CITY OF DANA POINT
SALT CREEK OZONE TREATMENT PLANT

FINAL REPORT
SWRCB Agreement No. 02-217-550-0

South Coast Water District
Providing Quality Water and Wastewater Services to the Coastal Communities

PBS&J

PREPARED BY THE CITY OF DANA POINT
PUBLIC WORKS & ENGINEERING DEPARTMENT

FINAL: MARCH 2007

Acknowledgements

The City would like to give special recognition to ***South Coast Water District*** (SCWD), who operate and maintain the plant under contract, for their commitment to this project. SCWD has provided excellent service and technical expertise that has been instrumental in the plant's day-to-day operational success. The partnership between SCWD and the City of Dana Point has facilitated the implementation and success of this project, as well as other water quality projects, such as the thirteen nuisance water diversions located throughout the City in strategic locations, to help achieve common water quality protection goals.

The City would also like to recognize *PBS&J*, for providing superior construction management and design services and their commitment in providing ongoing technical support to address some of the operational issues that were encountered during the first year of operation. It is not uncommon, and should be expected, that unforeseen situations will arise when using innovative technology in a unique and new application. Discussions of the operational challenges, tips for success, and lessons learned are thought to be some of the most valuable information provided in this report and are thus provided, in additional to the project's results.

In addition, this project celebrates an unsurpassed demonstration of partnerships, collaboration, support, and cooperation on a myriad of levels. The following agencies, organizations and service providers have also contributed to the success of this project:

The City of Dana Point Council and Staff
State Water Resources Control Board
San Diego Regional Water Quality Control Board
Miocean Foundation
South Orange County Wastewater Authority
Orange County Flood Control District
Orange County Health Care Agency
Associated Laboratories
Monarch Beach Golf Links – Troon Golf
Monarch Bay Club Lifeguard Staff
Makar Properties / Capital Pacific Holdings
Monarch Bay Homeowners Association
Estates at Monarch Cove Homeowners Association
Metro Builders
Shasta Electric
Alexander Engineers ~ Ron Yeo, FAIA Architects
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RJM Design Group ~ GMU Geotechnical, Inc. ~ Gordon Bricken & Associates, Inc.
Ozone Water Systems
State of Department Fish & Game
United States Army Corps of Engineers
State of California Department of Transportation

Cover: Aerial photo Salt Creek Watershed and Salt Creek outlet onto Monarch Beach taken by City of Dana Point Staff Engineer, Werner Abrajano in October 2006.

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Salt Creek Ozone Treatment Plant Final Report
EXECUTIVE SUMMARY
City of Dana Point SWRCB Agreement No. 02-217-550-0

Project Description/Purpose: Monarch and Salt Creek beaches are extremely popular beach locations in the City of Dana Point. A small, offshore reef creates some of the best left swells along the entire coastline. Swimming, body surfing, sunbathing and tidepool exploration are among other popular beach activities. These beaches however were subject to numerous "postings" (health warnings) due to high levels of bacteria in urban runoff, even though aggressive urban runoff management programs were being implemented within the watershed in both the City of Dana Point and Laguna Niguel. The Salt Creek Urban Runoff Ozone Treatment Facility provides an advanced storm water treatment facility to reduce bacteria levels in the Salt Creek dry-weather flows just prior to discharge into the ocean. This project has significantly reduced the number of postings during its first year of operation and the beach water quality data has met de-listing criteria. It is anticipated that these beaches will be removed from the State's 2008 303(d) List of Impaired Waterbodies for bacteria. The project involved the construction of a 1,700 square foot ozone treatment facility located in the City of Dana Point. Dry weather flows are captured at the outlet and pumped to the treatment facility that is approximately 800 feet away on the golf course, adjacent to the tee box of Hole 3 on the Monarch Beach Golf Linx. The treatment facility is housed within an aesthetically pleasing masonry block building that includes ozone (ozone generators, contact chamber, etc.) and electrical equipment rooms, two basket strainers, and six horizontal media filters. The City has contracted with South Coast Water District (SCWD) to operation and maintain the plant and they have been instrumental in the plant's success.

The ozone treatment plants capture up to 1,000 gallons per minute of urban runoff, treats it to remove bacteria, and then directs it back down to Salt Creek outlet where it naturally meanders toward the beach. As filtration is a key component of the ozone treatment process, other pollutants typically found in urban runoff, such as trash and debris, silt and sediments, vegetation and hydrocarbons are also removed. A comprehensive comparative evaluation of both ozone and ultraviolet light disinfection (there options were considered due to their effectiveness and biologically friendly attributes) was conducted to determine the most favorable disinfection method to meet the City's goals. For this project, ozone was determined to be more reliable and cost effective for several reasons. The construction was completed in November and the official start-up began on November 14, 2006.

Effectiveness/Benefits: This project has demonstrated success in meeting it goals of reducing bacteria and beach postings are Monarch and Salt Creek beaches. Notable improvements in water quality have been shown in a variety of methods including the Orange County Health Care Agency's Water Quality Report, Heal the Bay's Annual Report Card, and through the City's monitoring data. The most significant achievement however, is the evaluation which concludes that the water quality at these beaches now meet stringent de-listing criteria and can be removed from the State's 2008 303(d) List of Impaired Waterbodies!

The project has also won a number of awards, served as a technology transfer vehicle by being published in a number of technical journals and publications, and has provided outreach opportunities through facility tours to a variety of audiences. The project also achieves compliance with indicator bacteria Total Maximum Daily Loads (TMDL) requirements which are currently in development. The City continues to explore the feasibility of reusing the treated urban runoff for irrigation purposes.

Public Agency/Private Partners: State of California Water Resources Control Board, San Diego Regional Water Quality Control Board, South Coast Water District, South Orange County Wastewater Authority, County of Orange, Makar Properties, Monarch Beach Golf Links - Troon Golf, MiOcean Foundation, Ozone Water Systems Associated Laboratories, Monarch Bay & Estate's at Monarch Beach Homeowner's Associations, Metro Builders, Shasta Electric, Alexander Engineers, RJM Design Group, Ron Yeo, FAIA Architects, Glenn Almquist, Structural Engineer, Loren Toomey, L.S., GMU Geotechnical, Inc., Gordon Bricken & Associates, Inc. State Department of Fish & Game, United States Army Corps of Engineers, State Department of Transportation.

Total Project Cost: $6,700,000
Project Funding Sources: State Water Resources Control Board Clean Beach Initiative: $4,000,000
City of Dana Point: $2,550,000
MiOcean Foundation: $150,000

ACRONYMNS & SELECT TECHNICAL TERMS

ACRONYMNS

AB411	Assembly Bill 411
ACEC	American Council of Engineering Companies
APWA	American Public Works Association
BCEE	Board Certified Environmental Engineer
BMD	Beach Mile Days
BMP	Best Management Practices
CBI	Clean Beaches Initiative
CDS	Continuous Deflection Separation
CELSOC	Consulting Engineers and Land Surveyors of California
CEQA	California Environmental Quality Act
CFM	Certified Floodplain Manager
CMAA	Construction Management Association of America
CPSWQ	Certified Professional in Storm Water Quality
EIT	Engineer In Training
GPM	Gallons per minute
HTB	Heal The Beach
MGD	Million Gallons per Day
MP	Monitoring Plan
O&M	Operation & Maintenance
OC	Orange County
OCFCD	Orange County Flood Control District
OCHCA	Orange County Health Care Agency
PE	Professional Engineer
QAPP	Quality Assurance Project Plan
SCADA	Supervisory Control and Data Aquistion
SCCWRP	Southern California Coastal Water Research Project
SCWD	South Coast Water District
SOCWA	South Orange County Wastewater Authority
SWRCB	State Water Resource Control Board
TMDL	Total Daily Maximum Load
TSS	Total Suspended Solids
UV	Ultraviolet
WEFTEC	Water Environment Federation Technical Exposition and Conference

SELECT TECHNICAL TERMS

AB411: Assembly Bill which added sections to the California Health & Safety Code to create bacteriological ocean water quality standards.

Anthracite media: Crushed anthracite coal media provides angularity resulting in a large void ratio which allows more solids holding capacity than rounded sands, yielding a consistently better filtrate quality throughout a filter run.

Filter media: a bed of granular material which retains the solid particles by having a large surface area where the particles can be trapped.

Continuous deflective separation (CDS): Technology which uses fluid dynamics in a balanced system to effect a natural separation of solids from liquids.

Corona discharge: method of ozone production which consists of passing dried, oxygen-containing gas (atmospheric air) through an electrical field. The electrical current causes the "split" in the oxygen molecules The resulting oxygen atoms (O^-), seeking stability, attach to other oxygen molecules (O_2), forming ozone (O_3).

Filtration: – Process by which a filter is used to mechanically separate a mixture of solids and fluids.

Oxidation Reduction Potential (ORP): The relative capacity of a solution to oxidize or reduce. The measure of the cleanliness of water and its ability to break down contaminants.

Ozonation: The act of treating with ozone.

Ozone: An unstable gas made of three oxygen atoms. The instability that makes ozone a powerful oxidant. By oxidizing all organic substances, ozone destroys pesticides and pathogens (viruses and bacteria) by rupturing the organism's wall.

Turbidity – Cloudiness of haziness of water caused by individual particles that are generally invisible to the naked eye.

1. INTRODUCTION

1.1 Problem Statement & Existing Conditions

Monarch Beach and Salt Creek County Beach are extremely popular beach locations in the City of Dana Point (approximately 1.8 Million visitors annually). A small, offshore reef creates some of the best left swells for surfing along the entire coastline. Residents and visitors also enjoy swimming, body surfing, sunbathing and exercising, such as running and walking. These beaches, however, were subject to numerous postings (health warnings) during dry weather periods due to high levels of bacteria. In 2004, Monarch Beach was posted for 92 days during high use season of April through October (referred to as the AB411 Period when, under the California Health and Safety Code, testing of public beaches for indicator bacteria is required and are "posted" with health warnings when bacteria results exceed standards). In 2005, 65 days were posted, with the majority occurring during the AB411 period. Salt Creek beach adjacent and south of Monarch Beach also has experienced beach postings, but not at as high of a frequency as Monarch Beach (**Figure 1.2**).

