Comments and Recommendations

Regarding

Southern Delta Electrical Conductivity Objectives (Issue #10)

Of The

State Water Resources Control Board

Water Quality Control Plan

For The

San Francisco Bay/Sacramento-San Joaquin Delta Estuary

Submitted By:

SAN JOAQUIN RIVER GROUP AUTHORITY

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I. INTRODUCTION

The San Joaquin River Group Authority ("SJRGA") is comprised of the South San Joaquin Irrigation District, the Oakdale Irrigation District, the Merced Irrigation District, the Turlock Irrigation District, the Modesto Irrigation District, the City and County of San Francisco, the Friant Water Users Authority, and the San Joaquin River Exchange Contractors Water Authority. As water-right holders and providers of irrigation, municipal, and industrial water in the San Joaquin River Basin, these diverse entities have a critical interest in proper management of the San Joaquin River.

In 1995, the State Water Resources Control Board ("SWRCB") adopted the Bay-Delta Water Quality Control Plan ("WQCP".) The San Joaquin River Tributary Association sued the SWRCB over adoption of the 1995 WQCP, because the salinity standard was not based on sound science, failed to protect the reasonable and beneficial uses designated by the 1995 WQCP, failed to reasonably use water as required by Article 10, §2 of the California Constitution, and did not balance competing interests.

The current Southern Delta Electrical Conductivity ("EC") Objectives contained in the Water Quality Objectives for Agricultural Beneficial Uses (Table 2 of the 1995 WQCP) are designed to protect southern Delta agriculture. The Southern Delta Electrical Conductivity Objective at Vernalis ("Vernalis Objectives") requires an EC of 0.7 decisiemens per meter ("dS/m") during the summer irrigation season from April 1 through August 31 ("Vernalis Summer Objective"), and 1.0 dS/m at all other times. There is presently no schedule, scale or other provision for differing objectives based upon water year type, unlike the flow standards.

New data demonstrates the Vernalis Summer Objective is over-protective of the agricultural beneficial uses it is designed to protect. The SJRGA recommends changing the Vernalis Objectives to 1.0 dS/m for the entire year ("Alternative Objective").

II. DEVELOPMENT OF THE VERNALIS OBJECTIVES.

The definition of the salinity problem in the San Joaquin River has changed over the years. As set forth in the testimony of William Johnston, Delta salinity was a concern even before the Central Valley Project ("CVP") was built in 1944 and the State Water Project ("SWP") was built in 1968. (Presentation of William R. Johnston, submitted as SJRG Exh-08, p1.) The primary concern was salt intrusion from the San Francisco Bay and Pacific Ocean. (Id.; Water Code Appendix §§116-4.1(a)(1), 117-4(a)(1); D-990, p43.) In dry years such as 1924, 1931, and 1934, water with an EC above 1.56 dS/m infiltrated nearly every Delta channel, including the Grant Line Canal and Upper Roberts Island. (Id., p45; SJRG Exh-08, p1.) Water with an EC in excess of 1.56 dS/m only stayed below Antioch in 1938, a very wet year. (D-990, p43.)

In 1920, the State Water Commission advocated storing water for later release as a method of controlling salt intrusion from the Pacific Ocean. (D-990, p46.) Then, in response to a 1925 request for a plan for water resource development from the Legislature, the State Engineer concluded that a salt water barrier would be required to prevent salt intrusion. (Id.) When the State Legislature authorized the CVP in 1931, it acknowledged that salinity control was one the primary purposes of Shasta Dam, because flow at Antioch would prevent the need to construct a physical barrier at the mouth of the river. (Id., p48.)[1]

In 1961, the State Water Rights Board, the predecessor to the SWRCB, adopted D-990, which approved water rights for the CVP. (1995 WQCP, p4.) The SWRCB attached no specific terms and conditions to the CVP permits for salinity, but reserved jurisdiction to impose such requirements in the future. (Id.)

The first Delta salinity standards were adopted in 1967 in D-1275, which approved the water rights for the SWP. (Id.) In response to growing concerns for Delta water quality however, the SWRCB subsequently adopted Resolution 68-17 in 1968 and D-1379 in 1971. (Id., p5.) D-1379 required the CVP and SWP to meet water quality standards, although it was later stayed as a result of litigation. (Id.) The SWRCB eventually required the United States Bureau of Reclamation ("USBR") to meet a salinity standard at Vernalis when it adopted D-1422 and D-1616, the decisions issuing permits for New Melones. (D-1485, p79.)

In developing the Vernalis Objectives in 1978, the SWRCB focused on two salt-sensitive crops grown in the south Delta – beans and alfalfa. (SJRG Exh-08, p1) It was thought that if the salinity of the irrigation water was sufficient to protect these crops, then the salinity of the applied water would not be a limiting factor for other, less salt-sensitive crops grown in the south Delta. (Id.) As such, the Vernalis Objectives were based on the perceived maximum threshold salinity of irrigation water able to maintain 100% yield potential for beans, corn, and alfalfa. (Id.) It should be noted, however, that

[1] Throughout D-990, the salinity problem is only discussed as an issue of seawater intrusion, because in Dry and Critical years, Delta salinity problems were due to seawater intrusion from the San Francisco Bay.

crop yields can vary by 10% due solely to variations in weather, seeds, field conditions, farming practices, and countless other variables. (SJRG Exh-06, p2.)

> "The SWRCB based southern Delta EC objectives on the calculated maximum salinity of applied water which sustains 100% yields of two important salt sensitive crops grown in the southern Delta (beans and alfalfa.)." (SJRG Exh-08, p1.)

In the D-1485 hearings, the SWRCB focused on the principal salt-sensitive crops grown at the time, corn, beans, and alfalfa, the types of soils, organic and mineral, and types of irrigation methods, sub-surface and surface.[2] (Id., p2.) Experts from the University of California testified that good leaching and low salt accumulations were found in all locations where the irrigation water supply averaged 1.1 dS/m, and the wide variability of Delta soils contributed more to the variability in the salt accumulation than did San Joaquin River salinity. (SJRG Exh-08, p3.) Despite these findings, the experts from the University of California concluded that "salinity is a problem now in the South Delta. Given the wide variety of soils in the South Delta, good yields and diversity of crops appear to be related to water quality and levels of farm management." (Id.)

After testimony ended, the SWRCB inquired about crops, particularly corn, grown on organic soils. (Id., p4.) The SWRCB heard substantial testimony from experts at the University of California Agricultural Extension Service concerning the ability to leach salt from the soil to avoid salt accumulation in the crop root zone. (SJRG Exh-08, p2.) Two witnesses, Mr. Carlton and Mr. Kegal, testified at length regarding the difficulty

[2] Sub-irrigation is an irrigation technique in which water is applied in open ditches or tile lines that are blocked, which raises the existing water table until it is high enough to wet the soil to the surface. (San Joaquin County Soil Survey, p260.) The upward movement of the water tends to concentrate salts at or near the surface regardless of whether salinity originates from the soil or the water. (Ayers and Westcot, Water Quality For Agriculture §2.4.5.)

in leaching peat soils, due primarily to the fact that these soils were often on islands located below sea level. (Id.) As a result, the water surrounding the islands was higher than the surface of the soil, and thus the surrounding water table was generally too high to permit adequate leaching. (Id., p2.) Mr. Meyer added such peat soils were sub-irrigated and could only be leached in the non-irrigation season. (Id., p3.) In response, Mr. Ayers calculated that to achieve a 100% yield with surface irrigation of corn on mineral soils with a 16% leaching fraction, water with a salinity of 1.13 dS/m would be needed.[3] (SJRG Exh-08, p3.)

Mr. Ayers concluded that the range of water quality needed for 100% yield of beans with subsurface irrigation, and with the leaching and water management found at the study site, which consisted of organic soils, ranged from 0.34 to 0.68 dS/m. (Id.) The SWRCB, after public review, testimony, workshops, and negotiation, finally established the Vernalis Objectives. (Id.)

D-1485 revised the existing standards for flow and salinity and ordered the USBR and Department of Water Resources ("DWR") to meet these standards by either reducing pumping, releasing water stored in upstream reservoirs, or doing both. (1995 WQCP, p5.)

In the 1995 WQCP, the SWRCB revisited the Vernalis Objectives and made minor modifications. The 1995 WQCP was implemented by D-1641, where the SWRCB found the USBR was the sole cause of the salinity problem in the lower San Joaquin River. (D-1641, p95.) Based on the evidence presented at the hearing, the SWRCB found the salinity objective could not be met with releases solely from New Melones. (D-1641, p80.) While giving the USBR latitude in choosing how to meet the Vernalis Objectives,

[3] The salt tolerance tables developed by Ayers and Westcot apply when leaching fractions range from 15-16%. (SJRG Exh.-08, p3.)

the SWRCB nevertheless imposed the obligation for meeting the Vernalis Objectives on the USBR. (D-1641, p159-160, 162.)

Even though the SWRCB adopted D-1641 without major changes to the Vernalis Objectives, recent data and information reveal significant problems with information upon which the Vernalis Objectives were based, and justify establishing a new objective for salinity at Vernalis.

III. THE CURRENT OBJECTIVE HAS ALMOST NO APPLICABILITY TO SOUTH DELTA AGRICULTURE.

The conventional school of thought for many years has been that the Delta has a serious salinity problem, but neither Delta farmers nor historical data has drawn a solid link between Vernalis salinity and south Delta crop yields for three reasons. First, the Vernalis Summer Objective was based on assumptions inapplicable to the southern Delta, because it focused heavily on sub-irrigation of organic soils, even though organic soils are absent from the south Delta. It also failed to reflect field conditions, as opposed to laboratory conditions, because it ignored the effects of rainfall on leaching salt from the root zone. Second, prior modeling indicated the existence of a severe salinity problem in the summer months due to a grossly inadequate equation, whereas the latest modeling shows the problem in the summer months is greatly exaggerated and that current projects and water resource management will meet the Vernalis Objectives in all years. Finally, due to barrier operations in the southern Delta and export pumping, very little of the water from the San Joaquin River irrigates crops grown in the south Delta. As a result of assumptions that were either wrong or have now become outdated, the Vernalis Summer Objective no longer applies to the majority of the farmland irrigated with surface water in the southern Delta.

A. South Delta Farmers Have Never Established a Relationship Between Their Yields and Vernalis Water Quality.

Given that the Vernalis Objectives were specifically intended to set the maximum amount of salinity in the water at Vernalis that would support 100% crop yield, it became conventional wisdom that any time the Vernalis Objectives were exceeded, particularly in the summer, crop yields were affected. A farmer in the south Delta, William Salmon, has testified that "**Any** actions which will increase salinity flowing into the South Delta will simply incrementally increase the harm which [my] farming operation is subjected to each year." (South Delta Water Agency ("SDWA") PowerPoint presentation, March 15, 2005, submitted as SDWA Exh-09, p47-48.) (emphasis added.) Another farmer, Kurt Sharp, has testified similarly. Mr. Sharp stated "As salinity at Vernalis rises, particularly above the Vernalis standard, there is a corresponding negative effect on the irrigated crops grown by [me]." (Central Delta Water Agency ("CDWA") v. USA, declaration of Kurt Sharp, p3 (June 14, 1999).) (emphasis added.)[4] Although these statements and others[5] have been made consistently, there has been no evidence submitted by these individuals, the SDWA, or the CDWA supports such statements.

For example, while Mr. Salmon's statement submitted by SDWA in this proceeding certainly attempts to link the quality of water at Vernalis with the quality and yield of crops that he grows, the allegedly supporting information he submitted shows no correlation between his crops and salinity at Vernalis. (SDWA Exh-09, p46-47.) In a

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[4] This testimony and similar testimony submitted by Mr. Sharp by SDWA in this process should be rejected, as the property Mr. Sharp farms is not located within the south Delta, but in CDWA, far to the north of the area to be protected by southern Delta water quality objective.

[5] Alex Hildebrand has testified that "Any time the Vernalis standard is exceeded, there is a corresponding negative effect on the irrigated crops grown in the South Delta. I have personally experienced such harm on my crops." (CDWA v. USA, Decl. of Hildebrand, p12-13 (May 7, 1999).)

prior declaration, he stated that the salinity problem has been getting worse since 1999. (Bay-Delta, Depo. Tr. William Salmon, p13 (May 25, 1999).) If true, this is certainly odd, as there have been no violations of the Vernalis standard since at least 1995. (CDWA v. USA, Depo. Tr. Alex Hildebrand, p62-63 (June 17, 2003); see also salinity data in Appendix C.) Indeed, Mr. Salmon testified in his deposition that he did not know if the Vernalis Objectives had been violated since 2000. (Bay-Delta, Depo. Tr. William Salmon, p15 (May 25, 1999).) Thus, regardless of the veracity of Mr. Salmon's claims of salt damage to his crops, he failed to provide any data suggesting that such salinity damage is directly related to violations of the Vernalis Objectives.[6]

In his statement submitted by SDWA in the current proceeding, Mr. Salmon cites EC measurements made in the summer months Grant Line Canal and Middle River in an attempt to correlate Vernalis EC with his crop losses, but other than referencing the Vernalis Summer Objective, his statement says nothing about EC actually measured at Vernalis. (SDWA Exh-09A, p47.) Mr. Salmon also could have cited EC measurements at Vernalis, in addition to EC measurements at Grant Line Canal and Middle River, to support a correlation between EC at Vernalis, EC in the Grant Line Canal and Middle River, salt accumulation in his soil, and ultimately, his crop losses, but did nothing of the

[6] Mr. Salmon's claim that salinity is the cause of the yield loss of his crops is dubious at best. In a 1999 deposition, Mr. Salmon admitted that he was unable to correlate damage to his walnuts to salinity of the irrigation water he used. He stated "Now, that is not totally. it is not totally. I can't totally say that it is the salt. I also have a virus, what they call black line disease which walnuts get." (Bay-Delta, Depo. Tr. William Salmon, p78 (May 25, 1999).) Mr. Salmon made a similar admission regarding tomatoes, for which he stated "And in 1990 I finally gave up growing tomatoes because I was no longer – it was no longer economically feasible for me to grow with my yields. My yields kept coming down. Now, I can't sit here and tell you that it was directly related to the salt in the water…" (Id., p81.) Perhaps most telling, despite this dramatic statement about quitting tomatoes due to declining yields, in 1999 Mr. Salmon planted 357.5 acres of tomatoes. (Id., Exh. 5.)

sort. (Id.) Mr. Salmon's most recent statement, just like his deposition, fails to support any relationship, correlative or causal, between his crop losses and EC at Vernalis.

Mr. Sharp's statement has even less evidentiary support. Despite alleging a direct connection between salinity at Vernalis and adverse impacts to crops grown by R.C. Farms, Mr. Sharp has frequently admitted that he has absolutely no basis for attempting to make such a connection. In a 2003 deposition, Mr. Sharp acknowledged that knowing the salt content of the irrigation water he was applying would be a key piece of information regarding his claim of connection between salinity at Vernalis and adverse impacts to crops he grows. (CDWA v. USA, Depo. Tr. Kurt Sharp, p10-11 (June 24, 2003).) Despite this, Mr. Sharp admitted that he did not know or check the salt content of the water he was applying, and acknowledged that water quality could be getting better and he would not even know it. (Id., p11, 21-22.)

Mr. Sharp was even more open and honest about lacking any information correlating EC at Vernalis EC impacts to the crops grown at R.C. Farms, as the following exchange illustrates:

> "Q. Have you done any analysis to understand the correlation between EC at Vernalis and EC at R.C. Farms?"
>
> "A. Have I done any what?"
>
> "Q. Analysis."
>
> "A. No."
>
> "Q. Are you aware of any reports or studies that you have read or reviewed that has a correlation between EC's at Vernalis and EC's at where you divert from the San Joaquin River?"
>
> "A. Say that question again."

> "Q. Yeah. Have you read any books, analysis, reports that shows a correlation between EC's at Vernalis and EC's at R.C. Farms?"
>
> "A. No, I have not." (CDWA v. USA, Depo. Tr., Kurt Sharp, p25 (June 24, 2003).)

When asked to give specific details about crop yield declines due to salt, Mr. Sharp testified that certain parts of R.C. Farms' fields have been experiencing declines from 1997 up and through 2003 which he attributed to salt build-up (In re Long-Term Petition Change of: Modesto Irrigation District, et al., Depo. Tr. Kurt Sharp, p15-17 (March 27, 2003).)

Even assuming that Mr. Sharp has seen yield declines in parts of his fields beginning in 1997, and even assuming that such declines were related to salt build up in the soils, those impacts do not correlate with violations of the Vernalis Objectives. As noted earlier, there have been no violations of the Vernalis Objectives since 1995. (CDWA v. USA, Depo. Tr. Alex Hildebrand, p62-63 (June 17, 2003); see also Vernalis EC data in Appendix C.) Since then, the seasonal average salinity at Vernalis was never worse than 0.58 dS/m. (See Appendix B, p2, Table 2.) Moreover, immediately preceding the alleged decline, water quality in 1996 was one of the best years since 1970, averaging about 0.25 dS/m during the irrigation season. (Id.) Then, in 1998, water quality at Vernalis was the best it had ever been since 1970, averaging about 0.19 dS/m during the growing season. (Id.) The salinity data at Vernalis simply does not support a correlation between EC at Vernalis and crop yields in the south Delta.

B. Historical Data Does Not Support Any Relationship Between Vernalis Water Quality and Southern Delta Agriculture.

The statements from Mr. Salmon and Mr. Sharp not only fail to provide any objective, correlative data, they also skew the analysis of whether south Delta yield declines correspond with exceedances of the Vernalis Summer Objective. Ignoring south Delta farmers whose yields did not decline when the Vernalis Summer Objective was exceeded biases the sample, improperly determines whether violations of the Vernalis Summer Objective cause or correlate with declines in south Delta crop yields, and ultimately distorts the results.

Due to the lack of competent analysis and objective, correlative data supporting the conventional wisdom that every time a violation of the Vernalis Summer Objective occurs farmers in the Southern Delta experience a corresponding negative impact on their crops, the SJRGA conducted its own investigation to determine whether such a relationship existed. The SJRGA obtained data from the San Joaquin County Agriculture Commissioner's Reports and compared the data to historical salinity at Vernalis for every year from 1970 to 2003. (See Appendix B, p2-5, Tables 2-5.) The results indicate no relationship exists between Vernalis salinity and south Delta crop yields.

Since the Vernalis Summer Objective was established at the salinity threshold for sub-irrigated beans, 0.7 dS/m, the SJRGA started its analysis with beans. (SJRG Exh-08, p4.) If the south Delta farmers were correct in their belief that their crops yields declined in direct relation to violations of the Vernalis Summer Objective, then violations of the Vernalis Summer Objective would impact beans more than any other crop.

