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<u>Via email</u>

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Re: Comments on the Submitted Groundwater Sustainability Plans for the Upper Valley Aquifer Subbasin, Forebay Aquifer Subbasin, Eastside Aquifer Subbasin, Langley Aquifer Subbasin, and Monterey Subbasin

Dear Mr. Altare:

I write on behalf of LandWatch Monterey County to comment on the Salinas Valley Basin Groundwater Sustainability Agency's ("SVBGSA") Groundwater Sustainability Plans (GSPs) submitted to DWR for the above-referenced subbasins.

To frame our comments, I want to share LandWatch's basic goals in its participation in the SGMA process:

- Achieve verifiable, sustainable groundwater, equitably, at the least cost, and with the fastest implementation, most importantly in the critically overdrafted 180/400-Foot Aquifer Subbasin
- Rely on the best available groundwater science and economics
- Protect existing urban and agricultural groundwater rights

Regrettably, the plans for the five GSPs fail to make material progress toward these goals because they fail to comprehensively propose, let along evaluate, the cost/benefit of projects and policies that are required to achieve compliance with SGMA.

The five plans are for adjacent, overdrafted subbasins in the Salinas Valley. Three of the five subbasins are also adjacent to the critically overdrafted 180/400-Foot Aquifer Subbasin for which DWR approved a GSP in June 2020.

We submit the comments on all five GSPs together because the comments primarily concern the failure to integrate or coordinate the five new GSPs with each other and with the 180/400-Foot Aquifer Subbasin Groundwater Sustainability Plan ("180/4000 GSP"). All six of these GSPs were adopted by the SVBGSA.[1]

DWR should return the five new GSPs to the SVBGSA for revision to comply with SGMA by making the following changes:

1. Identify the projects and management actions that <u>will be</u> implemented when circumstances trigger their implementation, as required by 23 CCR § 354.44(b)(1)(a). As drafted, the GSPs make no commitment to the projects and management actions they describe and instead defer their selection to a future committee process, a process that is not consistent with SGMA's procedure to specify projects and management actions in the GSPs themselves.

   If the GSPs are not revised immediately to identify commitments to projects, management actions, and triggers, DWR should require such revision within 18 months through a Recommended Corrective Action.

2. Identify the specific methods by which the SVBGSA intends to meet the costs of large capital-intensive projects as required by 23 CCR § 354.44(b)(8). It is not sufficient merely to list a set of common financing methods for capital projects as if all of these methods would be applied.

   If the GSPs are not revised immediately to identify financing methods, DWR should require such revision within 18 months through a Recommended Corrective Action.

3. Provide substantial evidence that such financing is feasible based on a demonstration that the SVBGSA would have the necessary financial resources as required by 23 CCR § 355.4(b)(5) and (9). The GSPs provide no evidence that water users would be willing to pay for the water supply projects identified in the GSPs, for which the per-acre-foot water costs would be many multiples of the historic amounts paid for agricultural water supplies and the amounts agricultural users have been determined to be willing to pay for long-term supplies. The GSPs also provide no evidence that water users in multiple subbasins would actually benefit and be willing to pay for the critical multi-subbasin projects described in the Eastside and Monterey subbasin GSPs.

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[1] The GSP for the Monterey Subbasin was jointly adopted by the SVBGSA and the Marina Coast Water District Groundwater Sustainability Agency. The GSP for the Forebay Aquifer Subbasin was jointly adopted by the SVBGSA and the Arroyo Seco Groundwater Sustainability Agency.

If the GSPs are not revised immediately to identify substantial evidence of the feasibility of funding the identified projects and management actions, DWR should require such revision within 18 months through a Recommended Corrective Action. Substantial evidence should require an econometric study of willingness to pay for water projects based on a Salinas Valley farm production model.

4. Address the long-standing stakeholder concerns about equitable allocation of sustainability burdens to each subbasin. The GSPs ignore this issue even though some resolution would be needed to implement any Basin-wide projects or management actions. Indeed, the GSP's aggravate the issue by relying on inconsistent information to prepare water balances.

   The GSPs should be revised to specify necessary data collection and analysis and a data-driven process to support a principled allocation of the costs of Basin-wide projects and management actions.

LandWatch also asks that DWR instruct the SVBGSA to revise the 180/400-Foot Aquifer Subbasin GSP to correct its previous representations to DWR that its projects and management actions will be coordinated among all six Salinas Valley subbasins and paid for through a common Water Charges Framework based on a system of pumping allowances.

Detailed comments in support of these recommendations follow.

A. Selection and funding of proposed projects are not coordinated among subbasins, which is contrary to the 180/400 GSP and to DWR's findings approving it. And the five new GSP's fail to provide the evidence SGMA requires that their proposed projects are financially feasible.

The GSPs are deficient because they contain no clear commitment to a set of integrated Basin-wide projects, as promised in the 180/400 GSP and no evidence of financial feasibility of the projects in the five draft GSP.

1. In approving the 180/400 GSP, DWR relied on the SVBGSA's representation that it will identify a suite of Basin-wide projects needed to attain sustainability, which will be funded through the Basin-wide Water Charges Framework based on pumping allowances, and that this system will be set up by June 30, 2023.

The 180/400 GSP approved by DWR identifies 13 projects that purport to "constitute an integrated management program for the entire Valley," 9 of which are identified as "priority projects." (180/400 GSP, p. 9-25.) The 180/400 GSP states that "[s]ome subset of these priority projects <u>will be implemented</u> as part of the six Salinas Valley Groundwater Subbasin GSPs," although some additional projects may be needed in some basins. (*Id.*) The 180/400 GSP found that the "projects and management actions identified in Chapter 9 are sufficient for attaining sustainability in the 180/400-Foot Aquifer Subbasin as well as the other five subbasins in the Salinas Valley Groundwater Basin." (*Id.*, p. 10-9.)

The 180/400 GSP provides that a "water charges framework" ("WCF") will be implemented basin-wide in order to fund these projects and to deter pumping in excess of groundwater allowances. (180/400 GSP, pp. 9-2 to 9-4.) The WCF is to be based on tiered charges for different levels of groundwater pumping. Tier one charges would be based on a "Sustainable Pumping Allowance," and its revenues would cover just the SVBGSA administration. Tier 2 and 3 charges would be assessed for amounts in excess of a "Transitional Pumping Allowance" and, after the Transitional Pumping Allowances are phased out, for amounts in excess of the Sustainable Pumping Allowance. Tier two and three revenues would be used to fund the new water supply projects. The pumping allowances and fee structures were to be separately determined for each subbasin, so they would not be uniform for each subbasin; but a system of tiered charges for each subbasin would be included "in the final water charges framework agreement." (*Id.*, p. 9-4.)

In approving the 180/400 GSP, DWR relied on the feasibility and likelihood of the integrated set of Basin-wide projects funded by a Basin-wide WCF:

> The projects and management actions designed to eliminate overdraft and prevent seawater intrusion are reasonable and commensurate with the level of understanding of the basin setting, as described in the Plan. The water charges framework, at this time, appears feasible and reasonably likely to mitigate overdraft, which is an important management action to help prevent undesirable results and ensure that the 180/400 Foot Aquifer Subbasin is operated within its sustainable yield.

(DWR, Statement of Findings Regarding The Approval Of The 180/400 Foot Aquifer Subbasin Groundwater Sustainability Plan, June 3, 2021, p. 2.) DWR found:

> To achieve sustainability, the Plan proposes to assess fees for groundwater extraction and use these funds to implement other projects or management actions, as needed. The proposal to charge fees for extraction is called the water charges framework and involves a three-tiered system where groundwater users will be charged a series of fees based on the volume of annual groundwater extraction. The proposal includes exemptions for some groundwater pumpers, including de minimis users that will not be included in the fee program. The foundation of the water charges framework is a sustainable pumping allowance that each parcel will be allocated based on the calculated sustainable yield. Groundwater users will be allowed to pump more than their sustainable allocation; however, this additional pumping (supplemental pumping) will be subject to higher extraction fees. The proposed water charges framework is also

> <u>proposed to be instituted in the other five groundwater subbasins overseen by the SVBGSA, representing a Salinas Valley Basin-wide management action</u>.

(*Id.*, p. 5, emphasis added.) DWR concluded that the "<u>fundamental structure</u> of groundwater management in the Subbasin is a management action called the water charges framework." (*Id.*, p. 31, emphasis added; see also *id.*, p. 33.) DWR found that "implementation of projects will depend, fully or partially, on revenue generated by the proposed water charges framework." (*Id.*, p. 13; *see also id.*, p. 33, 6.)

The 180/400 GSP requires development of the WCF by January 31, 2023 <u>for all six subbasins</u>:

> Details of the water charges framework for all six subbasins will be developed during the first three years of this GSP's implementation through a facilitated, Valley-wide process. This process will be similar to the successful facilitated process that resulted in the SVBGSA serving as the GSA for some or all parts of all six subbasins. The result of this facilitated process will be an agreement on the financing method approved by the SVBGSA. The facilitation will be complete by January 31, 2023, and the financing method will be implemented in all six subbasins immediately following.

(180/400 GSP, p. 10-4.) The 180/400 GSP also requires refining the list of projects intended to support the integrated management of the entire Basin on the same schedule:

> An additional benefit of refining the projects during the first three years of implementation is that this approach complements the approach for refining the water charges framework, as outlined in Section 10.2. Refinement of the projects and actions will occur simultaneously with refinement of the funding mechanism that supports the projects and actions. By refining all of these plans simultaneously, the funding mechanism and the projects will all be in place by June 30, 2023. Projects and management actions will then be immediately implemented in a coordinated fashion across the entire Salinas Valley Groundwater Basin.

(*Id.*, p. 10-10.)

Since the WCF is based on pumping allowances, these pumping allowances must be determined on the same schedule:

> This GSP proposes a water charges framework that provides incentives to constrain groundwater pumping to the sustainable yield while generating funds for project implementation. <u>The framework creates sustainable pumping allowances</u>, charging a Tier 1 Sustainable Pumping Charge for pro-rata shares of sustainable yield, Tier 2 Transitional Pumping Charge to help users transition to pumping allowances, and higher Tier 3 Supplementary Pumping Charge for using

> more water. Pumping allowances are not water rights, but would be established to incentivize pumping reductions.

(*Id.*, p. ES-14.) The Sustainable Pumping Allowance is the "base amount of groundwater pumping assigned to each non-exempt groundwater pumper. The sum of all sustainable pumping allowances and exempt groundwater pumping is the sustainable yield of the Subbasin." (*Id.*, p. 9-3.) Pumping allowances "are not water rights. Instead, they are pumping amounts that form the basis of a financial fee structure to both implement the regulatory functions of the SVBGSA <u>and fund new water supply projects</u>." (*Id.*)

In sum, DWR relied on the 180/400 GSP's Basin-wide plan to determine pumping allowances, set the tiered rates for the WCF, and select the basin-wide projects to be financed by January 2023 for all six subbasins.

2. The five draft GSPs are inconsistent with the 180/400 GSP because they do not rely on, assume, or identify a common set of Basin-wide projects and do not include participation in a Basin-wide Water Charges Framework.

Each of the five GSPs identify a different set of projects, which are also different than the projects identified in the 180/400 GSP. (Compare Tables 9-1 in each GSP.) There is little overlap among the projects, and there are no projects that are common to all of the GSPs.

Furthermore, both the Upper Valley Aquifer ("UVA") and Forebay GSPs expressly reject the Water Charges Framework. (Forebay GSP, pp. 10-15 to 10-16; UVA GSP, pp. 10-15 to 10-16.) The Eastside, Monterey, and Langley GSP's do not mention the water charges framework in their discussions of funding options. (Eastside GSP, p. 10-15; Monterey GSP, p. 10-23; Langley GSP, p. 10-15.)

At this point, the SVBGSA has effectively cast aside the "fundamental structure" on which DWR relied to approve the 180/400 GSP because the five new GSPs no longer propose a Basin-wide Water Charges Framework or a common set of Basin-wide projects to attain sustainability. (DWR, Statement of Findings Regarding The Approval Of The 180/400 Foot Aquifer Subbasin Groundwater Sustainability Plan, June 3, 2021, p. 31.)

If DWR approves the five new GSPs as written, it must require the SVBGSA to fundamentally revise the 180/400 GSP, which would no longer be viable if other subbasins do not adopt a common set of Basin-wide projects and participate in the funding system identified by the 180/4000 GSP.

3. The UVA and Forebay GSPs do not require, and presumably will not fund, common Basin-wide projects.

The only project listed by the UVA GSP and Forebay GSP that is common to some of the other GSPs is the Multi-benefit Stream Channel Improvements. This project is included in the Eastside and Monterey GSPs, and one component of this project, the Invasive Species Eradication, is described by the 180/400 GSP. But the Multi-benefit Stream Channel Improvements project is expected to benefit primarily the GSP's along the Salinas River, rather than the Langley or Eastside subbasins, and it is not even included in the Langley GSP. Indeed, the GSPs do not estimate any benefits to the Monterey, Eastside, and Langley Subbasins from this project. In sum, there is no meaningful overlap of the projects and management actions proposed by the UVA and Forebay GSPs and the other four GSPs.

Furthermore, because neither the UVA nor the Forebay GSP acknowledge an overdraft condition (UVA GSP, pp. 6-20, 6-22; Forebay GSP, pp. 6-21, 6-23, 6-39, 6-40, 6-42), neither the UVA GSP nor the Forebay GSP actually purport to require any projects to attain sustainability. (UVA GSP, p. 9-1; Forebay GSP, pp. 9-1 to 9-3.) The UVA GSP states that no projects are necessary even to maintain sustainability. (UVA GSP, p. 9-1.) And the Forebay GSP does not commit to any particular project to maintain sustainability, disavows any commitment to specific projects, and merely pays lip service to integrated planning. (Forebay GSP, pp. 9-1 to 9-3.)

Thus both the UVA and Forebay GSPs state unequivocally that management actions and projects are not needed to maintain sustainability at this time. (Forebay, GSP, p. 10-9; UVA GSP, p. 10-9.)

At this point, no GSP can be predicated on the assumption that the Forebay and UVA water users would agree to provide funding for any large Basin-wide capital projects, either through the Water Charges Framework or through a Proposition 218 vote. Thus, to the extent that the Eastside, Langley, and Monterey GSPs assume funding contributions from the Forebay and UVA subbasins, the five draft GSPs are inconsistent on their faces and should not be approved. At minimum, the project discussions in the Eastside, Langley, and Monterey GSPs should be revised to make clear that the proposed projects do not rely on funding contributions or project-participation from the Forebay and UVA subbasins.

Alternatively, if the lack of commitment to projects in the UVA and Forebay GSPs is based on inaccurate water budgets and if there is in fact an overdraft condition that must be remedied, the UVA and Forebay GSPs should be revised. Indeed, stakeholders have expressed concern that the GSPs are not integrated, that the water budgets for the GSPs are not based on consistent data and modeling, and that the GSPs fail adequately to analyze impacts to adjacent subbasins.[2] Stakeholders have also objected that the lack of

[2] See, e.g., Stephanie Hastings, letter to Donna Meyers et al, Oct. 15, 2021, re Draft Groundwater Sustainability Plans for the Upper Valley, Forebay, Eastside, Langley, and Monterey Subbasins of the Salinas Valley Groundwater Basin, available at pdf pages 488 et seq. at https://svbgsa.org/wp-content/uploads/2021/12/Compiled-Forebay-Appendices-All-Volumes.pdf.

commitment to projects and management actions in the UVA and Forebay GSPs may represent an inequitable resolution of basin-wide sustainability problems.[3] The GSPs fail to acknowledge the conflicting views on the adequacy of the various GSPs or to set out a clear mechanism to resolve it.

4. The Eastside, Langley, and Monterey GSPs do not propose a common set of Basin-wide projects and do not provide the evidence required by SGMA that any large capital projects that benefit multiple subbasins are financially feasible.

Contrary to the expectation set up by the 180/400 GSP, there is no common set of Basin-wide projects proposed by the GSPs. Although there are several large capital projects that are listed by more than one of the GSPs, the GSPs fail to provide evidence that these projects are financially feasible. This failure is because the GSPs do not address the critical question of the willingness to pay for the water these projects might deliver.

For agricultural uses, irrigation water is an input to production, so the maximum value of water is constrained by expected returns. There must be some price beyond which agricultural users will not pay for water projects. Is it $500 AF? $750 AF? $1,000 AF? $1,500 AF? And how much water would be demanded at each of these prices? What does the demand curve for agricultural water supply look line in the Valley? The GSPs simply fail to address these critical questions.

Water markets provide some evidence of willingness to pay. Although some farmers have reportedly paid as much as $2,200 per AF for some amounts of water for high value crops (e.g., on a short term basis to protect investments in permanent crops), the average NASDAQ Veles California Water Index water futures price is now only $686 AF, an extraordinarily high price attained only as a result of a long drought period[4] Agricultural water has reached market prices in the $500 to $1000 range only in times of water stress.[5]

Research by the Public Policy Institute based on econometric analysis by UC Merced researchers establishes that most farmers in the San Joaquin Valley would not be willing to pay more than $300 to $500 per AF for new long-term supplies:

> Our economic model of valley agriculture (described below) provides some guidance on how much farmers would be willing to pay for additional long-term water supplies. This price is the profit farmers can earn with an additional acre-

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3 Id.

4 Aquaoso, California Agricultural Water Prices by Water District, June 17, 2021, available at https://aquaoso.com/blog/california-agricultural-water-prices/.

5 *Id.*

> foot of water; above this level, it is more economical for them to reduce water use and irrigated acreage. A small number of farmers might be willing to pay a very high price—as much as $900/acre-feet (af)— to avoid long-term fallowing of some very profitable lands. And to cope with temporary shortages—such as at the height of the 2012–16 drought—some farmers will pay top dollar for water to keep their orchards alive. [footnote omitted] But with available options, most valley farmers will not be willing to pay more than $300 to $500/af for new long term supplies.[6]

That research establishes that many San Joaquin Valley farmers would be willing to forego water supplies at much lower unit costs, leading to the conclusion that investments are unlikely in projects costing more than $500 per AF:

> For more than half of valley cropland, the cut-off price would be much lower, because an additional acre-foot of water would generate less than $200 in added profits. This difference in the profitability of water in different uses drives incentives to trade water. When valley-wide surface water markets are allowed, the price of water in the market falls to about $185/af. In our analysis of willingness to pay, we consider farmers' water demand with and without valley-wide trading under current conditions, and we also consider the possibility that profitability of farm water use may increase by up to 25 percent from shifts toward more profitable crops, higher prices for farm output, or cost-reducing technology. With this higher profitability and no valley-wide water trading, some farmers would be willing to pay more than $500/af to acquire up to 340 taf of new supplies. With more limited increases in profitability and some valley-wide trading, farmers would only be willing to pay this price for up to 100 taf. We assume farmers would seek to invest in less expensive projects where feasible, however. This reduces the likelihood of investments in projects costing more than $500/af. See Technical Appendix D for details.[7]

Based on this analysis, the research concludes that the San Joaquin Valley farmers would only be willing to invest in a subset of the potential new water supply projects – those with the lowest cost, such as reservoir reoperation and some groundwater recharge projects.

Salinas Valley farmers may be willing to pay higher prices for long term water supplies than San Joaquin Valley farmers based on higher land productivity. However, there is clearly a limit.

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[6] Hanak et al, Water and the Future of the San Joaquin Valley, p. 22, Feb. 2019, available at https://www.ppic.org/wp-content/uploads/water-and-the-future-of-the-san-joaquin-valley-february-2019.pdf.

[7] Id., fn. 34.

The analysis of fallowing and agricultural land retirement in the Eastside, Langley, Upper Valley, and Forebay GSPs indicates the limits to willingness to pay for water supplies by identifying the opportunity cost (i.e., lost profits) for not farming. Based on local land values, water usage per acre, and cover crop costs, these analyses conclude that farmers would be willing to fallow land, thereby making its water available to others, at costs of between $195 to $1,730 per AF.[8] As in the analysis of San Joaquin Valley willingness to pay, the opportunity cost would be lower for those farms with lower profitability per acre-foot, so a fallowing program designed to generate a particular volume of pumping reductions to attain sustainability would not necessarily need to be based on the higher prices at which farmers would be willing to participate in a fallowing program.

If Salinas Valley agricultural users would find it more profitable not to use water at all when it is worth more than these fallowing cost estimates, it is not reasonable to suppose that they would vote to assess themselves for a capital project that produces water at higher costs per acre foot. Projects intended to produce agricultural water supplies at costs greatly in excess of the cost of water produced by a fallowing program may not be financially feasible.

Despite this, the GSPs propose large capital water projects with unit costs well in excess of $1,000 per AF.[9] For example, the Eastside GSP identifies the Chualar and Soledad diversion projects using the 11043 surface water rights as costing $55 million and $104 million respectively. The 6,000 AFY provided by these diversion projects would cost $1,280 and $2,110 per AF respectively. The projects would benefit Eastside and 180/400 water users, but there is no analysis in either the Eastside GSP or the 180/400 GSP that would support the assumption that agricultural users would be willing to pay that much for water.

Similarly, both the Monterey and Eastside GSP's identify winter reservoir releases with Aquifer Storage and Release ("ASR") as a potential project, costing $172 million to provide 12,900 AFY at a unit cost of $1,450 per AF. Both the Monterey and Eastside GSPs say that the distribution of benefits would be determined through a benefits assessment. But there is simply no analysis that supports the assumption that there is a willingness to pay $1,450 per AF for agricultural water, much less to do so through a long term commitment in a Proposition 218 vote or through adoption of a Water Charges Framework.

The Eastside and Monterey GSPs both identify a Regional Municipal Supply project that is based on desalinating brackish water pumped from a seawater intrusion barrier. The

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[8] See Tables 9-1 in the various GSPs.

[9] By contrast, many of the projects that are proposed to benefit only one subbasin are more modest in scale and in price per AF.

unit cost for desalinating this water would come to $2,900 per AF, to which must be added the $1,200 per AF to pump the source water from the seawater intrusion barrier. While municipal users are willing to pay more than agricultural users for water, there is no analysis in the Eastside and Monterey GSPs of how the costs would be allocated between agricultural and urban beneficiaries or whether either group would be willing to pay as much as $4,100 per AF for this water, which they now enjoy for the cost of pumping.

Some proposed large capital projects may make sense financially. The 3,500 acre expansion of the Castroville Seawater intrusion Project ("CSIP"), identified in the Langley and Eastside GSPs, and proposed in the 180/400 GSP, could proceed based on the existing CSIP model if the expanded benefit assessment district is willing to assess itself $630 per AF for this water. Similarly, the direct delivery (as opposed to the aquifer storage and recovery) of winter release surface water for MCWD's winter urban demand at $1,100 per AF may make sense given the likely willingness of new urban customers to pay higher rates.

Critically, however, the GSPs do not reflect any prior analysis of willingness to pay for capital water projects.

Each of the GSPs should be revised to include a discussion of likely willingness to pay for the proposed capital projects and the likely financial feasibility of proposed projects. The discussion should reflect whether the large capital projects are scalable and whether sufficient numbers of water users would be willing to pay the average cost per AF to actually cover the minimum scale project's entire cost. The willingness of one water user to pay the average cost per AF is not evidence that the entire project can be funded.

Without an analysis of the willingness to pay for large capital projects, especially those projects for which the cost per AF is in excess of $500, the GSP's should not be approved by DWR. SGMA requires that a GSP include both the estimated cost for each project and "a description of how the Agency plans to meet those costs." (23 CCR § 354.44(b)(8).) DWR must have substantial evidence to support a finding that the projects are "feasible" and that the GSA "has the financial resources necessary to implement the Plan." (23 CCR § 355.4(b)(5),(9).)