Through studying the watershed in Dana Point, the City determined that a signficant source of the bacteria impacting Monarch Beach and the adjacent beach is the urban runoff that flows in Salt Creek and discharges onto Monarch Beach. The Salt Creek drainage (watershed) area is approximately 4,500 acres (see **Figure 1.1** below). The dry weather flows range from 500-900 gpm and carry with them the typical urban runoff pollutants, including indicator bacteria. The bacteria that are present in Salt Creek appeared to have a direct impact on the ocean water quality at the Beach causing numerous beach postings, resulting in negative economic impacts.

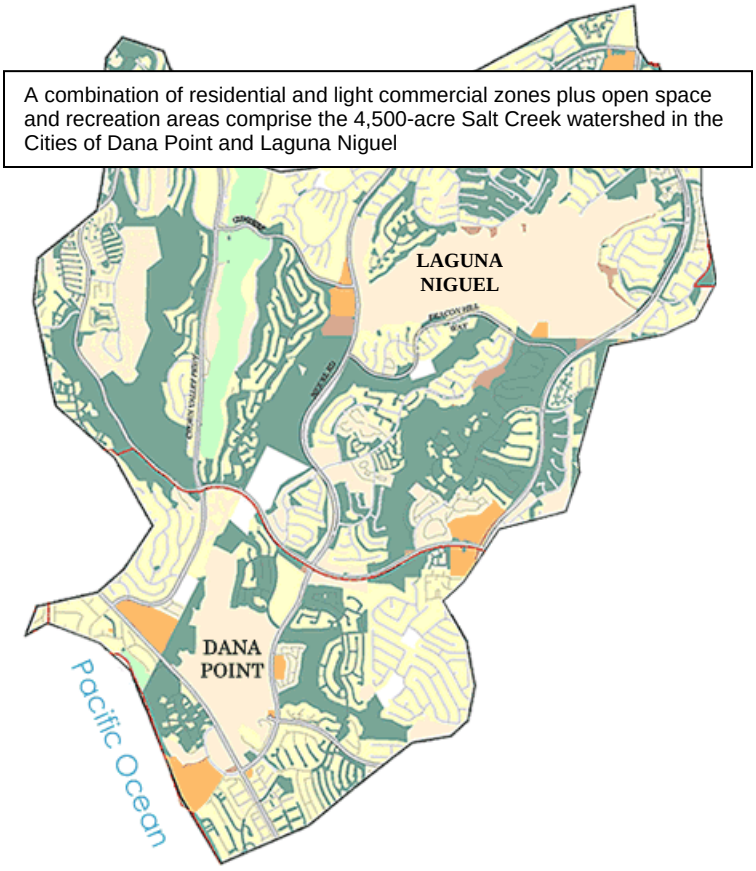

Figure 1.1: Salt Creek Watershed

Both Cities within the watershed, Dana Point and Laguna Niguel, have been implementing comprehensive urban runoff management programs for a number of years. These aggressive urban runoff programs include a number of best management practices (BMPs) designed to minimize urban runoff and pollutant sources in the watershed and reduce beach postings. Public information campaigns, BMP requirements for new developments, comprehensive street sweeping programs, commercial and construction site inspection programs and ordinance enforcement are some of the components to these programs. In addition, the City of Dana Point has installed inlet filters on all publicly-owned catch basins, while Laguna Niguel has implemented a number of stream/wetland restoration projects. Both cities cooperate with other local agencies to develop programs to reduce the quantity of urban runoff, including irrigation management BMP rebate programs. Despite these programs however; the frequency of beach postings at Salt Creek Beach was not notably reduced. As a progressive coastal City with

water quality as the number one strategic goal, the City was determined to find a solution that would benefit the water quality at these beaches in the near term.

1.2 Project's Objective & Scope

The goal of the Salt Creek Ozone Treatment Plant is to decrease beach postings at Monarch and Salt Creek beaches and restore beneficial uses by reducing bacterial loadings from dry weather urban runoff flows in Salt Creek.

The Salt Creek Storm Drain Treatment Facility provides an advanced storm water treatment facility, utilizing filtration and ozonation, to reduce bacteria levels in the Salt Creek dry-weather flows just prior to discharge to the beach and ocean. Dry weather flows are captured at the outlet and pumped to the 1,700 square foot treatment facility that is approximately 800 feet away on the Monarch Beach Golf Links. The treatment facility is housed within an aesthetically pleasing masonry block building, paid by City match funds (**Figure 1.3)** that includes the ozone equipment (ozone generators, contact chambers, destruct unit, etc.), two basket strainers, six horizontal anthracite coal filters, and other accessory equipment. **Figure 1.2** shows the treatment facility in relation to the outlet and surrounding area. A simplified schematic of the treatment process is provided in **Figure 1.4** below. The City has contracted with South Coast Water District (SCWD) to operate and maintain the plant and their staff have been instrumental in the plant's success.

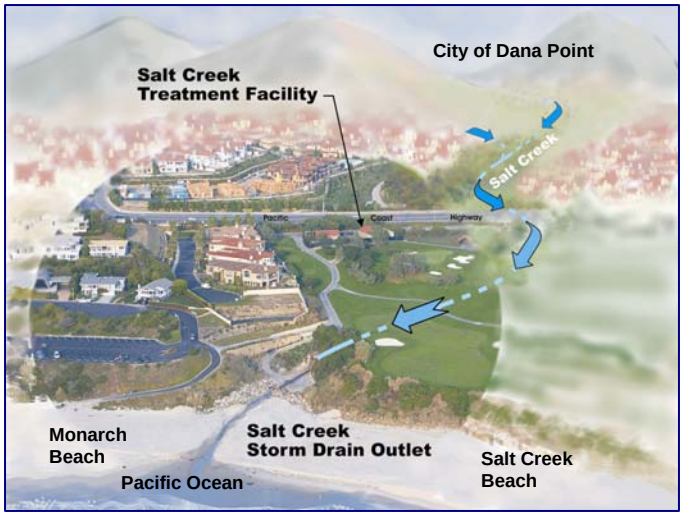

Figure 1.2: Vicinity Map

The Spanish-style building blends in well with neighboring architectural styles.

Figure 1.3: Salt Creek Ozone Treatment Plant Building located on Monarch Beach Golf Links

The Treatment Plant is designed to capture up to 1,000 gallons per minute (1.44 MGD) of urban runoff during dry weather, treat it to reduce the bacteria levels, and discharge it back into the Salt Creek outlet (via gravity) where it naturally meanders toward the beach. As filtration is a key component of the ozone treatment process (and occurs in a four-stage process – the inlet screening device, the solids removal unit, the basket strainers and the anthracite coal filters), other pollutants typically found in urban runoff are also reduced/removed. Such pollutants include trash and debris, silt and sediments, vegetation, hydrocarbons, etc.

Though the plant was designed to function only during the dry season (AB 411 months of April through October), due to its success, the City has opted to run the plant as much as practical during the calendar year. During rain events, the treatment process will be typically bypassed via an automatic shut down triggered by excessive flows or a

proactive shut down by plant operators in anticipation of a significant rain. These plant shut-down procedures protect the facility from being overloaded by high solids loadings associated with first-flush stormwater. Operational protocols will be continually reviewed and evaluated, along with data, to determine the most effective and efficient operation schedule of the plant. The design of the Project will provide treatment capacity for 20 years from the date of initiation of construction.

1.3 The Treatment Process

As shown in **Figure 1.4** below, urban runoff is captured in the intake grate (hydraulically designed to capture all dry weather flows up to 1,000 gpm), flow is directed through a solids removal unit (hydrodynamic separator) to remove coarse solids and oils, the urban runoff is then pumped up approximately 800 feet to the treatment plant, located in the golf course. In the plant, urban runoff is filtered through one of two basket strainers and then flows through one of six anthracite coal filters which filter out finer silts and sediments. The anthracite coal filters are automatically backwashed based on time or flow. The backwash water supply basin is stored with either filtered water (non-ozonated) or ozonated water (all from the creek). Backwash wastewater is discharged to the sanitary sewer at a rate approved by SCWD (sewering agency). Once the runoff has been filtered, it enters the ozone contact chambers, where it flows through a series of seven chambers which provide effective contact time of the ozone to the runoff to kill the bacteria and potential viruses (design contact time is approximately eight minutes at 1,000 gpm, 10 minutes at 800 gpm and 16 minutes at 500 gpm). The ozone is generated by one of two generators via the corona discharge method from prepared atmospheric air. Ozone is injected via diffuser stones. The plant has the capacity to generate up to 100 lbs/day of ozone. The ozone dosage is based on the oxidation reduction potential (ORP) which measures the ability of the water to oxidize contaminants. Four ORP sensors provide this parameter. Any off-gas produced runs through an ozone destruct unit and the final product can safely be discharged to the atmosphere through a roof vent. Once the runoff has been ozonated it is discharged by gravity to the outlet which discharges to the Orange County Flood Control channel apron energy dissipating boulders at the beach.

