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Assessing the Impact of the Tentative Discharge Permit for the Sacramento Regional Wastewater Treatment Plant on Sacramento Area Income and Employment

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We thank the Sacramento Regional County Sanitation District (SRCSD) for data and their assistance in understanding the technical and financial details of the advanced treatment process and their operations, and for financial support of this project.

Executive Summary

Ecological problems in the Sacramento-San Joaquin Delta have raised concerns about the discharge from the Sacramento Regional County Sanitation District (SRCSD) wastewater treatment plant that serves most of Sacramento County and West Sacramento in Yolo County. The Central Valley Regional Water Quality Control Board recently released a Tentative NPDES Discharge Permit that would require over $2 billion in upgrades to the Sacramento Regional Wastewater Treatment Plant. This report evaluates the economic costs to the Sacramento region of complying with the tentative permit. All costs and economic impacts in this report are measured in 2009 dollars.

The project would require nitrification, denitrification, microfiltration, and UV disinfection. The capital cost is estimated at $2.083 billion, and operation and maintenance of the completed facility is estimated at $77 million per year. We project that the project will require SRCSD to generate an additional $239 million annually through increased rates and fees. SRCSD is projecting even higher rate increases, because they anticipate larger debt coverage requirements to maintain their bond rating and continued slow growth in their service area. The range of potential rate and fee increases is as follows:

- The typical Sacramento household wastewater treatment bill would increase between $28 and $42 per month ($336 to $504 annually) from their current level of $20 per month.[1]
- Government, commercial and industrial users would also face proportional wastewater treatment cost increases between 150% and 200%.
- New development wastewater treatment impact fees would increase from $7,450 to between $15,000 and $35,000 per ESD (equivalent single family dwelling). In-fill development impact fees would increase from $2,800 to between $6,000 and $13,000 per ESD.

In addition to higher bills, the total economic impact of the project was assessed by estimating the negative effects of reduced disposable income on consumer spending, the negative effects of reduced construction activity, and the positive effects of building and operating the wastewater plant. Considering all the effects, the average annual economic impacts over the 30 year analysis period on the Sacramento Region are:

- Annual income loss of $246 million.
- Annual employment loss of 976 jobs.

This is a conservative assessment of regional impacts. SRCSD estimates rate increases will be even larger than our projections. We also assume increased impact fees will only have a small effect on the amount of new development over 30 years, and only reduce the average output of the construction industry by an amount equivalent to the increased fee payments. While the impact on development over 30 years will be relatively small, the effect will be greatest in the near term, pushing back the date at which many development projects become financially feasible for several

[1] This is a separate charge from "local wastewater collection" which Sacramento region users also pay to separate providers of that specific service. One such provider of local wastewater collection in the SRCSD service area is Sacramento Area Sewer District whose monthly rate is $19.85, which would be additive to the SRCSD rates mentioned above.

years and delaying Sacramento's recovery from the recession.[2] The report assumes no effect on local electricity costs, although the project will generate a substantial increase in SMUD's electricity demand. We assume increased wastewater treatment rates will not be significant enough to affect the location, operation or investment decisions of businesses, and that lost corporate income flows outside the region. Due to these conservative assumptions, the negative impacts could be larger than we estimate. On the other hand, the negative impacts could be smaller than we estimate if less advanced, lower cost treatment options suggested by Central Valley Regional Water Quality Control Board consultants were developed in more detail and proven to satisfy regulatory requirements as well as the scale and site requirements of the SRCSD plant.

The results of this study inform planning and regulatory decisions regarding the San Joaquin-Sacramento Delta, and can be compared to analysis we have conducted on other aspects of the Delta issue. In a recent analysis conducted in cooperation with UC-Davis researchers, we estimate that reduced agricultural water supplies due to Delta pumping restrictions to protect endangered species result in an income loss of $72 million and the loss of 1,400 jobs in the San Joaquin Valley.[3] We have also estimated that the closure of the salmon fishery in 2008 and 2009 created an annual loss in California of about 1,800 jobs and $120 million in income.[4] Our initial analysis of Sacramento wastewater treatment upgrades was limited to nutrient reduction, and we estimated an average loss of 390 jobs and $94 million in income.[5] The $246 million estimate of lost income from the Tentative NPDES Discharge Permit for Sacramento are more than double the loss estimated in these other cases, whereas the job loss is lower since sewer impacts are distributed across hundreds of thousands of households rather than being concentrated on a low-wage industry such as agriculture.

