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RE: CA Water Policy and Water Transfers, Public Bd. Meeting October 26, 2011

Dear Members of the Board;

I value yesterday's opportunity to participate in this critical component of California water policy and to listen to other panelist and presenters regarding California Water Transfers. I feel I left a number of issues on the table that I failed to clearly define: I believe you can agree that something as complex as a natural system that has been greatly engineered cannot receive justice in 5-10 minutes. I also failed to adequately represent myself, and that is where I'll start. I have worked on water issues since 2003, mostly as a volunteer and always as an independent consultant. Early in 2004, I returned to school to work on an M.S. in Env. Science after discovering that supporting science did not exist behind our ground water management policies. [1] In 1994, our domestic well went dry following a wholesale ground water transfer. [2] This fact was unknown to us until after we purchased a ground water dependent farm 8 years later.

Working with a number of organizations, over the last 8 years, I have been instrumental in helping shape policy in Butte County that is more founded in science; participated in reshaping the California Environmental Water Caucus' perspective on water transfers; participated in reshaping the Sacramento Valley Integrated Regional Water Management Plan (IRWMP); and have spoken on behalf of Northern Sacramento Valley (NSV) water and ecosystems at State and Regional Water Board hearings, at the 2010 POWER conference and was the environmental voice on the 2010 Water Education Foundation's Northern California Water Tour. I was V.P. of the Durham Mutual Water District board for three years, a privately held irrigation district (despite what the name implies, they only service landscape and irrigation water needs).

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1 My research examines water-rock interactions and recharge through hydrogeochemistry.

2 In 1994, the area around Durham, Butte County, suffered an ill-planned water sale involving ground water – a conjunctive use experiment. It was a classic case of mismanaged public trust: the State did not come to the aid of affected communities; no one really knew what had taken place or why wells went dry. There was no support for keeping these farming communities whole, and no recourse. It is prudent to mention that there has not been another wholesale transfer since 1994, but it is also important to mention that the overall volume of this transfer was rather small in comparison to 1991-92. No one can say for sure that 1994 was the straw that broke the camels back—the problem being a complex combination of variables: too much pumping over an extended period of years; unknown stratigraphy, extended dry conditions; and as Dr. Richard Howitt eluded to, and this is significant, it was and remains a 'measurement problem.' While it is understood that water transfers take place, what alarms farmers and residents in the NSV is that infrastructure has changed. Large production ground water wells are situated along canals, funded in part by State and Federal agencies, in an area rich with surface water sources and rights, west of the Sacramento River. Conjunctive use has become the experiment of the day. In addition, while CVPIA and DWR claim adherence to a 'no-injury' clause; these clauses address district water users only.

A 'WILLING SELLERS' CONCEPT MISREPRESENTS THE DISTRIBUTION OF WATER INTERESTS

The Agricultural Water Stewardship recommendations point out that there is a regional nature to the problem of water supply, distribution, and use that demands 'different approaches in different contexts.' [3] Yet, from the NSV perspective, once again the voice and interests of those living in the state's areas of origin including the claims of Native American Tribal entities are continuously unrepresented. [4] I realize in the sake of time, you could not have heard from too many voices, but having a balance between users and those of us in the regions of supply would have been significant in easing some of the valid concerns of my region.

Agricultural water use does not have to compete with environmental needs or population increases (Figure 1). [5] Not enough water occurring at the right place or right time is the real crux. Hardened demands created late in CA water history through poor business decisions in water districts south of the Delta have placed this State's agricultural sector in a quandary. While these districts have implemented state-of-the-art technologies to improve agricultural water efficiencies, moving from annual to perennial crops forced the state to impose market conditions on water that brought harm to farming communities in the NSV. [6] Long-term water transfer programs are currently touted as facilitated efforts to address water shortages due to drought, however, in the same sentence references are made about water users that "...require *supplemental* water supplies to meet anticipated demands..." (emphasis added) [7] The fact that the State failed to correct reliable delivery numbers and has remained in denial regarding available supply and continues to engage in closed-door sessions at the expense of those in the area-of-origin—continues the hardening demands of junior-rights holders. NSV ground water is the golden goose of local and State agriculture.

