APPENDIX H

ESTIMATING ECONOMIC IMPACTS TO AGRICULTURAL PRODUCTION

PURPOSE/OBJECTIVE

The project alternatives for the Pajaro Valley Water Management Agency (PVWMA) Revised Basin Management Plan (Revised BMP) EIS have been modified from those analyzed by the PVWMA Local Water Supply and Distribution EIR in May 1999. While the design of the new alternatives are very similar to those previously analyzed, the construction cost estimates and corresponding projected augmentation charges for agricultural water users in the Valley have increased. Additional and updated information on agricultural production in the Pajaro Valley has also become available. The purpose of this economic analysis is to evaluate the impact that the new alternatives will have on agricultural production within the Pajaro Valley.

The purpose of the agricultural impact analysis was to evaluate the probable economic adjustments by growers and related businesses to the proposed higher water costs in the PVWMA service area resulting from the implementation and financing of the local water supply projects and distribution system. The analysis:

- Characterizes existing agricultural production in the Pajaro Valley and its economic linkage to the broader economy;
- Quantifies expected changes in production costs resulting from increased water costs for representative crops grown in the Pajaro Valley;
- Quantifies expected changes in net cash returns to management due to changes in baseline production costs;
- Discusses the likely magnitude of long-term adjustments inland rental rates induced by the increased costs for water.

This technical appendix presents the methodology, key assumptions and information used to project the likely impact that the project alternatives will have on future agricultural production in the Pajaro Valley.

METHODOLOGY

The projected future impacts on agricultural production in the Pajaro Valley were evaluated by assessing the expected changes to the net returns of agricultural production under each of the alternatives. The proposed increase in the augmentation charges for agricultural water was identified as the predominant factor affecting future agricultural production. Therefore, the future impact of each alternative was evaluated by estimating the expected changes to the net returns of agriculture resulting from the proposed water price increases.

The current net returns to agricultural production were determined by estimating average per acre production costs and revenues for the region's predominant agricultural crops. These cost estimates were based on typical crop types and cultivation practices currently used in the region. The revenue estimates were based on average yields and crop prices for these crop types and

typical cultivation practices. The key assumptions and information used to estimate the average net returns are provided in the following sections.

The future net returns for agricultural production were projected based on the current net returns and expected changes in production costs (such as increased augmentation charges for irrigation water), crop revenues and/or changes in agricultural production practices associated with each of the project alternatives.

DESCRIPTION OF STUDY AREA

The Pajaro Valley is located approximately 100 miles south of the City of San Francisco. The valley lies adjacent to Monterey Bay and consists of approximately 120 square miles of rich, loamy soils that are well suited to agricultural production. The valley is bisected by the Pajaro River which flows from the Santa Cruz and Gavilan mountain ranges, and lies within the Pajaro Ground Water Basin which is the region's principal source of water. The valley's commercial center is the City of Watsonville and agriculture is the area's principal economic activity.

The combination of Pajaro Valley's unique marine climate and fertile soils makes the area one of the most productive agricultural regions in the world. Annually, the valley produces on average over $520 million in vegetable, berry and ornamental crops (in 2001 dollar terms) on over 30,000 acres of agricultural acreage.[1] The gross revenue per cultivated acre averages more than $16,000 per acre.

AGRICULTURAL PRODUCTION

PAJARO VALLEY

The most recent information on agricultural production in Pajaro Valley is presented in **Table H.1**. Since 1995, the Monterey and Santa Cruz Agricultural Commissions no longer regularly report agricultural production statistics separately for Pajaro Valley. As a result, more recent agricultural information detailing crop acreages for Pajaro Valley, specifically yields and crop values, was unavailable. However, local agricultural extension staff suggested that current farming production is comparable to the 1992 to 1995 conditions and the more general recent agricultural conditions in Monterey and Santa Cruz Counties. Furthermore, since the Northern Pajaro Valley area represents nearly all the agricultural land in Santa Cruz County, the Santa Cruz county statistics provide representative indications of the agricultural production trends for Pajaro Valley as a whole.

As shown in **Table H.1**, the total cultivated acreage in Pajaro Valley averages approximately between 32,000 and 33,000 acres with an annual value of over $0.5 billion (in 2001 dollars). This level of agricultural production makes Pajaro Valley, on a per acre basis, one of the most productive agricultural regions in the world.

[1] Santa Cruz County Agricultural Commission Crop Reports 1992-95, 1998.

TABLE H.1
VALUE OF AGRICULTURAL PRODUCTION IN PAJARO VALLEY (1992-95)
(in 2001 dollars)

Crop Category	Crop	Pajaro Valley Average 1992-95 Acres	Value ($ 000)	*Acres percent*	*Value percent*
Field Ornamentals	Field Flowers	**976**	**$23,483**	*3.0%*	*4.4%*
	Landscape Plants	**176**	**$8,984**	*0.5%*	*1.7%*
Total Field Ornamentals		**1,152**	**$32,467**	*3.5%*	*6.1%*
Fruits & Berries	Strawberries	**6,005**	**$216,494**	*18.3%*	*40.6%*
	Raspberries	**1,351**	**$41,640**	*4.1%*	*7.8%*
	Apples	**3,993**	**$12,165**	*12.2%*	*2.3%*
	Bushberries	**327**	**$3,613**	*1.0%*	*0.7%*
	Other Fruit	**125**	**$329**	*0.4%*	*0.1%*
Total Fruits & Berries		**11,801**	**$274,241**	*36.0%*	*51.5%*
Greenhouse	Roses - Hybrid	**202**	**$24,546**	*0.6%*	*4.6%*
	Indoor Pots	**44**	**$7,290**	*0.1%*	*1.4%*
	Carnations - Standard	**24**	**$3,011**	*0.1%*	*0.6%*
	Roses - Sweetheart	**19**	**$2,829**	*0.1%*	*0.5%*
	Other Indoor Flowers	**30**	**$2,685**	*0.1%*	*0.5%*
	Carnations - Miniature	**22**	**$2,568**	*0.1%*	*0.5%*
Total Greenhouse		**341**	**$42,929**	*1.0%*	*8.1%*
Vegetables	Mushrooms		**$62,011**	*0.0%*	*11.6%*
	Lettuce - Head	**9,323**	**$56,248**	*28.5%*	*10.6%*
	Other Vegetables	**2,652**	**$21,782**	*8.1%*	*4.1%*
	Lettuce - Leaf	**2,447**	**$13,695**	*7.5%*	*2.6%*
	Cauliflower	**1,841**	**$9,610**	*5.6%*	*1.8%*
	Celery	**956**	**$7,353**	*2.9%*	*1.4%*
	Broccoli	**1,238**	**$6,497**	*3.8%*	*1.2%*
	Brussels Sprouts	**1,002**	**$6,061**	*3.1%*	*1.1%*
Total Vegetables		**19,459**	**$183,257**	*59.4%*	*34.4%*
Total Agricultural Production		**32,753**	**$532,894**	*100.0%*	*100.0%*

SOURCES: Draft Pajaro Valley Water Supply Augmentation Fees Report, M.Cubed, January 1998. Pajaro Valley Crop Reports, 1992-1995.

PVWMA SERVICE AREA

The PVWMA service area incorporates the majority of the Pajaro Valley. While the reported cultivated acreage in the Pajaro Valley averages approximately between 32,000 and 33,000 acres, the total agricultural area within the PVWMA service area is estimated to be 30,349 acres (including over 1,200 of pasture land). The PVWMA service area more precisely represents the agricultural production area potentially impacted by future PVWMA irrigation water management changes. **Table H.2** provides summary information on the agricultural land use within the PVWMA service area. This information represents the baseline agricultural production conditions to be used by the agricultural impact analysis. This data was also used as baseline information in the hydrologic modeling.

TABLE H.2
CURRENT AGRICULTURAL PRODUCTION IN THE PVWMA SERVICE AREA

Crop	Average Cultivated Acreage
Strawberry	6,940
Vine (primarily Raspberries)	1,640
Vegetable Row Crops	9,724
Irrigated Fallow[1]	4,174
Field Crops	645
Deciduous (primarily Apples)	3,891
Nursery (Outdoor)	1,475
Nursery (Indoor)	632
Pasture	1,228
Total Cultivated Acreage	**30,349**

[1] Irrigated Fallow acreage represents agricultural lands that were not in production (e.g. land unplanted during the transition between crop rotations) when the land use survey was performed.

SOURCE: WRIME, Draft Technical Memorandum, Hydrological Analysis and Modeling in Support of the Basin Management Plan for Pajaro Valley Water Management Agency, September 2002.