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[2] For an assessment of increased impact fees on the feasibility of proposed developments in the Sacramento areas, see "Sacramento Regional County Sanitation District Potential Fee Increase Feasibility Analysis," Economic and Planning Systems, Inc. October 8, 2010.

[3] "A Retrospective Estimate of the Economic Impacts of Reduced Water Supplies to the San Joaquin Valley in 2009," September 28, 2010. http://forecast.pacific.edu/water-jobs/SJV_Rev_Jobs_2009_092810.pdf. In the same report, the UC-Davis agricultural economists estimated the loss as 3,000 jobs and $112 million in income.

[4] "Employment Impacts of California Salmon Fishery Closures in 2008 and 2009." April 1, 2010. http://forecast.pacific.edu/BFC%20salmon%20jobs.pdf.

[5] "Advanced Wastewater Treatment for Nutrient Reduction: Impact on Sacramento Income and Employment." August 23, 2010. http://forecast.pacific.edu/water-jobs/SRCSD%20Treatment%20Final.pdf

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Background

The Central Valley Regional Water Quality Control Board released its Tentative NPDES Discharge Permit for the Sacramento Regional Wastewater Treatment Plant on September 3, 2010. The tentative permit requires an advanced microfiltration and UV disinfection process in addition to the total nutrient reduction process we evaluated in an earlier report.[6] This report updates that earlier analysis to assess the economic impact of the Tentative Permit. All costs and economic impacts in this report are measured in 2009 dollars.

The Sacramento-San Joaquin Delta is in an ecological crisis headlined by dramatic declines in the population of salmon, Delta smelt, and other threatened and endangered fish species. Scientists studying the cause of the ecological decline have identified water pumping operations for the State Water Project and the federal Central Valley Project as a significant contributor to the species decline. Scientists are also exploring other potential causes of species decline, including nutrient discharges, especially ammonia, from the Sacramento Regional County Sanitation District (SRCSD) wastewater treatment plant.

The SRCSD wastewater plant serves most of Sacramento County and West Sacramento in Yolo County. The regional plant began operation in 1982 and provides primary and secondary treatment to the wastewater of over 500,000 households through a pure oxygen activated sludge process. The plant is located in Elk Grove, CA and discharges treated wastewater into the Sacramento River near Freeport. Upgrading the plant to the requirements of the Tentative NPDES Permit requires an investment in microfiltration, UV disinfection, nitrifying trickling filters, fluidized bed reactors, and three new pumping stations (or equivalent technologies) sufficient to process 181 million gallons of wastewater per day. The capital costs alone are estimated at $2.083 billion and on-going operations and maintenance would add an additional $77 million per year.

This report evaluates the economic impact on the Sacramento area of investing in the advanced treatment process proposed by the Central Valley Regional Water Quality Control Board. We evaluate the impact on ratepayers' bill, and how higher costs would affect their spending patterns and jobs in Sacramento area businesses. We also estimate the impact of increased impact fees on construction spending. In addition to the costs, we evaluate job and income creation from the construction and operation of the advanced treatment facility.

The report captures most of the likely economic impacts on the Sacramento region, but does have several important limitations. First, we do not estimate the economic value of environmental changes, such as improvements in Delta water quality from advanced wastewater treatment or increased greenhouse gas emissions from greater electricity consumption. Second, the cost estimates and economic impacts are conservative. Rates could increase by more than our conservative projection, and we generally assume that the rate increases will have little impact on the average rate of development over 30 years and business location decisions, and that all lost corporate income flows outside the region and has no multiplier effect on the local economy. We also assume that the project will have no effect on local electricity costs, although it will increase total electricity demand in the Sacramento area by nearly 1%.

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[6] "Advanced Wastewater Treatment for Nutrient Reduction: Impact on Sacramento Income and Employment." August 23, 2010. http://forecast.pacific.edu/water-jobs/SRCSD%20Treatment%20Final.pdf

Cost of Tentative Discharge Permit

Cost estimates for the construction and operation of the advanced treatment processes were given to us by SRCSD staff. The project is estimated to cost $2.083 billion dollars to construct. The microfiltration process has the highest capital cost of $1.132 billion. The nitrifying trickling filers, fluidized bed reactors and pump stations are estimated to cost $549 million, $166 million and $61 million respectively. Design and construction is expected to take eight years, three years for design and five years for construction. Once the facility is finished, annual operations and maintenance costs are estimated at $77 million. Annual labor costs are estimated at $19.8 million, electricity costs of $24.6 million, supplies and chemicals of $10.9 million, and $21.5 million for maintenance and replacement of components.

