

# **An Economic Review of the Draft Irrigated Lands Regulatory Program Environmental Impact Report**

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ECONorthwest specializes in the economic and financial analysis of public policy. ECONorthwest has analyzed the economics of resource-management, land-use development, and growth-management issues for municipalities, state and federal agencies, and private clients for more than 30 years.

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## I. INTRODUCTION

The Central Valley Water Board (Board) authorized the preparation of an Environmental Impact Report for the Irrigated Lands Regulatory Program (ILRP). The ILRP regulates water discharges from irrigated agricultural lands. ILRP goals include preventing agricultural discharges from impairing receiving waters. At the Board's direction, consultants prepared the *Draft Irrigated Lands Regulatory Program Environmental Impact Report (Draft EIR)*. Appendix A to the *Draft EIR* is the *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program (Technical Memo)*.

Michael Lozeau of Lozeau Drury LLP, contracted with ECONorthwest (ECONW) to review and provide preliminary comments on the *Technical Memo*. Specifically, he asked that we review the economic analysis described in the *Technical Memo*, including the analytical approach, simplifying assumptions, data, analyses and conclusions, to determine if it provides reliable information on which the Board can base decisions regarding the alternatives described in the *Draft EIR*. In this report we describe our preliminary findings to date. If we are asked to review additional information, or address additional topics, we may revise our critique and findings.

## II. OVERVIEW OF RESULTS

The following discussion substantiates our conclusion that the *Technical Memo* developed in support of the *Draft EIR* has serious errors of omission and commission that violate the generally accepted standards of practice that apply to this type of economic analysis. Because of these errors, the report does not provide a reliable basis for understanding the full potential economic consequences of each the five alternatives the *Draft EIR* considers. It also does not fully depict the differences in potential economic consequences among the five alternatives. The various errors are interrelated but, to facilitate our discussion of them, we separate them into these six categories:

- A. **The Analytical Objectives and Approach:** The study's analytical objectives and approach do not follow generally accepted guidelines. The analysts ignored standards and procedures developed by the California Department of Water Resources specifically for this type of economic analysis. The resulting analysis is flawed and incomplete, and, hence, it provides decision-makers and stakeholders with biased and unreliable descriptions of the economic outcomes likely to materialize if the Board were to implement any of the alternatives in the *Draft EIR*.
- B. **Baseline:** The economic analysis described in the *Technical Memo* does not compare the alternatives against an appropriate baseline that describes potential future conditions absent implementation of each alternative. Hence, it provides an incomplete, biased representation of the alternatives' economic consequences.

- C. **Management Practices:** The management practices considered in the *Draft EIR* and *Technical Memo* do not reflect the full range of options available to irrigators. They particularly exclude low-cost, high-benefit options. Hence, the *Draft EIR* and *Technical Memo* provide an incomplete and biased representation of the choices that realistically are available to irrigators or the Control Board.
- D. **Costs and Benefits:** The analysis described in the *Technical Memo* incorrectly calculates the costs of adopting practices that improve water quality. The analysis also overlooks major categories of economic costs and benefits that would be affected by the alternatives. Hence, it provides an incomplete, biased representation of the alternatives' economic costs.
- E. **Risk and Uncertainty:** The *Technical Memo* provides no information on how each of the five alternatives would affect the risks and uncertainty facing irrigators and others. Economic analyses of the scale and scope described in the *Technical Memo* typically include analyses of risk and uncertainty as a matter of course. The analysts' failure to comply with this generally accepted standard of practice gives decision-makers and stakeholders incomplete descriptions of the economic significance of the alternatives' outcomes.
- F. **Regional Impacts:** The *Technical Memo* provides a biased and incomplete description of the regional impacts of the alternatives. The conclusions in this section emphasize negative outcomes and ignore the analytical assumptions that overstate costs and the resulting negative outcomes.

We describe each category in the following sections.

### III. ANALYTICAL OBJECTIVES AND APPROACH

The study's analytical objectives and approach do not follow generally accepted guidelines. In particular, the analysts ignored standards and procedures developed by the California Department of Water Resources specifically for this type of economic study. The resulting analysis is flawed and incomplete, and provides decision-makers and stakeholders with biased and unreliable descriptions of the economic outcomes likely to materialize if the Board were to implement any of the five alternatives in the *Draft EIR*.