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[3] Agricultural Water Stewardship: Recommendations to Optimize Outcomes for Specialty Crop Growers and the Public in California. California Roundtable on Food and Water Supply. June 2011

[4] The BDCP process is another case in point where closed-door concessions are occurring similar to the Monterey Amendments.

"Five Northern California Members of Congress are demanding answers on the current state of the Bay-Delta (BDCP) planning process and calling on the Interior Department today to rescind a "flawed" Memorandum of Agreement that was developed behind closed doors and that gives water export agencies south of the Delta and in Southern California unprecedented influence over an important public process concerning California's precious fresh water supplies."

[5] According to supporting documents for the State Water Plan Update 2005, the level of transfers was reported to be 1,200,000 acre-feet in 2001, with urban recipients comprising two percent of the total and agricultural districts accounting for half of all transfers. (The remaining percentage is not explained.) One will also note that actual data for the Water Plan update process is severely outdated and it appears there was no attempt in 2009 to provide more current data.

[6] Volume 2, Chapter 23: Water Transfers, California Water Plan Update 2005.

The supporting documents for the 2005 Water Plan Update state "…there is no guarantee that benefits to the seller will benefit the source area as a whole."

[7] Draft Environmental Assessment: 2010-2011 Water Transfer Program. US Bureau of Reclamation. January 2010.

The release date of this draft, at the onset of the water year, begs the question how one would know what demand is, based solely on natural conditions and not some predetermined, unnatural causes stemming from poor business decisions.

Water never falls where and when most needed in California where rights exceed actual volume or supplies by 5, 8, or even 10 times. [8] "Despite a drenching in 2009, west side farmers complain their water woes are far from over. Rain hasn't fallen when most needed." [9] The State must decide if we are in a perpetual state of drought (a drought created by administrative mismanagement) and take appropriate actions that are not at the expense of other Californians: those lacking assurances for their protection (ground water dependent farms large and small and domestic water users that are not within water districts).

DWR has noted that as climate change begins, California will experience more precipitation as rain rather than snow; snowpack is the State's most significant recharge source for ground water [10] and this natural storage source is estimated to decrease by 3.8 to 6 MAF by 2050. The Central Valley currently has reference evapotranspiration (ETo) that exceeds precipitation by 3 feet placing this valley in a state of 'perennial water deficiency.' [11]

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[8] http://bwnews.us/2011/10/17/public-trust-recommendations-the-delta-how-much-water-is-that/Last accessed on October 19, 2011.

"The California water rights system is complicated. There are junior rights, senior rights, riparian rights, ground water rights, and state and federal contract allocations based on large infrastructure projects. All total [sic], water rights exist for 531 million acre-feet, nearly 10 times as much as is available."

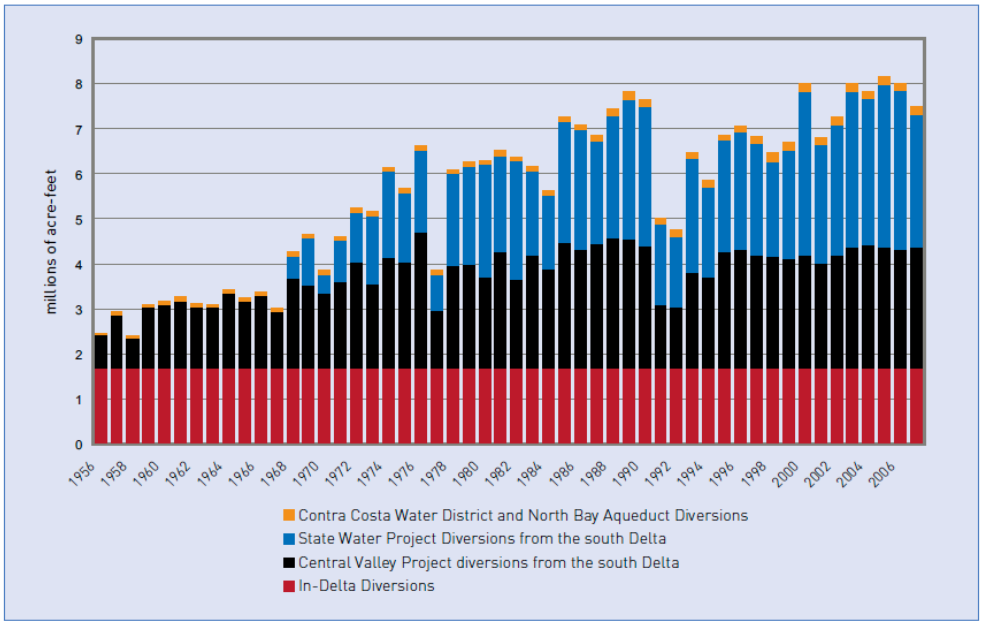
[9] Quotes from a Fresno newscast in 2009 during a meeting of the CA Board of Food and Agriculture with CalFed in Fresno County.

