

Technical Memorandum 3

Hydrologic Period

This memo identifies the recommended hydrologic period to utilize as part of the Kings Groundwater Sub-basin (Kings Basin) effort to evaluate historical changes in groundwater storage. Determination of a recent hydrologic period that approximates long-term average conditions is needed to consider the change in groundwater storage over time.

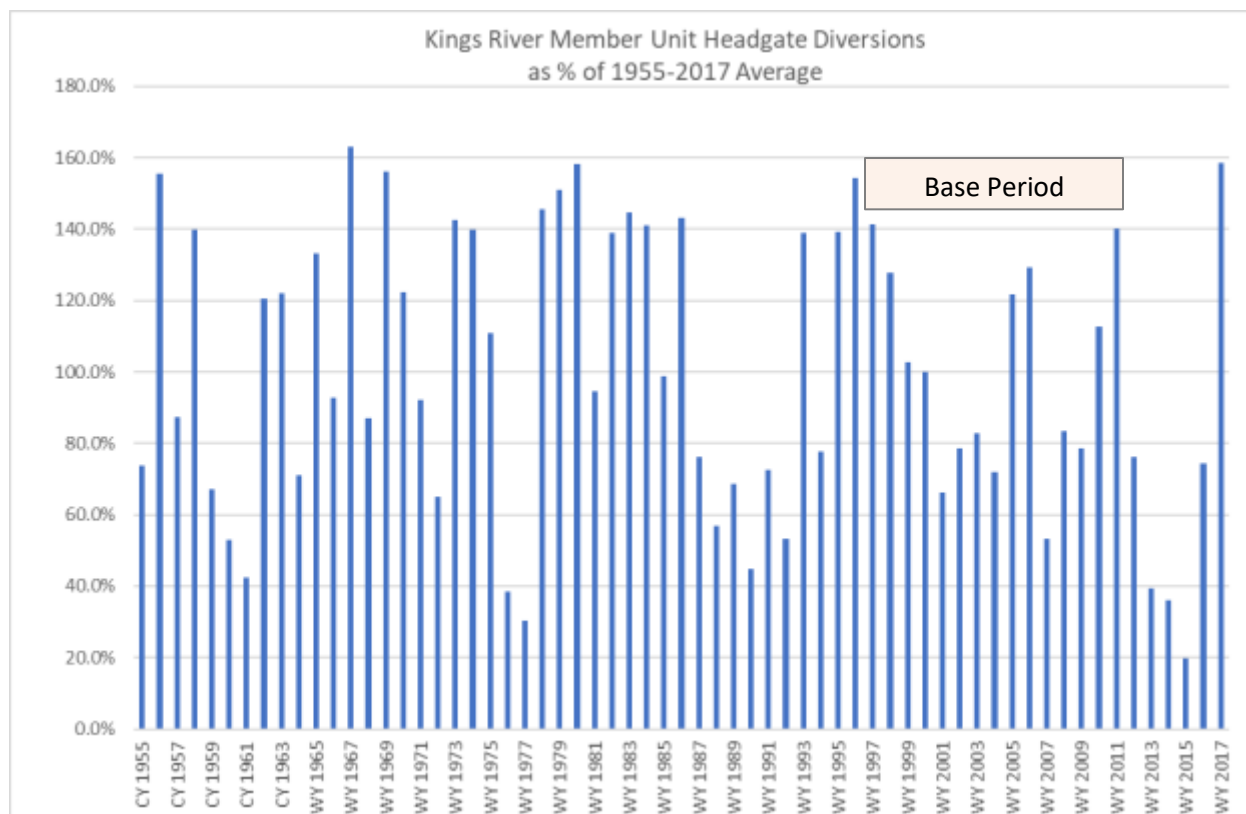
Section 354.18 (b) (5) of DWR's Groundwater Regulations states: *"If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions."*

Surface water supplies in the Kings Basin come from three primary sources: Kings River, San Joaquin River and local streams. The Kings River is the primary source of surface supply, and typically accounts for nearly 90% of the delivered surface water. Therefore, the analysis to determine the hydrologic period was performed based on Kings River supplies. To determine an average period within the Kings for analysis, the total deliveries of Kings River water into the Kings Subbasin were considered rather than the total runoff of the Kings River (Pre-Project Piedra), which would include water delivered to the Tulare Subbasin as well as periodic flood releases that leave the KRWA service area. Actual deliveries into the Kings Subbasin can further vary significantly on a percent of average basis each year as compared to the total watershed runoff of the Kings because of the entitlement schedule and ability to store water for coordinated water runs. This is especially true in dry years during which portions of the Kings basin receives considerably more surface water than other areas within the KRWA service area.

