

STATE OF THE BEACH REPORT BABY BEACH REGION, DANA POINT HARBOR, CALIFORNIA



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EXECUTIVE SUMMARY

Baby Beach in Dana Point Harbor, California is chronically posted by the Orange County Health Care Agency for the presence of fecal indicator bacteria in exceedence of State health standards as specified in California Assembly Bill 411 (AB411). The sources of these bacteria have remained elusive. Numerous Best Management Practices (BMPs) have been implemented at Baby Beach including:

- Storm drain plugs in the summertime
- Netting under adjacent piers to discourage bird nesting
- Expedited trash collection
- Public education with signage.

Yet, the bacteria persist. As part of this Clean Beaches Initiative (CBI) grant, three investigations were conducted in an attempt to identify the sources of the bacteria so that further BMPs targeted at potential sources could be selected and implemented to mitigate those bacteria:

- Data Mining: Historic water quality and associated data from 1997-2002 were collected, compiled, and analyzed systematically to attempt to discern trends, patterns, and correlations that could be used to identify sources of bacteria.
- Circulation Study: A 48-hour circulation study was conducted in September, 2002 to quantify the amount of circulation and water movement that occurs in the vicinity of Baby Beach. This was done to try to capture the relative amount of mixing that may be occurring or not occurring between the near shore waters of Baby Beach where the bacteria exceedences occur and the rest of Dana Point Harbor and the Pacific Ocean.
- Special bacteriological studies. Several specific bacteriological sampling and analytical events took place in 2002 to attempt to track the source of indicator bacteria to the beach. Some attempts were made to use advanced microbial source tracking techniques to try to identify the organism from which the bacteria originated.

These studies were completed at the end of 2002. The results in brief were:

- Bacteria appear to be entering Baby Beach from the storm drains even while the plugs are in place, indicating plug leakage. The most significant contributor of bacteria appeared to be the storm drains.
- Recreational boaters did not appear to be contributing bacteria.
- Bacteria did not appear to be leaking into or through groundwater from the storm drains or sewer lines.
- Bacteria were found to be resident and viable in sediments at the beach, especially near storm drains. This suggests that bacteria may remain resident in the environment and when sediments become resuspended due to wind or wave action, bacteria concentrations may increase.

- Bacteria appear to reside in seagull stool, particularly enterococci, and birds, particularly gulls and pigeons, may be a contributor of bacteria to Baby Beach waters.
- Bacteria concentrations fluctuate significantly during the day and the fluctuations do not appear to conclusively correlate with any specific factor. However, all three indicator bacteria measured fluctuated at similar times.
- Circulation during “typical” dry-season periods (May through September) is limited in the near-shore waters of Baby Beach. The “typical” summer winds appear to “pin” surface waters near the beach and create local eddies, which do not appear to mix very much with harbor waters.
- Advanced microbial source tracking methods were not capable of providing dependable answers regarding the animal (or human) sources from which the bacteria originated.

Thus, the results of the investigations suggest four (4) primary sources for which BMPs could be implemented:

- Contaminated discharges of urban runoff from storm drains;
- Bacteria resident in beach sediments,
- Limited near-beach water circulation, and
- Bacteria contamination from local birds.

BMPs were evaluated on the basis of effectiveness, implementability, and cost. The total remaining budget from the CBI grant for BMP implementation is approximately \$250,000. BMPs that were the most effective and implementable and remained within the available budget were selected. Table E-1 lists the BMPs that were developed and considered. Table E- 2 lists those BMPs that were of acceptable effectiveness and implementability and are recommended for implementation should bacteria levels not decline. Table E- 3 lists the BMPs that have been selected for implementation under the remaining CBI grant funding.

The BMPs selected were the most cost-effective based on the engineering analyses and professional judgment used during the evaluation.

Table E-1: Summary Comparison of BMPs					
Problem addressed BMP	Effectiveness	Implementability	Capital Costs	30 Year Present Value O&M	Total Present Value
Storm Drains					
Dry Season Plugs	Low-Medium to Medium	High	0	30,000	30,000
Year-Around Diversion	Low-Medium to Medium	Low	N/A	N/A	N/A
Dry Season Diversion	Low-Medium to Medium	Medium-High to High	170,000	20,000	190,000
Eliminate Bacteria Sources Year-Round	Low-Medium to Medium	Low	1,000,000	150,000	1,150,000
Eliminate Dry-Season Runoff (Irrigation Controllers)	Low-Medium to Medium	Medium to High	95,000	0	95,000
Sediments					
Dredging - Beach Replacement	Low to Medium	Low to Medium	125,000	385,000	510,000
Artificial Aeration/ Mixing of Sediments	Low	Medium	50,000	461,000	511,000
Limited Water Circulation					
Artificial Circulation of Water (INSTREEM)	Medium	Medium	120,000	277,000	397,000
Breakwater Modification	Low to Medium	Low	5,000,000	0	5,000,000
Birds					
Netting at Pier	Medium to High	High	10,000	30,000	40,000
Sonic Repellers	Low	Medium to High	20,000	30,000	50,000
Expand Trash Disposal/Collection	Low to Medium	High	10,000	80,000	90,000
Expand Public Education with Signage	Medium	High	5,000	77,000	82,000
Falconry	Medium	Low	30,000	480,000	510,000
Netting, Trash Collection, and Public Education	Medium to High	High	25,000	187,000	212,000

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Table E- 2: Medium to High BMP Alternatives					
Problem addressed BMP	Effectiveness	Implementability	Capital Costs	30 Year Present Value O&M	Total Present Value
Storm Drains Dry Season Diversion	Medium	Medium-High to High	170,000	20,000	190,000
Eliminate Dry-Season Runoff (Irrigation Controllers)	Medium	Medium to High	95,000	0	95,000
Limited Water Circulation Artificial Circulation of Water (INSTREEM)	Low-Medium to Medium	Medium	120,000	277,000	397,000
Birds Netting, Trash Collection, and Public Education	Medium to High	High	25,000	187,000	212,000
Totals			410,000	484,000	894,000

Table E- 3: Selected BMP Alternatives					
Problem addressed BMP	Effectiveness	Implementability	Capital Costs	30 Year Present Value O&M	Total Present Value
Storm Drains Eliminate Dry-Season Runoff (Irrigation Controllers)	Medium	Medium to High	95,000	0	95,000
Limited Water Circulation Artificial Circulation of Water (INSTREEM)	Low-Medium to Medium	Medium	120,000	277,000	397,000
Birds Netting, Trash Collection, and Public Education	Medium to High	High	25,000	187,000	212,000
Totals			240,000	464,000	704,000

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1.0 PROJECT INTRODUCTION AND OBJECTIVES

Baby Beach, located in the northwestern area of Dana Point Harbor, California (Figure 1-1), has been routinely posted since the passing of Assembly Bill 411 (AB411) in 1999 due to bacterial contamination. Best management practices (BMPs) implemented to date have had limited effectiveness.

Specifically, routine bacterial monitoring of seawater at four near shore sampling sites (Figure 1-1) at Baby Beach has often shown levels that exceed AB411 water quality standards. The sites include:

- West end (station number BDP12),
- Buoy line (BDP13),
- Swim area (BDP14) and
- East end (BDP15) of Baby Beach (Figure 1-1).

A series of investigations have been conducted to help identify the sources of bacteria. These include:

- Data Mining
- Circulation (tidal and currents)
- Bacteriological Special Studies

Each of these investigations was reported separately (SAIC 2003a, SAIC 2003b, Orange County Public Health Laboratory et al. 2003). This State of the Beach report provides an overview of results and conclusions from the three investigations and evaluates BMPs for potential implementation at Baby Beach.

