2.18	1.02	2.02
9/12/2010	268	0.77	1.53	0.62	1.24	2.50	4.96	--	--	1.10	2.18	1.02	2.01
9/13/2010	269	0.77	1.52	0.62	1.23	2.50	4.96	--	--	1.10	2.17	1.02	2.01
9/14/2010	270	0.76	1.51	0.62	1.23	2.50	4.96	--	--	1.09	2.17	1.01	2.01
9/15/2010	271	0.76	1.50	0.62	1.22	2.50	4.96	--	--	1.09	2.17	1.01	2.01
9/16/2010	272	0.75	1.50	0.61	1.22	2.50	4.96	--	--	1.09	2.16	1.01	2.01
9/17/2010	273	0.75	1.49	0.61	1.21	2.50	4.96	--	--	1.09	2.16	1.01	2.01
9/18/2010	274	0.75	1.48	0.61	1.21	2.50	4.96	--	--	1.09	2.15	1.01	2.01
9/19/2010	275	0.74	1.47	0.61	1.20	2.50	4.96	--	--	1.08	2.15	1.01	2.01
9/20/2010	276	0.74	1.46	0.60	1.20	2.50	4.96	--	--	1.08	2.15	1.01	2.01
9/21/2010	277	0.73	1.45	0.60	1.19	2.50	4.96	--	--	1.08	2.14	1.01	2.01
9/22/2010	278	0.73	1.44	0.60	1.19	2.50	4.96	--	--	1.08	2.14	1.01	2.00
9/23/2010	279	0.72	1.43	0.60	1.18	2.50	4.96	--	--	1.08	2.14	1.01	2.00
9/24/2010	280	0.72	1.43	0.59	1.18	2.50	4.96	--	--	1.07	2.13	1.01	2.00
9/25/2010	281	0.71	1.42	0.59	1.17	2.50	4.96	--	--	1.07	2.13	1.01	2.00
9/26/2010	282	0.71	1.41	0.59	1.17	2.50	4.96	--	--	1.07	2.12	1.01	2.00
9/27/2010	283	0.71	1.40	0.59	1.16	2.50	4.96	--	--	1.07	2.12	1.01	2.00
9/28/2010	284	0.70	1.39	0.58	1.16	2.50	4.96	--	--	1.07	2.12	1.01	2.00
9/29/2010	285	0.70	1.38	0.58	1.15	2.50	4.96	--	--	1.06	2.11	1.01	2.00
9/30/2010	286	0.69	1.37	0.58	1.15	2.50	4.96	--	--	1.06	2.11	1.01	2.00
10/1/2010	287	0.69	1.36	0.58	1.14	2.50	4.96	--	--	1.06	2.10	1.01	2.00
10/2/2010	288	0.68	1.36	0.57	1.14	2.50	4.96	--	--	1.06	2.10	1.01	1.99
10/3/2010	289	0.68	1.35	0.57	1.13	2.50	4.96	--	--	1.06	2.10	1.00	1.99
10/4/2010	290	0.67	1.34	0.57	1.13	2.50	4.96	--	--	1.05	2.09	1.00	1.99
10/5/2010	291	0.67	1.33	0.57	1.12	2.50	4.96	--	--	1.05	2.09	1.00	1.99
10/6/2010	292	0.67	1.32	0.56	1.12	2.50	4.96	--	--	1.05	2.08	1.00	1.99
10/7/2010	293	0.66	1.31	0.56	1.11	2.50	4.96	--	--	1.05	2.08	1.00	1.99
10/8/2010	294	0.66	1.30	0.56	1.11	2.50	4.96	--	--	1.05	2.08	1.00	1.99
10/9/2010	295	0.65	1.29	0.56	1.10	2.50	4.96	--	--	1.04	2.07	1.00	1.99
10/10/2010	296	0.65	1.28	0.55	1.10	2.50	4.96	--	--	1.04	2.07	1.00	1.99
10/11/2010	297	0.64	1.28	0.55	1.09	2.50	4.96	--	--	1.04	2.06	1.00	1.99
10/12/2010	298	0.64	1.27	0.55	1.09	2.50	4.96	--	--	1.04	2.06	1.00	1.98
10/13/2010	299	0.63	1.26	0.55	1.08	2.50	4.96	--	--	1.04	2.06	1.00	1.98
10/14/2010	300	0.63	1.25	0.54	1.08	2.50	4.96	--	--	1.03	2.05	1.00	1.98
10/15/2010	301	0.63	1.24	0.54	1.07	2.50	4.96	--	--	1.03	2.05	1.00	1.98
10/16/2010	302	0.62	1.23	0.54	1.07	2.50	4.96	--	--	1.03	2.04	1.00	1.98
10/17/2010	303	0.62	1.22	0.54	1.06	2.50	4.96	--	--	1.03	2.04	1.00	1.98
10/18/2010	304	0.61	1.21	0.53	1.06	2.50	4.96	--	--	1.03	2.04	1.00	1.98
10/19/2010	305	0.61	1.21	0.53	1.05	2.50	4.96	--	--	1.02	2.03	1.00	1.98
10/20/2010	306	0.60	1.20	0.53	1.05	2.50	4.96	--	--	1.02	2.03	1.00	1.98
10/21/2010	307	0.60	1.19	0.53	1.04	2.50	4.96	--	--	1.02	2.02	1.00	1.97
10/22/2010	308	0.59	1.18	0.52	1.04	2.50	4.96	--	--	1.02	2.02	1.00	1.97
10/23/2010	309	0.59	1.17	0.52	1.03	2.50	4.96	--	--	1.02	2.02	0.99	1.97
10/24/2010	310	0.59	1.16	0.52	1.03	2.50	4.96	--	--	1.01	2.01	0.99	1.97
10/25/2010	311	0.58	1.15	0.52	1.02	2.50	4.96	--	--	1.01	2.01	0.99	1.97
10/26/2010	312	0.58	1.14	0.51	1.02	2.50	4.96	--	--	1.01	2.00	0.99	1.97
10/27/2010	313	0.57	1.13	0.51	1.01	2.50	4.96	--	--	1.01	2.00	0.99	1.97
10/28/2010	314	0.57	1.13	0.51	1.01	2.50	4.96	--	--	1.01	2.00	0.99	1.97
10/29/2010	315	0.56	1.12	0.51	1.00	2.50	4.96	--	--	1.00	1.99	0.99	1.97
10/30/2010	316	0.56	1.11	0.50	1.00	2.50	4.96	--	--	1.00	1.99	0.99	1.97
10/31/2010	317	0.55	1.10	0.50	0.99	2.50	4.96	--	--	1.00	1.98	0.99	1.96
11/1/2010	318	0.55	1.09	--	--	2.50	4.96	--	--	--	--	0.99	1.96
Total:		437		298		1,066		37		476		446	

