

APRIL 2011

MEETING WATER QUALITY STANDARDS FOR SAN DIEGO'S RECREATIONAL WATERS: > A Cost Benefit Analysis

Commissioned by The City of San Diego Transportation & Storm Water Department
Researched and produced by the Fermanian Business & Economic Institute



POINT LOMA
NAZARENE UNIVERSITY

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Meeting Quality Standards for San Diego's Recreational Waters: A Cost Benefit Analysis

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The City of San Diego
Transportation &
Storm Water Department**



- Fermanian Business & Economic Institute
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LETTER TO THE READER

The Fermanian Business & Economic Institute is pleased to present its original research report, Meeting Quality Standards for San Diego's Recreational Waters: A Cost Benefit Analysis. Commissioned by the City of San Diego Transportation & Storm Water Department, our task was to present a cost/benefit analysis of a plan designed for San Diego to comply with water standards established at the federal, state, and local levels. In doing so, we intend to provide leaders in public policy, government, academia, business and other interested fields a highly readable, yet significant, economic analysis of a critical topic to all within our community.

Increasingly, public and private leaders, agencies and organizations need an independent and objective view of a technology, regulation, strategy, business, or economic process or trend. The Fermanian Business & Economic Institute's reputation for authoritative and objective insight frequently makes us a popular choice for important business, economic, and policy questions facing our region.

At the Fermanian Business & Economic Institute this is what we refer to as "actionable economics". We are grateful to the City of San Diego for its important service to our community in the important areas of water quality, conservation, and economic stewardship.

We look forward to additional opportunities to serve our community.

Randy M. Ataide, J.D.
Professor of Entrepreneurship
Executive Director
Fermanian Business & Economic Institute

About the Fermanian Business & Economic Institute

The Fermanian Business & Economic Institute (FBEI) is a strategic unit of Point Loma Nazarene University, providing the following services:

- > Economic forecasting and events
- > Expert business and economic commentary and speeches
- > Economic consulting and related services
- > Professional and executive development events
- > Business and economic roundtables
- > Economic studies and research
- > Special projects

We take the integrity of our work very seriously. Representing the academic standards of our University and the professional credentials of the Economics community, we insist on maintaining an objective approach. The Institute accepts projects and contracts only on the condition that the conclusions will be derived on the basis of data, evidence, and careful analysis. We eschew any approach calling for a study that will "support a particular desired conclusion." Objectivity is a key feature of the ethical standards we embrace.

The focus of the Institute since we officially began in January 2010 has been to provide economic analysis and forecasts to assist various businesses, non-profit organizations, and government organizations in San Diego. Projects we have undertaken include:

- A study of the economic impact of military construction spending, commissioned by the San Diego Military Advisory Council

- An analysis of the potential of Biomimicry (the field involved in taking solutions inspired by Nature to commercial application), commissioned by San Diego Zoo Global
- A study of the marginal costs of different solutions to meeting the region's water demands, commissioned by the Equinox Center
- An analysis of the outlook for California's housing and commercial real estate for the California Air Resources Board, commissioned by the Associated General Contractors
- Economic Forecasts for 2010 and 2011

We are currently working on a number of other projects, including

- An analysis of the economic costs of and solutions to homelessness in San Diego
- An economic analysis of commercial real estate development in Santee, California
- An economic structural and forecasting model of the chain link fence manufacturing industry

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EXECUTIVE SUMMARY

- San Diego features some of the best beaches and spectacular coastline in the world. In 2010, an estimated 24 million people visited the beaches located within the boundaries of the City of San Diego. In addition to a significant intangible value to its residents, the City's beaches generate sizable economic benefits. In 2010, the coastal areas within the City of San Diego saw taxable sales of \$1.7 billion.
- Under the mandates from the Federal Clean Water Act, state legislation, and the San Diego Water Board, the City of San Diego is required to meet certain water quality standards. These are quantified in terms of Total Maximum Daily Loads (TMDLs) or the maximum amount of bacteria, metals, pesticides or other pollutants that a given water body can safely carry.
- Two major approaches have been considered to achieve the various water quality standards. The first would require large scale and costly investments in treatment systems and other infrastructure. An alternative strategy was developed by Weston Water Solutions, Inc. for the City of San Diego in 2007. (<http://www.sandiego.gov/stormwater/plansreports/index.shtml>) It features a tiered approach over 20 years and involves lower costs and smaller community impacts. The cost parameters of the tiered approach (referred to as "the Strategic Plan") are used in this report's analysis.
- The costs of the proposed Strategic Plan will still be sizable. Over the next 20 years, they are estimated to cumulate to a total of \$3.7 billion.
- Considerable benefits would accrue from achieving the improvement in water quality envisioned under the Strategic Plan's objectives. They are estimated to cumulate to a total of \$617 million over the next 20 years. However, the gap between the total costs and benefits of the Water Plan is considerable, with costs equal to six times the value of expected benefits.
- On a per household basis, San Diego City residents would see benefits from the Strategic Plan averaging an estimated \$57 per year over the next 20 years versus costs of \$351 per year.
- A gradual approach to improving water quality, involving lower cost solutions with a careful monitoring and identification of best management practices, would appear warranted. At the same time, more scientific research needs to be done to validate the relation between various standards and the goals of reduced health risk.

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PURPOSE OF THE STUDY

The purpose of this study is to present a cost/benefit analysis of a plan designed for the City of San Diego to comply with water standards established at the federal, state, and local levels. The cost and benefits are described over a 20-year period, commencing in 2011 and ending in 2030. Costs and benefits are presented in terms of annual dollar totals, cumulative sums over the 20-year period, and average costs and benefits per household.

Section I summarizes the mandates to improve water quality at the federal, state, and local areas. Section II analyzes the costs versus benefits. Section III discusses the importance of its beaches to San Diego and the record of water quality along its shoreline during the past decade. Section IV delineates the expenditures and investments required over the next 20 years to satisfy water quality requirements in a tiered approach. This approach is contrasted to a more infrastructure-intensive and expensive strategy that would be necessary to achieve water quality objectives over a much shorter and compressed time frame.

Section V analyzes the economic benefits of improved water quality in terms of (a) the implicit value households place on the access to beaches; (b) the economic value related to beach visits from both direct spending and ripple effects throughout the economy; and (c) the potential savings in health-related costs both in terms of direct medical expenses and reduced absences from work.

Section VI concludes with recommendations and action steps.

I. WATER QUALITY STANDARDS AND MANDATES

The Federal Clean Water Act of 1972 and California's Porter-Cologne Water Quality Control Act require the San Diego Water Board to determine water quality standards for each water body within its jurisdiction. Section 303(d) of the Clean Water Act also requires states to identify water bodies that do not meet water quality standards, to prioritize them, and to establish maximum levels of pollutants that all water bodies can receive and still be able to meet water quality standards.