The reports fulfill part of the grant funding awarded to the County by the State Water Resources Control Board (SWRCB) under the Clean Beaches Initiative (CBI). The goal of the CBI is to help provide solutions for improving water quality at beaches subject to chronic contamination, particularly due to bacterial sources.

Data from the Special Studies, coupled with results from the Data Mining and Circulation Study investigations, are used to evaluate potential sources of bacteria at Baby Beach:

- Storm drains
- Seepage from stormdrains or sewers into shallow groundwater and ultimately to the beach waters
- Poor water circulation in the Baby Beach vicinity
- Resuspension of bacteria in sediments due to episodic (e.g., influenced by storms and high waves/winds) currents and tides
- Correlation with birds or other biological vectors

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Figure 1-1: Baby Beach Site Map

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- Releases from boaters during heavy boat use days
- Consistent spatial and temporal differences that occur systematically and could potentially point out a source
- Specific biological vectors as sources using advanced microbial source tracking methods (MST)

Based on these data, objectives of this report are to integrate the results and conclusions of the three reports and to evaluate potential BMPs for improving water quality subject to chronic bacterial contamination. A synopsis of the three studies is presented in Section 2. BMP evaluations and recommendations based on these data are provided in Sections 3 and 4.

2.0 SYNOPSIS OF RESULTS AND CONCLUSIONS

This section presents a synopsis of the three studies: Data Mining, Circulation Study, and Special Studies.

2.1 Data Mining Report (SAIC 2003a)

General Trends. In this report, data that was collected by the County and other agencies from 1997-2002 was systematically compiled into a database and analyzed. These data show a long-term general decrease in the concentration and frequency of fecal and total coliform contamination, suggesting there has been some benefit of current BMPs, such as storm drain plugs. However, *Enterococcus* values have increased slightly in concentration and frequency from 1999 to 2002. *Enterococcus* are one of the indicator organisms used under the AB411 program for determining if a beach should be posted with a health warning. *Enterococcus* is also being recommended by USEPA as an indicator organism for regulating surface waters for achieving pathogen water quality objectives. If *Enterococcus* values are rising, this could indicate increased pollution from sewage or other bacteria sources. Results also indicated a strong influence of rainfall on bacterial contamination, particularly at the Baby Beach sampling stations.

Bird Influence. Some increases in contamination may potentially have been associated with increased bird abundance. However, the lack of consistently collected bird data indicated that additional data and studies were needed to verify any relationships of bacteria with this potential source.

Boat Influence. There was no obvious relationship between high boat use days and bacterial contamination, but increases in other potential sources such as rainfall and/or birds often occurred on the same days so final conclusions could not be determined due to this overlap. This conclusion also suggested that additional study was necessary.

Tidal Influence. No relationships of bacterial contamination to tidal data were evident, although this is likely due to the fact that bacterial compliance data were collected once

per week, which is not of sufficient frequency to do a correlation study with tidal signals which swing from low to high once every 6 hours.

2.2 Circulation Study (SAIC, 2003b)

General Circulation Patterns. A two-day circulation survey was conducted in September, 2002. The results indicated that currents within Dana Point Harbor were most strongly influenced by ocean tides, generally ebbing and flowing towards or away from Baby Beach with these corresponding tidal cycles. The currents at discrete measurement locations were often highly variable in speed and direction. Surface currents in the immediate vicinity of Baby Beach were generally slow and on average directed towards the shoreline. There appeared to be limited circulation exchange between waters near Baby Beach and further in the harbor channel.

As detailed below, the study results suggest that general flow conditions can hold surface waters in the vicinity of Baby Beach. Therefore, bacteria, once released to near-shore beach waters could be restricted to the immediate vicinity of the beach, possibly contributing further to the high incidence of postings.

Wind Influence. During periods of strong winds, without a strong tidal flow or significant waves, the surface currents appeared to be mainly driven by the winds. These winds appear to tend to “pin” water near the beach and, restrict water flow. Local eddys observed during the circulation study could be trapping surface waters along Baby Beach and possibly prevent the “flushing” of surface pollutants from the beach region. Because of this, water quality problems may be exacerbated by relatively limited circulation in the immediate vicinity of Baby Beach. Note, circulation patterns in the main channel area of the harbor suggest that there is movement of water through the west breakwater into and out of the harbor channel. However, in the immediate vicinity of Baby Beach, where bacteria samples are collected for AB411 compliance and where swimming activities occur, little mixing with the harbor channel was apparent.

Wave Influence. Wave energy is generally transmitted through the west breakwater, flowing toward Baby Beach and appearing to pin surface waters in the immediate area of the beach. When large waves are transmitted episodically through the breakwater, bottom sediments in the northwest end of the harbor (adjacent to the west storm drain outlet), may be resuspended and moved towards Baby Beach. An example of this process was noted when 6-10 foot waves from a south swell were observed on the seaward side of the west breakwater during a joint Circulation Study and Special Study field evaluation of potential discharges from boats (Section 2.3). Contaminants associated with floating and/or resuspended particles or sediments in the northwestern portion of the harbor could flow toward or along Baby Beach under the influence of tides, winds, and waves.

Winds and wave patterns can vary significantly throughout the year, particularly during seasonal shifts in weather patterns, and the Circulation study represents only a two-day period during one summer season at Baby Beach. Additional studies are needed to

evaluate currents under variable conditions, although this study is believed to have captured conditions that occur with relative frequency throughout the summer. These conclusions are a good starting point for understanding how circulation may be impacting bacterial concentrations at Baby Beach, but more data are needed to draw firm conclusions.

2.3 Special Studies (Orange County Public Health Laboratory et al. 2003)

Special bacteriological studies were conducted in the Baby Beach vicinity during Summer and Fall 2002. These consisted of seven field sampling and laboratory analysis programs to evaluate the potential sources of bacteria and one laboratory-focused program to evaluate the potential for advanced microbial source tracking methods to identify specific sources of bacteria. These collective studies helped verify patterns and trends suggested from the Data Mining and Circulation investigations by evaluating the following:

- Spatial source and magnitude of indicator bacteria, including patterns and trends to the extent practicable; and
- Species (e.g., birds, humans, etc.) generating the indicator bacteria, to the extent practicable.

Storm Drain Seepage and Groundwater. Studies at the West End Storm Drain confirmed that indicator bacteria were entering Baby Beach from the storm drain outlet while the plugs were installed. Groundwater well studies confirmed that bacteria were not migrating through groundwater from the storm drains or sewer.

Storm Drain Influence and Sediment Contamination. Transect studies extending from the west storm drain further confirmed that concentrations of indicator bacteria (particularly enterococci) in sediments and water samples were highest near the drain and decreased with distance from this apparent source area. Some relationship of concentrations in water and sediments was suggested that contaminated water from the storm drain contributes to contamination in the sediments.

An additional “10-Week” study was conducted to evaluate temporal variations of indicator bacteria in water and sediments from the Baby Beach region, including the West and East Storm Drains. This study also concluded that the drains represented the highest apparent point source of contamination. However, temporal variability was high and trends or correlations could not be made with this data.

It is notable that an incidental observation from the boat study (below) showed that large waves and swell along the outer breakwater caused substantial disturbance and resuspension of sediments in the Baby Beach, vicinity. During this disturbance, sharp increases in bacterial concentrations in water samples were observed, suggesting a direct cause and effect relationship.

Finally, a study of bacterial indicators in intertidal and subtidal sediments suggested that enterococci can survive in sediments, consistent with results from several other studies (e.g., Christian 2002; Craig et al. 2000; Desmarais et al. 2002).

Boat Influence. A study of potential bacterial indicator contamination from recreational boat discharges was conducted during and after the Labor Day weekend in 2002. Results indicated no measurable impacts from the boats.