First, the SJRGA directly compared bean yields to the corresponding average EC of each irrigation season in order to observe when yield declines corresponded with high salinity and when they did not correspond with high salinity. (see Table 1.) An "irrigation season" was defined as the period each year from April 1 through August 31.

Table 1: Dry Bean Yield and Seasonal Average Water Quality at Vernalis, 1970-2003.[7]

Year	Yield (Tons/Acre)	EC (dS/m)	Year Type[8]
1970	0.88	0.68	AN
1971	0.88	0.72	BN
1972	1.05	1.01	D
1973	1.16	0.68	AN
1974	1.18	0.53	W
1975	1.18	0.57	W
1976	0.91	0.99	C
1977	0.89	1.49	C
1978	0.85	0.41	W
1979	0.97	0.68	AN
1980	1.07	0.71	W
1981	1.04	0.73	D
1982	0.80	0.28	W
1983	0.85	0.19	W
1984	0.91	0.63	AN
1985	1.15	0.62	D
1986	1.05	0.38	W
1987	1.06	0.72	C
1988	1.07	0.74	C
1989	1.04	0.75	C
1990	1.50	0.75	C
1991	1.15	0.86	C
1992	1.09	0.78	C
1993	1.13	0.64	W
1994	1.20	0.74	C
1995	1.15	0.26	W
1996	1.08	0.49	W
1997	1.14	0.56	W
1998	0.8	0.19	W
1999	1.15	0.45	AN
2000	1.09	0.46	AN
2001	1.05	0.58	D
2002	1.08	0.56	D
2003	1.09	0.55	BN

[7] Consecutive years in which the seasonal average exceeded the Objective are shaded yellow. Years in which the yield was less than 10% below the mean are shaded green.
[8] San Joaquin River Basin Index Year Types. W= Wet, AN = Above Normal, BN = Below Normal, D = Dry, C = Critical. (SJRG Exh-07, p32.)

Overall, seasonal average EC at Vernalis ranged from a low of 0.19 dS/m to a high of 1.49 dS/m. The mean EC for the period was 0.63 dS/m.[9] Yields for that period ranged from a low of 0.80 tons/acre to a high of 1.5 tons/acre. The mean yield was 1.05 tons/acre.[10] However, since yields vary by about 10%, solely due to variations in weather, seeds, farming practices, and other factors, yields could have been as low as 0.90 tons/acre for reasons unrelated to salinity. (SJRG Exh-06, p2.)

In the thirty-four years observed, the seasonal average EC exceeded the Vernalis Summer Objective thirteen times. However, yields declined to less than 10% below the mean yield only twice – once in 1971, when yields were 0.88 tons/acre and EC was 0.72 dS/m, and again in 1977 when yields were 0.89 tons/acre and EC was 1.49 dS/m, the highest EC during the sample period.

None of the other twelve instances in which seasonal average EC exceeded the Vernalis objective accompanied significant declines in bean yields. Eight of these years had yields at or above the mean. Some of these years even had the best yields of the entire thirty-four year period. In fact, the highest yields in the entire period, 1.5 tons/acre occurred in 1990, when the average EC of the season was 0.75 dS/m! In contrast, 1997 had one of the worst yields, at only 0.8 tons/acre, but the best water quality, at 0.19 dS/m.

South Delta farmers such as Mr. Salmon and Mr. Sharp have repeatedly claimed that violations of the Vernalis Summer Objective lead to corresponding declines in their yields. They also repeatedly failed to provide any documentation or other supporting evidence demonstrating a correlative or causal relationship between exceedances of the Vernalis Summer Objective and harm to their crops. They could not do so, because no

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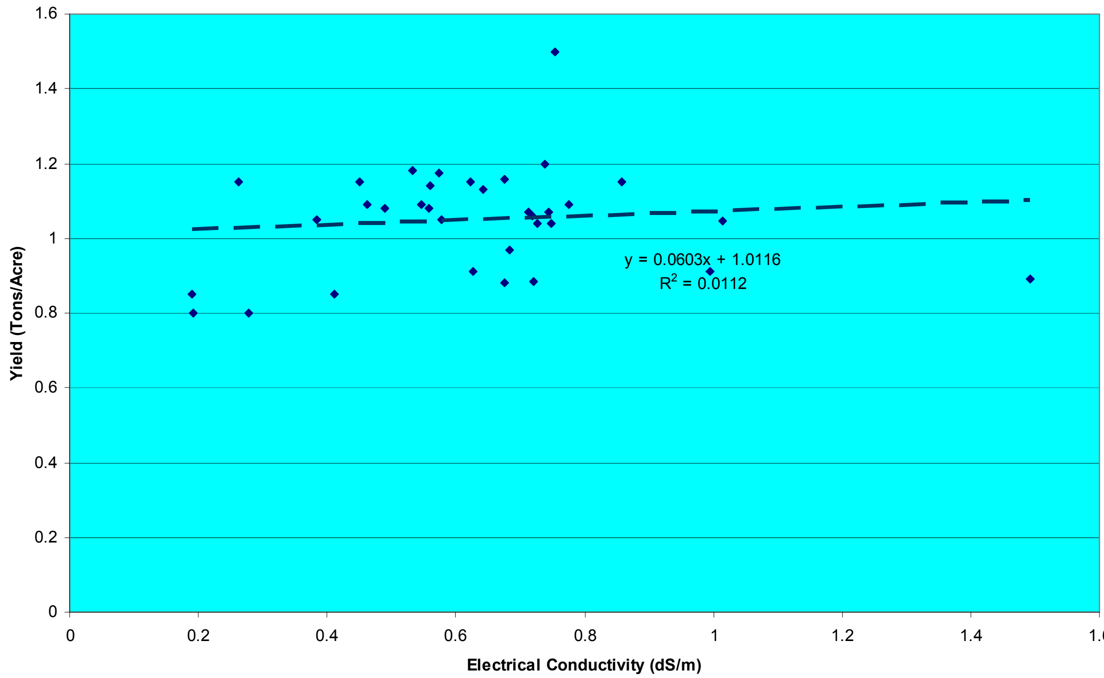
[9] The standard deviation was 0.17 dS/m.
[10] The standard deviation was 0.10 tons/acre. The median yield was 1.07 tons/acre

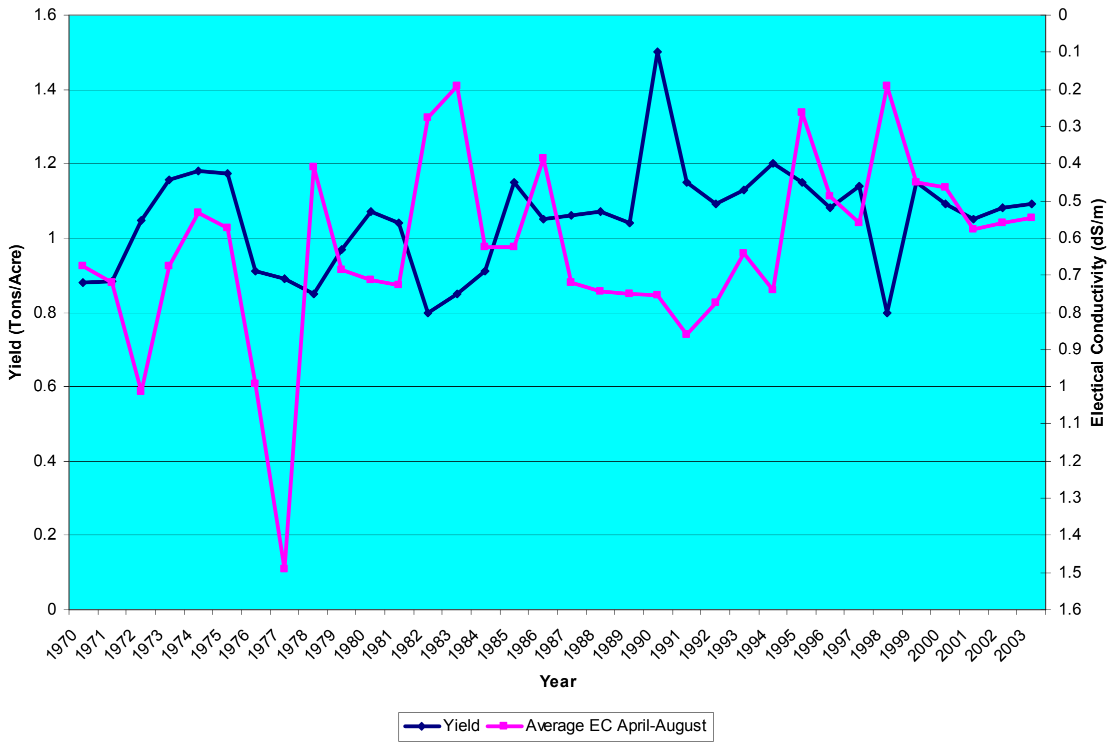
such evidence exists. Comparing seasonal average EC at Vernalis with bean yields demonstrates that bean yields do not decrease when EC exceeds the Vernalis Summer Objective and that no relationship between the two exists. (see Figure 1.)

Figure 1: San Joaquin County dry bean yield and seasonal average EC.



According to the work of Ayers and Westcot however, it takes time for salt to accumulate in the root zone to a concentration sufficient to reduce yield. (Ayers, R.S. and D. W. Westcot, Water Quality For Agriculture §2.4.2 (Food and Agriculture Organization of the United Nations, Irrigation and Drainage Paper, 29 Rev. 1 1985).) Even without leaching, two or more years of irrigation are generally required before salt concentrations climb high enough to harm yields. (Id.) Consequently, the SJRGA examined bean yields and salinity over the period from 1970 to 2003 to determine whether any patterns or trends emerged. Based on the Ayers and Westcot work, one or more consecutive years in which the seasonal average salinity exceeded 0.7 dS/m should have eventually led to declines in yields, but again there was no relationship between Vernalis salinity and bean yields. (Id.; see Figure 2.)

Figure 2: San Joaquin County dry bean yield and seasonal average water quality from 1970 to 2003.



In the entire thirty-four year period observed, there were two instances in which yield declines more than 10% below the mean followed one or more years in which the seasonal average EC at Vernalis exceeded 0.7 dS/m.

The first instance occurred in 1977, when the yield was 0.89 tons/acre, the EC at Vernalis the prior year was 0.99 dS/m, and the EC at Vernalis that year was 1.49 dS/m. It should be noted that the 1977 water year was one of the driest years on record, and a water shortage could have impacted crop yields just as well as any water quality degradation. (see Appendix B, p1, Table 1.) The second instance occurred in 1982, when yields were 0.85 tons/acre, after 1980, when the seasonal average EC at Vernalis was 0.71 dS/m and 1981, when the seasonal average EC at Vernalis was 0.73 dS/m.

However, there was also a significant period when seasonal average EC exceeded 0.7 dS/m every year from 1987 through 1992 - a total of six consecutive years. Throughout that period, however, bean yields stayed remarkably stable. In fact, they were higher than the mean in all six years. 1990, the fourth consecutive year in which seasonal average EC exceeded 0.7 dS/m, had the highest bean yields, 1.5 tons/acre, of the entire period from 1970 to 2003. Such a long period of EC at Vernalis in excess of the salinity tolerance of beans defeats the notion that even violations over multiple, consecutive seasons correlate with or cause declines in yields.

Since bean yields bore no relationship with EC, the SJRGA also tried to find trends in corn, both grain (see Figure 3) and silage (see Figure 4), and alfalfa (see Figure 5), but the only trends found were inconsistent with the conventional wisdom.

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Table 2: Corn grain, corn silage, and alfalfa yields and seasonal average water quality at Vernalis, 1970-2003.[11]

Year	Corn Grain Yield (Tons/Acre)	Corn Silage Yield (Tons/Acre)	Alfalfa Yield (Tons/Acre)	EC (dS/m)	Year Type
1970	3.14	22.75	6.33	0.68	AN
1971	3.25	20.50	6.70	0.72	BN
1972	3.15	25.00	6.63	1.01	D
1973	3.60	23.70	7.00	0.68	AN
1974	3.40	24.30	6.66	0.53	W
1975	3.59	22.11	6.54	0.57	W
1976	3.51	23.50	7.32	0.99	C
1977	3.95	21.40	7.47	1.49	C
1978	3.85	20.94	6.77	0.41	W
1979	4.03	24.87	6.86	0.68	AN
1980	4.40	24.14	6.48	0.71	W
1981	3.89	23.90	6.83	0.73	D
1982	4.50	24.20	6.93	0.28	W
1983	3.92	25.10	6.74	0.19	W
1984	4.47	24.51	6.95	0.63	AN
1985	4.70	27.30	7.31	0.62	D
1986	4.62	26.30	6.46	0.38	W
1987	4.70	26.60	6.79	0.72	C
1988	4.46	22.90	7.14	0.74	C
1989	4.64	24.50	6.90	0.75	C
1990	4.32	23.70	6.78	0.75	C
1991	4.67	26.90	7.30	0.86	C
1992	5.07	25.10	8.33	0.78	C
1993	5.04	26.10	7.00	0.64	W
1994	5.20	29.00	7.25	0.74	C
1995	4.97	27.73	7.25	0.26	W
1996	4.48	27.55	6.81	0.49	W
1997	5.14	27.18	6.98	0.56	W
1998	4.50	28.17	6.10	0.19	W
1999	4.95	28.15	6.32	0.45	AN
2000	5.13	28.89	6.22	0.46	AN
2001	4.76	29.87	7.2	0.58	D
2002	5.20	30.00	7.00	0.56	D
2003	4.63	28.35	7.11	0.55	BN

[11] Consecutive years in which the seasonal average exceeded the Objective are shaded pink.

Figure 3: San Joaquin County corn grain yields and seasonal average water quality from 1970 to 2003.

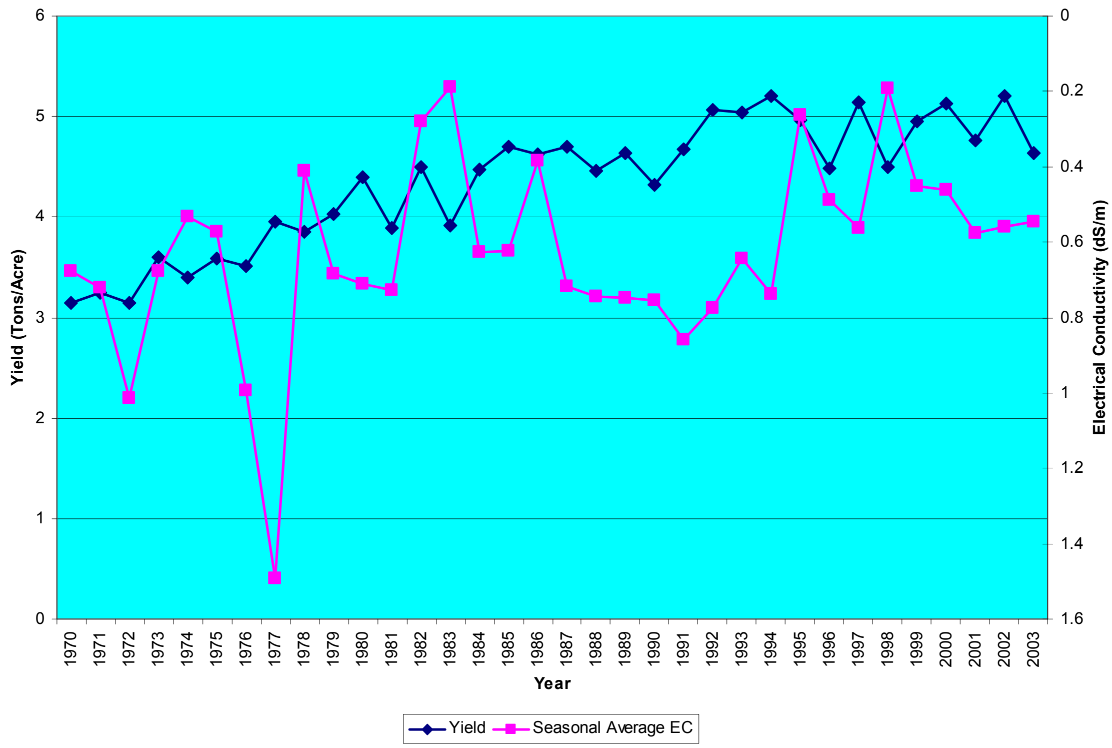
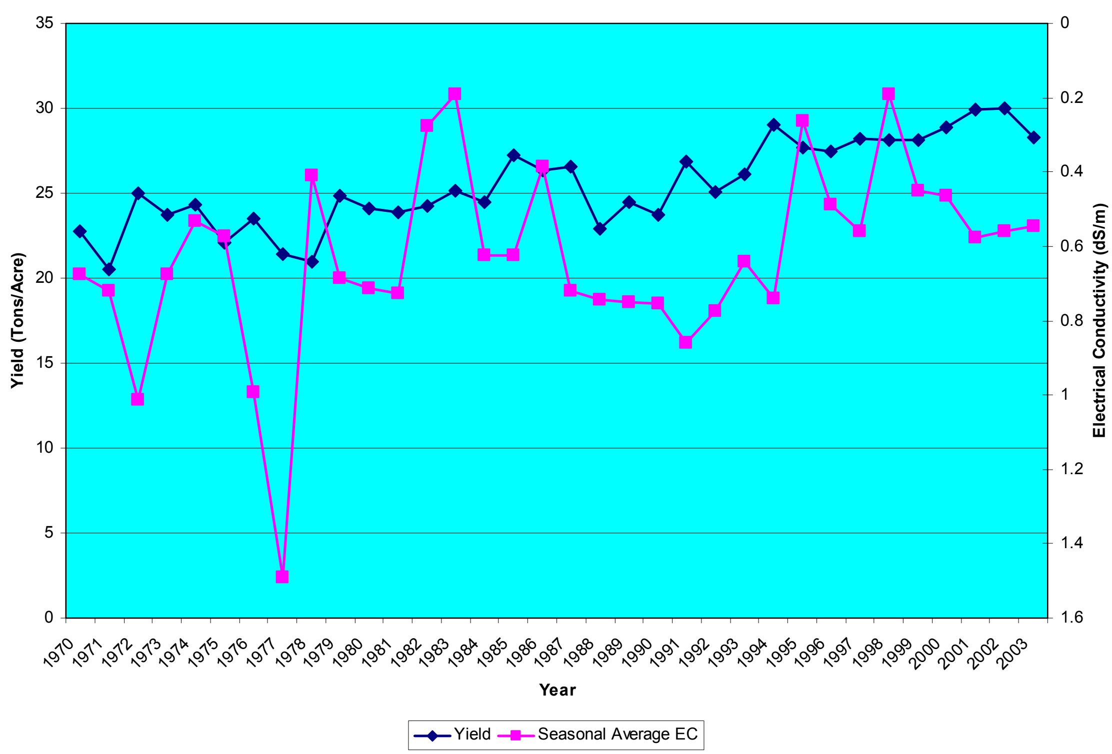
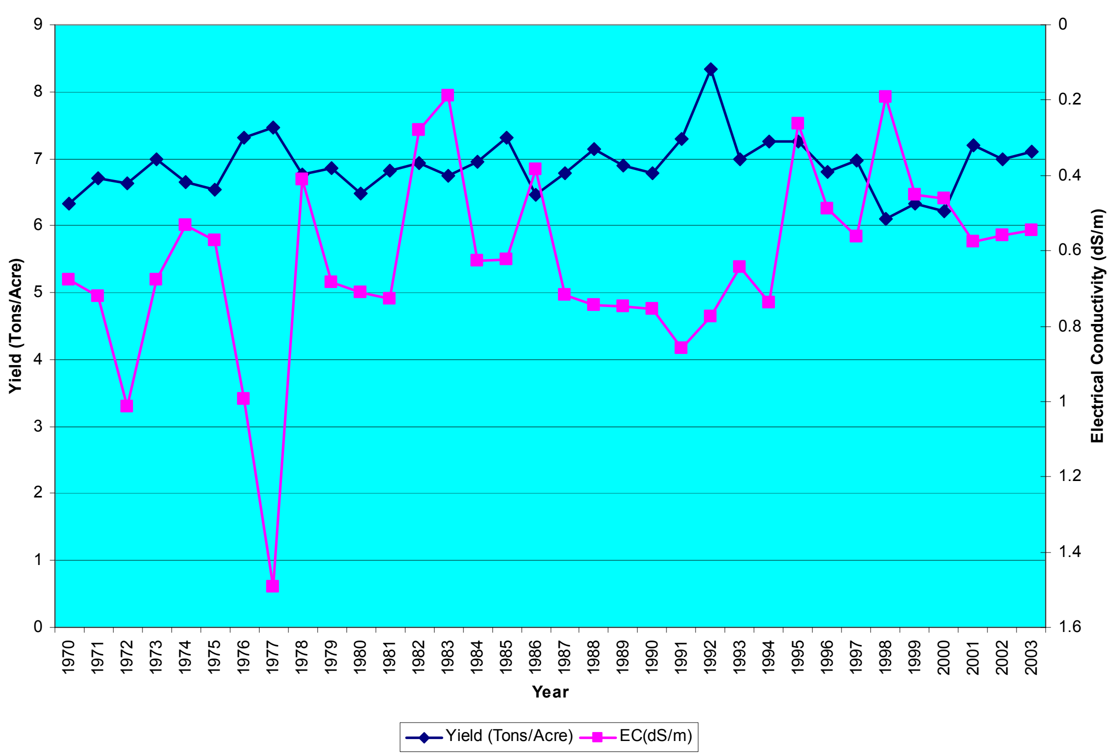