Surface water diversions from the Kings River are measured at the head gates for each canal by the Kings River Water Association (KRWA) and then aggregated to head gate diversions for each KRWA member unit. Historic annual water year head gate diversions for each member unit in each GSA were obtained from the KRWA Watermaster Reports through 2009 and from the KRWA database through 2017. The water year on the Kings River occurs from October to September. Attachment 1 shows that the average annual head gate diversions for the member units in each GSA from 1955 through 2017 was approximately 1,088,696 AF. Included in Attachment 1 is the water year total for diversions into the Kings Basin as a percentage of the 1955-2017 average, as well as for comparison the water year Pre-Project Piedra (PPP) total runoff percentage and the April-July runoff of the Kings River for each year. To determine an appropriate average base period, 10, 15, and 20 year rolling averages of water year totals were calculated as a percentage of the 1955-2017 average, with the 15-year period for water years 1997 through 2011 representing a normal period for surface water deliveries, and hence an expected normal period for groundwater pumping. The average Kings River diversions during this base period for each GSA is also shown in Attachment 1.

The graph below shows each water year as a percentage of the 1955-2017 average.

KINGS SUBBASIN GSA COORDINATION EFFORTS



Recommendation

Although this effort is not directly associated with the Water Budget requirements of the SGMA regulations, Section 354.18 (c) (2) (A), requires that the water budget start with the most recently available information and extend back a minimum of 10 years. A 10-year period was considered as a minimum number of years to establish average water conditions.

The desired outcome was to find a minimum 10-year period that approximates close to 100% of the long-term average. It is recommended to consider as recent a period as practical to represent surface water use in meeting more recent demands based on current cropping patterns in the basin, as well as changes in facilities and water use that are different from 30 to 40 years ago. In reviewing the rolling averages, the period from water year 1997-2011 is recommended as the base period. This 15 year period is approximately 99.4% of the 1955-2017 average. This range of years includes a few above average years, as well as some dry years.

Groundwater level readings used for the storage change analysis will cover this base period. Fall readings are not available for all areas in the basin, so the recommended water level readings for the storage calculation will be Spring 1997 and Spring 2012. This is also consistent with SGMA guidelines that require groundwater storage calculations to be based on seasonal high-water levels in the Spring.

KINGS SUBBASIN GSA COORDINATION EFFORTS

Other Surface Water Supplies

Data was collected for other surface water sources delivered into the subbasin, including CVP deliveries from the Friant Kern Canal and Delta-Mendota Canal, along with Kings River floodwater diversions that were added to the Kings River diversions. A listing of annual diversions from each source for each GSA is included as Attachment 2.

Total Surface Water Supplies

A summary of Kings River diversions and other surface water supplies for each GSA during the base period is shown in the table below.

Kings Subbasin GSA Surface Water Deliveries					
	Kings River SW Deliveries into each GSA				
	Historical Member Unit Diversions from KRWA Records	Base Period			
GSA	1955-2016/2017 Average	WY 1996/1997-2010/2011		Other Surface Water Supplies	Total Surface Water Supplies during Base Period
Central Kings	277,669	275,366		0	275,366
James	5,691	2,064		32,458	34,522
Kings River East	206,343	210,862		36,063	246,925
McMullin Area	0	0		1,874	1,874
North Fork Kings	152,559	163,671		162	163,833
North Kings	446,807	429,737		64,608	494,345
Total	1,089,069	1,081,700		135,165	1,216,865
% of Long-term Avg		99%			
Notes:					
1) Base period selected based on member unit head gate diversions from canal headgate diversions. Data from KRWA Watermaster Reports or KRWA database.					
2) Central Kings includes Consolidated ID and Lone Tree Kings River head gate diversions.					
3) James ID includes James Kings River head gate diversions plus other CVP water to James ID.					
4) Kings River East includes Kings River head gate diversions to Alta ID and Kings River WD ; other includes CVP Friant-Kern Canal water to Hills Valley ID, City of Orange Cove, Orange Cove ID and Tri-Valley WD.					
5) McMullin Area other includes KR floodwater to Mid-Valley WD and Terranova, plus CVP to Mid-Valley WD					
6) North Fork Kings includes Kings River head gate diversions to Burrel Ditch Company, Clark's Fork RD, Crescent Canal Company, Laguna ID, Liberty Canal Company, Murphy Slough Association, Stinson Canal & Irrigation, and Upper San Jose Water Company. Other includes CVP Section 215 water.					
7) North Kings includes Kings River head gate diversions to Fresno ID, other includes CVP FKC water to City of Fresno. Fresno ID. Garfield WD. and International WD.					