Other Parameter Influences. Two 12-hour studies (2-hour sampling intervals) evaluated the potential influence of changes in tides, birds, humans, boats, temperature, specific conductivity, dissolved oxygen, pH, total dissolved solids, dissolved oxygen saturation percentage, turbidity, and solar irradiance on bacterial indicator concentrations. General trends in data suggested:

- Bacteria concentrations varied widely with time. The three indicator bacteria trended similarly. The cause of the trends was not determinable from the data collected.
- There was a slight possible correlation between bacteria concentrations and bird counts, but strong conclusions were not possible. It is possible that some detected bacteria come from local bird populations, but probably not all.
- Enterococci were detected in bird stool samples from these 12-hour studies.
- No relationships with bacterial indicators were observed for the other parameters. Additional studies may be needed to broaden the data set.

Microbial Source Tracking (MST) Studies. Blind spiked sample validation studies tested two *Bacteroides* methods and one Microbial Community Analysis (CA) method for potential use in determining bacterial sources. The *Bacteroides* methods reported some false positives and non-detects of known spikes. However the CA method was able to successfully amplify rRNA material from environmental fecal indicator bacteria suggesting the potential for determining if the microbiological “fingerprint” of one sample differs significantly from another sample. Such “fingerprinting” of water samples shows potential for identifying potential sources of contamination on a geographical basis. However, the method is not highly focused on determining what organism the bacteria originated from. Comparing genetic markers amplified and detected by CA with known libraries of genetic markers may allow identification of specific pathogens or identification of source specie for indicator bacteria, but the method is not sufficiently developed at this time to be used in such a fashion. It was concluded that more method development and testing was needed prior to broad-scale use for environmental sampling and decision-making.

2.4 Integrated Results and Conclusions

Combined results and conclusions from the Data Mining, Circulation, and Special Studies are summarized in Table 2-1.

These data suggest the following most likely sources of bacterial contamination and conditions that influence patterns and trends:

- West and East Storm Drains at Baby Beach (drainage from watershed);
- Sediments, particularly fine-grained near storm drains that appear to serve as some sort of reservoir or regrowth medium for bacteria from other sources; and
- Weak circulation in the very near-shore waters where AB 411 sampling occurs.
- Some amounts possibly from birds on the beach;

Compared to these sources and conditions, other factors such as , relationship to bacterial contamination.

Potential Sources or Influences	Data Mining	Circulation Study	Special Studies
Storm drains	Yes; historical data patterns	NA	Yes; gradient studies of water and sediments
Birds, primarily gulls and pigeons, on beach	Maybe; some possible historical data patterns	NA	Possibly, small correlation observed in one 12-hour study
Other Animals	NA	NA	NA
Sediments	NA	Yes; elevated bacteria in sediments; also in water samples from same day as Circulation Study high surf/swell	
Boats	Inconclusive; insufficient data	NA	No; limited scope, but results fairly conclusive
Tides, Currents, Circulation	Probably; general trends, but no statistical correlation (likely data limited)	Yes; incoming/flood tides “pin” water near Baby Beach; tide plus wind patterns produce eddys that restrict flow (and mixing) away from beach	Probably; general trends, but limited data
Winds	NA	Yes; onshore-directed winds “pin” water near Baby Beach	NA
Humans on Beach	NA	NA	No; unlikely, even though limited scope of data
Time of Day/Solar Irradiance	NA	NA	Potential weak pattern, but limited data
Other Physical/Chemical (e.g., dissolved, pH, nutrients, etc.)	NA	NA	No; unlikely, even though limited scope of data
NA = Not analyzed in listed study.			

3.0 EVALUATION OF BMPs AND RECOMMENDATIONS

This section presents an evaluation of BMP alternatives for four categories of water quality problems related to bacterial contamination at Baby Beach:

- Contaminated discharges from storm drains;

- Bacteria resident in beach sediments,
- Limited near-beach water circulation, and
- Bacteria contamination from local birds.

The BMPs were evaluated on the basis of:

- Effectiveness: How well would the BMP reduce bacteria concentrations in beach water? A rating of low, medium, or high effectiveness was assigned.
- Implementability: How likely is it that the BMP could be installed at Baby Beach based on engineering/technical and/or administrative constraints? A rating of low, medium, or high effectiveness was assigned.
- What would the estimated cost of installing the BMP be within a range of accuracy of +50 to -30%? A dollar value was assigned that is expected to be within +50 to -30% of the actual installed cost.

At the end of this section all the BMPs evaluated and the results of the evaluations are listed comparatively. Section 4 lists the recommended BMPs to be implemented under the current Clean Beaches Initiative (CBI) grant.

3.1 Problem 1- Contaminated Discharges from Storm Drains

As discussed in Section 2 of this report, investigations suggested that even with the plugs installed, the storm drains were still contributing bacteria to the Baby Beach waters. This section evaluates alternatives that deal with this specific problem.

3.1.1 Potential Alternatives

The following BMP alternatives were evaluated to address contaminated discharges from storm drains:

- continued use of dry season plugs;
- diversion of the east and west stormdrains to the sanitary sewer
 - year-round;
 - dryweather only
- watershed controls to reduce source contamination or source runoff
 - dryweather only
 - year-round.

3.1.2 Continue Use of Dry Season Plugs

Under this alternative, as is currently being done, storm drain plugs would be installed in the East and West storm drains during the dry season, from about April 15 to October 15. Water that accumulates behind these plugs would be periodically pumped with portable pumps to the sanitary sewer. The sanitary sewer is managed by the South Coast Water District (SCWD) and flows to the wastewater treatment plant managed by

the South Orange County Wastewater Authority (SOCWA), of which SCWD is a member.

3.1.2.1 Effectiveness

Effectiveness of this BMP is low-medium as a continuing method to reduce dry season contamination at Baby Beach. Studies by the County at the West End Storm Drain have shown that water with indicator bacteria are leaving these storm drains while the plugs are installed and entering beach waters.

This BMP also would not mitigate the bacterial contamination during the wet season.

3.1.2.2 Implementability

Implementability of this BMP is high. This BMP is already implemented. Some improvements to the plug system may be attempted, but it is believed that the current plug system is as effective as possible. After trying different plug systems, the current "Pillow Plug" design was determined to be the most effective and reliable (T. Rossmiller, City of Newport Beach, personal communication). This BMP requires regular monitoring during the dry season, maintenance, and manual pumping operations. The current pumping of the backwater to the sanitary sewer has been permitted by SCWD and SOCWA on a short- to mid-term basis (T. Rozales, South Orange County Wastewater Authority, personal communication).

3.1.2.3 Cost

Cost for this BMP is approximately \$5,000 per year for labor, materials, and equipment to install, inflate, pump backwater from, deflate, remove, and, when needed, replace the plugs. The plugs are already owned and used by the County at this location. Principal recurring costs are for plug maintenance and monitoring and pumping of collected runoff by County personnel. There is currently no cost for treatment of this runoff by SCWD and SOCWA. The transferred runoff has helped to flush sanitary sewer lines in a low-gradient area, which has benefited SCWD operations (T. Rossmiller, City of Newport Beach, personal communication). This annual cost calculates to a present value of approximately \$77,000 using a 5% discount rate and 30 year period.

3.1.3 Year-Around Diversion into Sanitary Sewer System

This BMP alternative would permanently intercept and eliminate both dry and wet season flows from the East and West Storm Drains by diverting them into the sanitary sewer system.

3.1.3.1 Effectiveness

Effectiveness of this BMP would be high because all of the contaminated discharges from these storm drains would be diverted to the SCWD sewer and SOCWA treatment facility instead of the discharging into Baby Beach. The exception would be during any overflow periods of moderate to high rainfall that exceeded the capacity of the collection system.