The *Technical Memo* gives this description of its analytical objectives and approach:

“The analysis of economic (and fiscal) effects for the long-term Irrigated Lands Regulatory Program (ILRP) focuses on addressing the following three analytical questions.

- “How much currently is being spent annually by growers, landowners, and administering entities in the Central Valley on compliance with the ILRP pollution control implementation program?”

- “What are the expected additional costs, both to growers and administering entities, of compliance with the long-term ILRP alternatives?”
- “How is imposition of these additional costs expected to affect the economic viability of farming in the Central Valley? (*Technical Memo* p. 1-1)

By focusing on just these three questions, the study’s authors restricted their analysis to a subset of the economic issues the Board must consider to satisfy its obligations. Hence, the *Technical Memo* cannot provide an adequate basis for the Board’s consideration of these issues. The Board’s responsibilities extend well beyond the narrow set of costs described in the *Technical Memo*. For example, the Board’s website describes its mission as, “To preserve, enhance, and restore the quality of California’s water resources, and ensure their proper allocation and *efficient use* for the benefit of present and future generations.”<sup>1</sup> [emphasis added] The Board can assess the extent to which the *Draft EIR*’s alternatives promote efficient water use only if it weighs all of their relevant economic costs and benefits, not just those that are the focus of the *Technical Memo*.

The Board’s website also lists the strategic goals for California’s nine water boards, including the Central Valley Board. These goals include:

- “Goal 1 - The Boards’ organizations are effective, innovative and responsive.”
- “Goal 2 - Surface waters are safe for drinking, fishing, swimming, and support healthy ecosystems and other beneficial uses.”
- “Goal 3 - Groundwater is safe for drinking and other beneficial uses.”
- “Goal 6 - Water quality is comprehensively measured to evaluate protection and restoration efforts.”<sup>2</sup>

From an economic perspective, the analysis described in the *Technical Memo* is neither effective nor innovative given the study’s limited and incomplete focus relative to the generally accepted guidelines for these types of economic analyses. We describe these guidelines below. For example, the study ignores the economic benefits of the *Draft EIR*’s alternatives on drinking water, fishing, swimming, ecosystems and other beneficial uses. A comprehensive assessment of the changes in water quality brought about by the *Draft EIR* alternatives would include these and other relevant costs and benefits.

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<sup>1</sup> California Water Boards web site  
[http://www.swrcb.ca.gov/centralvalley/about\\_us/water\\_boards\\_structure/index.shtml](http://www.swrcb.ca.gov/centralvalley/about_us/water_boards_structure/index.shtml),  
 accessed September 22, 2010.

<sup>2</sup> California Water Boards web site  
[http://www.swrcb.ca.gov/centralvalley/about\\_us/water\\_boards\\_structure/index.shtml](http://www.swrcb.ca.gov/centralvalley/about_us/water_boards_structure/index.shtml),  
 accessed September 22, 2010.

Specific to the study at issue, the *Existing Conditions Report (Existing Conditions)* referenced throughout the *Technical Memo*, describes the regulatory setting for the economic analysis and notes the purpose of water quality regulations in California:

“Water quality regulation and permitting processes are designed to limit the discharge of pollutants to the environment in an effort to achieve the highest surface water and groundwater quality, protect fish and wildlife and their habitats, and protect other beneficial uses (e.g., domestic and agricultural water supply and recreational resources).” (*Existing Conditions* p. 2-1)

The study’s analytical approach focuses on a narrow subset of the full range of potential economic outcomes of the *Draft EIR’s* alternatives, and, hence, provides limited and biased information regarding the proposed regulations’ overall economic costs and benefits. Board members and others interested in furthering the Board’s goals will find little useful information in the economic analysis described in the *Technical Memo*. This study does not serve these groups well.

Those interested in an unbiased and comprehensive assessment of the economic outcomes of adopting the *Draft EIR* alternatives will find the study’s deficiencies especially troubling, given the fact that the study area includes a large part of California. It also includes the majority of the state’s irrigated land. The study leaves uncounted many of the economic costs and benefits that would occur throughout much of the state with the adoption of the *Draft EIR* alternatives. The *Existing Conditions* describes the geographic extent of the Board’s responsibilities.