KINGS SUBBASIN GSA COORDINATION EFFORTS

Attachment 1

Historical Kings River Member Unit Headgate, AF Diversions



					CENTRAL KINGS GSA		JAMES ID GSA	KINGS RIVER EAST GSA		NORTH FORK KINGS GSA									NORTH KINGS GSA	
	WY PPP	% WY	Apr-Jul	% A-J	Consolidated ID	Lone Tree Channel	James ID	Alta ID	Kings River WD	Burrel Ditch Company	Clark's Fork Recl District	Crescent Canal Co	Laguna ID	Liberty Canal Co	Murphy Slough Assoc	Stinson Canal & Irrigation	Upper San Jose Water Co	Fresno ID	Total	
CY 1955	1,119,176	65.9%	861,924	70.0%	143,904	-	-	109,983	56,080	4,903	748	7,156	30,397	1,777	25,153	6,408	1,704	414,866	803,079	73.7%
CY 1956	2,600,733	153.1%	1,599,859	129.9%	433,041	-	22,441	276,019	55,320	19,319	1,558	24,222	111,743	18,121	93,189	35,016	3,065	598,825	1,691,879	155.4%
CY 1957	1,251,497	73.7%	1,011,180	82.1%	185,048	24,427	-	180,157	53,856	6,050	1,577	12,396	46,219	5,146	36,173	-	3,164	398,079	952,292	87.4%
CY 1958	2,545,394	149.8%	2,016,761	163.8%	397,891	23,821	29,397	247,027	54,490	10,423	1,180	27,148	84,051	15,513	99,828	16,487	2,458	514,123	1,523,837	139.9%
CY 1959	806,803	47.5%	528,285	42.9%	104,217	28,390	4,068	101,498	57,583	-	617	8,651	29,701	2,650	27,108	5,452	2,082	360,388	732,405	67.3%
CY 1960	722,629	42.5%	542,217	44.0%	86,133	28,193	-	71,097	54,217	-	484	-	14,533	-	1,016	-	76	321,819	577,568	53.0%
CY 1961	568,993	33.5%	403,682	32.8%	58,759	18,122	-	46,225	56,448	-	-	-	11,304	-	11,041	-	-	258,249	460,148	42.3%
CY 1962	1,900,229	111.8%	1,499,752	121.8%	305,618	27,282	-	234,915	60,425	9,586	1,457	18,793	69,282	13,796	65,069	7,210	4,108	494,469	1,312,010	120.5%
CY 1963	1,939,139	114.1%	1,435,163	116.6%	357,135	24,456	-	213,984	52,619	9,959	1,177	15,997	75,684	12,292	56,973	12,002	3,356	492,825	1,328,459	122.0%
CY 1964	911,642	53.7%	645,306	52.4%	114,760	29,332	-	125,441	53,241	3,724	652	7,017	39,167	-	30,632	1,488	1,047	368,184	774,685	71.1%
WY 1964 - 1965	2,013,721	118.5%	1,336,183	108.5%	347,131	28,789	10,515	239,474	58,779	9,067	895	21,745	82,232	11,459	62,859	12,435	4,590	561,469	1,451,438	133.3%
WY 1965 - 1966	1,215,778	71.6%	833,554	67.7%	239,546	29,185	-	112,724	61,980	2,922	617	9,596	46,681	5,337	46,376	4,669	1,107	450,217	1,010,957	92.8%
WY 1966 - 1967	3,374,398	198.6%	2,367,938	192.3%	525,136	33,580	6,754	281,538	53,862	2,992	1,706	24,493	111,549	20,598	94,440	19,000	3,019	595,359	1,774,026	162.9%
WY 1967 - 1968	843,204	49.6%	565,657	45.9%	198,681	30,295	637	94,645	59,731	4,300	817	10,873	36,466	-	37,245	6,834	1,260	466,696	948,479	87.1%