Figure 4: San Joaquin County corn silage yields and seasonal average water quality from 1970 to 2003.



Corn grain and corn silage yields steadily increased over the period of 1970 to 2003. (see Figures 3 and 4.) Corn grain yields continued rising in 1977, and continued doing so in 1978. Corn grain yields even continued rising throughout the period from 1987 to 1992, when seasonal average salinity exceeded the Vernalis Summer Objective every year. Silage corn yields had a similar trend. Yields decreased slightly in 1977 and 1978, but then increased again in 1979 and returned to their upward trend. However, the work of Ayers and Westcot would not predict yield declines when seasonal average EC exceeds 0.7 dS/m, but instead when seasonal average EC exceeds 1.1 dS/m. (Ayers and Westcot, Water Quality For Agriculture §2.4.3.) In the entire thirty-four year period, seasonal average EC at Vernalis only exceeded 1.1 dS/m in one year, 1977. The conventional wisdom would have predicted declines in the yields of both grain corn and silage corn, but instead grain corn yields increased!

Figure 5: San Joaquin County alfalfa yields and seasonal average water quality from 1970 to 2003.



Alfalfa yields stayed relatively stable from 1970 to 2003, despite wide fluctuations in EC. (see Figure 5.) Alfalfa yields even increased between 1987 and 1994, when the seasonal average EC at Vernalis exceeded 0.7 dS/m in six out of seven years. Even consecutive years of EC at Vernalis exceeding 0.7 dS/m failed to impact alfalfa yields. The highest yields of the entire period, 8.33 tons/acre, occurred in 1992, the fourth consecutive year in which seasonal average EC at Vernalis exceeded 0.7 dS/m. However, the work of Ayers and Westcot would not predict yield declines when seasonal average EC exceeds 0.7 dS/m, but instead when seasonal average EC exceeds 1.3 dS/m. (Ayers and Westcot, Water Quality for Agriculture §2.4.3.) In the entire thirty-four year period, seasonal average EC at Vernalis only exceeded 1.3 dS/m in one year, 1977. Contrary to conventional wisdom however, alfalfa yields did not decline that year, but increased instead.

The SJRGA's analysis was based on information obtained from the San Joaquin County Agriculture Commission, rather than data specific to the southern Delta, but south Delta agriculture constitutes a significant portion of San Joaquin County agriculture. In 1996, the most recent land use survey data available from the DWR, the southern Delta alone accounted for almost half of San Joaquin County's bean production, with about 10,550 acres of bean grown in the southern Delta and 22,800 acres of beans grown in San Joaquin County. (Presentation of John W. Hagen and Bert O. Mason, submitted as SJRG Exh-05, p2, 56.) Alfalfa constituted an even larger portion of San Joaquin County output, about 55%, with 35,600 acres of alfalfa grown in the southern Delta and 64,890 acres grown in the entire county. (See Appendix B, p4-8, Tables 4 and 7.) Corn grown in the southern Delta, both grain and silage, accounted for about 24% of county output, a smaller portion than beans and alfalfa. (SJRG Exh-05, p40, 48.) Nevertheless, since the south Delta accounts for such a large portion of county output, San Joaquin County statistics adequately represent southern Delta bean, corn, and alfalfa statistics.

If the south Delta farmers were correct, then corn, alfalfa, and especially bean yields should have declined in relation to exceedances at Vernalis. Yields showed significant declines in correspondence to seasonal average EC at Vernalis in only a small fraction of years. In the vast majority of years, no yield declines occurred. Contrary to conventional wisdom and the deeply-held beliefs of many, the historical data disproves the existence of any correlation or causal relationship between high EC's at Vernalis and impacts to south Delta agriculture.

Finally, San Joaquin County yields of grain corn, silage corn, and dry beans are substantially better than average yields in the United States and California, sometimes by as much as 20%. (SJRG Exh-05, p8, 17, 23.) San Joaquin County grain corn and silage corn yields even exceed those of major corn growing states such as Nebraska. (Id., p8.) If yields of salt-sensitive crops in the south Delta are so high, then salinity cannot be the serious problem impairing agriculture that south Delta farmers and conventional wisdom would lead one to believe.

C. Prior Modeling Exaggerated the Salinity Problem.

As presented by Daniel Steiner, the latest modeling of the San Joaquin River Basin represented in CALSIM II ("CALSIM II-Revised") is the product of over three years of refinement and enhancement of prior models used to simulate the hydrology and water resource operations of the Basin. (Presentation of Daniel Steiner, submitted as SJRG Exh-07, p17.)

CALSIM II-Revised first analyzes "Maze", the San Joaquin River upstream of its confluence with the Stanislaus River, because conditions at Maze drive conditions at Vernalis. (SJRG Exh-07, p14; see Figure 6.) Here, it captures the effects of upstream operations of the Merced River and Tuolumne River, and occasional flow from the upper San Joaquin River and Kings River. It analyzes water quality using a new mass balance approach. (Id.) Then, it presents results for Vernalis. (Id.; see Figure 7.)

Figure 6: Water quality at Maze simulated by CALSIM II-Revised.[12] (SJRG Exh-13, p15.)

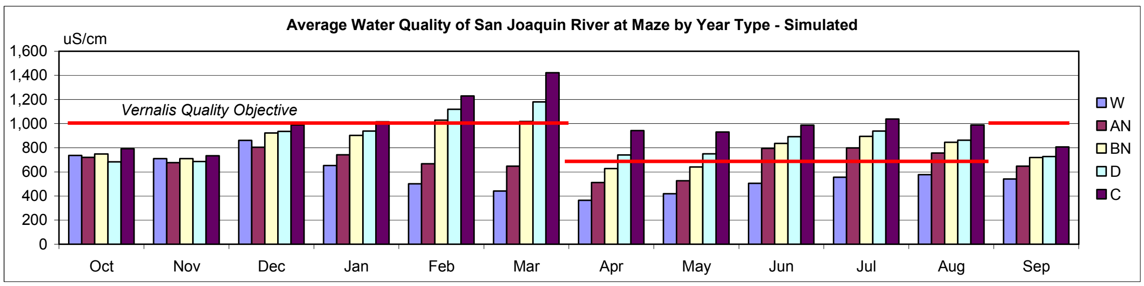
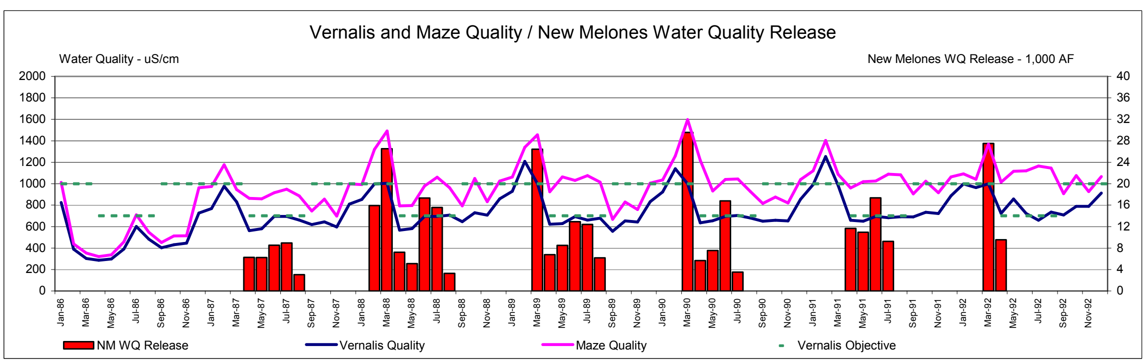


Figure 7: CALSIM II-Revised simulation of San Joaquin River water quality at Vernalis. (SJRG Exh-13, p20.)

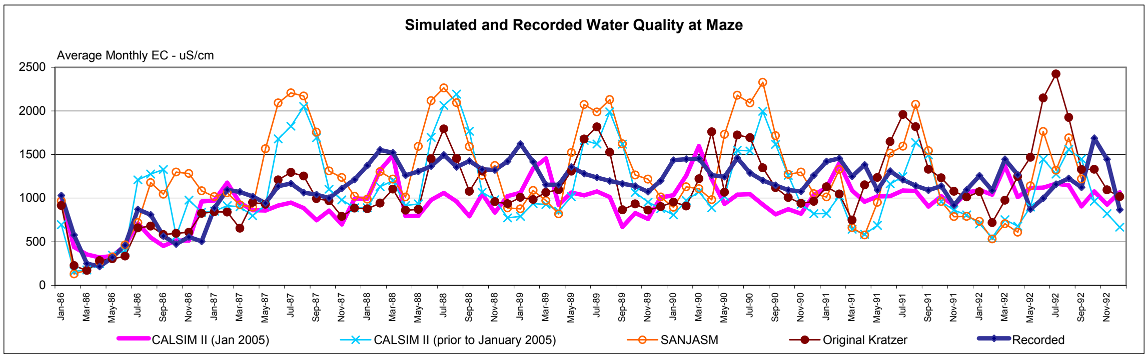


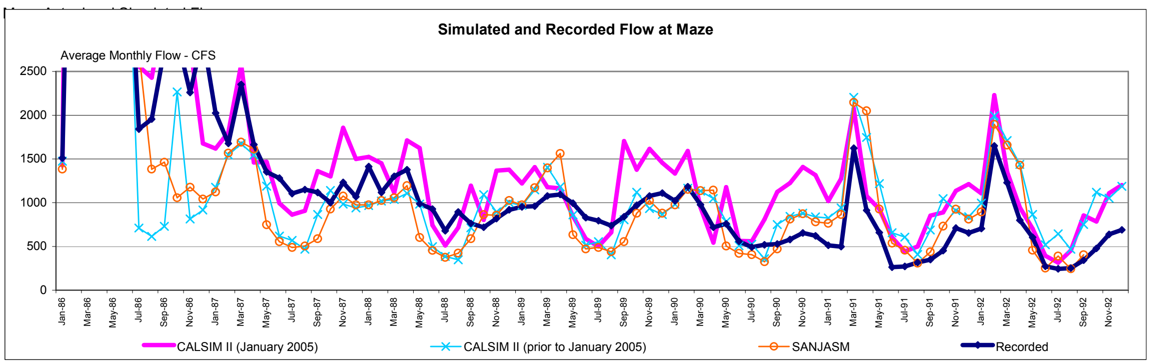
CALSIM II-Revised significantly improves on prior modeling efforts. SANJASM, the original Kratzer equation, and prior versions of CALSIM II overestimated salinity at Maze, which in turn all overestimated water quality release needs from New Melones. (Id., p19.) These prior models overstated salt loading in the

[12] Note that EC is depicted in "uS/cm." For purposes of conversion, 1000 uS/cm = 1 dS/m.

lower San Joaquin River occurring in the summer months and, as a result, exaggerated the Delta salinity problem. (Id., p19-20; see Figure 8.)

Figure 8: Comparison of CALSIM II-Revised to water quality and flow at Maze simulated by previous models and to historical water quality and flow.[13] (SJRG Exh-13, p17.)





One effect of incorporating current river management methods is that CALSIM II-Revised simulates different historical conditions than were actually experienced. (Id., p20.) CALSIM II-Revised incorporates current river and water resource management practices and new projects, such as the Vernalis Adaptive Management Plan, the Grasslands Bypass Project, and the New Melones Interim Operations Plan, which have changed the river's hydrology from conditions existing in the past. It has been refined

[13] Note that EC is depicted in "uS/cm." For purposes of conversion, 1000 uS/cm = 1 dS/m.

and calibrated against recent recorded data, and more accurately models current river hydrology and actual salinity conditions.[14] (Id.)

According to the Central Valley Regional Water Quality Control Board ("CVRWQCB"), between 1986 and 1998, the Vernalis Summer Objective was exceeded 49% of the time.[15] (Central Valley Regional Water Quality Control Board, Total Maximum Daily Load for Salinity and Boron in the Lower San Joaquin River, June 2002, p11.) The Vernalis Objective for September through March was exceeded 11% of the time. (Id.)

Using CALSIM II-Revised to simulate historic conditions with current river and water resource management practices shows that in the 73-year data set, 15 violations of the Vernalis Summer Objective would have occurred. (SJRG Exh-07, p12-13; see Table 3.) Given that each violation counts as a month and in the 73-year data set there were 876 months, violations would have occurred less than 2% of the time. (Id., p12-13.) Violations of the Vernalis Summer Objective would have occurred 10 times, which over the 73-year period, was about 3% of the time. (Id.) Violations of the Vernalis Objective for September through March would have occurred five times, which over the 73-year period, was less than 1% of the time. (Id.)

The largest violation of the Vernalis Summer Objective, and the largest violation of either of the Vernalis Objectives in the entire 73-year period, would have occurred in

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[14] So far, CALSIM II-Revised has only simulated flow and salinity. ("Consideration of Potential Amendments or Revisions of the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, Hrg. Tr. Daniel Steiner, p1100, 1223 (March 15, 2005).) It has not evaluated sediments, algae, pesticide residue, or any other pollutant. As new information becomes available, calibration and improvement of CALSIM II-Revised will continue. (Id., p1103.)

[15] All of these violations would have occurred before 1995, because there have been no violations of the Vernalis Objective since then. (CDWA v. USA, Depo. Tr. Alex Hildebrand, p62-63 (June 17, 2003).) Additionally, almost half of the sample period used by the CVRWQCB consists of the 1987-1992 drought which skewed the results toward lower water quality and more frequent violations than would a larger sample.

May, 1992, when the objective was exceeded by 0.311 dS/m.[16] (Id.) All other violations of the Vernalis Summer Objective would have exceeded the objective by less than 0.05 dS/m. (Id.) Meeting the Vernalis Summer Objective in May, 1992, would have required 21,000 AF of water, but all other violations would have required 1,000 AF to 6,000 AF of additional water.[17] (Id.)

Table 3: Violations of the objective at Vernalis.[18] (SJRG Exh-13, p21.)

Average Monthly Water Quality at Vernalis - Simulated (uS/cm)

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1935	C	C	C	C	1080	C	C	C	C	C	C	C
1961	C	C	C	C	1058	C	C	C	C	C	717	C
1977	C	C	C	C	C	C	C	C	C	C	710	C
1988	C	C	C	C	C	C	C	C	C	C	708	C
1989	C	C	C	C	1207	C	C	C	C	C	C	C
1990	C	C	C	C	1139	C	C	C	C	C	C	C
1991	C	C	C	C	1253	C	C	C	C	C	C	C
1992	C	C	C	C	C	C	749	1011	723	C	737	C
1994	C	C	C	C	C	C	C	C	735	718	725	C

Notes: "C" means water quality was within compliance for month. Exceedence during April or May is during non-pulse flow period.

Water Quality Objective - uS/cm

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	1000	1000	1000	1000	1000	1000	700	700	700	700	700	1000

Estimated Additional New Melones Release Needed to Provided Water Quality Compliance - 1,000 acre-feet

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1935					10							
1961					7						2	
1977											1	
1988											1	
1989					20							
1990					15							
1991					22							
1992							6	21	1		3	
1994									4	1	2	

End of Month New Melones Storage - 1,000 acre-feet

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1935	584	580	583	616	640	690	820	1012	1127	1074	1001	958
1961	1201	1216	1231	1239	1243	1224	1186	1132	1079	1023	966	934
1977	1448	1444	1436	1428	1400	1339	1273	1209	1181	1124	1069	1047
1988	1443	1424	1410	1414	1404	1361	1298	1222	1182	1145	1109	1081
1989	1045	1029	1022	1020	1029	1079	1047	1002	984	932	882	886
1990	906	908	923	936	952	920	856	786	733	676	633	609
1991	598	580	589	587	584	626	594	558	521	461	404	385
1992	382	371	386	400	450	467	441	361	308	252	194	166
1994	716	738	772	802	825	775	723	675	619	552	490	455

[16] Despite the exceedance in May, 1992, yields for dry beans, the most salt-sensitive crop grown in the south Delta, were far above the mean yield for San Joaquin County. (SJRG Exh-05, p56.) It was also a Critical Year following five consecutive Critical years. (SJRG Exh-07, p32.)