These maximum levels of pollutants are described as TMDLs (Total Maximum Daily Loads). Pollutants that can contaminate water bodies include pathogens (bacteria and viruses), nutrients, sediments, pesticides, mercury, and various metals. TMDLs are established for each type of pollutant.

Contaminants of water bodies can come from point sources, such as industrial plants or sewage treatment plants. They can also result from general runoff as rainwater or water from car washing or watering of crops or lawns picks up various contaminants before flowing into streams, rivers, and the ocean. These pollutants can include oil and sand from roadways, chemicals, organic materials, and toxic substances, which flow to water bodies either directly or through storm drain collection systems. Water quality standards are set based on the intended purpose of each type of water body. Compliance to standards is monitored through regular collection of water samples from the various sites. Water policies are established that will both bring water bodies up to standards which will protect current users and prevent any future degradation of water in areas that already meet or exceed quality standards.

II. COSTS VERSUS BENEFITS

For any significant project or endeavor, it is important to weigh the costs relative to the benefits that will affect various stakeholders. The intent of this report is to present an unbiased, comprehensive, and realistic assessment of the costs and benefits that would accrue to the residents of the City of San Diego if the proposed Strategic Plan is adopted to meet the various water quality regulations.

Exhibit 1 summarizes the costs and benefits in terms of (a) the cumulative totals over the next 20 years; (b) the average annual figures over that 20-year span; and (c) the annual averages per household.

While total benefits are projected to cumulate to an estimated \$617 million over the next 20 years, costs are expected to sum to \$3.7 billion. This means that total costs will be six times the amount of projected overall benefits.

Exhibit 1

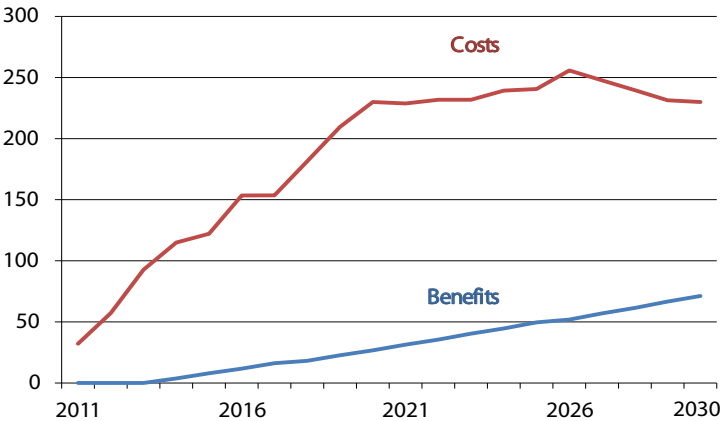
Benefits and Costs of the Strategic Plan
2011 dollars

	Benefits	Costs	Difference
Cumulative 20 -year totals (millions)	\$617	\$3,724	\$(3,107)
Average annual totals (millions)	\$31	\$186	\$(155)
Average annual amounts per household	\$57	\$351	\$(294)

Source: FBEI

Exhibit 2

Annual Costs versus Benefits
Millions of 2011 Dollars



Source: FBEI

Annual costs are forecast to peak around the year of 2026 as some of the infrastructure projects reach their maximum build-out rates. In contrast, benefits continue to rise throughout the next two decades. (See Exhibit 2.) Improved water quality should lead to progressively larger numbers of beach days for visitation and spending. At the same time, a reduction in water pollution should yield increased health-related savings over time. Total costs will significantly outstrip estimated benefits throughout the next 20 years, with the gap averaging about \$155 million per year.

San Diegans could also reap intangible benefits of becoming better stewards of our environment, but the gap between costs and benefits would still appear to be significant.

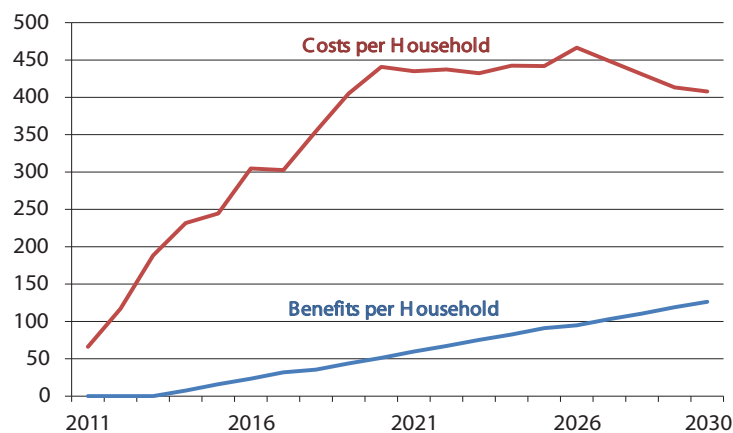
On a per household basis, the divergence between costs and benefits narrows slightly over time but also remains substantial. (See Exhibit 3.)

Average benefits per household are projected to average \$57 per year over the period through 2030, while annual costs per household are forecast to average \$351. This implies that the typical San Diego City household will pay an average of \$294 more per year than the benefits received. (See Exhibit 4.)

Will San Diego residents be willing to pay the costs of improving water quality over

Exhibit 3

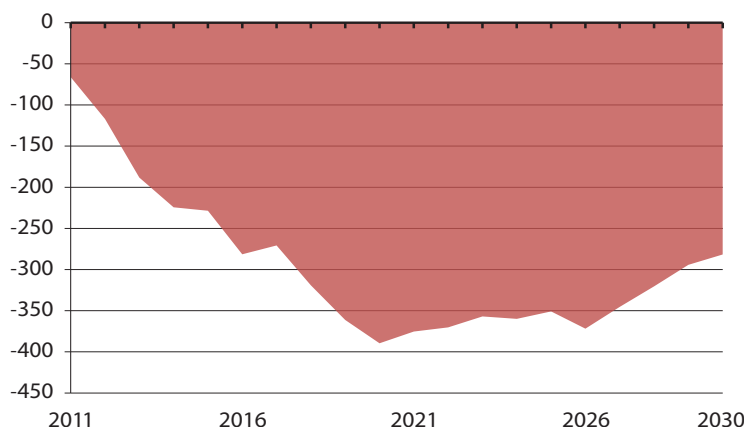
Costs and Benefits per Household



Source: FBEl

Exhibit 4

Benefits less Costs per Household 2011 Dollars



Source: FBEl

the next two decades even those these costs are likely to exceed the benefits realized? San Diego City residents may place a greater value on improved water quality than described in this report. Improved water quality in other recreational areas could generate value above that relating to the beach and coastal areas focused on in this study. Non-beachgoers may also place a significant value in improving the quality of the area's beaches.