WY 1968 - 1969	4,386,300	258.2%	3,140,519	255.1%	536,275	27,269	28,979	258,016	46,091	3,009	1,059	24,039	104,176	21,119	100,810	18,067	766	530,991	1,700,665	156.2%
WY 1969 - 1970	1,330,595	78.3%	886,438	72.0%	334,162	40,462	1,720	169,439	54,284	1,339	1,139	18,809	57,422	7,702	57,983	7,348	2,448	578,030	1,332,285	122.3%
WY 1970 - 1971	1,174,952	69.2%	822,353	66.8%	161,959	24,772	-	138,093	55,018	3,604	956	8,912	38,890	5,163	35,325	3,426	1,799	525,411	1,003,329	92.1%
WY 1971 - 1972	859,583	50.6%	548,352	44.5%	99,349	26,904	-	86,774	60,628	1,204	871	1,211	19,815	-	18,896	-	438	392,176	708,266	65.0%
WY 1972 - 1973	2,135,442	125.7%	1,673,187	135.9%	490,632	23,528	99	208,240	50,817	7,950	1,182	17,531	88,313	17,078	70,398	4,993	2,398	568,445	1,551,605	142.5%
WY 1973 - 1974	2,095,945	123.4%	1,540,003	125.1%	422,996	39,667	17,024	255,604	51,492	8,545	1,577	26,111	92,482	14,220	81,243	8,307	2,069	551,006	1,522,343	139.8%
WY 1974 - 1975	1,583,365	93.2%	1,276,059	103.6%	210,603	34,655	-	184,035	55,435	6,000	1,882	16,695	64,790	4,278	55,883	8,426	3,340	559,379	1,205,401	110.7%
WY 1975 - 1976	540,664	31.8%	305,499	24.8%	-	13,894	-	43,381	50,288	-	865	3,965	18,890	-	25,315	5,576	1,353	255,148	418,674	38.4%
WY 1976 - 1977	395,994	23.3%	280,318	22.8%	153	15,597	-	38,722	47,798	-	474	-	-	-	6,815	-	666	220,962	331,187	30.4%
WY 1977 - 1978	3,453,853	203.3%	2,412,444	195.9%	520,937	35,483	12,607	217,628	45,422	889	1,978	21,493	94,298	16,265	84,582	18,340	4,522	511,505	1,585,949	145.6%
WY 1978 - 1979	1,729,846	101.8%	1,267,726	103.0%	469,458	40,473	7,543	210,624	53,096	14,493	1,747	25,321	86,127	14,678	79,010	28,374	2,682	609,539	1,643,166	150.9%
WY 1979 - 1980	3,046,952	179.3%	1,989,470	161.6%	499,664	48,305	26,627	253,273	50,375	8,634	1,989	30,329	106,448	22,609	104,457	31,173	5,586	531,727	1,721,195	158.0%
WY 1980 - 1981	1,040,415	61.2%	799,848	65.0%	181,711	26,674	-	145,400	53,271	6,773	1,097	23,969	23,969	5,717	47,292	15,974	2,563	496,327	1,030,737	94.6%
WY 1981 - 1982	3,111,011	183.1%	2,230,771	181.2%	413,642	15,571	19,442	231,137	49,468	13,339	1,995	32,853	86,911	17,121	100,577	20,753	3,515	507,629	1,513,954	139.0%
WY 1982 - 1983	4,476,391	263.5%	2,728,596	221.6%	514,494	19,042	32,829	222,733	39,442	3,610	1,543	33,662	70,947	17,614	109,059	28,368	4,873	475,370	1,573,586	144.5%
WY 1983 - 1984	1,971,145	116.0%	1,139,961	92.6%	379,581	22,029	11,159	217,919	46,803	18,105	1,890	35,404	72,343	13,179	75,821	26,001	2,517	611,124	1,533,875	140.8%
WY 1984 - 1985	1,252,501	73.7%	908,459	73.8%	187,617	29,268	-	170,827	45,184	2,838	1,141	10,875	51,723	5,584	38,839	10,720	2,608	516,841	1,074,064	98.6%