[17] The average amount of water required to meet the Summer Vernalis for all 10 of the irrigation season violations would have been 8,400 AF. If the violation in May, 1992, is excluded, the average amount of water required would have been 2,333 AF.

[18] Only violations of the Objective are shown. Violations are shaded pink. For purposes of conversion, 1000 uS/cm = 1 dS/m.

For every violation, New Melones had more than sufficient storage available to achieve the Vernalis Objectives. (Id.) D-1641 requires that the USBR, as a condition to its permits, meet the Vernalis Objectives with "any measures available." (D-1641, p79, 89.) Since the USBR can always achieve the Vernalis Objectives and is legally required to do so, no violations will ever occur. Consequently, the southern Delta salinity problem is far less severe than depicted by the CVRWQCB in their §303(d) listing of the Lower San Joaquin River and by the SWRCB in D-1641.

D. Assumptions Underlying the Development of the Vernalis Objective in D-1485 Were Incorrect.

Since the historical data showed no impact on crop yields due to EC exceeding 0.7 dS/m at Vernalis, the SJRGA re-examined the information used to establish Vernalis Objectives in D-1485, and found the SWRCB erred in two important areas. In addition, the most important assumption, that the south Delta is actually irrigated with water from the San Joaquin River, is a fallacy.

1. Data Used to Establish the Vernalis Objective Did Not Account for Rainfall.

As discussed in the testimony of Dr. James Brownell, the initial work on establishing crop salinity relationships, which was later used by the SWRCB in D-1485, was done in large pots, under controlled conditions and did not consider leaching due to natural rainfall. (SJRG Exh-06, p1.)

For example, the SWRCB considered the 1974 UC-Committee of Consultants developed "Guidelines for Interpretation of Water Quality for Agriculture" (1976 UC Exhibit 1), which evaluated the interrelationship between the salinity of the irrigation water, the soil salinity, and the leaching fraction to determine the impact on crop yields.

Another exhibit submitted by the University of California Agricultural Extension (1976 UC Exhibit 7), similarly evaluated only the impacts of the salinity of the irrigation water actually applied. UC Exhibit 3 predicted yield declines based upon crops grown under controlled circumstances, with salinity of the irrigation water applied at one of two fixed amounts, 1.35 dS/m and 2.0 dS/m. (1976 UC Exhibit 3.)

Agronomy research continued after D-1485 and began incorporating the effects of rainfall. The SWRCB considered much of this material when it re-examined the Vernalis Objectives in the late 1980's. In 1983, Prichard, Hoffman, and Meyer determined that the winter rainfall observed in their study generally leached surface soils free of salts and allow good seed germination. ((Ayers and Westcot, Water Quality for Agriculture §8.2.) With such conditions, corn could be irrigated with an EC_w as high as 2.2 with no loss in yield. (SJRG Exh-08, p5.)

In 1986, Hoffman et al. obtained similar result when they reported that 100% yields of corn could be achieved using irrigation water with an EC_w as high at 2.0 dS/m if leaching were adequate from either winter rain or irrigation to reduce the average soil water EC_e below the tolerance threshold. (SJRG Exh-08, p5.) Even sub-irrigation with irrigation water with an EC_w as high as 1.5 dS/m failed to reduce corn yields. (Id., p5.) If leaching was inadequate, maximum yield was impossible even with non-saline water. (Id.)

Ayers and Westcot compiled additional information in 1985, including a model derived from previous work performed at the United States Department of Agriculture Salinity Laboratory in 1977 by Maas and Hoffman. (Exh-06, p1.) Ayers and Westcot assumed the plant root zone was divided into four equal quarters where the plant extracted forty percent of its water from the top quarter, thirty percent from the second quarter, twenty percent from the third quarter, and ten percent from the bottom quarter. (Id.) It also assumed a 15% leaching fraction and the occurrence of no rainfall. (SJRG Exh-03, p11.) Based on these assumptions Ayers and Westcot concluded irrigation water with an average root zone salinity of 1.0 dS/m, the salinity threshold for beans, would require irrigation water with an EC_w of 0.7 dS/m. (Id.) Even though their work excluded rainfall, they recognized rainfall could provide additional leaching benefits beyond that provided by irrigation water alone by stating

> "Rainfall **must** be considered in estimating the leaching requirement..[rainfall] in excess of ET... will satisfy all or part of the leaching needed to control salts. The advantage of rainfall in accomplishing all or part of the leaching is that it uniformly applies an almost salt-free water (EC_w<0.05 dS/m.)" (Ayers and Westcot, Water Quality For Agriculture §2.4.2.) (emphasis added)

Hoffman, Prichard and Meyer later developed a mathematic equation to quantifying the impact of rainfall. (Hoffman, p1.) Using this equation, they predicted relative crop yield using the same assumptions used by Ayers and Westcot, except one scenario lacked rainfall and the other include "normal effective rainfall." (Hoffman, Table 4.) In the scenario without rainfall, the maximum irrigation water EC_w able to maintain 100% yield of beans was 0.8125 dS/m. With "normal effective rainfall" however, 100% yields were attainable with irrigation water EC_w's as high as 0.906 dS/m. (Hoffman, Table 4.)

Despite recognition that natural rainfall was a factor in predicting the maximum salinity in irrigation water protective of 100% crop yield, research excluding rainfall essentially supported the existing 0.7 dS/m water quality objective. (Hoffman, Table 5; (Ayers and Westcot, Water Quality for Agriculture §2.4.2.) Apparently giving more credence to the predictions that did not include rainfall, the SWRCB left the Vernalis Summer Objective unchanged. In doing so, the SWRCB has maintained a standard which is objectively over-protective of the south Delta agricultural beneficial uses. (SJRG Exh.-06, p9.)

2. The SWRCB Developed a Policy Protecting Sub-Irrigation on Organic Soils, Which are Rare in the South Delta.

In the D-1485 proceedings, the SWRCB was concerned about the large amount of corn grown on organic (peat) soils using sub-irrigation. (SJRG Exh-08, 2.)

Their concern was misplaced however, because almost all of the soil in the south Delta is mineral soil. A review of the San Joaquin County soil survey shows there are no organic soils south of the Grant Line Canal. (See San Joaquin County Soil Survey; see also Appendix A, p15-19, Figures 12 through 17.) The only organic soils in the south Delta are within the boundaries of the CDWA. (Id.)

Mr. Hildebrand corroborated the absence of organic soils in the south Delta in testimony before the SWRCB in 1987, which stated

> "let us examine the source and nature of the technical information which is needed in order to make a valid application in the South Delta of generalized data on applied water quality versus crop yield. You heard a lot about peat soils, but **ours are mineral soils**. **Some are below sea level, but most are above summer mean levels**." (SDWA Exh-07, p2-3 (includes Bay-Delta testimony from Mr. Hildebrand from the 1980's).)

Mr. Hildebrand further testified that

> "The "Report on the Salt Tolerance of Corn in the Delta" by the U.S. Salinity Laboratory, et al. was based on peat lands. **It, therefore, has limited applicability in the South Delta**." (Id., p12.) (emphasis added.)

The SWRCB improperly designed the Vernalis Objectives to protect crops grown on organic soils, because it improperly assumed there were organic soils in the south Delta. Then, as now, the SWRCB should have focused on the data and testimony concerning the affects of salinity on salt sensitive crops such as beans which are grown in mineral soils with surface irrigation. (see Appendix A, p15-19, Figures 12 to 17.)

3. Fish and Agriculture Barriers Limit the Reach and Influence of San Joaquin River Water.

The development of the Vernalis Objectives in D-1485 also relied on a critical, fundamental assumption –that south Delta agriculture uses San Joaquin River water for irrigation and therefore EC at Vernalis influences EC elsewhere in the south Delta. To determine the hydrologic relationship between Vernalis and other parts of the Delta, Ms. Susan Paulsen used the Fischer Delta Model ("FDM") to simulate hydrodynamics and salinity within the Delta. (Presentation of Susan Paulsen, submitted as SJRG Exh-04, p1.) As explained in her presentation, once operations of the Head of Old River Barrier ("HORB"), Grant Line Canal Barrier ("GLCB"), Middle River Barrier ("MRB"), Old River Barrier at Tracy ("ORB"), and Delta Cross Channel Barrier ("DXC") begin in April, and until they end in December, almost 100% of the water from the San Joaquin River remains in the San Joaquin River. (Presentation of Susan Paulsen, submitted as SJRG Exh-04, p12; see Figures 9 and 10.)

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Figure 9: Flow split at confluence of Old and San Joaquin Rivers with standard HORB schedule. (SJRG Exh-04, p12.)

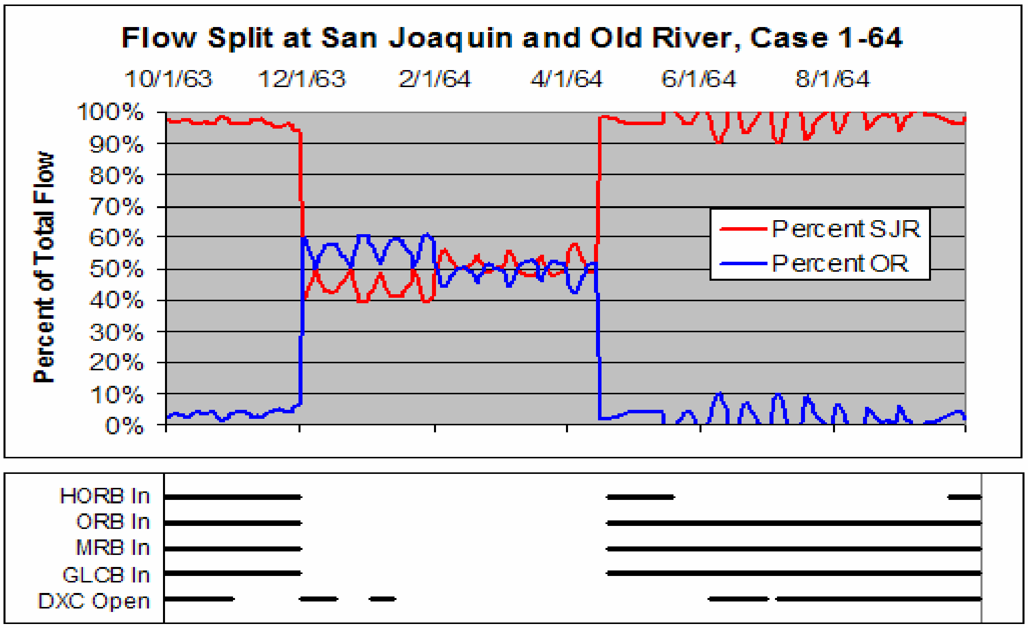
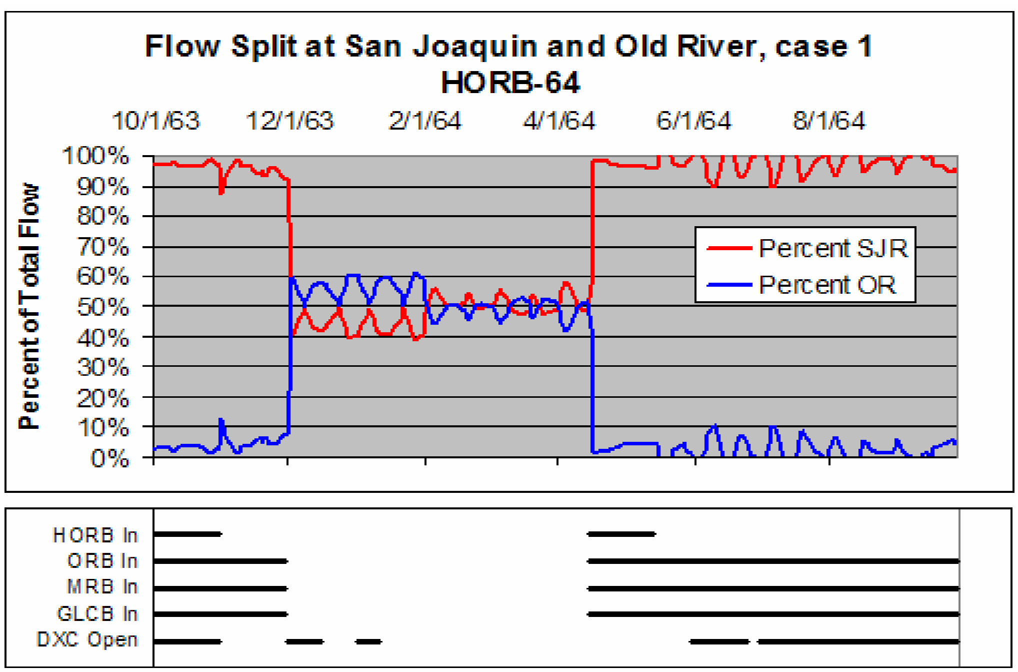
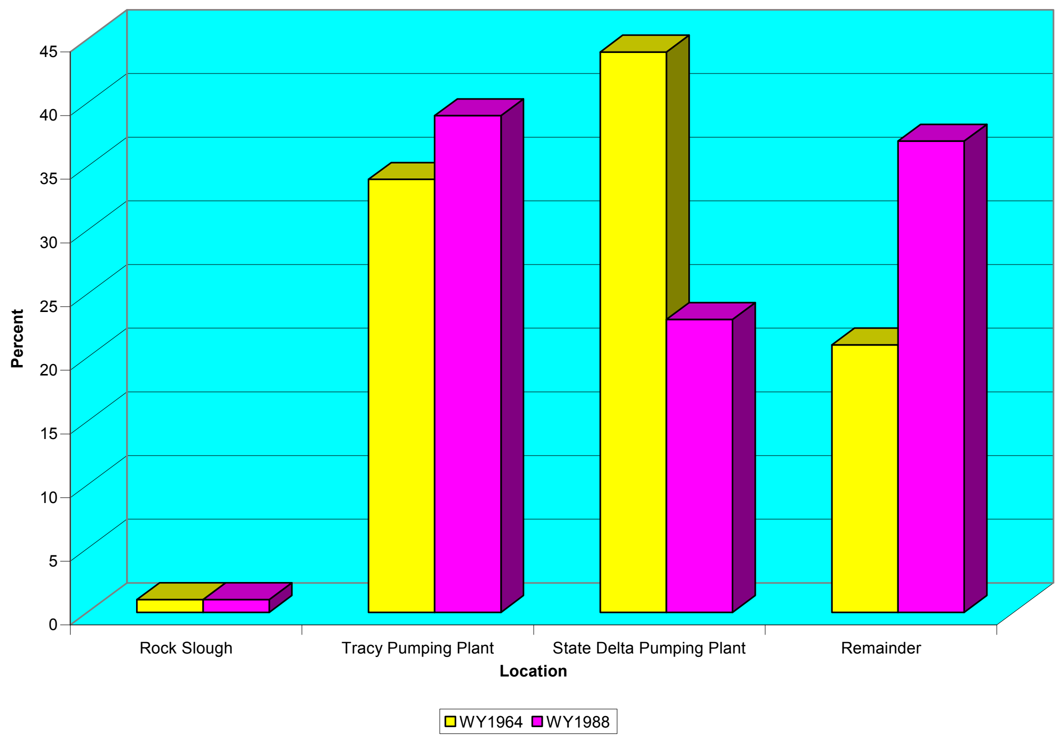


Figure 10: Flow split at confluence of Old and San Joaquin Rivers with modified HORB schedule. (SJRG Exh-04, p12.)



Ms. Paulsen also analyzed the effects of exports. In a Dry year, only 21% of San Joaquin River water remains in the Delta.[19] (Id., p4, 11; see Figure 11.) The rest of the water is exported. (Id.) In a Critical year, only 37% of San Joaquin River water remains in the Delta.[20] (Id.) As in Dry years, the remaining water is exported. (Id.)

Figure 11: Fate of San Joaquin River Water in Water Years 1964 and 1988. (SJRG Exh-04, p4.)



Ms. Paulsen also added a tracer to further isolate fate of San Joaquin River water. She determined that in an Above Normal year, no more than 18.5% of San Joaquin River water flowed into Turner Cut.[21] (see Appendix F, p13-14.) Even in a Dry year, when a greater proportion of water remains in the Delta, no more than 23% of San Joaquin River

[19] Ms. Paulsen modeled water year 1964 as the Dry year. (SJRG Exh-04; see also Appendix E.)
[20] Ms. Paulsen modeled water year 1988 as the Critical year. (SJRG Exh-04; see also Appendix E.)
[21] Water year 2000 was used to simulate the Above Normal year. (see Appendix E.)

water enters Turner Cut.[22] (Id.) These simulated percentages, as low as they may appear, actually overestimate the amount of San Joaquin River water flowing into Turner Cut, because the FDM sometimes counts tracers multiple times.[23] Therefore, the amount of San Joaquin River water entering Turner Cut is less than that predicted by the simulation. (Id.)

Together, the barriers and exports prevent almost all of the San Joaquin River's water from entering Old River and effectively eliminate any significant hydrologic relationship between Vernalis and the interior south Delta during the summer irrigation season and thwart any significant influence EC at Vernalis can have on EC on Old River at Middle River, Old River at Tracy Road Bridge, or other locations in the interior south Delta. (SJRG Exh-05, p4-6.) Once the San Joaquin River reaches the Stockton Deep Water Ship Channel, water from San Joaquin River joins the Sacramento River. (Environmental Impact Report ("EIR") for the 1995 WQCP, pIII-104, III-106; SJRG Exh-05, p5-6.) Very little of the water in Turner Cut, Paine Slough, the Grant Line Canal, and other areas in the interior southern Delta comes from the San Joaquin River. (Id.) Instead, most water comes from the Sacramento River. (Id.) As a result, the interior south Delta is irrigated primarily with Sacramento River water, and the most fundamental assumption underlying the Vernalis Objectives, that San Joaquin River water irrigates crops in the south Delta, is wrong.

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[22] Water Year 2001 was used to simulate the Above Normal year. (Appendix F, p3.)

[23] On Tables 2 and 3, the CVP, SWP, Los Vaqueros, and Contra Costa export columns, plus the Martinez column should total approximately 100%. (Appendix F, p13-14.) If they total less than 100%, the remaining percentage represents water remaining in the Delta. The sum of the Old River, Stockton Ship Channel, Turner Cut, Columbia Cut, Little Connection Slough, and Middle River columns will exceed 100%, because the tracers are counted multiple times.

Thomas M. Zuckerman, a farmer on the Rindge Tract, corroborated Ms. Paulsen's analysis. He testified that, due to the "myriad of channels and connections to the Sacramento River, both natural and constructed as part of the Central Valley Project", the water he pumps comes from either the Sacramento or Mokelumne River, not the San Joaquin. (Bay-Delta, Depo. Tr. Thomas A. Zuckerman, p33-34 (May 25, 1999).)