A consultant review of SRCSD cost estimates prepared for the Central Valley Regional Water Quality Control Board estimates that capital costs could be reduced from $2.083 billion to $1.318 billion if mixed media filtration followed by ozonation/peroxide disinfection was used as a substitute for the microfiltration and UV disinfection process proposed by SRCSD.[7] We are unable to use this lower capital estimate in the analysis, because no operating and maintenance or lifecycle costs were developed in the brief consultants report. Furthermore, SRCSD staff has raised a number of reasons why the less costly and less advanced process is infeasible for the site and scale of their plant, may not satisfy regulatory requirements, and is less effective at reducing other contaminants (e.g. mercury) of concern. Given the absence of operating cost data, unanswered questions about whether the less advanced treatment process would meet regulatory requirements, and the numerous conservative assumptions we utilize to estimate impacts of increased costs throughout the study, we feel the best approach is to analyze the more advanced, microfiltration and UV disinfection processes and utilize the more detailed cost estimates prepared for SRCSD by Carollo Engineers.

The large capital expenditure of over $2 billion will be financed by issuing revenue bonds. Assuming a 5% interest rate and 30 year amortization period, the project would generate an annual debt service of $135 million. However, SRCSD will need to increase revenues by more than the amount of new debt service in order to sell the bonds and maintain a strong bond rating. To protect against default risk if revenues or expenses were to unexpectedly change, bond covenants require minimum levels of revenue in relation to debt. For example, the collapse in new Sacramento development during the recession caused SRCSD's revenue from impact fees to decrease by $40 million per year. Despite the large unexpected drop in revenue, SRCSD was able to make all scheduled payments on existing debt because of cash reserves.

For planning purposes, SRCSD's net operating revenue target is 1.4 times current debt service although the minimum required is 1.2. For the $135 million in debt service for the full permit-related treatment processes, this amounts to a planning target of an additional $54 million in needed revenues per year for the required financial coverage, and at least an additional $27 million in revenue to reach the minimum requirement of revenues at 1.2 times debt service. For the economic impact analysis, we conservatively use the minimum $27 million level of financial coverage. After adding in the approximately $77 million in operating and maintenance costs, the full permit-related treatment processes project will require an additional $239 million in annual revenues from SRCSD customers.

Following current SRCSD capital cost allocation practices, the $162 million in capital costs will be 70% financed from rate increases to existing customers, and 30% from increased impact fees on new residential

[7] "Technical Review of Estimated Costs for Proposed Changes to the Sacramento Regional Wastewater Treatment Plant." PG Environmental, LLC. August 18, 2010.

and commercial development. The $77 million in additional operating and maintenance costs will be entirely paid by rate increases. Thus, the $239 million in new annual SRCSD revenues is estimated to come from a $190 million increase in rate revenues, and $49 million annual increase in impact fee revenue. Current rates generate a little more than $140 million in revenue, thus the additional $190 million would require an approximately 140% rate increase, an additional $28 per month for a single family dwelling. Government, commercial and industrial ratepayers would experience similar proportional rate increases.

The other $49 million in annual revenue would need to come from impact fees paid by residential and commercial developments. The necessary increase in impact fees is much more difficult to estimate, because it depends on the rate and type of future growth and development rather than a relatively stable base of current ratepayers. Earlier in the decade, SRCSD was adding 10,000 or more ESDs (equivalent single dwellings) per year, but this has dwindled to 2,000 per year during the current recession. We project that population growth will eventually lead to an average of 6,000 to 8,000 new ESDs per year over the 30 year analysis period, and this would require about a doubling of current fees to generate an average of $49 million in revenue. This is a very rough, and possibly optimistic, estimate to illustrate the possible change to fees. For the purposes of the economic impact analysis, the amount of the total cost burden on new development, $49 million, is more important than the exact amount of the fees.

SRCSD has made different, more conservative, estimates of anticipated rate and fee increases. We have reviewed their estimates and methodology, and consider their rate estimates to be very plausible, but inappropriate for our economic impact analysis. Their analysis assumes that larger reserves will be needed, and that growth will be very slow to recover and continue to depress their revenues and financial reserves. The rates estimated by SRCSD represent prudent financial planning, especially given the current economic uncertainty and the enormous size of the required bond issue. SRCSD must plan for substantial financial reserves and be financially prepared for more negative scenarios. However, if more positive results are obtained, the financial reserves are an asset that can be used in the future for rate stabilization or paying off debt. Our purpose is different, and the lower rate assessment is more appropriate for an economic impact analysis. We focus narrowly on costs that can be directly attributed to the advanced treatment, and do not include additional rate increases that may be required to rebuild financial reserves depleted by the recession and unrelated cost increases. Below, we present a range of possible rate increases, but we emphasize that SRCSD believes our estimates understate the likely increase in rates that will be required and that the actual rate requirements depend on uncertain factors such as future growth rates.