WY 1985 - 1986	3,262,497	192.0%	2,086,612	169.5%	390,452	26,131	31,181	227,708	44,660	11,937	2,095	38,882	97,124	18,603	118,027	25,203	4,205	523,704	1,559,911	143.2%
WY 1986 - 1987	779,051	45.9%	569,580	46.3%	158,999	19,751	-	121,323	43,395	3,481	2,037	9,945	34,207	2,181	29,590	12,570	2,493	390,539	830,511	76.3%
WY 1987 - 1988	827,211	48.7%	539,687	43.8%	72,086	19,967	-	59,348	42,280	149	1,172	-	-	743	13,274	-	768	410,916	620,703	57.0%
WY 1988 - 1989	905,624	53.3%	639,909	52.0%	114,136	23,618	-	89,636	48,491	298	-	-	-	28,788	1,190	15,870	-	424,943	746,970	68.6%
WY 1989 - 1990	662,989	39.0%	493,197	40.1%	61,775	18,964	-	58,283	43,885	-	-	-	-	-	7,728	-	-	297,670	488,305	44.8%
WY 1990 - 1991	1,075,608	63.3%	859,308	69.8%	147,523	19,470	-	107,230	39,315	3,400	434	6,367	30,878	3,567	23,228	4,054	730	405,293	791,489	72.7%
WY 1991 - 1992	705,247	41.5%	500,401	40.6%	74,649	17,373	-	66,816	43,230	-	-	-	-	337	9,072	-	-	368,478	579,956	53.3%
WY 1992 - 1993	2,553,114	150.3%	1,884,141	153.0%	338,183	30,540	-	246,845	47,784	11,405	2,733	35,642	111,502	21,013	87,214	25,462	3,935	549,368	1,511,627	138.8%
WY 1993 - 1994	861,045	50.7%	632,612	51.4%	167,122	21,220	-	123,895	44,159	4,439	1,204	5,629	29,754	2,896	21,499	3,808	647	418,821	845,093	77.6%
WY 1994 - 1995	3,460,047	203.6%	2,398,607	194.8%	436,102	24,626	-	235,598	38,652	4,835	3,168	39,293	101,064	18,814	115,610	26,156	4,566	467,790	1,516,205	139.2%
WY 1995 - 1996	2,095,921	123.4%	1,509,461	122.6%	437,416	32,512	-	221,624	51,087	17,542	4,524	43,357	88,446	12,778	102,051	26,577	4,360	636,275	1,678,550	154.1%
WY 1996 - 1997	2,652,070	156.1%	1,344,730	109.2%	382,346	33,149	-	214,341	51,664	16,497	2,955	32,831	91,680	18,487	103,457	27,575	5,835	558,018	1,538,836	141.3%
WY 1997 - 1998	3,104,062	182.7%	2,300,989	186.9%	392,186	23,197	30,847	172,176	40,504	4,860	2,337	31,777	75,124	15,701	118,028	26,097	2,914	455,173	1,390,921	127.7%
WY 1998 - 1999	1,261,024	74.2%	890,467	72.3%	262,680	28,511	111	155,463	46,821	10,324	2,331	20,833	59,994	8,887	52,034	18,574	2,609	449,068	1,118,240	102.7%
WY 1999 - 2000	1,534,654	90.3%	1,157,277	94.0%	261,592	25,978	-	166,411	50,622	8,180	1,726	15,194	61,822	6,681	54,010	12,218	3,572	419,477	1,087,483	99.9%
WY 2000 - 2001	1,010,201	59.5%	781,979	63.5%	118,242	18,708	-	124,465	48,403	6,050	1,452	13,095	30,672	3,745	32,567	7,720	1,628	313,330	720,077	66.1%
WY 2001 - 2002	1,141,149	67.2%	839,385	68.2%	179,455	21,609	-	133,219	49,903	1,363	1,032	7,087	33,868	3,172	24,220	2,894	1,543	396,707	856,072	78.6%

