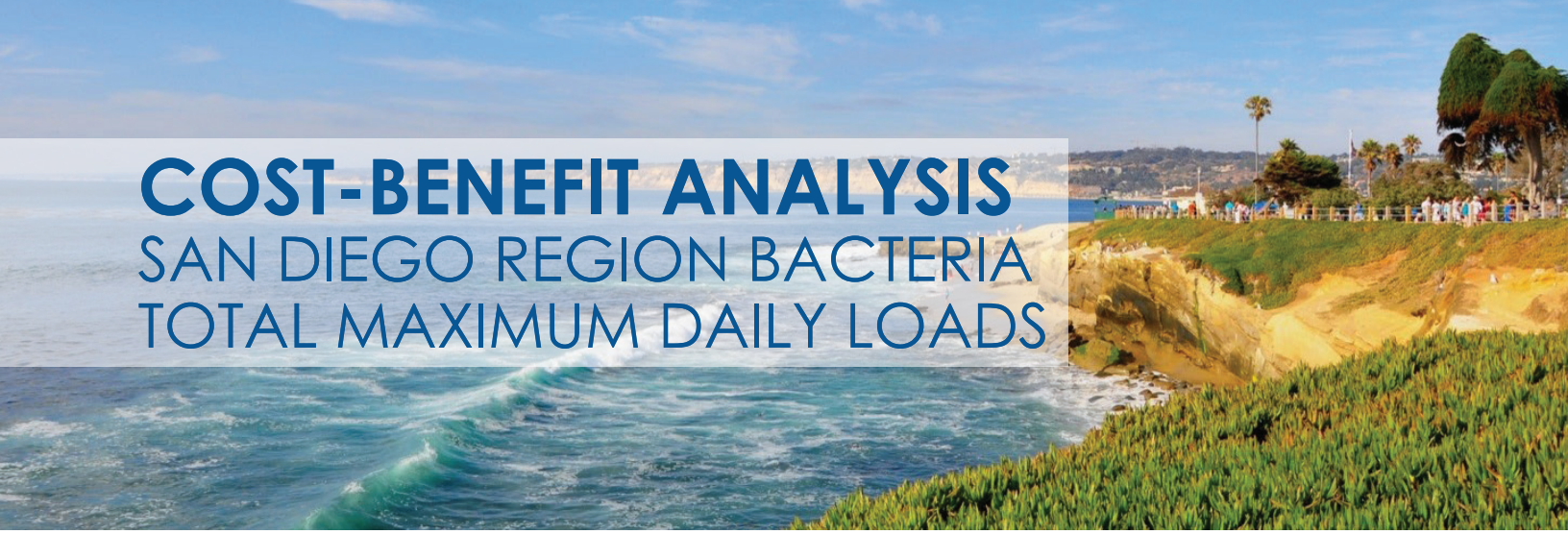

COST-BENEFIT ANALYSIS
SAN DIEGO REGION BACTERIA TOTAL MAXIMUM DAILY LOADS

Pathogens can threaten the health of those who recreate along the coastline and creeks of San Diego and Orange Counties. Water-borne pathogens can cause illness, requiring people to miss work and spend money for medical care; and beach closures can result in fewer tourists and visitors to coastal communities. Recognizing these potential impacts, state and federal agencies established the 2010 Bacteria Total Maximum Daily Load (TMDL) to limit the bacteria entering the region's coastal ecosystems during dry- and wet-weather conditions.

The Cost-Benefit Analysis (CBA) uses federal guidance and the most current practices in economic valuation to evaluate options for achieving Bacteria TMDL goals. It leverages results of a first-of-its kind wet-weather epidemiological study. The CBA evaluates a range of potential scenarios using the best available science and economic data to identify total benefit units, cost effectiveness and net benefits for each scenario. It provides unbiased and credible information to decision makers and stakeholders as they consider changes to TMDL implementation that could lead to greater benefits at a lower overall cost.

PROCESS AND SCENARIOS

The CBA includes selected streams and beaches of San Diego and Orange Counties, and evaluates fourteen scenarios that alter individual aspects of bacteria treatment to determine how costs and benefits change. The scenarios are grouped into four types:

Focus on stormwater implementation (Stormwater) by implementing traditional stormwater programmatic and structural practices that reduce runoff volume and bacteria on surfaces exposed to runoff.

Change schedule of compliance (Scheduling) by extending the TMDL compliance deadline beyond 2031 or aligning stormwater capital improvement projects with other municipal capital improvement plans to reduce project costs and gain synergy with other departments.

Target human waste sources of bacteria (Human Sources) by reducing human sources of bacteria from leaking sewer pipes, failing septic systems, and transient camps through structural repairs and social programs.

Reduce bacteria through stream restoration (Stream) by restoring streams and wetlands alongside rivers to filter runoff and bacteria.

For each scenario, the CBA performs (1) a health risk analysis that quantifies the illnesses expected given the scenario assumptions, (2) a benefits analysis that assesses health, recreation and environmental benefits compared to a business-as-usual baseline condition, and (3) a cost analysis that evaluates the costs of implementing each scenario's programmatic and structural practices (BMPs).

