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BEFORE THE STATE WATER RESOURCES CONTROL BOARD

WATER RIGHT PHASE OF THE BAY-DELTA ESTUARY PROCEEDINGS

Consideration of Interim Water Rights Actions pursuant to Water Code Sections 100 and 275 and the Public Trust Doctrine to Protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary

REBUTTAL TESTIMONY ON AGRICULTURAL WATER CONSERVATION POTENTIAL

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REBUTTAL TESTIMONY of

THE NATURAL HERITAGE INSTITUTE, representing

Friends of the River
Natural Heritage Institute
Planning and Conservation League
San Francisco Baykeeper
Save San Francisco Bay Association
Sierra Club
United Anglers of California

EXHIBIT WRINT-NHI-21
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REBUTTAL TESTIMONY
ON AGRICULTURAL WATER CONSERVATION POTENTIAL

WRINT-NHI-21

This rebuttal testimony responds to the several statements by agricultural witnesses to the effect that there is little potential for generating additional water for environmental uses in the estuary through improvements in the efficiency of agricultural use, except in areas overlying saline groundwater, because excess irrigation water is ultimately recovered and used for other beneficial purposes. This argument is made, for instance, in the direct testimony of Steve Hall for the State Water Contractors and in the testimony of Richard Moss of the Central Valley Project Water Association (WRINT-CVPWA-7).

In brief, the argument is that excess irrigation water either percolates into and replenishes groundwater basins from whence it can be pumped for future agricultural use, or that irrigation runoff augments stream flows or wetland water supply and is thus used beneficially for environmental purposes. This argument is certaiiy true to some degree. But, if taken to extreme, it amounts to a proposition that the only water that can be truly saved in agriculture is through reductions in evapotranspiration or water that is otherwise lost to saline sinks. It implies that, in other areas of the state, water can be saved only by changing crops or fallowing land, but not by changing irrigation practices, improving irrigation timing, switching to modern irrigation technologies, lining canals, or improving water district delivery systems. This rebuttal testimony demonstrates why the fallacies in this argument and shows how agricultural conservation, properly implemented, can free up very substantial quantities of agricultural water for environmental improvement in the estuary.

It easy to eliminate from the debate the secondary use of excessive irrigation water for stream flow and wetland enhancement. Simply stated, that fraction of water saved in agriculture that would otherwise provide such secondary benefits can continue to be allocated to those environmental uses as a first and principal use. The Board can require that this be done within the water rights order that it is crafting in this proceeding. That would avoid the putative adverse impacts to the aquatic environment for which the water users have shown so much solicitude in this proceeding, and thus preserve the exemption from the California Environmental Quality Act on which the Board relies.

The presumed effect of agricultural conservation on groundwater levels has two variants. It is argued that (1) diminution of surface water supplies would cause irrigators to draw more heavily on groundwater thus depleting it more rapidly, or (2) that less deep percolation of irrigation water would deprive the aquifers of recharge that they currently receive. Under either variant, the argument has been made that land subsidence--an adverse environmental effect--would likely result.

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The first argument misapprehends the nature of efficiency improvements which involves applying less water from any source, not merely substituting groundwater for reductions in surface water supply. As NHI testified in its direct testimony, tiered water rates that induce conservation through rational price signals can avoid groundwater substitution by setting the marginal or tail block price at the cost of groundwater supplies.

With respect to the second argument, there are two problems. To the extent that the argument asserts that water applications in excess of evapotranspiration are not lost to the system, it is mistaken; in fact, inefficient application methods appreciably increase water loss to evaporation to the atmosphere. To the extent that the argument claims that excessive irrigation should be maintained as a method of artificial groundwater recharge, the problem is that it tends to recharge groundwater at the wrong time, often in the wrong place, and at larger cost to both the irrigator and the aquatic environment compared to a well-managed conjunctive water use program.

1. Excessive irrigation water is, in part, lost to the system by evaporation:

The traditional way of evaluating water use inefficiency uses a simple water balance equation that fails to distinguish between evapotranspiration (ET) and "effective water". The concept of "effective water" (others may call it efficient water), developed by Caswell and Zilberman and others, means the amount of water consumed by the crops and contributing to crop productivity. Formerly, for convenience, water efficiency has been considered to be identical to ET. Under this erroneous view, irrigation regimes where most of the applied water ends up being used in ET are considered to be highly efficient. But ET consists of two elements--evaporation and transpiration. Transpiration is obviously an efficient use of water, but all water lost to evaporation to the atmosphere is wasted because it is not associated with crop growth or productivity. Thus, for example, in flood irrigation, the ratio of ET to applied water may be very high, but much of the water is wasted due to evaporation that is unconnected with crop production.