					CENTRAL KINGS GSA		JAMES ID GSA	KINGS RIVER EAST GSA		NORTH FORK KINGS GSA								NORTH KINGS GSA	Total	
	WY PPP	% WY	Apr-Jul	% A-J	Consolidated ID	Lone Tree Channel	James ID	Alta ID	Kings River WD	Burrel Ditch Company	Clark's Fork Recl District	Crescent Canal Co	Laguna ID	Liberty Canal Co	Murphy Slough Assoc	Stinson Canal & Irrigation	Upper San Jose Water Co	Fresno ID		
WY 2002 - 2003	1,426,170	83.9%	1,038,245	84.3%	178,511	21,407	-	137,603	47,403	6,119	1,351	6,910	42,222	4,114	39,240	4,810	1,535	409,908	901,133	82.7%
WY 2003 - 2004	1,050,714	61.8%	698,583	56.7%	135,600	25,320	-	128,426	59,580	396	4	3,881	18,102	2,632	18,235	1,601	807	389,044	783,628	72.0%
WY 2004 - 2005	2,531,327	149.0%	1,917,065	155.7%	328,331	22,135	-	212,052	46,836	9,868	1,978	26,768	76,070	12,972	81,162	18,181	4,751	483,028	1,324,132	121.6%
WY 2005 - 2006	2,948,677	173.5%	2,352,852	191.1%	397,176	10,779	-	211,646	44,436	4,634	2,921	29,816	81,189	10,733	103,461	27,500	3,873	477,848	1,406,012	129.1%
WY 2006 - 2007	679,047	40.0%	436,295	35.4%	49,801	15,733	-	76,225	53,289	1,785	801	3,429	15,285	595	14,860	3,916	436	344,190	580,345	53.3%
WY 2007 - 2008	1,216,651	71.6%	915,185	74.3%	216,719	16,776	-	131,685	52,261	2,578	660	5,018	27,310	2,390	25,869	5,506	908	421,157	908,837	83.5%
WY 2008 - 2009	1,348,201	79.3%	1,006,920	81.8%	147,690	22,298	-	150,834	48,229	4,126	329	6,496	31,351	1,494	35,385	2,487	698	405,715	857,132	78.7%
WY 2009 - 2010	2,062,001	121.4%	1,576,537	128.0%	311,141	24,970	-	220,277	43,008	11,017	1,359	13,740	65,517	6,920	67,543	7,963	4,646	449,830	1,227,931	112.8%
WY 2010 - 2011	3,319,830	195.4%	2,295,580	186.4%	431,959	26,492	-	208,331	36,816	11,732	2,388	38,178	96,959	15,383	119,436	59,671	3,810	473,562	1,524,717	140.0%
WY 2011 - 2012	825,683	48.6%	543,009	44.1%	165,460	18,632	-	127,137	42,530	482	820	2,981	27,856	1,716	27,749	536	1,760	411,320	828,979	76.1%
WY 2012 - 2013	691,301	40.7%	430,191	34.9%	13,722	8,692	-	35,730	44,856	-	-	-	6,807	-	5,365	-	-	314,036	429,208	39.4%
WY 2013 - 2014	536,924	31.6%	405,903	33.0%	50,234	5,795	-	25,791	44,924	-	-	-	2,029	-	7,603	-	-	255,211	391,587	36.0%
WY 2014 - 2015	360,979	21.2%	208,480	16.9%	11,858	-	-	-	42,770	-	597	115	4,413	-	1,503	-	-	153,802	215,058	19.7%
WY 2015 - 2016	1,253,961	73.8%	880,495	71.5%	137,298	20,104	-	130,613	40,630	1,962	-	-	12,153	3,941	14,335	343	329	449,317	811,025	74.5%
WY 2016 - 2017	4,096,148	241.1%	2,700,109	219.3%	519,137	5,891	64,577	241,182	35,218	9,918	1,863	43,589	106,913	22,060	142,975	38,885	5,294	488,110	1,725,612	158.4%
Min	360,979	21%	208,480	17%	-	-	-	-	35,218	-	-	-	-	-	1,016	-	-	153,802	215,058	
Max	4,476,391	263%	3,140,519	255%	536,275	48,305	64,577	281,538	61,980	19,319	4,524	43,589	111,743	22,609	142,975	59,671	5,835	636,275	1,774,026	
Avg	1,724,403	101%	1,213,195	99%	254,124	23,545	5,691	157,118	49,225	5,602	1,288	15,875	53,264	8,139	54,152	11,955	2,283	446,807	1,089,069	
GSA Average					277,669		5,691	206,343		152,559								446,807		
Average 1996/97-2010/11					252,895	22,471	2,064	162,877	47,985	6,635	1,575	17,004	53,811	7,594	59,300	15,114	2,638	429,737	1,081,700	99%
GSA Average					275,366		2,064	210,862		163,671								429,737		