The GSP's do not provide evidence that funding is actually feasible. Their discussions of project funding merely list the kinds of funding arrangements that are commonly used for large capital projects. (Eastside GSP, p. 10-15; Monterey GSP, p. 10-23; Langley GSP, p. 10-15; UVA GSP, p. 10-15; Forebay GSP, p. 10-15.) As noted, the UVA and Forebay GSPs do not propose to provide <u>any</u> project funding because they determine that no projects are actually needed to attain sustainability and they specifically reject participation in the Water Charges Framework. (Forebay GSP, p. 10-15 to 10-16; UVA GSP, p. 10-15 to 10-16.) Merely listing the kinds of arrangements that can <u>conceptually</u> be used to fund projects does not explain how the SVBGSA could <u>actually</u> meet their costs, especially where there is substantial uncertainty about willingness to participate in these funding arrangements.

The findings that projects are financially feasible are particularly critical for the Eastside and Monterey Subbasins because they depend on the success of high capital, multi-subbasin projects to address overdraft conditions. (Eastside GSP, pp. 9-103 to 9-104; Monterey GSP, p. 9-105.)

For example, the Eastside Subbasin GSP's projected 2030 overdraft is 20,400 AFY. (Eastside GSP, p. 6-27.) Although the Eastside GSP rejects its own modeling of future conditions and relies instead on an estimated historic overdraft of only 10,000 AFY (id.), there is clearly a need to provide substantial new water supplies or make pumping reductions. The Eastside GSP proposes a number of multi-subbasin infrastructure projects intended to provide additional water supplies. Considering just those projects that would provide more than a 1,000 AFY benefit, there is a wide range of benefit volumes and costs per acre-foot:

- The proposed Regional Municipal Supply project would supply 15,000 AFY of desalinated water to north County urban and agricultural users at a cost per AF of $4,033 to $4,146. Some portion of which would benefit the Eastside.[10]

- The Somavia Road project would move 3,000 AFY of groundwater from the 180/400 Subbasin to the Eastside Subbasin at $3,980 per AF. (Eastside GSP, p. 9-5.)

- The diversion of surface water using the 11043 Water Rights at Chualar or Soledad at $1,280 or $2,110 per AF respectively would provide 6,000 AFY to the Eastside. (Id.)

- Winter Releases with Aquifer Storage and Recovery would supply 12,900 AFY for ASR injection at $1,450 per AF or direct winter use by urban suppliers of a

[10] The capital cost for the desalination plant and distribution pipelines would be $385-$393 million. (Eastside GSP, pp. 9-50 to 9-56; see also Monterey GSP, pp. 9-31 to 9-32.) This project would only be built as a supplement to the $102 million sea water intrusion barrier project, from which it would obtain brackish source water, so the total capital cost would be $487-$495 million. O&M for the desalination plant portion would be $13.2-$13.4 million, presumably in addition to the $9.8 million O&M for the seawater intrusion barrier, resulting in a total annual O&M cost of about $25 million. Over 30 years at a 3% discount rate, the present value of the cost of this 15,000 AFY project would come to $977-985 million. The reported cost per acre-foot for this water for just the desalination plant would be from $2,833 to $2,946. The cost of source water provision from the seawater intrusion barrier would add $1,200 per acre-foot, bring total cost to $4,033 to 4,146 per acre-foot. (Monterey GSP, p. 9-32.)

3,600 AFY portion at $1,100 AFY, some portion of which would benefit the Eastside. (Eastside GSP, p. 9-7, Monterey GSP, p. 9-9.)

- Expansion of CSIP would provide 9,900 AFY of recycled and river water for agriculture at $630 per AF, some portion of which would benefit the Eastside. (Eastside GSP, p. 9-6.)

- The multi-benefit Stream Channel improvements program might supply from 2,780 to 20,880 AFY at a cost of $60 to $600 per AF, but it is not yet clear what subbasins would benefit. (Eastside GSP, p. 9-7.) The primary benefits would be to those basins adjacent to the River; the Eastside may get unspecified indirect benefits.

- The Interlake Tunnel would increase recharge to multiple subbasins by 32,000 AFY at a capital cost of $180.8 million and an unspecified operating cost. (Eastside GSP, pp. 9-8, 9-87.)[11] No costs per AF are identified in the GSP and it is not clear to which subbasins the benefits would accrue.

There is insufficient information in the GSP to determine whether some combination of these projects could provide the Eastside Subbasin the needed new water supplies. First, there is no clarity what portion of the multi-subbasin projects would benefit the Eastside. But, more problematically, there is simply no evidence that water users would be willing to pay costs per acre-foot estimated in the GSPs.

Similarly, there are no demonstrably economically feasible project proposals to address the 10,900 to 8,600 AFY overdraft and continuing seawater intrusion in the 180/400 Subbasin (180/400 GSP, p. 9-87). And since attainment of Monterey Subbasin sustainability is expressly made dependent on the success of projects to control overdraft and seawater intrusion in the adjacent 180/400 GSP (Monterey GSP, p. 9-105), there is no assurance that sustainability in the Monterey Subbasin is economically feasible either.

Even if the GSPs are not revised to provide financial feasibility information, their implementation chapters should be revised to require that the missing analysis of willingness to pay is developed. The Langley, Forebay, and UVA GSPs simply punt the issue to the other GSPs by providing that no major projects will move forward unless they are initiated by other subbasins. (Langley GSP, p. 10-11; UVA GSP, p. 10-9; Forebay GSP, p. 10-9.) The Eastside and Monterey GSPs' implementation plans discussion of project planning and selection make no reference to any plan to determine what multi-subbasin projects and management actions are financially feasible. (Eastside GSP, pp. 10-10 to 10-11; Monterey GSP, p. 10-13.)

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[11] Eastside GSP, p. 9-7, 9-95.

B. The GSPs fail to acknowledge or address the long-standing stakeholder concerns about equitable allocation of sustainability burdens to each Salinas Valley subbasin.

As noted, stakeholders have objected that the lack of commitment to projects and management actions in the UVA and Forebay GSPs may represent an inequitable resolution of basin-wide sustainability problems.[12] These objections mirror a longstanding concern that the Basin-wide investments in water management projects have not been made equitably and/or that the existing infrastructure has not been operated fairly. For example, a 1995 white paper prepared for MCWRA by group of ten hydrologists working in the Salinas Valley Groundwater Basin explains that the benefits of the San Antonio and Nacimiento reservoirs, the two major capital projects, have not been equitably distributed because the entire scope of the project has never been completed.[13]

The white paper explains that DWR's 1946 Bulletin 52 recommended construction of reservoirs and conjunctive use facilities using available groundwater storage capacity in the Forebay Subbasin to support groundwater transfers to the north for in-lieu recharge to address overdraft and seawater intrusion in the Eastside and 180/400 aquifers. Although the reservoirs were built, the transfer facilities to implement conjunctive use based on available groundwater storage capacity was not completed. Thus the benefits of the reservoirs were not equitably distributed:

> The dams that were recommended have been constructed, but the companion transfer facilities have not been constructed. The result of partially completing the project has been an uneven distribution of benefits throughout the Valley. The Forebay Area and Upper Valley Areas have enjoyed relatively large benefits from San Antonio and Nacimiento reservoirs that would have been shared equally with the Pressure and East Side Areas if the intended transfer facilities had been built. In the absence of the transfer facilities, seawater intrusion into the Pressure Area and water-level declines within the East Side Area have not been mitigated.[14]

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12 Stephanie Hastings, letter to Donna Meyers et al, Oct. 15, 2021, re Draft Groundwater Sustainability Plans for the Upper Valley, Forebay, Eastside, Langley, and Monterey Subbasins of the Salinas Valley Groundwater Basin, available at pdf pages 488 et seq. at https://svbgsa.org/wp-content/uploads/2021/12/Compiled-Forebay-Appendices-All-Volumes.pdf.

13 Hydrogeology And Water Supply Of Salinas Valley, A White Paper prepared by Salinas Valley Ground Water Basin Hydrology Conference For Monterey County Water Resources Agency, June 1995, pp. 15-16.

14 Id., p. 16.

The dams altered land use in the mid-Valley region by bringing 37,000 acres of viticulture into production, which was perceived to have made the overdraft and seawater intrusion in the north worse:

> The favored solution to the problem was management of the flow of the valley's principal river to enhance percolation from the riverbed to the aquifer system. This would minimize overdraft and, theoretically, salt intrusion. With the construction of two dams at the far inland reach of the river, the problem was believed solved. One dam was constructed in the mid-1950s on the main river; the other was constructed on a principal tributary within a few miles of the first in the early 1960s (Fitzsimmons, 1983).
>
> This solution eventually proved to be problematic because of the unanticipated impact of the dams on land use in the valley. The dams provided a more reliable source of water in the middle and inland reaches of the basin. Vineyards were installed on 37,000 acres of bottomlands and benchlands, and new wells were drilled to irrigate them, producing a new demand for 55,000 acre-feet of water annually. Truck crop cultivation expanded to include 5,000 new acres, more than quadrupling the acreage farmed during World War II. By the mid-1970s, growers in these newly cultivated acreages were withdrawing proportionately larger amounts of water at a greater rate than those closer to the coast. Those closer to the coast had actually decreased their water use, but the depth to ground water in this area was nevertheless increasing. It was decreasing in the more inland area of the valley because of recharge from dam releases. Of course, salt intrusion continued to increase (Fitzsimmons, 1983).
>
> Substantial inequities were apparent. The dams were financed by ad valorem property taxes. Since growers in the coastal region and some of the midbasin areas had the most valuable land, they paid the largest share of the project costs. The taxing procedure also included urban landowners who were said to benefit from the economic well being of agriculture. The unforeseen development and use of water in the mid- and far-inland acres of the basin resulted in disproportionate benefits to growers in this area regarding tax contributions. Moreover, it did not improve and might have aggravated salt intrusion (Fitzsimmons, 1983).[15]

[15] John Thompson and Robert Reynolds, Jr., Cultural Evolution and Water Management in the Salinas River Valley, Journal Of The American Water Resources Association, Dec. 2002, pp. 1668-1669.

Efforts to pursue the mid-Valley well field "collapsed at a public hearing in the spring of 1992 under the weight of contradictory testimony and resistance by many growers, particularly those in the vicinity of the proposed well field."[16]

Nonetheless, the 1995 white paper urged completion of the transfer facilities based on a mid-valley well field as proposed as the second phase of DWR's Bulletin 52 recommendation because it remains the most effective and equitable sustainability path:

> With transfers, benefits would be distributed more uniformly throughout the Valley. Without transfers, the benefits would continue to be weighted toward the Forebay and Upper Valley Areas.[17]

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However, instead of the well-field, MCWRA implemented two other projects, the Castroville Seawater Intrusion Project using recycled water for coastal in-lieu recharge, and the Salinas Valley Water Project, relying only on redistribution of <u>surface</u> water storage. The perception that burdens and benefits from these subsequent water management projects are inequitably shared persisted.[18] Objections have been made by both sides in support of these claims.

The GSPs for the 180/400, Monterey, and Eastside subbasins make clear that additional projects or management actions are required to halt seawater intrusion and address overdraft. Regardless whether a Basin-wide solution implements groundwater transfers or relies only on surface water movements, most of the identified solutions would move water from the south to the north. Preliminary cost estimates in the GSPs suggest that moving water from the south to the north to restore protective elevations to halt seawater intrusion may be substantially less expensive on a per acre-foot basis than projects that do not move water between subbasins. For example, the Regional Municipal Supply/ extraction barrier project proposed in the 180/400 GSP is much more expensive on an absolute and per acre-foot basis than water-moving projects. However, without the cooperation and coordination of multiple subbasins, water moving projects may not be feasible.

The GSPs' failures to coordinate projects and management actions to resolve, or to set up a clear mechanism to resolve, the longstanding concerns about north/south equity should

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[16] Id., p. 1670.

[17] Hydrogeology And Water Supply Of Salinas Valley, A White Paper prepared by Salinas Valley Ground Water Basin Hydrology Conference For Monterey County Water Resources Agency, June 1995, p. 17.

[18] See, e.g., John Thompson and Robert Reynolds, Jr., Cultural Evolution and Water Management in the Salinas River Valley, Journal Of The American Water Resources Association, Dec. 2002, pp. 1670..

be remedied. At minimum, the GSPs should identify a workable process and decision path to resolve north/south equity concerns and to select and implement a suite of projects and management actions to attain sustainability. At minimum, the GSPs should identify analytic tasks that are necessary to a north/south resolution, such as analyses of intersubbasin groundwater and surface water flows and recharge under different pumping regimes and a comparison by subbasin of the incurred financial costs (assessments) and actual benefits from existing and proposed groundwater management projects.

Equally important is that the GSPs should specify a process to develop a principled allocation of the costs of multi-subbasin projects and management actions using the data generated by these analyses. For example, a hydrological analysis of the effects of subbasin extractions on inter-subbasin subsurface flows, or an analysis of the historical subbasin benefits and assessments for past groundwater management projects, are of no use without a principled agreement as to how such analyses can be used to determine cost or benefit sharing arrangement. The GSPs implementation sections should be revised to require that the SVBGSA directly take on the issue of inter-subbasin cooperation. This issue is too important to leave out of the public participation process under SGMA.

C. Inadequate comment responses

LandWatch raised many of the foregoing objections in comments on the draft GSPs.[19] However, the GSP failed to respond meaningfully to the comments by revising the GSP or by explaining why the requested revisions were not required.

LandWatch objected that the SVBGSA has not fulfilled its commitment to DWR in the 180/400 GSP that it will identify a suite of Basin-wide projects needed to attain sustainability, which will be funded through the Basin-wide water charges framework based on pumping allowances, and that this system will be set up by June 30, 2023.[20] In response, the GSPs first state that neither the "180/400 GSP nor DWR's review of it commit SVBGSA to anything in other subbasins."[21] This response is inconsistent with the 180/400 GSP because its sustainability findings depend on the implementation of a set of specific "priority projects," which it describes as an integrated suite of Basin-wide projects. (180/400 GSP, p. 9-25.) If that suite of projects is no longer to be included in

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19 John Farrow, letter to Colby Pereira, Chairperson, SVBGSA, Oct. 14, 2021, available at pdf pp. 329 et seq at https://svbgsa.org/wp-content/uploads/2021/12/Compiled-Eastside-Appendices-All-Volumes.pdf.

20 Id., pp. 1-7.

21 Eastside Subbasin Comment Table through 10/20/21.xlsx, available at https://svbgsa.org/wp-content/uploads/2021/11/Eastside-Comment-Letters-Responses-102621.pdf. The same responses were made in the comment tables for the Langley, Upper Valley, and Forebay GSPs.

the GSPs for other subbasins, the 180/400 GSP is no longer a realistic plan for sustainability.

The response then admits that the priority projects described in the 180/400 GSP are not needed by the other subbasins and that those subbasins will not participate in the Water Charges Framework described by the 180/400 GSP as the financing mechanism for the suite of Basin-wide projects:

> Not all the subbasins need all the projects or management actions that are planned in other subbasins. The projects included in the Eastside, Langley, Forebay, Upper Valley, and Monterey GSPs are not dependent on the water charges framework for funding. They took a different approach and <u>described all potential funding mechanisms</u> due to the recognition that the appropriate funding mechanism varies according to the specific project.[22]

The decision to abandon the previously proposed Water Charges Framework is inconsistent with the 180/400 GSP, which states that all of the subbasins will adopt the Water Charges Framework. (180/400 GSP pp. 9-2 to 9-4.)

Furthermore, the decision to simply describe "all potential funding mechanisms" instead of describing the <u>actual</u> funding mechanism proposed for the GSP projects, violates SGMA's requirement that the GSP include a "description of the estimated cost for each project and management action <u>and a description of how the Agency plans to meet those costs</u>." (23 CCR § 354.44(b)(8).) There is no clear plan for how the SVBGSA would meet the costs of the proposed projects identified in the four draft GSPs

The response then undercuts any actual commitment to the various projects described in the four draft GSPs. In addition to acknowledging that the 180/400 GSP's Basin-wide priority projects are not needed by the other subbasins, the response expressly leaves open the possibility that the "Subbasin Implementation Committees and Integrated Implementation Committee" may decide <u>not</u> to pursue <u>any</u> of the projects described in the four draft GSPs:

> The projects for the Eastside, Langley, and Monterey Subbasins were determined by the Subbasin Planning Committees. Each subbasin is unique and while there are some projects that are currently conceptualized as being multi-subbasin, the details are to be determined during GSP implementation. Project costs are still being refined but the GSP provides initially estimates. The Subbasin Implementation Committees and Integrated Implementation Committee will determine if <u>**any**</u> of these projects will be used to achieve or maintain

22 *Id.*, emphasis added.

> sustainability and will subsequently refine the scoping, costs, and funding approach.[23]

The failure of the draft GSPs to make clear commitments to projects and management actions and their deferral of the formulation and selection of projects to the future violates SGMA. SGMA requires that "each plan shall include a description of the projects and management actions the agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin." (23 CCR § 354.44(a).) The GSP must include the projects and management actions that are "proposed in the plan." (23 CCR § 354.44(b)(1).) The GSP must also state "the circumstances under which projects or management actions **shall** be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the agency **shall** determine that conditions **requiring** the implementation of particular projects or management actions have occurred." (23 CCR § 354.44(b)(1)(a).) The use of mandatory language (e.g., "shall be implemented"), and the requirement that the GSP spell out the process that will determine that implementation is required, clearly contemplates a commitment to the projects proposed in the GSP, not merely a description of a set of some projects that might or might not be implemented.

The deferral of project identification and description to some ad hoc future committee process outside the GSP formulation process fails to comply with SGMA's mandate that the SVBGSA prepare and adopt Groundwater Sustainability Plans that describe real plans for projects and management actions and its mandate for public participation in the planning process culminating in a GSP. And the failure to make any real commitment to projects and management actions renders the DWR approval of a GSP pointless.

Finally, the comment responses simply ignore LandWatch's objection that there is no evidence of financial feasibility and substantial evidence that the projects are not feasible. Infeasibility is apparent from the unwillingness of multiple subbasins to pay for basin-wide projects as evidenced by the omission of those projects from their GSPs, and, for the Upper Valley and Forebay GSPs, their conclusions that no projects or management actions are needed. (Forebay, GSP, p. 10-9; UVA GSP, p. 10-9.) Infeasibility is also evident from the exorbitant estimated costs per acre-foot for the proposed projects. LandWatch objected that the SVBGSA proposed projects that would cost well in excess of agricultural water users' likely willingness to pay, and that the GSP's fail to provide any discussion or evidence of willingness to pay. For example, LandWatch provided evidence that water users are unlikely to finance water projects which would provide water at costs in excess of $1,000 per acre-foot. The comment responses did not address LandWatch's objections that (1) the GSPs fail to provide evidence of willingness to pay

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[23] *Id.*, emphasis added.

and (2) available evidence indicates that the proposed project costs would exceed willingness to pay.

In addition to the evidence in LandWatch's October 14, 2021 letter, we direct you to our recent report, which cites research that agricultural water users are unlikely to pay more than $300 to $500 per acre-foot for new water supplies.[24] The GSPs remain fundamentally inadequate because most of the proposed projects are not demonstrably feasible economically and the GSPs lack any analysis of the users' willingness to pay.

Yours sincerely,

M. R. WOLFE & ASSOCIATES, P.C.

John Farrow

JHF:hs

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Attachments

1. Hydrogeology And Water Supply Of Salinas Valley, A White Paper prepared by Salinas Valley Ground Water Basin Hydrology Conference For Monterey County Water Resources Agency, June 1995.
2. John Thompson and Robert Reynolds, Jr., Cultural Evolution and Water Management in the Salinas River Valley, Journal Of The American Water Resources Association, Dec. 2002.
3. LandWatch, Selection of Projects and Management Actions for Salinas Valley Water Supplies, Draft Report, October 28, 2021.

[24] LandWatch, Selection of Projects and Management Actions for Salinas Valley Water Supplies, Draft Report, October 28, 2021.

ATTACHMENT 1

Hydrogeology And Water Supply Of Salinas Valley, A White Paper prepared by Salinas Valley Ground Water Basin Hydrology Conference For Monterey County Water Resources Agency, June 1995.

HYDROGEOLOGY AND WATER SUPPLY

OF SALINAS VALLEY

A White Paper prepared by

Salinas Valley Ground Water Basin
Hydrology Conference

For
Monterey County Water Resources Agency

June 1995

TABLE OF CONTENTS

CONCLUSIONS

- No member of this panel has any substantive disagreement with the conclusions of previous reports.
- The panel reached unanimous agreement on all major issues.
- Data that are available have been useful in determining regional and local surface water and ground water relationships and quality.
- Based on all the studies completed to date, there appears to be an adequate supply of water within Salinas Valley to meet all existing and projected future requirements.
- Despite this abundance, past and present water distribution and management practices have caused seawater intrusion, declining ground water levels in the East Side Area, and nitrate contamination.
- The solution for the seawater intrusion and declining ground water levels in Salinas Valley that was recommended in 1946 is so compelling we could not refrain from recommending it.
- Some form of extraction and conveyance system should be constructed.
- More recent studies conducted by Monterey County Water Resources Agency (MCWRA) since 1946 have reaffirmed and endorsed the original concepts.
- Residents of Salinas Valley are fortunate that an in-valley conjunctive use solution is available to them.

RECOMMENDATIONS

Monterey County Water Resources Agency should:

- Complete the extraction facilities and conveyance system, similar to those that were outlined in California Department of Water Resources Bulletin 52 in 1946, that are integral components of a total project.
- Continue studies to determine the relationships between fertilizer application, irrigation practices, plant growth, movement of water past the root zone, and ground water contamination under growing conditions prevalent in Salinas Valley.
- Use these studies to develop and demonstrate improved irrigation and fertilizer management methods that farmers can adopt with confidence.
- Continue to evaluate seawater intrusion monitoring data.
- MCWRA should continue their surface water and ground water monitoring program for quantity and quality. The data should be evaluated to ensure that the information is adequate for effective management of water resources.

INTRODUCTION

Purpose and Scope

The Monterey County Water Resources Agency (MCWRA) convened a panel of 10 geologists, hydrogeologists, and engineers familiar with Salinas Valley ground water basin to attempt to reach agreement on the basic physical characteristics of the basin, and the surface and ground water flow within the basin. Agreement on the completeness and accuracy of existing data and previous hydrogeological studies was seen as an important first step in identifying and implementing a technically sound solution acceptable to the public that would stop seawater intrusion that began some 60 years ago.

Mike Armstrong, General Manager of MCWRA, instructed the panel to review and, if possible, reach consensus on the hydrogeological characteristics of the basin, define clearly the water resources problems in the basin, and determine surface water and ground water flow within the basin. We were not requested to discuss specific local projects or political and institutional aspects of the problems.

The panel met in a closed-door session in Monterey on May 24 and 25, 1995. The session was closed to the public and the press to enable the panelists to discuss and explore ideas and opinions freely without worrying about statements, questions, and hypotheses being repeated out of context.

Members of the panel believe the process worked very well. This report presents our findings, conclusions, and recommendations. We were able to achieve more than our original scope of work. There was remarkable unanimity of opinion on our understanding of the physical characteristics of the basin, the hydrologic system, the interaction between surface water and ground water, and definition of the specific ground water problems in the basin.

In summary, the facts we agreed upon point so compellingly toward an already identified *regional* solution to the Valley's ground water resources problems that the panel has included a potential solution. We have included a strong recommendation in this White Paper for implementing that regional solution.

Panel Members

The panel consisted of 9 members and 1 facilitator/editor:

Mr. Carl Hauge, California Department of Water Resources, Sacramento, facilitator/editor.

Dr. Steven Bachman, Integrated Water Technologies, Santa Barbara.

Mr. Tim Durbin, HCI Hydrologic Consultants, Davis.

Mr. Martin Feeney, Fugro West, Monterey.

Mr. Joseph Scalmanini, Luhdorff and Scalmanini, Woodland.

Mr. Jim Schaaf, Schaaf & Wheeler, San Jose (attended May 25 only).

Dr. Dennis Williams, GEOSCIENCE, Claremont.

Mr. Gus Yates, Jones & Stokes Associates, Sacramento.

Dr. Young Yoon, Montgomery Watson, Sacramento.