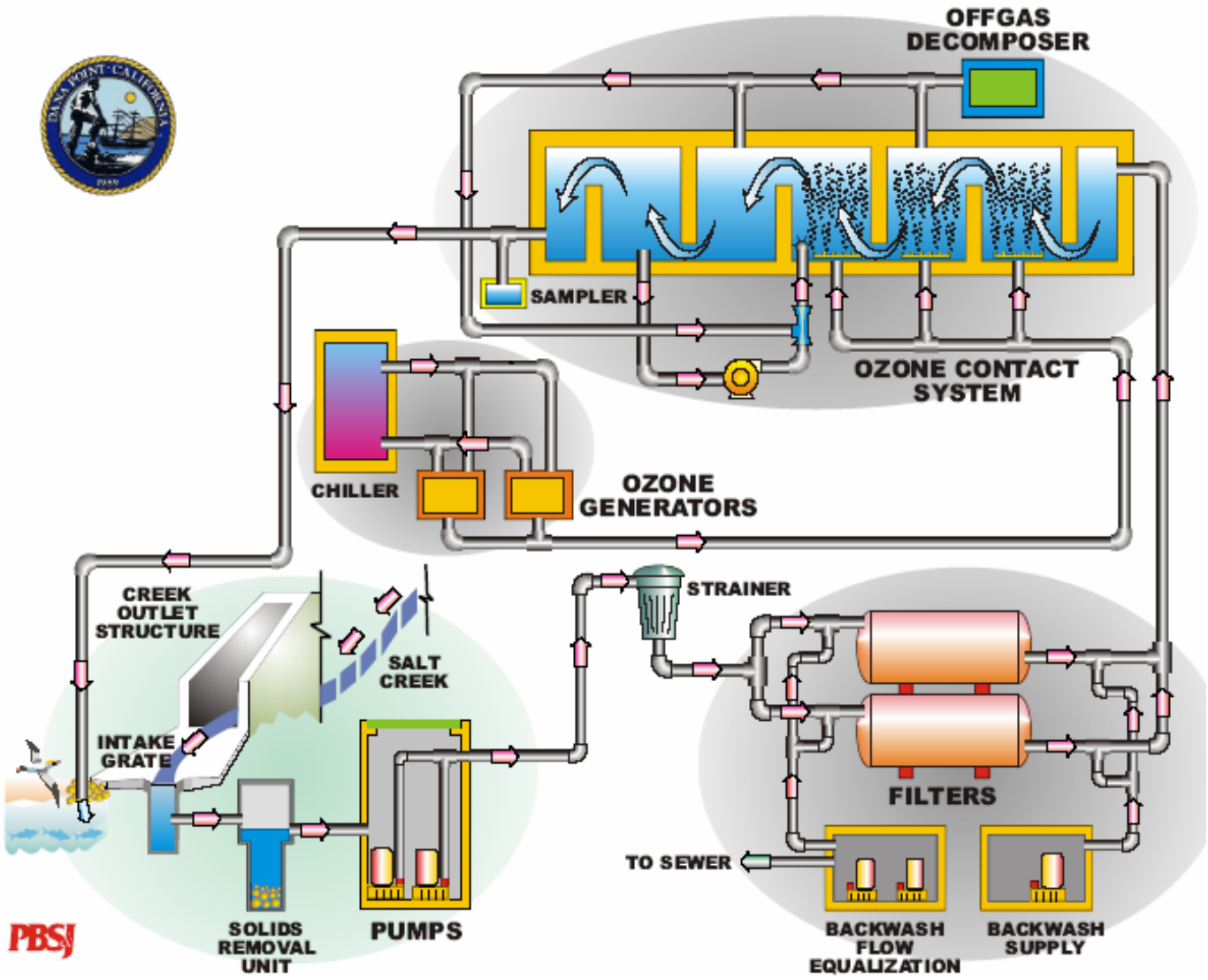

Figure 1.4: Simplified Schematic of Salt Creek Ozone Treatment Plant.

1.4 Approach & Techniques

The City was determined to find a solution that made an immediate positive impact to beach water quality, noting that the source control strategies implemented within the watershed may take some time to make a notable improvement at the beaches. One alternative – diverting flows during the dry season to an existing sewage treatment plant- was deemed infeasible given the capacity charges of the sewage treatment plant, the total dissolved solids in the water at times (as the treatment plant recycles water) and the collection system's capacity relative to the creeks peak flow rate at up to 1,000 gpm.

The City explored disinfection technologies to address the primary pollutant of concern for this project, bacteria. Chlorination and dechlorination were eliminated right away, since the new facility would be located near the creek outlet, and close to homes, resorts, and beaches. With limited access for deliveries of chemicals and the safety concerns arising from the need to store chemicals on-site eliminated chlorination from the list of possibilities. Both ozonation and ultraviolet (UV) light methods for disinfection were considered next for the Salt Creek Storm Drain Treatment Project because of their effectiveness and environmentally friendly attributes. A comprehensive comparative evaluation of both ozone and ultraviolet light disinfection was

conducted to determine the most favorable disinfection method to meet the City's goals, based on the specific watershed characteristics, in the most cost effective manner.

For this project, ozone was determined to be more reliable and cost effective for the following reasons.

- Effectiveness of a UV disinfection system depends on the characteristics of the inflow, such as total suspended solid (TSS), turbidity, iron, manganese, and total hardness. TSS and metal salts absorb UV light and lower UV transmission rates, resulting in limited energy available to inactivate microorganisms. High concentrations of total hardness and iron also cause deposition on the UV lamp's sleeve, reducing the amount of light that can penetrate the water and increasing long term operation and maintenance costs. When occurring at high rates, such deposition also reduces the reliability of the UV disinfection process.

- Effectiveness of an ozone disinfection system depends on the ozone dosage applied to the stream flow. The correct dosage applied is a function of influent water quality. A properly designed ozone disinfection system will increase or decrease the ozone dosage based on the level of oxidants in the influent water to help ensure adequate disinfection under a wide variety of conditions.

- To help determine the best method of disinfection for this project, a number of water quality tests were conducted throughout a two year period. According to the Salt Creek water quality data, TSS, turbidity, total hardness and iron concentrations were relatively high. These levels were much higher than those levels typically used for UV disinfection. Further, the UV transmission rate, even after filtration by a 1.5 micron filter, was relatively low, in the range of 46 to 55 percent. Based on discussions with UV manufacturers, it was determined that reliability for disinfection of bacteria was low for transmission rates in this range, without additional treatment methods. The additional treatment methods would likely include the oxidation and removal of iron and manganese, plus a greater amount of filtration to handle the high solids loading. These treatment processes, in addition to the UV disinfection system would be extremely costly.

- Ozone is one of the strongest disinfectants currently being used in the water treatment industry, and its ability to inactivate bacteria, protozoa, and viruses is highly reliable. Although ozone treatment involves more mechanical equipment compared to UV disinfection, it has been proven to be a highly reliable disinfection system for variable water quality as observed in Salt Creek.

This detailed evaluation is included in the Salt Creek Storm Drain Treatment Project Preliminary Design report dated July 2002 and is available upon request.

1.5 Permitting

The project was designed in compliance with the California Environmental Quality Act (CEQA). An extensive list of permits were required for the project, including: California Coastal Commission Coastal Development Permit, U.S. Army Corps of Engineers Streambed Alteration Agreement, City Site Development and Conditional Use Permit, U.S. Army corps of Engineers 404 Permit, California Department of Fish & Game, San Diego Regional Water Quality Control Board 401 Permit, Orange County Fire Authority approval, California Department of Transportation Permit, Orange County Flood Control District Encroachment Permit and the South Coast Water District/South Orange County Wastewater Authority Agreement/Special Waste Discharge Permit..

1.6 Costs and Funding Sources

The budget for this project (design, permitting, and construction) totaled $6,700,000. The City was fortunate to receive a $4,000,000 grant through the State's Clean Beaches Initiative (CBI) Proposition 40 Program. A local non-profit group, MiOcean also contributed $150,000 to the project. The City General Fund funded the remaining $2,550,000.

2. TASK PRODUCTS & SCHEUDLE OF COMPLETION

Table 2.1 below outlines the Tasks and Schedule of Completion for this Project.

Table 2.1: Task Products and Schedule of Completion

TASK		***PRODUCT***	***COMPLETION DATE***
1.0		***Project Management and Administration***	
	1.2	Quarterly Progress Reports	Completed as required.
	1.5	Contract Summary Form	February 2004
	1.6	Subcontractor Documentation	May 2004
	1.7	Project Survey Form	June 2006
2.0		***Federal, State, and Local Permitting***	
	2.1	CEQA Documentation	November 12 & 13, 2003 – Mitigated Negative Declaration
	2.2a	Agreement with South Coast Water District	November 26, 2003
	2.2b	County of Orange Encroachment permit: No. 2003-00100	October 2003
	2.2c	Coastal Development Permit	April 11, 2003
	2.2d	Department of Fish & Game Streambed Alteration Agreement	February 20, 2003
	2.2e	Site Development and Conditional Use Permit	December 4, 2002
	2.2f	Army Corp of Engineers 404 Permit	April 21, 2003
	2.2g	Regional Water Quality Control Board 401 Permit	April 21, 2003
	2.2h	Orange County Fire Authority	December 16, 2003
	2.2i	Caltrans Permit	October 1, 2003
	2.2j	SOCWA Special Waste Discharge Permit	April 14, 2004
	2.3	Approval Certifications	February 2004
3.0		***Quality Assurance Project Plan***	
	3.1	QAPP	December 2004
	3.2	Monitoring and Reporting Plan	June 2004
4.0		***Project Construction***	
	4.1	Subcontract Documents	November 2003
	4.2	Evidence of Advertisement(s)	February 6, 2004
	4.3	Copy of executed subcontract	April 28, 2004
	4.5	Notice of Completion	December 21, 2005
	4.6	Operator/Maintenance Manual and List of Attendees	October 2005 May 4, 2006
5.0		***Reporting***	
	5.1	Annual Progress Summary	September 2004, 2005, 2006
	5.2	Draft Final Report	January 2007
	5.3	Final Report	**March 2007**

The construction was completed in November and the official start-up began on November 14, 2005. The one-year post-construction monitoring plan covers from November 14, 2005 through November 14, 2006.