“The jurisdiction of the California Regional Water Quality Control Board, Central Valley Region ... extends from the Oregon border to the northern tip of Los Angeles County and includes all or part of 38 of the State’s 58 counties. ... The three basins [major watersheds included in the study area] cover about 40% of the total area of the State and approximately 75% of the irrigated acreage [citation omitted].” (*Existing Conditions*, page ES-1)

An economic study of this magnitude should conform to generally accepted analytical guidelines. Many such guidelines apply here.<sup>3</sup> The California Department of Water Resources’ *Economic Analysis Guidebook (Guidebook)*, is particularly relevant, given the study area and topic. The *Guidebook* notes,

“... the Department of Water Resources (DWR) has a policy that all economic analyses conducted for its internal use on programs and projects be fundamentally consistent with the federal *Economics and Environmental*

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<sup>3</sup> Examples include: California Department of Water Resources. 2008. *Economic Analysis Guidebook*, January; U.S. Army Corps of Engineers. 1983. *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*. March – and 2009 Draft Update; U.S. Environmental Protection Agency. 200. *Guidelines for Preparing Economic Analyses*. EPA 240-R-00-003. September.

*Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) ...*

“It is also DWR policy to adopt, maintain, and periodically update its own Economics Analysis Guidebook, which is consistent with the P&G but can also incorporate innovative methods and tools when appropriate.”

“*The Economic Analysis Guidebook (Guidebook)* was developed to assist DWR economists in performing economic analyses ...” (*Guidebook*, p. vii)

Comparing the approach described in the *Technical Memo* with the *Guidebook's* recommended approach shows the extent of the study's analytical deficiencies. For example, the *Guidebook* describes generally accepted methods of conducting economic analyses of public policies that affect water. The *Guidebook* describes three methods of economic analysis (*Guidebook* p. 12):

- A cost-effectiveness study identifies the least cost method of achieving the stated goals. The analysis in the *Technical Memo* is not a cost-effectiveness analysis because, as the *Memo* states, the analysis did not include information on the effectiveness of the management practices in the *Draft EIR* alternatives.
- A benefit-cost (B-C) analysis compares the social benefits of a proposed action with the social costs. The economic analysis at issue is not a B-C analysis because it considered only a subset of relevant costs and benefits. This narrow focus yields a biased and incomplete description of the direct or initial economic outcomes of adopting the *Draft EIR* alternatives.
- A socioeconomic impact (SI) analysis describes a broader set of impacts than a B-C study because it considers regional or indirect impacts in addition to direct benefits and costs. Given that an SI analysis is more comprehensive than a B-C analysis, the economic analysis in the *Technical Memo* falls far short of the generally accepted standards for SI analyses.

The approach described in the *Technical Memo* does not satisfy the *Guidebook's* standards. The *Technical Memo's* description of analytical methods also lacks foundation or citation to relevant economic literature that supports the approach.

## IV. BASELINE CONDITIONS

The *Technical Memo* does not compare the alternatives against an appropriate baseline that describes potential future conditions absent implementation of each alternative. Hence, it provides an incomplete, biased representation of the alternatives' economic consequences.

Generally accepted standards applicable in this context include establishing a baseline against which analysts compare the economic outcomes of policy alternatives. Analysts calculate the amount of economic change attributed to a policy by comparing economic conditions that would result with the policy against baseline economic conditions. A properly defined baseline takes into

account economic changes that will occur for reasons other than the policy alternative. Analyses that lack a baseline, or use an improperly defined baseline, yield biased results because costs or benefits that would have otherwise occurred are mistakenly attributed to the policy alternative. The *Guidebook* describes the importance of establishing a baseline using a *with* and *without* analytical approach.

“The objective of economic analysis is to determine if a project represents the best use of resources over the analysis period ...:

The test of economic feasibility is passed if the total benefits that result from the project exceed those which would accrue without the project by an amount in excess of the project costs. It is important that the comparison be *with* and *without* rather than *before* and *after* because many of the after effects may even occur without the project and can thus not properly be used in project justification. ...”  
(*Guidebook* p. 5)

The *Technical Memo* lacks a clear and concise description of baseline conditions. The available information indicates that analysts did not control for factors other than the *Draft EIR's* alternatives that can affect irrigators' costs of managing water quality. For example, the analysis incorrectly attributes costs of management practices previously implemented to the future costs of adopting the *Draft EIR's* alternatives. This overstates the costs of adoption.