Yet, the sizable six-to-one gap between costs and benefits estimated in this study will be difficult to narrow substantially even with a significant boost to benefit estimates. At the same time, there is no guarantee

that achieving certain TMDL standards will achieve the increased number of days for beach access or the projected reduction in incidence of various illnesses. San Diego residents who never or rarely visit the area's beaches may be unwilling to pay the expense of water quality improvement, especially if it is marginal. Costs of implementing the various projects and elements of the Strategic Plan could also exceed current estimates.

These results suggest that policymakers will confront a major challenge. They will need to win the endorsement of the public for embarking on a sizable multi-year commitment to a spending program whose projected costs substantially exceed its projected benefits. These additional expenditures will aggravate further the City's budget problems and could imply even greater reductions in other programs or tax increases.

III. SAN DIEGO BEACHES

The Importance of San Diego's Beach Properties

San Diego features some of the best beaches and spectacular coastline in the world, which attract both local residents and visitors from outside the region. The area's coastal areas are a major reason why people choose to live in San Diego and are a primary driver of tourism.

In 2010, an estimated 24 million people visited the beaches located within the boundaries of the City of San Diego. This followed a record of 25 million city beach goers in 2009 in a year which featured better weather. (See Exhibit 5.)

The beaches within the City of San Diego's boundaries encompass some of the most prime shoreline, including Torrey Pines, La Jolla, Pacific Beach, Ocean Beach, and Point Loma. About sixty percent of those who visit San Diego City beaches reside within the City, accompanied by another forty percent from outside the immediate area. On any given day during the year, an average of about three percent of the City's

Exhibit 5

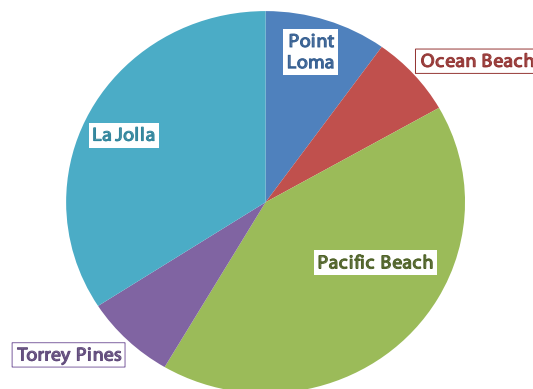
Annual Attendance at San Diego City Beaches
Millions



Source: City of San Diego Lifeguard Services

Exhibit 6

Taxable Sales for San Diego
Beaches in 2010



Source: MuniServices, LLC

residents visit its beaches. Attendance is much higher during weekends than week days and varies greatly during the year, with a much higher attendance during the peak summer months.

Spending by beach visitors generates a sizable volume of sales for hotels, restaurants, clothing stores, shops selling various accessories, and enterprises renting beach and sporting equipment (bicycles, surfboards, beach umbrellas, etc.). In 2010, the coastal areas within the City of San Diego saw taxable sales of \$1.7 billion. Prior to the onset of the recession, this figure had reached a record of \$2.0 billion in 2007. Pacific Beach accounts for the largest share, followed by La Jolla. (See Exhibit 6.)

The Record on Water Quality

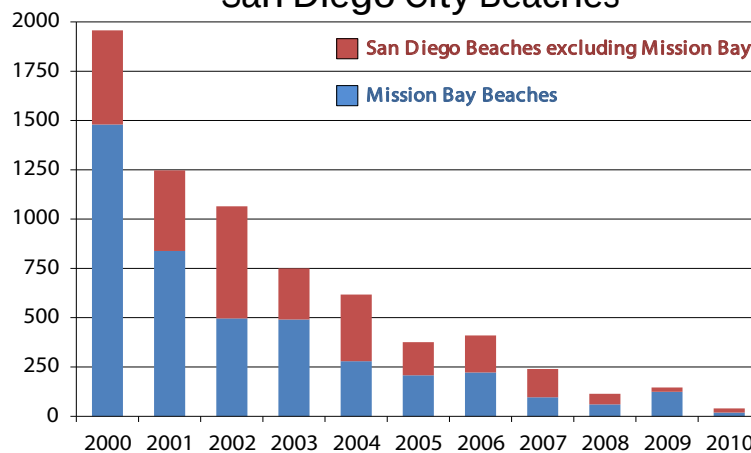
The water quality of San Diego's beaches is constantly monitored and the public is alerted of any potential hazards. Beaches are closed if there is any report of a major incident, such as a sewer line break or fuel spill. Warnings are posted in cases where water sampling tests indicate unacceptably high levels of bacteria. In addition, because of the risk of contamination from runoff, general advisories are issued for the three days following each time it rains.

The water quality of San Diego City's beaches has improved markedly over the past decade. (See Exhibit 7.)

Total beach postings and closures because of noted contamination exceeded 1,950 in 2000. By 2010, this number had fallen to 40. Mission Bay beaches have registered a

Exhibit 7

Total Postings and Closures for San Diego City Beaches



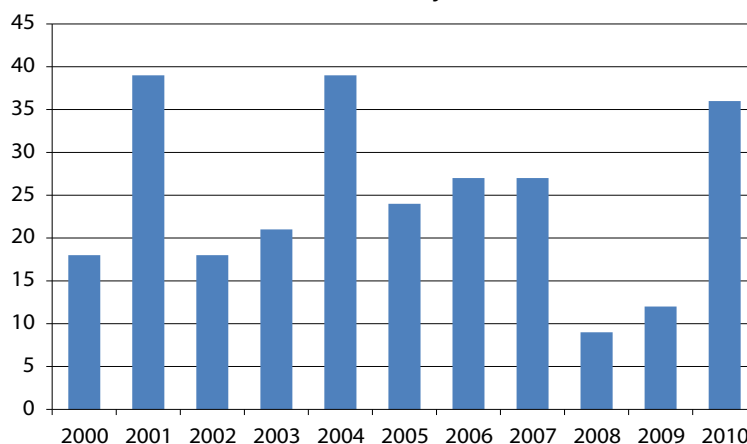
Source: City of San Diego Transportation & Storm Water Dept.

particularly sharp decline. Nearly 1,500 postings or closures were experienced in 2000.¹ By 2010, this number had shrunk to less than 20. Maintaining the higher quality of San Diego's shoreline quality in the future could be an ongoing challenge.

General rain advisories remain a significant impediment to beach access. (See Exhibit 8.) Since 2000, the number of days that San Diego beaches have been off limits to bathers because of possible pollution has averaged about 25 per year. (This count excludes the initial day of rain.) Reducing the potential contamination because of runoff could add materially to the accessibility of the area's beaches.

Exhibit 8

General Rain Advisories in San Diego County Days



Source: City of San Diego Transportation & Storm Water Dept.

IV. THE COSTS OF ACHIEVING WATER QUALITY STANDARDS

Meeting the water standards dictated by the federal and state government, and as defined by the San Diego Water Board, will require sizable annual expenditures and investment over a number of years. The City of San Diego has worked on a number of water quality improvement plans in recent years that bring various watersheds into compliance with prescribed TDMLs.