Data from KRWA Watermaster Reports
Bold numbers from KRWA database

KINGS SUBBASIN GSA COORDINATION EFFORTS

Attachment 2

Kings Basin GSA surface water data, AF

Kings Basin GSAs surface water data for Coordinated Kings effort

All data in Acre-Feet

ATTACHMENT 2

		WY 1996 - 1997	WY 1997 - 1998	WY 1998 - 1999	WY 1999 - 2000	WY 2000 - 2001	WY 2001 - 2002	WY 2002 - 2003	WY 2003 - 2004	WY 2004 - 2005	WY 2005 - 2006	WY 2006 - 2007	WY 2007 - 2008	WY 2008 - 2009	WY 2009 - 2010	WY 2010 - 2011	Average 1997 - 2011
CENTRAL KINGS GSA		275,366															
Kings River Diversions	Consolidated ID Head Gate Diversions	382,346	392,187	262,680	261,592	118,242	179,455	178,511	135,600	328,331	397,176	49,801	216,719	147,690	311,141	431,959	252,895
	Lone Tree Channel Head Gate Diversions	33,149	23,197	28,511	25,978	18,708	21,609	21,407	25,320	22,135	10,779	15,733	16,776	22,298	24,970	26,492	22,471
Subtotal		415,495	415,384	291,191	287,570	136,950	201,064	199,918	160,920	350,466	407,955	65,534	233,495	169,988	336,111	458,451	275,366
Other surface water supplies	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JAMES ID GSA		34,522															
Kings River Diversions	James ID Head Gate Diversions	-	30,847	111	-	-	-	-	-	-	-	-	-	-	-	-	2,064
Other surface water supplies	CVP - JID	44,142	13,219	43,304	33,242	29,051	33,280	38,336	38,216	38,669	44,175	38,502	20,147	14,198	24,672	33,710	32,458
KINGS RIVER EAST GSA		246,925															
Kings River Diversions	Alta ID Head Gate Diversions	214,341	172,176	155,463	166,411	124,465	133,219	137,603	128,426	212,052	211,646	76,225	131,685	150,834	220,277	208,331	162,877
Kings River Diversions	Kings River WD Head Gate Diversions	51,664	40,504	46,821	50,622	48,403	49,903	47,403	59,580	46,836	44,436	53,289	52,261	48,229	43,008	36,816	47,985
Subtotal		266,005	212,680	202,284	217,033	172,868	183,122	185,006	188,006	258,888	256,082	129,514	183,946	199,063	263,285	245,147	210,862
Other surface water supplies	FKC - Hills Valley Irrigation District	4,084	2,546	3,507	3,887	3,642	4,895	4,225	5,121	3,901	4,649	5,538	4,888	5,778	5,551	4,770	4,465
	FKC - City of Orange Cove	1,464	923	1,218	1,398	1,442	1,580	1,582	1,899	1,971	2,078	2,099	2,334	2,063	1,921	1,793	1,718
	FKC - Orange Cove Irrigation Distric	35,215	22,167	28,742	28,204	29,772	30,056	29,393	34,401	26,014	29,774	29,313	25,864	26,697	31,251	25,981	28,856
	FKC - Tri-Valley Water District	878	594	874	1,098	1,040	1,493	1,416	1,640	1,040	930	826	860	991	1,015	653	1,023
Subtotal		41,641	26,230	34,341	34,587	35,896	38,024	36,616	43,061	32,926	37,431	37,776	33,946	35,529	39,738	33,197	36,063
McMullin GSA		1,874															
Other surface water supplies	Kings River Floodwater - MVWD	-	7,298	459	-	-	-	-	-	-	3,648	-	-	-	-	-	760