[10] Monitoring Networks for Long-term Recharge Change in the Mountains of CA and NV: a PIER Meeting Report. Earman, S. and M. Dettinger, 2007.

"Several studies in Western mountains have shown that snowmelt provides more in-place recharge than does rain, even when snow makes up a relatively small portion of the total precipitation at the sites (e.g., Earman et al., 2006). In large part, this is because the accumulation of multiple precipitation events in the snowpack provides an amount of water for infiltration that is large enough to break through the thick unsaturated zones that are common in many western settings, while water from individual rain events may not be sufficient to overcome the evapotranspirative demands of the unsaturated zone. Studies in the Southwest indicate that 50 to 90% of mountain recharge originates as snowmelt (e.g., Earman et al., 2006, Simpson et al., 1972, Winograd et al., 1998). For example, recharge-temperature analyses of dissolved gases in ground water suggest that recharge in the central part of the Chiricahua Mountains, Arizona, is derived only from altitudes above seasonal snowlines and not from lower altitudes (Earman and Phillips, 2003). Geochemical hydrograph separations in the highest basins of the Rockies demonstrate that, even during the peak snowmelt, 60% or more of the streamflow is supplied by ground water (Liu et al., 2004). On the other hand, recharge from streamflow infiltration through fans and basin floors depends on large, rapid, but generally infrequent, outflows of runoff from the mountains onto surrounding fans and basins. The mix of mountain vs. fan and basin recharge presumably varies from basin to basin and from year to year, but these variations are poorly understood in most of the West."

[11] Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766, 225 p. 2009.

"More than 120 DWR weather stations throughout California measure ETo. California Irrigation Management Information System (CIMIS) has been using a well-watered, actively growing, closely clipped grass that completely shades the soil as a reference crop. ETo values that were estimated using the Hargreaves–Samani equation are correlated highly with corresponding CIMIS ETo values but summer ETo values generally were underestimated and winter ETo values generally were overestimated (*table C7*) (California Department of Water Resources, 2007)."



In spite of additional operating criteria to protect fisheries including the Central Valley Project Improvement Act (1992), the Water Quality Control Plan (1995) and the Calfed Environmental Water Account (2000), diversions from the Delta have reached record levels in recent years.

Source: California Data Exchange Center (also used in Delta Vision report)

Figure 1: CVP and SWP diversions from the Delta [12]

CURRENT KNOWLEDGE OF NSV SURFACE AND GROUND WATER SYSTEMS AND INTERCONNECTIONS

I spoke yesterday strictly from the perspective of the region north of the Sutter Buttes, and I referred to this region as the NSV. This is an important geographical distinction, an area defined by the Cascade Province that provided this area with rich volcanic soils and a complex, water-bearing rock known as the Tuscan Formation. This formation has drawn a lot of unfounded media-hyperbole regarding the 'vast, under-used, subsurface reservoir that might contain as much as seven times the amount of water stored in Lake Shasta.' There are existing, known gaps in scientific data and research that must be pursued prior to further development of this aquifer system for local use; and more specifically, prior to integrating into CVP or SWP programs involving transfers. The science thus far has not been adequate to guide sound decision-making on how to protect the area regarding recharge, interaction between surface and ground water, safe yield. [13] The science is not

[12] Finding the Balance: A Vision for Water Supply and Environmental Reliability in California. Environmental Defense Fund. 2008.