Fruits and berries account for approximately half of the total production value in the Valley, with strawberries accounting for approximately 80 percent of the value produced by this category. Vegetable crops (primarily mushrooms and lettuce) account for about a third of total production, while greenhouse and field ornamentals account for most of the remainder.

Strawberries and lettuce are the leading crops grown in the valley in terms of field crop production. Although production levels can fluctuate significantly on an annual basis, during the last ten years the strawberry crop acreage has increased steadily in Santa Cruz County. According to local agricultural specialists, strawberry production has become increasing prevalent in Pajaro Valley. In recent years, apple production has been in steady decline as many orchards have gradually been removed and converted to other crops such as strawberries. While the acreage converted to head lettuce has declined over the last ten years, head lettuce still

accounted for over a fifth of the agricultural acreage within Santa Cruz county. Furthermore, nearly all of the decrease in head lettuce cultivation has been replaced by increases in leaf lettuce production, reflecting trends in market demand. Combined lettuce production in Santa Cruz County accounted for over 30 percent of the cultivated acreage between 1996 and 2000.

Greenhouse production has declined in recent years as a result of increase foreign competition, and this trend is expected to continue.

CURRENT AGRICULTURAL PRODUCTION METHODS

REPRESENTATIVE CROP ROTATIONS

Based on the past agricultural production and trends, the following crop rotations were selected to represent agricultural production in Pajaro Valley:

- A one year strawberry crop,
- A two year rotation consisting of one year of strawberry production followed by two head lettuce crops in the second year, and
- A one year rotation consisting of two head lettuce crops and one broccoli crop.

These crop rotations are the same as the main cultivation practices used in the Revised BMP EIR (2002). Strawberry production is very comparable to raspberry and bushberry production and therefore can be used to represent the production, net returns and impacts. Similarly, broccoli production is comparable to other row crop vegetable production (such as cauliflower, celery and brussel sprout production). Therefore it has been used in the agricultural analysis to more generally represent the agricultural production for other similar vegetable crops.

AGRICULTURAL WATER DEMAND AND SUPPLY

According to the water modeling analysis performed for the Revised BMP, current agricultural water demand in the PVWMA is 59,300 acre-feet per year (afy). Growers within the PVWMA service area meet their irrigation water needs primarily through groundwater pumping. The average applied water needs for the crops were assumed to be unchanged from those estimated for the Revised BMP EIR. Specifically, the average applied water need for strawberries was assumed to be 2.6 af and annual water needs for vegetable production were estimated to be 2.1 af for the net returns analysis. These water use estimates are generally consistent with the results of the PVWMA Crop Water Use Study[2] which was also used to develop the average agricultural net water use estimate of 2.1 af/acre used for the hydrological analysis. Strawberry producers in Pajaro Valley (like the rest of Monterey county's berry production) almost exclusively use drip

[2] V. Bogenholm, *PVWMA: Crop Water Use Study (1994-1997)*, March 1998.

irrigation. For vegetable production, over 60 percent of the acreage is currently irrigated with a combination of sprinkler and furrow irrigation.[3]

CROP PRODUCTION INPUT COSTS

The crop budgets used previously in the Revised BMP EIR were reviewed and analyzed. The previous budget and estimates of average net returns were revised based on subsequent changes in production costs and practices. Recent University of California Cooperative Extension analyses of sample costs for broccoli, lettuce and strawberry production in the Central Coast region were used as the basis for estimating the average costs of production in the Pajaro Valley. Based on additional information obtained from local growers, harvesters and other agricultural specialists, these budgets were modified to be more representative of current and future farming production in Pajaro Valley.

Agricultural production can be separated into several stages of production and sets of inputs. Typically, land preparation is the first stage. This may include application of manure or other soil amendments, discing of the ground to break up the soil and shaping the beds in preparation for crop planting. If a second repeat crop is to be grown, in many cases little additional land preparation will be required.

The cultivation stage of production consists of the planting and subsequent care of the crop until maturity. Cultural costs will typically include irrigation, fertilization and pest control.

Crop harvesting represents another distinct stage of production. Generally, harvesting includes picking, packing and haulage to the buyer. For higher value perishable crops, refrigerated transport may be necessary and an added cost to the farmer.

The crop budgets estimating the total cost of production for each of the three representative crop rotations are presented in **Tables H.12.1** through **H.12.6** (at the end of this appendix). Each stage of production has been identified in the crop budgets. In addition, labor and machinery costs were separated from material costs. The principal cost assumptions, modifications and issues are discussed in the following sections.

CURRENT WATER PRICES

The current augmentation charge for groundwater in Pajaro Valley is $80/af. In addition, it is estimated that average groundwater costs (including ownership, operating and maintenance costs) are approximately $92/af. Using the average groundwater pumping characteristics from the Revised BMP and recent PG&E utility prices, average utility costs for groundwater pumping accounted for an estimated $39 of those costs. The remaining $53 represents landowner costs for the wells and the landowners are compensated for these expenses through the land leases. Therefore, to avoid double counting this cost when estimating the net returns of production, the

[3] Monterey County Water Resources Agency, *1998 Ground Water Extraction Summary Report*, October 2000.

water price used in the crop budgets only include the grower's direct costs for water (i.e. augmentation charges and utility costs).

LAND COSTS

Land rental prices are a major cost element affecting the profitability of agricultural production in the Pajaro Valley. Unfortunately, there is little publicly available information on land prices and lease rates within the Pajaro Valley since properties are rarely sold and the land lease terms between landowners and leasees are confidential.

In the 1998 Revised BMP EIR analysis, average land rents were estimated to be $1,400 for high quality agricultural lands. In the *Revised Basin Analysis Plan*, the average land lease cost was estimated to be $1,500 although it was also noted that "in the coastal area the annual cost to lease land is approximately $2,500 to $3,000 per acre."[4] The California chapter of the American Society of Farm Managers and Rural Appraisers' "Trends in Agricultural Land and Lease Values" (2001), reports that comparable agricultural properties in the Salinas Area rents are $1,200 - $2,400. According to the opinion of the Santa Cruz County Tax Assessor, typical rental rates for high quality agricultural land suitable for strawberry and lettuce production would be approximately $1,800. However, discussions with local growers and agricultural specialists suggest that rents for high quality agricultural land in the Pajaro Valley are most suitable for strawberry and lettuce production averaging about $2,200/acre.[5]

OVERHEAD, INTEREST AND DEPRECIATION COSTS

In addition to the direct costs of agricultural production discussed previously, there are additional costs associated with farming. Overhead costs represent expenses that are assigned to the farm operations as a whole. These include taxes, office expenses, insurance and interest on capital. Interest on capital represents the cost of money associated with carrying the "debt" of the production costs between when an expense is incurred (such as paying for fertilizer) and when the crop is later sold. This cost can be significant for more capital and input intensive crops such as strawberries and lettuce.

Similarly depreciation costs have been included to recognize the decrease in the value of capital investments in equipment over time. However, in some budgets (such as those for lettuce production) the labor and machinery costs were determined based on custom contract rates for the task. Custom contract rates will typically be sufficient to cover the independent operator's full costs for machinery (including equipment depreciation). Therefore, in such cases separate depreciation expenses have not been included.

4 *Revised Basin Management Plan*, Pajaro Valley Water Management Agency, February 2002, page 3-3.
5 This higher land lease cost was used to be conservative in the agricultural impact analysis by not overestimating the profitability of current local agricultural production.

CROP YIELDS & PRICES

Agricultural production is generally a cyclical business in which prices, yields and, in some cases, costs may vary significantly between years and also during the production season. The precise timing of the harvest and delivery of the crop to market can be important for determining the prices received by growers for higher value and perishable crops. Monthly vegetable and strawberry price data from the National Agricultural Statistics Service for the Watsonville-Salinas area show that it is not uncommon for prices to vary by a factor of four or more over the course of a growing season.

In addition, crop yields may also vary as a result of weather conditions. While management, soil and water quality may also affect the yields, for larger operations yields typically vary by no more than 10 to 15 percent from year to year.