3.1.3.2 Implementability

Implementability of this BMP is low. Physical routing of the West and East Storm Drain discharges to the sanitary sewer system is feasible, but higher wet season storm flows are expected to overwhelm the current sanitary sewer system leading to the SOCWA treatment facility. Additionally, the SOCWA facility is already near its hydraulic loading limit (T. Rossmiller, City of Newport Beach, and T. Rozales, South Orange County Wastewater Authority, personal communications), and cannot accept significantly greater flows during wet weather than those that already enter the sanitary sewer system.

3.1.3.3 Cost

No cost estimate is presented for this BMP because diversion of wet weather storm flows to the SOCWA facility would not be feasible due to limited hydraulic capacity. A cost estimate for dry season diversion to the sanitary sewer is presented below.

3.1.4 Dry Season Piped Diversion into Sanitary Sewer System

This BMP would intercept and divert dry season watershed runoff flows from the East and West Storm Drains to the sanitary sewer. Connecting lines to the sanitary sewer would be constructed and valves installed. The valves would divert flow to the sanitary sewer from April through October. The valves would be turned to allow flow to continue through the storm drain outlets during the winter months.

3.1.4.1 Effectiveness

Effectiveness is medium for overall control of contamination at Baby Beach from discharges into the West and East Storm Drains. This BMP would be more effective at reducing bacterial contamination during the dry season than the current plug system is because the proposed valves would have a lower likelihood of leakage. The summer months are when public use is highest for the beach, so this is the most important time of the year to mitigate the runoff. However, this system would not address wet season runoff, which still impacts the beach.

3.1.4.2 Implementability

Implementability of this BMP is medium-high. Routing of the West and East Storm Drain discharges to the sanitary sewer system is feasible from an engineering and construction standpoint. However, issues may arise during permitting for connecting to the sewer system. Dry season flows are already being pumped into the sewer system as part of the storm drain plug program described above, and these relatively low volumes would not represent an issue for hydraulic loading to the SOCWA facility. However, the current agreement with SCWD and SOCWA for discharge to the sanitary sewer for the plug system is not a long-term agreement. Obtaining a long-term agreement for a permanent diversion will require further discussions with SCWD and SOCWA (T. Rozales, South Orange County Wastewater Authority, personal communication).

3.1.4.3 Cost

Purchase and installation of the diversion equipment is estimated at about \$60,000 for each storm drain, or \$120,000 for both. Engineering and permitting is estimated to cost approximately \$50,000 for a total capital cost of approximately \$170,000.

SCWD and SOCWA are currently not charging a discharge fee for treatment of dry season flows that are currently pumped from behind the plugs into the sanitary sewer. Approximately 190,000 gallons of runoff from the West Drain, and 10,000 gallons of runoff from the East Drain are expected to require treatment (T. Rossmiller, City of Newport Beach, personal communication) per season.

However, for a permanent diversion there is likely to be a charge by SCWD/SOCWA. The cost of treatment for diverted flows are estimated to be approximately \$1,000 per million gallons, or \$.001 per gallon, resulting in an annual cost of \$200 for treatment of dry weather flows from both storm drains (T. Rozales, South Orange County Wastewater Authority, personal communication). Other annual operations and maintenance such as sewer cleaning may average approximately \$1,000 per year. Total annual operations and maintenance are estimated to be approximately \$1,200 per year. The total 30-year present value (5 percent discount rate) operation and maintenance costs are estimated to be approximately \$20,000.

3.1.5 Year Round Elimination/Treatment of Contaminated Flows from Watershed into Storm Drains

This BMP alternative consist of:

- Finding sources of bacteria in the drainage that enter the east and west storm drains
- Mitigating bacteria and/or water that leaves those sources and enters the east and west storm drains on a year round basis.

3.1.5.1 Effectiveness

Effectiveness of this BMP would be medium to high. If the sources can be identified and mitigated, then this should be a highly effective solution. Also, rather than with “end-of-pipe” treatment solutions such as stormdrain diversions, mitigating the source provides significant long-term benefits to other water pollution concerns in addition to beach contamination.

3.1.5.2 Implementability

Implementability of this BMP is expected to be low.

- Tracking bacteria through the entire watershed to find their source is very problematic. Years would be needed to conduct such an investigation. Even with the small drainage area of baby Beach, it is likely that tens of thousands of samples would need to be analyzed for bacteria. There is usually no single source of pollution. Also, identifying bacterial strains unique to human, bird and animal hosts using molecular typing methods is complex. Some species of bacteria are shared

between hosts. The DNA pattern of a single species of bacteria may also change over time due to environmental pressures. The patterns may be so similar that clustering of strains around certain DNA patterns is used to indicate the probability that the bacterial strain from the water came from humans or other sources. Thus, even with the small drainage area of baby Beach, hundreds of bacterial isolates would need to be collected from the water and potential sources for statistical analysis following MST testing. If current methods to enumerate fecal indicator bacteria are used to make decisions regarding sources, numerous duplicate sampling efforts would be needed. Additionally, once one leaves the stormdrain system to a piece of property, finding the source on that property becomes equally problematic due to the difficulty of sampling sheet flows of water and administrative issues with property access.

- Once the source is identified, mitigating it may be challenging. Should the source be unidentifiable on a piece of property and one wishes to mitigate all surface flows from that property and then disinfect those flows prior to entering the stormdrain system, designing the retention and treatment system for stormflows would result in a very large and probably expensive retention and treatment system. It is not likely that the land footprint exists to retain storm flows sufficiently for adequate treatment.
- Mitigating flows from properties through the installation of things like pervious pavement may not be administratively implementable for existing property, but could potentially be implemented in new developments. However, the drainage area into the Baby Beach area is currently built out and little, if any, new development is likely.

3.1.5.3 Cost

The costs of sufficient studies to identify sources cannot be accurately predicted at this time. As an example, the studies conducted at Baby Beach cost approximately \$250,000 in professional labor, sampling labor, and analytical services. To extend this throughout the drainage area would require substantially more labor and analytical services than those expended in the current series of investigations.

Should the sources be identifiable, site-specific BMPs at various properties deemed to be sources could potentially range from inexpensive at \$10,000 to fairly expensive at \$100,000 per property. Thus, it is possible for costs for site-specific BMPs at dozens of properties to accrue to the hundreds of thousands of dollars.

In short, it is reasonable to anticipate that costs for this alternative could approach or exceed \$1M. Annual operations and maintenance (O&M) of numerous source control BMPs could reasonably be expected to range near or exceed \$10,000 per year, resulting in a 30 years present value (5 percent discount rate) for O&M of \$150,000 or more.

3.1.6 Dry Season Elimination of Runoff Flows from Watershed into Drains

This BMP alternative would involve identification and elimination of non-stormwater discharges in the treatment area. This would be accomplished with a number of steps:

- Installation of evapotranspiration irrigation controllers on irrigation systems within the Baby Beach drainage. Evapotranspiration controllers are devices that adjust the amount of time an irrigation system runs and when the irrigation system runs based on local weather data. The local weather data is used to estimate the precise amount of water needed by a type of vegetation in order to remain healthy. Thus, over-watering does not occur. Stopping over-watering prevents runoff from leaving a plot and entering the storm drain and it prevents water from infiltrating below the vegetative root zone and migrating laterally through soils into the storm drains.
- Passing of and enforcement of ordinances that restrict car-washing on city streets or areas that drain into city streets or storm drains within the Baby Beach drainage.
- Enforcement of ordinances (Municipal Code 15.10.040) restricting outdoor wash-down of restaurant facilities in the Baby Beach drainage.
- Passing of and enforcement of ordinances that restrict wash-down of sidewalks or building exteriors within the Baby Beach drainage.