“Although Alternative 1 represents the continued implementation of current Central Valley Water Board policies, limited information was available to determine the extent of management practice implementation to date. Further, the existing conditions information used as a baseline for analysis dates from the early 2000s. As a result, changes from Alternative 1 relative to existing conditions do not capture implementation that has already occurred at the time of this report, and thus likely overstate the impacts of further implementation of Alternative 1.” (*Technical Memo* p. 1-2)

The analysis also incorrectly attributes adoption costs to the *Draft EIR's* alternatives in cases where growers adopt management practices for reasons other than the alternatives. The authors recognize the importance of accounting for costs attributable to other factors:

“Existing conditions corresponds to the level of water quality management practices that are in the baseline. It is acknowledged that most practices are not implemented to improve water quality but rather to provide for another agronomic or economic need. ... Therefore adjustments were made to best capture costs attributable only to improvements in water quality. ....” (*Technical Memo* p. 2-2)

Here they describe the adjustment:

“Potential cost savings or other benefits from the irrigation system changes also were considered. These included estimates of savings in grower’s costs for water, fertilizer, and labor and revenue increases resulting from improved crop yield and quality. These benefits were subtracted from the implementation cost of the irrigation system or management changes, so the analysis considered only the net cost to growers of implementing a change.”  
(*Technical Memo* p. 3-1)

This “adjustment,” however, ignores the fact that the management practices at issue were adopted for reasons *other than* the *Draft EIR* alternatives. Such changes belong in the baseline conditions and not the *Draft EIR* alternatives. The authors provide no citations to economic literature or other relevant sources that support such an adjustment. The resulting adjusted costs overstate the true costs of the alternatives.

Our critique of the *Technical Memo’s* treatment of the alternatives’ costs (see below) notes that the analysts selected some of the most expensive management alternatives available. Assuming for the sake of argument that we agree with the described adjustment— which we do not— using more realistic adoption costs would yield lower or negative “net” costs of adopting the practices in the *Draft EIR* alternatives.

Had the analysts used a *with vs. without* analytical approach they could have isolated the extent to which irrigators adopt management practices that have water-quality impacts, but were adopted for other reasons. For example, they may change irrigation practices from flood to drip or sprinkler systems not to improve water quality but to reduce their fertilizer and pesticide costs. The analysts acknowledge the likelihood that irrigators make such changes for purposes other than to accomplish the Board’s water-quality goals. But they then do not account for these changes in a manner that yields an accurate, unbiased representation of the costs of the alternatives being considered by the Board.

A similar conclusion applies to the *Technical Memo’s* treatment of various laws that affect irrigators’ behavior. Chapter 2 of the *Existing Conditions* report, for example, notes that the Federal Endangered Species Act (ESA) could affect future irrigation practices. The *Technical Memo*, however, makes no provision for the potential impacts of the ESA or other laws and regulations on irrigation methods and costs. Instead, it attributes all future irrigation changes and costs to the *Draft EIR* alternatives. A *with vs. without* analytical approach would acknowledge that regulations other than the *Draft EIR* alternatives can influence irrigators’ practices and costs in the future.

## V. MANAGEMENT PRACTICES

The management practices considered in the *Draft EIR* and *Technical Memo* do not reflect the full range of options available to irrigators. Instead, they consider seven practices that emphasize high-cost options and exclude low-cost, high-

benefit options. Hence, the *Draft EIR* and *Technical Memo* provide an incomplete and biased representation of the choices that realistically are available to irrigators and the Control Board.

The *Technical Memo* identifies the management practices in the analysis but provides no justification for how the analysts selected these practices.

“Although a wide variety of management practices could be used to reduce impacts on water quality, this suite [the seven practices selected and listed in Table 2-1] of management practices is deemed sufficient from a programmatic point of view to encompass all flow path and management needs that must be addressed to reduce impacts on water quality.” (*Technical Memo* p. 2-2)

The *Technical Memo* provides no assessment of how these practices were “deemed sufficient” for the analysis. More fundamentally, the authors provide no discussion of selection criteria they applied to reach their conclusion. Without this information, the Board, other decision-makers and stakeholders cannot assess the appropriateness of the selected practices. This is especially important given that, as we describe in our critique of adoption costs, the selected practices are some of the most expensive available.

As described in the *Existing Conditions* report, over 100 practices exist with proven potential to improve water quality.