- The typical Sacramento household wastewater treatment bill would increase between $28 and $42 per month ($336 to $504 annually) from their current level of $20 per month.
- Government, commercial and industrial users would also face proportional wastewater treatment cost increases between 150% and 200%.
- New development wastewater treatment impact fees would increase from $7,450 to between $15,000 and $35,000 per ESD (equivalent single family dwelling). In-fill development impact fees would increase from $2,800 to between $6,000 and $13,000 per ESD.

Economic Impact Methodology and Definitions

The economic impact analysis was performed using an input-output (I/O) model. It generated a detailed representation of the Sacramento County economy through which the project's impacts were assessed. In deriving the model we utilized IMPLAN Version 3 software and 2008 county totals data, the most recent data IMPLAN currently has available for Sacramento County. The full range of economic impacts that result from the project, the *Total Impact* is the sum of the direct, indirect, and induced effects:

- *Direct effects* are the changes in income and jobs related exclusively to the project. This includes all construction costs for building the facility (e.g. infrastructure, equipment, labor, etc.). Direct benefits also include annual operating expenditures (e.g. salaries, supplies, maintenance, etc.). Whether payroll related or associated with the purchase of goods and services, all impacts are directly related to the project.

- *Indirect effects* represent the iterative impacts of inter-industry transactions as supplying industries respond to the increased demands from the direct beneficiaries of the project. An example of an indirect benefit would include a chemical company's new employment and increased purchase of feedstock to meet the demand of the expansion project.

- *Induced effects* reflect household consumption expenditures of direct and indirect sector employees. Induced effects also include the effect on local consumption from changes in disposable income through higher utility rates. Examples of induced benefits include employee's expenditures on items such as retail purchases, housing, medical services, banking, and insurance.

In this analysis, the total, direct, indirect, and induced effects are presented for three categories of income and employment:

- *Employee compensation* includes wages, salaries, benefits, and all other employer contributions. This measures the financial value of associated employment.

- *Proprietor income* consists of payments received by self-employed individuals and unincorporated business owners.

- *Other property income* consists of items such as corporate profits, capital consumption allowance, payments for rent, dividends, royalties and interest income.

- *Employment*, demonstrates the number of full- and part-time jobs generated on an annual basis.

Further details on methodology follow later in the report.

Findings on the Increase in Wastewater Treatment Costs

The Tentative NPDES Discharge Permit will result in $239 million in additional annual costs to Sacramento area households and businesses. About $162 million of these annual costs are associated with capital expenditure outlays and will be split between rate payers (70%) and impact fees for new connections (30%). The other $77 million in annual costs is associated with operations and maintenance and will be paid by rate payers. We used a detailed list of all SRCSD customers to break down ratepayers between households, government entities, and businesses.

For non-residential ratepayers, increased wastewater costs were assumed not to be significant enough to impact the level of output or location decisions of commercial and industrial users. Thus, the increase in costs was treated as a loss of income to the affected enterprises. All commercial use categories and industrial customers were assigned a 6-digit NAICS code that best matched the description, and we used estimates of proprietor and corporate income by NAICS code to allocate the lost income. Following accepted best practices in local economic impact analysis, we assumed all corporate income flowed outside the area and did not enter the loss into the input-output model. In contrast, losses to proprietor's income were included. Some of the existing commercial and industrial users are public agencies such as schools and prisons. For these customers, the increased wastewater costs ($5.236 million) were treated as a loss in budget and entered into the input-output model using standard institutional spending patterns. Impact fees were allocated between the commercial and residential construction sectors according to the proportions of residential and commercial users among current customers.

The effect of increased impact fees on construction and development is an important issue. The current recession has pushed the market value of most new residential and commercial development below the cost of construction, resulting in a 90% decline in development activity that is at the center of the severe recession in the Sacramento area. Impact fees are a substantial component of development costs, and render most new development infeasible at their current levels. Further increases to these fees due to the increased wastewater costs make new projects even more infeasible, and would undoubtedly delay or even halt many of the small number of projects currently going forward. As real estate values eventually begin to recover, more projects will become feasible and development activity will increase. Higher impact fees mean that an even greater recovery in values will be required before projects become feasible, and could substantially impact an economic recovery that has already been slow to arrive. Using a single-family home as an example, the proposed increase in wastewater impact fees will increase the cost of building the average new home in the Sacramento area between 2% and 7%. Therefore, existing home prices will have to appreciate an additional 2-7% beyond inflation in other building costs before becoming financially feasible, and homebuilding regains momentum.