Observations from Brockway's Email dated 12-6-10

1. I agree that I probably overestimated GW diversions, not sure by how much.
2. My first example is not a year 2000 example. It is a generic example where V-recharge is assumed to equal foregone storage.
3. Brockway's approach is almost identical to our approach only difference is no "historical recharge volume" limitation from Table 7.
4. Brockway states that E_i equals 1 when TWS is at or near 13K-14K. Except for 2002. This will change to 12K-13K if we reduce GW diversions.
5. If we assume E_i equals 1 whenever TWS is greater than 13,500 AF, then this condition will have never been met since the lowering of the spillway.

Discussion Topics for the 12-16-10 Brockway Teleconference

- ✓ 1. Discard the concept of additional limitation on recharge volume based on simulated historic recharge volume estimates.
2. It is appropriate that irrigation efficiency (E_i) capture the system, as it existed prior to the lowering of the spillway. Therefore, the E_i used in the methodology should be some function of the E_i values calculated for 1996, 2000, and 2002. 1996 represents the best water year on record, 2000 is close to an average water year, and 2002 represents a fairly poor water year.
 - a. E_i = average(1996:2000:2002) – advantage simple
 - b. E_i = linear function between 1996 and 2002 where E_i is predicted based on the water supply. – Advantage provides an E_i value that is dependent upon real world conditions for that year. Disadvantages: what do you use for your water supply term in the linear function relationship, complexity.
- ✓ 3. It seems appropriate to consider ground water diversions that are based on a season of use (average 206 days) as described on the water right. This is less than my proposed 200 day season, but more than Brockway's proposed 153 season day.

GW Diversion Method Comparison

Desc.	Sweat	P&V	Pardue/Whitby	Molyneux	Carney	Skelton	Combined
Mat (206)	406.6	498.3	991.8	713.0	456.3	458.7	3524.7
Brockway (153)	311.1	227.6	758.7	33.3	364.2	318.6	2013.5
Brockway (206)	437.1	319.8	912.4	33.3	476.0	447.8	2626.5

- ✓ 4. The Department advocates replacing the calculations necessary to compute conveyance loss volumes with a specified number for simplicity. Brockway to propose a fair number.
↳ DATA THERE ALREADY BROCKWAY WANTS TO KEEP EQN FOR
- ✓ 5. Will recharge just be diverted by local ground water users?
DIFF. A.Q. BASALT VS. WELLS IN ALLUVIUM NOT LIKELY
SAKE OF ACCURACY
6. Next step – Brockway needs to file an application with the Department.

→ AVAILABLE FOR GW WELLS TO DIVERT