These measures would eliminate most of the dry-weather urban runoff that enters the Baby Beach storm drains und the summer months. It would not eliminate the bacteria. It would not eliminate winter stormwater flows. These stormwater flows may contain bacteria. However, the summertime flows would be almost eliminated and the summer is the time during which beach usage is the highest.

3.1.6.1 Effectiveness

Effectiveness of this BMP would be medium. Summer flows would be almost entirely eliminated. Therefore, if this alternative is implemented, little water is expected to enter the East and West stormdrains that lead into Baby Beach during the summer months. During the winter months, however, stormwater will still flow into the storm drains and into Baby Beach. This measure does not remove bacteria from the winter storm flows. It removes the summer urban runoff flows.

It will probably not be feasible to eliminate 100 percent of all summer urban runoff flows for the following reasons:

- Enforcement and education programs are rarely 100 percent effective. Education programs can require considerable periods of time for measurable effectiveness to be observed.
- There may be administrative difficulties in installing evapotranspiration irrigation controllers on some of the private parcels within the drainage that delay their installation somewhat.

Note, implementing this alternative in conjunction with dry-weather diversions of the East and West storm drains is expected to be highly effective and cost-effective at

mitigating the movement of bacteria from the Baby Beach drainage area into the Baby Beach waters during the summer months, when beach usage is highest.

3.1.6.2 Implementability

Implementability is estimated to be medium to high:

- Ordinances restricting outdoor wash-down of restaurant equipment and other items already exist in the City of Dana Point (Municipal Code 15.10.040). Increasing enforcement should be administratively feasible. It may require a funding source outside of the CBI grant.
- Creating additional ordinances may be challenging. The current political climate in Dana Point appears to be conducive to the passing of additional ordinances restricting activities that result in discharges to storm drains. However, there is always uncertainty regarding the political will of a community to restrict behaviors that have traditionally been allowed.
- Enforcement and education programs are not expected to be 100 percent effective. There are likely to be occasional violations that are not caught.
- Evapotranspiration irrigation controllers have been shown to be highly effective at eliminating over-watering by the City of Irvine. However, compelling private land owners or tenants to install them may be administratively challenging in some instances. A substantial amount of land in the Baby Beach drainage is owned and maintained by the County. 100 percent of this land can have an evapotranspiration irrigation system installed with little problem. A substantial number of non-County landowners and tenants are likely to allow the installation of evapotranspiration irrigation controllers under this program, particularly if the CBI grant money is used to fund the installation. The water cost savings would be an additional benefit to landowners. However, there may be a small number of landowners or tenants who, for some reason, would not voluntarily allow the installation of such irrigation controllers.

Based on these factors, we believe that this alternative's implementability is medium to medium-high. Note again, that implementing this alternative to the extent practicable plus installing dry-weather diversions of the stormdrains is likely to be highly effective during the summer months. Additionally, implementing this alternative to the extent practicable is likely to reduce the annual costs of the dryweather diversions by reducing the urban runoff flows that ultimately are diverted from the stormdrains. Hence, implementing both alternatives may prove more cost effective than implementing only one of the alternatives

3.1.6.3 Cost

It is anticipated at this time that the cost of ordinance passing and enforcement will fit within current City of Dana Point and County of Orange budgets. Some coordination with the City of Dana Point will be necessary to track progress. Labor costs associated with this progress tracking are already built into the County of Orange and City of Dana

Point NPDES compliance budgets. Installation of the evapotranspiration control system within the drainage is estimated to be approximately \$95,000.

Once evapotranspiration controllers are installed, they will require some operations and maintenance much as the current irrigation system requires operation and maintenance. There is also a savings in water costs due to less water being used for irrigation. For the purpose of this analysis, we have assumed that the savings in water cost by the County covers the operations and maintenance cost increase to the irrigation systems that are incurred due to the evapotranspiration irrigation controllers.

3.2 Problem 2- Contaminated Sediments

As discussed in Section 2 of this report, viable bacteria, especially enterococci, were found in high concentrations in sediment, indicating that they are residing in sediments at Baby Beach. It is unknown how long these bacteria remain viable in the sediments or if they can multiply in those sediments, however given the high levels detected, it is reasonable to assume that either long term deposition and/or growth is occurring. However, because bacteria become associated with sediments and do remain viable for some period of time, removing the source of bacteria may not be sufficient to achieve AB411 compliance. It may be necessary to remove or sanitize existing sediments.

3.2.1 Potential Alternatives

BMP alternatives to address potential contamination from sediments are presented in two general categories: sediment removal via dredging and artificial aeration and mixing.

3.2.2 Dredging – Beach Replacement

This BMP alternative would involve dredging and disposal of sediments at Baby Beach identified to contain bacteria and replacement with clean beach-compatible sand. New beach material would be verified with bacteriological sampling and testing. Sediment disposal would be at an EPA approved offshore disposal site. Because of the presence of bacteria, direct beach replenishment is not being considered. However, it may be possible to stockpile the sediment in a manner that results in destruction of the bacteria and then find a beneficial use for the sediment such as construction fill material in another location. However, for the purpose of this analysis, it is assumed that the relative costs of offshore disposal with the necessary testing and permitting will be commensurate with upland stockpiling, testing, and re-use.

3.2.2.1 Effectiveness

Effectiveness of this BMP would be low to possibly low-medium for removal of this secondary contaminant source. Success would depend on elimination or reduction of primary contaminant sources such as storm drain discharges. Long-term success may be difficult if bacteria seeded in sediments from (1) wet weather runoff (2) birds

defecating on the sand and in the water or (3) other unidentified sources re-establish residency in the sediments. Recent studies in Lake Michigan by the United States Geological Survey on a similar beach sediment replacement project showed that after several weeks newly placed sediments showed viable concentrations of enterococci (Donna Ferguson, Orange County Health Care Agency personal communication).

3.2.2.2 Implementability

Implementability would be low to medium. Although dredging and disposal of sediments from this general area has been conducted historically, and the dredging technology and equipment are mature technologies, it may take several years to implement this alternative. It would be necessary to test the sediments and permit their disposal at an offshore disposal facility with the U.S. Army Corps of Engineers and California Coastal Commission. It would also be necessary to identify a source of clean sand and do the necessary permitting to remove that clean sand from its borrow source and deposit it at Baby Beach. Environmental permitting could be time consuming.

3.2.2.3 Cost

Unit costs from 1999 were \$26 per cubic yard to dredge and dispose of material at an offshore site. This inflates to approximately \$30 per cubic yard in 2004 dollars. The total quantity of sediments requiring removal at Baby Beach is estimated to be approximately 750 cubic yards. Approximately twice this amount, or 1,500 cubic yards is needed for beach replenishment. This is because sediments have been depleted through wind, wave, and tidal action since the last time they were replenished. Mobilization and demobilization costs would be about \$5,000. Required testing of the existing sediments to confirm suitability for ocean disposal, and permitting, engineering, and oversight could cost approximately \$50,000. Clean sand costs are estimated to be approximately \$30 per cubic yard. Based on this, total capital costs are estimated to be approximately \$125,000.

It is assumed that this beach replacement will take place every 5 years much as the current beach replenishment program does. Based on the cost estimate above, beach replacement to mitigate bacteria in sediments appears to cost approximately twice the cost of beach replenishment. Beach replacement operations and maintenance costs are estimated to be \$125,000 every 5 years. The 30 year present value (5 percent discount rate) of these recurring operations and maintenance costs is estimated to be approximately \$385,000.

3.2.3 Artificial Aeration and Mixing of Sediments

This BMP would use artificial aeration and mixing of sediments via a pumping system to dilute and disperse fine-grained sediments that are subject to bacterial contamination near the west end of Baby Beach. The system would result in resuspension and dispersion of fine grained sediments from Baby Beach to the channel in Dana Point Harbor. This would be done once at the beginning of every beach season, typically before the Memorial Day weekend.