These fluctuations tend to average out over time, and average prices and yields will provide a more typical representation of likely crop revenues. Therefore, whenever possible, 10-year historical yields and price information for Monterey County was collected and used to project future prices and yields. Past prices were adjusted (into 2001 dollar terms) using the National Consumer Price Index for all Urban Consumers. Average county yields and prices were then used to project the net returns of future agricultural production in Pajaro Valley. Based on the past county data, the following per acre yield and price assumptions have been used to represent typical future crop production revenues:

Broccoli: 645 cartons/acre, $7.25/carton, carton = 22-23 lbs

Head Lettuce (wrapped): 970 cartons/acre, $9.19/carton, carton = 42 lbs

Strawberries: 4,720 cartons/acre, $7.15/carton, carton = 12 lbs

ESTIMATES OF NET RETURNS FOR AGRICULTURAL PRODUCTION

The average net returns per acre for each of the three crop rotations were estimated using the production costs and revenue estimates crop budgets outlined above. Based on these assumptions, the net returns for each of the representative crop rotations have been estimated as follows (see also **Table H.3**):

One year strawberry crop: Average annual net returns were estimated to be $4,675/acre. The total cost of production was determined to be $29,075/acre. Therefore the return on investment for strawberries was estimated to be approximately 16 percent.

Two year rotation of one strawberry crop and two lettuce crops: Average annual net returns for strawberries were estimated to be $4,675/acre. The total cost of production was determined to be $29,075/acre. Average annual net returns for wrapped head lettuce were estimated to be $1,855/acre. The total cost of production was determined to be $15,975. Therefore, the average annual net returns are $3,265 with an average cost of production of $22,525. The return on investment for the two year of strawberry and lettuce rotation was estimated to be approximately 14 percent.

TABLE H.3
NET RETURNS FOR REPRESENTATIVE CROP ROTATIONS

Crop Rotation	Average Total Production Cost (/ac)	Average Revenue (/ac)	Net Returns (/ac)	Return on Investment
1 Year – Strawberry	$29,075	$33,750	$4,675	16%
2 Year – Strawberry & Lettuce (x2)	$22,525	$25,790	$3,265	14%
1 Year – Lettuce (x2) & Broccoli	$19,480	$22,505	$3,025	16%

Totals may not add up exactly due to rounding.

One year vegetable rotation of two lettuce crops and one broccoli crop: Average annual net returns for wrapped head lettuce were estimated to be $2,640/acre. The total cost of production was determined to be $15,190. Average annual net returns for broccoli were estimated to be $385/acre. The total cost of production for broccoli was determined to be $4,290. Therefore, the overall average net returns for the rotations were estimated to be $3,025 with a total cost of production of $19,480. The return on investment for the vegetable rotation was estimated to be approximately 16 percent.

IMPACTS ON AGRICULTURAL PRODUCERS

ALTERNATIVE B – RECYCLED WATER PROJECT AND IMPORT WATER PROJECT

WATER PRICES – FUTURE

The future augmentation charges for groundwater and the Delivered Water Charges are based on the Recommended Rate Plan in the Revised BMP.[6] Under Alternative B, it was assumed that future augmentation charges would increase steadily over a ten-year period beginning in 2003 until 2013 when the future Augmentation and Delivered Water Charges would be $158/af and $316/af respectively.

Growers Using Delivered Water

The net increase in water prices for delivered project water in 2013 would be $236/af ($316/af - $80/af). In addition, growers would on average save approximately $40/af in avoided electricity cost for groundwater pumping. Therefore the total net increase in water costs would be $196/af ($236 minus $40) which represents a 163 percent increase to the grower's water costs.[7] The estimated cost impact on future agricultural production for growers using delivered project water is estimated below in **Table H.4**.

6 *Revised Basin Management Plan*, Pajaro Valley Water Management Agency, February 2002, page 8-4.
7 Well development and maintenance costs are typically paid by the landowner.

TABLE H.4
ESTIMATED COST IMPACT ON FUTURE AGRICULTURAL PRODUCTION FOR GROWERS USING DELIVERED PROJECT WATER

Crop Rotation	Current Aver. Cost of Production (/ac)	Average Water Use (/ac)	Water Price Increase	Future Aver. Cost of Production (/ac)	Cost Increase
1 Year – Strawberry	$29,075	2.6 af	$196/af	$29,585	1.8%
2 Year – Strawberry & Lettuce (x2)	$22,525	2.35 af	$196/af	$22,985	2.0%
1 Year – Lettuce (x2) & Broccoli	$19,480	2.1 af	$196/af	$19,890	2.1%

Totals may not add up exactly due to rounding.

Growers Using Groundwater

The net increase in water prices for groundwater in 2013 would be $78/af ($158/af minus $80/af) which represents a 65 percent increase in the price of water. The estimated cost impact on future agricultural production for growers using groundwater is estimated below in **Table H.5**.

TABLE H.5
ESTIMATED COST IMPACT ON FUTURE AGRICULTURAL PRODUCTION FOR GROWERS USING GROUNDWATER

Crop Rotation	Current Aver. Cost of Production (/ac)	Average Water Use (/ac)	Water Price Increase	Future Aver. Cost of Production (/ac)	Cost Increase
1 Year – Strawberry	$29,075	2.6 af	$78/af	$29,280	0.7%
2 Year – Strawberry & Lettuce (x2)	$22,525	2.35 af	$78/af	$22,710	0.8%
1 Year – Lettuce (x2) & Broccoli	$19,480	2.1 af	$78/af	$19,645	0.8%

Totals may not add up exactly due to rounding.

INITIAL IMPACTS ON NET RETURNS

The water cost increases may be expected to correspondingly reduce the net returns from production if growers make no adjustments to their crop production approach. This would represent the greatest possible impact to growers of the proposed changes.

Growers Using Delivered Water

Table H.6 provides estimates of the impact on net returns for growers using delivered water if no adjustments to their crop production methods are implemented.

TABLE H.6
ESTIMATED IMPACT ON NET RETURNS FOR GROWERS USING DELIVERED WATER WITH NO ADJUSTMENTS TO CROP PRODUCTION METHODS

Crop Rotation	Current Net Returns (/ac)	Average Water Use (/ac)	Water Cost Increase	Future Net Returns (/ac)	Change in Net Returns
1 Year – Strawberry	$4,675	2.6 af	$196/af	$4,165	- 10.9%
2 Year – Strawberry & Lettuce (x2)	$3,265	2.35 af	$196/af	$2,805	- 14.1%
1 Year – Lettuce (x2) & Broccoli	$3,025	2.1 af	$196/af	$2,615	- 13.6%

Totals may not add up exactly due to rounding.

Growers Using Groundwater

Table H.7 provides estimates of the impact on net returns for growers using groundwater if no adjustments to their crop production methods are implemented.

TABLE H.7
ESTIMATED IMPACT ON NET RETURNS FOR GROWERS USING GROUNDWATER WITH NO ADJUSTMENTS TO CROP PRODUCTION METHODS

Crop Rotation	Current Net Returns (/ac)	Average Water Use (/ac)	Water Cost Increase	Future Net Returns (/ac)	Decrease in Net Returns
1 Year – Strawberry	$4,675	2.6 af	$78/af	$4,470	- 4.3%
2 Year – Strawberry & Lettuce (x2)	$3,265	2.35 af	$78/af	$3,080	- 5.6%
1 Year – Lettuce (x2) & Broccoli	$3,025	2.1 af	$78/af	$2,860	- 5.4%

Totals may not add up exactly due to rounding.

However, this level of impact on future crop production would only be expected to be a short-term impact of the water price increase. It is reasonable to expect that most growers would make some production adjustments since: (1) growers would be forewarned of the proposed water price increases and (2) the increases would be implemented gradually.

As a result, it would be expected that over time growers would likely change their methods of production to minimize the effects of the increased water costs on their net returns.

ALTERNATIVE C – IMPORT WATER PROJECT ONLY

WATER PRICES – FUTURE

Under Alternative C, it was assumed that future augmentation charges would increase steadily over a ten-year period beginning in 2003 until 2013 when the future augmentation and delivered water charges would be $168/af and $327/af respectively.

Growers Using Delivered Water

The net increase in water prices for delivered project water in 2013 would be $247/af ($327/af minus $80/af). In addition, growers would on average also save approximately $40/af in avoided electricity cost for groundwater pumping. Therefore the total net increase in water costs would be $207/af ($247 minus $40) which represents nearly a 173 percent increase in the cost of water. The estimated cost impact on future agricultural production for growers using delivered project water is estimated below in **Table H.8**.

TABLE H.8
ESTIMATED IMPACT ON FUTURE AGRICULTURAL PRODUCTION
FOR GROWERS USING DELIVERED WATER

Crop Rotation	Current Aver. Cost of Production (/ac)	Average Water Use (/ac)	Water Price Increase	Future Aver. Cost of Production (/ac)	Cost Increase
1 Year – Strawberry	$29,075	2.6 af	$207/af	$29,615	1.9%
2 Year – Strawberry & Lettuce (x2)	$22,525	2.35 af	$207/af	$23,010	2.2%
1 Year – Lettuce (x2) & Broccoli	$19,480	2.1 af	$207/af	$19,915	2.2%

Totals may not add up exactly due to rounding.