Thus, we believe these fee increases are likely to push back the timing of the recovery in development by 1 to 3 years, and have a significant negative impact on the economic recovery. There would be some boost from constructing the treatment plant upgrades, but that would not begin until several years of design and preparation work were completed. It would also have permanent impacts on housing affordability in the Sacramento area both by increasing average housing costs, and the fixed nature of fees means it would have a proportionally greater impact on the financial feasibility of more affordable housing development. Despite these short-run delays in development, we do not believe the additional fees will greatly affect the pace of development in the long-run, although the additional permit costs could impact the size, quality, and cost of

the permitted structure. As a result, we have conservatively limited the impact on the construction sector to the direct cost of additional fees allocated to this sector.

Figure 1. Allocation of Increased Wastewater Treatment Cost Components

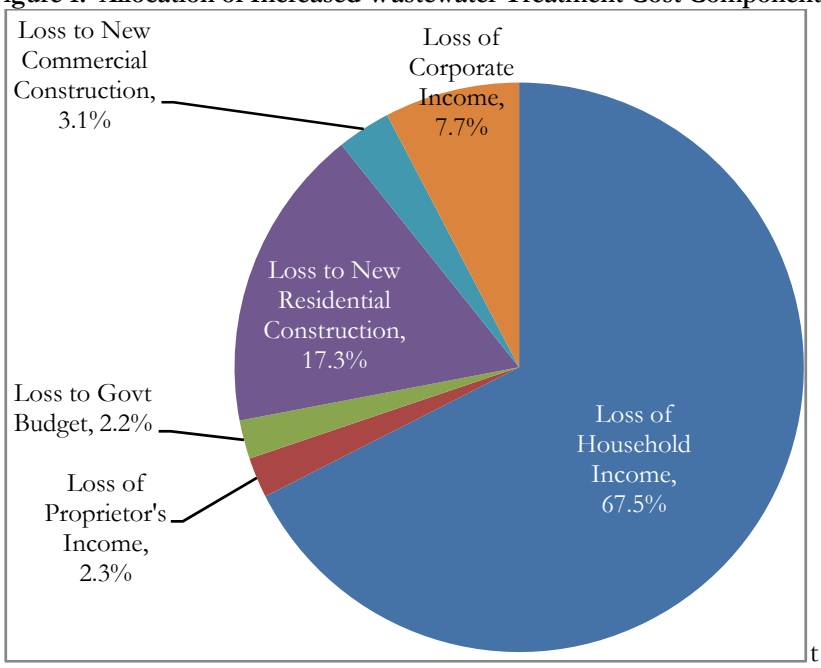

Figure 1 shows the breakdown of costs between different groups. We estimate the $239 million annual increase in rates and fees will directly reduce Sacramento household disposable income by $161.4 million annually, reduce construction spending by $48.6 million, reduce business income by $23.7 million, and impose a new $5.2 million cost on government facilities, primarily schools.

Household income losses to rate payers account for the largest share cost, 68% ($161 million), and were distributed across income classes according to latest Census data and entered associated income losses into the IMPLAN model according to these categories as represented in Table 1. The model then estimated the resulting loss in local spending, and the impacts across economic sectors.

Table 1 Treatment Cost Losses to Households by Income in Sacramento County

Annual Household Income	Number of Households	Loss to Households
HH LT 10k	43,871	($13,398,6183)
HH 10-15k	31,293	($9,557,178)
HH 15-25k	63,242	($19,314,705)
HH 25-35k	68,329	($20,868,322)
HH 35-50k	90,152	($27,533,273)
HH 50-75k	108,308	($33,078,287)
HH 75-100k	57,935	($17,693,897)
HH 100-150k	45,478	($13,889,411)
HH 150k+	19,745	($6,030,310)
Total Losses to Households		($161,364,000)

The increased wastewater costs described above will reduce economic activity and employment in the Sacramento area. Table 2 shows our estimate of a total of 1,810 lost jobs. Induced job losses are the largest category, and primarily result from decreased local consumer spending from the $161 million decline in household disposable income. The 380 direct lost jobs are primarily construction jobs lost due to increased wastewater impact fees.