“This section provides a summary of the management and hardware actions that have been proven to provide a water quality benefit. ... The single most comprehensive reference for individual management practices is the NRCS [citation omitted]. This website lists over 100 proven practices, that provide information for physical actions that apply to several of the management measure categories. Although the NRCS guides were developed for general use, they contain sufficient guidance for local implementation.” (*Existing Conditions* p. 5-5)

Without information on the “deemed sufficient” selection criteria, the choice of management practices appears arbitrary, and lacks analytical rigor.

The *Technical Memo* also provides no information on the effectiveness of the management practices in the analysis.

“Management practices were assumed to be 100 percent effective.” (*Technical Memo* p. 2-1)

Assuming complete effectiveness strays outside the bounds of rational expectations. The analysts make this assumption without support or citation to relevant studies. The assumption thus appears arbitrary and devoid of analytical veracity.

Given these considerations, the standard analytical approach applicable to the *Draft EIR* and *Technical Memo* would entail describing the full range of options before the Board and their respective consequences. The *Draft EIR* and *Technical Memo* exhibit neither of these characteristics. Consequently, they do not (and cannot) provide a reliable basis for the Board to make decisions that will satisfy its obligations to “preserve, enhance, and restore the quality of California’s water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations”.<sup>4</sup>

## VI. COSTS

The *Technical Memo* incorrectly calculates the costs associated with irrigators adopting practices that reduce their impacts on water quality. The analysis also overlooks major categories of economic costs and benefits that the *Draft EIR* alternatives would affect. Hence, it provides an incomplete, biased representation of the alternatives’ overall economic costs.

The *Technical Memo* describes that the management practices in the *Draft EIR* alternatives are “relatively expensive.” The report provides no information about the criteria the authors used to reach this judgment, no evaluation of the extent to which the projects included in the *Draft EIR* are more expensive than those excluded from it, and no justification for why those who constructed the alternatives selected the more expensive projects. The inclusion of more expensive projects and exclusion of less expensive ones has an important impact on the economic analysis and biases its conclusions, insofar as the large majority of the acres in the study produce field, forage, grain, and other crops whose value is lower than crops in other categories. By selecting more expensive projects, the analysis also increases the number of acres that growers take out of production as operating costs increase.

“Some key analytical assumptions and data limitation contributed to the relatively large estimated change in acreage.

“More importantly, management practices assumed to be implemented for the analysis are relatively expensive, especially for lower-revenue crops ... As a result, crops such as irrigated pasture, hay, and some small grains would have difficulty supporting such costs. The analysis indicated large reductions in their acreages in the regions where those costs were incurred. “

“Irrigated pasture, hay, and other field crops ... accounted for more than 95 percent of the acreage reductions shown in Table 3-7. To the extent growers of these crops could identify less-expensive ways to comply, such as avoiding

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<sup>4</sup> California Water Boards web site  
[http://www.swrcb.ca.gov/centralvalley/about\\_us/water\\_boards\\_structure/index.shtml](http://www.swrcb.ca.gov/centralvalley/about_us/water_boards_structure/index.shtml),  
accessed September 22, 2010.

the use of certain pesticides, the acreage and revenue impacts would be substantially reduced.” (*Technical Memo* p. 3-8, 3-9)

“... acreage revenue and net income changes were *relatively sensitive to the implementation cost assumptions*. The same general conclusion applies to the results for all alternatives. If growers can identify and implement more cost-effective methods to comply with ILRP requirements, impacts on production and income can be reduced substantially, especially for lower-value field and forage crops.” [emphasis added] (*Technical Memo* p. 3-19)

With this conclusion, the authors, themselves, acknowledge the underlying flaws and biases in the *Technical Memo*. These characteristics render it and its findings unsuitable as a basis for decision-making by the Board, or any other entity.

The analysts who conducted the economic work described in the *Technical Memo* apparently ignored existing models that describe economic outcomes of changes in water quality. The *Guidebook* describes two such models specific to water-quality assessments in California:

“The maintenance of good water quality is an important project objective [and the focus of the study at issue in our critique]. The State Water Resources Control Board (SWRCB) and the Metropolitan Water District of Southern California (MWD) in cooperation with the US Bureau of Reclamation (Bureau) and other agencies have developed economic models to assess the impacts of changes in water quality.” (*Guidebook* p. 37)

- SWRCB Lost Beneficial Use Value Calculator estimates the lost benefits attributed to diminished water quality.
- MWD Salinity Economics Impacts Model estimates regional economic impacts of changes in salinity of water sold by the Metropolitan Water District of Southern California. (*Guidebook* p. 37)

The analysis in the *Technical Memo* also overlooks major categories of costs and benefits that the *Draft EIR* alternatives will affect. Given the Board’s mission and goals (which we cite above) regarding efficient use of water and protecting beneficial water uses, this omission constitutes a fatal deficiency in the study.