GROWERS USING GROUNDWATER

The net increase in water prices for groundwater in 2013 would be $88/af ($168/af minus $80/af) which represents a 73 percent increase in the price of water. The estimated cost impact on future agricultural production for growers using groundwater is estimated below in **Table H.9**.

TABLE H.9
ESTIMATED IMPACT ON FUTURE AGRICULTURAL PRODUCTION FOR GROWERS USING GROUNDWATER

Crop Rotation	Current Aver. Cost of Production (/ac)	Average Water Use (/ac)	Water Price Increase	Future Aver. Cost of Production (/ac)	Cost Increase
1 Year – Strawberry	$29,075	2.6 af	$88/af	$29,305	0.8%
2 Year – Strawberry & Lettuce (x2)	$22,525	2.35 af	$88/af	$22,730	0.9%
1 Year – Lettuce (x2) & Broccoli	$19,480	2.1 af	$88/af	$19,665	0.9%

Totals may not add up exactly due to rounding.

INITIAL IMPACTS ON NET RETURNS

The water cost increases may be expected to correspondingly reduce the net returns from production if growers make no adjustments to their crop production approach. This would represent the greatest possible impact to growers of the proposed changes.

Growers Using Delivered Water

Table H.10 provides estimates of the impact on net returns for growers using groundwater if no adjustments to their crop production methods are implemented.

Growers Using Groundwater

Table H.11 provides estimates of the impact on net returns for growers using groundwater if no adjustments to their crop production methods are implemented.

However, this level of impact on future crop production would only be expected to be a short-term impact of the water price increase. It is reasonable to expect that most growers would make some production adjustments for the following reasons: (1) growers would be forewarned of the proposed water price increases and (2) the increases would be implemented gradually.

TABLE H.10
ESTIMATED IMPACT ON NET RETURNS FOR GROWERS USING DELIVERED WATER WITH NO ADJUSTMENTS TO CROP PRODUCTION METHODS

Crop Rotation	Current Net Returns (/ac)	Average Water Use (/ac)	Water Cost Increase	Future Net Returns (/ac)	Change in Net Returns
1 Year – Strawberry	$4,675	2.6 af	$207/af	$4,135	- 11.5%
2 Year – Strawberry & Lettuce (x2)	$3,265	2.35 af	$207/af	$2,780	- 14.9%
1 Year – Lettuce (x2) & Broccoli	$3,025	2.1 af	$207/af	$2,590	- 14.4%

Totals may not add up exactly due to rounding.

TABLE H.11
ESTIMATED IMPACT ON NET RETURNS FOR GROWERS USING GROUNDWATER WITH NO ADJUSTMENTS TO CROP PRODUCTION METHODS

Crop Rotation	Current Net Returns (/ac)	Average Water Use (/ac)	Water Cost Increase	Future Net Returns (/ac)	Decrease in Net Returns
1 Year – Strawberry	$4,675	2.6 af	$88/af	$4,445	- 4.9%
2 Year – Strawberry & Lettuce (x2)	$3,265	2.35 af	$88/af	$3,060	- 6.3%
1 Year – Lettuce (x2) & Broccoli	$3,025	2.1 af	$88/af	$2,840	- 6.1%

Totals may not add up exactly due to rounding.

As a result, it would be expected that over time growers would likely change their methods of production to minimize the effects of the increased water costs on their net returns.

FARM LEVEL ADJUSTMENTS

Faced with substantial increases to their water costs, agricultural producers in the Pajaro Valley may be expected to adjust their farming practices. These changes could include changes in crop growing technique or types of crops grown. Producers may also be able to increase the sale prices of produce to increase the net revenues from their production. The following sections

discuss the principal issues associated with the various strategies that growers could adopt to offset their income losses from the water cost increases.

CHANGES IN PRODUCTION METHODS

The most direct impact of the water cost increases will likely be an increase in incentive for growers to reduce their water requirements. There may be potential for significant reductions to their farm water use by increasing the operational efficiencies of the current growers' irrigation systems. In the opinion of some local agricultural experts, water consumption by current growers could on average be reduced by up to 15 percent primarily by more careful management of their existing irrigation practices. These water use savings could be achieved without significant additional capital expenditures by improved scheduling and control of the water applications to the crops.

While these measures might require some greater technical knowledge and management oversight (which would represent some additional cost of production), these additional management requirements would be minor compared to the potential cost savings when water prices have reached $316/af in 2013. For example, a 10 percent reduction in total water use by strawberry growers would reduce their typical annual water use from 2.6 to approximately 2.35 af and this 0.25 af reduction in water consumption would result in a water cost saving of $80 per acre.

Additional water savings can be achieved in transitioning to more sophisticated irrigation systems. According to local agricultural irrigation specialists, typical water use efficiencies for furrow irrigation range from 60 to 80 percent, while sprinkler and drip irrigation systems generally operate at 70 to 85 percent and 75 to 90 percent rates respectively. Under good to excellent management, even better levels of water use efficiency can be achieved. According to the "PVWMA Water Conservation 2000" study, management techniques can allow for furrow irrigation efficiencies ranging from 70 to 85 percent, and solid set sprinkler and drip systems efficiencies of 75 to 90 percent and 80 to 90 percent respectively.[8]

At 60 percent efficiency, a furrow irrigation system would use 1.67 af of water to deliver 1.0 af to the crop (1/0.6), while an average sprinkler and drip system would only use 1.29 af and 1.18 af respectively. Based on these efficiencies transitioning from sprinkler to drip irrigation would reduce typical irrigation water use by more than 9 percent (1.29 af/1.18 af).

Currently, nearly all the strawberry production in Pajaro Valley uses drip irrigation. However, in 2000 over 62 percent of the irrigated agricultural production in Pajaro Valley used a combination of sprinkler irrigation while 36.7 percent used drip irrigation.[9] These figures suggest that there may be additional water use savings if some of the current sprinkler irrigation is replaced by drip systems. While there is currently a major additional cost for drip systems, there are numerous additional potential advantages: reduced environmental impacts, disease control, energy use, reduction in herbicide and fertilizer use, and lesser water supply constraints. As demonstrated by

8 "Final Draft PVWMA Water Conservation 2000," CH2MHill for PVWMA, November 1999, pg 5-11.
9 "PVWMA Memorandum," Douglas Coty PVWMA, November 21, 2001.

the use of drip irrigation by strawberry growers, drip irrigation is expected to be increasingly adopted by growers updating their irrigation systems, and who are cultivating high value crops such as lettuce. Although the majority of vegetable crops are currently irrigated the entire season by sprinkler systems, there has been an increasing use of drip irrigation for vegetable crop irrigation in the Pajaro Valley in recent years.[10] This suggests that further increases in drip irrigation of the future vegetable production may be possible especially since the proposed water prices increases will provide greater cost incentives to growers using drip systems.

The "PVWMA Conservation 2000" study identified numerous other water conservation measures for agriculture developed a proposed Agriculture Conservation Program. While the cost impacts to the producers of implementing the conservation measures have not be estimated, faced with the water price increases projected, it is expected that many of the measures could offer cost effective approaches to reduce on farm water use. In which case, such farm level production changes would reduce the negative economic impact to growers' net returns from the proposed water price increases.

CROP SUBSTITUTION

Agricultural producers in Pajaro Valley may be able to reduce the negative impacts of the water price increases by changing to higher value crops such as strawberries, lettuce or packaged salad crops. High land costs and poor market conditions make production of low value "truck crops" such as broccoli, cauliflower and celery currently unprofitable in the Pajaro Valley. Most of the remaining production is conducted by farmers who own their own land and/or currently lack the resources (financial and technical) to change their production methods. These producers also generally account for the remaining furrow irrigation in the area.

The future price increases will likely encourage these marginal producers to change their crop production to higher value crops such as lettuce and strawberry production which offer potential positive net returns (even with the higher water prices). By substituting crops, growers will be able to avoid the greater negative impact that the water price increases will have on the low value crops. While gradual implementation of the future water price increases will encourage growers to make such a transition, other factors may make it difficult for specific producers to make the necessary crop substitutions. As can be seen from the production budgets, (see **Tables H.12.1** through **H.12.6** at the end of this appendix) production of high value crops such as strawberry and lettuce requires significantly greater capital resources for equipment, materials and labor expenses. Furthermore, there are also greater production risks for growers associated with poor growing conditions or sale prices – although the increasing incidence of contract growing can reduce the grower's risks, it will also decrease the potential financial rewards from a good yield or high prices.