Mr. Matt Zidar, Monterey County Water Resources Agency, Salinas.

Previous Reports

One of the first reports published on the hydrology of Salinas Valley was California Department of Water Resources Bulletin 52, *Salinas Basin Investigation,* released in 1946. Bulletin 52 recommended construction of a project consisting of dams to provide additional recharge and yield throughout the Valley, ground water extraction facilities, and a water conveyance facility to transport some of the additional yield to the area near the coast.

Other recent reports include:

Durbin, T.J. Kapple, G.W., and Freckleton, J.R., 1978, *Two-dimensional and three-dimensional digital flow models of the Salinas Valley ground water basin, California*; U.S. Geological Survey Water-Resources Investigation 78-113, 134 p.

Leedshill-Herkenhoff, Inc., 1985, *Salinas Valley Seawater Intrusion Study.*

Montgomery Watson, 1994, *Salinas River Basin Water Resources Management Plan, Task 1.09 SalinasValley Groundwater Flow and Quality Model Report.*

Todd, D.K., Consulting Engineers, Inc., 1989, *Sources of Saline Intrusion in the 400-Foot Aquifer, Castroville Area, California.*

Yates, E.B., 1988, *Simulated Effects of Ground-Water Management Alternatives for the Salinas Valley, California,* United States Geological Survey Water Resources Investigation Report 87-4066.

PROBLEM STATEMENT

The water resources problem in Salinas Valley is not a water supply problem. It is a water distribution problem. The basin has enough surface and ground water to meet existing and projected future average annual agricultural, and municipal and industrial (M & I) water demand through the year 2030. The problem lies in managing those supplies to meet water demands at all locations in the Valley at all times.

The overall water resources problem has three principal components:

- Seawater intrusion

  Seawater intrusion occurs near the coast principally because extraction of fresh ground water in the northern part of Salinas Valley exceeds recharge in the northern part of the Valley.

  In recent decades, the annual volume of intrusion has ranged from 2,000 to 30,000 acre feet per year (afy) and has averaged 17,000 acre feet per year.

  Seawater has advanced about 6 miles inland.

  About 20,000 acres of agricultural land near the coast are underlain by one or more aquifers that contain water too salty to use for irrigation.

- Declining ground water levels in the East Side Area

  Ground water levels continue to decline in the East Side Area.

  Lower ground water levels in the East Side Area induce additional recharge from the Pressure Area and the Forebay Area but also cause conditions for potential movement of additional seawater inland into the coastal area.

- Nitrate contamination

  Nitrate has contaminated ground water to varying concentrations throughout the Valley, but the level of contamination is especially high in the East Side, Forebay, and Upper Valley Areas.

  The maximum contaminant level (MCL) for drinking water is 45 mg/l as nitrate. In 50 percent of the wells sampled throughout the Valley, nitrate exceeds 45 mg/l; in some wells nitrate has reached several hundred mg/l.

High concentrations of nitrate limit beneficial use of the ground water for potable uses and for some agricultural uses.

An additional long-range problem is the build up of salts in the basin that is occurring because there is no subsurface outflow from the basin. Although the impacts of such a condition are manifested much more slowly than other problems, there is a long-term increase in salt concentration within the aquifer system. At some time in the future, such a build up will render the aquifer system unusable for certain beneficial uses.

These water resources problems result in economic and institutional consequences primarily because of water quality standards and the loss of supply associated with violation of those standards. The severity of the economic and institutional problems is not the same for all 3 of the problems and is dependent on the specific location and the use of the water.

The variability of precipitation and runoff is an important component of water supply planning and management. Water supply issues may appear to be non-existent when the *average* annual water supply is used for planning purposes. But in dry years, which are also a part of that average, those same supply issues become critical.

DESCRIPTION OF THE BASIN

Hydrogeology

The Salinas Valley ground water basin is one hydrologic unit. Four subareas based on differences in local hydrogeology and recharge have been identified: Upper Valley Area, Forebay Area, East Side Area and Pressure Area (which includes the area near the coast). All information collected to date indicates there are no barriers to the horizontal flow between these subareas, although aquifer characteristics decrease the rate of ground water flow in certain parts of the basin (for example, from the Pressure Area to the East Side Area, and especially from the Forebay Area to the Pressure Area). Ground water can move between the East Side and Pressure Areas, and between the Forebay and Pressure Areas, the Forebay and East Side Areas, and the Upper Valley and Forebay Areas. The "boundaries" between these areas have been identified as zones of transition between different depositional environments in past millennia.

While Salinas Valley ground water basin is one hydrologic unit, the impacts of ground water use are not distributed uniformly throughout the Valley. The impacts of ground water extraction occur mostly within the local area of the extraction. The impacts diminish rapidly with distance from the extraction, and the impacts tend to be very small at large distances from the extraction.

The alluvial fill in Salinas Ground Water Basin encompasses approximately 344,000 acres. The Upper Valley and Forebay Areas are unconfined and in direct hydraulic connection with Salinas River. The Upper Valley Area covers an area of approximately 92,000 acres near the south end of Salinas Valley from Greenfield to Bradley. Primary ground water recharge to the Upper Valley Area occurs from percolation in the channel of Salinas River.

The Forebay Area from Gonzales to Greenfield, consists of approximately 87,000 acres (including Arroyo Seco Cone) of unconsolidated alluvium. Principal recharge to the Forebay Area is from percolation of water from Salinas River and Arroyo Seco Cone, and ground water outflow from the Upper Valley.

Arroyo Seco Cone is located on the west side of southern Salinas Valley and is a part of the Forebay Area. Arroyo Seco Cone receives recharge from percolation in channels of Arroyo Seco and tributaries. The Cone covers approximately 26,000 acres of the Forebay Areas. The Arroyo Seco Cone may provide some opportunity for additional recharge.

The Pressure Area covers an area of approximately 91,000 acres between Gonzales and Monterey Bay. The Pressure Area is composed primarily of confined and semi-confined aquifers separated by clay layers (aquitards) that limit the amount of vertical recharge. Three primary water bearing strata have been identified in the Pressure Zone: the 180 Foot Aquifer, the 400 Foot Aquifer, and the Deep Zone. These aquifers are separated by aquitards, although some vertical recharge occurs locally where the aquitards are thin or missing. The uppermost aquitards allow some limited recharge from Salinas River directly to the 180-foot aquifer in the area near Spreckels. The areas of thin or missing aquitards also allow some interconnection between the shallow (180 foot) and deeper (400 foot) aquifers.

The exact nature of the connection between the Deep Zone and the ocean is unknown. Seawater intrusion has not been detected in Deep Zone wells, but there is no evidence indicating that the Deep Zone is not connected to the ocean. Lacking this evidence, it must be assumed that the deep zone, like the 180-foot and 400-foot aquifers above it, is connected to the ocean and vulnerable to seawater intrusion if ground water levels fall below sea level. Similarly, the aquitards between the 400-foot and the Deep Zone are subject to leakage of degraded water downward to the Deep Zone as the water level is lowered.

The Deep Zone is currently undefined both geologically and areally. In some locations, it is considered to be Purisima Formation, in others, lower Paso Robles Formation. Some recent evidence suggests that it may be Santa Margarita Formation. Water levels in Deep Zone wells have fallen approximately 60 feet since the late 1970s and are now substantially below sea level. Total extraction over this period of time has averaged less than 5,000 acre-feet per year. Water quality in the Deep Zone is unsuitable for agriculture because of extremely high sodium-adsorption ratios (SAR).

The East Side Area consists of 74,000 acres and contains unconfined and semiconfined aquifers in the northern portion of the Basin that historically received recharge from percolation from stream channels on the west slope of the Gabilan Range. As a result of extraction in excess of recharge, the decline in ground water level in the East Side Area has induced subsurface recharge from the Pressure Area, as well as from Salinas River and the Forebay Area. This inflow is now a larger source of recharge than the stream channels coming from the Gabilan Range.

Sources of Recharge

Ground water recharge in Salinas Valley is principally from infiltration from Salinas River, Arroyo Seco Cone, and, to a much lesser extent, from deep percolation of rainfall. Minor amounts are derived from infiltration from small streams and inflow from bedrock areas adjoining the basin. Deep percolation of applied irrigation water is the second largest component of the ground water budget, but because it represents recirculation of existing ground water rather than an inflow of "new" water, it is not considered a source of recharge for this discussion. Seawater intrusion is another source of inflow to the basin, but because it is not usable fresh water it is also excluded as a source of recharge for this discussion.

Infiltration from Salinas River and deep percolation of rainfall would occur under natural conditions, but both are increased by present water use patterns in the Valley. Ground water extraction increases the amount of infiltration from the river upstream of Salinas. Irrigation increases the amount of rainfall that percolates past the root zone by increasing antecedent soil moisture at the beginning of the rainy season. The low permeability of the Salinas Valley aquitard in the Pressure Area decreases but does not altogether eliminate deep percolation of rainfall and irrigation return flow directly to the 180-foot aquifer in the Pressure Area.

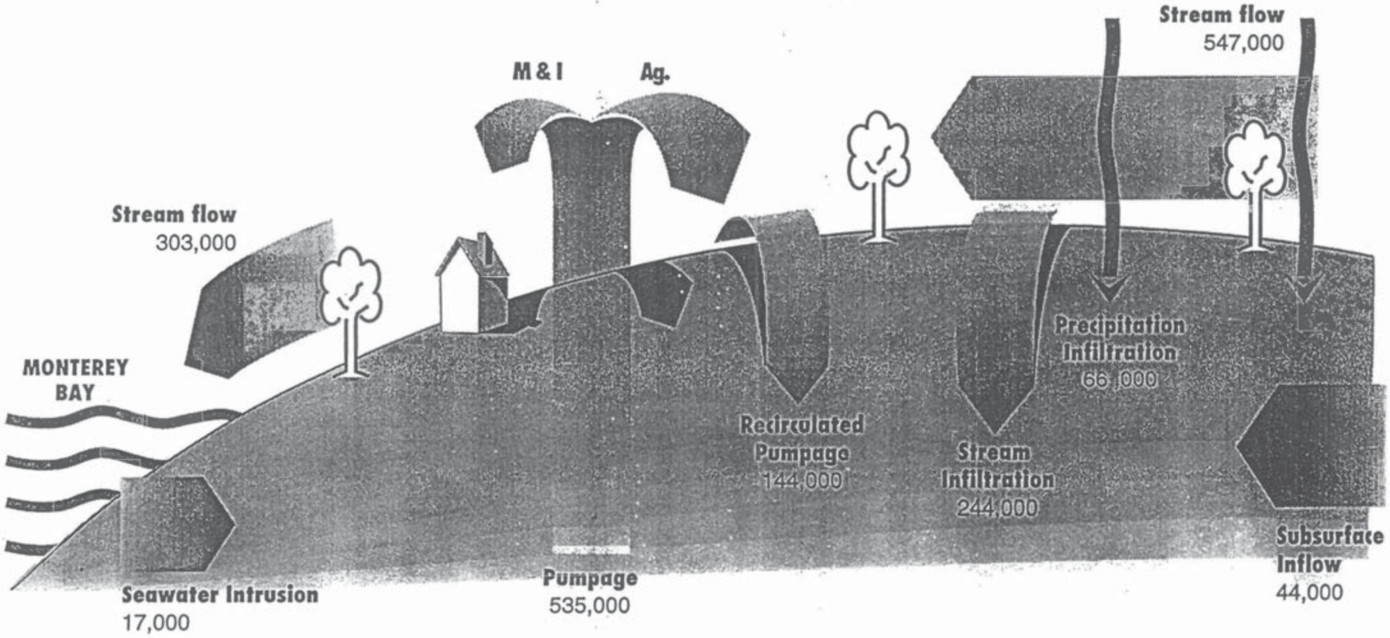
Figure 1 shows estimates of the average annual amounts of recharge derived from each source during 1970-1992 for the entire Valley. Average annual recharge, including irrigation return flow and seawater intrusion, totals 514,000 afy.

The estimates of items in the water budget are derived from a combination of direct measurement and extrapolation using three different and independently designed ground water models. It is important to recognize that the models include all available measured data and that all three of the modeling efforts completed to date have resulted in very similar estimates of the average annual basin-wide water budget. Our confidence in the general magnitude and proportion of flows in the budget is fairly high.

The water budget shown in Figure 1 is an average annual budget indicative of the long-term balance of components of the budget. It does not reveal the large amount of variation in annual flows in the water budget. These annual variations are an important factor in management of water resources and must be considered in any solution to water management in Salinas Valley.

The water budget indicates that ground water storage in the Valley has declined by 460,000 acre feet from 1970 to 1992, an average rate of 20,000 afy. However this decline was

Average Annual Basin-Wide Surface and Ground-Water Flows in Salinas Valley (AFY, 1970-1992 average flows)



Change in Ground Water Storage = -20,000 AFY

caused largely by the 1987 through 1992 drought.

Infiltration of water from Salinas River is relatively constant from year to year, partly because river flows are partially regulated by Nacimiento and San Antonio reservoirs and partly because ground water extraction--which induces a substantial amount of infiltration from the river--also remains fairly constant. In contrast, rainfall recharge is much more variable, with little, if any, recharge occurring in below-average rainfall years and large amounts occurring in wet years.

In the Upper Valley and Forebay Areas recharge from Salinas River is a rapid process, so that the effects of dry years on ground water levels are rapidly reversed in subsequent normal and wet years. After declining somewhat during the 1976-1977 and 1986-1992 droughts, water levels in the Upper Valley and Forebay Areas recovered fully within 1 to 2 years following the resumption of normal streamflow, including reservoir releases. This demonstrates the feasibility of conjunctively using ground water storage capacity in those areas to increase overall system yield.

BASIN MANAGEMENT

Seawater Intrusion

Analysis of water samples from wells in the Pressure Area has indicated that seawater has been intruding the aquifers for the last 60 or so years. The intrusion has moved progressively landward within the 180-foot and 400-foot aquifers during this time. To date, there has been no observed intrusion in the Deep Zone. The intrusion has moved as much as 6 miles inland in the 180-foot aquifer and 2 miles inland in the 400-foot aquifer, rendering wells in the intruded area unusable and decreasing usable basin storage. Between 1970 and 1992, the annual decrease in usable basin storage for ground water because of seawater intrusion has amounted to an average of 17,000 acre feet per year. While the average is 17,000 acre feet per year, it has varied from 2,000 acre feet per year to 30,000 acre feet per year. The cumulative total of seawater intrusion during the period 1970 to 1992 is about 374,000 acre feet.

Seawater intrudes coastal aquifers when ground water levels in the aquifers in contact with seawater decline below sea level. When this occurs, the normal gradient that produces ground water discharge into Monterey Bay is reversed. This reversal of ground water gradient in the Pressure Area resulted from extraction of ground water in excess of recharge in that Area. Seawater has intruded the aquifer in response to the reversed gradient that was caused by lowered ground water levels.

This saline water can move both horizontally within the aquifer or vertically through breaches in the various aquitards or through improperly constructed wells, wells that were abandoned but not destroyed, or through failed well casings. Most of the salinity is caused by intrusion of seawater through the offshore outcrops of the aquifers. An additional source of salinity may be the dewatering of salty marine clays within or between the aquifers in response to the lowered pressure levels in the aquifer system.

If the intrusion of seawater is left unchecked, seawater will continue to advance inland, eventually contaminating the East Side and Pressure Areas as far inland as Salinas. This will degrade the water supply of additional agricultural areas and will also degrade municipal drinking water supplies.

The only effective solution to controlling seawater intrusion in Salinas Basin is the re-establishment of higher ground water levels by relieving pumping stresses in the coastal portion of the aquifer. This can most efficiently be achieved by the cessation of pumping and the delivery of an alternative source of water to this area. This solution will allow recovery of water levels in the aquifer, thereby halting the advance of seawater intrusion and restoring normal aquifer pressures. The re-establishment of these conditions will also control the other possible sources of saline degradation such as the dewatering of marine clays and interaquifer leakage.

If a solution other than the delivery of water to the coastal area is to be considered, additional information regarding the components of the saline intrusion may be advisable.

Overdraft

In general, the term overdraft has been used to describe conditions where extraction from a ground water basin exceeds the perennial yield over a period of time, resulting in undesirable conditions. Undesirable conditions may include subsidence, seawater or other saline water intrusion, lower ground water level, and depletion of the supply. Perennial yield is sometimes called the safe yield or the sustained yield of the basin.

In Salinas Valley, the undesirable conditions lowered ground water levels and seawater intrusion. The conditions are the result of:

a) the physical characteristics of ground water occurrence in the Valley,

b) physical connection between the aquifers and seawater,

c) areal distribution of extraction from the aquifer system, and

d) water use practices.

These conditions require that management of ground water in different parts of the Valley recognize local hydrogeologic issues specific to each area.

There is a difference between total ground water in storage and usable ground water storage. The **total** storage of ground water in Salinas Valley is in the millions of acre feet. The **usable** storage is only a portion of the total volume in storage because all of the ground water is not available for extraction without causing some of the undesirable impacts that were listed above. Usable storage can be greatly influenced by the distribution of extraction and recharge facilities, water management practices, and physical facilities for storage and distribution of surface water and ground water.

Valley-wide, the ground water basin is only slightly out of balance because total inflow to the aquifer system is less than total outflow. Fresh water inflow consists of recharge from precipitation, streamflow, and recirculated irrigation water. Outflow consists of ground water extraction, which totals 20,000 afy more than total fresh water inflow.

Seawater is another source of inflow because of the lowering of ground water levels near the coast. The high chloride content, however, makes this water unusable. The average seawater intrusion totals about 17,000 afy. Thus, the Valley-wide water budget shows an average fresh water deficit of 37,000 afy.

In addition to the overdraft in the East Side Area and seawater intrusion in the Pressure Area, 2 other factors exacerbate the ground water supply problem in the Valley. First, nitrate concentrations in ground water are increasing in many areas of the Valley. Second, the basin is hydraulically closed to subsurface outflow, leading to long-term salt accumulation.

The undesirable conditions in the Valley include: seawater intrusion near the coast, decreasing ground water in storage in the East Side Area, nitrate increases in the Forebay and Upper Valley Area, and the salt build-up caused because the Valley is hydraulically closed. These conditions are occurring despite the fact that an essentially full aquifer system has existed under the major portion of the Valley.

The solution to these problems lies in focused relief of the pumping stresses. Such relief could include reduced local extraction in the areas where intrusion and declining water levels are occurring, development of a supplemental water supply to replace the reduced extraction, while maintaining current beneficial uses.

Nitrate

Nitrate contamination of ground water poses a significant threat to the beneficial use of ground water for drinking water and for some agricultural water uses. Nitrate concentrations exceed drinking water standards in many parts of the basin. The principal source of nitrates to ground water is almost certainly excess fertilizer that is leached by rainfall and applied irrigation water. Nitrates also originate from animal and human waste. The contribution of nitrate from various sources has been estimated at 90 percent from agriculture and 10 percent from urban sources. Contamination by nitrate has been observed in the unconfined aquifer and in some locations in the 180-foot aquifer of the Pressure Area.

Nitrate contamination can best be controlled by integrated on-farm fertilizer and water management practices. Such practices may require the voluntary implementation of improved water and fertilizer management by growers, possibly with incentives from MCWRA.

Water Conservation

There are probably some water supply benefits that can be achieved by implementing agricultural and urban water conservation measures. In agriculture, the potential savings would be achieved by decreasing direct evaporative losses during irrigation and by minimizing outflow of irrigation return flow from coastal areas to Monterey Bay. The potential for agricultural conservation of irrigation water is closely linked with interactions in the plant root zone, crop yield, and salt build-up. Any attempt to improve irrigation efficiency must evaluate each of these factors.

Water conservation by itself would not be sufficient to solve the problems of seawater intrusion near the coast and overdraft in the East Side Area.

PROBLEM SOLUTION

Seawater Intrusion and Overdraft

The only reasonable and effective solution for controlling seawater intrusion and overdraft in Salinas Valley is re-establishment of higher ground water levels by relieving pumping stresses in the aquifers in the Pressure and East Side Areas. The 2 alternatives for relieving pumping stresses are either 1) fallow land in the Pressure and East Side Areas, or 2) deliver an alternate supply of water to replace the reduced pumpage. If present agricultural and urban beneficial uses of water are to continue, the obvious solution is some sort of program to deliver water in lieu of ground water extraction. The Castroville Seawater Intrusion Project is a step in this direction, but it will not provide enough water to replace current extraction sufficiently to halt seawater intrusion.

Two approaches could be used to relieve overdraft in the East Side Area. One approach would be to allow water levels to continue declining. They would eventually stabilize near a level low enough to induce increased inflow from the Forebay and Pressure Areas at a rate sufficient to balance ground water extractions. This approach would result in high ground water extraction costs for the indefinite future and continued seawater intrusion in the Pressure Area.

An alternative approach would be to deliver in-lieu water to the East Side Area by means of a surface conveyance facility. This approach would decrease local ground water extraction costs and avoid the intrusion risk but would incur construction and pumping costs for the surface water facility.

The water-supply problem in Salinas Valley is the result of a water distribution problem. The water supply in Salinas Valley is the streamflow runoff from Salinas River watershed and the deep infiltration of precipitation on the Salinas Valley floor. However, a substantial part of this water supply is not captured at present and discharges to Monterey Bay from Salinas River. This discharge occurs mostly during storm periods, and the largest part of the discharge occurs during extreme flood events. The water-management solution to stop overdraft consists of facilities and management practices that use part of the discharge to Monterey Bay from Salinas River, while providing protection for instream uses in the River and in wetlands.

Valley-wide water management in Salinas Valley could best be accomplished by the conjunctive use of surface water and ground water storage. Storage could be used to retain some storm runoff from Salinas Valley watershed and the stored water could be made available for beneficial use within Salinas Valley. At present, runoff is stored in San Antonio and Nacimiento Reservoirs and within the ground water basin, but the current use of ground water storage is not adequate to resolve the problems of seawater intrusion into the Pressure Area and water-level declines within the East Side Area. More intensive management is required to address such conjunctive operation of surface water and ground water storage.

The need for conjunctive operation of surface water and ground water storage was recognized as early as 1946. In 1946, the California Department of Water Resources published a report on Salinas Valley that described the occurrence of seawater intrusion and declining ground water levels. The report recommended a project to eliminate these problems that included development of surface water and ground water storage. Surface water storage was to be accomplished by the construction of dams on tributaries to Salinas River, and ground water storage was to be accomplished by ground water transfers from the Forebay Area to the Pressure Area and East side Area. The Department recommended transfer facilities that included wells in the Forebay Area, conveyance facilities from the Forebay Area to the Pressure and East Side Areas, and distribution facilities within the Pressure and East Side Areas.

In such a conjunctive operation, the increased extraction in the Forebay Area and conveyance of water to the Pressure and East Side Areas would vacate ground water storage in the Forebay Area. This empty storage space would be refilled by additional infiltration from Salinas River. This mode of operation would effectively capture some of the water that presently flows to the ocean and would make it available for conveyance to the Pressure and East Side areas. The well-documented rapid recovery of ground water levels in the Forebay and Upper Valley Areas following recent drought years demonstrates the physical feasibility of this type of conjunctive use.

Part of the recommended facilities for surface water and ground water storage have been completed by the construction of the dams for SanAntonio and Nacimiento reservoirs, but the facilities for the effective use of ground water storage have not been completed. The operation of San Antonio and Nacimiento reservoirs has produced benefits to salinas Valley, but the ultimate benefits that would result from the construction and operation of transfer facilities have not been realized.

The panel concluded that the facilities recommended in 1946 by the California Department of Water Resources should be completed immediately. The Department recommended both dams and transfer facilities. Since that time, additional studies conducted by MCWRA have served to reaffirm and validate the original recommendations.