Improving water quality may increase irrigators’ costs relative to baseline conditions – though, as we note above, the analysis in the *Technical Memo* grossly overstates these costs – but it will also generate economic benefits for other water users by lowering the costs they incur from water polluted by farm runoff. The current analysis ignores these benefits. For example, improving water quality can reduce filtration costs for downstream users. Recreational-water users, including sport and commercial fishing interests, can also benefit from improved water quality. Board members and other interested parties will find no information in the *Technical Memo* on these economic benefits of the *Draft EIR* alternatives.

Readers can look no further than the Central Valley Region’s own Water Quality Control Plan (Plan) for information on the significance of beneficial water uses. Chapter II of the Plan describes these uses.

“Beneficial uses are critical to water quality management in California. State law defines beneficial uses of California’s waters that may be protected against quality degradation to include (and not be limited to) ‘...domestic; municipal; agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources of preserves’ [citation omitted]. Protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning.”<sup>5</sup>

The *Technical Memo* provides a biased and incomplete assessment of the economic outcomes of adopting any of the *Draft EIR* alternatives. This is especially true regarding the economic benefits of the alternatives. Consideration of these benefits is essential, given the “primary goal” of water quality planning, as described by the Central Valley Region. Because of these flaws, Board members cannot not rely on the analysis and conclusions in the *Technical Memo* for a balanced, comprehensive, or informed assessment of the relevant economic outcomes of the *Draft EIR* alternatives.

## VII. RISK AND UNCERTAINTY

The *Technical Memo* provides no information on how each of the five alternatives would affect the risks and uncertainty facing irrigators and others. Economic analyses of the scale and scope described in the *Technical Memo* typically include analyses of risk and uncertainty as a matter of course. The analysts’ failure to comply with this generally accepted standard of practice gives decision-makers and stakeholders incomplete descriptions of the economic significance of the alternatives’ outcomes.

The *Guidebook* describes the importance of accounting for risk and uncertainty in economic analyses of policies that affect water management.

“Although it is impossible to account for all sorts of uncertainty and risk in a planning study, there are techniques that can be used to acknowledge their existence and to assign some quantitative importance to them in the analysis. These techniques include ....” (*Guidebook*, p. A-17)

The economic analysis described in the *Technical Memo* violates generally accepted standard by not assessing how the *Draft EIR* alternatives affect the risks and uncertainty that irrigators and other water users face.

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<sup>5</sup> California Regional Water Quality Control Board Central Valley Region. 2009. The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region Fourth Edition. Page II-1.00.

## VIII. REGIONAL IMPACTS

The *Technical Memo* provides a biased and incomplete description of the regional impacts of the alternatives. The conclusions in this section emphasize negative outcomes and ignore the analytical assumptions that overstate costs and the resulting negative outcomes.

In spite of the fact that the analysis described in the *Technical Memo* overestimates the costs of adopting the alternatives in the ILRP, Alternatives 3, 4, and 5 yield *net positive* impacts on employment and personal income. According to the *Technical Memo*, total personal income and total regional employment would *increase* with the adoption of Alternatives 3, 4, or 5. (*Technical Memo* p. 4-35)

The Conclusions subsection of the Regional Impacts portion of the *Technical Memo* describes reasons why the analysis likely underestimated the net adverse effects of the alternatives, which overstates the positive impacts on employment and personal income. A more balanced summary of this portion of the analysis would also comment on the reasons why the analysis likely overstates – perhaps significantly – the estimated costs of the alternatives.

The analysts present their IMPLAN assessment of regional impacts without disclosing the limitations of these types of multiplier models, or the implications of these limitation for their conclusions. For example, IMPLAN and other input-output models assume a static economy, or an economy that cannot respond to economic forces and trends, e.g., increasing market pressure to improve irrigation efficiency by switching from flood to sprinkler irrigation. In this example, the IMPLAN limitation compound the deficiencies associated with the study's baseline, which we describe above.