Evaporation losses associated with furrow and especially flood irrigation may be relatively high in comparison to drip irrigation, which provides water to the root of the plant but does not irrigate the area between plants. (Of course, the magnitude of the relative loss of water due to evaporation varies across crops during the season and according to the age of perennials.) Drip irrigation is only one example of a technology that reduces evaporation There are many other ways to reduce the evaporation losses even with more traditional technologies. Any modification of this kind requires investments in equipment, modification of irrigation practices, and some research. However, when water is cheap and abundant, farmers do not have any incentives to undertake these water-saving improvements.

Furthermore, there is evidence, which we can discuss in our oral rebuttal testimony, that one can increase water productivity of ET by moving from traditional furrow irrigation to more advanced practices including drip irrigation and improved irrigation scheduling.

Some of the gains in water productivity are associated with a reduction of evaporation losses. Other gains are associated with improving the timing of irrigation by providing water to the crops during times when they need it most. This only reemphasizes the point that there is a substitution between ET and investment in capital and other inputs and that, with higher water prices at the margin (such as is accomplished with tiered water rates), productivity of water will increase because growers will invest in using water more wisely.

2. Excessive irrigation recharges the groundwater at the wrong time:

Viewed as a form of artificial groundwater recharge, excessive irrigation does not make good use of surface supplies when they are most scarce, and therefore of greatest value for other uses, including environmental maintenance in the estuary. The principle purpose of conjunctive use management of surface and groundwater is to store water underground during periods of high-runoff for eventual use during periods of low runoff. This, in effect, increases the yield of developed water and permits expanded use of the resource by all beneficial users, including, potentially, the public trust resources in the estuary. This salutary purpose is frustrated when water is wasted on farms in dry years and allowed to percolate to the aquifer. The water goes to the wrong place at the wrong time.

There is no environmental imperative about the current levels of groundwater. In the Central Valley of California, groundwater levels have varied greatly over the course of this century. As a matter of principle, there is nothing sacred about the level of groundwater at any one point in time: there is no reason why one should rigidly preserve the water table at some specific level regardless of circumstances, including variation in precipitation. The correct management goal is to prevent long-term or permanent depletion. The concept of safe yield anticipates depletion in some years and recharge in others. In other words, groundwater recharge should be accomplished during wetter years as an explicit feature of a conjunctive use management program, not as an incident to poorly-managed irrigation without regard to the competing needs for the resource in drier years.

3. Excessive irrigation recharges the groundwater at the wrong place:

It is a poor agricultural management practice to allow excess irrigation water to accumulate where it cannot be recovered and reused beneficially. That is the situation in large areas on the west side of the San Joaquin Valley, the Tulare Basin and Kern County where a shallow water table and soils laden with salts and toxic trace elements degrade the quality of the groundwater and jeopardize crop productivity. These problems are graphically described in the report of the San Joaquin Valley Drainage Program, entitled "A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990), which has been received into evidence in this proceeding as WRINT-EDF-12. This drainage-problem area, comprising some 1 million acres of irrigated land, is not an area where the fullest beneficially use of the state's waters is well-served by permitting the deep percolation of irrigation water.

Even where the percolating irrigation water or runoff returns to the surface water course, it may contribute to instream flows at the wrong time or at the wrong temperature to help the estuary. Spring-time inflows are of greater value to the delta and Suisun Bay than are flows later in the irrigation season. And, this Board is already well-aware that a critical problem with temperature maintenance in the lower Sacramento River is the influence of warm water discharges from farms.

4. Excessive irrigation recharges the groundwater in an unduly costly manner:

Compared to a well-managed conjunctive use program, excessive irrigation tends to be a costly way to recharge groundwater. It is obviously costly to fish and wildlife resources that are deprived of this water in drier years. But it is also costly to California agriculture.