While there has been a steady growth during the last ten years in strawberry production within Pajaro Valley, market demand for increased production would need to be sufficient to maintain the existing crop prices. Without sufficient demand, additional production from additional

[10] "Final Draft PVWMA Water Conservation 2000," CH2MHill for PVWMA, November 1999, pg 2-4.

growers would depress market prices as a result of oversupply. According to the California Strawberry Commission, since 1990 summer production of strawberry in California increased by 60 percent and further growth in demand is expected as strawberries are increasingly marketed as a year-round fruit. Recent growth trends in consumer demand for strawberries suggest that the market is far from saturated – especially as recent improvements in production techniques and varietals have maintained quality, improved yields and increased the price competitiveness of strawberries.[11]

CROP PRICE IMPACTS

Under certain circumstances, increases in agricultural input prices (such as fertilizer or labor costs) can result in a corresponding increase in the crop sales prices so that much of the production cost increase is passed on ultimately to the customer by increases. However, the market conditions for growers in Pajaro Valley make it unlikely that they will be able to pass on their future water cost increases to consumers. First, in this case, the cost increases are localized to Pajaro Valley growers. As a result, growers in other regions will be unaffected and therefore can easily undersell Pajaro Valley growers. Second, as a result of consolidation of agricultural distributors, a small number of distributors manage the majority of distribution opportunities for producers. Since these distributors can also purchase crops from other growing areas and local growers have few other sale outlets, generally growers must accept distributor pricing and terms. Increasingly, many growers are negotiating contract terms for their produce before they begin planting – effectively locking in their sale terms long before the crop is ready for distribution. The increasing prevalence of such contract farming has increased the role of distributors and further reduces the abilities of growers to determine crop prices.

IMPACTS ON LANDOWNERS

Land/Rent Impacts

Currently, agricultural production is the highest and best use for most of the land in the Pajaro Valley. While significant demand exists for residential use of many properties, current zoning and planning restrictions prevent sub-division and residential use of most of the farmland in the Pajaro Valley. During the last ten years, land prices have risen significantly and few properties have been available for purchase. Although no public information is available for lease terms in the area, interviews with local agricultural experts and growers consistently reported that most leases are short-term and there is strong demand from growers in Pajaro Valley. The relative fluidity of the lease demand and lease terms suggests that future land leases will be more likely and can more readily adjust to any external shifts in market conditions. In general, lease rates and land prices have been relatively inelastic in response to changes in demand. As such, during periods when their have been reductions in property demand, lease prices have not swiftly responded and reflected reductions in the demand but instead have remained unchanged until demand begins to raise prices.

[11] Telephone discussion with Cindy Jewel, California Strawberry Commission, May 15th, 2002.

Future water price increases in the Pajaro Valley can be expected to affect land leases rates and land prices over time. The impact will be expected to be greatest for landowners whose properties will be required to use delivered water for irrigation. The lease rates that all landowners can expect in the future will be directly related to the net returns that growers can achieve on their properties. Assuming that growers are currently making a fair return from production under the existing lease rates, major increases in input prices (such as the proposed augmentation charge) would negatively affect their net returns earnings. If growers can find cost effective water conservation measures to economize on their water use or maintain future yield and production efficiencies, then not all of the full water cost increase ($196/af) would be passed on to the landowners. If no cost savings can be achieved by growers, then all of the additional costs would need to be absorbed by the land owners through reductions in lease rates (which will also reduce the land values of the property since the land's income potential will have been reduced).

DISTRIBUTION OF IMPACTS

The water price schedules for delivered water and groundwater users have been developed so that, on average, growers would pay comparable rates for the water. The difference in the price schedules between delivered water and groundwater represents: the capital cost of well development; annual operating and maintenance costs of well facilities; the groundwater pumping energy costs for pumping and a small additional charge to users of delivered water. Typically landowners pay the cost for the capital costs for the well facilities and leasees pay the utility costs. In which case, there would likely be differences in the lease rates between delivered and groundwater irrigation properties. However, landowners avoiding the capital costs of groundwater wells will receive a comparable return for their lands from a lower lease rate. In addition, there may some differences in water costs for growers on property with shallower and deeper irrigation wells. In general, the impacts to landowners should be equivalent whether their properties are served by delivered water or they can continue to use groundwater for irrigation. This will be more likely since some growers can be expected to benefit from the greater service reliability, improved water quality and reduced operating and maintenance needs expected to be associated with the proposed delivered water supply.

As discussed previously, future water price increases are expected to encourage growers to shift much of their production to high value crops and to adopt more efficient irrigation systems and agricultural production methods. However, due to the technical and capital requirements involved in shifting their production some growers may lack the necessary financial resources or technical skills. In which case, some individual growers may be negatively impacted while other growers with the necessary skills and resources may benefit from the additional opportunities to expand their production. The estimated average impacts estimated will represent the net impact to the agricultural industry as a whole.

IMPACTS TO THE REGIONAL ECONOMY

ALTERNATIVE A – NO ACTION

ELIMINATION OF COASTAL GROUNDWATER PUMPING

Under this alternative, to curtail seawater intrusion it is assumed that PVWMA would have to either (1) impose groundwater pumping restrictions on the coastal agricultural or (2) purchase and retire coastal agricultural lands. Based on the results from Hydrologic Analysis (WRIME, 2002) it is estimated that coastal agricultural production would need to reduce agricultural water use equivalent to the estimated imported water requirement of 18,500 af to curtail salt water intrusion. A reduction of 18,500 af in agricultural water supply would represent over a 31 percent reduction in the Pajaro Valley's current agricultural water use. Based on a corresponding decrease to total Pajaro Valley agricultural production (estimated to be approximately $520 million), this reduction would represent approximately a $162 million loss of annual production.

The lost future agricultural production impacts might be less than this estimate if the higher value agricultural production (e.g. strawberries) previously occurring on the impacted lands would likely relocate locally by displacing lower value agriculture elsewhere in the PVWMA service area. This would require that the majority of the inland agricultural lands have suitable soil and growing conditions for growing the higher value crops. However, given the current incidence of strawberry and lettuce throughout much of the inland agricultural lands, land and growing conditions may not be a major constraint to any such crop substitutions. In which case, it may be expected that implementation of such restrictions would result in a shift in agricultural production with the Pajaro Valley so that primarily lower value crops would be lost.

If groundwater pumping is prohibited, the affected properties will only be usable for dryland farming or rangeland grazing purposes (unless current land use zoning restrictions are changes and economic feasible water sources can be developed that permit other use of the land such as industrial or residential development). If the coastal properties lose their viability for irrigated production, then their land leases and land values will be drastically reduced. While the current agricultural producers are estimated to be paying annual lease rates between $1,500 to $2,200 an acre, rangeland lease rates for the property would be less than $15 acre. Based on the high cost of production it is also expected that dryland farming would likely be economically infeasible. Local real estate specialists also estimate that the sale value for the land would be reduced from a current price of $25,000 to $35,000 to less than $1,000 per acre. Using an average land value estimate of $30,000/acre for the coastal properties, impact from the groundwater prohibitions would represent a land value loss of at least $29,000 per acre. If approximately 8,070 acres of coastal property would be affected, then the total direct economic impact from the lost agricultural production would be nearly $234 million in lost capital value.

The reduction in the land's productive capacity would drastically decrease both land leases and local agricultural spending. Since fewer growers will be purchasing agricultural supplies, employing farm workers and selling their produce, the economy will experience less economic activity. While the total economic impacts from the future lease income and agricultural

production losses are incorporated in the land's valuation, the annual employment and economic income impacts can also be quantified based on the expected annual effects on the area's economy.

The magnitude of the lost agricultural production can be estimated based on the projected lost agricultural crop sales. Reduced agricultural production will result in job losses for agricultural workers. In addition to the direct loss of farming jobs, there will also be additional indirect and induced job and income losses resulting from the reduction in local agricultural production. Indirect jobs result from supplier purchases made by the farming operations and include industries such as agricultural support services, farming equipment and business services. Induced jobs result from spending made by agricultural production employees. These industries are typically local serving businesses such as retail and personal services.

The magnitude of the indirect and induced impacts will depend on the size and structure of the local economy. If there are many local agricultural support businesses then a greater proportion of a grower's spending on agricultural supplies is likely to be made and benefit the local economy. If there are few businesses that can provide the necessary services then it more likely that much of a grower's spending will leak out of the local economy and instead benefit the economy of another area. The magnitude of the indirect and induced impacts can be estimated using an IMPLAN input-output model. The IMPLAN model provides multipliers than estimate the expected indirect and induced changes in jobs and income that may be expected to result from the lost agricultural production.