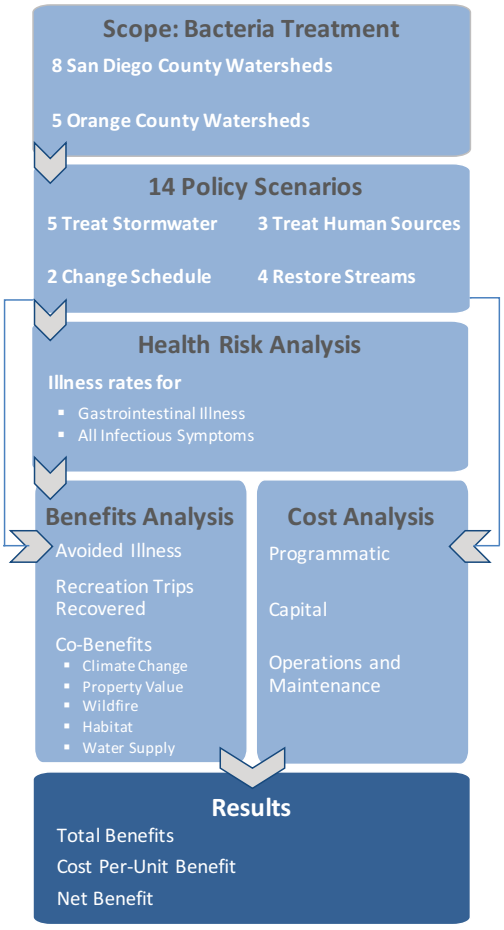

Figure 1. Summary of the CBA process including scope, major analyses and key results

RESULTS

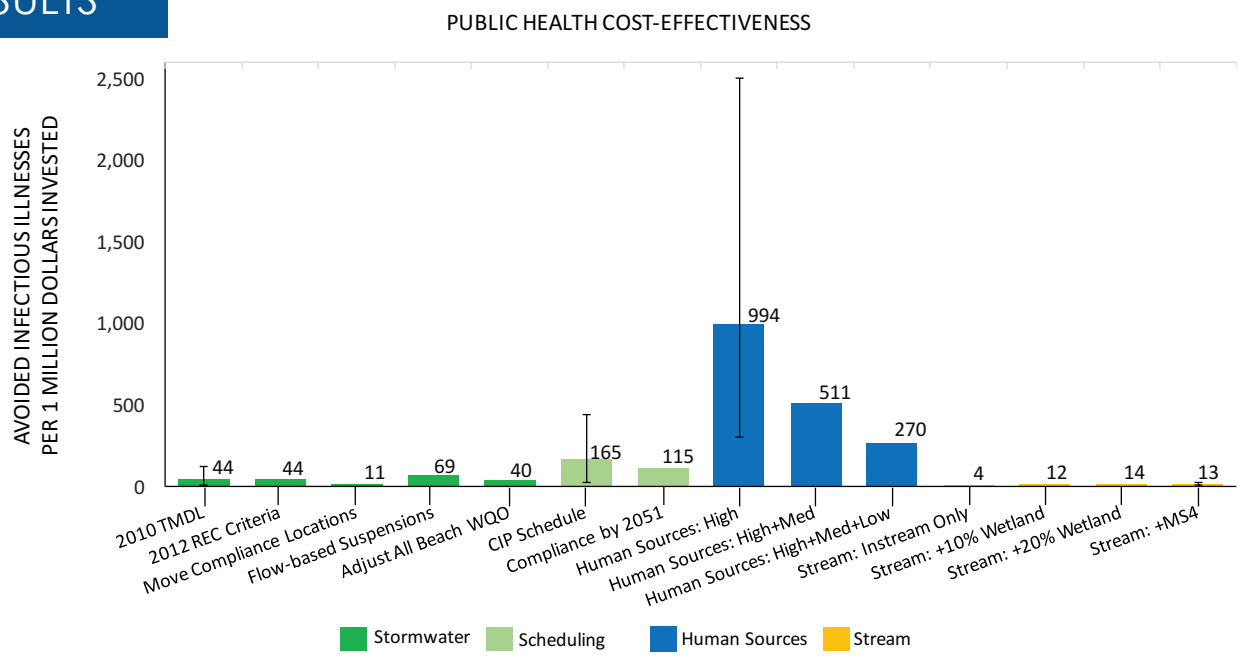

Figure 2: A chart showing number of illnesses avoided throughout the 65-year analysis period per million dollars invested. Human Sources scenarios (blue bars) provide many times greater cost-effectiveness compared to other scenarios. Whiskers indicate the ranges of uncertainty calculated using appropriate methods for each scenario; creating statistical high and low bracket values based on the important drivers of uncertainty in each scenario's benefits and costs.

FINDINGS

Targeting human waste sources of bacteria is the most cost-effective strategy to improve public health and increase recreational opportunities following rain events. The Human Sources: High scenario that focuses on treating high-risk sources of human pathogens is many times more cost-effective than the 2010 TMDL scenario that focuses on treating stormwater sources of bacteria (See Figure 2). Scenarios that coordinate implementation of stormwater projects with other capital projects or extend compliance timelines are cost-effective as well. Results are very similar for recreation cost-effectiveness.

Net benefits are negative for all scenarios. When total costs are subtracted from total quantifiable benefits in each scenario, the net benefits of each scenario are negative. Programmatic costs are the largest cost category for Stormwater scenarios because codes, education, street sweeping and other non-structural BMPs are sufficient to reduce bacteria loads in many watersheds. For benefits, co-benefits such as property value, riparian habitat and treatment of other water pollutants provide more than half of the total benefits value.

Uncertainty analysis and sensitivity testing provide important context to understand overall cost-effectiveness and net benefit findings. The CBA includes a substantial effort to provide a quantitative analysis of the uncertainty within the CBA results. This uncertainty calculation provides a "best estimate" that is analyzed in the CBA, then introduces high and low "bracket values" that are passed through the remainder of the analyses steps to show error bars in key CBA results. The CBA provides recommendations for additional research to further refine numeric results.

Together, these findings help policy makers to understand the effect of decisions to change compliance schedules, prioritize cost effective approaches or explore implementation together with other infrastructure projects. For more information, and to read the full report including additional results, visit the San Diego Regional Water Quality Control Board's CBA website at http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/issue3.shtml.

CBA Steering Committee

CBA Producers