The dams that were recommended have been constructed, but the companion transfer facilities have not been constructed. The result of partially completing the project has been an uneven distribution of benefits throughout the Valley. The Forebay Area and Upper Valley Areas have enjoyed relatively large benefits from San Antonio and Nacimiento reservoirs that would have been shared equally with the Pressure and East Side Areas if the intended transfer facilities had been built. In the absence of the transfer facilities, seawater intrusion into the Pressure Area and water-level declines within the East Side Area have not been mitigated.

Instead, within the Forebay Area ground water levels are 20 to 30 feet higher than would have occurred without the dams. The Upper Valley Area has also benefited from somewhat higher ground water levels, and has used the yield of the 2 reservoirs to significantly increase the amount of irrigated land in this Area. Benefits have accrued also to the Pressure Area where seawater intrusion is 30 percent less than would have occurred. Benefits to the Pressure and East Side Areas have been relatively small

When Nacimiento and San Antonio dams were built, the effect of the additional water on seawater intrusion could not be predicted, and a "wait and see" attitude was adopted. Since the 2 dams have been operating, it has become clear that the Forebay Area has benefitted from essentially "full" ground water storage, but the ground water flow into the Pressure and East Side Areas has not been sufficient to stop the seawater intrusion and overdraft in these 2 areas. The remaining components of the solution proposed originally, an overland transfer of water directly to the intruded and overdrafted areas, are necessary to solve those problems.

The California Department of Water Resources recommended an effective plan for water-supply management within the Salinas Valley. That plan has been partly implemented. We recommend in the strongest terms that the transfer component be implemented immediately. Transfer of ground water from the Forebay Area to the Pressure and East Side Areas is the only feasible approach to eliminating seawater intrusion into the Pressure Area and water-level declines within the East Side Area. As recommended by the Department and others, transfers would be accomplished by extraction within the Forebay Area, conveyance of the extracted ground water to the Pressure Area, and distribution of water within the Pressure and East Side Areas.

The transfer facilities would produce minor water level declines within the Forebay Area. However, studies estimate that the solution can be accomplished by limiting the average decline to about 5 feet, and maximum localized decline to about 20 feet. The Forebay Area has enjoyed an average water-level rise of 25 feet due to operation of San Antonio and Nacimiento reservoirs. With transfer facilities, the average annual water-level rise, relative to pre-project conditions within the Forebay Area, would still be about 20 feet, seawater intrusion into the Pressure Area would be eliminated or severely curtailed, and water-level declines would be stopped within the East Side Area. With transfers, benefits would be distributed more uniformly throughout the Valley. Without transfers, the benefits would continue to be weighted toward the Forebay and Upper Valley Areas.

Nitrate

MCWRA knows enough about the nitrate problem to recommend initial steps to manage it. However, additional study is needed to understand the complex interrelationships of crop, irrigation, fertilizer, and soil management under conditions prevalent in Salinas Valley. Additional research into the plant-water-soil-nutrient relationships on specific soils in Salinas Valley will be required to maintain an acceptable salt balance and acceptable crop yields.

Critical information is not available to encourage growers to adopt best management practices for the mitigation of nitrate contamination of ground water. An intensive program must be undertaken by MCWRA to provide information on the effectiveness of practices for the management of soils for water conservation and the mitigation of nitrate contamination. Information is available to make initial steps toward developing best management practices, but additional information is critical to the long-term success of improved soils management.

Water Conservation

Some water supply benefits can probably be achieved by implementing agricultural and urban water conservation measures. In agriculture, the potential savings would be achieved by decreasing direct evaporative loss during irrigation and minimizing outflow of irrigation return flow from coastal areas to Monterey Bay, while maintaining a favorable salt balance.

On-farm management of irrigation needs to be done jointly with management of fertilizer application and salt leaching requirements. We recommend that MCWRA undertake studies to further understand these interrelated issues and develop best management practices tailored to growing conditions in Salinas Valley.

However, water conservation by itself would not be sufficient to solve the problems of seawater intrusion near the coast and overdraft in the East Side Area.

LAST WORD

The solution to the water resource problems within the Salinas Valley has been known since at least 1946. The solution that was proposed then by the California Department of Water Resources recognized that sufficient supplemental water could be developed within the basin. That proposal also recognized the need to transfer water from the Forebay Area to the Pressure and East Side Areas. The solution proposed in 1946 remains the best solution even today.

We urge the MCWRA to focus its attention on the completion of the original plan by the construction and operation of water transfer facilities. The MCWRA should avoid diverting its attention to suggested alternatives that are less viable economically or less effective technically. These less viable and less effective alternatives would <u>not</u> provide the same benefits as the original plan, would be more expensive, and the projected price of water would be significantly higher for all parties.

The panel believes strongly that Salinas Valley is fortunate that an in-Valley solution is available. We urge the Salinas Valley community to support the MCWRA in this effort to distribute the available water supplies for more efficient water management and lasting benefits for all residents of the Valley.

ATTACHMENT 2

John Thompson and Robert Reynolds, Jr., Cultural Evolution and Water Management in the Salinas River Valley, Journal Of The American Water Resources Association, Dec. 2002.

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CULTURAL EVOLUTION AND WATER MANAGEMENT IN THE SALINAS RIVER VALLEY[1]

James G. Thompson and Robert Reynolds, Jr.[2]

ABSTRACT: This article reports the findings of a case study of a major California water management district's effort to change its management approach. The following key findings and factors have influenced the Salinas basin management plan (BMP) and its progress: (1) the Salinas Valley is an economy dominated by highly sophisticated irrigated agriculture dependent on ground water; (2) a persistent pattern of agricultural overdraft of ground water has hurt growers primarily in the north end of the valley via induced saline intrusion of irrigation wells; (3) a complex set of water institutions, property and water rights, and land lease practices offer little incentive for good stewardship of land and water; and (4) the BMP approach initially may have intensified tension among growers and between growers and other water user groups. Water rules and practices in the Salinas Valley and Monterey County have evolved through a long historical process of adaptations. Therefore, any significant changes in local water use practices need to be understood in terms of cultural change, that is, changes in deeply held values, beliefs, and assumptions. We believe the BMP and the MCWRA are succeeding when evaluated from this evolutionary perspective. The fact that both still exist relatively intact testifies that they are working, *albeit* slowly.
(KEY TERMS: basin management planning; social science technologies; collaborative planning; cultural evolution.)

INTRODUCTION

Water management practices in the United States have been changing to accommodate the pressures of expanding populations and attendant shifts in water use. Traditionally, water has been viewed as plentiful and a cheap (or free) good. More recently, however, growth pressures have made it clear that while there still is adequate water, it is not always available in the locality where it is needed at a price and quality that is acceptable. Recognition that water is a finite resource has fostered a series of new approaches to water management. Where historically water management was oriented to delivery of new water supplies to satisfy growth requirements, current management concepts almost always include some notion of conserving the existing supply. These concepts include best management practices, integrated resource management, and basin management planning. These concepts involve a "systems" view of hydrology and its relationship to user populations and usually a blending of traditional supply orientations with conservation approaches. The most sophisticated version of conservation is water demand management (WDM). WDM reflects the view that a resource cannot be sustained for optimal benefit to society without concerted management of demand and resource augmentation of supply (Tate, 1990).

A major objective of this study is to help policy makers better understand the sociopolitical environment in which WDM plans are implemented. Such knowledge can improve their ability to select WDM technical assistance activities that will be most effective. In our opinion, water managers need the major "technologies" of social science – public policy analysis (PPA), socioeconomic impact assessment (SIA), pubic involvement, and collaborative planning (CP) – to manage the sociopolitical processes of WDM. These technologies have been used increasingly in the fields of energy development, hazardous waste management, and many areas of natural resource management. Yet, just as they once were in these areas, public agencies have been slow to recognize the need for such technological assistance with sociopolitical problems in WDM.

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THE STUDY AREA

The Monterey County Water Resources Agency (MCWRA) manages the Salinas River Valley and some adjacent areas in Monterey County, California (Figure 1). Under pressure from the Monterey County Board of Supervisors and the California State Water Control Board, the agency has been developing and implementing a basin management plan (BMP) since 1992 to help solve two long standing problems – overdraft of the aquifer system (exceeding the rate of replenishment) and the resulting salt intrusion into the aquifer from the ocean.

The Salinas River Basin is the primary location for the more than $1 billion agricultural economy of Monterey County, California. As shown in Figure 1, the Salinas River is unusual in that it flows from southeast to northwest. Because the river goes underground after about one-third of its total reach, it is also known as "the world's longest underground, backward flowing river" (Verardo and Verardo, 1989). The primary water basin is indicated by the hatch marks (Figure 1.) As indicated, the basin is hydrographically divided into four main pressure areas: Pressure (area), East Side, Forebay, and Upper Valley, as viewed from northwest to southeast. The valley is sometimes perceptually separated into North Valley and South Valley growers. The demarcation between north and south is not a precise location but rather a general distinction based historically on where ground water had been available on an assured year-round basis. This area was generally the Pressure and East Side areas, also called the North Valley. Historically, the Forebay and Upper Valley, also called the South Valley, are areas where less ground water was pumped for irrigation. In the 1960s, two dams were built in the headwater region of the Salinas River to provide more continuous recharge to the

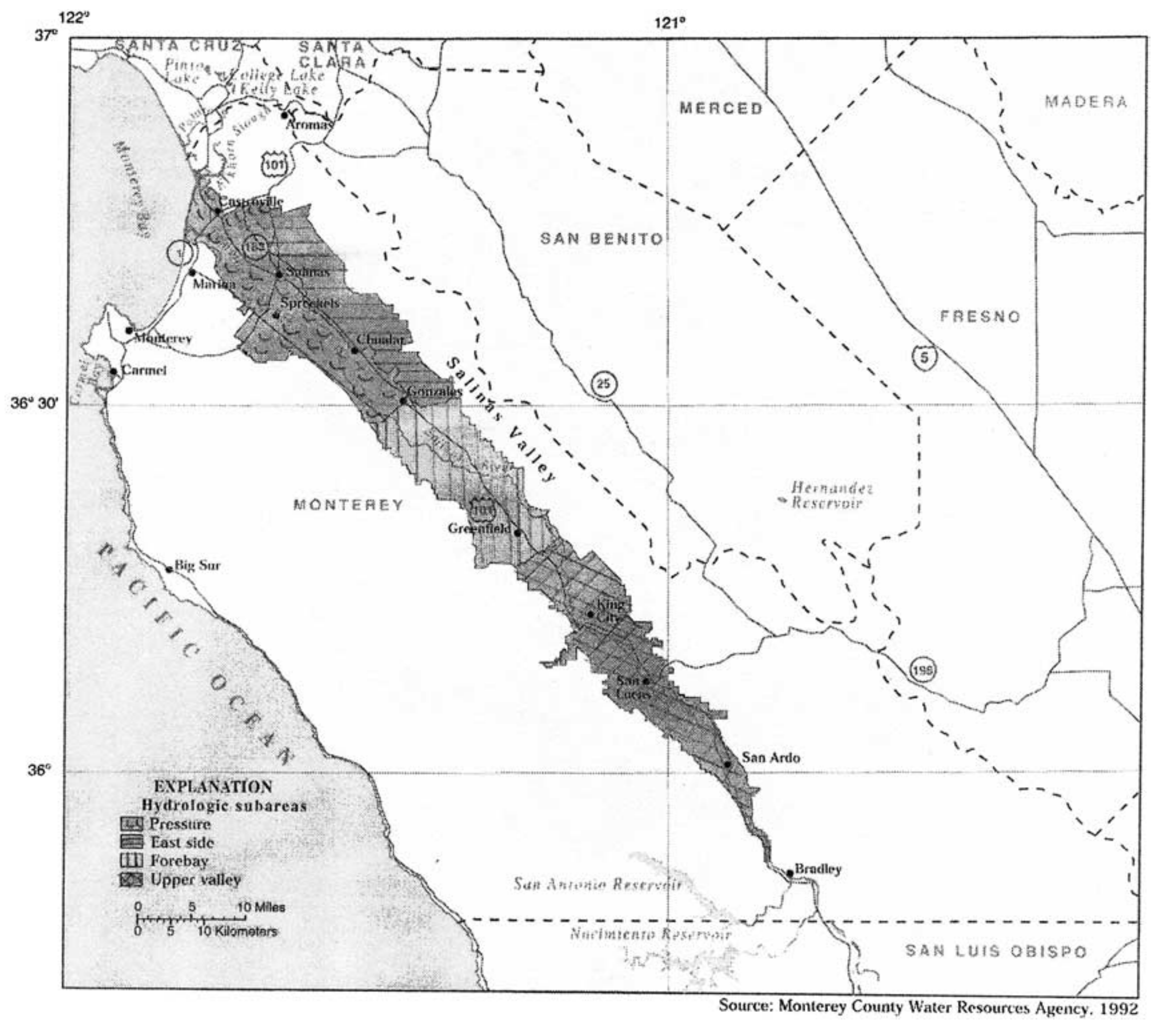

Figure 1. Hydrologic Subareas, Salinas Valley, California.

river. The recharging made ground water mining in the South Valley more economical.

Eleven towns in the valley depend on ground water from the river basin as their primary water supply. Salinas is the major urban area, accounting for about 80 percent of the population in the valley. Other towns shown on the map – Marina, Monterey, Carmel, and Big Sur – are not dependent on water from the Salinas River Basin. Agricultural water requirements represent about 85 to 90 percent of the basin demands. Overdrafting has become a problem as a result of ground water withdrawal exceeding annual replenishment for more than 50 years. Seawater has intruded into the valley aquifers, which are interconnected with the ocean, and has advanced about five miles or more inland, affecting about 12,000 acres of farmland. Decreasing ground water supplies have been a threat to the increasing water demands for more than 200,000 acres of prime farmlands and a local population of around 200,000 people (Westra and Vinton, 1992).

Increased ground water contamination by nitrate and other agricultural chemicals has been another cause for reduction of available water supplies. Importing water from outside of the county is almost impossible for both technical and political reasons. Unlike many agricultural areas in California, the Salinas Valley draws all of its water from basin sources, most of it ground water. During recent years the overdraft has climbed from 50,000 acre-feet per year to as much as 350,000 acre-feet per year. This has been a cause for concern because beginning in the mid- to late-1930s, the reduction of hydraulic pressure (head) caused by overdraft via irrigation has allowed saltwater beneath the ocean floor to intrude into the fresh water aquifer along the coast. Irrigating with salt contaminated water kills most crops and contaminates the soil over time.

USE OF SOCIAL SCIENCE TECHNOLOGIES

We believe there are several well developed "macro" social science technologies (SSTs) that can be incorporated routinely into WDM projects. Two major methods were obviously appropriate for this study: socioeconomic impact assessment (SIA) combined with a social organization model (SOM). These approaches are elaborated on in the *Guide to Social Assessment* (Branch *et al.,* 1984), *Social Assessment* (Taylor *et al.,* 1995), and *Guidelines and Principles for Social Assessment* (ICGP, 1994). In these approaches, "economic impact assessment" is subsumed as part of the social assessment model. Most sources on SIA emphasize the need to understand historical and cultural contexts as well as economic, social, and environmental impacts and their interrelationships. But this model of impact assessment is not effective unless public involvement and collaborative planning are the accompaniments.

The SIA process (Figure 2) occurs in six steps: Scoping, Identification of Alternatives, Preliminary Assessment, Detailed Assessment of Impacts, Mitigation and Monitoring, and Evaluation. This six-step process summarizes most approaches to SIA, which has been designed to describe and forecast social and economic impacts that may occur as a result of policy changes, planning activities, and projects and to identify monitoring and mitigation strategies that may be implemented to minimize negative impacts and maximize positive effects. For this project, we used the SIA process described by Branch *et al.* (1984) because of its emphasis on the need to understand the social organization of communities affected by projects, policies, or plans. Branch *et al.* (1984) emphasized that a social organization approach is necessary because the social organization of communities intervenes between system inputs and individuals to determine the effects on social well being in the area.

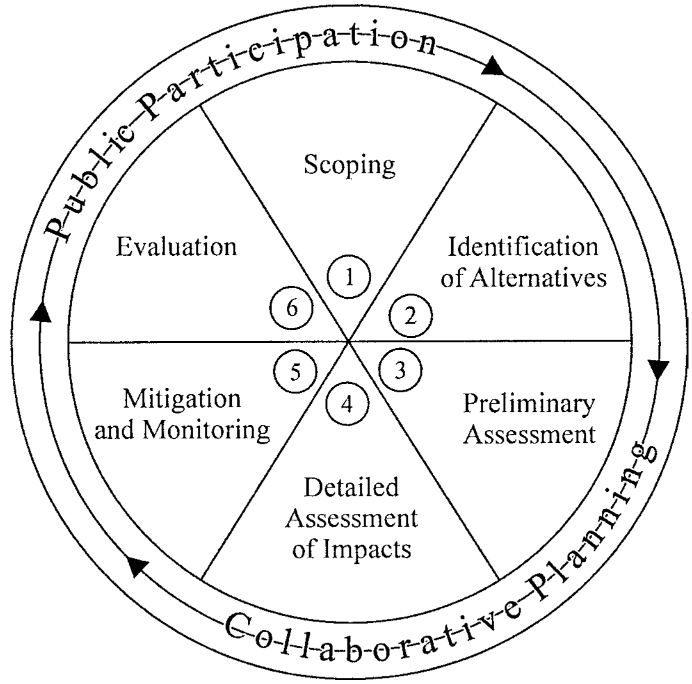

Figure 2. Six-Step Process for IA.

We reformulated the social organization model (SOM) presented in Branch *et al.* (1984) to show how it could be reorganized for water demand

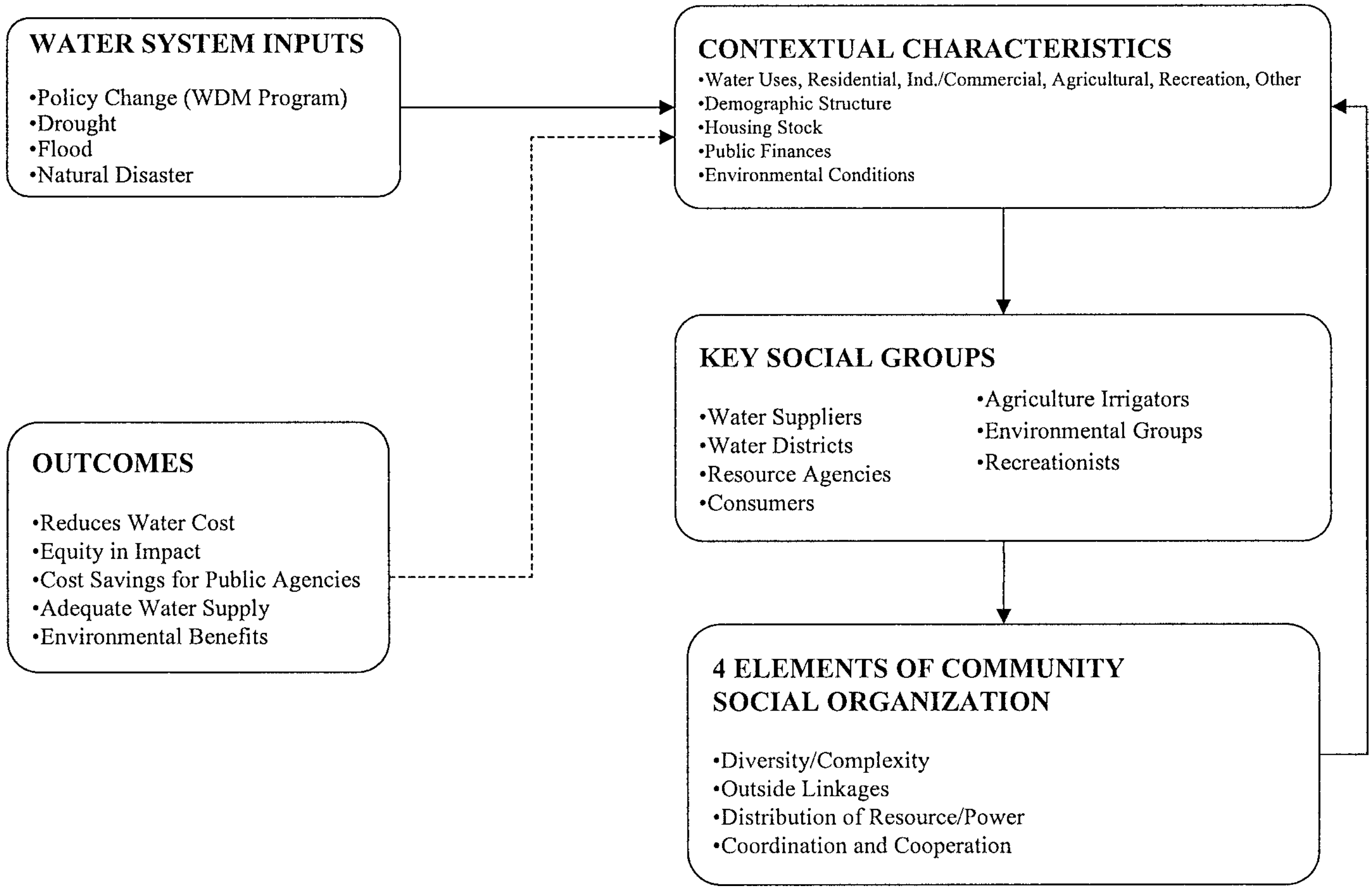

Figure 3. Social Organization Framework: Water Planning.

management SIAs. Our reformulation (Figure 3) identi-fies five major components of the social system for analysis: (1) water system inputs (conceptualized as policy changes, water supply projects, droughts, etc.); (2) contextual characteristics; (3) community social organization (social structures, social processes, and value/attitude systems); (4) key social groups within the water basin (the focus for measuring the distribution of impacts); and (5) outcomes (the social outputs, or effects, of a new water policy or project). New inputs to a basin (Figure 3) might consist of policies, structures, droughts, or floods. These "inputs" are received in an existing community organization or "social field," which is conceptualized as four major social processes. Social groups in the community experience "outputs," or the impacts of system inputs, only after these inputs have been processed, or altered, by the social organization of the community.

Changes in a community's environment become social effects only as people experience them. Thus, it is necessary to identify the social groups that experience the effects of policy changes and/or development. Not all people in a basin or area will experience significant impacts from a project, and those groups that are impacted are likely to exhibit different reactions (Thompson *et al.,* 1982). To measure the social impacts of inputs, it is necessary to identify who is experiencing what effects and to understand and explain how these changes are occurring. The SOM describes the impacts experienced by social groups as changes in social well being. In this approach, well being is determined by using both objective and subjective measures. Objective indicators measure the aspects of life that local citizens define as significant to their well being. Subjective measures describe the meanings that these same people attach to the effects of project actions.

Components of the social system go through continual iterations. As social groups experience impacts, they may seek to alter the effects of these impacts to improve their own well being. This can be done in a variety of ways. For example, if negative impacts are anticipated, individuals may try to change the organizational or regulatory structure in the community (social structural change) or they may attempt to change community integration by mobilizing others to respond to the project (social process change). Individuals also may modify their personal values and attitudes. They may demand that a project stop altogether, request specific mitigations, or seek to expand the project to increase perceived benefits.

While the SIA research design focuses on the causal flow from left to right in Figure 3 (system inputs change community social organization which in turn affects social well being in the community), the important feedback loops cannot be ignored. This is particularly true in the case of water planning. Individual and community response begin before actual changes in policies or structures take place. Local attitudes are affected not only by physical change but also by the anticipation of change (i.e., information about possible inputs). Community mobilization may occur, organizational and regulatory structures may change, and individual attitude and value structures may change; therefore, the model enables the analyst to examine the typical flow of impacts associated with the introduction of new inputs into a community and the special flow that results from highly politicized activities. This latter characteristic can contribute to the magnitude and nature of social impacts in unusual ways.

As the model explains, proposed projects, policies, and events set into motion a process of social change that involves project managers, local social groups, and extra local social groups in an interactive fashion. Inputs are processed through changes in local social organization into effects on social well being. Impacts on social well being in turn may cause people to react through their social groups to modify social organization and project inputs. The larger and more controversial the proposed change, the more pervasive the resulting social change will be.