3. PROJECT RESULTS

3.1 Project's Effectiveness in Achieving Goals

The goal of the Salt Creek Ozone Treatment Plant is to decrease beach postings at Monarch and Salt Creek beaches and restore beneficial uses by reducing bacterial loadings from dry weather urban runoff flows in Salt Creek.

Based on the evaluation, it has been determined that this project has successfully achieved its goals during the first year of operation. A detailed discussion and various tools used to evaluate the project's effectiveness, as well as monitoring data is provided below.

3.1.1 County of Orange Health Care Agency Annual Ocean and Bay Water Quality Report

The County of Orange Health Care Agency (OCHCA) prepares an annual report summarizing beach water quality throughout the County. The term Beach Mile Days (BMDs) is used to represent the number of days and the linear area of the ocean of bay front waters that are posted for a violation of the AB411 Ocean Water- Contact Sports Standard (or closed due to a sewage spill). BMDs are calculated by multiplying the number of days of a posting (or closure) by the number of miles of beach posted (or closed).

Using BMDs as a measurement of ocean water impairments is more meaningful than using the number of incidences or the number of days since BMDs take into account both the amount of beach and the length of time of a posting (or closure). This method is used by the State of California Water Resources Control Board and all California coastal communities and hence will be used as a measurement of effectiveness for this project.

MONARCH BEACH

Using the data below, there has been a significant reduction in beach postings for Monarch Beach (Station ID OSC25 on Figure 3.1 that follows), both during the AB411 period (from 3.7 to 0.8 BMDs posted) and calendar year (from 4.0 to 0.8 BMDs posted), since the Salt Creek Ozone Treatment Plant started operation in November of 2005. Monarch Beach is located directly at the Treatment Plant outlet and immediately adjacent to the north, and is directly impacted by the quality of the water discharging from the creek and treatment plant.

Table 3.1: Monarch Beach – AB411 Period Summary of Postings

Year	Postings	Days	Beach Mile Days (BMDs)
2004	4	92	5.2
2005	3	60	3.7
2006	2	8	0.8

Source: Orange County Health Care Agency, as of November 14, 2006.

Table 3.2: Monarch Beach – Calendar Year Summary of Postings

Year	Postings	Days	Beach Mile Days (BMDs)
2004	4	92	5.2
2005	4	65	4.0
2006 (Jan-Nov 14)	2	8	0.8

Source: County of Orange Health Care Agency, as of November 14, 2006.

SALT CREEK COUNTY BEACH

Using the data below, there has been a slight increase in beach postings for Salt Creek Beach, both during the AB411 period and calendar year (from 0.2 to 0.6 BMDs posted), since the Salt Creek Ozone Treatment Plant started operation in November of 2005. Salt Creek County Beach is located slightly south of the Treatment Plant outlet and would appear to be less directly impacted by the quality of the water discharging from the creek and treatment plant (Sampling Station S-2 in Figure 3.1 below). Review of test results immediately at the beach discharge point indicate the amount of disinfection accomplished by the plant.

Table 3.3: Salt Creek County Beach – AB411 / Calendar Year Summary of Postings

Year	Postings	Days	Beach Mile Days (BMDs)
2004	6	15	0.9
2005	1	1	0.2
2006	4	11	0.6

Source: County of Orange Health Care Agency, as of November 14, 2006.

The data at Salt Creek County Beach does not show a definitive improvement as in the case of Monarch Beach, based on BMDs. This could be for a couple of reasons:

1) the Salt Creek Monitoring Point (S-2 in Figure 3.1 below) is further downcoast of the Salt Creek Outlet (not immediately adjacent as Monarch Beach is), and other impacts may recontaminate the treated effluent;
2) one of the postings identified which last two days was located downcoast of the Selva Road Ramp at Salt Creek County Beach, and is directly impacted by a storm drain outlet that drains the park's parking lot, which could be a significant factor in the postings and is not directly related to the treatment plant's performance.
3) Treatment plant was down due to maintenance (see detailed explanation in Section 3.1.3 and **Table 3.7**).

A monitoring map is provided in **Figure 3.1** below that will help illustrate the concerns outlined above.

The City will continue to monitor this beach to see if any notable improvements are made. The dynamics of beach water, ocean currents, tides, anthropogenic and non anthropogenic inputs are complex and direct impacts of this project to Salt Creek Beach may not be quantifiable at this time. It is clearly understood that the quality of water exiting the treatment plant at Salt Creek is much higher than the previous untreated water.

It should also be noted that there have been no additional postings at either beach as of date of preparation of this report.

3.1.2 Heal the Bay Annual Beach Report Card

Another well-respected "grading" tool for California's beaches is the annual Heal the Bay (HTB) Report Card (www.healthebay.org). Both Monarch Beach and Salt Creek Beach showed exceptional results of the grading system used by HTB, as Monarch Beach improved from a Beach Bummer with a grade of "D" in 05-06 to a "B" grade in 2006 and Salt Creek County Beach improved from an "A" to an "A+". The City is excited to see these improvements noted in **Table 3.4**.

Table 3.4: Heal the Bay Grades For Dry AB411

Year	2004-05	2005-06	2006 (dry)
Monarch Beach	C	D listed as a "Beach Bummer"	B
Salt Creek	B	A	A+

Source: www.healthebay.org

3.1.3 Project's Effectiveness Evaluation in Compliance with Monitoring Plan (MP) and Quality Assurance Project Plan (QAPP)

Pursuant to the requirements of the Clean Beaches Initiative Contract (Proposition 13), SWRCB requires the City of Dana Point to perform water sampling for indicator bacteria (Total Coliform, Fecal Coliform and Enterococcus) on a weekly basis for one-year at the following sites:

- #1- at the influent in the concrete apron (before treatment), and
- #2 - at the effluent (after treatment)

Flow data through the plant was also to be recorded.

The bacteria results from locations #1 and #2 were evaluated with the surf zone measurements taken by the County of Orange Health Care Agency and the South Orange County Wastewater Authority (SOCWA). **Table 3.5** and **Figure 3.1** below describe and show the locations of the following sampling stations:

Table 3.5: Existing Monitoring Sites

Monitoring Agency	Frequency	Area	Station ID
OCHCA	1/week	Monarch Beach – North of Salt Creek	OSL25
OCHCA	1/week	Salt Creek (50' before surf zone interface)	CSLSC
OCHCA	1/week	Salt Creek County Beach – South of Salt Creek	S2
SOCWA	Nov. 1- April 30: 1/week May1-Oct 31- 2/week	Salt Creek County Beach – South of Salt Creek	S2

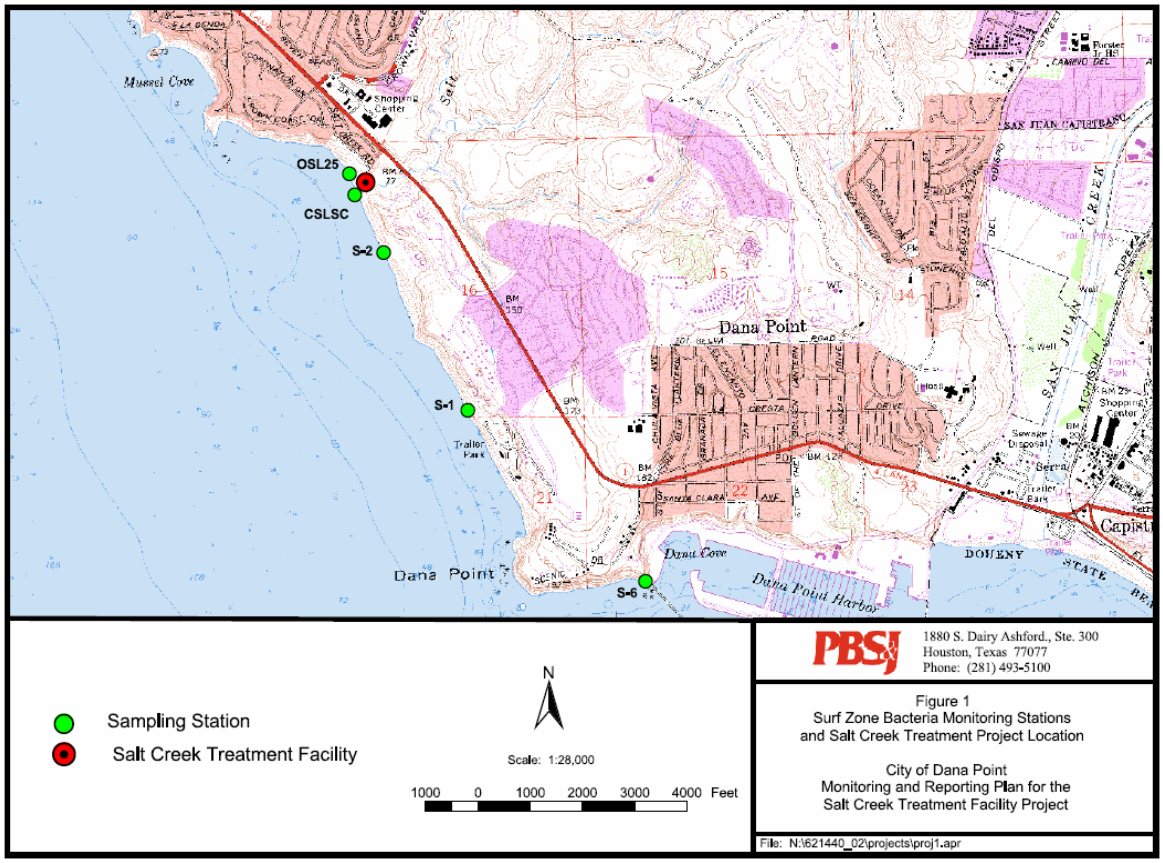

Figure 3.1: AB411 Sampling Station Locations and ID.