The City and our consulting team developed a tiered approach that would enable us to meet water standards over the next twenty years (identified as the Strategic Plan in this report). This incorporates best management practices (BMPs) that have been deployed in various areas throughout the country.

An alternative approach that could achieve water quality objectives in a much shorter time period (ten years) would require much more infrastructure investment in treatment systems. Large storage capacity systems would also be necessary to equalize water flows prior to treatment. In addition to the sizable costs of completing these infrastructure investments in a relatively short time span, there would be considerable impacts on residential communities. Private property would need to be acquired through eminent domain. This process could face significant legal hurdles and make it difficult to achieve the prescribed water quality goals within the designated time period.

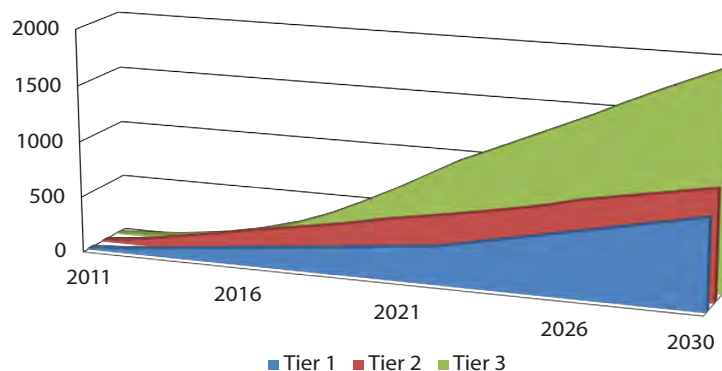
The alternative strategy considered in this report takes a more comprehensive or integrated approach over a longer time horizon. As proposed by Weston, it envisions three phases or tiers to comply not only with current TMDLs but also with future ones anticipated for bacteria, dissolved metals, and pesticides. This approach should help minimize the need for retro-fitting to meet new standards that might be imposed in later years.

The first phase or tier focuses largely on efforts to control potential water contamination at its source. This phase emphasizes education, targeted enforcement, enhanced development standards, greater permit analysis, and other steps to control

pollution at the various sources. (See Exhibit 9.)

Exhibit 9

Plan to Meet TMDL Standards for City of San Diego
Cumulative costs, millions of 2011 dollars



Source: Weston Solutions, Inc; FBEL

The second phase entails more expenditures but not on the scale of major investments in infrastructure. This tier calls for more aggressive street sweeping, increased targeted trash segregation, more active catchment cleaning, and additional trash debris cleanups.

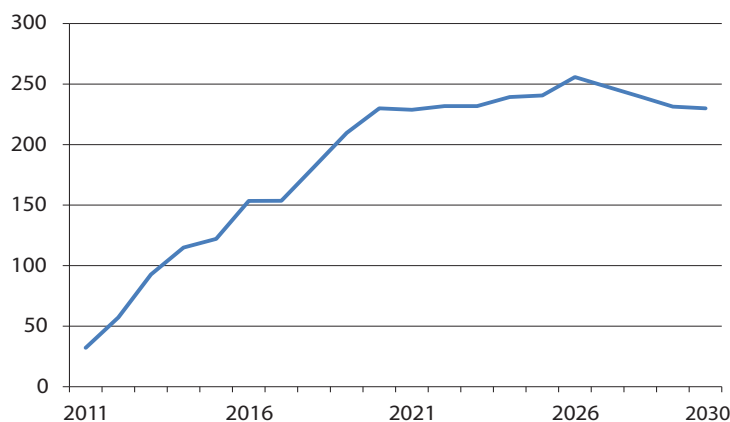
It also proposes public-private partnerships to reduce dry weather flows and to undertake some projects for retro-fitting that have become necessary.

The recommended approach would be to monitor the success of the various programs in Tier 1 and Tier 2 to determine their success in meeting TMDL requirements. Pilot projects could be run in different areas to assess which solutions are most effective and should be adopted as BMPs.

The third tier, involving the more infrastructure and investment intensive projects, would then be phased in depending on the success of the various programs and BMPs of the first two tiers. Although Tier 1 and Tier 2 projects may not fully accomplish water quality goals, they should result in a significant reduction in runoff volumes and pollutant loads. Tier III would then include investments in infiltration projects and

Exhibit 10

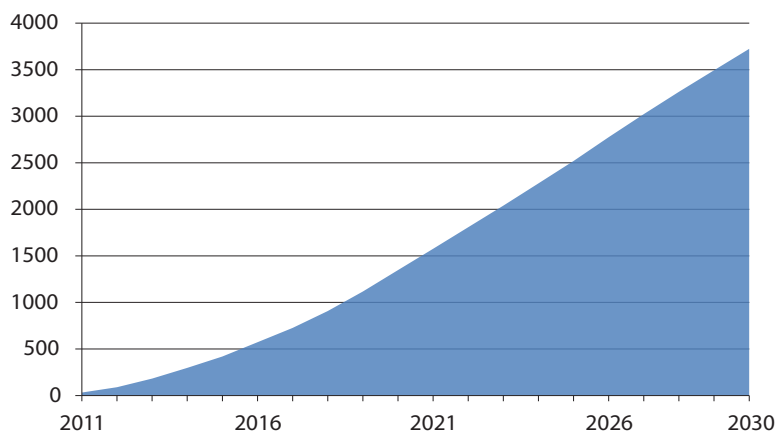
Projected Annual Costs of the Strategic Plan Millions of 2011 Dollars



Source: Weston Solutions, Inc; FBEI

Exhibit 11

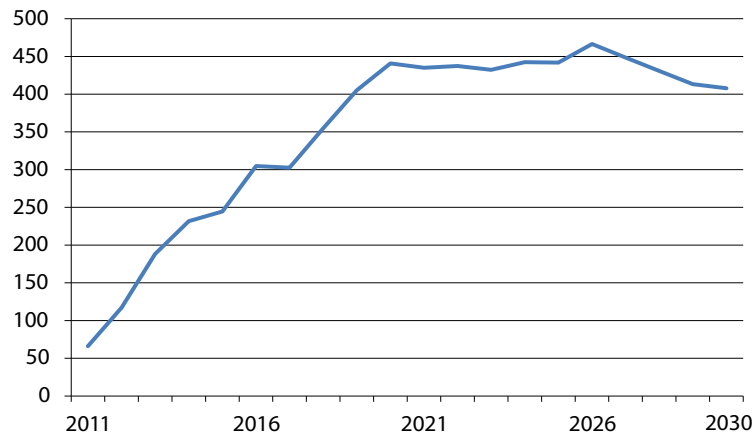
Cumulative Cost of the Strategic Plan Millions of 2011 Dollars



Source: Weston Solutions, Inc; FBEI

Exhibit 12

Annual Cost per Household 2011 Dollars



Source: Weston Solutions, Inc; FBFI

various multi-drainage area treatment systems on both smaller and larger scales. Even this more phased-in approach will be expensive. In current or 2011 dollars (not adjusted for price increases or inflation in future years), the cumulative cost over twenty years will be about \$3.7 billion. This will amount to an average of \$186 million per year over the next two decades. Based on population and household counts from the 2010 census, FBFI has estimated the number of households that will reside in the City of San Diego each year through 2030.² Using these projections, the average cost per San Diego household of the proposed Strategic Plan would be \$351 per year over the next twenty years. (See Exhibits 10, 11, and 12.)