3.2.3.1 Effectiveness

Effectiveness of this BMP is expected to be low for reducing bacterial contamination at Baby Beach. Getting sufficient dispersal of sediments may not be possible. Predicting and managing the hydrodynamics necessary to move the sediments away from the beach and prevent their return in the near term will prove challenging. Pumping methods are available to resuspend and disperse sediments. However, in the Baby Beach region local currents and winds may serve to redeposit the dispersed material in the original vicinity of the contaminated sediments, thereby reducing the effectiveness of this alternative. As with the Beach Replacement alternative this BMP would need to be conducted along with bacterial source reduction BMPs to minimize recontamination of sediments from any continuing sources.

3.2.3.2 Implementability

Implementability would be medium. Pumping equipment to aerate and mix the sediments is available. Power for the equipment is available from nearby pier locations, and the sediments would be easy to access since they are mainly in water less than 10 feet deep. It may be difficult to implement a system that can move the material to the rest of the harbor channel. It may be difficult to obtain local stakeholder acceptance of this approach and resource agency permits for this approach.

3.2.3.3 Cost

Field costs are expected to be approximately \$30,000, assuming one treatment period that lasted from one to two days. Engineering and permitting is expected to cost approximately \$20,000 based on potential concerns of resource agencies and stakeholders. Total capital costs are estimated to be approximately \$50,000.

We assume that this project would be done every year at the beginning of the summer beach season to prepare the beach for beachgoers. The recurring cost is estimated to be \$30,000 per year assuming that minimal engineering and permitting are needed every year after the first year's project is permitted and designed. The 30 year present worth (5 percent discount rate) for operations and maintenance is estimated to be approximately \$461,000.

3.3 *Problem 3 – Limited Water Circulation*

As discussed in Section 2 of this report, circulation appears to be limited in the near shore waters of Baby Beach. Deeper harbor channel circulation appears to be greater. However, summer winds appears to pin near shore waters at the beach and eddies near the beach form that appear to result in little mixing between near shore waters and the channel waters.

3.3.1 Potential Alternatives

BMP alternatives to address improvements in water circulation as a mechanism for improving water quality in the Baby Beach region are presented in two categories:

artificial enhancement using pumping equipment; and breakwater modification to partly restore ocean-influenced circulation.

3.3.2 Artificial Enhancement of Circulation

In this BMP alternative water pumping equipment would be used to increase circulation in the Baby Beach region. This could aid in the mixing and dispersion of bacteria to levels that more frequently fulfill compliance standards. The focus of this alternative would be during summer and fall when calmer conditions typically occur and public use is highest.

3.3.2.1 Effectiveness

Effectiveness of this BMP is expected to be medium or may be low-medium for reducing bacteria in the Baby Beach region. Increased circulation will increase mixing and dilution of near shore waters with harbor channel waters and will result in greater dilution and dispersion of bacterial contaminants, but it is also likely to re-suspend fine grained sediments. These fine grained sediments appear to have bacteria associated with them. It is unclear whether increased water movement would sufficiently dilute the fine grained sediments that become resuspended. It is also unclear if increased water movement would sufficiently dilute any bacteria that continue to flow into beach waters.

IN-STREEM™ pumping devices were evaluated by the City of Newport Beach as part of a study to improve circulation and improve water quality in the Newport Dunes area, which is also a backwater area with limited circulation and chronic bacteria problems. Evaluations to date have included a short demonstration followed by hydraulic modeling. The data collected during the demonstration were limited to a few current measurements in the bay. These current measurements were used to check the calibration of the numerical hydraulic model. The model results suggested that circulation could be increased substantially using INSTREEM™ devices. However, there is uncertainty over how effective the devices would be at the edge of the model, namely the beach shoreline, which is where bacteriological sampling is currently conducted. No bacteria concentration data were collected during the demonstration to determine how effective increasing circulation was at reducing bacteria concentrations.

3.3.2.2 Implementability

Implementability is medium. Devices such as IN-STREEM™ are readily available for purchase and potentially for lease (Y. Poon, P.E., Everest International). Power for the equipment is available from nearby pier locations. The devices are relatively quiet because the pumping mechanism is submerged. They extend approximately 3 feet above the water surface, but are visually unappealing because their current primary use is at wastewater treatment facilities. If increasing the circulation near the beach increases the turbidity of the water, there can be public resistance to the alternative.

Another issue to consider with this approach is increased beach replenishment needs. Baby Beach requires replenishment approximately once every five years due to losses

of sand during storm currents. Increasing flows at the beach may result in more sand loss throughout the year and increase the frequency of required beach replenishment. This is not impossible to accommodate, but will increase overall costs.

3.3.2.3 Cost

Each IN-STREEM™ unit costs approximately \$70,000 to purchase with up to \$20,000 for power connection and installation (Y. Poon, P.E., Everest International). Engineering and permitting is anticipated to cost approximately \$30,000. Thus, the total capital costs are estimated to be approximately \$120,000.

The primary ongoing operations and maintenance costs are estimated to be approximately \$5,000 per year. In addition to these costs, there is likely to be additional beach replenishment needed resulting from the increased circulation. We assume that the INSTREEM™ unit increases the beach replenishment frequency to twice every 5 years. Beach replenishment costs (not including sediment dredging and disposal) are approximately \$45,000 per event. Engineering and permitting of beach replenishment may be approximately \$20,000. Since beach replenishment is already budgeted once every 5 years, we assume that long-term operations and maintenance of this alternative will require one more beach replenishment every 5 years. Thus, the average annual operations and maintenance cost will be $\$5,000 + (\$45,000 + \$20,000)/5 = \$18,000$.

The 30 year present value (5 percent discount rate) of this annual O&M cost is estimated to be approximately \$277,000.

3.3.3 Breakwater Modification

In this BMP alternative the harbor protective structure would be modified with the engineering of “gaps” in the West Breakwater to allow more water circulation between the ocean and the harbor area leading towards Baby Beach. This could aid in the mixing and dispersion of bacterial contaminants in the Baby Beach region to levels that more frequently fulfill compliance standards.

3.3.3.1 Effectiveness

Effectiveness of this BMP is low to medium for increasing water circulation in the Baby Beach region. As the circulation study showed, the current breakwater gaps allow circulation between the ocean and harbor. Additionally, circulation in the harbor is relatively good. However, the very near shore waters at Baby Beach are not mixing well with the harbor waters. Modifying the breakwater is not expected to improve the circulation of these near shore waters substantially. The same summer winds would blow from the ocean toward the shore and trap the waters at Baby Beach.

If the breakwater was modified enough to allow waves to propagate through the breakwater to the beach, then the beach will no longer be a small child-friendly beach. Wave action will increase although it may be small compared to the far side of the breakwater. Wave action would be greater than it is today. The calmness of the area

today is the primary attractive feature of this particular beach for families with small children who want them to become accustomed to the water in a protective setting.

3.3.3.2 Implementability

Implementability would be low. Engineering of gaps in the breakwater would reduce the protection to boats and public facilities from waves and ocean swell and could fundamentally change the purpose and use of the harbor. The larger the gaps, the more change that would occur from increased circulation.

3.3.3.3 Cost

Engineering and construction costs are expected to be \$5 million dollars or more. Similar or greater additional costs would also be likely if increased circulation was high enough to require redesign and construction of other harbor facilities such as moorings, piers, and protective structures along the shoreline. Operations and maintenance are estimated to be negligible.

3.4 Problem 4 – Contamination from Birds

As discussed in Section 2, there is some evidence that some bacteria, especially enterococci may be contributed from local bird populations, primarily gulls and pigeons. Gull fecal material is known to contain enterococci as well as fecal and total coliforms and pathogens such as Salmonella, which cause disease. Gulls and pigeons frequent the beach. Enterococci are routinely found in the beach water and sediments at Baby Beach.