Ms. Paulsen's analysis further refutes the testimony of Mr. Salmon. (SDWA Exh-09, p47.) Mr. Salmon describes declines in the yields of walnuts and grapes grown at his farm at the east end of the Grant Line Canal. (SDWA Exh-09, p47.) No correlation existed between his crop yields and EC at Vernalis however, because in the irrigation season there is no significant hydrologic relationship between the water he diverts and the water at Vernalis. (SJRG Exh-04, p12; see §III(A), *supra*.) Even if Mr. Salmon, the SDWA, or others had evidence demonstrating a correlation between the EC of the water Mr. Salmon diverts and EC at Vernalis, the lack of any significant hydrologic relationship forecloses the existence of any causal relationship.

The Vernalis Summer Objective was set at a level of salinity sufficient to protect the yields of beans, the most salt-sensitive crop grown in the south Delta[24], but due to the combined effects of exports and barriers, the Vernalis Summer Objective only provides substantial protection to crops irrigated with San Joaquin River water upstream from the Stockton Deep Water Ship Channel and east of the HORB. (see Appendix A, p20-21, Figures 18 and 19.) About 3,000 acres of beans are grown in this area[25], and almost all of

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[24] Mr. Hildebrand testified that beans are so salt sensitive that as the irrigation water became saltier, beans in the south Delta were replaced with corn. (SDWA Exh-07, p10.) In fact, Mr. Hildebrand testified that so much corn was grown that there a surplus. (Id.)
[25] Drs. Hagen and Mason estimated that, based on the rate of decline in bean production in San Joaquin County, 4,346 acres of beans would be grown in the south Delta in 2003. (SJRG Exh-05, p2.) In 1996,

them are located in the Banta-Carbona Irrigation District ("BCID").[26] Consequently, the Vernalis Summer Objective only protects 3,000 acres of beans.

IV. A SALINITY OBJECTIVE OF 1.0 DS/M WILL BE SUFFICIENT TO PROTECT REASONABLE BENEFICIAL USES IN ALL YEAR TYPES.

Article 10, §2 of the California Constitution recognizes that "due to the conditions prevailing in this State the general welfare requires that the water resources of the State be put to" reasonable and beneficial use "to the fullest extent of which they are capable." The rule of reasonable use applies to all water rights in California, whether riparian or appropriative. (Peabody et al. v. City of Vallejo (1935) 40 P.2d 486, 498-499.)

"The purpose of [the Bay-Delta Water Quality Control Plan] is to establish water quality control measures which contribute to the protection of beneficial uses in the Bay-Delta Estuary." (1995 WQCP, p3.) In establishing water quality objectives designed to protect identified beneficial uses, the SWRCB must consider several factors, including the beneficial use to be protected, the local environment, the water quality that can be achieved, economic considerations, the need for housing and the need to develop and use recycled water. (Water Code §13241.) By listing these factors, the SWRCB has made it clear that simply designing a water quality objective that will protect an identified beneficial use is improper, and the SWRCB must instead instill the concept of reasonableness into the process of establishing water quality objectives from the outset. (Water Code §§100, 101.)

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about 75% of the beans were irrigated with surface water. (Id.) Assuming the proportion of beans irrigated with surface water remained constant, about 3,259 acres of beans would have been irrigated with surface water in 2003.

[26] In 2003, about 2,300 acres of beans were grown in the BCID. (SJRG Exh-05, p2.)

A. Current Science Indicates a Continuous San Joaquin River Salinity Objective of 1.1 dS/m at Vernalis Will Provide Irrigation Water of Sufficient Quality to Allow 100% Yield For All Crops Grown in the South Delta at All Times.

A water quality control plan consists of the beneficial uses protected and water quality objectives that reasonably protect the beneficial uses. (1995 WQCP, p3, 8.) The beneficial use at issue is the protection of southern Delta agriculture from the effects of salinity intrusion and agricultural drainage. (Id., p14.) This beneficial use was established initially in the 1978 Bay-Delta Plan, and was not changed in any substantive manner in the formulation or adoption of the 1995 WQCP (Id., p8.)

Since 1978, the Vernalis Objectives have been designed to protect 100% yield for all crops grown in the south Delta. (SJRG Exh-08, p4.) A more stringent salinity objective would provide no further protection, because yields of 100% are the highest yields possible. Therefore, the Vernalis Objectives should be set at the salinity threshold of the most salt-sensitive crop generally grown in the south Delta and no higher.

Beans are the most salt sensitive crop grown in the south Delta in the summer months. (See §III(B), *supra*.) Barrier operations and exports prevent virtually all of the San Joaquin River's flow from entering Old River. (see §III(D)(3) and Figures 9 and 10, *supra.*) As a consequence, most of the water diverted from Tom Paine Slough, Old River, Middle River, and other areas in the internal south Delta, is actually Sacramento River water. This is especially true in Dry and Critical year types. Almost all of the beans grown in the south Delta that are irrigated with water from the San Joaquin River are grown in the Banta Carbona Irrigation District ("BCID"). Accordingly, the Vernalis Objectives must be designed to protect the yields of beans in the BCID.

1. The Addition of Rainfall to the Work of Ayers and Westcot Indicates a Vernalis Objective of 1.1 dS/m at Vernalis is Appropriate.

The SWRCB's reliance upon data and predictions that did not take natural rainfall into account may have been in the 1970s and 1980s. However, a similar reliance today would be completely inappropriate.[27] Whereas there may not have been scientific tools available to accurately take natural rainfall into account in the 1970s and 1980s, despite the recognition of the importance that natural rainfall played in determining the maximum threshold of applied irrigation water salinity, such tools do exist and are available today. The work of Dr. Brownell on behalf of the SJRGA (SJRG Exh-06), as well as the work done by Drs. Isidoro-Ramirez, Berenguer-Merelo and Grattan on behalf of the Regional Water Quality Control Board (Isidoro-Ramirez, Daniel, Maria Jose Berenguer-Merelo and Stephen R. Grattan, An Approach to Develop Site-Specific Criteria for Electrical Conductivity to Protect Agricultural Beneficial Uses that Accounts for Rainfall, University of California, Davis, Unpublished Manuscript (July 2004), submitted as SJRG Exh-03.) demonstrate models and studies can account for natural rainfall and accurately predict the maximum salinity of irrigation water that can be applied to crops without affecting crop yields.

In his testimony, Dr. Brownell built on the work of Ayers and Westcot to quantify the effects of rainfall. Dr. Brownell used the same assumptions Ayers and Westcot used regarding root zone quarters, leaching fraction, and effective rooting depth in each of five scenarios. (SJRG Exh-06, p2-3.) The first four scenarios used 22 inches of irrigation water over the course of the season. (Id.) Scenario 1, the "base case", assumed no

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[27] Even research conducted in the 1970's and 1980's identified the significant leaching effects of rainfall, although it did so qualitatively, not quantitatively.

significant rainfall and applied irrigation water with an EC_w of 0.7 dS/m. (Id., p3.) Scenarios two through four each added 12 inches of rain, but varied the EC_w of applied water in five irrigations over the course of the season.[28] (Id., p3-6.) Scenario 2 used irrigation water with an EC_w of 0.7 dS/m, Scenario 3 used irrigation water with an EC_w of 1.1 dS/m, and Scenario 4 used irrigation water with an EC_w of 1.5 dS/m. (Id.)

Scenario 1, the base case, predicted an average soil salinity of 2.6 dS/m. (SJRG Exh-06, p3.) This would be the maximum average soil salinity protective of bean yields. Scenario 2 predicted an average root zone EC_e of 1.3 dS/m at the end of the season, far less than the 2.6 dS/m predicted by Scenario 1. (Id., p4.) Scenario 3 predicted an average root zone EC_e of 2.0 dS/m at the end of the season, still less than that predicted by the Scenario 1, even though the EC_w of the irrigation water was 1.1 dS/m. (Id., p5.) Scenario 4, which applied water with an EC_w of 1.5 dS/m, predicted an average root zone EC_e of 2.5 dS/m at the end of the season, which is still less than the maximum average EC_e beans can tolerate in the root zone. (Id., p6.) Assuming the assumptions of Ayers and Westcot accurately depict the south Delta, the addition of rainfall in Scenarios 2-4 demonstrate the current Vernalis Objectives vastly over-protect south Delta agricultural beneficial uses, and that almost identical protection could be achieved with irrigation water salinity as high as 1.5 dS/m. (see Figure 11.)

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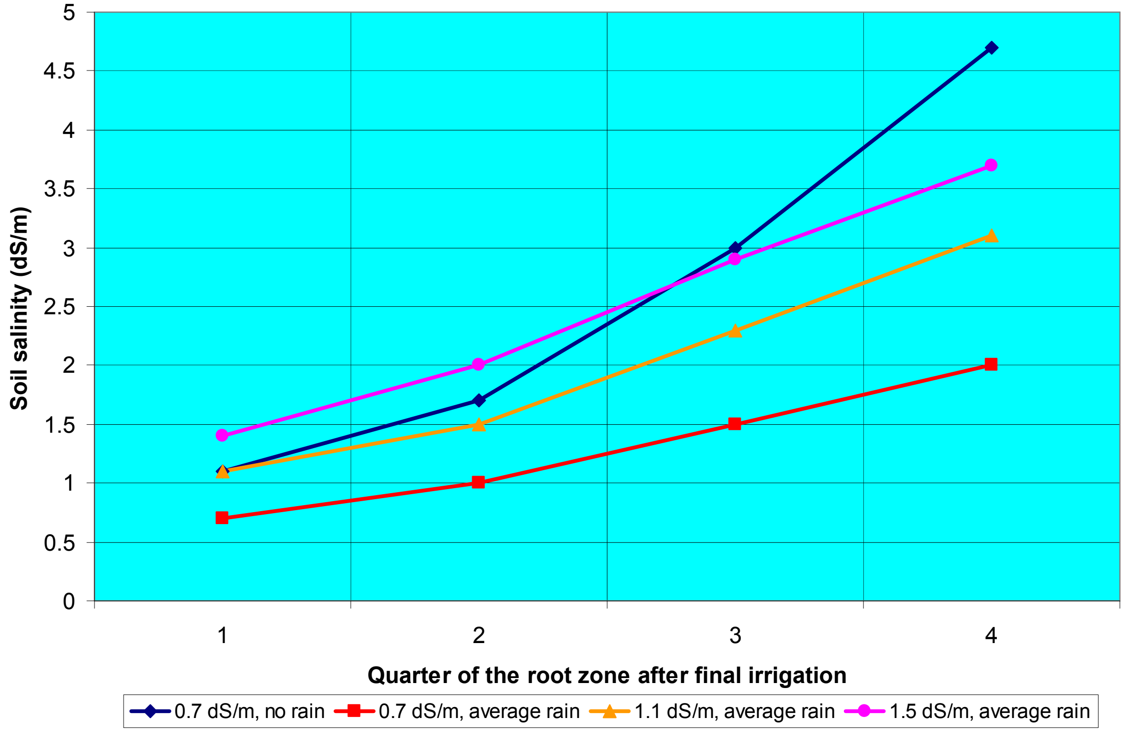
[28] Dr. Brownell assumed 12 inches of rainfall based on precipitation data from the Tracy Carbona area (annual average of 10 inches) and the Tracy Pumping Plant (annual average 12 inches.) (SJRG Exh-06, p8.)

Figure 11: Comparison of four irrigation scenarios. (SJRG Exh-06, p8.)



In Scenario 5, Dr. Brownell applied the work of Ayers and Westcot to the BCID. (Id., p7.) This time, he altered the assumed application of 22 inches of water and instead used 40 inches of water, the amount reported by the BCID used by farmers to grow beans. (Id.) He also assumed the irrigation water had an EC_w of 1.1 dS/m and that no rain fell. (Id.) These assumptions predicted an average root zone EC_e of 1.4 dS/m, a dramatic reduction from the 2.6 dS/m predicted by Ayers and Westcot, even without rainfall. (Id.) With so much applied water, farmers in the BCID achieve leaching fractions of nearly 75%. (Id.) With such a large amount of irrigation water applied in the BCID, Dr. Brownell concluded that if natural rainfall were factored in, irrigation water with an EC_w of 1.5 dS/m could achieve the same crop yields as the "base case" in Scenario 1. (Id.)

Based upon the results of his own efforts to add rainfall to the Ayers and Westcot model, as well of recent research by Isidoro-Ramirez, Berengue-Merelo and Grattan (discussed below), Dr. Brownell concluded that rainfall in San Joaquin County "is significant in regard to salinity management in the production of agricultural crops. (Id., p12.) It is Dr. Brownell's opinion, that the current standard of 0.7 dS/m is "over protective to achieve 100% yields for crops irrigated with San Joaquin River water" and a new standard of 1.1 dS/m should be adopted. (Id., p 9, 12.)[29]

2. Recent Research at UC Davis Suggests a Vernalis Objective of 1.1 dS/m Will Be Sufficient to Maintain 100% Crop Yields.

The work of Ayers and Westcot while widely accepted, only predicts soils salinity at the end of a single season based entirely on the EC_w of irrigation water applied during that season. Relying on a single-season analysis could lead to a focus on "worst case" scenarios. For example, although Dr. Brownell demonstrated irrigation water salinity can be as high as 1.1 dS/m without affecting crop yields, he assumed 12 inches of rainfall, the average amount for the region. (SJRGA Exh-08, p5.) However, since 12 inches is an average, the actual amount of rain in some years is more than 12 inches. (Id.) In other years, it is less than 12 inches. (Id.) Furthermore, it takes time for salt to accumulate in the root zone to a concentration sufficient to reduce yield. (Ayers and Westcot, Water Quality for Agriculture §2.4.2.) Even without leaching, two or more years of irrigation are generally required before salt concentrations climb high enough to harm yields. (Id.)

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[29] Dr. Brownell's opinion is supported by the personal observations of William Johnston. Mr. Johnston testified that "I have personally observed that in San Joaquin Valley soils without a shallow saline water table, when the annual precipitation is 10 to 12 inches, sufficient natural leaching takes place to prevent salt buildup in the crop root zone." (Exh-08, p5.) It is also supported by experts from the University of California who, in the D-1485 hearings, testified that good leaching and low salt accumulations were found in all locations where the irrigation water supply averaged 1.1 dS/m. (Id., p3.)

Consequently, a single-season analysis fails to accurately reflect actual mechanisms of salt accumulation in soil.

Grattan et al. recently addressed the shortcomings of single-season analyses with a new model developed for the CVRWQCB. The purpose of the model is to determine how the EC_w of applied irrigation water affects crop yields when annual rainfall is taken into account. (SJRG Exh-03, p1.) The model begins with the assumptions used by Ayers and Westcot in 1985 and, like Dr. Brownell, adds rainfall. (Id., p5.) However, the key difference is that while the model can provide a "snapshot" view based upon a single season's rainfall, it can also analyze a multi-year rainfall series. (SJRG Exh-03, p9.) Thus, the model

> "results indicate whether soil salinity gets high enough to reduce yields of a particular crop under the given rainfall patterns and irrigation practices or whether there is a net salinization of the soil profile **over time** such that salinity will eventually affect crop yields." (SJEG Exh-03, p9) (emphasis added.)

Grattan et al. tested three scenarios with their model. All three scenarios used beans, because beans were the most salt-sensitive crop grown in the study site. Scenario 1 compared the model to work by Ayers and Westcot, with irrigation water with an EC_w of 0.7 dS/m and no rain. (Id., p11.) Scenario 1 predicted the same result, that irrigation water with an EC_w of 0.7 dS/m and no rainfall would result in a mean soil water with an EC_e of 0.95 dS/m. (Id., p14.)

Satisfied that the model was accurate, Grattan et al. moved on to Scenario 2, which compared two five-year periods of rainfall using historical data. (Id., p15.) The first series, 1953-1957, was a dry period. As such, there is an 80% probability that any randomly selected five year period would have a higher annual rainfall. The second series, 1963-1967, was an average period. Thus, there is only a 50% probability that any randomly chosen five year period would have a higher annual rainfall. (Id.)

For the dry series, mean soil salinity was 1.03 dS/m, with a maximum single year of 1.09 dS/m. (Id., p15.) From these results, the Grattan et al. determined an irrigation water salinity of 1.2 dS/m would, when combined with the expected rainfall in either the 50% or 80% probability series, would not affect the yield of beans. (Id., p17.) For the average series, the seasonal mean soil salinity was 1.02 dS/m. Three years had soil salinities less than 1.0 dS/m, and two had EC_e's of 1.13 dS/m and 1.14 dS/m. (Id., p15-16.) While these two soil salinities were high enough to affect bean yields, they only would have reduced bean yields by three percent, a reduction less than the margin of error associated with the yield threshold value itself, (Id., p17.)

Grattan et al. recognized that the results for the five year series simulation were still susceptible to skewing by single year impacts, such as the amount of drainage in year five. (Id.) They therefore ran a third scenario which evaluated the entire 53 year rainfall series based upon known rainfall records. (Id., p17.) With irrigation water with an EC_w of 1.2 dS/m, only seven of the 53 years predicted significant yields losses (predicted at more than 2%.) (Id., p18.) Despite fluctuating soil salinities in individual years, soil salinity neither increased nor decreased over time. (Id., p19.) With irrigation water with an EC_w of 1.1 dS/m, the model predicted only three years with significant yield loss. (Id., p19.) All of these years were drought years, and the predicted losses ranged from 2.4% to 6.2%. (Id., p20.) Since these percentages were within the margin of error for the salinity threshold value itself, these losses were considered "outliers" and not statistically significant. (Id., p21.) Grattan et al. therefore concluded

> "[g]iven these results, and taking into account all of the other factors that potentially impact crop yield (e.g., climate, water stress, and biotic stresses) and the conservative nature of all inputs into the model, the use of 1.1dS/m as the threshold EC value for irrigation water is considered protective for beans, and thus all other agricultural uses of the water in the Davis area." (Id., p21.)