V. THE ECONOMIC BENEFITS OF ACHIEVING WATER QUALITY STANDARDS

The benefits of achieving certain water quality goals can be analyzed in three distinct dimensions as they would pertain to the beaches contained within the boundaries of the City of San Diego. First, beachgoers would benefit from a potential increase in the number of days they could safely enter the water. Second, the region could benefit from increased spending from visitors to the area's beaches. Third, improved water quality could yield health care savings both from lower direct medical expenses and reduced absences from work.

Over the next twenty years, total benefits are projected to cumulate to a total of \$617 million in 2011 dollars. (See Exhibit 13.) They will average about \$31 million per year or about \$57 per household. (See Exhibit 14.)

Exhibit 13

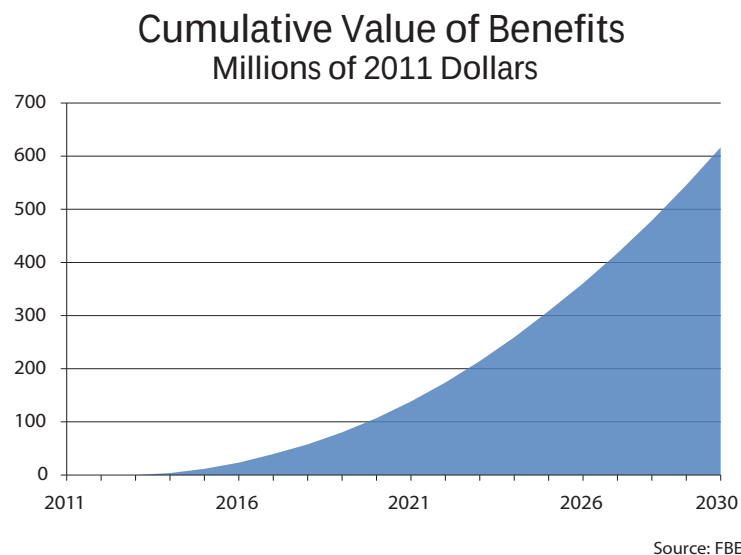
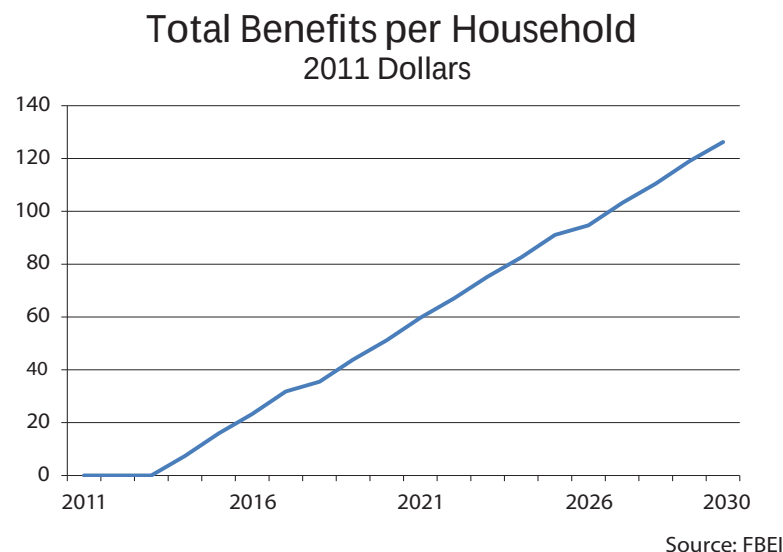


Exhibit 14

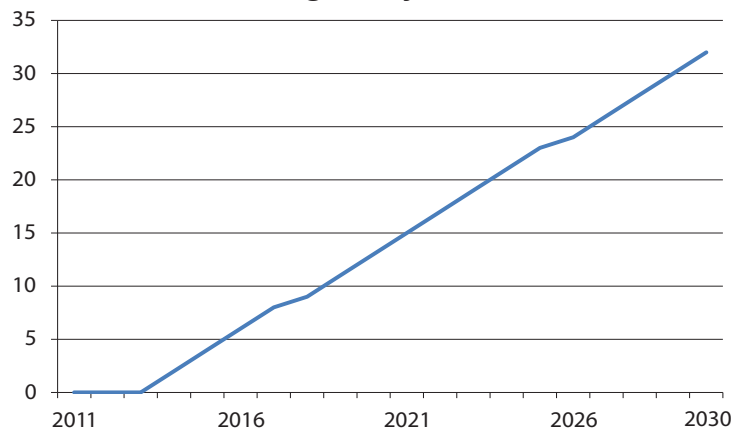


Implicit Beach Value

As discussed in Section II, on average, about 25 days a year are effectively closed to San Diego beachgoers because of general rain advisories. Another estimated 15 days are lost due to beach postings or closures as a result of sewer spills or other major contamination incidents or to water sampling tests indicating unacceptably high levels of pollution.

Exhibit 15

Additional Days Available for San Diego City Beaches*



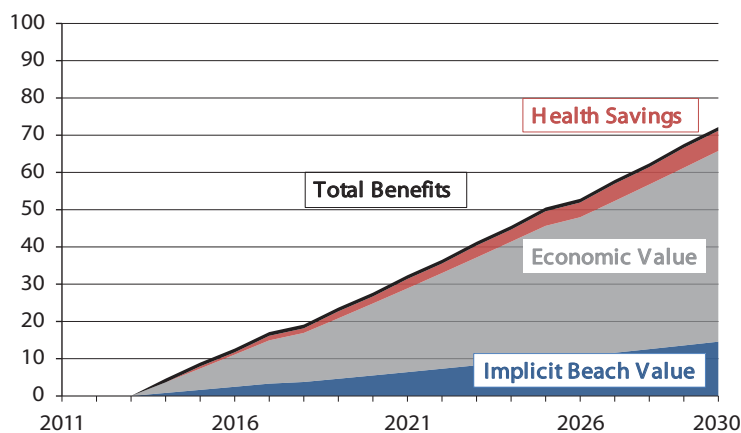
*Assuming Implementation of the Water Plan

Source: FBFI

If an 80% reduction in pollution could be achieved, as described under TMDL requirements, the total number of days off limits to swimmers could be reduced from 40 to 8 over the next twenty years. This means that by 2030, beachgoers would have an additional 32 days per year of access. (See Exhibit 15.)