Table 2 Treatment Cost Employment Effects

	Direct	Indirect	Induced	Total
Total Employment	-380	-130	-1,300	-1,810

Business Forecasting Center, September 2010
Data Source: IMPLAN, 2008 Coefficients.

On top of the direct loss in disposable income from higher bills, the resulting decline in economic activity will generate additional income losses. Table 3 details the additional lost income with a $77.3 million annual loss in employee compensation being the largest component. Direct employee compensation impacts are estimated to be equal to $20.8 million per year, indirect impacts $5.7 million and, and induced impacts a further $50.7 million in losses. Annual losses in proprietor income from treatment costs will equal $12.1 million in total effects, and losses to other property income equal $39.8 million in total effects annually.

Table 3 Treatment Cost Income Effects

	Direct	Indirect	Induced	Total
Total Income Effects	**($25,451,861)**	**($8,744,494)**	**($94,896,909)**	**($129,093,263)**
Employee Compensation	($20,823,017)	($5,688,737)	($50,763,901)	($77,275,655)
Proprietor Income	($3,524,612)	($931,271)	($7,608,895)	($12,064,778)
Other Property Income	($1,104,232)	($2,124,486)	($36,524,113)	($39,752,830)

Business Forecasting Center, September 2010
Data Source: IMPLAN, 2008 Coefficients.

The income effects in Table 3 are the losses that are generated from the changes in economic activity in the input-output model. They are in addition to the loss in disposable household and business income that results directly from higher utility rates. As discussed earlier, the increased wastewater treatment bills will directly reduce Sacramento household disposable income by $161 million annually, and reduce business income by $24 million. Combined with the income losses estimated by the input-output model, the total negative impact on Sacramento area income is $314.257 million.

Findings on the Project's Facilities Development

The Tentative NPDES Discharge Permit will require new treatment facilities costing $2.083 billion in total. Development of these facilities is estimated to take five years, resulting in our analysis of $416.6 million in annual project expenditures. Allocating these expenditures into an institutional spending pattern for construction of public sewerage systems generated the following results.

Table 4 Facilities Employment Effects

	Direct	Indirect	Induced	Total
Total Employment	1,341	503	653	2,497

Business Forecasting Center, September 2010
Data Source: IMPLAN, 2008 Coefficients.

During the facilities five years of development, the project should average direct employment of 1,341 individuals. A further 503 indirect jobs and 653 induced jobs should lead to a total annual average of 2,497 jobs during the treatment facilities development.

Overall, the construction of the new facility will generate an average of $186.35 million in Sacramento area income during each year of the five year construction period. The facility construction will generate total annual employee compensation of $123 million. Direct employee compensation impacts are estimated to be equal to $71.5 million per year on average, indirect impacts $25.7 million, and induced impacts a further $25.4 million. Proprietor income from the facilities development will equal $30.7 million per year, in total effects, and other property income will increase by $33 million.

Table 5 Facilities Income Effects

	Direct	Indirect	Induced	Total
Total Income Effects	**$99,806,508**	**$39,179,508**	**$47,368,773**	**$186,354,788**
Employee Compensation	$71,509,989	$25,662,209	$25,413,174	$122,585,371
Proprietor Income	$22,396,651	$4,629,338	$3,700,350	$30,726,339
Other Property Income	$5,899,868	$8,887,961	$18,255,249	$33,043,078

Business Forecasting Center, September 2010
Data Source: IMPLAN, 2008 Coefficients.

Findings on the Project's Operations

Operating the new facilities required by the Tentative NPDES Discharge Permit will generate $77 million in annual expenditures. The economic impact of these expenditures is estimated through an institutional spending pattern based on annual component estimates provided in a technical memorandum on the treatment process and illustrated in Figure 2 below.