[13] The fresh water aquifer systems in the NSV are underlain by old marine sediments many of which are saline aquifers. The presence of natural, inorganic constituents are found throughout this valley under current pumping regimes; further development of the fresh, ground water system may impact every user that relies on this aquifer system for supply conveyance. Recommendation 1.A.i. from the June 2011 report of the California Roundtable on Food and Water Supply is one critical step in the success of the State and Federal water transfer program.

available to enable an understanding of long-term affects and impacts to the upper and lower Tuscan Formation units. [14]

I had hoped to make another distinction between the Sacramento Valley and the Northern Sacramento Valley. The City of Roseville has an Aquifer Storage and Recovery system. The variability in the Tuscan Formation, which took over 1.5 million years to form, includes structural beds that exhibit characteristics less permeable than other units of the same formation. This resistance to downward percolation and lack of mapping of the extent of the lithologic and structural differences within this formation, limit the feasibility of conjunctive use and ground water banking in this region.

All environmental assessment documents associated with water transfer programs treat the entire Central Valley as a similar-functioning hydrologic system. This is critically flawed analysis. For example, losses of stream flow due to ground water pumping within a certain distance and depth from a stream are referred to as a depletion factor. This value is set at 12% for the entire CV, yet DWR studies in 1993-1995 indicate that a well 400 feet southeast of the Sacramento River '...encountered a very substantial recharge source within 9 minutes of starting...' a pump test. The well has a 665 foot depth and 320 feet of casing screened between 128 and 250 feet below ground surface. It is estimated that 2000 gpm was drawn (subsurface recharge to the pumping zone) directly from the Sacramento River while pumping at a 3500 gpm rate; this is closer to a 60% depletion rate. [15]

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14 Feasibility Study of a Maximal Program of Groundwater Banking. Natural Heritage Institute. December 1998.

"Characterization of the aquifer system underlying the Sacramento-San Joaquin has changed significantly over time. Early reports viewed the Sacramento basin essentially as a single unconfined aquifer and the San Joaquin essentially a two or multi-layered system in which confined and unconfined aquifers were separated by the dense and regionally extensive Corcoran Clay, or e-clay, member of the Tulare formation (Bertoldi, Johnston et al. 1991). More recently, the intensive Regional Aquifer System Analysis (RASA) study undertaken by the USGS has changed that image fundamentally. This detailed modeling effort characterized both the Sacramento and San Joaquin systems as essentially a single aquifer with multiple, discontinuous layers of low permeability clays creating semi-confined conditions in many locations (Bertoldi, Johnston et al. 1991). Study authors viewed flow within the system as linked throughout with substantial changes due to development. In some areas, vertical permeability of confining layers such as the Corcoran Clay has been reduced by 1.5 to 6 times (Bertoldi, Johnston et al. 1991, p. A26). Overall vertical flow has, however, increased by roughly an order of magnitude from conditions prior to development up to the 1970s. This was caused by leakage through wells with long perforated sections (Bertoldi, Johnston et al. 1991). Most recently, work by the California DWR suggests that much of the Sacramento Valley might best be conceived as a two layer aquifer system in which extraction from or recharge to lower layers is essentially isolated from river flows.110 ***The above uncertainties have potentially great implications for conjunctive use activities. First, in parts of the Central Valley, the hydrologic system is not well enough understood at present to predict potential recharge and extraction effects on stream flows, wetlands and other associated environmental resources.*** This is particularly true in the Sacramento basin. Second, the same uncertainty limits the assurance a program could have regarding how much of the water it recharges will actually be available for extraction when needed and what liabilities the program might incur due to impacts on third parties. Vertical flow rates might be particularly important to this. In the Sacramento valley, for example, much would depend on whether or not recharge to deeper aquifer levels could be tapped during drought years without affecting levels in the upper unconfined aquifer or surface streams. (emphasis added)

110 Discussion with Glen Pearson, DWR on 8/17/95. In rice growing areas of the Sacramento Valley, shallow wells are observed to maintain steady water levels (lots of recharge) but deeper wells fluctuate substantially as pumping levels change. This suggests at least partial isolation of lower aquifers from upper levels."