Exhibit 16

Projected Annual Value of Benefits Millions of 2011 Dollars



Source: FBFI

FBFI estimates that the annual value of this increased accessed to beaches (Implicit Beach Value) to San Diego City's residents could approach \$15 million (2011 dollars) by 2030. (See Exhibit 16.)

Methodology:

Because the costs of the Strategic Plan would be borne by San Diego City residents,

FBFI focused on the benefits from a greater availability of beach days to them. Using our projections on San Diego City population growth, FBFI developed estimates of average daily beach attendance of San Diego residents over the next twenty years. These projections utilized our finding that, on any given day during the year, approximately 3% of the City's population visit its beaches.

How much would San Diego residents value an additional day of beach access during the year? Several studies have been done on placing an implicit value on an area's beaches.³ FBEI selected a market-based approach and assigned the value of a beach day per person as the cost of parking (\$10) that San Diego beachgoers might typically experience. Although some residents would not be willing to pay that much for an additional beach day, others would pay more.

The projected implicit values of increased beach access each year through 2030 was then derived from FBEI's estimates of average daily beach attendance, additional days available, and the value per person of each beach day.

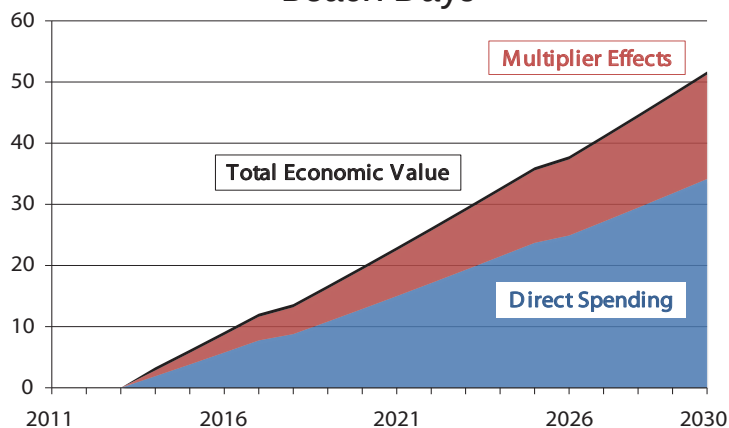
Economic Value

Coastal communities in San Diego experience a sizable falloff in business on days when beaches are closed. Visitors from outside the region, staying for more than one day at hotels or other lodgings, are unlikely to cancel their plans. Beach postings or closures are generally implemented with little prior notice. Individuals on day trips may also opt to visit an area's restaurants and shops. Nevertheless, beach closures definitely impose losses on businesses dependent on those attracted to the sand and surf.

FBEI calculated the total economic value that additional beach days could generate for the City of San Diego. This includes not only the direct dollar effects of additional spending on various goods and services but also the various "multiplier" impacts as this spending ripples through the economy.

Exhibit 17

Economic Value of Additional Beach Days



Source: FBEI

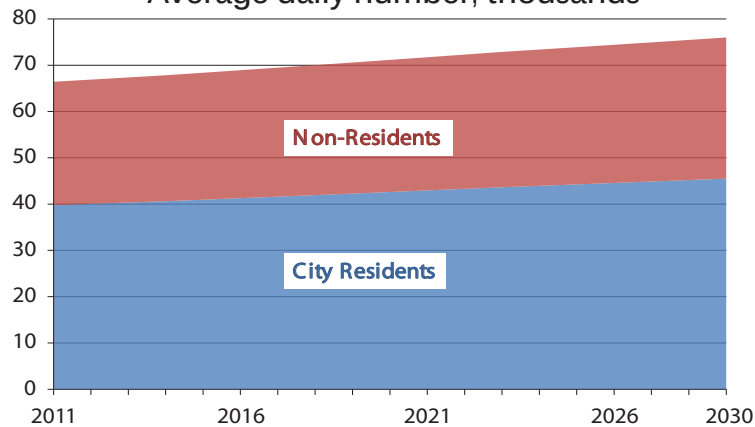
The total annual economic value of additional beach days resulting from the Strategic Plan's implementation could reach approximately \$51 million (2011 dollars) by 2030. (See Exhibit 17.) About two-thirds of this would represent the impact of direct spending, with the additional amount representing the multiplier effects.

Methodology: Careful economic impact analysis requires that the changes in spending considered emanate from outside the area under review. For example, in the case of beach closings in San Diego, most San Diego City residents can be expected to spend their money at other venues within the City. In contrast, most visitors from outside the City deciding not to visit its beaches because of closures are likely to opt for activities and spending in their own or other areas.

This study, therefore, focused on potential changes in beach-related spending by non-City residents. In its first step of the analysis, FBEI estimated annual average beach attendance by non-City residents. These estimates reflected our forecasts of average attendance by City residents (see Methodology in section above) and historical data suggesting that non-City residents typically account for about 40% of daily attendance. (See Exhibit 18.)

Exhibit 18

San Diego City Projected Beach Visitors Average daily number, thousands



Source: FBEI

The second step involved determining the average value of daily spending at beaches. FBEI used survey data on average spending by daily beachgoers for Southern California beaches.⁴ This data reflected spending at beaches in Los Angeles and Orange Counties during the summer of 2000 for parking, food & beverages, beach

supplies, rental equipment, and other shopping. FBEI adjusted these numbers to current dollars based on different relevant Consumer Price Indexes. We also added an average expected daily per person expenditure of \$10 for gasoline. The result was an estimated \$35 per day for each person visiting San Diego beaches.

FBEI was then able to estimate the total amount of direct spending that could take place in San Diego each year by calculating the product of the number of additional beach days available, the average daily beach attendance by non-City residents, and the average expected spending per day (\$35).

Multiplier effects were then analyzed. These have two components—"indirect" and "induced". Indirect effects include the supply chain effects or the impact on producers of various goods and services in the area benefiting from the additional spending by beachgoers. Induced effects reflect the additional economic impact of outlays by individuals and firms as they spend some of the additional income they earn either directly or indirectly from beachgoers.

The IMPLAN® V3.0 modeling program was utilized to determine the magnitude of the indirect and induced impacts of the additional assumed amounts of spending. This analysis indicated that a multiplier of 1.5 (the ratio of total economic effects to the amount of direct spending) would be appropriate. The relatively low number of this multiplier reflects the fact that many of the products purchased by beachgoers are produced outside of the City (e.g., gasoline, food, apparel, etc.).

FBEI then was able to calculate the total economic value for each year through 2030, combining the annual amounts of additional direct spending and the multiplier effects.