It has been estimated that for the Pajaro Valley, approximately 24.8 jobs will are generated by each $1 million of agricultural production. In addition, 0.9 indirect jobs (e.g. farming support and equipment businesses) and 5.3 induced jobs (e.g. local retail and service businesses) are generated in Monterey and Santa Cruz region from each $1 million of agricultural production.[12] Therefore the total employment associated with each $1 million of agricultural production is 31 jobs.

It is also estimated by ADE and the IMPLAN model that for each $1 million of agricultural production 0.05 million in indirect and 0.35 million in induced spending is generated in the region.

Based on these economic multipliers, the projected decrease of $162.2 million annual agricultural production would result in a loss of approximately 860 jobs in region. Of these 5,025 lost jobs, approximately 4,020 agricultural worker jobs, 145 indirect jobs and 860 induced jobs (such as general retail and service workers) would be lost. The economic impact of the projected agricultural production loss would also cause an $8.1 million decrease in indirect spending and $56.7 million decrease in induced spending in the local economy.

The projected decrease of 4,020 agriculture jobs is equivalent to a 9.1 percent decrease in the region's agricultural employment which would represent a long-term major adverse impact. While the impacts on the local economy would greater, the severity of the impacts would be

[12] The multipliers were obtained from ADE's unpublished report " Salinas/Pajaro Valley Growth Alternatives Study" and IMPLAN data.

potentially be partly ameliorated by the remaining agricultural production remaining in the region – especially within the neighboring Salinas Valley. The loss of indirect and induced jobs would be expected to have a negligible adverse impact on the regional economy. The net present value of the lost annual agricultural spending is estimated to be approximately $2.6 billion.[13]

Under a future scenario where the remaining growers must pay additional water fees to compensate coastal growers to retire their properties from agricultural production, the adverse impacts to the local economy would even be greater.

The additional average annual cost to the remaining Pajaro growers is estimated to be at least $16.05 million a year to cover an estimated total cost of $234 million to purchase the retired lands (based on an annual interest rate of 6% over 30 years). This would cost would result in an additional water cost of at least $393/af. This additional water cost would have a far greater adverse effect than either of the two action alternatives which, at most, would result in water cost increases of $207/af for delivered water users and $88/af for the majority of growers (who would still rely on groundwater). Furthermore, a $393/af increase would also have a major negative impact on the remaining growers' property values and lease rates since their land's income generating potential will be greatly reduced by the additional water cost.

ADJUDICATION

It is considered extremely unlikely that the previous scenario would occur under any future conditions. In the unlikely event that PVWMA did not enforce some groundwater pumping restrictions to reduce the coastal seawater intrusion, it is expected that adjudication would be imposed to reduce valley-wide groundwater pumping so that no further salt-water intrusion occurs.

Under the No Action Alternative, future agricultural groundwater irrigation pumping would be controlled by adjudication. Based on an estimated need to reduce total groundwater pumping within the valley from 69,000 af to 24,000 af (RMC, 2002), current annual agricultural pumping would need to be reduced from 59,300 af to 12,200 af. In which case, the expected average groundwater allocation would be approximately 0.4 af/acre (for 30,350 acres of agricultural production).

For a conservative estimate of the impact on agricultural production in the Pajaro Valley, it may be expected that growers would be able to organize their future production and water use exclusively for high value crops such as strawberries and lettuce. Most other agricultural production (except possibly for green house production of cultivated flowers) will generate significantly lower net returns from production and therefore would result in a more severe reduction in the area's agricultural production.

[13] Based on a 6 percent discount rate over 30 years. This estimate is comparable to estimated net present value of the cost for the proposed water supply alternatives.

Based on an estimated average water need of 2.6 af/ac for strawberry production, 12,200 af would be adequate to support approximately 4,690 acres of production annually. Based on average revenues of $33,750/acre, future agricultural production under this alternative would be approximately $158.3 million. Compared with the current estimated annual agricultural production of $520 million, there would be a lost of nearly $362 million in annual agricultural production. This loss of value would also be represented by decreases in land prices since, without sufficient water supplies, formerly productive agricultural property would no longer have productive use except as dryland farming or rangeland. The economic impacts from the lost agricultural production could be reduced if the existing zoning and planning restrictions preventing residential development of the properties were changed.

Based on the economic multipliers identified earlier, the projected decrease of $372 million in annual agricultural production would result in a loss of 11,530 jobs in the region. Of these 11,530 lost jobs, 9,925 would be agricultural workers, 335 would be indirect jobs and 1,970 would be induced jobs such as general retail and service workers. The economic impact of the projected land value decrease would also be represented by a $18.6 million decrease in indirect spending and $130.2 million decrease in induced spending. Given the baseline of regional agricultural employment of 44,300, the 9,225 agricultural job losses would represent a 20.8 percent decrease in agricultural employment and would represent a long-term major adverse impact to the region's economy.

ALTERNATIVE B – WATER RECYCLING PROJECT AND IMPORT WATER PROJECT

Under this alternative, water prices for growers in Pajaro would increase significantly. The additional water charges would be necessary to repay the debt from construction of the water delivery system.

If the additional water costs could be passed on to consumers by raising sales prices of their crops, the increased water prices would have no appreciable effect on local growers. However, recent trends in crop prices and consolidation of agricultural produce wholesalers and distributors suggest that growers would be unable to raise their crop sale prices. Growers may be able to offset or absorb some of the increased water costs if they can make changes in their crop production approaches and future improvements in yields that improve their overall profitability. However, due to the magnitude of the water cost increase and the tightening profit margins, it is expected that a major proportion of the increased water costs will correspondingly reduce growers abilities to pay the existing land lease rates. In which case, if growers cannot make adequate returns from their production, growers will be forced to either cease production or renegotiate lower lease rates for the land. For landowners, reduction in their lease rates (or if they are owner-growers, the increased water costs) will directly decrease their land's value since the value of the land's productive use will be reduced.[14] In effect, landowners will be required to

[14] Several agricultural experts suggested that, in the long run, development of a reliable, high quality and reasonably priced water supply for Pajaro would a major asset for local agriculture. In their opinion, future agricultural production and land values would be comparably enhanced by reducing dependency on groundwater irrigation.

absorb the additional water costs by lowering their lease rates. The increase in water costs would also be reflected in corresponding decreases in their land values.

If it is expected that few future improvements in future agricultural production techniques will give Pajaro Valley growers profitability advantages over growers in other regions, then most of the increased water costs will likely be borne ultimately by land owners. As a conservative assumption for the impact analysis, the magnitude of the future impacts under the preferred alternative will be greatest if landowners absorb all the water price increase. This would emphasize the impacts of the preferred alternative compared to those of the other alternatives. For the purposes of this analysis, it has been assumed that, in the long run, landowners would absorb the entire water price increase.

Once the water supply system is completed, future agricultural water use is expected to be 64,400 af, of which 18,500 af would be provided to coastal growers as delivered water at an additional charge of $196/af. The remaining 45,900 af of agricultural groundwater usage would incur an additional augmentation charge of $78/af. Based on this proposed water price schedule, the total increased in annual water costs for agriculture in Pajaro Valley will be $7.2 million. If this annual production cost increase is "absorbed" by landowners through reduced land lease rates, there will be associated reductions to the local economy since this money will no longer be spent locally but instead will pay the debt service for the water system. In which case, the money instead will flow out of the area to the debt holders. Therefore, based on the ADE multipliers, the loss of $7.2 million in annual local agricultural spending would result in a loss of 223 jobs in the region. Of these 223 lost jobs, 179 would be agricultural workers, 7 would be indirect jobs and 38 would be induced jobs such as general retail and service workers. The economic impact of the projected land value decrease would also result in a $0.4 million decrease in indirect spending and $2.5 million decrease in induced spending annually.

The lost of 179 agricultural jobs would correspond to a 0.4 percent decrease in regional agricultural employment which would represent a long-term negligible adverse impact.