Public involvement (PI) collaborative planning (CP), and other consensus-based processes have facilitated effective responses to natural resource problems (Fisher *et al.*, 1991; Gray, 1985; Wondolleck and Yaffee, 2000). Decision makers have gravitated to consensus-based conflict resolution for a variety of reasons: the recognition that those affected by a problem should be part of the solution seeking process; the realization that nothing else has worked; dislike for the adversarial nature of judicial decisions that produce only winners or losers and deteriorating relationships among the parties; and the perception that judicial based decisions tend to be shortsighted and they appease the present by discounting the future. But consensus building methods such as PI and CP are only effective if they are based on accurate and sufficient understanding of the sociopolitical setting and of the social impacts that are generated by inputs. SIA and SOM can provide the level of detailed understanding needed in complex water management projects. SSTs are most commonly used to evaluate, assess, and help select and implement proposed alternatives for resource development (see Cortese, 1999, for a good example). In other words, some aspects of SST (e.g., CP) involve "interactive" participation of social scientists. But because our involvement was limited to observation, we confined our efforts to SIA and the SOM to explain how the BMP progressed and the conditions that were affecting its successes and failures. Included in our observations were an assessment of how the BMP dealt with the use of selected SST techniques encompassed in its scope of work, namely, economic assessment and public involvement.

The amount of information needed to implement the SOM can be daunting. In this instance, we had the luxury of a three-year time frame. While researching, we unearthed numerous studies that the BMP management was not aware of or had not had time to review. Especially important was a doctoral dissertation entitled "Consequences of Agricultural Industrialization: Environmental and Social Changes in the Salinas Valley, California, 1945-1978" (Fitzsimmons, 1983). This analysis became an organizing device that enabled us to bring the BMP into focus and to connect to other sources of information, which included numerous studies of the valley; secondary sources such as agency meetings and records and newspaper accounts of events; semistructured interviews we conducted; and our personal observations spread over three years. These information sources are discussed in detail below.

METHODS

Our role in this case study can best be described as nonparticipant observation. Social assessment techniques were employed as required by the SOM. Initially, to analyze resource decision making patterns, we reviewed several historical books and documents on the evolution of Salinas Valley agriculture and water use. Then, indepth interviews were conducted with approximately 30 key players in the study area, some of whom were directly involved with the MCWRA and the BMP, while others were less directly involved. We conducted interviews with open ended, focused questions at five different intervals beginning near the onset of the BMP (summer 1992) development effort and ending approximately three years later. Seven or eight key informants were interviewed repeatedly. Interviewees initially were selected on the basis of formal position, but subsequent selections were determined by the confluence of suggestions made by previous interviewees. We also reviewed agency newsletters, local newspaper articles, and documents that predated the study.

STUDY SITE SELECTION CRITERIA

We selected the Salinas Valley BMP case for two reasons: it is one of the most comprehensive basin water management efforts in the United States, and it included in its objectives both supply and demand management alternatives.

A CONCEPTUAL FRAMEWORK

A somewhat obscure fact about the Salinas BMP is that a major project goal is to sustain and even further develop profitable agricultural enterprises. The historical means for doing this is to develop and sustain a highly rationalized production system. Key ingredients have been the development of flexible, interchangeable inputs and the creation of rules, regulations, and institutions. These include practices governing water use, labor supply and use, and land use practices. Once we understood these processes for the Salinas Valley, we were able to explain and understand the meanderings of the BMP process more fully. By following the SOM, we examined the Salinas Valley through historical and cultural lenses and thus recognized three distinct transition periods that led to the present situation:

- **1900 to 1930s.** Subsidence farming shifted to truck crops, and many labor-saving practices added productivity to a large labor force.

- **1930s to Mid-1980s**. Absentee landowners who rented land in and out of the valley came to dominate production. Supply side water augmentation practices and institutions such as water management districts and dam building were developed.

- **1980s to Present.** Adverse effects of previous efforts, along with overdraft, droughts, and external political pressures, forced searches for solutions beyond supply augmentation, among them WDM. However, for numerous reasons including cultural barriers to change, early efforts have not been very successful in implementing options to which operators up and down the valley can agree.

The remainder of this article presents a brief synopsis of the more important actions and events leading to the present situation with the BMP; evaluates the success of the BMP in achieving its predominant goal of reconciliating the highly organized agricultural production system with growth in other economic sectors and population growth in the valley; and identifies stakeholder groups and offers insights on polarized positions with respect to issues and recent events. These are the primary ingredients for informing and initiating problem resolution techniques such as CP.

Site History: 1800s to 1980s

Since the days of early Spanish land grants, the basin region has undergone a transformation from large owner operated ranching of cattle and other livestock to field crops such as wheat and sugar beets. Gradually, land holdings were reduced as original Spanish land grants were split up and more Anglos migrated to the area and bought land. In the early 1900s, truck crops irrigated by ground water began to emerge (Verardo and Verardo, 1989). By the 1930s, irrigated truck crop production became the defining feature of the landscape. At first, most production was in tracts along the coast, but gradually it spread to the middle areas of the valley and to some extent the lower end of the valley. The need for manual labor for harvest led to the use of large crews of immigrant labor – at one time Japanese and, later, largely Mexican.

As operations spread around the valley and the national demand for California truck crops (principally lettuce) increased, growers began to take advantage of the favorable microclimates distributed over the basin region, enabling them to stagger harvests and thereby produce up to three crops per year. As elsewhere in California, profits grew, and growers expanded and began to vertically integrate their operations, gradually consolidating power. This trend eventually attracted agri-firm investors from outside the valley (Fitzsimmons, 1983).

As the production systems became more sophisticated, growers gradually realized it was cheaper to rent land scattered throughout the valley than to own it. While growers own some of the land they work, most of them rent substantial amounts to take advantage of multicropping prospects. Because this form of production is labor intensive, contiguous plots offer no real advantage in efficiency. Multicropping, in turn, enables growers to use labor resources year-round, and this system contributes to efficiency.

While other regions of California and the nation have experienced an increased use of rented land in agricultural production, nowhere is this more prominent than it is in this basin. Tables 1 and 2 present an

TABLE 1. Number of Farms in Monterey County and California by Tenure Class for Agriculture Census Years 1945 to 1992.

	All Leased Land				Combination: Own and Lease				Total*	
	Monterey		California		Monterey		California		Monterey	California
Year	No.	Percent	No.	Percent	No.	Percent	No.	Percent	Farms	Farms
1992	380	31	9,639	12	644	52	21,110	27	1,245	77,669
1987	430	32	10,360	12	693	52	22,578	27	1,364	83,217
1982	420	31	9,215	12	708	53	21,907	27	1,347	82,463
1978	427	34	8,763	12	706	56	21,465	29	1,253	73,194
1974	370	33	7,958	12	622	56	20,335	30	1,120	67,674
1969	448	33	9,787	13	785	58	24,148	31	1,344	77,875
1964	311	28	9,667	12	648	58	27,634	34	1,115	80,852
1959	373	26	11,408	11	750	52	30,782	31	1,438	99,274
1954	361	23	11,302	13	731	46	29,970	34	1,598	89,426
1950	442	23	16,300	12	858	45	36,334	26	1,893	137,168
1945	489	25	17,121	12	885	46	35,969	26	1,911	138,917

*Totals exceed sum of individual categories due to unclassified land tenure status of some lands.
Source: U.S Department of Commerce, Census of Agriculture, 1945 to 1992, Vol. 1.

TABLE 2. Harvested Acreage in Monterey County and California by Tenure Class for Agricultural Census Years 1945 to 1992.

	All Leased Land				Combination: Own and Lease				Total*	
	Monterey		California		Monterey		California		Monterey	California
Year	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Acres
1992	107,582	42	1,703,091	22	209,199	82	5,215,131	67	255,938	7,760,773
1987	76,318	36	1,562,135	20	167,188	78	4,973,894	65	214,053	7,676,287
1982	85,037	33	1,455,714	17	193,745	76	5 700 607	65	255,043	8,764,808
1978	95,867	38	1,597,400	18	217,836	86	6,184,292	70	253,933	8,804,374
1974	NA		NA		NA		NA		NA	NA
1969	100,813	43	1,410,698	18	202,914	87	5,495,902	72	233,173	7,649,021
1964	75,783	32	1,095,930	14	207,318	88	6,095,489	77	234,855	7,845,850
1959	67,784	28	1,174,530	15	202,599	84	5,842,020	73	239,908	8,021,816
1954	77,629	32	1,295,314	16	204,810	84	5,829,261	70	243,666	8,350,581
1950	71,174	29	1,220,589	15	201,533	83	5,259,267	66	242,091	7,956,671
1945	66,583	29	1,252,132	17	172,418	76	4,659,710	62	226,826	7,535,523

*Totals exceed sum of individual categories due to unclassified land tenure status of some lands.
Source: U.S. Department of Commerce, Census of Agriculture, 1945 to 1992, Vol. 1.

overview of farms in the valley. Table 1 summarizes the number of farms by tenure class, indicating whether a farm is all leased land or a combination of owned and leased land. Table 2 shows the same tenure classes for land by number of acres harvested for each class. Although this complexity of factors has fostered billion dollar plus annual revenues in a system as profitable as any in North America, it has wrought curious consequences for California water resources. Following Fitzsimmons (1983), it appears that the California rules for ground water use are uniquely suited to this advanced production system (and no doubt were fostered by it). Water use is coupled closely with land use rights. Those who own or lease the land are entitled to free water drawn from the underlying aquifers.

By the 1960s, the relative economic power of tenants *vis-à-vis* landlords evolved to the point that lease conditions, which required meticulous stewardship of rented property, were relaxed. From this point, grower tenants have had minimal constraints from either landowners or property right prescriptions that required them to exercise stewardship in the quantity or quality of water use. Energy costs for pumping have been the only incentives to curb use. Huge overdrafts are not a surprise under these circumstances. Growers have avoided policy changes or problem solving approaches that would challenge the water use rules from which they presently benefit (Fitzsimmons, 1983).

The relatively small amount of owner operated land and the labor intensive nature of the production system, plus the spatial separation of operations, have not deterred outside investment. To the contrary, these patterns have contributed to substantial growth in profit because they are unique complements to the highly rationalized production system. This system has even succeeded in reducing the most basic agricultural resources – land and water – to mere inputs. For this reason the system can operate like some basic industries with the flexibility to substitute even the most basic inputs. There are few incentives to make any changes that might have even short-term negative consequences on profit.

History of Water Problems

Given the status of water in the basin production system, it is not surprising to discover that while salt intrusion was discovered as early as the late 1930s, little has been done about it. In 1945, a state water agency noted that salt intrusion was proceeding inward from the coast at about 6,000 linear feet per year (CDPW, 1946). Initial attempts to deal with the problem were straightforward; at their own cost, growers sunk wells into deeper aquifers until they reached the last accessible aquifer at 900 feet. But pumping costs increased, and gradually, salt intruded even into the deeper aquifers (Fitzsimmons, 1983).

Development of Water Districts

The first organized effort of basin residents to deal with water problems occurred when they decided to adopt the water district management approach. In the late 1940s, via enabling state legislation, a special water management district and agency were created to control floods and manage water distribution. Districts were authorized to replenish ground water and to levy special taxes, including irrigation pump taxes, to accomplish their goals. The advantage to having constituents is that projects can be undertaken that are beyond the means of individual growers, and the costs can be spread over the whole district population to include nongrowers. Growers favored this approach because withdrawals were not limited (although the authority to levy pump taxes could be exercised in a manner that could limit withdrawals). The water district agency finally proposed increases in pumping charges, but they were steadfastly resisted.

Obviously, irrigation is a mainstay in agricultural production. This practice grew from covering about 10 percent of the basin's cropland in the 1930s to 72 percent by the late 1950s and has continued to grow, along with salt intrusion. Studies in the 1950s suggested several causes of this overdraft: competitive pumping, inefficient irrigation, and the loss of a large portion of total surface water flow to the ocean during rainy winter months.

Regulation of pumping was not given serious thought in the 1950s, apparently because such concepts clashed with the prevailing "correlative rights" ground water doctrine. Correlative doctrine permits pumping from land overlying an aquifer, provided the water is put to "beneficial use." Agricultural extension agents have attempted to educate growers about efficient irrigation practices, but the impact of such efforts have been minimal (Fitzsimmons, 1983).

Construction of Dams to Replenish Water

The favored solution to the problem was management of the flow of the valley's principal river to enhance percolation from the riverbed to the aquifer system. This would minimize overdraft and, theoretically, salt intrusion. With the construction of two dams at the far inland reach of the river, the problem was believed solved. One dam was constructed in the mid-1950s on the main river; the other was constructed on a principal tributary within a few miles of the first in the early 1960s (Fitzsimmons, 1983).

This solution eventually proved to be problematic because of the unanticipated impact of the dams on land use in the valley. The dams provided a more reliable source of water in the middle and inland reaches of the basin. Vineyards were installed on 37,000 acres of bottomlands and benchlands, and new wells were drilled to irrigate them, producing a new demand for 55,000 acre-feet of water annually. Truck crop cultivation expanded to include 5,000 new acres, more than quadrupling the acreage farmed during World War II. By the mid-1970s, growers in these newly cultivated acreages were withdrawing proportionately larger amounts of water at a greater rate than those closer to the coast. Those closer to the coast had actually decreased their water use, but the depth to ground water in this area was nevertheless increasing. It was decreasing in the more inland area of the valley because of recharge from dam releases. Of course, salt intrusion continued to increase (Fitzsimmons, 1983).

Substantial inequities were apparent. The dams were financed by ad valorem property taxes. Since growers in the coastal region and some of the mid-basin areas had the most valuable land, they paid the largest share of the project costs. The taxing procedure also included urban landowners who were said to benefit from the economic well being of agriculture. The unforeseen development and use of water in the mid- and far-inland acres of the basin resulted in disproportionate benefits to growers in this area regarding tax contributions. Moreover, it did not improve and might have aggravated salt intrusion (Fitzsimmons, 1983).

The 1980s: Stalemate

By the early 1980s it was clear the problems were not being solved – overdraft and salt intrusion were increasing. Between 1980 and 1991, little materialized in terms of policy or project solutions. Projects to augment water supply (e.g., constructing small dams) and/or to transfer water to points of need were considered. Attempts to form action groups during this period to address the problem were stymied by emerging tensions between growers from the north and the south. Most recently, most of the conflict over policy still lines up geographically between growers in the north and south basin. These groups tend to view each other as water competitors, and each claims that the other is seeking an unfair advantage whenever a proposal is under consideration.

Negative feelings have grown out of the dam project's legacy. North basin growers tended to view the south county growers as having aggravated salt intrusion problems by pumping, while north county growers had reduced their pumping but still paid the "lion's share" of the remediation bill. South county growers felt they were paying for projects, *albeit* at a lower rate, that were designed primarily to benefit growers near the coast. Their opinions were based on the assumption that the aquifers in the valley were not interlinked for inland pumping to sufficiently impact aquifer pressure in the coastal area. Also overlooked was the fact that the water from the dam projects made it possible for cultivation of vineyard and truck crops on acreage that was either not previously cultivated or that had produced crops of lower cash value. Right or wrong, these positions were motivated by perceived threats by growers to their economic well-being.

The 1990s: Pressure from the California State Water Control Board

Growing tensions between grower factions prompted the county grand jury (1990) to take up the issue. The jury declared that salt intrusion and overdraft were extremely serious problems, and it directed the appropriate local agencies to come up with a viable action plan. It also indicated that the board of supervisors was not getting the job done and needed a board of directors with powers independent of the supervisors. Subsequently, the state Water Control Board sent a letter to the county board telling it to either come up with a feasible plan to solve the problem or face intervention by the state.

Under the stimulus of state pressure and a prolonged drought, the county board decided that its efforts, the water district's efforts, and the efforts of citizen working groups were not going to be effective. In concert with other county officials, the board sought legislation that would provide the water agency with sufficiently expanded policy and taxing powers to address the growing crisis. Enabling legislation was passed in 1990 and 1991, and it provided for a board of directors to be appointed by a variety of public and private local organizations and associations. The board of directors, however, was not granted policy autonomy – its proposals need final approval by the board of supervisors. We learned that the agricultural community lobbied hard to ensure that interests sympathetic to agriculture would dominate the nine appointees to the board. Moreover, the first chairman of the board was a prominent member of the agricultural community in the north basin area. This selection appears to have been an ill fated choice that tended to solidify inland growers' suspicions that the agency was "co-opted" by north county interests.

The agency was renamed to reflect its changing role and, under guidance from its new board, set out to address the crisis in two ways, both of which reflect an element of dualism in philosophy between agency and board members. One initiative seems to reflect a preference for the agency's past "engineering" policies which involved water transfer – in the form of two projects designed to move water from uncontaminated areas to impacted coastal regions. The other initiative was a decision in 1990 to develop a new problem solving policy approach, called a basin management plan. The effort to produce a plan was launched in 1992 and was supposed to be completed by late 1994. The agency also was directed to develop a water allocation plan but was never given a strict timetable or sanctions for failing to do so. A volunteer group of private citizens was given the task, but no viable plan was forthcoming. Although it was never explicit, some members of the agency felt that the BMP would accomplish this.

Development of the Basin Management Plan

In the early stages of the BMP process, evidence indicates that the BMP was indeed an effort to formulate a new policy approach that would broaden the traditional mission to include not only supply-side engineering strategies but also to encompass conservation activities. The staff assigned to the BMP argued that experience had taught them they needed a policy plan that integrated existing water projects operated by the agency and other organizations in the basin, such as efforts to reduce seawater intrusion; conservation programs; updated data pertaining to water balance, water supply, and water demand; and improved in-house capability of analyzing complex water situations. The plan also would have to recognize conflicts and the need for wide-scale public involvement; accept water resources management that goes beyond engineering solutions; incorporate interdisciplinary approaches; and approach problem solving holistically (Howard and Win, 1992). The agency decided to develop a long-term water resources plan that would comprehensively address all water resource management areas as a system encompassing the entire river basin (Howard and Win, 1992)

Efforts to Balance the Aquifer for Sustainability

A central focus in BMP documents was the notion of bringing the basin aquifer system into balance on a sustainable basis. The BMP process would achieve these goals by following a state environmental impact review (EIR) process to produce a "preferred plan" that would theoretically provide a long-term water and sustainable aquifer balance plan for achieving and maintaining this goal. It is clear that the intention was to address water management in a systems fashion, with attention to both supply and demand issues for a more comprehensive response to problems. Nevertheless, it was clear from the beginning that there was plenty of "wiggle room" in the formal statement of this initiative (and in the key actors' perceptions of the BMP's purpose), suggesting that it could look quite different in the end than its apparent statement of purpose suggested.

Two projects had been under consideration since the late 1980s. One involved a mid-valley well field and coastal pipeline transfer. The other involved a recycled water treatment and delivery system designed to partially treat and deliver sewerage water (gray water) from an urbanized coastal area to a nearby agricultural area that salt had intruded. Collectively, these two projects were known as the Salt Intrusion Project (SIP). The SIP had preceded the BMP and continued to be a focal point for the struggle over the salt intrusion issue as preliminary activities of the BMP unfolded (e.g., public meetings to discuss goals). Under pressure of potential state intervention, those projects were pushed hard by some members of the board. The gray water project possessed laudable conservation features, and both projects would provide relief directly to growers in the most highly salt-impacted areas of the basin. In other words, these projects would get the attention of the State Water Control Board.

Seeds of Controversy

As the scoping process unfolded, controversy began to build. Growers in the south and mid-basin areas sensed the pace had picked up, stimulating suspicions that those projects were being imposed on them without proper consideration of their impacts. The mid-valley well field transfer project collapsed at a public hearing in the spring of 1992 under the weight of contradictory testimony and resistance by many growers, particularly those in the vicinity of the proposed well field.

Similarly, the perception was very clear that the gray-water project was being financed by everyone in the basin under the false assumption that south basin pumping was a contributing cause of saltwater intrusion. Growers in this region began to discuss the perceived threat of this project and the BMP, and soon they decided to form a coalition of growers to assess and deal with agency actions.

At about this time, an agency hydrologist reported that salt intrusion had moved substantially farther inland than anticipated and threatening the major urban area in the valley. Certain members of the board of directors, fearing further collapse of progress on the SIP, utilized (and may even have orchestrated) this threatening news to pave the way for what one board member described as "the way things really get done." A closed door meeting with members of the coalition and other growers was held in the summer of 1992. At this meeting, grievances were aired, with both sides claiming they had been "gouged" by previous agency projects such as dams. Nevertheless, they eventually managed to reach an agreement on the wastewater project.

The agreement called for capital costs to be paid by urban and south basin growers at a relatively low tax rate, while growers in the coastal impact area would pay proportionately higher taxes, and users of the wastewater would pay the full cost of the delivered water. Supposedly, south basin growers also extracted a promise from north basin growers to join them in opposing recent agency efforts to initiate water metering on irrigation pumps. On the surface, this appeared to be a reasonably good compromise, but it enraged some urban board members as well as urban residents because the agreement was not effected in a public forum. The story hit the newspapers, and the excluded parties complained bitterly.

Ultimately, the gray water distribution project's tax assessment plan was supported by the boards of directors and supervisors. The board of supervisors, however, publicly censured the participants of this backroom action and warned that no more would be tolerated. It is prudent to note that a drought had been underway for a couple of years, and this fact probably contributed to the urgency for action and a tolerance for bending rules.

Failure of Attempts to Implement Regulatory Ordinances

In early 1993, the board of directors, by virtue of persistent urging from the agency's new conservation department, decided that the agency must have solid data on actual water use by growers. It proposed an ordinance to require growers to register their pumping facilities by early 1995 and to require annual water withdrawal reports. The supervisors passed the ordinance. Apparently, grower opposition was not organized enough to block this action, but many south and mid-basin growers were outraged by this apparent breach of a key condition of the backroom agreement on the gray water project. In response, membership in the south basin coalition began to grow, and its leadership indicated it would challenge the new SIP assessment plan in court. It filed a suit on the grounds of inequity.

Meanwhile, BMP public hearings began to reflect distrust on the part of growers and urban interests – distrust of each other and the policy process. At this point, agency personnel responsible for the BMP, board members, and members of the public seemed unsure of what the water policy conflicts were about and just how the BMP fit into the process. The MCWRA published newspaper announcements and sent out letters to invite residents to the public meetings to discuss and help formulate goals, but participation was uneven and sometimes dominated by county officials (Price, 1992).

The state Water Control Board, no doubt sensing a lack of progress, asked the agency leadership and its board for a meeting in March 1993 to review the status of remediation of basin problems in March 1993. The state board members were not pleased with what they heard in the status meeting and requested that a stronger plan of action be developed for another review meeting in August; failure to do so would result in state intervention in the form of water allocation via adjudication.

Implementation of More Stringent Regulations

In early summer, the board of directors met and proposed a series of mandatory rules, including pumping meters and pumping limits. In public hearings these proposals met stiff opposition, particularly from coalition growers. Members of the board, including its north basin chairman, openly expressed frustration over the public's unwillingness to accept any new initiatives. Ultimately the board developed a series of voluntary measures to curb water use.

Sentiment against agency policy was strong and growing, which became evident as the coalition pursued its opposition to the SIP gray water assessment plan in court. The coalition ultimately lost this action but remained resistant and prepared for action in other areas. At about the same time, the agency's ground water modeling consultant reported that the basin model indicated that a modest interaction of valley aquifers indeed existed. To the coalition members, this was evidence that their pumping was inconsequential as far as salt intrusion was concerned. In fact, as later events unfolded, the coalition developed its own model to combat implications by the agency's modeling consultant.

The August meeting with the state control board was decidedly tense. The board, in a subsequent letter, told the agency that the revised package of voluntary measures was inadequate, and it expressed doubts about SIP and BMP activities. The letter questioned the financial feasibility of the SIP and its efficacy. The board directed the agency to develop a short-term mandatory plan of pumping limits and related controls to be in place by October 15, 1993, or else an adjudication process would be initiated.