While the work performed by Dr. Brownell and the UC Davis scientists differed in many key respects, they both nonetheless concluded an irrigation water salinity of 1.1 dS/m would, when combined with natural rainfall, protect 100% yields of beans and by extension, all other crops. The ability to consider rainfall, both in a single year and over the long-term, has shown that the current 0.7 dS/m southern Delta EC objective is over-protective of south Delta agriculture, and an objective of 1.1 dS/m is more appropriate.[30]

Based on its analysis of the inapplicability of a southern Delta EC objective of 0.7 dS/m and the work of Drs. Brownell, Grattan, and others, the SJRGA has concluded a year-round objective of 1.1 dS/m will more than adequately protect 100% yields of even the most salt-sensitive crops grown in the south Delta and thereby protect the beneficial use of agriculture.[31] The SJRGA's analysis has been extremely conservative, although in

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[30] Witnesses for SDWA, including Alex Hildebrand and Terry Prichard, argued that the UC Davis model results cannot be used when considering irrigation water salinities in the south Delta since the model was based upon rainfall, climate and soil types in the Davis/Putah Creek area which are or may be different than those found in the south Delta. (Statement of Terry L. Prichard, submitted as SDWA Exh-05, p1; Outline of Testimony of Alexander Hildebrand on South Delta Agriculture, submitted as SDWA Exh-07, p5-6.) There are two responses. First, the model results at a minimum suggest that the current standard of 0.7 dS/m is over-protective, which Dr. Brownell, Mr. Johnston and even Hoffman, Prichard and Meyer, confirmed by the simple fact of recognizing that rainfall was not considered in any previous work relied upon by the SWRCB. Second, the model was designed and intended to be adaptable to any situation in which site specific data regarding rainfall history, soil type and irrigation water salinities are available. (SJRG Exh-03, p2.) The SJRGA has contacted Grattan et al. and is having specific scenarios tested upon information specific to the south Delta. The results of these tests will be made available to the SWRCB and interested parties as soon as they are available.

[31] The SJRGA plans to use the results of UC Davis testing in the south Delta to assist in designing the most precise water quality objective possible.

the interest of maintaining a safety margin, the SJRGA recommends an EC objective of 1.0 dS/m at Vernalis for the entire year.

B. Reasonable Use of Water Only Requires the Minimum Amount of Protection Capable of Protecting the Beneficial Use.

"What is a beneficial use at one time may, because of changed conditions, become a waste of water at a later time." (Tulare Irrigation District v. Lindsay-Strathmore Irrigation District (1935) 45 P.2d 972, 1007.) However, "beneficial use" is not necessarily "reasonable use." (Joslin v Marin Municipal Water District (1967) 60 Cal.Rptr. 377, 385.) "What may be a reasonable beneficial use, where water is present in excess of all needs, would not be a reasonable beneficial use in an area of great scarcity and great need." (Tulare Irrigation District v. Lindsay-Strathmore Irrigation District (1935) 45 P.2d 972, 1007.) A diversion providing what is, in some respect, a beneficial use, may be unreasonable when compared to present and future demands for more important uses. (Imperial Irrigation District v. State Water Resource Control Board (1990) 275 Cal.Rptr. 250, 266.)

The Porter-Cologne Act incorporates the standard of reasonableness contained in Article 10, §2, by requiring that "activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is **reasonable**, considering **all demands being made and to be made** on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible." (Water Code §13000.) (emphasis added.)

Whether a use is beneficial depends on the facts of each case. (Tulare Irrigation District, 45 P.2d, p1007.) Accordingly, in the current proceeding, the SWRCB must decide whether maintaining EC of 0.7 dS/m throughout the summer, in even the driest of years, for 3,000 acres of beans, with a release of over 50,000 AF of stored water constitutes a reasonable beneficial use of water.

1. Based on CALSIM II-Revised, Changing the Vernalis Objective Will Not Substantially Affect Water Quality.

Mr. Steiner also used CALSIM II-Revised to model the effect of the Alternative Objective on San Joaquin River flows and salinity. (SJRG Exh-07, p21.) Currently, the Vernalis Summer Objective and the dissolved oxygen objective at Ripon require similar levels of release from New Melones. (Id.) As a result, the dissolved oxygen objective at Ripon drives EC at Vernalis, and the Alternative Objective does not significantly change releases from New Melones or EC at Vernalis. [32] (Id., p21-22; see Figures 12 and 13.)

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[32] In CALSIM II-Revised, assumed operation of the IPO at New Melones "layers" one component of flow upon another, i.e., the fishery release is assumed to provide the "first" water in the river. (SJRG Exh-07, p21.) Then, if required to meet the Vernalis Objective, supplemental releases are made. (Id.)

Figure 12: Simulated Salinity with Vernalis Objectives. (SJRG Exh-07, p26.)

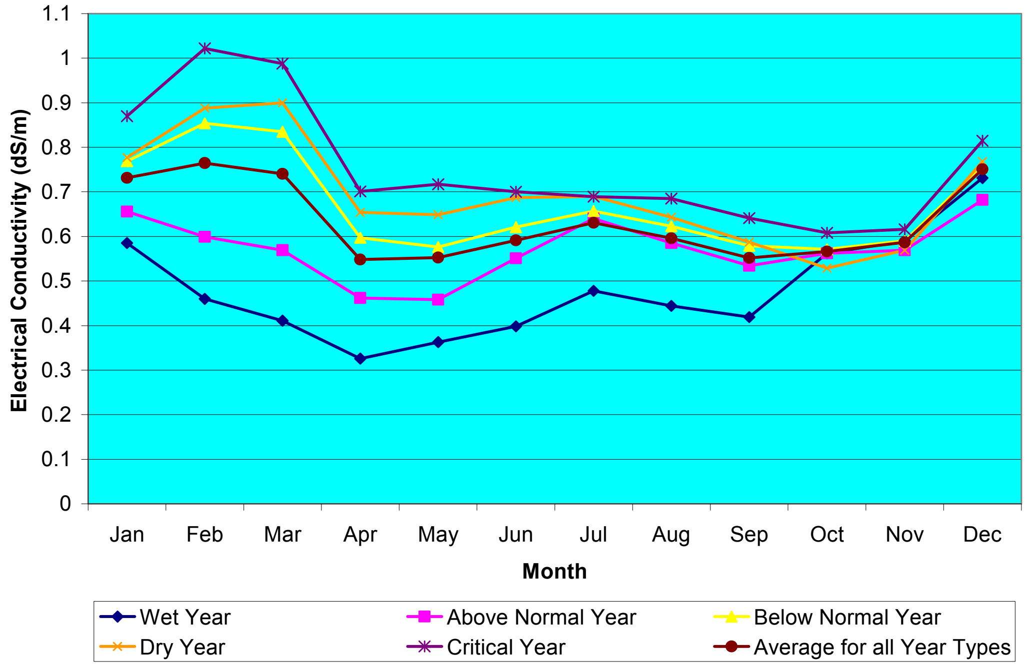
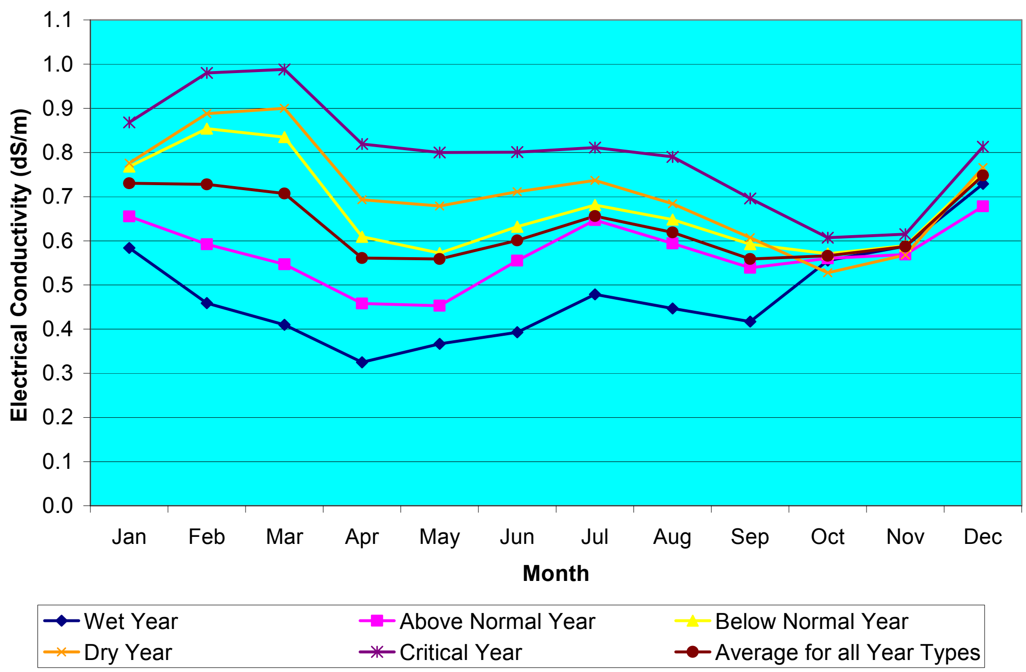


Figure 13: Salinity with Alternative Objective.[33] (Id.)



[33] In Figure 13, the dissolved oxygen objective is been replaced with a 100 cfs surrogate.

Salinity, on average, would be about the same. (Id.) In Critical year types, however, EC at Vernalis would increase by about 0.1 dS/m. (Id.) In Dry year types, the most marked change would occur in July, but even this change would only be about 0.05 dS/m. (SJRG Exh-07, p26.) It should be emphasized, that such changes only occur when a 100 cfs flow surrogate is used. **If the current dissolved oxygen objectives remain, EC at Vernalis does not change.** (Id.)

2. Even if the Change in Salinity Impacts Crop Yields, the Economic Impact Would Be Minimal.

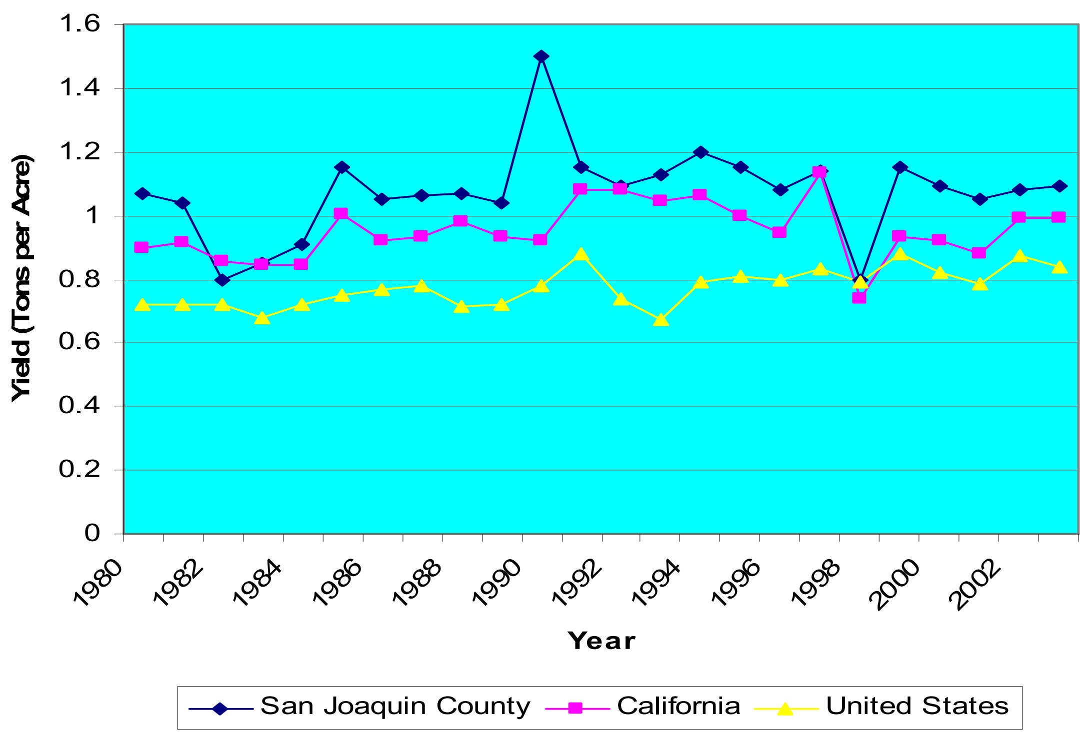
The SJRGA has determined, based on its analysis, that the Alternative Objective is sufficient to protect south Delta agriculture and the Vernalis Summer Objective provides no further protection or benefit. However, in order to determine what benefit the Vernalis Summer Objective should provide, based on the reasoning in D-1485, the SJRGA tested a "hypothetical scenario" in which a change in EC diminished yields by ten percent.

Any impact resulting from changes in EC would be extremely limited. The Alternative Objective would result, at most, in very small changes in EC at Vernalis. Only in Critical years would salinity change by more than 0.1 dS/m. (SJRG Exh-07, p26.) Even then, actual EC at Vernalis would always remain below 1.0 dS/m. (Id.) In many of these years, Term 91 would take effect and eliminate the water supply for those with appropriative rights. (SWRCB Term 91.) Additionally, a lack of natural flow in August, September, and October would deprive riparian users of their water supply. (Anaheim Union Water Co. v. Fuller (1907) 150 Cal. 327, 332.)

Beans are the only crop grown in the south Delta with a salinity threshold lower than 1.0 dS/m, year-round standard proposed for the Alternative Objective. (Grattan, Stephen, Irrigation Water Salinity and Crop Production, University of California at Davis (2002), Publication 8066, submitted as SJRG Exh-02, p5.) Corn, the next most salt-sensitive crop generally grown in the south Delta, has a salinity threshold of 1.1 dS/m. (Id.) Therefore, beans would be the only crops affected.

As explained in the testimony of Drs. John Hagen and Bert Mason, San Joaquin County has historically produced about 13 to 15 percent of California's dry bean crop (Id., p21.) San Joaquin County has very high dry bean yields, higher than the average in California and even the United States.[34] (Id.; see Figure 14.)

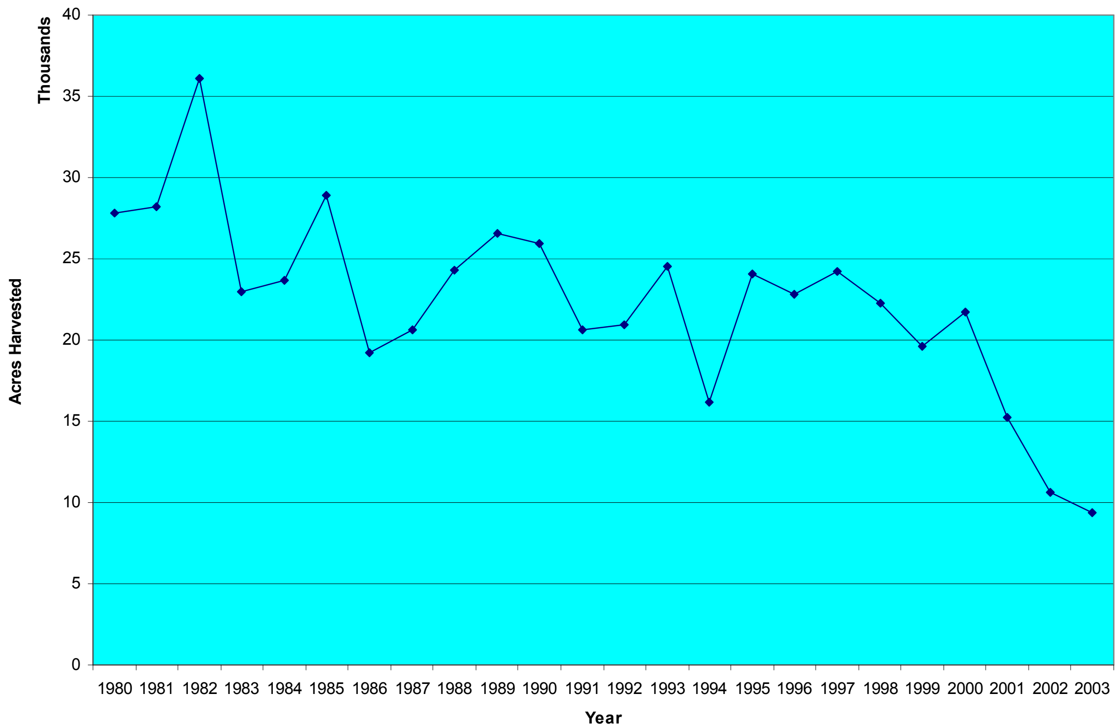
Figure 14: Comparison of bean yields in San Joaquin County, California, and the United States. (SJRG Exh-05, p24.)



[34] If San Joaquin County yields are so high compared to the United States and the rest of California, then the salt problem in the San Joaquin River cannot be as severe and crippling to agriculture as asserted by conventional schools of thought.

Dry bean production in San Joaquin County has significantly declined over the last ten years, however, as growers have shifted production to lower-cost regions such as North Dakota, Washington, and Texas. (SJRG Exh-05, p20; see Figure 15.) The production decline has been due in part to declining profit margins on beans and bankruptcy of San Joaquin County's major bean cannery. (Id.)

Figure 15: Acres of dry beans grown in San Joaquin County from 1980-2003. (SJRG Exh-05, p56.)



Based on their analysis of the San Joaquin County and south Delta corn and bean markets, Drs. Hagen and Mason determined what impacts, if any, a hypothetical ten percent reduction in the yields of beans irrigated with San Joaquin River water would have on San Joaquin County generally and the southern Delta in particular. Their analysis included reduced income and employment as direct impacts of reduced production. (Id., p32.) It also included spillover effects in areas linked to agriculture, such as in fertilizer, seed, and farm implement sales. (Id.)

Currently, almost all of the beans grown in the south Delta that are irrigated with San Joaquin River water are grown in the BCID. (SJRG Exh-05, p2.) In 2003, the bean farmers in the BCID grew 2,301 acres of beans. (Id.) If a change in EC causes a ten percent loss of yield, the value of the lost bean crop would be $160,518. (Id., p36.) If spillover effects are considered, the total loss would be $362,129.[35, 36] (Id.)

3. The Vernalis Objective Must Focus on Protecting Water Quality, Not Water Quantity.

As part of its presentation on southern Delta EC, the SDWA argued the Alternative Objective would decrease flow into the Delta and potentially affect Delta outflow and other obligations. (Transcript, p1310; SDWA Exh-09, p67.) This issue is unrelated to whether **science** justifies relaxing the southern Delta EC objective to 1.0 dS/m year-round in order to continue providing adequate water quality without affecting crop yields.

As is clearly explained in the 1995 WQCP, the agricultural beneficial uses in the south Delta, which the Vernalis Summer Objective is designed to protect, include the use of water "for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing." (1995 WCQP, p12.) The only relevant inquiry is what maximum electrical conductivity will protect 100% yields of crops grown in the south Delta.

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[35] About 3,000 acres of beans are grown in the south Delta and irrigated with San Joaquin River water. Based on the ratio of 3,000 to 2,301, this would constitute a total value of about $460,000.
[36] Again, the SJRGA believes the Alternative Objective will fully protect the beneficial use of agriculture, and the preceding hypothetical is used for the SWRCB to weigh and balance the potential economic impact versus the release of up to 57,000 AF of water for 3,000 acres of beans.