ALTERNATIVE C – IMPORT WATER PROJECT ONLY

Once the new water supply is completed, future agricultural water use is expected to be 64,400 af, of which 18,500 af would be provided to coastal growers as delivered water at an additional charge of $208/af. The remaining 45,900 af of agricultural groundwater usage would incur an additional augmentation charge of $88/af. Based on this proposed water price schedule, the total increased in annual water costs for agriculture in Pajaro Valley will be $7.9 million. If this annual production cost increase is "absorbed" by landowners through reduced land lease rates, there will be associated reductions to the local economy since this money will no longer be spent locally but instead will pay the debt service for the water system. In which case, the money instead will flow out of the area to the debt holders. Therefore, based on the ADE multipliers, the loss of $7.9 million in annual local agricultural spending would result in a loss of 245 jobs in the region. Of these 245 lost jobs, 196 would be agricultural workers, 7 would be indirect jobs and 42 would be induced jobs such as general retail and service workers. The economic impact of the

projected land value decrease would also result in a $0.4 million decrease in indirect spending and $2.8 million decrease in induced spending annually.

The lost of 245 agricultural jobs would correspond to a 0.5 percent decrease in regional agricultural employment which would represent a long-term negligible adverse impact.

TABLE H.12.1
STRAWBERRY PRODUCTION – CENTRAL COAST (in 2001 $)

Operation		Cost/Acre
Land Preparation		
Labor & Materials		
Disc		40
Subsoil		56
Chisel 4X		21
Laser Level 2X		19
List & Preplant Fertilizer		15
Install Drip Tape 2/bed & Trench for Laterals		45
Lay Mulch & Punch Holes		128
Layout/Pickup Sprinkler Pipe 3X		83
Preirrigate – Sprinkler		3
Materials		
Fertilizer for preplant		225
Install Drip Tape 2/bed		240
Mulch		297
Water (preirrigate)	0.3 af	36
Total Land Preparation Cost		$1,208
Cultural		
Labor & Materials		
Plant (includes replant), Roll Plants to Pack		429
Irrigate		113
Fumigate		1,728
Weed		957
Pest Control 3X		110
Yearend Plastic Retrieval / Landfill		92
Materials		
Water	2.3 af	276
Plants		1,176
Herbicide		1,073
Yearend Plastic Retrieval / Landfill		10
Total Cultural Costs		$5,964
Harvest		
Labor & Machinery		9,159
Materials		6,608
Total Harvest Cost		$15,767

TABLE H.12.1 (Continued)
STRAWBERRY PRODUCTION – CENTRAL COAST (in 2001 $)

Operation			Cost/Acre
Overhead			
General Expenses			1,937
Rent			2,200
Total Overhead Costs			$4,137
Interest & Depreciation			
Interest on Operating Capital			1,284
Depreciation & Interest on Investment			715
Total Interest and Depreciation Costs			$1,999
TOTAL COSTS			**$29,075**
TOTAL RETURNS			
Yield[1]	4,720 cartons		
Price[1]	$7.15/carton		
TOTAL RETURNS			**$33,748**
NET RETURNS			**$4,673**
Assumptions	Pickers	$7.03/hr	
	Field or Non-Machine Labor	$9.38/hr	
	Skilled or Machine Labor	$11.73/hr	
	Water Cost (Aug. Charge)	$80/af	
	Water Cost (Energy Cost)	$40/af	
	- Amount	2.6/af	

[1] Prices and Yields based on Monterey County Averages (1991-2000). With adjustment for better than management and production.

SOURCES: Adapted from UC Cooperative Extension, "Sample Production Costs for Fresh Market Strawberries Central Coast Region," K. Klonsky & R. De Moura, 2001. Monterey Agricultural Commission, Monterey Agricultural Reports. PVWMA, “Water Conservation 2000,” CH2MHill, 1999.

TABLE H.12.2
HEAD LETTUCE PRODUCTION – CENTRAL COAST
First Crop of Double Crop Rotation ($2001)

Operation	# of Times/Crop/Ac		Cost/Time/Ac	Total Cost
Land Preparation				
Labor & Machinery				
Cover Crop	0.2		75	15
Disc	4	X	13	52
Soil Amendments	1	X	10	10
Subsoil	2	X	35	70
Chisel	2	X	21	42
Minimum Tillage	0.1		40	4
Laser Level	0.25		160	40
Land Plane	0.25		12	3
List & Preplant Fertilizer	1	X	15	15
Preirrigate	1	X	11	11
Cultivator (Lilliston)	2	X	8	16
Bed Shape/Preparation	1	X	15	15
Materials				
Cover Crop	0.2		25	5
Soil Amendments	1	X	50	50
Fertilizer	1	X	60	60
Preirrigate	1	X	8	8
Total Land Preparation Cost				$416
Cultural				
Labor & Machinery				
Precision Plant	1	X	8	8
Irrigate	10	X	125	125
Thin	1	X	148	148
Cultivate & Fertilize	1	X	10	10
Cultivate & Break Bottoms	1	X	17	17
Herbicide	1	X	8	8
Insect & Disease Mgmt	Custom		350	350
Hand Weed	1	X	57	57
Water Run Fertilizer	1	X	8	8
Materials				
Precision Plant	1	X	118	118
Irrigate	10	X	$126	126
Cultivate & Fertilize	1	X	92	92
Herbicide	1	X	40	40
Water Run Fertilizer	1	X	29	29
Total Cultural Costs				$1,136

TABLE H.12.2 (Continued)
HEAD LETTUCE PRODUCTION – CENTRAL COAST
First Crop of Double Crop Rotation ($2001)

Operation		# of Times/Crop/Ac		Cost/Time/Ac	Total Cost
Cash Overhead					
Overhead	- (10% of Total Production Costs)				155
Rent - @	1/2 Year			$2,200	1100
Total Cash Overhead Costs					$1,255
Harvest					
Cut, Pack, Haul		$4.00	/carton		3,880
Cool & Sell		$1.50	/carton		1,455
Total Harvest Costs					$5,335
TOTAL COSTS					**$8,142**
TOTAL RETURNS					
Yield		970	cartons		
Price		$9.19	/carton[1]		
TOTAL RETURNS					**$8,914**
NET RETURNS / ACRE					**$772**
Assumptions	Non-Machine Labor		$11.40/hr		
	Machine Labor		$13.40/hr		
	Water (Aug. Charge)		$80/af	1.05/af	
	Water (Energy)		$40/af		

[1] Price and Yield information based on Monterey County Average (1991-2000). Includes price adjustment for fresh wrapped iceberg lettuce

SOURCES: Adapted from UC Cooperative Extension, "Sample Production Costs for Wrapped Iceberg Lettuce, Monterey & Santa Cruz Counties 2000-2001," L. Tourtes & R. Smith Monterey Agricultural Commission, Monterey Agricultural Reports. PVWMA, "Water Conservation 2000," CH2MHill, 1999.

TABLE H.12.3
HEAD LETTUCE PRODUCTION – CENTRAL COAST
Second Crop of Double Crop Rotation ($2001)

Operation	# of Times/Crop/Ac		Cost/Time/Ac	Total Cost
Land Preparation				
Labor & Machinery				
Disc	2	X	13	26
List & Preplant Fertilizer	1	X	15	15
Preirrigate	1	X	11	11
Bed Shape/Preparation	1	X	15	15
Materials				
Fertilizer	1	X	60	60
Preirrigate	1	X	8	8
Total Land Preparation Cost				$135
Cultural				
Labor & Machinery				
Precision Plant	1	X	8	8
Irrigate	10	X	125	125
Thin	1	X	148	148
Cultivate & Fertilize	1	X	10	10
Cultivate & Break Bottoms	1	X	17	17
Herbicide	1	X	8	8
Insect & Disease Mgmt	custom		350	350
Hand Weed	1	X	57	57
Water Run Fertilizer	1	X	8	8
Materials				
Precision Plant	1	X	118	118
Irrigate	10	X	126	126
Cultivate & Fertilize	1	X	92	92
Herbicide	1	X	40	40
Water Run Fertilizer	1	X	29	29
Total Cultural Costs				$1,136
Cash Overhead				
Overhead - (10% of Total Production Costs)				127
Rent - @ 1/2 Year			$2,200	1,100
Total Cash Overhead Costs				$1,227
Harvest				
Cut, Pack, Haul	$4.00	/carton		3,880
Cool & Sell	$1.50	/carton		1,455
Total Harvest Costs				$5,335
TOTAL COSTS				**$7,833**

TABLE H.12.3 (Continued)
HEAD LETTUCE PRODUCTION – CENTRAL COAST
Second Crop of Double Crop Rotation ($2001)

Operation		# of Times/Crop/Ac		Cost/Time/Ac	Total Cost
TOTAL RETURNS					
Yield		970	cartons		
Price		$9.19	/carton[1]		
TOTAL RETURNS					**$8,914**
NET RETURNS / ACRE					**$1,081**
Assumptions	Non-Machine Labor		$11.40/hr		
	Machine Labor		$13.40/hr		
	Water (Aug. Charge)		$80/af	1.05/af	
	Water (Energy)		$40/af		

[1] Price and Yield information based on Monterey County Average (1991-2000). Includes price adjustment for fresh wrapped iceberg lettuce

SOURCES: Adapted from UC Cooperative Extension, "Sample Production Costs for Wrapped Iceberg Lettuce, Monterey & Santa Cruz Counties 2000-2001," L. Tourtes & R. Smith, Monterey Agricultural Commission, Monterey Agricultural Reports.