The monitoring sites above are the sites that are used by Orange County to post beaches and the results are reflected in **Tables 3.1**, **3.2** and **3.3** above.

In addition to the required sampling, the City opted to include four (4) additional sites to the monitoring plan as follows:

- #3 – in scour pond that runs from the boulders at outlet partially across beach
- #4 – in meandering stream from pond to beach (prior to surf zone)
- #5 – 50 yards North of Salt Creek in surf zone (Monarch Beach)
- #6 – 50 years South of Salt Creek in surf zone (Monarch Beach)

Locations #3 and #4 were added due to the City's concern of potential "recontamination" of the pond water after treatment due to bird and wildlife waste, degradation of vegetation and other non-anthropogenic sources. Locations #5 and #6 were added to make sure sampling in the surf zone was consistent with the samples taken at the plant, as it is well documented that indicator bacteria counts can be highly variable depending on time of sampling, location, tidal influence, etc.

A monitoring map for the City of Dana Point is provided in **Figure 3.2**.

All sampling, monitoring and reporting was conducted in accordance with the approved Quality Assurance Project Plan (QAPP).

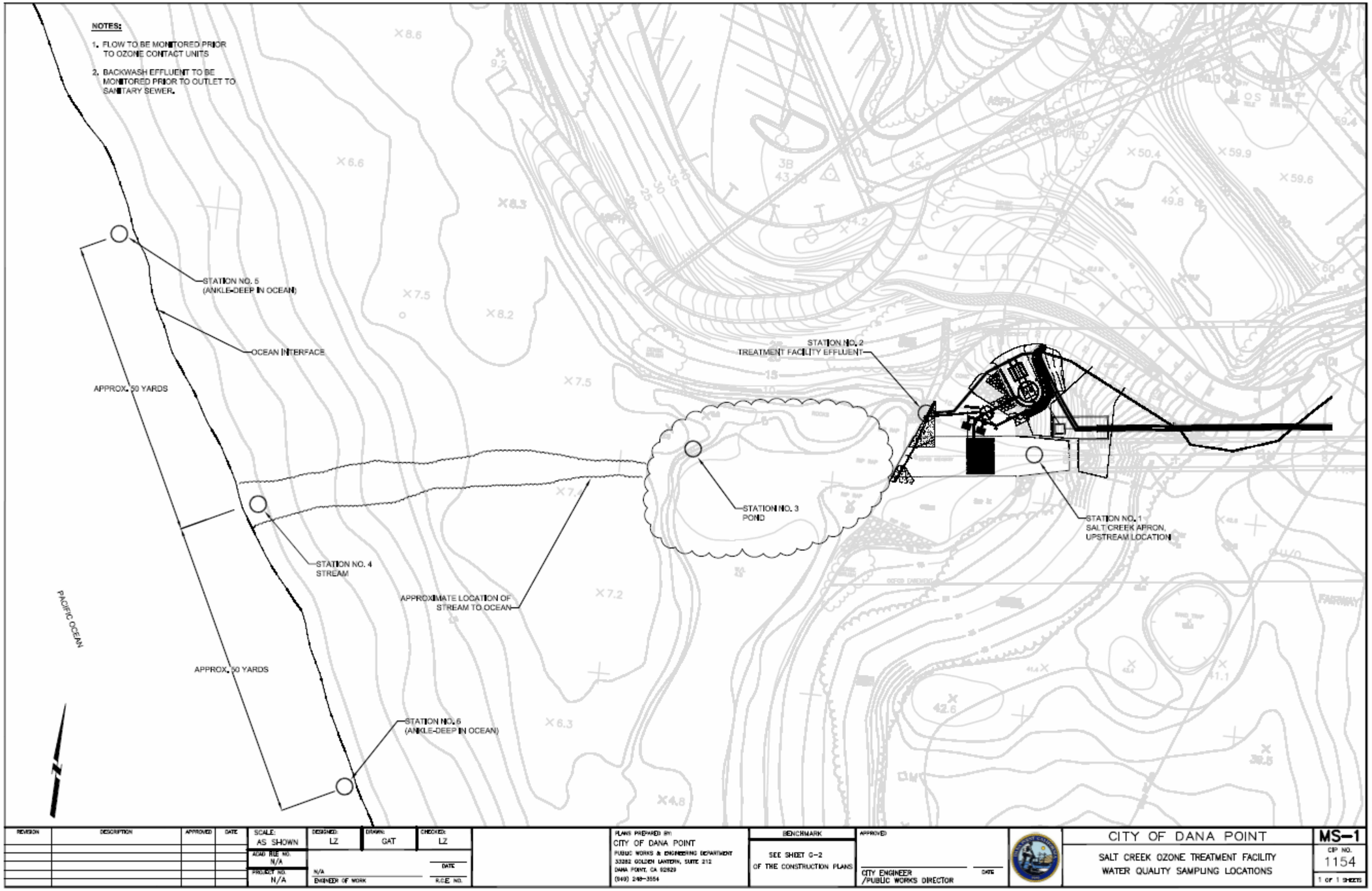

Figure 3.2: Map of City of Dana Point Monitoring Sites

Please see **Appendix A**, which includes a spreadsheet of the indicator bacteria data for the six sites monitored by the City of Dana Point, along with the Orange County Health Care Agency Data and South Orange County Wastewater Authority data (also attached) obtained from http://www.ocbeachinfo.com, Downloads, Reports and Data, Data, Bacteriological Monitoring for Dana Point Harbor and Doheny State Beach. The Station ID for Salt Creek (in the creek) is CSLSC and Monarch Beach is OSL25. The most recent data is found in the "Bacteriological Monitoring – Dana Point and Doheny State Beach" download.

Please note that the highlighted values in Appendix A exceed applicable water quality criteria.

Summary of Bacteria Data

As indicated by the data shown in the attached spreadsheet, the plant, when operating properly, is effectively treating bacteria found in the urban runoff to well below Rec-1 Standards. Location #1 represents untreated influent samples and Location #2 represents the treated effluent at pipe discharge samples. Surf zones samples (locations #5 & #6) generally show corresponding bacteria counts that meet the standards.

It is interesting to note, that in general, in the hotter summer months (May through September 2006), bacteria counts do increase in the scour pond (Location #3) and meandering stream (Location #4); however only rarely did this impact the surf zone water quality at locations #5 and #6, based on the City's test results.

The recontamination phenomena at the scour pond was a concern of both the City and the Regional Water Quality Control Board – San Diego and temporary approval to extend the treated effluent discharge pipe closer to the surf zone, if necessary, was obtained, as the City did not want the existing natural pond to negate the benefits of the treatment plant. Based on the data, however, the pipe extension has not been required and no action is recommended at this time.

Please note that weeks without sample data include days when the plant was not operating due to rain or maintenance.

Summary of Plant Activities

The plant ran seamlessly from November 2005 through June 2006. In July, the region experienced unseasonably hot weather. The hot, dry weather appeared to facilitate the growth of dense algae mats upstream in Salt Creek which sloughed off and triggered a series of operational challenges, besides normal treatment plant maintenance issues (pump repairs, equipment inspection, maintenance and repairs, etc.). See **Table 3.6**.

Table 3.6 – Operational Challenges and Actions Taken

Operational Challenge	Action Taken/Solution
Dense algae mats observed during periods of extremely hot weather. Mats would slough off clogging inlet grate, CDS unit and anthracite coal filters.	A removable debris screen was designed to be constructed just inside the box culvert to provide an additional filter process. OC Flood Control Approvals were obtained. The device was designed to be easily removed during rain events. Increased cleaning and inspection of inlet grate and basket strainers.
Continuing high inlet pressures at anthracite coal filters	After a series of troubleshooting exercises, the problem was attributed to clogged slots on the filter under drains and improper installation of the anthracite coal filter beds resulting in ineffective backwashing which caused the media to get clogged. The Media was removed and replaced in an enhanced manner. The underdrains were cleaned. Backwash protocols have been revised.

During the months of August and September the plant was operated on and off to accommodate repairs, maintenance and troubleshooting.

Summary of Plant Activities correlated with Bacteria Data

Table 3.7 below provides a summary of beach postings since the plant has been in operation:

Table 3.7: Summary of Postings and Correlations

Date of Posting	Location	Correlation	# days posted
May 11, 2006 – May 12, 2006	300 feet downcoast of the Selva Road Ramp at Salt Creek County Beach	This isolated posting at a location not directly adjacent to the outlet does not appear to be directly related to the plant's operation.	2
July 28, 2006 – Jul 30, 2006	Dana Point at Monarch Beach, from Salt Creek to 300 feet upcoast of Salt Creek	Plant was shut down on 7/28/06 due to high inlet pressures on anthracite coal filters.	2
August 16, 2006 – August 17, 2006	Dana Point from Salt Creek to 300 feet downcoast of Salt Creek at Salt Creek County Beach	Plant was shut down for previous two weeks as troubleshooting exercises were conducted.	2

Date of Posting	Location	Correlation	# days posted
September 6, 2006 – September 11, 2006	9/6: Dana Point from Salt Creek to 300 feet downcoast of Salt Creek at Salt Creek County Beach 9/7: Dana Point from Salt Creek to 300 feet upcoast of Salt Creek at Monarch Beach 9/8: Dana Point from Salt Creek to 300 feet upcoast of Salt Creek at Monarch Beach 9/10: Dana Point from Salt Creek to 500 feet upcoast of Salt Creek at Monarch Beach	Inlet pressures at anthracite coal filters slowly escalated and cause was not able to be determined without shutting down plant. Plant was shut down on 9/6/06 for thorough troubleshooting exercise. Anthracite coal filters were reworked. Other maintenance was performed. Some significant issues were identified and addressed. Normal plant operation commenced at end of September. In interim, while some of the issues were being addressed, the plant was operated as much as possible in filter "by-pass" mode where the urban runoff bypassed the anthracite coal filters and was ozonated without fine filtration (treatment still goes through solids removal unit and basket strainers for large solids removal). From the data, this appeared to be partially effective and more time experimenting with this operational protocol will be needed to determine if this is an effective manner in which to operate the plant, when necessary, during maintenance periods.	6-7

The times with beach postings correlate well with operational challenges faced at the plant during this shakedown period, which helps to further demonstrate that the Salt Creek Ozone Treatment Plant, when operating effectively, does improve water quality at the beach. As we learn more during varying circumstances, operating and maintenance procedures are being adjusted accordingly. The City's data is generally consistent with the Orange County Health Care Agency Data.