	CVP - MVWD	2,986	1,830	1,343	275	17	2	368	-	849	3,980	-	-	-	-	2,899	970
	Kings River Floodwater - Terranove Ranch	-	-	-	-	-	-	-	-	-	2,162	-	-	-	-	-	144
Subtotal		2,986	9,128	1,802	275	17	2	368	-	849	9,790	-	-	-	-	2,899	1,874
NORTH FORK KINGS GSA		163,833															
Kings River Diversions	Burrel Ditch Company Head Gate Div	16,497	4,860	10,324	8,180	6,050	1,363	6,119	396	9,868	4,634	1,785	2,578	4,126	11,017	11,732	6,635
Kings River Diversions	Clark's Fork Recl District Head Gate Div	2,955	2,337	2,331	1,726	1,452	1,032	1,351	4	1,978	2,921	801	660	329	1,359	2,388	1,575
Kings River Diversions	Crescent Canal Company Head Gate Div	32,831	31,777	20,833	15,194	13,095	7,087	6,910	3,881	26,768	29,816	3,429	5,018	6,496	13,740	38,178	17,004
Kings River Diversions	Laguna Irrigation District Head Gate Div	91,680	75,124	59,994	61,822	30,672	33,868	42,222	18,102	76,070	81,189	15,285	27,310	31,351	65,517	96,959	53,811
Kings River Diversions	Liberty Canal Company Head Gate Div	18,487	15,701	8,887	6,681	3,745	3,172	4,114	2,632	12,972	10,733	595	2,390	1,494	6,920	15,383	7,594
Kings River Diversions	Murphy Slough Association Head Gate Div	103,457	118,028	52,034	54,010	32,567	24,220	39,240	18,235	81,162	103,461	14,860	25,869	35,385	67,543	119,436	59,300
Kings River Diversions	Stinson Canal & Irrigation Head Gate Div	27,575	26,097	18,574	12,218	7,720	2,894	4,810	1,601	18,181	27,500	3,916	5,506	2,487	7,963	59,671	15,114
Kings River Diversions	Upper San Jose Water Company HG Div	5,835	2,914	2,609	3,572	1,628	1,543	1,535	807	4,751	3,873	436	908	698	4,646	3,810	2,638
Subtotal		299,317	276,838	175,586	163,403	96,929	75,179	106,301	45,658	231,750	264,127	41,107	70,239	82,366	178,705	347,557	163,671
Other surface water supplies	FKC Section 215 water	-	-	-	-	-	-	1,906	-	200	-	-	-	-	-	-	162
NORTH KINGS GSA		494,345															
Kings River Diversions	Fresno ID Head Gate Diversions	558,018	455,173	449,068	419,477	313,330	396,707	409,908	389,044	483,028	477,848	344,190	421,157	405,715	449,830	473,562	429,737
Other surface water supplies	FKC - City of Fresno	60,000	25,333	74,686	38,618	58,000	60,595	59,689	56,226	60,130	54,704	42,692	59,303	7,743	20,530	50,649	48,593
	FKC - Fresno Irrigation District	20,587	1,978	26,129	57,555	1,805	6,418	3,887	11,606	7,711	3,090	4,462	558	23,288	8,778	3,731	12,106
	FKC - Garfield Water District	3,806	2,017	3,216	2,949	2,680	2,797	2,564	2,841	1,988	2,490	2,023	2,238	2,127	1,808	1,552	2,473
	FKC - International Water District	1,533	1,325	1,310	1,498	1,413	1,548	1,423	1,584	1,751	1,589	1,091	1,034	1,713	1,106	1,622	1,436
Subtotal		85,926	30,653	105,341	100,620	63,898	71,358	67,563	72,257	71,580	61,873	50,268	63,133	34,871	32,222	57,554	64,608