Health Care Savings

The potential health care benefits of improved water quality are difficult to quantify. San Diego County does not track incidents arising from possible beach water contamination. It is frequently difficult to isolate the cause of various ailments. For example, skin rash can often be the result of allergies or jelly fish stings rather than contaminants.

In addition, research done by Colford⁵ on a cohort of nearly 9,000 beachgoers at Mission Bay indicated that, although there was some evidence of illness related to water exposure, there was little correlation between the measures now used to monitor water quality and the incidence of such illness.

FBEI's study attempts to estimate the potential health care savings that could be realized through improved water quality and a reduction of illness. Health care savings would include both a reduction in direct medical costs (doctor visits and medication) and the economic losses from possible absences of work. Our estimates indicate that total annual health care savings could reach \$5.4 million (2011 dollars) by 2030. (See previous Exhibit 16.)

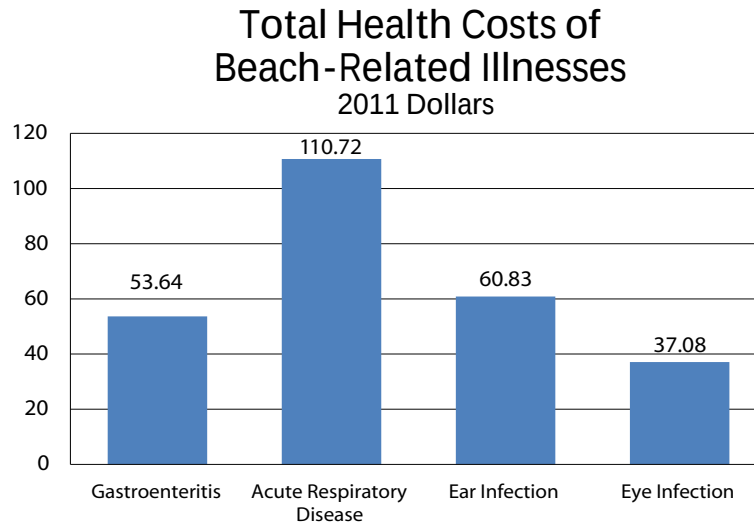
Methodology: The methodology used to estimate health care savings followed the approach utilized by Dwight, Fernandez, Baker, Semenza, and Olson.⁶ Four primary illnesses associated with coastal water pollution were analyzed: Gastroenteritis (GI), Acute Respiratory Disease (ARD), ear infections, and eye infections.

Colford's research reported a 4-6% incidence among swimmers in Mission Bay of GI symptoms, although actual GI may not materialize. For the purpose of this study's analysis, the Strategic Plan is assumed to achieve a 0.8 percentage point reduction in the probability that a swimmer will incur GI by 2030. Illness rates relative to the incidence of GI were used based on the work of Fleisher et al:⁷ ARD (.337), ear infection (.551), and eye infection (.303). This work also estimated the percent of the four illnesses likely to result in a doctor visit as well as the number of days expected to be lost at work.

The number of individuals potentially affected by health care factors each day were projected based on FBEI's estimates of population growth, beach attendance by San Diego residents, and the proportion of beachgoers expected to swim or go in the water.⁸ Doctor visits in San Diego can typically cost between \$100 and \$300 (excluding the amounts paid by insurance companies). FBEI assumed an average cost for medical treatment, including prescribed medicines, of \$200 per incident. The cost of foregone earnings was derived from the average annual wage and salary projected by FBEI for 2011 (\$50,329). This figure was used to estimate earnings losses due to the various illnesses after adjusting for the number of workdays per year and the probability that illness occurs on a weekend or holiday. (It should be noted that although some illnesses will affect non-wage earners, such as children, wages may be foregone because of the necessity of childcare.)

Exhibit 19 shows the total cost (2011 dollars) of each beach-related illness in terms of direct medical expenses and the losses resulting from work absence. These costs range from about \$37 for an eye infection to about \$111 for a serious respiratory ailment (ARD).

Exhibit 19



Source: FBEI

FBEI then calculated the total annual costs for possible health care savings per year using the expected reduction in probability for GI, the associated expected smaller incidents of the other three ailments, and the average total cost of each of the four illnesses.

VI. RECOMMENDATIONS AND ACTION STEPS

The task of complying with TMDL and water quality mandates at a time of major budget and funding constraints suggests several major recommendations:

- 1) A priority should be placed on solutions to improving water quality that will require relatively low amounts of expenditures and will not disrupt existing communities through acquisition and condemnation of private property. For example, a more frequent cleaning and regular maintenance of storm drains, intensified street sweeping, and increased trash pickup should be deployed.
- 2) Scientific studies need to be conducted to more carefully document the correlation between TMDL standards and the incidence or risk of various illnesses. Alternative indicators of water quality may be necessary.
- 3) Chambers of Commerce and other civic organizations in the beach areas (e.g., Ocean Beach Main Street Association) should be consulted on their recommendations and support for ways to reduce the flow of contaminants and pollutants.
- 4) A collaborative approach involving government, business, and academic experts should be used to help develop some of the most cost-effective approaches to achieving the various water quality standards.
- 5) As suggested in the Strategic Plan, efforts to control pollution at its various sources need to be enhanced through greater monitoring and enforcement.
- 6) A more complete analysis of the relative importance of various causes of pollution in general runoff needs to be conducted (e.g., car washing, lawn pesticides, etc.) Aggressive public education needs to then be conducted, with possible restrictions implemented if necessary.
- 7) New parking lots should be required to have porous payments and follow other best management practices to reduce runoff and existing lots should be retrofitted in strategic areas.
- 8) As emphasized in the Strategic Plan, various programs and projects should be carefully evaluated as they are implemented to identify best management practices. Major expenditures or investments should first be piloted in one area before expanding them on a wider scope.
- 9) Public-private partnerships should be formed to implement the various projects entailing significant spending or investment.
- 10) Data on illnesses related to swimming in San Diego City waters needs to be collected from health care providers and analyzed to better understand the scope and severity of water pollution risk in the area.
- 11) San Diego City residents should be polled with respect to their opinions about the current quality of the City's beaches and their willingness to pay for additional enhancements. This data needs to be analyzed to ascertain the difference in response between frequent and infrequent beachgoers.

12) Methods to pay for the cost of implementing the Strategic Plan need to be considered that would be the most equitable and efficient. For example, beachgoers might be asked to pay a somewhat larger share of the total cost burden through parking fees, sales taxes, or hotel fees because of the special value they place on clean beaches. In addition, or alternatively, water pollutants could be taxed more heavily.

13) Given its budget pressures and this study's finding of the sizable gap between expected costs and benefits, the City of San Diego should consider requesting relief from the San Diego Water Board in achieving various TDMLs or in extending the period in which they are accomplished. This would allow a more thorough analysis of the potential effectiveness of such standards in San Diego. It also would allow more time to determine if solutions featuring lower costs with smaller impacts on established communities can produce significant improvements in water quality.