Figure 2 Operating Cost Components

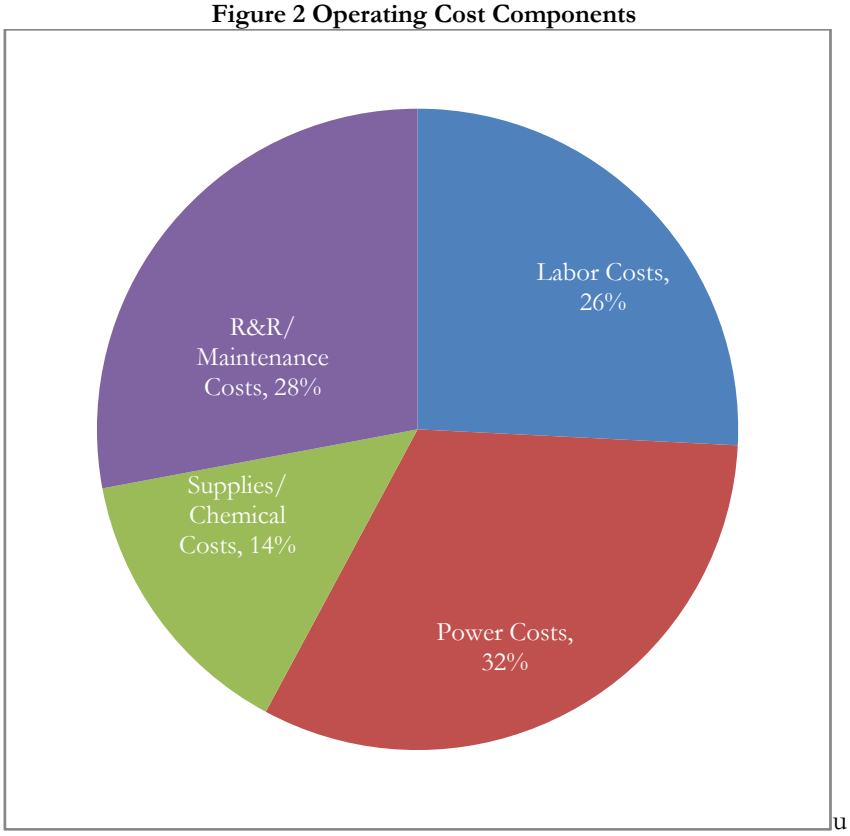

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Table 6 Operations Employment Effects

	Direct	Indirect	Induced	Total
Total Employment	236	127	140	502

Business Forecasting Center, September 2010
Data Source: IMPLAN, 2008 Coefficients.

Operations should average direct employment of 236 individuals. A further 127 indirect jobs and 140 induced jobs should lead to a total annual average of 502 jobs from operation of the new treatment facilities.

Table 7 Operations Income Effects

	Direct	Indirect	Induced	Total
Total Income Effects	**$19,823,002**	**$14,802,811**	**$10,131,900**	**$44,757,713**
Employee Compensation	$17,501,664	$8,289,774	$5,435,195	$31,226,633
Proprietor Income	$0	$1,716,369	$794,881	$2,511,250
Other Property Income	$2,321,338	$4,796,668	$3,901,824	$11,019,830

Business Forecasting Center, September 2010
Data Source: IMPLAN, 2008 Coefficients.

Overall, the operation of the new treatment facilities will generate $44.8 million in Sacramento area income. Operations will generate annual employee compensation effects of $31.2 million in total. Direct employee compensation impacts are estimated to equal $17.5 million per year, indirect compensation impacts $8.3 million, and induced employee compensation impacts a further $5.4 million. Proprietor income from operations will total $2.5 million per year, in total effects. Other property income effects will equal $11 million in total annually.

Conclusion

The Tentative NPDES Discharge Permit for the Sacramento Regional Wastewater Treatment Plant would directly cost Sacramento ratepayers $239 million annually. Most of these costs would be paid by low and middle-income residential households. The increased bills will directly reduce Sacramento household disposable income by $161 million annually, reduce business income by $23.8 million, and impose a new $5.5 million cost on government facilities, primarily schools. We estimate the increased impact fees would cause an approximately $48.6 million annual decline in construction spending.

The project would also generate a number of associated economic impacts on the Sacramento economy. Reduced consumer and government spending due to higher sewer bills, and reduced construction spending from higher impact fees would eliminate 1,810 jobs and create an additional $129 million decline in regional income. These losses would be offset by new jobs and income created by the construction and operation of the expanded wastewater treatment facility. During the construction period, the project is estimated to create 2,497 jobs and $186.4 million in regional income. The operation of the facility will sustain 502 jobs and increase income by $44.8 million.

Considering all the effects, the average annual economic impacts over the 30 year analysis period on the Sacramento Region are:

- Annual income loss of $245.9 million.
- Annual employment loss of 976 jobs.

During the 5 year construction period, the net annual income loss would be $127.9 million and there would be a net gain of 687 jobs. After the construction period, we estimate an annual net income loss of $270 million and a net loss of 1,308 jobs. The primary impact is a loss of disposable income distributed broadly across Sacramento households, with over half of the loss falling on households with annual incomes below $50,000.