TABLE H.12.4
HEAD LETTUCE PRODUCTION – CENTRAL COAST
First Crop of Triple Crop Rotation ($ 2001)

Operation	# of Times/Crop/Ac		Cost/Time/Ac	Total Cost
Land Preparation				
Labor & Machinery				
Cover Crop	0.2		75	15
Disc	4	X	13	52
Soil Amendments	1	X	10	10
Subsoil	2	X	35	70
Chisel	2	X	21	42
Minimum Tillage	0.1		40	4
Laser Level	0.25		160	40
Land Plane	0.25		12	3
List & Preplant Fertilizer	1	X	15	15
Preirrigate	1	X	11	11
Cultivator (Lilliston)	2	X	8	16
Bed Shape/Preparation	1	X	15	15
Materials				
Cover Crop	0.2		25	5
Soil Amendments	1	X	50	50
Fertilizer	1	X	60	60
Preirrigate	1	X	8	8
Total Land Preparation Cost				$416
Cultural				
Labor & Machinery				
Precision Plant	1	X	8	8
Irrigate	10	X	125	125
Thin	1	X	148	148
Cultivate & Fertilize	1	X	10	10
Cultivate & Break Bottoms	1	X	17	17
Herbicide	1	X	8	8
Insect & Disease Mgmt	Custom		350	350
Hand Weed	1	X	57	57
Water Run Fertilizer	1	X	8	8
Materials				
Precision Plant	1	X	118	118
Irrigate	10	X	$102	102
Cultivate & Fertilize	1	X	92	92
Herbicide	1	X	40	40
Water Run Fertilizer	1	X	29	29
Total Cultural Costs				$1,112
Cash Overhead				
Overhead - (10% of Total Production Costs)				153
Rent - @ 1/3 Year			$2,200	733
Total Cash Overhead Costs				$886

TABLE H.12.4 (Continued)
HEAD LETTUCE PRODUCTION – CENTRAL COAST
First Crop of Triple Crop Rotation ($ 2001)

Operation		# of Times/Crop/Ac		Cost/Time/Ac	Total Cost
Harvest					
Cut, Pack, Haul		$4.00	/carton		3,880
Cool & Sell		$1.50	/carton		1,455
Total Harvest Costs					$5,335
TOTAL COSTS					**$7,749**
TOTAL RETURNS					
Yield		970	cartons		
Price		$9.19	/carton[1]		
TOTAL RETURNS					**$8,914**
NET RETURNS / ACRE					**$1,165**
Assumptions	Non-Machine Labor		$11.40/hr		
	Machine Labor		$13.40/hr		
	Water Cost (Aug Charge)		$80/af	1.5/af	
	Water Cost (Energy)		$40/af		

[1] Price and Yield information based on Monterey County Average (1991-2000). Includes price adjustment for fresh wrapped iceberg lettuce.

SOURCES: Adapted from UC Cooperative Extension, "Sample Production Costs for Wrapped Iceberg Lettuce, Monterey & Santa Cruz Counties 2000-2001," L. Tourtes & R. Smith, Monterey Agricultural Commission, Monterey Agricultural Reports.

TABLE H.12.5
HEAD LETTUCE PRODUCTION – CENTRAL COAST
Second Crop of Triple Crop Rotation ($2001)

Operation	# of Times/Crop/Ac		Cost/Time/Ac	Total Cost
Land Preparation				
Labor & Machinery				
Disc	2	X	13	26
List & Preplant Fertilizer	1	X	15	15
Preirrigate	1	X	11	11
Bed Shape/Preparation	1	X	15	15
Materials				
Fertilizer	1	X	60	60
Preirrigate	1	X	8	8
Total Land Preparation Cost				$135
Cultural				
Labor & Machinery				
Precision Plant	1	X	8	8
Irrigate	10	X	125	125
Thin	1	X	148	148
Cultivate & Fertilize	1	X	10	10
Cultivate & Break Bottoms	1	X	17	17
Herbicide	1	X	8	8
Insect & Disease Mgmt	Custom		350	350
Hand Weed	1	X	57	57
Water Run Fertilizer	1	X	8	8
Materials				
Precision Plant	1	X	118	118
Irrigate	10	X	102	102
Cultivate & Fertilize	1	X	92	92
Herbicide	1	X	40	40
Water Run Fertilizer	1	X	29	29
Total Cultural Costs				$1,112
Cash Overhead				
Overhead - (10% of Total Production Costs)				125
Rent - @ 1/3 Year			$2,200	733
Total Cash Overhead Costs				$858

TABLE H.12.5 (Continued)
HEAD LETTUCE PRODUCTION – CENTRAL COAST
Second Crop of Triple Crop Rotation ($2001)

Operation		# of Times/Crop/Ac	Cost/Time/Ac	Total Cost
Harvest				
Cut, Pack, Haul		$4.00/carton		3,880
Cool & Sell		$1.50/carton		1,455
Total Harvest Costs				$5,335
TOTAL COSTS				**$7,440**
TOTAL RETURNS				
Yield		970 cartons		
Price		$9.19/carton[1]		
TOTAL RETURNS				**$8,914**
NET RETURNS / ACRE				**$1,474**
Assumptions	Non-Machine Labor	$11.40/hr		
	Machine Labor	$13.40/hr		
	Water Cost (Aug Charge)	$80/af	0.85/af	
	Water Cost (Energy)	$40/af		

[1] Price and Yield information based on Monterey County Average (1991-2000). Includes price adjustment for fresh wrapped iceberg lettuce.

SOURCES: Adapted from UC Cooperative Extension, "Sample Production Costs for Wrapped Iceberg Lettuce, Monterey & Santa Cruz Counties 2000-2001," L. Tourtes & R. Smith, Monterey Agricultural Commission, Monterey Agricultural Reports.

TABLE H.12.6
BROCCOLI PRODUCTION – CENTRAL COAST
Third Crop of Triple Crop Rotation (in 2001 $)

Operation	Cost/Acre
Land Preparation	
Labor & Machinery	
Manure (contract)	11
Subsoil (1/3 to Broccoli)	11
Disc & Roll 3X	21
Chisel 2X	16
Laser Level 2X (1/3 to Broccoli)	11
List & Preplant Fertilizer (contract @ $ /ac)	11
Shape Beds & Roll	6
Materials	
Manure	17
Fertilizer	60
Total Land Preparation Cost	$164
Cultural	
Labor & Machinery	
Plant - 4 Bed Planter	4
Herbicide (contract)	4
Irrigate 6X	59
Fertilizer 2X (contract @$ /ac)	19
Pest Control 3X (contract @ $ /ac)	32
Cultivate 5X	13
Weed	75
Miscellaneous	14
Materials	
Water	48
Seed	137
Herbicide	33
Fertilizer	83
Pest Control	124
Total Cultural Costs	$645
Total Harvest Cost (contract @ $4.00 per carton)	$2,580
Overhead	
General Expenses	59
Rent (4 months)	733
Total Overhead Costs	$792

TABLE H.12.6 (Continued)
BROCCOLI PRODUCTION – CENTRAL COAST
Third Crop of Triple Crop Rotation (in 2001 $)

Operation			Cost/Acre
Interest & Depreciation			
Interest on Operating Capital			65
Depreciation & Interest on Investment			46
Total Interest and Depreciation Costs			**111**
TOTAL COSTS			**$4,292**
TOTAL RETURNS			
Yield[1]		645 cartons	
Price[1]		$7.25/carton	
TOTAL RETURNS			**$4,676**
NET RETURNS			**$384**
Assumptions	Non-Machine Labor	$9.38/hr	
	Machine Labor	$11.73/hr	
	Water Cost (Aug. Charge)	$80/af	
	Water Cost (Energy)	$40/af	

[1] Price and Yield information based on Monterey County Average (1991-2000).

SOURCES: Market Broccoli Central Coast Region," R. Smith et al, 2001. Monterey Agricultural Commission, Monterey Agricultural Reports. Interviews with local farmers.