In conclusion, the objective of improving the quality of San Diego's important beaches and other recreational water bodies is commendable. However, at a time when the economic recovery is still relatively fragile, a measured and thoughtful approach appears warranted. This is particularly true given this study's finding of a large divergence between expected costs and benefits.

ENDNOTES

- 1 Multiple closures and postings may be recorded for any given day reflecting the conditions at the various beaches within the jurisdiction of the City of San Diego.
- 2 Based on its annual projections for population and average household size, FBFI estimates indicate that the number of households in the City of San Diego will grow at an average rate of 0.74% per year through 2030.
- 3 See for example Pendleton & Kildrow (2006).
- 4 Several studies have estimated the impact of beach spending. See for example, reports by King (2001). FBFI's study used survey data collected by Wiley, Leeworthy & Stone (2006).
- 5 Colford, Wade, Schiff, Wright, Griffith, Sandhu, et al (2006).
- 6 Dwight, Fernandez, Baker, Semenza, & Olson (2005).
- 7 Fleisher, Kay, Wyer, & Godfree (1998).
- 8 Survey data collected by Colford et al (2006) included the percent of swimmers in data collected over the summer months in Mission Bay. FBFI estimated the probable percentages of swimmers in each month in deriving an expected annual average for San Diego beachgoers.

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AGENCIES AND INSTITUTIONS CONSULTED

California Department of Finance

California Employment Development Department

California Environmental Protection Agency State Water Resources Control Board

City of San Diego Financial Management

City of San Diego Lifeguard Services

City of San Diego Transportation & Storm Water Department

County of San Diego Department of Environmental Health

County of San Diego Land and Water Quality Division

Department of Environmental Analysis & Design

Ocean Beach Main Street Association

San Diego City Fire-Rescue Department

San Diego Coastkeeper

San Diego Convention & Visitors Bureau

U.S. Environmental Protection Agency

Weston Solutions, Inc.

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LYNN REASER, CHIEF ECONOMIST

As a professional economist, Dr. Reaser brings extensive experience in the financial services sector with a keen ability to translate complex economic issues into understandable language with relevant and actionable implications. Dr. Reaser, a leading spokesperson for the University, conducts over 300 media interviews annually, including newspapers, magazines, television, radio, wire services, and the internet. She also addresses numerous domestic and international conferences and forecast events. She is presently a member of the PLNU School of Business Faculty, teaching managerial economics in the MBA program. Involved in public policy, she is the Chief Economist of the Council of Economic Advisors for California State Controller John Chiang, and is a participating economist in the S & P/Case-Shiller Real Estate Index and many other leading economic gauges and surveys. Dr. Reaser is active in many professional organizations including serving as past President of the National Association for Business Economics (NABE), which has also named her a Fellow for her contributions to the profession. This year, she received the NABE Outlook Award for the most accurate economic forecast in 2011-12.

Leading a skilled business and economic research team at the Fermanian Business & Economic Institute (FBEI), she is highly proficient at analyzing economic data, modeling, and forecasting, with special attention given to providing clear and concise recommendations for the reader. She brings an engaging, personal, and practical approach to writing and speaking on economic issues to all audiences with a passion towards using economics as a tool to assist people personally and in their enterprises. In her role as Chief Economist for the FBEI she provides actionable economic counsel to PLNU and its stakeholders. Guest lecturing, publishing, consulting, and public speaking are among many of her responsibilities. Consulting clients include Sempra Generation, San Diego Zoo Global, Equinox Center, San Diego Military Advisory Council, Jacobs and Cushman San Diego Food Bank, as well as other trade associations and professional organizations.

From 1999 to 2009, she served as the Chief Economist for the Bank of America Investment Strategies Group. Dr. Reaser provided the global and U.S. economic framework for investment strategy for high net-worth, institutional, and brokerage clients, encompassing over \$500 billion under management. She previously served as Barnett Bank's (Bank of America) and First Interstate Bank's (Wells Fargo Corporation) Chief Economist. In these roles she furnished economic advice for all of the Bank's various business lines, including consumer finance, business banking, real estate, and wealth management, and built and led an extraordinarily cohesive team of professional economists who advised senior management on tactical and strategies involving all aspects of their business.

Previously she served as Chairman of the American Bankers' Association's Economic Advisory Council. She has also served on the Governor's Council of Economic Advisors for the State of California; Leadership Florida; Boston Economic Club; was a fiscal advisor to cities of Los Angeles and San Francisco; California's Economic Strategy Panel; Chairman of the Board of Economic Advisors to the Los Angeles Area Chamber of Commerce; President of the Economic Roundtable of Jacksonville; President of the Los Angeles Chapter of the National Association for Business Economics; and member of the Editorial Advisory Board, Contemporary Economic Policy. She holds a B.A. in Economics (cum laude) and a M.A. and Ph.D. in Economics, all from the University of California, Los Angeles. She resides in San Diego, Ca.

**DIETER MAUERMAN, BUSINESS AND ECONOMIC RESEARCH ASSOCIATE**

Dieter Mauerman joined the staff of the Fermanian Business and Economic Institute (FBEI) as Research Assistant in January 2010 and in January 2013 was promoted to his present role as Business and Economic Research Associate. His role at the FBEI includes conducting field research, data acquisition and analysis, and crafting communications of the results of research and analysis for a wide range of client projects and presentations. Mauerman also manages the research teams that are required for some of the FBEI's larger consulting projects. He is a pending graduate of the Masters of Business Administration program at PLNU, and is currently preparing his thesis. He was awarded a certificate in economic measurement from the National Association for Business Economics in 2010. A 2009 undergraduate in Business Administration from PLNU, Mauerman possesses a strong quantitative and qualitative base including accounting, statistics, finance, management, strategy, and other courses. He also studied in London at Kingston University in business and culture enhancing his knowledge of international business, and in 2011 he joined with PLNU faculty and staff in an extended business and economic trip to France and Portugal which included many meetings and sessions with leading economists of the European Union.

He honed his experience by his internship with Matrix Media Technologies in 2008. At Matrix he conducted Competitive and Market Research which located competition data that allowed for more in depth pricing and strategizing. He also performed Online Brand Analysis and Lead generation which included conducting keyword research for major brands while factoring in search volumes. He also had sales experience in the form of crafting communications and targeting current and future clients to bolster overall sales.

In the years leading up to and including High School, Mauerman was active in the Boy Scouts of America organization for the full 12 years possible. During the later years of his scouting experience he held many different positions of senior leadership. Mauerman was also nominated and then inducted to the National Honor Society of the Boy Scouts of America, The Order of the Arrow brotherhood which recognizes the most exemplary scouts of the organization. He finished his scouting career with the highest rank attainable within the organization, Eagle Scout. He resides in San Diego, Ca.



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