To the extent that other beneficial uses identified in the 1995 WQCP depend on flow, then the appropriate amount of flow necessary to protect such beneficial uses must be determined independently from any other consideration. However, the desire to protect south Delta agriculture via the Vernalis salinity standard cannot be utilized as a surrogate to obtain flow for achieving other goals. If the policy of the State is to identify a maximum level of salinity in irrigation water from the San Joaquin River to that will protect agriculture in the south Delta by maintaining 100% crop yields, then the impact that such level will have on other obligations is, as an initial matter, irrelevant.[37]

4. The Use of Flow to Achieve Reduced Salinity Values is an Unreasonable Use of Water When 1.0 dS/m Would Adequately Protect Beneficial Uses and 0.7 dS/m Provides Very Little Additional Protection, if it Provides Any Additional Protection At All.

The USBR can use "any measures available" to meet the Vernalis Objectives, but has historically used flow. (D-1641, p79, 89.) In D-1422, the USBR estimated salinity control at Vernalis would require no more than 70,000 AF. (Id.) In some years however, water quality releases have more than doubled the USBR's 70,000 AF estimate. (Id.) Under the IPO, the USBR allocated up to 250,000 AF for water quality. (Id., p80.)

Under Mr. Steiner's analysis of the flow and salinity impacts of the Alternative Objective, flows would increase in some years and decrease in others due to a reaction of

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[37] If the SWRCB examines the reasonableness of the policy itself (100% protection of south Delta agricultural yields) as a justification for amending the Objective, as suggested in §§III and IV, *supra*, then the issue of changes in flow that might result would be appropriate. However, even that discussion would have to far more detail than just a statement that "flow to the Delta would be reduced." Again, flow itself is only important to the extent that it meets/protects beneficial uses. Those uses would have to be identified, the policy behind the decision to protect such uses would have to be identified, and the scientifically based level of protection would need to be identified. Thereafter, a rational, meaningful discussion about the impact of relaxing the Vernalis salinity standard on these other beneficial uses can take place.

the IPO to an increase in carryover storage and occasional increased spills.[38] (SJRG Exh-07, p22; see Tables 4 and 5.)

Table 4: Change in average Vernalis salinity flow requirements by year type with Alternative Objective and 100 cfs Dissolved Oxygen flow surrogate. (SJRG Exh-07, p26.)

Year Type	Change in Flow (cfs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
W	15	61	15	35	21	32	43	-14	31	32	8	8
AN	-3	24	86	72	59	-12	-31	-20	-23	8	3	87
BN	4	3	2	-12	23	-36	-62	-64	-45	2	5	5
D	4	-1	0	-93	-76	-57	-96	-94	-68	3	6	6
C	3	75	1	-220	-177	-156	-166	-161	-134	3	3	3
All	5	38	21	-41	-29	-42	-55	-68	-43	12	5	21

Year Type	Change in Required Water Volume (acre-feet)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
W	930	3416	930	2100	1302	1920	2666	-868	1860	1984	480	496	17216
AN	-186	1344	5332	4320	3658	-720	-1922	-1240	-1380	496	180	5394	15276
BN	248	168	124	-720	1426	-2160	-3844	-3968	-2700	124	300	310	-10692
D	248	-56	0	-5580	-4712	-3420	-5952	-5828	-4080	186	360	372	-28462
C	186	4200	62	-13200	-10974	-9360	-10292	-9982	-8040	186	180	186	-56848
Average	285	1814	1290	-2616	-1860	-2748	-3869	-4377	-2868	595	300	1352	-12702

Year Types: “W” = Wet, “AN” = Above Normal, “BN” = Below Normal, “D” = Dry, “C” = Critical

Based on Mr. Steiner’s analysis, the Vernalis Summer Objective requires, on average, about 13,000 AF of water more than the Alternative Objective would require. (Id.) In Dry years, required volume climbs to almost 30,000 AF, and in Critical years, when the least water is available and supply in a subsequent year is uncertain, 57,000 AF is required. (Id.)

[38] Mr. Steiner’s analysis removed flows for the dissolved oxygen objective in order to isolate flows required for water quality. The dissolved oxygen flow was replaced with a 100 cfs surrogate. (Exh-07, p21-22.)

Table 5: Change in average Vernalis salinity flow requirements by year type with Alternative Objective without Relaxed Dissolved Oxygen Flow. (Appendix D.)

Year Type	Change in Flow (cfs)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
W	1	15	9	7	-6	1	13	0	13	16	1	1	
AN	7	15	2	6	5	0	0	4	0	2	2	30	
BN	1	0	1	-58	-24	-1	0	0	0	1	1	1	
D	1	0	0	-94	-78	-4	-7	0	0	1	1	1	
C	1	73	0	-227	-184	-40	-8	0	0	1	1	1	
All	2	23	3	-70	-57	-9	1	1	4	5	1	6	
Year Type	Change in Required Water Volume (acre-feet)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
W	62	840	558	420	-372	60	806	0	780	992	60	62	4,268
AN	434	840	124	360	310	0	0	248	0	124	120	1,860	4,420
BN	62	0	62	-3,480	-1,488	-60	0	0	0	62	60	62	-4,720
D	62	0	0	-5,640	-4,836	-240	-434	0	0	62	60	62	-10,904
C	62	4,088	0	-13,620	-11,408	-2,400	-496	0	0	62	60	62	-23,590
All	136	1,154	149	-4,392	-3,559	-528	-25	50	156	260	72	422	-6,105

Year Types: "W" = Wet, "AN" = Above Normal, "BN" = Below Normal, "D" = Dry, "C" = Critical

Even when the flow for dissolved oxygen is not "relaxed", the Alternative Objective conserves a substantial amount of water, especially in Dry and Critical years. (see Table 5.) In a Critical year, the reduced flows would, on average, save almost 24,000 AF of water. (Id.)

Almost all of the beans grown in the south Delta are grown in the BCID, where bean farmers apply 40 inches of water per year. (SJRG Exh-06, p7-8.) 40 inches of water applied to 3,000 acres is approximately 10,000 AF of water.[39] Consequently, in a Critical year, the State uses over 55,000 AF to protect the use of 10,000 AF of water used to irrigate 3,000 acres of beans. (SJRG Exh-05, p36; see §III(D)(3), *supra*.)

[39] The UC Extension estimates a 22-inch water application more typical for growing beans. (SJRG Exh-06, p7.) 22 inches of water applied to 3,000 acres would be 5,500 AF of water.

A southern Delta EC objective 0.7 dS/m provides no greater protection for agriculture than an EC objective of 1.0 dS/m. Even if it does provide greater protection, it only protects 3,000 acres of beans, and the acres allocated to bean production have been steadily shrinking for nearly ten years. The USBR can use any means it has available to meet the Vernalis Objectives, and although it has historically used flow, when weighed against the multitude of other beneficial reasonable uses in Dry and Critical years, including wildlife habitat, environmental quality, and municipal uses, the use of so much water for so little benefit is in no way reasonable or beneficial.

C. The Alternative Objective Will Not Violate Anti-Degradation Policies.

At the workshop on southern Delta EC, the SDWA implied the Alternative Objective would violate state and federal anti-degradation policies. (SDWA Power Point Presentation, submitted as SDWA Exh-09, p37; Bay-Delta Hrg. Trs., p1297 (March 15, 2005).) Under the state anti-degradation policy,

> The State Water Resources Control Board, the State Department of Water Resources, the California Water Commission, and any other agency of the state having jurisdiction, shall do nothing, in connection with their responsibilities, to cause further significant degradation of the quality of water in that portion of the San Joaquin River between the point specified in §12230. (Water Code §12232.)

SDWA provides no analytical justification, and even a cursory review of the anti-degradation policies demonstrates amending the Vernalis Objectives to protect south Delta agriculture, assuming the new standard still provides such protection, does not run afoul of the anti-degradation policies.

Although SDWA references both federal and state anti-degradation policies (see 40 C.F.R. § 131.12 and SWRCB Resolution No. 68-16), this reference is misleading. Where federal anti-degradation policy applies, state anti-degradation policy is implemented *in lieu of,* and consistent with, the federal policy. Indeed, the state anti-degradation policy incorporates the required portions of the federal policy, and is more stringent and comprehensive than the federal policy. (SWRCB Order WQ 86-17 1986 WL 25526, p10.)

The state anti-degradation policy also provides, in part:

> "Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not **unreasonably** affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies." (SWRCB Resolution 68-16.) (emphasis added)

As applied in concert with the federal policy, the state policy applies to three categories of water. The first category consists of waters where water quality objectives are being met. For these waters, the anti-degradation policy applies to maintain the water quality necessary to support existing uses. The second category of water consists of waters where water quality is better than required to support existing uses. For these waters, the anti-degradation policy provides that water quality can be lowered to allow important economic or social development, provided is only lowered to the point where existing uses remain fully protected. The third category consists of waters that are outstanding national resources. For these waters, the anti-degradation policy prevents any lowering of water quality.[40] (40 CFR Section 131.12(a)(1)-(3).)

It is unclear whether the San Joaquin River and Delta fall into the first or second category. Certainly, portions of either one or both are considered impaired pursuant to

[40] There are only two such waters in this third category located in California – Lake Tahoe and Mono Lake.

§303(d) of the Clean Water Act. (33 USC §1313(d.).) However, regardless of which category encompasses these waterways, Resolution 68-16 clearly provides it will permit changes in water quality standards, provided the quality remains capable of supporting existing beneficial uses.

South Delta agriculture is the only beneficial use supported by the Vernalis Objectives. (1995 WQCP, p17.) The Alternative Objective is sufficient to protect 100% yields all crops generally grown in the south Delta. The Alternative Objective constitutes "degradation" in the sense that the acceptable EC will be higher than is currently allowed. Nevertheless, there will be no impacts to existing beneficial uses, and therefore no degradation in violation of the state or federal anti-degradation policies.

Furthermore, absolute protection is not required. Water Code §13232 only prohibits "significant degradation" and Resolution 68-16 allows changes in water quality if such changes do not "unreasonably" affect beneficial uses. Therefore, even if the Alternative Objective decreased bean yields by 10%, such an impact in Dry and Critical year would be reasonable and insignificant in light of the small economic impact.

Finally, a change in water quality must be consistent with the "maximum benefit" of the people of the State. Neither the Water Code nor Resolution 68-16 defines "maximum benefit", but the Vernalis Objectives require 55,000 AF of water to protect 3,000 acres of beans. In Dry and Critical years, using flow to maintain water quality for so little benefit certainly does not provide "maximum benefit" to the "people of the State." If anything, using ten of thousands of acre-feet of dilution flow in Dry and Critical years harms the people of the State more than it benefits them.

V. THERE SHOULD BE NO SALINITY OBJECTIVE AT ALL IN AUGUST, SEPTEMBER, AND OCTOBER IN BELOW NORMAL, DRY, AND CRITICAL YEAR TYPES.

A. Reasonable Beneficial Uses are Limited to Legal Uses.

Regardless of what the Vernalis salinity objective should be as a mater of science, policy and reasonableness, it seems clear that as a matter of water rights, there should be no standard at all in the summer months of below normal, dry and Critical years based solely upon the established principles of California water rights. A review of the water rights of diverters located in the south Delta demonstrates that there are few, if any, who have a legitimate right to divert water in below normal, dry and Critical years in the summer months. Since the entire purpose of the standard is to protect the quality of irrigation water for south Delta agriculture, this purpose is not at all served if the intended beneficiaries have no legal right to irrigate. Unimpaired flow data for the south Delta shows that there should be no controlling salinity objective at Vernalis in August, September and October of below normal, dry and Critical years.

B. Riparian Rights Holders Have No Right to Divert Water When There is No Natural Flow.

1. Riparian Rights Generally.

A riparian right confers upon an owner of certain property the right to reasonable and beneficial use of water on the property. (Lux v. Haggin (1886) 69 Cal. 255, 390-391; People v. Shirokow (1980) 26 Cal.3d 301, 307.) This right of use is part and parcel of the land. (Lux, *supra*, 69 Cal. 255, p391.) As a general matter, in order to be considered riparian, a parcel of land must satisfy three criteria. First, the property must be contiguous to a watercourse. (Rancho Santa Margarita v. Vail (1938) 11 Cal.2d 501, 528.) Second, it must be the smallest tract held under one chain of title. (Id., p529.) Thus, a portion of a riparian parcel that is severed, and then reunited under ownership with the original riparian parcel, will not regain riparian status. (Miller & Lux v. James (1919) 180 Cal. 38, 51-52; *see* Anaheim Union Water Co. v. Fuller (1907) 150 Cal. 327, 331).) Third, the property must be located within the watershed of the watercourse to which it is contiguous. (Rancho Santa Margarita, *supra*, 11 Cal.2d, p528-529.)

Riparian rights are limited to water reaching riparian land by way of its natural flow. (Anaheim Union Water Co. v. Fuller, *supra*, 150 Cal., p332.) Riparian rights do not attach to water that has been stored upstream during an earlier period. (Lindbloom v. Round Valley Water Co. (1918) 178 Cal. 450.) Thus, if water previously stored in another season is flowing in a stream, it is unavailable to riparian right holders. Similarly, water that is appropriated and is flowing in a channel under the control of its appropriator is not subject to appropriation by others, whether or not it had been stored in a prior season. (Stevens v. Oakdale Irr. Dist. (1939) 13 Cal.2d 343, 352.)

2. There is No Natural Flow in the San Joaquin River in August, September, and October in Below Normal, Dry, and Critical Years.

As part of the SWRCB proceedings culminating in D-1641, SDWA and others alleged that approval of the SJRA would injure legal users of water located within their boundaries, including riparian water right holders. (D-1641, p28-33.) To evaluate this claim, the SWRCB estimated natural flow entering the south Delta using DWR unimpaired flow data from October 1920 through September 1992. As explained by the SWRCB, "Unimpaired flow is flow in rivers and streams that would have occurred in the absence of water storage and diversion projects. The unimpaired flow estimates provide a measure of total water supply available for all uses after removing the impacts of most upstream alterations. Channel improvements, levees and flood bypasses are assumed to exist." (D-1641, p31.) Assuming that (1) all lands of the south Delta are riparian, and (2) that there are no riparian holders located upstream of Vernalis, the SWRCB subtracted the known south Delta channel depletion requirements (based upon evidence submitted by SDWA (Ex. 22) and the SWRCB (Ex. 3j) during the proceedings) from the estimated unimpaired runoff to determine the amount of unimpaired runoff at Vernalis that would be "available for the exclusive use of southern Delta riparian right holders." (D-1641, p31.) Based on these assumptions, the SWRCB determined the south Delta riparian diversion requirement is 1,400 cubic feet per second ("cfs") in July, 1,334 cfs in August, 1,057 cfs in September, and 902 cfs in October. (Id., p32.)

The SWRCB's analysis revealed that natural flow of the San Joaquin River subject to diversion pursuant to riparian rights is "inadequate to meet the agricultural demands in the southern Delta is some months of many years." (Id., p33.) Utilizing the 60-20-20 year type, the SWRCB concluded that

> "On average, insufficient water is available to supply the southern Delta in Below Normal, Dry and Critical Dry years in August, September and October." (Id.; see Table 6.)

Table 6: Average flow deficit by month and year type in cfs. (D-1641, p32.)[41]

Year Type	August	September	October
Below Normal	410	672	373
Dry	741	406	118
Critical	804	725	402

[41] It should be noted that the deficiencies are almost certainly worse than portrayed, as the SWRCB assumed that there were no riparian water right holders upstream of Vernalis. (Id., p31, fn. 33.) Thus, the SWRCB assumed that all unimpaired flow of the San Joaquin River entered the south Delta, which is certainly not the case. Thus, the analysis performed by the SWRCB in D-1641 represents the "best case" scenario.

Mr. Steiner, who analyzed unimpaired flows using DWR data, obtained similar results. (SJRG Exh-07, p32-33; see Figure 16.)

The SWRCB's conclusion – that there is an inadequate supply of natural flow at Vernalis to satisfy the needs of riparian users in the south Delta in August, September, and October in Below Normal, Dry and Critical year types – is based upon data which finally rebuts the myth, perpetrated by south Delta attorneys for years, that there was always sufficient natural flow before the CVP, SWP and other diversion facilities were constructed on the San Joaquin and its tributaries. (Bay-Delta., Depo. Tr. Alex Hildebrand, p18-19 (May 27, 1999).) Although most parties, including the SWRCB, never accepted this myth[42], none of these parties could substantiate their disbelief with hard data until the SWRCB conducted its analysis as part of D-1641.

Since riparian water right holders are limited to taking natural flow passing by their property, the fact that there is no natural flow in August, September and October of Below Normal, Dry and Critical year types means that there is no water available for diversion and use by riparian right holders.

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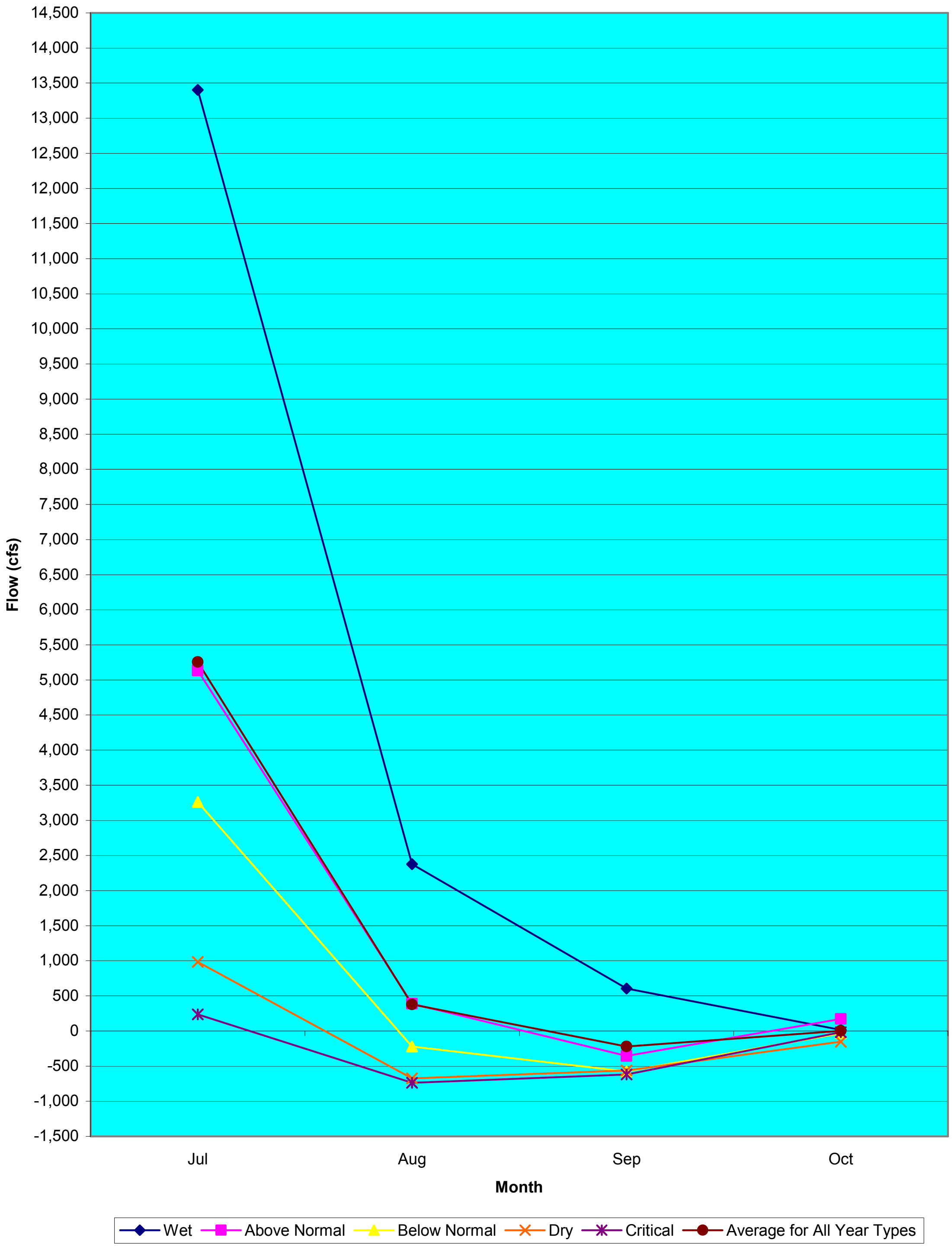
[42] In WR 98-01, the SWRCB stated "The natural flows in the San Joaquin River diminish during the irrigation season and **riparian right holders generally do not have adequate water available to them** during the entire irrigation season." (1997 WL 836395, p4) (emphasis added.)