3.2 Additional Benefits Provided by the Project

In addition to reducing BMDs at Monarch Beach, the project has also provided additional benefits, including:

- Demonstration of success in using an innovative technology to improve water quality;
- Success in implementation a complex project requiring the approval and coordination of multiple agencies and partners, in an environmentally and politically sensitive area;
- The project has won a number of awards, including:
  - Public Works Project of the Year for 2006 awarded by the American Public Works Association (APWA)
  - An Honor Award in the 2006 Consulting Engineers and Land Surveyors of California (CELSOC) Engineering Excellence Award competition
  - A National Recognition Award 2006 from the American Council of Engineering Companies' (ACEC)
  - A 2005 Project Achievement Award from the Orange County Section of the American Society of Civil Engineers
  - National Award for Construction Management Association of America (CMAA)

- California Water Environment Association – Orange County Section's Engineering Achievement Certificate, 2006

- Technology transfer vehicle- The project has been featured in a number of technology and engineering publications and has been presented at a number of water-related conferences, including:

  - APWA International Congress 2004, ***Ozone Disinfection to Reduce Bacteria in Urban Runoff in Salt Creek***, Comparison of disinfection alternatives and selection of process- Author- James B. Rasmus P.E., BCEE, Co-Author - Paul Cooley, P.E.
  - WEFTEC 2004, ***Ozone Disinfection to Reduce Bacteria in Urban Runoff in Salt Creek*** - Comparison of disinfection alternatives and selection of process, Author- James B. Rasmus P.E., BCEE, Co-Author - Dave Cover, P.E., BCEE
  - Civil Engineering Magazine December 2005, ***Seaside Solutions - Urban runoff treatment for the City of Dana Point*****,** Author- James B. Rasmus P.E., BCEE, Co-author Brad Fowler, P.E. - Director of Public Works for the City of Dana Point
  - StormCon 2006, ***Beyond The Sea: Treating Urban Runoff*** – Author- James B. Rasmus P.E., BCEE, Co-Authors - Brad Fowler, P.E.; Lisa Zawaski, CPSWQ
  - California and the World Oceans Conference 2006, ***Beyond The Sea: Treating Urban Runoff*** – Author- James B. Rasmus P.E., BCEE, Co-Author - Brad Fowler, P.E.
  - WEFTEC 2006, ***Meeting New Demands: Disinfecting Urban Runoff*** – Summary of project and review of 1st year operating results - Author- James B. Rasmus P.E., BCEE, Co-Author - Brad Fowler, P.E.
  - Orange County Stormwater LIP/PEA Subcommittee, July, 2006

- The plant has provided educational and awareness outreach opportunities through facility tours and presentations that have been conducted with a variety of audiences; including agencies, college students, community groups, etc.

- The project will help the Salt Creek Watershed achieve compliance with upcoming Bacteria I TMDL Implementation (Bacteria I TMDL is currently in development).

Lastly, the most significant achievement has been accomplished - recent comprehensive evaluation of beach water quality data since the plant began operation has shown such a dramatic improvement in water quality, the beaches now meet current de-listing criteria!. The data and evaluation has been submitted per the December 4, 2006 Public Solicitation of Water Quality Data for 2008 Integrated Report – List of Impaired Waters and Surface Water quality assessment. All the Salt Creek and Monarch beaches can be removed from the 2008 303(d) List of Impaired Waterbodies for bacteria!

4. MAINTENANCE SUMMARY

4.1 General Required Maintenance

As with any treatment BMP, maintenance requirements and costs are an integral component and must be considered in the planning and design phase. Maintenance was considered during evaluation of UV and Ozone disinfection.

The City has contracted with South Coast Water District (SCWD) to operate and maintain the plant. SCWD staff has been instrumental in the plant's success. SCWD and City staff, along with PBS&J, when necessary, work closely together to review operations, evaluate data, and troubleshoot.

A brief summary of general maintenance requirements is provided below. Please note that detailed maintenance requirements and schedule are provided in the Salt Creek Ozone Treatment Plant Operation and Maintenance (O&M) Manual, which is available upon request. Two training workshops were held in October 2005 and on May 4, 2006. Operations staff, engineers and City staff participated in the training which proved to be very beneficial as they provided a hand-ons, open forum for both the operators and engineers to learn from each other and address any concerns.

Summary of operation and maintenance requirements: (please note that this list is not exhaustive, and is only intended to give a general sense of O&M requirements):

- General pump, valve and electrical equipment maintenance
- Weekly cleaning and monthly calibration of four oxidation reduction potential (ORP) sensors
- Monthly cleaning of trash separation unit and wet well
- Daily plant visits, data logging and checking of parameters, inlet grate and basket strainer cleaning
- Bi-annual anthracite coal filter inspection and change as required (change every 1-5 years, as needed)
- Ozone equipment maintenance monthly-quarterly by maintenance contractor
- General building maintenance
- Annual draining and cleaning of ozone contact basins
- Monthly cleaning of backwash equalization basin

The plant is connected to SCWD's SCADA system and SCWD staff is notified if an alarm at the plant is signaled so that SCWD can take appropriate action.

It is important to distinguish this urban runoff treatment plant from a typical sewage plant, in the sense that if this plant does not operate it does not pose an eminent danger to human health or the environment. As such, while the plant does have many features that allow a lot of flexibility in its operation, it was not designed with the redundancy required for a sewage treatment plant.

4.1.2 Compliance with Permit SCWD-N4-004

In order to discharge the backwash water to the sanitary sewer system as required during daily operation; a Nuisance Water – Special Wastewater discharge Permit #SCWD-N4-004 from SOCWA/SCWD was obtained. The permit requires monthly reports containing a monthly grab sample that is tested for specific parameters and daily flow recording information. To date, the testing and flow data have been in compliance every month.

4.2 Operation & Maintenance Costs

Maintenance and operation costs are provided for the first year of operation. It is important to note that although the plant was designed to run only during the dry season months (in general, May through October), due to its success, the City has opted to run it all year, as practicable. There is a learning curve and it is the City and SCWD's goal to continue to maximize the efficiency of the plant operations, while retaining the treatment effectiveness. Ozone dosages will be continued to be adjusted and evaluated. Over time, the running schedule may be adjusted as well. Factors such as rains, number of beach users during specific times, cost, and water quality may be factors of consideration when adjusting the operation season, if appropriate.

- Electrical costs have averaged $5,900 per month.

- SCWD Operation & Maintenance budget is $6,000, which is a conservative estimate that includes a 10% contingency and all time, materials and specialty contractor costs.
- Monthly monitoring per Permit #SCWD-N4-004 is $550/month
- Backwash sewer charges have been budgeted conservatively at $1,800/month.

4.3 Keys to Success/Lessons Learned

Some Keys to Success of this project include:

- Engaging operations staff in design and planning;
- Engaging wastewater and stormwater professionals in planning and design;
- Careful evaluation of water quality is imperative to process selection;
- Allow flexibility in design to accommodate variable surface water conditions;
- Consider short-term and along-term monitoring plan and costs;
- Experienced operations personnel are invaluable troubleshooters;
- Careful, comprehensive and accurate record keeping is an integral component of successful troubleshooting;
- Properly trained staff, familiar with design and function of elements of plant, are key to efficient troubleshooting; and
- Working with local community and affected parties EARLY in planning process. Obtaining community support of the project was crucial for a successful completion.

Lessons learned include:

- Include features for automated data retrieval system, as budget allows. This is important for reporting requirements and continued operations evaluations;
- Carefully consider design and construction of filtration system and development of backwash protocols, acknowledging the dynamics of urban runoff water quality;
- Acknowledge that there may be materials and equipment that are not subject to ozone under normal operating conditions, but may be exposed under specific circumstance and evaluate and consider ozone-resistant materials where appropriate;
- Ensure that adequate access for maintenance is provided - consult with future operators in detail in design phase;
- Coordinate electrical engineer with operations staff to ensure proper and ease of access and efficient lock-out/tag-out procedures can be implemented; and
- Keep in mind that when using highly-specialized equipment, repairs may take longer than anticipated.

4.4 A Look to the Future

The City has seen success in a number of diversion and treatment plant projects which help alleviate water quality problems at the storm drain outlets (aka “end-of-pipe solutions”). See **Table 4.1** below for a list of projects.