The agency met in September and, after intense controversy, drafted a short plan with several stringent controls, including setting limits on new drilling in the shallow aquifer, reaffirming mandatory well metering (although due dates were extended), establishing upper pumping limits for three critical basin zones, requiring urban conservation and allocation plans, and establishing pumping block rate fees in the three critical zones. The latter provision was a noteworthy indication of a demand management initiative being proposed in the basin, *albeit* by the state board.

This did not deter the south basin coalition. It began protesting the ordinance proposals immediately. When the board of directors met in October 1993 to finalize the ordinance package a bailiff was present in case contentious behavior at the previous meeting might be repeated. The coalition had an attorney present to record the proceedings to prepare for a probable lawsuit. The directors passed the ordinance package and forwarded it to the county board, which also passed it.

In this atmosphere, the BMP has lagged and suffered from neglect. Neither the agency nor the board has fully embraced the BMP as a focus for change. Symbolic of its status, the BMP was assigned new offices in trailers adjacent to agency headquarters. Nevertheless, some progress was evident. By January 1994, the BMP unit had developed a package of about ten multifaceted options for addressing basin water problems. Several conservation measures were included in some options, but most items labeled "conservation" in nature were really traditional supply augmentation measures, such as ground water storage enhancement and small dams. Other suggested conservation activities included on-farm technical assistance, which had been initiated by the agency several years earlier. The leading two options were centered on the notion of developing a mid-basin well field for transferring water by pipeline to the north basin impact areas.

Evaluation by the agency's hydrologic consulting firms of the ground water model indicated that most of the alternate plans would in fact eliminate further salt intrusion. While the public provided input in shaping the BMP's goals (leading to the designation of a set of options), consideration of the impacts of options and the selection of preferred options involving public response had not been given much thought at this point. SIAs in particular seemed to be a vague notion that the consultants would probably address at some point. In any case, the directors approved the BMP package and passed it on to the county supervisors, who approved the package later that spring. The county supervisors also directed that the environmental review process begin. At the same time, efforts were moving slowly to obtain federal funding for construction of the SIP gray water project.

Ordinances Sued by South County Growers Coalition

That same spring, implementation of the state required ordinance was handed a major setback. Coalition lawyers identified a sympathetic retired judge in a neighboring county and requested and received a temporary injunction against the key ordinances, including the one that established pumping charges. The injunction led to three lawsuits (for metering, pumping limits, and pumping charges). Several agricultural service towns in the south and mid-valley voted to join the coalition as friends of the court. Within a matter of weeks, the board of supervisors agreed to hire a water law firm to respond to the suits.

In May, the directors heard testimony on the SIP/gray water assessment plan that revealed that a number of growers, due to geographical locations, such as elevation, did not physically contribute to the overdraft problem. Others protested that the assessments were supposed to be a temporary source of funding pending federal funding. Given recent news of progress in obtaining federal loans and grants, they asked that the assessment be canceled. In this atmosphere of heated resistance to all their efforts, the directors voted 8 to 1 to suspend the assessment, pending consideration of other options. This effectively cut off cash flow for the SIP/gray water project. At this time, the only federal money the project received was an initial grant from a federal agency for $7 million, which was promised on a matching funds basis. Thus, the board was gambling that another source of funds would be identified.

In July the county's water law firm recommended to the supervisors that two of the three contested ordinances named in the suits – pumping caps and charges – be dropped and instead be proposed within the context of the BMP and therefore become subject to the EIR process. The directors decided they would only go along with dropping the pumping charge ordinance, but they were overruled by the supervisors, who retained only mandatory metering as a subject for a lawsuit.

Early indications that the state Board of Control would not look upon these developments favorably were realized. Later in July, the control board requested $1 million from the Legislature to start the background investigation process supporting water allocation by adjudication. A letter to this effect was sent in August to the agency directors and the board of supervisors. The letter seemed to indicate that there was still an opportunity to avoid this but in the meantime that precautions were to be taken by the state.

Problems in the Agency

The coalition, however, would not relent, and the suit focusing on the metering issues was set to begin early the next year. At about the same time this was scheduled, the agency learned it had been successful in obtaining an initial federal loan increment for the SIP project. It was nevertheless clear that with federal budget cuts looming, the entire $53 million was in no way a certainty.

This small success did not outweigh the substantial division and conflict within the agency that centered on ambiguity over goals. While this tension partially reflected constituencies that were pulling in different directions, it also reflected leadership issues stemming from a lack of in-house experience with politically charged policy change. Needless to say, these issues created huge distractions. Ultimately, the board hired a professional “head hunter” to identify a general manager with background and skills to handle the politically contentious policy environment.

By fall 1994, it was clear that the BMP preferred option selection would not be finished by year’s, end as initially scheduled. Moreover, the board of supervisors decided to evaluate the conservation ordinance that was part of the mandatory package from the previous October, within the context of the BMP EIR process. Apparently, this evaluation was to minimize the risk of any other legal action. It was also consistent with the initial mission of the BMP – to be an integrating vehicle for water programs and policy. Up to this point, however, the BMP had been viewed by those individuals used to traditional engineering solutions as just another project and not a planning and integrative vehicle overarching all activities, as some had suggested at its inception.

Concern over delays in the receipt of U.S. Bureau of Reclamation (USBR) loans, caused the board of directors to recommend reinstatement of the SIP/gray water tax assessment process in October 1994 to ensure a financial base for initiating the project. A more equitable assessment plan was worked out and subsequently approved by the supervisors. But tension between north and south basin persisted, and news articles and editorials during this period made it clear that many growers in the south basin viewed north county growers, the agency, and the state Board of Control as probable conspirators.

In December, following some further internal screening and ranking, the BMP’s staff began to expose its list of options to the public in scoping sessions around the county. The two favored options were, as noted, predominately supply side plans that featured the mid-valley well field and water transfer pipeline. At this point, the screening concepts of impact assessment consisted primarily of concerns for intergroup equity *vis-à-vis* tax base. At these sessions, however, south and mid-county growers began to articulate further impact issues they would like evaluated. For example, concern was voiced over the amount of land that would be converted to nonagricultural uses under the implementation of various options, and another concern was the cost-to-benefit ratios of several conservation elements such as upper pumping limits associated with certain options. Clearly, the BMP EIR process, which had begun as a vehicle for decision making (but only by virtue of out-of-court legal settlement) was now provoking pointed concerns about "whose ox would be gored" and by how much!

New General Manger

At this time, the board of directors also announced it had selected an area resident as general manager who had held a similar position in the adjacent county with considerable success, though on a smaller scale. He was in fact selected because of a record of strong leadership and public relations skills. This move almost immediately began to clear up internal problems and also brought some indications that communication with various grower groups was improving. Nevertheless, conflicts over policy direction were still evident and a long way from resolution.

During January 1995, the grand jury again took up the matter of overdraft and salt intrusion and was critical of county efforts to date. The directors recommended that the board of supervisors take steps to improve opportunities for the public to participate in water policy decision making. They also recommended that the agency do something to reconcile competing views of the valley aquifers in terms of their interdependence, or lack thereof. This was now aggravated by having two models with dramatically different implications – one belonging to the agency, the other developed by the coalition’s ground water consultant.

The directors and the agency appeared sensitive to these concerns. That month the board selected a new chair, a grower from the south basin area, and implemented a strategic planning procedure. Early indications were that long time board members felt the board was beginning to operate more smoothly. Later in the spring of 1995, the board decided to assemble a panel of leading hydrologists to examine available historical data and modeling information to attempt to reach a conclusion about whether the basin was one hydrologic system. The panel was convened and later that spring issued a document concluding that the basin was indeed a single system.

Hearings began in February 1995 on the lawsuit. In May 1995 at the conclusion of the study period, the county and coalition reached an out-of-court settlement on the remaining contested ordinance – mandatory pumping meters. A conclusion reached not long before that about the interdependence of the valley aquifers was possibly a factor here. The decision was made to retain metering requirements but not to enforce it until it too could be subjected to an EIR as a component of the BMP.

PRIMARY OBSERVATIONS

At the close of our observation period, it seemed clear that although progress was being made to reduce conflict, balancing the aquifer system or solving salt intrusion problems were not in the near future. The stature of the BMP as an integrative device had improved. Problem solving would now involve evaluating a package of conservation remedial elements (the preferred option) to abate the problem rather than using an engineering supply project *per se*. Moreover, all packages would be subject to some degree of risk/benefit analysis. Nevertheless, the preferred options at this point are decidedly slanted in favor of supply-side thinking, and the scope of the risk/benefit analysis appears to be limited with respect to socioeconomic side effects. An assessment of distributive costs and benefits by group, by time frame, etc., is needed if the public is really going to understand how each option will affect them.

The bias toward supply side situations is understandable given the history of water management in this basin. This tradition has been challenged only a couple of times. The October 1993 ordinance requiring upper pumping caps and pumping block rate charges in selected zones are cases in point. These provisions, however, were required by the state and, thus, their inclusion in the BMP/EIR process was induced. In one other instance, a suit filed in October 1994 by the Sierra Club concerned instream uses of the principal river that diminished fish habitat. The suit challenged one basin city's use of ground water from the riverbed on the grounds that it lacked an appropriation permit to use what the Sierra Club said was actually streamflow. This is the only instance concerning instream flow in the whole controversy and the only challenge to the allocation issue based on the rules of use, i.e., property rights. Instream and other property rights issues may assume a larger role in this controversy before it is all over.

On the whole, the stated goal of the BMP (to achieve a balanced aquifer plan via a comprehensive systems approach) falls substantially short of the mark. None of the options really considers a balanced blend of supply side and demand side management strategies, much less a full-scale demand management approach. The alternatives also lack a long-term planning component. So how can a basin aquifer system be balanced over the long run without strategic planning for growth and estimates of future demands being compiled on an ongoing basis? Also, how can this goal be reached by relying largely on water transfer from one basin location to the other? If the adopted option does not include substantial conservation with water use modifications or incentives to reduce use, then it is unlikely the plan (shifting sites for pumping water in order to supply other locations) will balance the aquifer in the long run, and the whole process likely will have to be repeated in another 8 or 10 years.

A related consideration is that the current selection process may be further delayed as impact information is produced and evaluated by potentially affected groups. Impacts are particularly problematic because potentially affected stakeholders have not been involved or explicitly identified in the public involvement (PI) effort started under the BMP effort. The BMP process has proceeded from its inception to attempt to get PI in the decision making process. Many groups have participated in varying degrees, but the most powerful, such as growers, have been the most vocal, because they have the political experience and resources for participation. The BMP has relied mostly on public announcements and letter writing campaigns to recruit potential impact groups. This is not the most effective approach to involve low visibility, low resource groups. Conspicuous by their absence is the farm labor community, many of whom are of minority status and therefore particularly vulnerable to any dislocations in the agricultural economy.

The SOM approach summarized in the previous section provides the ingredients to begin PI/CP by clearly identifying key stakeholder groups, key interests of these groups, and clear separation of the latter from spurious issues (e.g., water use practices, policies, laws, and institutions) that often become divisive and the focus of struggle.

Agricultural stakeholder groups in the Salinas Valley include three basic factions – those whose primary base of cultivation is in the south end of the valley, those in the north, and those whose base of cultivation is distributed throughout the valley. Criteria for defining the third group would need to be rigorously developed, but this key group is important because its political loyalties regarding water issues are likely divided. This third group may prove to be pivotal in terms of resolving water policy. Other key stakeholders are urban residents who probably can be divided between those who are employed in the agricultural service sector and those who are not. Other stakeholder groups are the farm labor community, environmental activists, and business owners who operate around the two Salinas River manmade recharge lakes.

Perhaps the most ignored or obscured factor in the problem-solving process to this point has been the identification of stakeholder's basic interests, as opposed to issue positions. This part of CP helps stakeholders define themselves, but our analysis provides some hypotheses to assist facilitators. For example, environmental stakeholders have an interest agenda that includes establishment of instream water rights and protection of fish and wildlife habitat. Farm labor has not had the opportunity to really articulate its interests, but protecting employment and perhaps water quality are key interests. Agricultural sector and urban stakeholders have visibly sided with growers but have exhibited some ambivalence that needs to be fully detailed. The balance of urban stakeholders seems to be primarily defined by an interest in equitable tax policy for water management solutions and adequate potable water supply. Business interests (largely recreationally based) at the recharge lakes are defined by a concern for reservoir management practices that protect their profitability. Similarly, growers have lined up on opposite sides of a plethora of water issues, proposed solutions to overdraft and the like, but in the final analysis, they all have one common interest – to protect the profitability of agricultural enterprises.

SUMMARY

The application of SIA using a SOM has provided a detailed view of agricultural change in the Salinas Valley. The forces that intervened shape the use of water and in turn the key impact of these events on the community. Since the late 1800s, the history of water use decision-making in the Salinas Valley has evolved from a period of relatively low population and low pressure on valley water resources to substantially higher population growth, growth in volume of water demands, and increased complexity. Throughout history, rules and institutional processes evolved to accommodate the substantial growth, particularly of agricultural water use via irrigation. These changes have focused on ground water use, which has dramatically increased since the turn of the century, with annual estimates of overdraft persistently hovering at 60,000 acre feet, and increasing to 350,000 acre feet under drought conditions.

While rules and related institutions have evolved to accommodate ground water use for irrigation, they have not evolved with any sense of limits. Instead, the rules have evolved mainly to enable maximum use of the resource. Underlying market values tend to support any level of use that promotes economic growth, i.e., the so-called highest use. Under the prevailing overlying use and correlative rights doctrine in California, anyone who owns or leases lands overlying an aquifer can pump unlimited amounts, with the vague provision that they put it to some "reasonable and beneficial use."

Water, however, is essentially the property of the entire citizenry. The overlying users have a right to use only; they do not own the water. As a result of the *incomplete property rights* situation, users have no clear obligation under law, and except for energy and capital costs of pumping, they have little economic incentive to conserve or otherwise exercise care of the water they are using. In the Salinas Valley this has worked particularly well for agriculture because a high percentage of growers *lease rather own* most of the land they use. The net result of these two factors is that growers in the valley do not have binding incentives to practice good stewardship of two critical resources – land and water (Fitzsimmons, 1983). An outcome of this water use situation is substantial incentive to not reexamine principle assumptions and rules governing water use. Indeed, few groups in the valley appear to be asking whether the basic rules governing water use are appropriate for today's conditions.

The BMP was conceived in 1992 with the intent of developing not just supply projects but also policies for long term water management. These policies included forward looking water demand management (WDM) strategies. However, the BMP was most successful in contemplating technical projects and actions. Proposed policies and actions that require changes in underlying rules and assumptions such as cultural change proved more difficult. Regulating institutions appeared to operate under the assumption that there is plenty of water out there; the problem simply is getting it to the right places at the right time! Consequently, most decisions within county government and the MCWRA were oriented to making relatively small, discrete decisions as opposed to challenging major assumptions and rules about distribution and management, particularly management of demand. As a result, a concerted look at the institutional context and the long haul was lacking. This perspective effectively blocks adoption of significantly different management strategies that might balance the aquifer system.

Because of the eminent threat of saltwater intrusion, north county growers appear to be more able to accept policy changes that vary from extant water use values and rules. Nevertheless, north and south county growers historically favor approaches that do not disturb existing norms of water use and show distinct preferences for supply augmentation and technical solutions. For understandable reasons, most growers resist solutions that involve outside intervention such as adjudication. Not only does this threaten local control of water policy, but it also threatens the normative consensus that permits relatively unrestrained access to cheap water. Nevertheless, preoccupation with supply side projects fed frustration and raised the level of conflict because engineering projects are expensive and the benefit-to-cost ratios of such projects at this time are low to nonexistent (Reisner, 1986).

CONCLUSIONS

Possible solutions to current conflicts affecting the Salinas BMP and similar efforts may lie with new policy implementing processes such as collaborative planning (CP), a relatively new conflict resolving approach that is being tried in a number of natural resource areas. Usually it is inspired by crisis situations, such as reaching the limits of a resource under historic management regimes, and situations in which more traditional processes have failed to bring about agreements. Taking a new approach such as CP might create an atmosphere for more innovative thinking in terms of changing the rules for water management. WDM is, of course, threatening and possibly even inflammatory to many because it means revisiting basic values and assumptions underlying water use. However, it may be possible to construct a community-based collaborative approach to water management that could fit within the agricultural community's framework of values. That is, it might challenge old ideas but still produce solutions consistent with a grower's basic interests in maintaining a profitable enterprise within a free market framework. Suffice it to say a CP approach would still require changing basic attitudes and behaviors, but it is a grassroots approach to decision making, and this could make it easier to accept than most prevailing top-down approaches. Collaborative planning or a version thereof may be a constructive method to bring about fundamental change where conflicting interests are entrenched.

The CP approach appears to be working in some natural resource arenas, and it does raise the attractive possibility that if it does work, a solid base of constituency support can enable plans to be implemented more easily. This bodes well for future adjustments. Moreover, with Salinas Valley communities' concerns for maintaining autonomy over water, CP may be a problem-solving approach that can gain acceptance for both supply and demand management strategies as significant components of a comprehensive water plan for the basin.

CP begins by identifying interest groups and proceeds through a process of bringing them to the negotiating table, where all groups engage in defining the problem and their individual interests and in designing and evaluating solutions such as SIA. While there is a need to better define stakeholder groups and their basic interests, this analysis provides a sufficient identification and specification of these, plus a description of the water decision process over time to provide a foundation for facilitators who are initiating a CP process. We believe that the overview we have presented here of the Salinas Valley BMP process documents clearly that this effort could have moved forward more efficiently if participants had made more explicit use of SIA and CP. In fact, SIA and PI appear in early flowcharts for the project, and various program managers made an attempt to properly use these technologies. But our observations revealed two unfortunate factors: top managers and decision-makers did not fully appreciate the nature and importance of the sociopolitical processes, and those managers who did try to integrate SIA and PI did not fully understand these procedures well enough to know when they were not being properly administered. It is clear that early use of qualified experts is very important if SSTs are to be of significant value.

But almost all who undertake natural resource projects have to learn more about social science techniques. We already see the MCWRA BMP becoming more sophisticated about these techniques and their proper uses, which we view as a type of social learning that is occurring across the country. Water planning in the Salinas River Basin evolved from 1947 to 2000. This *evolutionary* process appears to be at a point at which local groups and communities have to reexamine their traditional cultural beliefs and practices about water use. From our vantage point, it appears that water planning in the valley is moving through a somewhat predictable and necessary process of change. If evaluated from a current, short-term perspective, the BMP can appear as going nowhere and caught up in conflicts and lawsuits. But from the longer perspective, it appears probable that the BMP is following a rather predictable, unavoidable process – a process necessary to create local cultural change. Viewed this way, the BMP has followed a logical progression: it has tried and temporarily exhausted a variety of technical, mostly supply oriented, solutions. Now the BMP appears to be moving gradually into broader, community based conflict resolution and planning processes that are more appropriate for implementing *cultural change*.

LITERATURE CITED

Branch, K., D. Hooper, J. G. Thompson, and J. Creighton, 1984. A Guide to Social Impact Assessment. Westview Press, Boulder, Colorado.

CDPW (California Department of Public Works), Division of Water Resources, 1946. Salinas Basin Investigation. Sacramento, California.

CDWR (California Department of Water Resources), 1971. Nitrates in Ground Waters of the Central Coastal Area. Memorandum Report, Sacramento, California.

Cortese, Charles F., 1999. The Social Context of Western Water Development. JAWRA 35(1):567-578.

Fisher, R., W. Ury, and B. Patton, 1991. Getting to Yes. Houghton Mifflin Company, New York, New York.

Fitzsimmons, Margaret I., 1983. Consequences of Agricultural Industrialization: Environmental and Social Change in the Salinas Valley, California 1945-1978. Ph.D. Dissertation. University of California, Los Angeles, California.

Gray, B., 1985. Conditions Facilitating Interorganizational Collaboration. Human Relations 38:912.

Howard, Lauran L. and U. Win, 1992. The Salinas River Basin Water Resources Management Plan in Managing Water Resources During Global Change. *In:* Managing Water Resources During Global Change, Raymond Herrmann (Editor). AWRA Proceedings, Annual Conference and Symposium, Reno, Nevada, pp., 417-427.

ICGP (Interorganizational Committee on Guidelines and Principles), 1994. Guidelines and Principles for Social Impact Assessment. U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-F/SPO-16.

Price, Holly J., 1992. Water Resources Management in the Salinas River Basin. Vol. 1: Water Rights Laws, Conflicts and Organizations. Prepared for Monterey County Water Resources Agency, Salinas, California.

Reisner, Marc, 1986. Cadillac Dessert: The American West and Its Disappearing Water. Viking Press, New York, New York.

Tate, D. E., 1990. Water Demand Management in Canada: A State-of-the-Art Review. Social Science Series No. 23, Inland Waters Directorage, Water Planning and Management Branch, Ottawa, Canada.

Taylor, N. C., C. H. Bryan, and C. G. Goodrich, 1995. Social Assessment: Theory, Process and Techniques. Taylor, Baines and Associates, Christchurch, New Zealand.

Thompson, J. G., K. M. Branch, and G. W. Williams, 1982. The BLM Social Effects Project: Summary Research Report. Mountain West Research, Inc., Denver, Colorado.

U.S. Department of Commerce, 1945, 1950, 1954, 1959, 1964, 1969, 1974, 1978, 1984, 1987, and 1992. Census of Agriculture: Vol. 1. Suitland, Maryland.

Verardo, Jennie D. and Denzil Verardo, 1989. The Salinas Valley: An Illustrated History. Windsor Publications, Chatsworth, California.

Westra, Rebecca and Rick Vinton, 1992. Final Social and Economic Present Condition Report for the Salinas River Water Resource Management Plan Study. Prepared by the U.S. Bureau of Reclamation, Salinas, California.

Wondolleck, J. M. and S. L. Yaffee, 2000, Making Collaboration Work. Island Press, Washington, D.C.

ATTACHMENT 3

LandWatch, Selection of Projects and Management Actions for Salinas Valley Water Supplies, Draft Report, October 28, 2021.

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Selection of Projects and Management Actions for Salinas Valley Water Supplies

DRAFT Report

Purpose of the Report

Numerous groundwater management projects have been proposed by the Monterey County Water Resources Agency (MCWRA) and by the Salinas Valley Groundwater Basin Groundwater Sustainability Agency (SVBGSA) and the other groundwater sustainability agencies (GSAs) in the six separate Groundwater Sustainability Plans (GSPs) adopted or drafted for the Salinas Valley. Although the SVBGSA proposes that it should ultimately identify and adopt an integrated suite of multi-subbasin projects,[1] the GSPs do not provide a methodology or criteria for selecting that suite of projects, for allocating their costs, or for evaluating the choice between projects and management actions, including pumping controls.

This report is intended to identify economic and technical issues that should be addressed in the selection of water supply projects and management actions for the Salinas Valley. Water management agencies must resolve these issues to choose projects using an open and reasoned process. Ultimately, selection of projects and management actions is their responsibility.

Summary of Issues in Selection of Projects and Management Actions

1. Willingness to pay. First, the agencies must determine the willingness of urban water suppliers and agricultural users to pay for projects and management actions. It appears possible that the unit cost per acre-foot (AF) for many of the proposed projects may exceed willingness to pay. These projects are therefore infeasible.

2. Water needs and water rights. Second, the agencies should identify the water needs and water rights of the urban suppliers and agricultural water users because those needs and rights critically affect willingness to pay and the scope of needed projects and management actions. Users should not be willing to pay for water projects to provide new or relocated water to replace water they already have a right to obtain at their cost of pumping. Rough calculations based on data from

[1] See, e.g., 180/400 GSP, p. 9-25; Eastside GSP, p. 9-4.

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the six GSPs suggests that at least 13,962 AFY of new or relocated water is needed to support urban suppliers and at least 28,630 AFY is needed to support agricultural users. If so, this suggests that projects or management actions providing at least 42,592 AFY are needed and that it may be equitable to allocate about one third of the cost of new water projects to urban suppliers and two thirds to agricultural users.