3.4.1 Potential Alternatives

BMP alternatives to address potential contamination from birds are presented in two general categories: exclusion of birds by continued use of netting under the pier and/or use a falconer; and reduction in the accessibility of trash as a food source for birds. The latter category includes alternatives for improved trash can design and collection, enforcement of prohibitions on bird-feeding, and expanded public education programs.

3.4.2 Continue to Minimize Bird Use of Pier

In this BMP alternative actions are continued and expanded to minimize bird use of the public pier between the west end of Baby Beach and the Ocean Institute. Netting is presently installed under the pier to discourage nesting and resting, mainly affecting pigeons, but needs repair and periodic maintenance to remain effective.

3.4.2.1 Effectiveness

Effectiveness of this BMP is medium for overall bird presence at Baby Beach. It is high for discouraging bird use under the pier since it provides a physical barrier that is only compromised if the netting is in disrepair (A. Lissner, personal observation). However, this alternative only solves part of the general goal of reducing bird usage of the Baby

Beach region. Therefore, overall effectiveness is medium and needs to be implemented along with other BMPs noted for reducing bird attraction sources.

3.4.2.2 Implementability

Implementability is high. Repair or replacement requires standard, easily available materials consisting of steel wire and netting and available construction methods to perform.

3.4.2.3 Cost

Replacement or repair of the existing netting is estimated to be approximately \$10,000 with annual maintenance costs estimated to be \$2,000. The capital plus 30 year present value of operations and maintenance is estimated to be approximately \$30,000

3.4.3 Sonic Bird Repellers

In this alternative, one or more sonic bird repellers would be installed in the vicinity of Baby Beach. These are devices that produce an audible sound that is said to dispel birds. The sound is advertised to recreate the sound of a predator species that many birds fear and, thus the birds will fly away from the vicinity of the sound.

3.4.3.1 Effectiveness

One of these devices, the Super BirdXPeller™ was attempted by the County and its effectiveness was limited (1997 letter from Dr. T. Rossmiller, Coastal Engineer for the County, to Bird-X, Inc.) Based on this experience, the effectiveness of this and these type of devices is believed to be low, particularly over the long term after birds become accustomed to the sound.

3.4.3.2 Implementability

The implementability would be medium to high. The devices are small and easy to install and maintain. There may be community or resource agency resistance to the devices because of the audible sound.

3.4.3.3 Costs

The items cost approximately \$300 each. Installing the devices throughout the drainage area would cost approximately \$10,000. Permitting, planning, and design would cost approximately \$10,000. Annual O&M costs are estimated to be approximately \$2,000/year. The 30 year present value O&M cost (5 percent discount) is estimated to be approximately \$30,000.

3.4.4 Improved Trash Receptacle Design, Disposal, and Collection

In this BMP alternative additional trash receptacles are installed and trash removal frequency is increased by one more pickup per week. Additionally, trash pickup is scheduled to coincide with high use periods. The new trash receptacles would have covers that restrict bird access similar to those sold by

[www.creativepipe.com/trash Receptacles.htm](http://www.creativepipe.com/trash_Receptacles.htm). Where existing receptacles do not prevent bird access, these are replaced with new receptacles that do prevent bird access.

3.4.4.1 Effectiveness

Effectiveness of this BMP is low to medium for further restricting access to trash as a food source for birds near Baby Beach. This is because the County already provides trash cans and collection on a regular basis, although additional receptacles, bird-restrictive receptacles, and more frequent collection would further reduce this source. This BMP only solves part of the general goal to reduce bird usage of the Baby Beach region. Therefore, overall effectiveness will be influenced by joint implementation of the other BMPs noted for reducing bird attraction.

3.4.4.2 Implementability

Implementability of this BMP is high. Alternate designs are already available for trash can lids that help restrict bird access, such as available through [www.creativepipe.com/trash Receptacles.htm](http://www.creativepipe.com/trash_Receptacles.htm). More frequent collection could be accomplished by augmenting the schedule of maintenance crews to coincide with the highest public use periods.

3.4.4.3 Cost

Costs are estimated to be approximately \$1,000 for each new trash receptacle. Approximately 10 new trash receptacles are expected to be sufficient for the Baby Beach region. The increased cost of maintenance crew labor is estimated to be approximately \$100/work-day. This amounts to approximately \$5,200/year in operations and maintenance costs. Based on this, the total capital and 30 year present value operations and maintenance costs (5 percent discount rate) are estimated to be approximately \$90,000.

3.4.5 Expand Public Education Program

In this BMP alternative a local public education program is expanded that includes additional signage to encourage proper disposal of trash and avoidance of bird feeding and working with the Ocean Institute and other educational institutions to develop messages for their visitors that deter behaviors that attract birds.

3.4.5.1 Effectiveness

Effectiveness of this BMP is expected to be medium. This is because some signage regarding trash disposal is already posted near Baby Beach and occasionally trash is still not disposed of properly. Additionally, the effectiveness of public education is not likely to be 100 percent. This BMP only solves part of the general goal to reduce bird usage of the Baby Beach region. However, since the activities of people at the beach contribute to the bird populations, it is necessary to exert efforts to educate the public so they can alter their behavior. Overall effectiveness will be influenced by joint implementation of the other BMPs noted for reducing bird attraction.

3.4.5.2 Implementability

Implementability of this BMP is high. Development and application of the program is straight forward.

3.4.5.3 Cost

Signage costs are estimated to be approximately \$5,000. This includes design, fabrication, and installation. Annual operations and maintenance costs and ongoing labor costs for coordination with educational institutions are estimated to be approximately \$5,000 per year. This includes periodic re-design of sign messages. The 30 year present value (5 percent discount rate) operations and maintenance costs are estimated to be approximately \$77,000.

3.4.6 Active Discouragement of Beach Use by Birds with Periodic Falconer

In this BMP alternative a falconer would fly his or her raptor in the Dana Point Harbor area. The presence of this raptor would cause gulls and other birds to flee the area to avoid the threat of predation.

3.4.6.1 Effectiveness

Effectiveness would be low to medium. Studies at landfills suggest that there is a strong immediate impact in that gulls and other birds immediately flee when the raptor is present, but ultimately the gulls and other birds have been observed to exhibit patterns of approaching the area when the raptor is not present. In general, it is presumed that for falconry to effectively mitigate bird usage of an area, another factor that attracts birds, such as a readily available and easily accessible food, also needs to be reduced substantially in conjunction with the use of the falconer.

3.4.6.2 Implementability

Implementability would be low. Public response to active predation by a raptor on local birds in a highly visible setting is expected to be negative. Birds are a common occurrence along most beach areas, so potentially graphic exclusion using a falcon may not be a publicly acceptable means of control. Additionally, concerns regarding the impacts of the raptor on any endangered species near the area are likely to be high among the local Audobon society.

Also, recent experience with a falconer pilot test at the County of Orange Prima Deshecha landfill suggests that there is not a large supply of falconers available on an as needed basis. The Prima Deshecha program was halted due to the inability of the contracted falconer to provide sufficient raptor resources to meet the goals of the study.

3.4.6.3 Cost

Initial capital planning and permitting costs are estimated to be approximately \$30,000 for environmental documentation, public meetings, and plan development. Ongoing falconry costs are estimated to be approximately \$600/day. Assuming that a falconer would randomly fly the Dana Point harbor area on average one day every week

throughout the year, this equates to an annual cost of approximately \$31,200 per year. This equates to a 30 year present value (5 percent discount rate) of approximately \$480,000.