In the eastern and southern portions of the San Joaquin Valley where groundwater overdraft is severe, the additions to groundwater from over-irrigation have been inconsequential, and certainly offer a poor management strategy for alleviating the overdraft problem. The cost of groundwater depends critically upon how far it must be lifted. Well-managed conjunctive use programs will prefer to store water in aquifers where the water level is relatively close to the surface. Poor irrigation management tends to store the water in underground basins indiscriminately. Where surface water is lost to very deep percolation, it becomes an increasingly expensive resource and, for practical purposes, may be lost permanently. Moreover, portions of the south and southwestern areas of the Valley are underlain by poor quality groundwater. The generally higher quality irrigation infiltration losses are subject to degradation by mixing with these waters.

Also, it appears that, excessive irrigation can actually cost the grower in reduced crop yields compared to advanced irrigation technology and improved irrigation practices. By now, a substantial body of evidence has accumulated showing that it is actually possible to increase yields for a given ET level with improved inputs and improved control over input application.

5. The value of conjunctive use programs as part of a comprehensive water efficiency strategy:

As this rebuttal testimony suggests, programs to recharge groundwater during wetter years would enhance the benefits of agricultural water conservation by allowing irrigation applications to be restricted to the root zone without long-term effects on the groundwater table. NHI strongly favors such programs and has suggested elsewhere some of the steps that could be taken by the State agencies to foster such programs.[1] While some of these

[1] In its response to Governor Wilson's April 6 water policy statement NHI has suggested that the substantial potential from conjunctive use management would be greatly facilitated by state programs to:

steps will require a few years to implement, that need not pose a barrier to aggressive water efficiency improvements in the interim, whether by tiered pricing incentives or otherwise, with the savings dedicated to improving the estuary.

As noted in this testimony, groundwater recharge is not accomplished every water year in a well-managed conjunctive use program. On the other hand, continuing neglect of the water needs of the fishery and marsh resources in the estuary in the immediate term may be a prescription for their permanent loss.

There are water conservation opportunities immediately available to California agriculture that do not affect in any way the contribution to groundwater. Tiered pricing reforms that are crop-neutral will tend to induce a shift away from the relatively water intensive and lower value crops to those that yield a higher return as a function of water applied. Secondly, and importantly, currently levels of irrigated acreage should not be taken as a given simply because the water demands of agriculture have been accommodated by the States water allocation system before those of the estuary were identified. In the past. the area of irrigated acreage has fluctuated in response to all manner of market forces--trends in world agricultural markets, fluctuations in commodity prices. changes in government programs. fluctuations in input prices, higher energy prices, etc. Cropping patterns and irrigated acreages were not insulated from those forces. There is no reason why they should automatically be insulated from any change in water costs or availability stemming from the Board's actions to protect environmental quality in the estuary. Reductions in irrigated agriculture would obviously reduce applications of both surface and groundwater supplies. Such reductions may be necessary until conjunctive use or other water development projects become operative.

In sum. conjunctive management of surface and groundwater is highly desirable, as is using groundwater basins for water supply storage, but we urge the Board to reject the argument that such groundwater recharge should be accomplished on a sporadic and

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--Supply additional surface water supply during wetter than average years to recharge groundwater basins.

--Provide temporary, off-stream surface storage for the additional wet year water collected during the winter for use in groundwater recharge.

--Purchase at firm and attractive rates the surface water entitlements that would be freed up by pumping of the groundwater during drier than average years.

--Investigate and provide better information regarding groundwater geohydrology so that more reliable estimates can be made of the safe yield of the groundwater basins.
--Insure that any net depletion of groundwater--a risk incident to the incomplete understanding of the geohydrologic structures--will be replenished without undue cost to the overlying landowner or water district.

--Construct facilities to recharge basins, pump groundwater and convey it to customers.

incidental basis by over-watering individual farms and without regard to local and regional conditions or other priorities for water use. The irrigator's argument assumes that groundwater replenishment through the random and incidental effects of inefficient delivery systems and poor on-farm irrigation practices is a legitimate goal of the State and Federal water projects. It seems incongruous that publicly-supplied irrigation water should be applied in excess as a groundwater banking technique. This is rather analogous to increasing welfare benefits for purposes of having recipients establish a savings account. It is the more indefensible when the consequence is that another supplicant--in the immediate case, the Bay-Delta estuary--is without the basic requirements of survival.