Overall, this is a conservative assessment of regional impacts. SRCSD estimates rate increases will be even larger than our projections. We also assume increased impact fees will only have a small effect on the amount of new development over 30 years, and only reduce the average output of the construction industry by an amount equivalent to the increased fee payments. While the impact on development over 30 years will be relatively small, the effect will be greatest in the near term, pushing back the date at which many development projects become financially feasible for several years and delaying Sacramento's recovery from the recession.[8] The report assumes no effect on local electricity costs, although the project will generate a substantial increase in SMUD's electricity demand. We assume increased wastewater treatment rates will not be significant enough to affect the location, operation or investment decisions of businesses, and that lost corporate income flows outside the region. Due to these conservative assumptions, the negative impacts could be larger than

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we estimate. On the other hand, the negative impacts could be smaller than we estimate if less advanced, lower cost treatment options suggested by Central Valley Regional Water Quality Control Board consultants were developed in more detail and proven to satisfy regulatory requirements as well as the scale and site requirements of the SRCSD plant.

The results of this study inform planning and regulatory decisions regarding the San Joaquin-Sacramento Delta, and can be compared to analysis we have conducted on other aspects of the Delta issue. In a recent analysis conducted in cooperation with UC-Davis researchers, we estimate that reduced agricultural water supplies due to Delta pumping restrictions to protect endangered species result in an income loss of $72 million and the loss of 1,400 jobs in the San Joaquin Valley.[9] We have also estimated that the closure of the salmon fishery in 2008 and 2009 created an annual loss in California of about 1,800 jobs and $120 million in income.[10] Our initial analysis of Sacramento wastewater treatment upgrades was limited to nutrient reduction, and we estimated an average loss of 390 jobs and $94 million in income.[11] The $246 million estimate of lost income from the Tentative NPDES Discharge Permit for Sacramento are more than double the loss estimated in these other cases, whereas the job loss is lower since sewer impacts are distributed across hundreds of thousands of households rather than being concentrated in a low-wage industry like agriculture.

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[10] "Employment Impacts of California Salmon Fishery Closures in 2008 and 2009." April 1, 2010. http://forecast.pacific.edu/BFC%20salmon%20jobs.pdf.

[11] "Advanced Wastewater Treatment for Nutrient Reduction: Impact on Sacramento Income and Employment." August 23, 2010. http://forecast.pacific.edu/water-jobs/SRCSD%20Treatment%20Final.pdf

Appendix One: Input-Output Methods

The measurement of economic impacts in this analysis was performed using an input-output (I/O) model called IMPLAN. It is, in a sense, a general accounting system of economic transactions between industries, businesses, and consumers that estimates the full range of impacts on sales (output), wages (personal income), jobs (employment), and taxes. IMPLAN creates complete, extremely detailed Social Accounting Matrices (SAMs) and Multiplier Models of local economies that enable in-depth examinations of national, state, multi-county, county, sub-county, and metropolitan regional economies.

IMPLAN was developed in the late-1970s by the United States Forest Service to estimate the economic impact of alternative land management options. In the mid-1980s, researchers at the University of Minnesota began developing IMPLAN for non-Forest Service users. Initially, IMPLAN was based on input-output accounts whose analysis was pioneered in the Nobel Prize winning work of Wassily Leontief. In 1993, a technology transfer agreement with the University of Minnesota led to the Minnesota IMPLAN Group (MIG) taking over development, distribution and support of IMPLAN.[12]

In the late-1990s, MIG enhanced IMPLAN with the release of Version 2 which included a modeling system that created SAMs. With SAMs input-output accounts are extended to include institutional, non-market, financial flows, thereby facilitating the examination of all economic transactions within an economy. Recently, MIG has further enhanced IMPLAN with Version 3 including a gravity model to estimate commodity trade flows between regional economies. This allows IMPLAN to estimate regional purchase coefficients (RPCs) that reflect region specific production patterns down to the county level. Using the derived trade flows between regions, Version 3 can also create multi-region input-output models.[13]

This model provides a comprehensive view of the project's economic impacts in Sacramento County. The BFC used scenarios based on technical memorandum and discussions with the SRCSD to calibrate the economic models and derive direct inputs. Details of the assumptions underlying the scenarios are included in Appendix One.

[12] IMPLAN Website (www.implan.com) Accessed 03/30/2010.
[13] Olson, D and G Alward (2009) "Revised IMPLAN RPCs" V3 Gravity Model Reference Document accessed from IMPLAN Website (www.implan.com) Accessed 03/30/2010.