3. Equity issues between subbasins. Third, the agencies must address equity issues between subbasins. The ad hoc development of six GSPs by six different subbasin committees has resulted in inconsistent assumptions about water budgets and about responsibility for undertaking projects and management actions. Two of the six GSPs do not acknowledge overdraft conditions in their subbasins and it is not clear what responsibility, if any, these GSPs would assume for projects and management actions that benefit other subbasins. Another GSP assumes that the primary responsibility for managing overdraft and seawater intrusion lies with adjacent subbasins, and, again, it is not clear what responsibility this GSP assumes. The inconsistent approaches to water budgets and mitigation responsibility must be resolved in order to secure water users' willingness to pay for water projects or to incur the cost of pumping allocations and controls.

4. Costs and benefits of pumping reductions compared with infrastructure projects. Fourth, the agencies must weigh the costs and benefits of pumping reductions against the costs and benefits of infrastructure projects. Pumping reductions can be achieved by fallowing or by pumping allocations and controls. To the extent that the direct unit cost per AF for fallowing, or, alternatively, the opportunity cost per AF for pumping allocations and controls, are lower than the cost per AF for infrastructure projects, then pumping reductions may be preferable. Information from water markets, studies of other groundwater basins, and information in the GSPs regarding fallowing costs suggests that pumping reductions may in fact be less expensive than many of the infrastructure project proposals in the six GSPs.

5. Least cost alternatives. Finally, the agencies should work through the range of potentially feasible projects and management actions to identify the least cost combination. This requires more information about proposed projects, especially unit costs and benefit volumes and locations, than is currently available, at least in the GSP documents.

The water agencies should address and resolve these issues openly in selection of groundwater projects and/or management actions. Without resolution of these issues, it is premature to proceed with the assumption that any particular project or projects should be pursued.

1. Determine the willingness to pay for water projects by agricultural water users and urban water suppliers because that determines project feasibility.

There is no point in pursuing projects that cannot be funded. Determining what projects may feasibly be funded requires estimating of the quantities of water (new or relocated supply) that would be purchased or financed at various price points, in effect developing a demand curve. It is not sufficient just to determine one value, e.g., the maximum amount that might be paid for an acre-foot by a farmer seeking to preserve permanent crops in an extended drought: a project is only economically feasible if there are buyers willing to pay the long term average cost for all of the water it supplies. Stakeholder rejection of the 2021 draft Proposition 218 Engineer's Report for the Nacimiento and San Antonio dams maintenance projects demonstrates that determining the willingness to pay is complex and that failure to determine willingness to pay accurately may result in significant delay in project selection and funding.

If projects are sponsored through the Sustainable Groundwater Management Act (SGMA) GSP process, then the GSPs must include both the estimated cost for each project and "a description of how the Agency plans to meet those costs."[2] DWR must have substantial evidence to support a finding that the projects are "feasible" and that the GSA "has the financial resources necessary to implement the Plan."[3] The current draft GSP's do not provide evidence that funding is actually feasible. Their discussions of project funding merely list the kinds of funding arrangements that are commonly used for large capital projects with no discussion of actual willingness to pay in the Salinas Valley.[4]

For agricultural uses, irrigation water is an input to production, so the maximum value of water is constrained by expected returns. There must be some price beyond which agricultural users will not pay for water projects. Is it $500 per AF? $750? $1,000? $1,500? And how much water would be demanded at each of these prices? The GSP's simply fail to address these critical questions. Furthermore, we are advised that MCWRA has not systematically studied willingness to pay for water projects. The GSAs or MCWRA should commission an econometric study to develop a rough demand curve to inform the feasibility of water supply projects for the Salinas Valley.

[2] 23 CCR § 354.44(b)(8).

[3] 23 CCR § 355.4(b)(5),(9).

[4] Eastside GSP at 10-15; Monterey GSP at 10-23; Langley GSP at 10-15; UVA GSP at 10-15; Forebay GSP at 10-15.

Many of the projects proposed in the draft GSP's produce water that would cost over $1,000 per AF. There is at least some evidence that such projects may not be feasible. First, water markets provide some evidence of willingness to pay. Although some farmers have reportedly paid as much as $2,200 per AF for some amounts of water for high value crops (e.g., on a short term basis to protect investments in permanent crops), the average NASDAQ Veles California Water Index water futures price is now only $686 AF, an historically extraordinarily high price attained only as a result of a long drought period.[5] Agricultural water has reached market prices in the $500 to $1000 range only in times of water stress.[6]

Research in the San Joaquin Valley establishes that most farmers would not be willing to pay more than $300 to $500 per AF for new long-term supplies:

> Our economic model of valley agriculture (described below) provides some guidance on how much farmers would be willing to pay for additional long-term water supplies. This price is the profit farmers can earn with an additional acre-foot of water; above this level, it is more economical for them to reduce water use and irrigated acreage. A small number of farmers might be willing to pay a very high price—as much as $900/acre-feet (af)— to avoid long-term fallowing of some very profitable lands. And to cope with temporary shortages—such as at the height of the 2012–16 drought—some farmers will pay top dollar for water to keep their orchards alive. [footnote omitted] But with available options, most valley farmers will not be willing to pay more than $300 to $500/af for new long term supplies.[7]

That research establishes that many San Joaquin Valley farmers would be willing to forego water supplies at much lower unit costs, leading to the conclusion that investments are unlikely in projects costing more than $500 per AF:

> For more than half of valley cropland, the cut-off price would be much lower, because an additional acre-foot of water would generate less than $200 in added profits. This difference in the profitability of water in different uses drives incentives to trade water. When valley-wide surface water markets are allowed,

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5 Aquaoso, California Agricultural Water Prices by Water District, June 17, 2021, available at https://aquaoso.com/blog/california-agricultural-water-prices/**.**

6 *Id.*

7 Hanak et al, Water and the Future of the San Joaquin Valley, p. 22, Feb. 2019, available at https://www.ppic.org/wp-content/uploads/water-and-the-future-of-the-san-joaquin-valley-february-2019.pdf.

> the price of water in the market falls to about $185/af. In our analysis of willingness to pay, we consider farmers' water demand with and without valley-wide trading under current conditions, and we also consider the possibility that profitability of farm water use may increase by up to 25 percent from shifts toward more profitable crops, higher prices for farm output, or cost-reducing technology. With this higher profitability and no valley-wide water trading, some farmers would be willing to pay more than $500/af to acquire up to 340 taf of new supplies. With more limited increases in profitability and some valley-wide trading, farmers would only be willing to pay this price for up to 100 taf. We assume farmers would seek to invest in less expensive projects where feasible, however. This reduces the likelihood of investments in projects costing more than $500/af. See Technical Appendix D for details.[8]

Based on this analysis, the research concludes that the San Joaquin Valley farmers would only be willing to invest in a subset of the potential new water supply projects – those with the lowest cost, such as reservoir reoperation and some groundwater recharge projects. Similar analysis should be undertaken for the Salinas Valley.

Conditions and farming profitability per acre in the Salinas Valley differ from the San Joaquin Valley. However, the Salinas Valley GSPs do provide evidence of willingness to pay based on Salinas Valley farming conditions reflected in local land values. The analysis of fallowing and agricultural land retirement in the Eastside, Langley, Upper Valley, and Forebay GSPs indicates the limits to willingness to pay for water supplies by identifying the opportunity cost (i.e., lost profits) for not farming. Based on local land values, water usage per acre, and cover crop costs, these analyses conclude that farmers would be willing to fallow land, thereby making its water available to others, at costs of between $195 to $1,730 per AF.[9] As in the analysis of San Joaquin Valley willingness to pay, the cut-off price would be lower for those farms with lower profitability per acre-foot, so a fallowing program designed to generate a particular volume of pumping reductions would not necessarily need to be based on the higher prices at which farmers would be willing to participate in a fallowing program.

If Salinas Valley agricultural users would find it more profitable not to use water at all when it is worth more than these fallowing cost estimates, it is not reasonable to suppose that they would vote to assess themselves for a capital project that produces water at higher costs per acre foot. Projects intended to produce agricultural water supplies at costs greatly in excess of the cost of water produced by a fallowing program may not be financially feasible.

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8 Id., fn. 34.

9 See Tables 9-1 in the various GSPs.

Economic feasibility for individual farmers is a first order consideration. A robust analysis may also consider the externalities from demand reduction to the extent that it results in lost economic value to the community from reductions in farming activity. However, to the extent that this second order cost is considered, the agencies responsible to choose and implement water projects should identify the parties that are expected to bear the cost to prevent this second order harm. It may not be realistic to expect individual farmers to pick up the social costs of their decision not to pay more for water.

Finally, as discussed in the next section, while municipal users may be willing to pay more per AF than agricultural users, it may be both legally difficult and inequitable to impose the entire burden of higher cost water on municipal suppliers who now pay the same cost as agricultural users, i.e., the cost to pump native groundwater.

In sum, the agencies responsible to implement water projects should determine the actual willingness to pay for infrastructure or fallowing projects in order to ensure that planning effort and capital are not diverted to economically unrealistic, infeasible projects.

2. **Determine the urban and agricultural water rights and needs as a critical factor in willingness to pay.**

Decisions about the amount and location of new or relocated water supply should be informed by a frank acknowledgment of water needs and water rights because needs and rights determine willingness to pay. Users who do not need new or relocated supplies because existing supplies to which they have superior rights are sufficient may not be willing to pay for projects. For example, urban suppliers may not be willing to pay for water for which they currently have superior rights to obtain at their cost of pumping. Or for example, the draft GSPs for the Upper Valley and Forebay Subbasins do not contemplate the need for any new water projects based on the conclusion that current and future supplies are likely sufficient. Although this conclusion has been challenged, for the purpose of planning new projects to produce or relocate water, some consensus regarding water needs and rights is essential.

a. Urban supplier water needs and rights.

Urban suppliers who have pumped in an overdrafted basin for five years have a prescriptive right that takes priority over pumping by agricultural overliers.[10] In an

[10] Garner et al., The Sustainable Groundwater Management Act and the Common Law of Groundwater Rights—Finding a Consistent Path Forward for Groundwater Allocation, Journal of Environmental Law V38:2, 2020, pp. 187, 207, available at https://www.edf.org/sites/default/files/documents/01JELP38-2_Garner_etal.pdf.

adjudication, the amount of that right is reduced by so-called "self-help" pumping by overlying landowners, and it would also likely be ramped down to reflect the "safe yield" of the aquifer (similar to SGMA's "sustainable yield").[11] Typically, the urban supplier would have the prescriptive right to pump the same percentage of the safe yield as the percentage of total pumping it pumped during the prescription period.[12]

Urban supply may not be limited to prescriptive rights because the constitutional mandate for reasonable and beneficial use may make domestic water use a higher priority even without prescription.[13] Water Code sections 106 declares as state policy that domestic use is a higher priority than agricultural use, and one court interpreted this to require urban use even without prescription.[14]

However, on balance, urban suppliers may not be willing to count on water rights greater than their prescriptive rights.[15] The prescriptive right may not be sufficient to cover existing urban demand because the right is determined by ramping-down historical pumping by the overdraft percentage, and it does not include water for growth. Thus, urban suppliers in overdraft areas or contemplating growth may be willing to pay for new or relocated supplies in an amount equal to their water needs for growth plus their percentage share of historic overdraft.

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[11] Id. at 189-190, 207. "Safe yield" is functionally equivalent to SGMA's "sustainable yield." (Id. at 206 n 189.)

[12] Id. at 187, 207.

[13] Id. at 177-178, 196-198.

[14] Id. at 197. No court has yet interpreted Water Code section 106.3, declaring the human right to water for domestic purposes.

[15] Urban suppliers are likely to want more certainty for planning than agricultural users:

> Thus the interests of urban utilities may diverge from agricultural interests in some basins: while many growers may prefer to forgo firm pumping allocations in favor of a slow glide path to sustainability, groundwater-reliant urban utilities will be interested in greater certainty. Setting pumping allocations—and devising a clear timeline for transitioning to sustainability—can put utilities on a firmer footing as they plan for the future.

(Ayres et al., Groundwater and Urban Growth in the San Joaquin Valley, Sept. 2021, available at https://www.ppic.org/publication/groundwater-and-urban-growth-in-the-san-joaquin-valley/.)

The amount for which urban suppliers may be willing to pay can be roughly estimated from data in the GSPs and AMBAG urban growth forecasts.

- The 180/400 GSP identifies an historic 10% overdraft totaling 10,900 AFY and current urban use of 17,400 AFY.[16] AMBAG projects that the primary urban areas in the 180/400, Salinas and Gonzales, will grow 15.8% from 2015-2045.[17] Thus, urban suppliers in the 180/400 Subbasin may be willing to pay for 10% of the existing use 17,400 AFY use, representing their share of historic overdraft mitigation, plus the water to support 15.8% growth, a total of 4,489 AFY.

- The Eastside GSP concludes a 27% to 30% reduction in pumping would be required to avoid overdraft and attain sustainable yield, and it identifies current urban pumping as 7,500 AFY.[18] Again, the primary urban users are parts of Salinas and Gonzales, for which AMBAG projects 15.8% growth from 2015-2045.[19] Thus, urban suppliers in the Eastside Subbasin may be willing to pay for 30% of their existing 7,500 AFY pumping plus 15.8% growth, or 3,435 AFY.

- The Monterey GSP reports current Monterey Subbasin pumping as 5,274 AFY.[20] It projects future pumping at 10,788 AFY.[21] It finds no overdraft in the Marina/Seaside/Fort Ord area, "if adjacent subbasins are managed sustainably and the 180/400 Foot Aquifer Subbasin reaches its SMCs."[22] It implicitly finds an overdraft of 374 AFY for the Corral de Tierra area based on a sustainable yield of

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16 180/400 GSP, pp. 3-11, 6-40, 6-42.

17 AMBAG, Final 2022 Regional Growth Forecast, Nov. 8, 2020, available at https://www.ambag.org/sites/default/files/2020-12/Final%20Draft%202022%20Regional%20Growth%20Forecast_PDF_A.pdf.

18 Eastside GSP, pp. 6-30, 6-28. Note that the Eastside GSP states that pumping may be understated. Id. at 6-29.

19 AMBAG, Final 2022 Regional Growth Forecast, Nov. 8, 2020.

20 Marina GSP, pp. 6-26, 6-31 [3,503 AFY for Marina-Ord and 1,771 AFY for Corrral de Tierra].

21 Monterey GSP, p. 6-36 [2,474 AFY for Corral de Tierra and 8,314 for Marina-Ord area].

22 Monterey GSP, 6-59 to 6-60.

2,100 AFY and pumping demand of 2,474 AFY.[23] Thus, urban suppliers in the Monterey Subbasin may be willing to pay for 5,888 AFY, representing 5,514 AFY for growth and 384 AFY of overdraft.[24]

- The Langley GSP reports current pumping of 1,400 AFY, consisting of 100 AFY of municipal supply, 700 AFY of agricultural supply, and 600 AFY of rural domestic supply.[25] It estimates that the sustainable yield is 1,100 AFY, resulting in a 300 AFY overdraft.[26] It projects no change in future urban or rural domestic demand and only a 100 AFY increase in agricultural demand.[27] Based on these data, urban and rural domestic users may be willing to pay for half of the overdraft mitigation, i.e., half of 300 AFY or 150 AFY, because they pump half of the current demand, but may not be willing to pay for any water for growth.

In sum, based on the GSP's for the northern subbasins that contain large urban populations where there is substantial overdraft and/or expected urban growth, there appears to be a potential willingness to pay for at least 13,962 AFY of new or relocated water to support northern Monterey County urban uses as follows:

• 180/400	4,489
• Eastside	3,435
• Monterey	5,888
• Langley	150
Total	13,962 AFY

b. <u>Agricultural water needs and rights.</u>

Even if there is no growth in irrigated land and water used per acre, agricultural users may be willing to pay more than their current cost to pump. In particular, agricultural users may be willing to pay for new or relocated water to eliminate overdraft or meet the Sustainable Management Criteria (SMCs) based on the mandate under SGMA to attain

[23] Monterey GSP, pp. 6-61, 6-36.

[24] This assumes that essentially all water use in the Monterey Subbasin is domestic and that the entire burden to mitigate the estimated 374 AFY overdaft should fall on urban suppliers.

[25] Langley GSP, p. 6-17.

[26] Langley GSP, p. 6-23.

[27] Langley GSP, p. 6-29.

sustainability within 20 years. As a first approximation, where pumping exceeds long-term sustainable yield, pumping must be reduced or, alternatively, new or relocated water must be supplied by water projects. Only two of the GSPs for subbasins with significant agricultural water use acknowledge overdraft conditions that must be ameliorated. In the 180/400 Subbasin, addressing a 10% overdraft in the existing 91,900 AFY agricultural pumping would require 9,190 AFY in new or relocated water.[28] In the Eastside Subbasin, addressing the 30% overdraft of the reported current agricultural pumping of 64,800 would require 19,440 AFY of new or relocated water.[29] Thus, agricultural users in northern Monterey County may be willing to pay for 28,630 AFY of new or relocated water.

In sum, northern Monterey County urban and agricultural water users may collectively be willing to pay for 42,592 AFY of new or relocated water or, alternatively, to accept the economic burden of pumping reductions. About a third of the new or relocated water would be needed by urban users and two thirds by agricultural users.

These rough estimates are primarily illustrative and are subject to revision as the GSPs are refined for new water budgets based on better modeling, a process that is now under way.

Similar calculations could be made for other subbasins in the southern portions of the County. However, since those subbasin GSPs do not report overdraft, there may be no willingness to pay for additional or relocated water.

In addition, the GSPs acknowledge that seawater intrusion, which affects the 180/400 and Monterey Subbasins, must be mitigated. The GSPs acknowledge that various projects that provide new or relocated water to improve recharge or reduce pumping in coastal areas may reduce seawater intrusion by raising groundwater levels, but the 180/400 GSP also proposes a "Seawater Intrusion Pumping Barrier" that it claims could remedy seawater intrusion without raising groundwater levels and thus without replacing the cumulative storage deficits in the coastal subbasins.[30] It is unclear whether and to what extent the proposed pumping barrier would obviate the need to address overdraft conditions in the near term, although logic suggests that a continuing level of overdraft is not sustainable in the long term. At this point, there is no consensus on a project or management action to address seawater intrusion. However, if new or relocated water

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28 180/400 GSP, pp. 6-25, 6-42.

29 Eastside GSP, pp. 6-28, 6-30.

30 180/400 GSP, p. 9-26 and Appendix 11G, response to comment 8-139, pdf page 991.

supplies in excess of the amounts needed to address overdraft are needed to mitigate seawater intrusion, this may substantially increase the estimated needs for new or relocated water, at least until the cumulative storage deficits in the coastal subbasins are made up.

c. Project and management action cost sharing between urban and agricultural users.

Both urban suppliers and agricultural users have incentives to pursue water projects or pumping reductions. However, based on their differing needs and water rights, they do not value water supplies equally. Urban use for domestic purposes is not valued primarily as part of a production function, and urban users are generally willing to pay more than agricultural users for whom willingness to pay is constrained by the need that their farming remain profitable. This complicates allocating the cost of water projects that may benefit both classes of users. For example, agricultural users may not be willing to pay the projected average cost of water for the 15,000 AFY Regional Municipal Supply project proposed in the Eastside and Monterey GSPs, which comes to $4,100 per AF ($2,900 for desalination plus $1,200 per AF for securing source water from the assumed seawater intrusion pumping barrier project), because that cost may exceed the cost at which farming would remain profitable. On the other hand, urban suppliers would not likely be willing to pay for more capacity than the shortfall between their future needs and current prescriptive rights, estimated above at 13,962 AFY for the Monterey, Eastside, Langley, and 180/400 Subbasins.

Urban suppliers and agricultural users may also not be willing to pay for higher cost desalination water if lower cost water supply or demand reduction projects are possible. For example, there may be much more willingness to pay the $1,100 to $1,450 per AF for the 12,900 AFY "Winter Release with ASR for CSIP and/or Direct Delivery to Marina Ord" project proposed in the Eastside and Monterey GSPs. These users may also be more willing to pay $195 to $1,730 per AF for a fallowing program or to incur the opportunity costs of pumping allocation and controls if these costs are less than the desalination project cost. Regardless which projects are selected, equitable allocation of the cost of water supply projects and demand reduction programs between urban and agricultural users should reflect their relative rights to the existing lowest cost water, i.e., pumped native groundwater, and, after that, to the lowest cost additional water suplies. As noted above, based on the GSP documents, it appears that urban suppliers are responsible for about a third of the needed supply increase or demand reduction and agricultural users are responsible for about two thirds. This may suggest a ratio for allocating the cost burdens between these classes of users.

Some may argue that urban users should pay a larger share of new water supplies simply because they are less able to do without it and therefore less price sensitive. In this realpolitik approach to cost allocation, a rule of thumb in deciding whether to proceed with a project or pumping reduction with benefits to both classes of users might be to determine first the cost per acre-foot to urban suppliers if the project were scaled only to meet urban supplier needs and then to determine what the marginal cost per acre-foot would be if the project were scaled up to provide benefits to agriculture. Only if both classes of users were willing to pay their marginal costs would it make sense to pursue the larger project; otherwise the project should only be scaled to supply urban users. In this approach, however, urban users should be able to look toward the public agencies to ensure that the least cost projects are made available to urban and agricultural users on an equal footing. It may not be equitable, for example, to permit all of the available low cost projects to be used to benefit agriculture, e.g., surface water supplies, leaving urban suppliers with only the high cost project opportunities, e.g., desalination.

3. Address the equity issues between subbasins clearly and promptly.

Groundwater users may not be willing to pay for projects that require complex cost and benefit allocations without knowing that there is some fair way to allocate these costs and benefits. Equity among subbasins is a major area of contention among agricultural users that may affect willingness to pay for projects to provide new or relocated water or to accept the burdens of reduced pumping. This issue would arise regardless whether sustainability is to be achieved through SGMA or through application of water rights law through adjudication. And indeed, groundwater rights experts recommend that SGMA plans that employ pumping allocation and controls model it on common law groundwater rights adjudication methods.[31]

SGMA mandates that DWR "shall evaluate whether a groundwater sustainability plan adversely affects the ability of an adjacent basin to implement their groundwater sustainability plan or impedes achievement of sustainability goals in an adjacent basin."[32] However, beyond mandating the provision of certain information, e.g., that descriptions of basin settings include inter-basin groundwater flows, SGMA does not provide clear guidance to determine the need for, and the allocation of costs and benefits for, multi-basin projects or management actions. For example, SGMA provides no definitive rule for sharing the sustainable yield of interconnected basins or subbasins: the "no-adverse-effect" rule by itself does not obviously lead to a specific set of sustainable management criteria for a subbasin or to the determination of minimum inter-subbasin flows.

Inter-subbasin flow objectives are an equitable consideration because they affect water balances, which in turn affect the obligation under SGMA to address overdraft

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[31] Garner et al, 2020.

[32] Water Code § 10733(c).

conditions. Inter-subbasin flows are directly affected by groundwater levels, for which SGMA requires each subbasin to set a minimum threshold and a measurable objective. Further complicating the issue, SGMA expressly leaves it to the discretion of the GSA whether, and to what extent, to address pre-2015 undesirable results such as low groundwater levels, storage depletion, and seawater intrusion, each of which has a causal relationship with groundwater levels that historically determined inter-subbasin flows:

> The plan may, but is not required to, address undesirable results that occurred before, and have not been corrected by, January 1, 2015. Notwithstanding paragraphs (1) to (3), inclusive, a groundwater sustainability agency has discretion as to whether to set measurable objectives and the timeframes for achieving any objectives for undesirable results that occurred before, and have not been corrected by, January 1, 2015.[33]

This invites the question whether the GSA goal will be to preserve only post-2015 levels of inter-subbasin flows or will attempt to restore some earlier historical condition, and if so, what condition. For most Salinas Valley subbasins, the groundwater level measurable objectives that will determine inter-subbasin flows are based on pre-2015 conditions.[34] Arguably, there is no obvious baseline or natural level of groundwater levels or inter-subbasin flows because the reservoir operation and pumping volumes in each subbasin determine groundwater levels and inter-subbasin flows. It is not clear that the GSA's process for setting groundwater level objectives through the ad hoc deliberations of each subbasin committees has identified or applied a consistent or principled method for determining inter-subbasin flows.