Table 4.1: Summary of Water Quality Projects and Costs

Project Name	*Status*	*Target Area*	*Funding Source*	*Grant Funds*	*Total Cost of Project*
Alipaz Storm Drain Treatment Facility	Complete	San Juan Creek / Doheny State Beach	Prop. 13	$369,500	$659,102
Del Obispo Storm Drain Treatment Facility	Complete	San Juan Creek / Doheny State Beach	Prop. 40	$500,000	$652,397
North Creek Storm Drain Diversion	Complete	San Juan Creek / Doheny State Beach	Prop. 13	$380,500	$1,028,691
Capistrano Beach Storm Drain	Complete	Capistrano Beach	Prop. 40	$500,000	$3,000,000
Salt Creek Ozone Treatment Facility	Complete	Salt Creek Beach / Monarch Beach	Prop. 40	$4,000,000	$6,700,000
			Total	*$5,750,000*	*$12,401,190*

While diversion facilities and treatment plants help alleviate water quality problems at the storm drain outlets, targeting smaller contributing sources of water pollution is also important. With this in mind, further efforts to aid in the improvement of water quality include a vigorous street sweeping program and the maintenance of catch basin filters in the storm drain inlets. The City also provides support to a relatively new community group, the Dana Point Earth Ocean Society, and one of their efforts includes studying and implementing improvements in the Salt Creek Watershed. The City continues to seek out innovative solutions to water quality issues.

The City's water quality program includes a comprehensive public education component that includes program targeting specific audiences, such as Homeowner's Associations, residents (general public), local business owners, contractors and children. The City provides educational materials and give-aways at well-attended events, such as the Dana Point Whale Festival, Ocean Awareness Day, Earth Day, and Coastal Clean Up Day. One of the initiatives of the City's Ocean Water Subcommittee is to enhance the existing outreach program.

Another significant effort is the City's partnership with the Southern California Coastal Water Research Project (SCCWRP) who was recently awarded grant funding to conduct a microbial source tracking and epidemiology study at Doheny State Park Beach. Although this beach is not within the Salt Creek watershed, the information gathered may have regional and national implications.

In addition to the City and region-wide efforts, the City hopes to see further improvements regarding this project, as the plant operation protocols are continually evaluated and adjusted as necessary, as well as the dynamics of bacteria in urban runoff, creeks, scour ponds, and beaches and ocean are better understood.

It should be noted that there may be continued fluctuations in data and beach postings as plant operational adjustments occur to further refine and maximize efficiency of the plant. For example, a goal of the City/SCWD is to develop an optimized ozone dosage protocol that applies the minimum required ozone dosage, yet still achieves effective treatment of bacteria. This will conserve electrical costs (higher energy costs result from greater ozone generation). During this optimization process a situation may occur, where an applied ozone dosage may not be enough to achieve the desired treatment and thus the water may come too close to and/or exceed the standards. This trial and error method of evaluation is complicated by the 3-7 day turn around time for the indicator bacteria test data to become available, so that an adjustment made one week ago, that may not have provided that anticipated results, will not be identified until a week later. The City, however; has acknowledged this fact and realizes the necessity and importance of

developing an effective and efficient plant and is willing to work through this on-going development phase.

The City is also working with a number of agencies to investigate the feasibility of recycling the treated urban runoff for irrigation purposes. This is still being studied, but the City is optimistic that this may be a possibility.

REFERENCES

Associated Laboratories, 2005-06. City of Dana Point – Salt Creek Ozone Treatment Plant Data.

Orange County Health Care Agency Environmental Health hard data provided via email.

Orange County Health Care Agency, 2004 & *2005 Annual Ocean and Bay Water Quality Report.* Orange County Health Care Agency, http://www.oc.ca.gov/hca/regulatory/ocean/downloads.htm.

Heal the Bay Annual Report Cards 2005 & 2006, www.healthebay.org.

Salt Creek Storm Drain Treatment Project Preliminary Design report, July 2002, PBS&J.

Operations and Maintenance Manual for Salt Creek Ozone Treatment Facility, March 2006, PBS&J.

Quality Assurance Project Plan (QAPP) and Monitoring Plan (MP) for Bacteriological Monitoring of the Salt Creek Treatment Facility Project, October 2004, PBS&J.

For questions or comments concerning this report, please contact the following City of Dana Point staff:

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Dana Point, CA 92629

Other Agencies currently involved in the project include:

South Coast Water District
31592 West Street, Laguna Beach, CA 92651
Director of Operations – Joe McDivitt: 949-499-4555
Wastewater Superintendent – John Langill: 949-499-4555

South Orange County Wastewater Authority
34156 Del Obispo St. Dana Point CA, 92629
Industrial Waste Administrator - Paul Schmidtbauer: 949-234-5412

Ozone Water Systems
5401 South 39th Street, Suite 1, Phoenix, AZ 85040
John Overby: 480-421-2400, Local Service Provider: 714-373-9976

PBS&J
175 Calle Magdalena, Encinitas, CA 92024
Contact: Rika Tobe: 760-753-1120

APPENDIX A

WATER SAMPLING DATA

Salt Creek Ozone Treatment Plant Monitoring Data, 3/13/2007

TREATMENT PLANT OPERATION BEGAN ON 11/14/05

NOTES	11/04/05 - 11/08/05 Salt Creek posted. plant alarm went off at 2:00 AM on Sunday, indicating low flow. interruption in plant functioning on the 15th so the test data is not valid.	due to low-flow alarm on Thursday 11/17/05 & holiday, no samples scheduled to be taken this week. Plant began to automatically run on Wednesday, 11/23/05	Plant shut off Thursday 12/1/05 due to anticipated rains.	12/5 - Sewer Spill - plant was not running on 12/5/05, Plant running 12/6/05 at 11:30. Samples taken on 12/9/05, only at plant.	12/15/ 8:30 PM - system shut down due to filter	12/31/05 - plant shut down due to rains. Scheduled for re-start after CDS and wet well cleaning on 1/4/05.	Treatment plant off from 12/31/05 until 1/5/06 12 PM. 1/05/06 - Ozone dosage scheduled to be modified from 300-900mV to 600-900mV - not completed to date, 1/5/05.		Ozone was adjusted on 1/11/06 at 2:50 PM (flow rate from 38-40%) via John G (Ozone Water Systems). Ozone quarterly maintenance to be coordinated between SCWD and John G. Monitoring Plan revised. Only bacteria samples taken. Monitoring Plan to be re-evaluated at beginning of dry-weather season in April/May 2006.				2/8/06 - shut down for a few hours to clean CDS. Efrem noted that rubber joints (recirculation pump) are being eaten away by Ozone. He has contacted Metrobuilders and will replace them. Plant back on line.	Plant shut down on 2/18/06 due to rain. The plant was started up on Tuesday, 2/21/06.		No samples taken this week due to rain on 2/27 & 2/28. The flows are still pretty high at Salt Creek and there is a 40% chance of rain on Thursday. CSD & sand filter maintenance to be conducted. Strainer lip to be reinforced. SCWD has scheduled Ozone contractor (John g) to come out next week for inspection maintenance on ozone equipment.	No samples taken this week due to rains			plant off on 3/28/06 due to forecasted rain	Treatment plant back on 4/6/06 @ 9:30 AM				
DATE OF SAMPLE	**11/15/2005**	**No Sample**	**12/1/2005**	**12/9/2005**	**12/14/2005**	**12/20/2005**	**12/28/2005**	**1/6/2006**	**1/11/06 AM**	**1/19/06 PM**	**1/25/06 Noon**	**1/31/06 AM**	**2/8/06 AM**	**2/15/06 AM**	**2/22/06 AM**	**No Sample**	**No Sample**	**3/15/06 AM**	**3/23/06 AM**	**3/28/2006**	**4/7/06 PM**	**4/12/06 AM**	**4/19/2006 AM**	**4/26/2006 AM**	**5/3/06 AM**
FLOW (MGD) - instantaneous	The flow has varied from 500-1000 gpm throughout the day and is recorded daily on log sheets.																								
Salt Creek Apron - Location 1																									
Total Coliform (MPN/100mL)	8,000	N/A	3,000	1,400	11,000	24,000	30,000	160,000	16,000	3,000	2,400	22,000	11,000	17,000	17,000	NA	NA	11,000	16,000	NA	30000	90000	30000	50000	50000
Fecal (E. Coli) (MPN/100mL)	300	N/A	500	700	3,000	900	1,100	1,600	500	170	900	800	5,000	2,300	500	NA	NA	300	300	NA	1100	9000	5000	3000	8000
Enterococcus (MPN/100mL)	2,710	N/A	210	387	2,900	4,500	5,800	10,640	15	5,000	12,800	4,900	7,000	5,300	4,000	NA	NA	1,300	4,900	NA	3300	2000	2400	4580	7800
Treatment Plant Effluent - Location 2																									
Total Coliform (MPN/100mL)	800	N/A	<2	1600	22	4	2	23	<2	<2	<2	2	<2	<2	<2	NA	NA	<2	<2	NA	<2	<2	<2	7	<2
Fecal (E. Coli) (MPN/100mL)	80	N/A	<2	11	<2	<2	<2	8	<2	<2	<2	<2	<2	<2	<2	NA	NA	<2	<2	NA	<2	<2	<2	<2	<2
Enterococcus (MPN/100mL)	814	N/A	<1	72	109	<1	3	140	<1	12	7	2	4	4	1	NA	NA	10	<1	NA	<1	<1	<1	5	1
In Pond towards Ocean - Location 3																									
Total Coliform (MPN/100mL)	300	N/A	1600	N/A	5000	240	80	1,300	900	<2	2	900	<2	<2	<2	NA	NA	<2	<2	NA	24000	80	4	500	240
Fecal (E. Coli) (MPN/100mL)	30	N/A	80	N/A	220	23	23	23	50	<2	<2	8	<2	<2	<2	NA	NA	<2	<2	NA	2400	8	4	50	11
Enterococcus (MPN/100mL)	22	N/A	111	N/A	106	27	23	289	22	1	3	131	3	2	1	NA	NA	1	<1	NA	864	14	3	125	69
In stream, near Ocean - Location 4																									
Total Coliform (MPN/100mL)	800	N/A	500	N/A	500	240	240	800	240	13	2	14	13	7	140	NA	NA	26	22	NA	3000	240	11	500	50
Fecal (E. Coli) (MPN/100mL)	80	N/A	50	N/A	300	50	50	30	240	4	<2	2	13	2	30	NA	NA	26	<2	NA	170	<2	<2	110	30
Enterococcus (MPN/100mL)	19	N/A	84	N/A	110	35	44	316	21	17	1	8	29	22	36	NA	NA	6	4	NA	329	2	3	86	68
In Ocean 50 yds North of outlet - Location 5																									
Total Coliform (MPN/100mL)	170	N/A	4	N/A	4	50	300	8	23	23	<2	8	50	4	130	NA	NA	27	2	NA	2400	14	7	<2	4
Fecal (E. Coli) (MPN/100mL)	170	N/A	4	N/A	2	11	300	<2	4	23	<2	8	30	4	7	NA	NA	22	2	NA	220	<2	4	<2	4
Enterococcus (MPN/100mL)	6	N/A	1	N/A	4	1	10	17	15	19	3	3	29	5	34	NA	NA	11	7	NA	150	2	7	29	9
In Ocean 50 yds South of outlet - Location 6																									
Total Coliform (MPN/100mL)	8	N/A	9	N/A	7	80	300	17	80	4	<2	13	130	22	11	NA	NA	130	4	NA	<2	4	7	<2	<2
Fecal (E. Coli) (MPN/100mL)	2	N/A	2	N/A	4	9	300	<2	30	4	<2	2	80	22	4	NA	NA	130	<2	NA	<2	2	<2	<2	<2
Enterococcus (MPN/100mL)	4	N/A	7	N/A	10	6	14	6	9	7	2	4	27	11	8	NA	NA	10	3	NA	2	1	3	4	4