[15] M & T Chico Ranch Ground Water Investigation Phase II. DWR Northern District. June 1995.

When considering the use of this aquifer system (leaning on ground water supplies to create surplus surface supplies for the transfer market) it is imperative that State and Federal agencies compare apples to apples. [16] When talking about interactions between surface and ground water systems the discussion centers on fairly shallow, local, and vulnerable aquifer systems; not the deep gift of the last ice age that approach ages tens of thousands of years old. [17] While the Lower Tuscan unit *may* be isolated from stream flow and therefore pumping from this unit *might* not have an immediate impact on stream flow, this also indicates that this unit is not readily recharged locally. [18]

There are two paths that 'old water' could have taken to get where it is today: (1) it took the majority of the water molecules tens of thousands of years to travel there; in which case it will take just as long to replenish; (2) the majority of the water molecules traveled there quickly, but then the system was somehow shut-off from the recharge source, in which case it would be considered a closed system that will never be replenished by natural percolation. To avoid possible subsidence while exploiting this 'old water' source, man would have to replenish this aquifer system through injection wells, requiring another new source of water unavailable to us in our overtaxed system. Man should not fix what is not broken, but rather focus on correcting the policies that have left the system mired in unreasonable promises and demands. The further we move away from this functioning, natural system the greater the catastrophe.

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16 State and Federal hydro- and geologic agencies have limited data about the specific but varied stratigraphic, structural, and lithologic characteristics and differences of the Central Valley, tending instead to lump these differences into one black box.

17 California GAMA Program: Groundwater Ambient Monitoring and Assessment Results for the Sacramento Valley and Volcanic Provinces of Northern California. LLNL and SWRCB. January 2005.

It is important to note that this report does not explore the variables in age dating or characterizing water types and vulnerabilities inherent in well construction. Wells are often screened across numerous sections where inflow and thus pump efficiencies will be greatly enhanced by drawing on water from multiple lithologic units.

18 Feasibility Study of a Maximal Program of Groundwater Banking. Natural Heritage Institute. December 1998.

"Banked water often cannot be directly applied to meet in-stream environmental needs. Aquifers are often located substantially downstream from critical environmental needs – such as spawning sites. In addition, [banked] groundwater is often warmer than water in surface streams. Since many habitat characteristics are temperature dependent, this can greatly affect the usability of banked groundwater for environmental purposes. As a result, generation of environmental benefits may depend critically on the degree to which banked water can be used to displace non-environmental demands on surface water supplies, particularly during intense drought periods. Similarly, the ability to create wetland habitat benefits depends on the match between the timing of water availability for recharge in relation to waterfowl wetland needs.[109] Overall, the environmental benefits of conjunctive management could be major – but the devil lies in specific details."

109 It would, for example, be ***important to evacuate reservoirs*** in the fall in advance of major precipitation periods in order to increase capture. Much of the recharge might, for this reason, need to be done in the late fall and early winter. Wetland habitat needs may, however, be particularly important in the spring and early summer. (emphasis added)

I encourage you to consider that further water transfer programs originating north of the Sutter Buttes should not take place until the appropriate research for this region is complete (not through flawed trial and error, but through a method that encourages appropriate scientific processes). As another sage friend expressed to me, "Politics cannot solve the physics of water." The state cannot afford to sacrifice the agricultural value of this region. It is important to understand that what adversely affects the water supply in this region will affect the water supply for all Californians. I look to this Board to encourage the State Water Board to call for a cessation of actions by state and federal agencies to re-operate the CVP and SWP that may engage conjunctive management until the requisite science is available and transfers remain aligned with the 'public welfare of the place of export.' [19]

Sincerely,

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[19] Hap Dunning. "In 1980, the California legislature embraced ―the voluntary transfer of water and water rights where consistent with the public welfare of the place of export and the place of import.‖ Cal. Water Code § 109(a). After that there was much discussion and study of what today is often known as ―water marketing,‖ but § 109 and other statutory provisions did not quickly lead to the development of a broad-based water market in California. Brian E. Gray, A Primer on California Water Transfer Law, 31 Ariz. L. Rev. 745, 780 (1989). [See generally supra Treatise § 14.04.]"