3.4.7 Change Use of Baby Beach

To mitigate human health impacts, two approaches can be taken: (1) remove the pathogens, and (2) keep people from getting exposed to the pathogens. The alternatives above are designed to keep bacteria from getting to the beach waters at Baby Beach. It is worth discussing briefly the possibility of changing the use of Baby Beach so that people do not use the beach for swimming and, therefore, do not become exposed to any bacteria that are in the water.

Under this alternative, the beach itself would be modified to be a non-contact tide-pool area with aesthetic qualities, but no allowable contact recreation. Under such a scenario, people using Baby Beach would have little risk of exposure to any bacteria or pathogens in the water because of the changed use.

This alternative may be effective for would-be beach-goers since those beach-goers would no longer be in the water at Baby Beach. However, this alternative would be ineffective for any other persons that entered the water under any other circumstances such as boaters, kayakers, or swimmers who enter the harbor waters from another location. Such persons would still be engaging in body-contact-recreation even though the beach area itself would prohibit such recreational activity.

This alternative is not likely to be implementable at all due to the fact that the waters of the Pacific Ocean, including Dana Point Harbor, are classified in the California Regional Water Quality Control Board San Diego Region Basin Plan as having a designated beneficial use of REC1, which is contact recreation. Changing a designated beneficial use to a "lower" value requires a substantial burden of proof that the designated use cannot be attained and that the waters do not have the potential to be used in such a fashion. Such a change in designated beneficial use has never been accomplished in California. Additionally, because boaters, kayakers, and other users of Dana Point Harbor do occasionally use the water for contact recreation, reducing the designated beneficial use is not expected to be possible at all. One would need to show that the harbor waters are not, nor are likely to be used for contract recreation for reasons that generally cannot be associated with impaired water quality.

As such, changing the use of Baby Beach is not expected to be feasible.

3.5 Comparison of Alternatives

A summary comparison of the effectiveness, implementability, and cost of BMP alternatives is presented in Table 3-1 by category of problem: storm drains, sediments, limited water circulation, and birds. In general, the best BMPs should have best effectiveness and implementability, coupled with low costs.

Table 3-1: Summary Comparison of BMP Alternatives.

Problem addressed BMP	Effectiveness	Implementability	Capital Costs	30 Year Present Value O&M	Total Present Value
Storm Drains					
Dry Season Plugs	Low-Medium to Medium	High	0	30,000	30,000
Year-Around Diversion	Low-Medium to Medium	Low	N/A	N/A	N/A
Dry Season Diversion	Low-Medium to Medium	Medium-High to High	170,000	20,000	190,000
Eliminate Bacteria Sources Year-Round	Low-Medium to Medium	Low	1,000,000	150,000	1,150,000
Eliminate Dry-Season Runoff (Irrigation Controllers)	Low-Medium to Medium	Medium to High	95,000	0	95,000
Sediments					
Dredging - Beach Replacement	Low to Medium	Low to Medium	125,000	385,000	510,000
Artificial Aeration/ Mixing of Sediments	Low	Medium	50,000	461,000	511,000
Limited Water Circulation					
Artificial Circulation of Water (INSTREEM)	Medium	Medium	120,000	277,000	397,000
Breakwater Modification	Low to Medium	Low	5,000,000	0	5,000,000
Birds					
Netting at Pier	Medium to High	High	10,000	30,000	40,000
Sonic Repellers	Low	Medium to High	20,000	30,000	50,000
Expand Trash Disposal/Collection	Low to Medium	High	10,000	80,000	90,000
Expand Public Education with Signage	Medium	High	5,000	77,000	82,000
Falconry	Medium	Low	30,000	480,000	510,000
Netting, Trash Collection, and Public Education	Medium to High	High	25,000	187,000	212,000

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The costs are shown as both capital and 30 year present value (5 percent discount rate) of the ongoing operations and maintenance costs. The CBI grant money will fund some or all of the capital costs, but local funds will be needed for long term operations and maintenance.

4.0 RECOMMENDED ALTERNATIVES FOR IMPLEMENTATION UNDER CBI GRANT.

Based on the analysis in Section 3, BMP alternatives are selected for implementation under the remaining CBI grant in this section. It is necessary for BMPs to have some degree of both effectiveness and implementability in order to justify the expenditure of funds on attempting to implement that BMP.

Table 4- 1 lists all BMPs that have either medium or high effectiveness and either medium or high implementability. Note that for the bird controls, the combined option of Netting, Trash Collection, and Public Education was retained in lieu of the single options. Note also that due to the relatively low effectiveness and/or implementability of alternatives that would address resident bacteria in beach sediments, these alternatives are not being carried forward at this time. Bacteria resident in sediments can be addressed through some additional study to understand better (1) why these bacteria are able to survive in these sediments and (2) what are the incidences of pathogens associated with such bacteria.

The current CBI grant contains approximately \$250,000 for permitting, design, and implementation of BMPs. The CBI funding is for capital costs. Operations and maintenance is funded from other County of Orange programs. There is not sufficient total budget in the CBI grant to implement all of the BMPs in Table 4- 1.

Based on this, some BMPs need to be selected from Table 4- 1 for implementation under the CBI grant. To do this, we have considered the following items of importance:

- The Regional Water Quality Control Board San Diego Region (RB-9) has established a preference for source control BMPs rather than “end-of-pipe” treatment or diversion BMPs. RB-9 is a significant stakeholder because they regulate discharges to Dana Point Harbor and will determine any water quality permit requirements for BMPs implemented at Baby Beach.
- If dry-weather runoff can be reduced significantly, or even eliminated, the need for a dry-weather diversion goes away. Thus, implementing irrigation control and enforcement of wash-down prohibition ordinances may mitigate the need for the diversion.
- Even if dry-weather flows are eliminated or diverted, bacteria may still be above AB411 threshold levels due to poor circulation, retention in sediments, and birds that cannot be successfully mitigated.

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Table 4- 1: Medium to High BMP Alternatives.					
<i>Problem addressed BMP</i>	Effectiveness	Implementability	Capital Costs	30 Year Present Value O&M	Total Present Value
<i>Storm Drains</i>					
Dry Season Diversion	Medium	Medium-High to High	170,000	20,000	190,000
Eliminate Dry-Season Runoff (Irrigation Controllers)	Medium	Medium to High	95,000	0	95,000
<i>Limited Water Circulation</i>					
Artificial Circulation of Water (INSTREEM)	Low-Medium to Medium	Medium	120,000	277,000	397,000
<i>Birds</i>					
Netting, Trash Collection, and Public Education	Medium to High	High	25,000	187,000	212,000
Totals			410,000	484,000	894,000

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Based on these considerations, the dry weather diversion will be eliminated from consideration at this time. It may be considered at a later under a different funding mechanism, particularly if the irrigation and runoff control is not effective..

Table 4- 2 lists the BMPs recommended for implementation under the remaining CBI grant.

Additionally, it is still unclear where the bacteria are originating in the watershed. It is recommended that other funding sources be secured to conduct additional source investigations to augment the BMPs installed under this program. This remaining CBI grant is reserved for BMP implementation.

5.0 REFERENCES

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Table 4- 2: Selected BMP Alternatives					
<i>Problem addressed BMP</i>	Effectiveness	Implementability	Capital Costs	30 Year Present Value O&M	Total Present Value
<i>Storm Drains</i> Eliminate Dry-Season Runoff (Irrigation Controllers)	Medium	Medium to High	95,000	0	95,000
<i>Limited Water Circulation</i> Artificial Circulation of Water (INSTREEM)	Low-Medium to Medium	Medium	120,000	277,000	397,000
<i>Birds</i> Netting, Trash Collection, and Public Education	Medium to High	High	25,000	187,000	212,000
Totals			240,000	464,000	704,000

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