It is no secret that in the Salinas Basin there are wide differences of opinion as to the likely obligations of various subbasins to shoulder the costs of water projects or pumping reductions. The GSPs manifest this in inconsistent estimates of inter-subbasin flows in their water balances, different conclusions as to the necessity of multi-subbasin projects and management actions, and in water budgets that are expressly contingent on adjacent basins attaining sustainable management criteria (SMCs), including calls for SMCs that represent pre-2015 conditions. Comments on GSPs and requests for additional inter-subbasin flow modeling reflect a concern for equitable allocation of project costs and the burdens of pumping reductions.

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[33] Water Code § 10727.2(b)(4).

[34] Eastside GSP, pp. 8-6, 8-11, 8-18 [ambiguously sets both the 1999 and 2011 level]; Monterey GSP [2004 and 2008 levels for its two subareas]; 180/400 GSP, p. 8-6 [2003 level]; Upper Valley GSP, p. 8-6 [2011 level]; Langley GSP, p. 8-6 [2010 level]; but see Forebay GSP, p. 8-6 [higher than 2015 level].

Water rights adjudication provides some guidance for the necessity to address connectivity of groundwater basins. Even where all water rights in connected basins are not adjudicated together, an adjudication may require maintenance of certain underflows between the basins.[35] Again, however, there may be no simple or obvious method to determine what those minimum underflows should be in determining future obligations to ameliorate overdraft.

Nonetheless, by adopting water balances for each subbasin, by defining sustainable yields, and by setting measurable objectives, the GSA will effectively commit itself to a de facto pumping allocation for each subbasin as a whole (because long-term pumping may not exceed sustainable yield) and to minimum inter-subbasin flow amounts, which in turn will determine responsibility to ameliorate overdraft under SGMA. Because willingness to pay for projects or to bear the burden of pumping reductions ultimately depends on agreements as to water balances and inter-subbasin flows, the GSA should frankly and transparently address the disagreements over these issues. Project selection cannot realistically proceed until the benefitted and burdened participants are identified.

One possible method for determining the groundwater level SMCs and the inter-subbasin flows to use in the subbasin water budgets, and by extension to use in allocating responsibility for ameliorating overdraft, would be to base them on the groundwater levels and flows assumed in allocating the cost of past water projects on the theory that these groundwater levels and flows represent benefits for which landowners have already made substantial investments.[36] Stakeholders probably need to address these issues directly before any progress can be made on selecting projects that have benefits to, or impose costs on, multiple subbasins.

4. **Evaluate the costs and benefits of pumping reductions against the costs and benefits of capital projects.**

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35 Garner et al., 2020, at 178-181.

36 The prior modeling need not, and likely will not, match the current modeling. The effect of past modeling errors, e.g., a systematic over-estimate of project benefits, could be prorated among subbasins. The point is not to match current conditions, which may be substantially different than previously modeled conditions due to other factors, e.g., increased pumping, but to establish a principled foundation for determining future cost allocations.

Statewide, SGMA planning has focused on expanding water supplies rather than demand management.[37] However, sustainability for overdrafted aquifers can be attained either by pumping reductions or by projects that supply new or relocated water.

Although the Salinas Valley GSPs have identified pumping allocation and controls as an available method to attain sustainability, the GSPs have not discussed how the decision would be made to choose this approach over construction of physical infrastructure.[38]

Before making any commitment to infrastructure projects, the project sponsor should investigate the cost to attain sustainability by means of pumping reductions instead. Pumping reductions may be less costly, and they may obviate infrastructure projects.

Pumping reductions may also be more timely. For example, the seawater intrusion minimum threshold in the 180/400 GSP calls for an immediate halt to intrusion at the 2017 line of advance. The 180/400 GSP provides that the proposed seawater intrusion pumping barrier would take five years to implement, presumably after it is selected for implementation, during which time seawater intrusion would advance.[39] Pumping controls would not require time for physical construction.

a. Example one: cost of pumping reductions vs. seawater intrusion barrier.

It is possible that a temporary reduction in pumping to levels below the sustainable yield in the Pressure Subarea, which includes the Monterey and 180/400 Subbasins, could restore protective groundwater elevations and halt seawater intrusion.[40] Once protective

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[37] Ayres et al., Groundwater and Urban Growth in the San Joaquin Valley, Sept. 2021, available at https://www.ppic.org/publication/groundwater-and-urban-growth-in-the-san-joaquin-valley/.

[38] The Langley, Monterey, and Eastside GSPs expressly identify pumping allocation and controls as a potential management action to attain sustainability. Arguably the Upper Valley and Forebay GSPs do not identify this potential management action only because these GSPs conclude that their subbasins are not in overdraft. The 180/400 GSP calls for determination of individual landowner pumping "allowances" for the 180/400 Subbasin as part of the "Water Charges Framework," in which tiered rates for pumping in excess of a prorata share of the subbasin's sustainable yield is supposed to deter that pumping and/or pay for projects to supply additional water.

[39] 180/400 GSP, p. 9-54.

[40] See Geoscience, Protective Elevations To Control Sea Water Intrusion in the Salinas Valley, CA, 2013, available at https://www.co.monterey.ca.us/home/showdocument?id=19642.

groundwater elevations were re-established by an interim period of pumping below sustainable yield, pumping the entire long-term sustainable yield for the Pressure Subarea should be possible without causing seawater intrusion, because that yield is defined as the level that would not cause undesirable results, including seawater intrusion.

If restoration of protective elevations via temporary reduction in pumping were possible, it could obviate the Seawater Intrusion Pumping Barrier proposed in the 180/400 GSP.[41] Rough calculations suggest that temporary reductions in pumping to levels below sustainable yield in order to restore protective groundwater elevations may in fact be less expensive than the proposed pumping barrier.

Pumping reductions might be obtained via fallowing at a direct cost or, alternatively, by pumping allocation and controls, at an opportunity cost, that would not exceed $1,000 per acre-foot. Based on a range of local land rentals, the Eastside GSP identifies the temporary fallowing management action cost to reduce water use as from $590 to $1730 per acre-foot; the other GSP's identify the same or lower costs. (Eastside GSP, p. 9-67; Langley GSP Table 9-2 [same]; Upper Valley GSP Table 9-2 [$195 to $395 per AF]; Forebay GSP Table 9-2 [$430 to $1270 per AF].) The fallowing cost per acre-foot may be a rough proxy for the farmers' opportunity cost not to farm, so if the pumping reductions were mandated through a program of pumping allocations and controls instead of being attained by voluntary fallowing, $1,000 per acre-foot may still be a reasonable estimate for the economic burden of pumping reductions. As noted above, water market data suggest that agriculture would rarely if ever pay more than $1,000 per acre-foot to buy water.

The reported cumulative storage deficit from 1944 to 2013 for the Pressure Subarea, which includes the Monterey and 180/400 Subbasins, is 110,000 AF.[42] The reported projected sustainable yield for the Pressure Subarea is 117,070 AFY with projected pumping demand of 126,255.[43] A 7.3% reduction in pumping would be required to attain

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41 180/400 GSP, pp. 9-52 to 9-55.

42 Brown and Caldwell, State of the Salinas River Groundwater Basin, p. ES-11, Table ES-3, available at https://digitalcommons.csumb.edu/cgi/viewcontent.cgi?article=1020&context=hornbeck_cgb_6_a.

43 The projected 2030 sustainable yield of the 180/400 GSP is reported to be 107,200 with projected pumping demand of 115,300 AFY. (180/400 GSP, p. 6-42.) The projected sustainable yield for the Monterey Subbasin is reported to be 9,870 AFY. (Monterey GSP at 6-59 to 6-60 [9,870 AFY can be pumped without overdraft if adjacent basins managed sustainably].) Future demand from the Monterey GSP is reported to be

the long-term sustainable yield. Further reductions of 8.7% would be required to eliminate the cumulative storage deficit of 110,000 AFY within 10 years. At $1,000 per AF, this water would cost $110,000 million. With a 3% discount rate, the present value of a program to reduce pumping by 110,000 AF over ten years would be $94 million. By contrast, the reported capital cost of the proposed pumping barrier would be $102 million with an annual O&M cost of $9.8 million, presumably payable in perpetuity. On a present value basis over just the next 30 years, the pumping barrier would cost $192 million. If the reported data in the GSPs for fallowing costs, sustainable yields, and water demand are accurate, the pumping barrier proposal to address seawater intrusion would be more than twice as expensive as pumping reductions. In addition, a program of pumping reductions could be implemented more quickly because it would not require a Proposition 218 process or physical construction.

This rough analysis does not address the possibility that the accumulated 330,000 AFY storage deficit in the Eastside Subbasin[44] would also have to be reduced or eliminated to halt seawater intrusion in the 180/400 Subbasin through a program relying on a one-time restoration of protective groundwater elevations rather than a pumping barrier. To the extent that the Eastside storage deficit induces flows from the 180/400, a protective elevation equilibrium condition in the 180/400 Subbasin may in fact require reduction or elimination of that deficit, significantly adding to the cost of this approach. A 2013 analysis concluded that provision of 60,000 AFY of in lieu recharge to coastal subbasins would be necessary and sufficient to halt seawater intrusion, and that this could be achieved by using the surface water supplies available through water right 11043.[45] The implication of that analysis was that the in lieu recharge program would be a perpetual infrastructure project, not a one-time replenishment of an historic storage deficit. Regardless, analysis to determine whether restoration of protective elevations would be less expensive than a pumping barrier should be undertaken before committing an agency to a perpetual pumping barrier.

b. Example 2: cost of pumping reductions vs. proposed Eastside capital projects.

10,955 AFY. (Monterey GSP, pp. 6-47 to 6-48 [projected pumping will total 10,955 AFY based on 8,767 from the Marina-Ord area and 2,188 AFY from the Corral de Tierra area].)

[44] Brown and Caldwell, State of the Salinas River Groundwater Basin, p. ES-11, Table ES-3 [accumulated storage deficits].

[45] Geoscience, Protective Elevations To Control Sea Water Intrusion in the Salinas Valley, CA, 2013, available at https://www.co.monterey.ca.us/home/showdocument?id=19642.

The Eastside Subbasin GSP's projected 2030 sustainable yield is 51,900 AFY and its projected demand is 72,300 AFY.[46] Thus, there is an ongoing need to mitigate a potential overdraft of 20,400 AFY. The Eastside GSP proposed a number of multi-subbasin infrastructure projects intended to do this. Considering just those projects that would provide more than a 1,000 AFY benefit, there is a wide range of benefit volumes and costs per acre-foot:

- The proposed Regional Municipal Supply project would supply 15,000 AFY of desalinated water to north County urban and agricultural users at a cost per AF of $4,033 to $4,146.47 Some portion of which would benefit the Eastside.[48]

- The Somavia Road project would move 3,000 AFY of groundwater from the 180/400 Subbasin to the Eastside Subbasin at $3,980 per AF.[49]

- The diversion of surface water using the 11043 Water Rights at Chualar or Soledad at $1,280 or $2,110 per AF respectively would provide 6,000 AFY to the Eastside.[50]

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46 Eastside GSP, p. 6-30.

47 As noted above, urban suppliers may be willing to pay for as much as 13,962 AFY of additional water for growth and their share of overdraft mitigation, but there may be no principled reason that urban suppliers should bear the burden of the highest cost water supply option.

48 The capital cost for the desalination plant and distribution pipelines would be $385-$393 million. (Eastside GSP, pp. 9-50 to 9-56; see also Monterey GSP, pp. 9-31 to 9-32.) This project would only be built as a supplement to the $102 million sea water intrusion barrier project, from which it would obtain brackish source water, so the total capital cost would be $487-$495 million. O&M for the desalination plant portion would be $13.2-$13.4 million, presumably in addition to the $9.8 million O&M for the seawater intrusion barrier, resulting in a total annual O&M cost of about $25 million. Over 30 years at a 3% discount rate, the present value of the cost of this 15,000 AFY project would come to $977-985 million. The reported cost per acre-foot for this water for just the desalination plant would be from $2,833 to $2,946. The cost of source water provision from the seawater intrusion barrier would add $1,200 per acre-foot, bring total cost to $4,033 to 4,146 per acre-foot. (Monterey GSP, p. 9-32.)

49 Eastside GSP, p. 9-5.

50 Eastside GSP, p. 9-5.

- Winter Releases with Aquifer Storage and Recovery would supply 12,900 AFY for ASR injection at $1,450 per AF or direct winter use by urban suppliers of a 3,600 AFY portion at $1,100 AFY, some portion of which would benefit the Eastside.[51]

- Expansion of CSIP would provide 9,900 AFY of recycled and river water for agriculture at $630 per AF, some portion of which would benefit the Eastside.[52]

- The multi-benefit Stream Channel improvements program might supply from 2,780 to 20,880 AFY at a cost of $60 to $600 per AF, but it is not yet clear what subbasins would benefit.[53] The primary benefits would be to those basins adjacent to the River, but the Eastside may get indirect benefits.

- The Interlake Tunnel would increase recharge to multiple subbasins by 32,000 AFY at a capital cost of $180.8 million and an unspecified operating cost.[54] No costs per AF are identified in the GSP and it is not clear to which subbasins the benefits would accrue.

There is insufficient information in the GSP to determine whether some combination of these projects could provide the Eastside Subbasin the needed 20,400 AFY, primarily because it is unclear what portion of the multi-subbasin projects would benefit the Eastside. However, if the direct or opportunity cost of pumping controls is in the vicinity of $1,000 per AF, most of these proposed project would be substantially more expensive than pumping controls. If the infrastructure projects costing less than pumping reductions cannot supply the entire 20,400 AFY, then the balance may better be supplied through pumping reductions. The analysis should be provided before commitments are made to infrastructure projects.

5. **Discussion of projects proposed to meet identified northern Monterey County needs; information needed to identify least cost suite of projects**.

As discussed above, although the GSPs for Upper Valley and Forebay do not evidence a willingness to pay for additional water supplies, the urban suppliers in the 180/400, Monterey, Eastside, and Langley subbasins may be willing to pay for 13,962 AFY for

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51 Eastside GSP, p. 9-7; Monterey GSP, p. 9-9.

52 Eastside GSP, p. 9-6.

53 Eastside GSP, p. 9-7.

54 Eastside GSP, p. 9-7, 9-95.

growth and to make up the shortfall in their prescriptive rights due to historic overdraft. Agricultural users in the 180/400 and Eastside may be willing to pay for 28,620 AFY to mitigate their share of the historic overdraft.

The 42,592 AFY needed for northern Monterey County could be provided through multiple approaches with widely varying unit costs, including fallowing, pumping allocation and controls, various uses of surface water under Water Right 11043, relocation of pumped groundwater, invasive species eradication, recharge improvements, recycling, and desalination. Several approaches are so much more costly than other alternatives, and appear to be so much more costly than the likely willingness to pay, that they may not warrant consideration unless all other options prove infeasible. In addition, there are many questions that must be addressed in order to proceed with a reasoned selection of projects or management actions.

a. Desalination.

At $4,100 per AF, the unit cost of the proposed 15,000 AFY Regional Municipal Supply project is at least twice the cost of most other alternatives.[55] Although the description of the Regional Municipal Supply project acknowledges that its excess water would be used by agriculture,[56] and its source water is assumed to be a pumping barrier project that would benefit both agricultural and urban users by mitigating seawater intrusion, the project has been understood to be a solution for urban supply shortages. However, unless less expensive alternative water supplies, e.g., surface water supplies from the Salinas River, are not available to urban uses for institutional or political reasons, it is hard to understand why urban users would be willing to pay so much more for water than agricultural users. The case has not been made publically that urban suppliers should shoulder more than their proportionate burden of the cost to mitigate overdraft. Thus, critical questions regarding the Regional Municipal Supply project include:

- Are there less expensive options to provide urban supplies?
- Is the Regional Municipal Supply feasible if it cannot obtain brackish source water from a seawater intrusion pumping barrier project?
- Which users benefit from the seawater intrusion pumping barrier project? How should its cost be allocated to those users?
- Which users benefit from a 15,000 AFY reduction in pumping for urban supplies? How should that cost be allocated?

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55 Similarly, relocation of 3,000 AFY groundwater from the 180/400 to the Eastside at $3,980 per AF proposed as the Somavia Road project may not be economically feasible.

56 Eastside GSP, p. 9-50.

- Is there a less expensive way to address seawater intrusion than the pumping barrier, e.g., via relocating surface waters to the north, fallowing, and/or pumping allocations and controls? If so, is there a feasible alternative source water supply for the Regional Municipal Supply project?

b. Recycling.

Modest amounts of recycled water may be available for use by MCWD for landscape and for an Indirect Potable Use project (i.e., aquifer injection and retrieval of recycled water). The Monterey GSP estimates the cost for 826 AFY of landscape quality water at $1,600 per AF and at $3,300 per AF for 2,400 AFY of Indirect Potable Use water. These unit costs are higher than the costs for increased recharge and invasive species eradication and higher than the median cost for surface water use projects. Although these projects might be feasible because they can be undertaken by an urban supplier whose customers have a greater willingness to pay, it may not make economic sense or be equitable to pursue them if there are less expensive alternatives. The critical question for recycling projects is whether there are less expensive alternatives.

c. Use of surface water and the 11043 water right.

Use of surface water from the reservoirs for which MCWRA has the 135,000 AFY water right 11043 is proposed in the Chualar Diversion project, the Soledad Diversion project, the Winter ASR and Direct Use project, the CSIP expansion project, and the Interlake Tunnel project, which are proposed by the 180/400, Eastside, Monterey, and Langley GSPs.[57] Use of this surface water supply is also assumed in proposals for reservoir reoperation, including increased winter releases in the Forebay and Upper Valley GSPs.[58] Use of the entire 135,000 AFY 11043 water right to guarantee at least a 60,000 AFY of in lieu recharge benefits to coastal subbasins was assumed to be necessary and sufficient to halt seawater intrusion by restoring protective elevations in a 2013 analysis.[59]

Unit cost estimates for delivering11043 water in the GSPs range from a low of $630 per AF (CSIP) to a high of $2,100 per AF (Soledad Diversion), with a median at $1,280 (Chualar Diversion). The GSPs do not identify a unit cost for the largest proposed 11043

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57 See Tables 9-1 in the respective GSPs.

58 Forebay GSP, pp. 9-6 to 9-7; Upper Valley GSP, p. 9-5.

59 Geoscience, Protective Elevations To Control Sea Water Intrusion in the Salinas Valley, CA, 2013, available at https://www.co.monterey.ca.us/home/showdocument?id=19642.

project, the Interlake Tunnel, but it may be in this range.[60] Furthermore, it remains unclear what subbasins the Interlake Tunnel would benefit. The Interlake Tunnel has been given independent momentum compared to the GSP-proposed projects because it is sponsored by MCWRA and has been funded with an initial $10 million grant for engineering, modeling, and environmental review. However, it may not make economic sense to invest in further engineering and environmental review for this project unless and until it appears to be viable and less expensive than other alternatives or a prerequisite to them.

Furthermore, it is difficult to compare the various surface water projects in the GSPs to each other and to the Interlake Tunnel because it is unclear whether the projects are mutually exclusive or could all be pursued in tandem. SGMA plans for the San Joaquin Valley have double counted available water sources for recharge and storage projects.[61] And for the Salinas Valley, for example, it is unclear if the Interlake Tunnel is a separate water source or simply a necessary precondition to accomplish some or all of the other GSP projects. It is also unclear what independent utility the Interlake Tunnel would have if the GSP surface water project were not undertaken. Coordinated analysis of these projects is essential to informed decision making.

Critical questions regarding proposals for increased use of surface waters include:

- What is the baseline assumption regarding reservoir operations and benefits to each subbasin, and how will those baseline conditions inform allocation of project costs to each subbasin?
- How will the costs and benefits be allocated between GSPs that identify no overdraft condition and those that acknowledge an overdraft conditions?
- Which surface water projects can be pursued in tandem and which, if any, are mutually exclusive?

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[60] When the Interlake Tunnel's estimated budget was only $82 million and its benefit was estimated at 20,000 AFY increase in reservoir storage, the unit cost was estimated at $309 per AF. (See https://www.co.monterey.ca.us/home/showpublisheddocument/67222/636668071806970000.) The Interlake Tunnel is now estimated to cost more than twice as much at $180.8 million and to provide less than twice as much water at 32,000 AFY. (Eastside GSP, p. 9-7, 9-95.) However, without modeling, it is unclear how the increase in reservoir storage would translate into overdraft mitigation in the two subbasins that do acknowledge overdraft conditions.

[61] Hanak, E., J. Jezdimirovic, A. Escriva-Bou, and A. Ayres. 2020. *A Review of Groundwater Sustainability Plans in the San Joaquin Valley*. Public Policy Institute of California.

- Is the Interlake Tunnel project a precondition for any of the GSP surface water projects?
- What are the Interlake Tunnel benefits to each subbasin and the unit costs for Interlake Tunnel water with and without the GSP surface water projects?
- What is the demand curve for agricultural water? For urban water?
- Are there less expensive alternatives than use of surface water supplies, e.g., fallowing, pumping allocations and controls, invasive species eradication? If so, what is the optimal combination of surface water supply projects and other projects?
- If 11043 water could be used to halt seawater intrusion, as suggested by the 2013 Geoscience analysis, would foreseeable urban and agricultural water needs in the four northern subbasins be met? If not, what would be the shortfall?

d. Recharge improvements.

Modest amounts of water could be provided by projects to increase recharge. A portion of the Multi-Benefit Stream Channel Improvements project identified by several GSPs would provide 1,000 AFY at a unit cost of $930 per AF. However, it appears that the primary subbasins benefitting from this project would be the Upper Valley and Forebay, which would each receive 400 AFY of recharge from four recharge basins, but which do not identify a need for additional water supply projects.

The Monterey GSP identifies a 160 AFY surface water diversion recharge project at a unit cost of $3,050 per AF. The Langley and Eastside GSPs identify similar 350 AFY surface water diversion recharge projects at $1,800 (Langley) or $2,350 (Eastside) per AF.

The Eastside, Langley, Upper Valley, and Forebay GSPs each identify a 400 AFY Managed Aquifer Recharge project at $870 per AF. The Eastside and Langley GSPs identify a 1,000 AFY Floodplain Enhancement and Recharge project with a unit cost of $1,050 per AF.

Critical questions regarding these projects include:

- Do recharge projects in the Upper Valley and Forebay provide any benefits to subbasins that acknowledge overdraft? If not, would they be pursued? How would the cost of such projects be allocated?

- Have these projects been studied in sufficient detail to support these estimates? The coincidence of costs and benefits for similarly described projects, e.g., the 400 AFY benefit and the $870 per AF cost for four GSPs' "Managed Aquifer Recharge" projects, suggests the analysis is fairly generic.

- Which projects are mutually exclusive, if any?

e. Invasive species eradication.

Although MCWRA has undertaken some invasive species eradication in the past,[62] there is still not a firm estimate of the costs and benefits of a larger program. The GSPs all estimate the benefit as from 2,790 to 20,880 AFY of increased recharge at a unit cost of from $60 to $600 per AF. The GSPs do not allocate these benefits to subbasins other than to state that subbasins adjacent to the Salinas River would benefit more than other subbasins.[63] Although the unit costs may be much lower than the costs of other projects and the benefits may be substantial, the estimates of costs and benefits vary by an order of magnitude. The project cannot be compared to other project without further refinements to these estimates. However, if the costs are actually as low as $60 per AF, this project would cost less than any other proposed project.

[62] Eastside GSP, p. 9-75.

[63] Eastside GSP, pp. 9-76 to 9-77.