Figure 16: Simulated differences between unimpaired Vernalis flow and riparian diversion requirement by year type. (SJRG Exh-07, p32-33.)



C. Appropriators Have No Legal Right To Divert and Use Water Due to Term 91.

1. Term 91 Generally.

Term 91 is a standard condition added to permits and licenses prohibiting diversion of water under the permit or license when the CVP or the SWP must release stored or foreign water to satisfy in-basin entitlements, such as wildlife protection, dissolved oxygen objective at Ripon, and salinity at Vernalis. (SWRCB Term 91.) The SWRCB has added Term 91 as a standard condition to all permits and licenses approved since 1965, and continues to do so when the permit/license authorizes diversion of 1 cfs or more within the San Joaquin River Basin (among others) or the Delta and hydraulic continuity with the Delta exists during the approved diversion season. (Id.)

Term 91 prohibits diversions when natural and abandoned flow in the San Joaquin River and Delta and their tributaries is insufficient to meet salinity objectives in the Delta and other in-basin uses, and the CVP and SWP are required to release stored water in order to meet such water quality objectives and in-basin uses. (SWRCB WR 2001-22, p4.) Term 91 is based upon the recognition that water diverted and stored by the CVP and SWP, while done pursuant to water rights junior to all other basin water rights, is appropriated at such times when there is sufficient water for all needs. Thus, when such water is released at a later time to meet water quality or other in-basin needs, it is considered appropriated water that is not abandoned, but rather is flowing under the control of the appropriator until it satisfies the appropriator's purposes. This water is therefore not available for appropriation by others. (Stevens, *supra*, 13 Cal.2d 352.)

Pursuant to Term 91, the SWRCB will notify affected water rights holders when the hydraulic conditions are met such that the appropriator is unable to divert due to the release of foreign or stored waters by the CVP and/or SWP (SWRCB Term 91.) Additionally, the SWRCB tries to give advance warning to affected appropriators of the probability of an imminent curtailment when possible to enable the diverter to maximize his options and flexibility. (SWRCB Term 91.) Thus, the SWRCB attempts to utilize Term 91 as a "real-time mechanism for telling water right holders when water is available..." (SWRCB Order WR0 2004-0004, p5.)

2. Term 91 Only Applies When There Is Insufficient Natural Flow, Therefore There Is No Right to Appropriate When There Is No Riparian Water Available.

Appropriations are only curtailed pursuant to Term 91 when there is insufficient natural flow to meet all needs within the Delta, including "all rights to divert," "unavoidable natural requirements for riparian habitat," "conveyance losses" and flows necessary to maintain "water quality and fish and wildlife." (SWRCB Term 91(a).) As explained by the SWRCB,

> "when the natural flow recedes during the dry season, the DWR and the USBR must release stored water to meet water quality objectives in the Delta. When there is not enough natural flow to meet the water quality objectives, so that the DWR and the USBR are meeting the objectives with stored water, other appropriators with Term 91 in their permits or licenses are notified to cease diverting water. In effect, Term 91 requires appropriators with this term in their water right permits or licenses to forgo diverting natural flow that is needed to meet the flow-dependent water quality objectives." (SWRCB Order WR0 2004-0004, p5.)

Since all water users in the Delta have a responsibility to share in meeting Delta water quality needs for riparian and other uses, this his curtailment is the appropriate method to account for the responsibility appropriators have in meeting Delta water quality. (SWRCB D-1594, p34-36.)

3. Since There is No Water Available for Diversion and Use By Either Riparian or Appropriative Right Holders in August, September and October of Below Normal, Dry and Critical Dry Year Types, There Should Be No Vernalis Standard At Those Times.

Term 91 takes effect when there is insufficient natural flow to meet all Delta needs, as a general matter it can be assumed Term 91 will be triggered to curtail appropriations from the San Joaquin River and Delta in August, September and October of Below Normal, Dry and Critical Dry year types. (SWRCB Term 91(a); SWRCB D-1594, p34-36.) Since the entire purpose of the Vernalis Objectives is to insure that water of sufficient quality to grow crops is available for irrigation by south Delta farmers, there is no point in having such an objective when there is no irrigation water available for use by south Delta farmers. Thus, the Vernalis Objectives, ***whatever number they happen to be***, should not apply in August, September and October of Below Normal, Dry and Critical Dry year types.

At a minimum, the Vernalis Objectives should not be in effect when Term 91 is triggered. During such times, the SWRCB has already determined there is insufficient natural flow and water in the San Joaquin River and Delta is stored water released by the CVP and/or SWP. Such a determination eliminates any assumptions as to whether or not there is water available for either riparian or appropriative rights holders.[43]

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[43] This proposed elimination of the applicability of the Vernalis salinity standard could be rescinded if Delta water users entered into a contract with DWR for the delivery of stored water. Since the water would be delivered under DWR's rights, and not the Delta user's rights, Term 91 would not curtail such deliveries. The SWRCB has already informed SDWA, CDWA and others of their ability to obtain such a contract to avoid curtailments pursuant to Term 91. (SWRCB WR0 2004-0004, p19-21.)

VI. SWRCB SHOULD IDENTIFY AND EXPLAIN TO THE REGULATED COMMUNITY THE EVIDENCE IT RELIED UPON AND THE RATIONALE FOR ITS DECISION.

A. SWRCB Has An Obligation to Thoroughly Examine Material Before Accepting It Into the Record As "Evidence."

The SWRCB's adoption or amendment of a water quality control plan under the Porter-Cologne Water Quality Control Act (Water Code §13000 et seq.) is a quasi-legislative act. (United States v. SWRCB (1986) 182 Cal.App.3d 82, 112.) As such, the SWRCB is not required to make detailed factual findings supporting its decision (McKinny v. Board of Trustees (1982) 31 Cal.3d 79, 88), and any decision it makes will be upheld unless it is arbitrary, capricious, entirely without evidentiary support or procedurally unfair. (Associated Builders & Contractors, Inc. v. San Francisco Airports Com. (1999) 21 Cal.4th 352, 361.)

In this instance, the SWRCB is considering whether to amend the Vernalis salinity standard established in the 1995 WQCP for the protection of south Delta agriculture. While it has conducted a workshop over the course of several days, during which interested parties were permitted to submit materials, no party was afforded the opportunity to cross-examine such materials. Moreover, the SWRCB Board and staff asked few, if any questions regarding the material, and have indicated they will permit anything and everything submitted to be entered into evidence. While neither illegal nor unprecedented, it is very troubling and continues a pattern of action by the SWRCB that enables all parties to cite to, rely upon and argue their points of view based upon "evidence in the record" that, given even minimal initial scrutiny, would never have been allowed into the administrative record.

Whatever the SWRCB's decision in this instance, it will almost certainly be the subject of litigation. Since the SWRCB is utilizing its delegated legislative authority, a reviewing court will not substitute its independent policy judgment for that of the SWRCB nor reweigh the evidence adduced during the administrative process. (California Hotel & Motel Assn. v. Industrial Welfare Com. (1979) 25 Cal.3d 200, 212; Shapell Industries, Inc. v. Governing Bd. (1991) 1 Cal.App.4th 218, 230.) Due to the deference given by courts to the separation of powers between the judicial and legislative branches, and by extension the exercise of delegated legislative authority by agencies with particular expertise, judicial review is limited to the administrative record, and the agency's decision will generally be upheld if its is supported by substantial evidence in the administrative record. (Western States Petroleum Ass'n. v. Superior Court (1995) 9 Cal.4th 559, 571-574; California Hotel, *supra*, 25 Cal.3d, p212.) As such, the SWRCB has a duty to all of the parties to insure that the administrative record contains evidence that is reasonable, credible and of solid value. (Western States Petroleum Ass'n., 9 Cal.4th 570-573; Wilmot v. Commission on Professional Competence (1998) 64 Cal.App.4th 1130, 1139.)

Unfortunately, the SWRCB has done nothing to date to determine whether the materials submitted are reasonable, credible, or of solid value, let alone eliminate those that are not. While accepting all submitted materials into the administrative record is certainly easier for the SWRCB – no contentious evidentiary issues, no on-the-record determination that a witness is unreliable or untrustworthy – and practically guarantees that its decision will be upheld by a reviewing court that will not re-evaluate whether specific materials should have been accepted into the administrative record in the first place, it does a terrible disservice to all of the parties involved and undermines the confidence that the parties have in the SWRCB and its processes.

The SWRCB can explain what evidence it does and does not find reliable, credible, and relevant, and then explain its reasoning for doing so in the WQCP, but it never provides such explanations. SWRCB staff responds to public comments in the EIR for the WQCP and cross-examinations are allowed in the subsequent water rights hearings. (EIR for the 1995 WQCP, Volume 3.) Nonetheless, such belated attempts at evidentiary considerations are too little, too late if the WQCP is inherently flawed based on faulty premises based on unreliable, biased, or false information.

For example, the SJRGA has submitted the written testimony of William R. Johnston regarding his knowledge, understanding and belief of the development of the Vernalis Objectives, as well as his opinion as to what the standard should be. Some of this testimony is based upon Mr. Johnston's personal observations. While the SJRGA is confident Mr. Johnston's credentials, testimony and exhibits would qualify as "substantial evidence," the plain fact of the matter is that absent cross-examination of Mr. Johnston by the other parties, the SWRCB, the SWRCB staff, or an independent expert hired and retained by the SWRCB, there is simply no way of determining whether Mr. Johnston's testimony and conclusions qualify as "substantial evidence." Mr. Johnston's testimony could contain critical errors or omissions, could be based upon faulty assumptions, or could be outright lies, and while the parties are free to suggest these things in their various submittals, absent any scrutiny of Mr. Johnston's testimony, there simply is no way to determine whether his testimony is reasonable, credible, or of solid value. Simply casting doubt, whether on the testimony of Mr. Johnston or anyone else, is insufficient protection for the parties in this process.

The SWRCB would do well to consider the case of Plastic Pipe and Fittings Association v. California Building Standards Commission (2004) 22 Cal.Rptr.3d 393. At issue in the case was the propriety of a quasi-legislative decision by the California Building Standards Commission to refuse to adopt Uniform Plumbing Code provisions allowing the use of PEX pipes. As part of the administrative process, a trade group submitted a letter from an environmental consultant who opined that use of PEX pipes could cause a variety of problems, including contamination, permeation, and outright failure. (Id., p397.) Also submitted was undisputed testimony that 180 local jurisdictions in California permit the use PEX pipes, 49 states have adopted model code provisions allowing the use of PEX pipes, and that PEX pipes have been used in Europe for 20-30 years. (Id., p399-400.) The Building Standards Commission, relying on the consultant's letter, refused to permit the use of PEX pipes. The trial court reversed the commission's decision, relying primarily upon the weight of the evidence suggesting use of PEX pipes was not troubling or dangerous. (Id., p399-400.) The trial court noted that, in contrast with the consultant's opinion, "I would think that somebody would have been able to come up with something showing that, indeed, there's been a tremendous problem with this product in Europe or a tremendous problem with it all over the country or a tremendous problem with it in California; and yet, there's really nothing that I can see here factually that's been pulled together with respect to PEX." (Id., p400.)

The appellate court reversed the trial court and found that the consultant's letter, although contradicted by other evidence, was "substantial evidence" upon which the commission was entitled to rely. (Id., p403-404.) What is particularly interesting is that in determining whether the consultant's letter constituted "substantial evidence," the appellate court had before it only the substance of the letter and the consultant's credentials. (Id., p404.) The court found that "On the record, there is no reasonable question that [the consultant] is qualified to state his opinion." (Id.)

The appellate court's decision is completely in line with established precedent, but illustrates the problem with quasi-legislative processes that fail to test the materials submitted as "evidence." In the Plastic Pipe case, it certainly appears from the limited amount of information provided by the appellate court that the weight of the evidence supported the use of PEX, and indeed one could at least infer that the consultant's opinion was incorrect or overstated by the lack of actual facts supporting such opinion. However, since it does not appear that the consultant was ever cross-examined or his opinions probed in any meaningful way, the consultant's opinion was legally considered "substantial evidence" based solely upon the fact that the consultant's credentials suggested that he was qualified to offer an opinion on PEX pipes.[44] Apparently, no one determined whether the consultant's opinion, once given, was true, reliable or otherwise credible.

Such a scenario should not be permitted to happen here. The time for cross-examination of witnesses by the SWRCB, the staff and other parties has obviously passed. Yet, the SWRCB can still take steps to insure the materials in the administrative record are reasonable, credible and of solid value by (1) internally scrutinizing the

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[44] It is possible the consultant was cross-examined and the appellate court simply did not discuss it. However, it seems reasonable to assume from the context of the appellate court's discussion, cross-examination did not occur.

information and, where appropriate, retaining outside experts who work for the SWRCB to assist in such scrutiny, and (2) identifying those materials, if any, that are not considered reasonable, credible and of solid value and excluding them from the record. Failure of the SWRCB to insure the materials admitted into the administrative record are reasonable, credible and of solid value may not be illegal, but will constitute a dereliction of its duty to the participants. Indeed, the participants have a right to know that the SWRCB is weighing, balancing and considering the evidence, and not just admitting everything in the hope that enough material supporting a pre-determined outcome will be submitted and that its reliance thereon will be upheld.[45]

B. SWRCB Should Explain Its Ultimate Decision.

For many of the same reasons that the SWRCB should identify the evidence it does and does not rely on, the SWRCB should explain its ultimate decision, even though it is not legally required to do so. In addition to knowing what the SWRCB relied upon in terms of evidence, the regulated community needs to know and understand how it utilized such evidence in reaching its ultimate decision. Absent this understanding, the parties are left to guess as to the SWRCB's rationales and priorities, and cannot develop with any certainty additional studies, evidence and arguments that the SWRCB will find useful in future proceedings.

For the 1995 WQCP, the SWRCB explained its decision was the result of a year-long process that included a series of workshops, negotiations, consideration and

[45] The trustworthiness of the process is important. A large part of the litigation regarding D-1641 is based upon the view of some participants that the process did not matter, as the SWRCB had already made up its mind about certain things as part of a "dirty deal." While the SJRGA does not agree with this conclusion, it does believe that the belief is truly held and not simply a litigation strategy. Taking care in this proceeding to evaluate the materials submitted and reject those that are not reasonable, credible and of solid value will go a long way to avoid future claims that the SWRCB is involved in "dirty deals."

comment of interested parties on a draft plan, the acceptance and consideration of written and oral comments, and the preparation of a substitute document for an environmental impact report. (SWRCB Resolution 95-24, p1-3) Despite recognizing the process that took place, nothing overtly connected the process itself and the SWRCB's decisions contained in the 1995 WQCP.

The 1995 WQCP contained several new water quality objectives for fish and wildlife beneficial uses. (1995 WQCP, p15, 18.) For flows, the SWRCB explained "the available information indicates that a continuum of protection exists" and therefore the flow objectives were based upon "a subjective determination of the reasonable needs" of all demands in the Delta. (Id., p14-15.) This "explanation" is particularly unsatisfying, as the SWRCB never identifies the "available information" to which it refers, nor does it establish the basis upon which its admittedly "subjective determination" of the reasonable needs was made.

The paucity of reasoning given by the SWRCB regarding establishment of the objectives to benefit fish and wildlife beneficial uses is a virtual cornucopia when compared with the "explanations" given by the SWRCB regarding establishment of water quality objectives for the protection of municipal and industrial beneficial uses and agricultural beneficial uses. In each case, the SWRCB simply stated the "objectives are unchanged from the 1991 Bay-Delta Plan." (Id., p14.) The reason or reasons these objectives remained unchanged was never given or addressed.

Any party seeking to either (a) understand the basis of the SWRCB's decision (e.g., why is the EC objective at Collinsville in October 19.0 dS/m, as opposed to 18.0, or 20.0 dS/m?), or (b) to develop information, studies or argument to change such decision in a future proceeding is left in the dark by the 1995 WQCP. Since the regulated community is expected to comply with the SWRCB's decisions, as well as participate in future proceedings designed to alter, amend and improve prior SWRCB decisions, it is imperative the regulated community understand what the SWRCB is trying to accomplish, the evidence it relies upon, and how it uses the evidence it relied upon to craft a decision that addresses what it is trying to accomplish.

Insanity has been defined as doing the same thing over and over again and yet expecting a different result each time. Unless the regulated community fully understands not only what the SWRCB is doing, but also why and upon what rationales, the same parties will continue appearing before the SWRCB making the same arguments, and offering the same witnesses and the same basic testimony hoping *this* time, things will be different. (SDWA Exh-07 (includes testimony submitted by Alexander Hildebrand in the 1980s).) To break this cycle, the SWRCB should explain what it is doing and why, even though it is not legally required to do so.

VII. CONCLUSION.

The SJRGA has carefully analyzed the salinity issue and attempted to develop recommendations based on law, the most recent science, and sound policy. It has also attempted to respond to comments, questions, and concerns raised by the SWRCB and various other parties at the workshops. Finally, the SJRGA has considered the Periodic Review process itself, and recommended procedural improvements that would result in a better water quality control plan. The SJRGA respectfully submits its analysis of Issue 10, southern Delta EC, to the SWRCB for their consideration and review.

Respectfully Submitted,

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Date: June ___, 2005

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