highlighted cell indicates exceedance of REC 1 standard, single sample

REC 1 Standards

Single Sample

Total	10000	/100 mL	
Fecal (E. Coli)	400	/100 mL	
Enterococcus	104	/100 mL	

Fecal/Total ratio >1000 Total Coliforms, if ratio exceeds 0.1

30-day Geometric Log Mean

Total	1000	per	100	ml	
Fecal (E. Coli)	200	per	100	ml	
Enterococcus	35	per	100	ml	

Salt Creek Ozone Treatment Plant Monitoring Data, 3/13/2007

TREATMENT PLANT C																							
NOTES	Salt Creek at Selva Road posted 5/11 & 5/12 - downstream of outlet- does not appear to be correlated with plant operation (unposted on 5/13)		5/18/06 - Ozone adjusted from 300 - 900 to 200 - 900			6/13/06, ozone adjust to 100-600			7/05/06 - no sample taken, plant alarm on and plant not operating when sampler on site. Plant restarted on 7/05/06. 7/7/-06 - 7/11/06 plant not operating due to bearing failure. Plant anticipated to be repaired and operating by 7/11/06 PM.	7/13/06 - Data Download system up and running; 7/14/06 Data Download system not functioning- sent to consultant	beginning og high inlet pressures at media filters	7/24/25 plant down, 7/26 plant down - no sample taken. Beach posted 7/28-30	No sample taken week of 8/7- plant down	Beach posted 8/16 17. Plant operating 8/18		Media Filter problems	Plant not running. Beach posted 9/6/06 - 9/11/06	Beach posted through 9/12/06 - plant running on By-pass mode - only ozone, no filtration	Plant running in by-pass mode- only ozone, no filtration	Plant began normal operation on 9/27/06	10/2/06 Backwash pumped went down & being repaired. Posted 10/5/06 - removed on 10/6/06.		Pump repaired Plant online on 10/16 8AM. Basketstrainers and CDS units noted oily film. Slight drizzle. 8/18/06: Ozone Reduced from 600-900 to 100-800 per Rika
DATE OF SAMPLE	**5/11/06 AM**	**5/17/06 AM**	**5/25/06 AM**	**6/01/06 AM**	**6/8/2006**	**6/13/06 AM**	**6/22/06AM**	**6/29/06 AM**	**No Sample**	**7/12/2006**	**7/20/2006**	**No Sample**	**No Sample**	**8/14/2006**	**8/25/2006**	**8/31/2006**	**No Sample**	**9/11/2006**	**9/18/2006**	**9/28/2006**	**No Sample**	**No Sample**	**10/18/2006**
FLOW (MGD) - instantaneous																							
Salt Creek Apron - Location 1																							
Total Coliform (MPN/100mL)	24000	90,000	>160000	90000	50000	90000	<160000	160000	NA	30000	28000	NA	NA	30000	50000	160000	NA	50000	160000	50000	NA	NA	90000
Fecal (E. Coli) (MPN/100mL)	3400	1400	>160000	24000	7000	6000	30000	24000	NA	3000	8000	NA	NA	5000	5000	8000	NA	5000	11000	24000	NA	NA	5000
Enterococcus (MPN/100mL)	10300	3700	12000	37000	6500	4300	14200	12900	NA	11600	53000	NA	NA	36000	18000	22800	NA	28800	20300	14700	NA	NA	7100
Treatment Plant Effluent - Location 2																							
Total Coliform (MPN/100mL)	<2	<2	2	<2	11	30	30	30	NA	240	2200	NA	NA	23	240	900	NA	23	30000	140	NA	NA	130
Fecal (E. Coli) (MPN/100mL)	<2	<2	2	<2	<2	2	8	30	NA	22	400	NA	NA	2	21	500	NA	2	1700	4	NA	NA	2
Enterococcus (MPN/100mL)	1	2	2	1	10	6	13	14	NA	37	1260	NA	NA	43	114	432	NA	21	9072	10	NA	NA	20
In Pond towards Ocean - Location 3																							
Total Coliform (MPN/100mL)	110	300	5000	16000	500	240	5000	3000	NA	9000	5000	NA	NA	9000	>160000	22000	NA	50000	50000	5000	NA	NA	800
Fecal (E. Coli) (MPN/100mL)	80	2	1400	1100	240	240	2400	1300	NA	2200	3000	NA	NA	900	90000	300	NA	2200	5000	240	NA	NA	80
Enterococcus (MPN/100mL)	105	67	576	430	471	331	432	241	NA	432	828	NA	NA	1440	4580	1070	NA	9360	11520	75	NA	NA	70
In stream, near Ocean - Location 4																							
Total Coliform (MPN/100mL)	80	80	500	500	900	1709	900	130	NA	5000	2400	NA	NA	16000	2800	500	NA	16000	300	1600	NA	NA	16000
Fecal (E. Coli) (MPN/100mL)	30	80	800	50	900	1100	300	50	NA	5000	800	NA	NA	2200	900	130	NA	1300	110	900	NA	NA	1300
Enterococcus (MPN/100mL)	71	19	580	92	432	509	720	16	NA	288	648	NA	NA	1548	520	105	NA	5040	150	3200	NA	NA	394
In Ocean 50 yds North of																							
Total Coliform (MPN/100mL)	4	90	2	14	90	30	22	8	NA	<2	500	NA	NA	2400	500	500	NA	50	500	50	NA	NA	80
Fecal (E. Coli) (MPN/100mL)	2	7	2	11	30	23	14	8	NA	<2	50	NA	NA	2400	300	500	NA	50	130	14	NA	NA	80
Enterococcus (MPN/100mL)	14	8	39	63	53	66	16	9	NA	13	159	NA	NA	319	135	58	NA	432	176	54	NA	NA	102
In Ocean 50 yds South of																							
Total Coliform (MPN/100mL)	12	22	30	12	22	<2	7	50	NA	4	80	NA	NA	300	<2	50	NA	50	500	4	NA	NA	50
Fecal (E. Coli) (MPN/100mL)	4	4	8	9	17	<2	4	8	NA	<2	50	NA	NA	300	<2	17	NA	30	22	4	NA	NA	50
Enterococcus (MPN/100mL)	12	7	47	812	27	3	18	3	NA	27	169	NA	NA	78	4	14	NA	35	55	12	NA	NA	58
REC 1 Standards																							
Single Sample																							
Total																							
Fecal (E. Coli)																							
Enterococcus																							
Fecal/Total ratio																							
30-day Geometric Log Mean																							
Total																							
Fecal (E. Coli)																							
Enterococcus																							

APPENDIX B

COMPILATION OF ANNUAL PROGRESS REPORTS

Salt Creek Ozone Treatment Facility Project
Dana Point, CA

Salt Creek Beach and Monarch Beach are extremely popular beach locations in the City of Dana Point. A small, offshore reef creates some of the best left swells along the entire coastline. Swimming, body surfing, sunbathing and tidepool exploration are other beach activities. These beaches are currently subject to numerous closures during dry weather periods due to high levels of bacteria. Through numerous studies, the City has determined that a key source of bacteria in Salt Creek is urban runoff that discharges to the beach. The source of water to Salt Creek is from storm drain flows from the Salt Creek watershed which consists of approximately 4,500 acres. The bacteria that are present in Salt Creek appear to have a direct impact on the ocean water quality at the Beach causing numerous beach closures and postings. The proposed Salt Creek Storm Drain Treatment Facility will provide an advanced storm water treatment facility to reduce bacteria levels in the Salt Creek dry-weather flows just prior to discharge into the ocean. The City believes that this project in combination with the County of Orange's efforts to maintain the outlet/beach adjacent to Salt Creek, will greatly improve ocean water quality and reduce the number of closures and postings.

The project involves the construction of a 2,000 square foot ozone storm water treatment facility to be located adjacent to the Salt Creek storm drain outlet in the City of Dana Point. The proposed facility will be located at the outlet of Salt Creek as well as on the third hole of the Monarch Beach Golf Links. Flows will be captured at the outlet and pumped to the treatment facility which is over 1500 feet away on the golf course. The treatment facility will be housed within a reinforced concrete building and will include both ozone and electrical equipment rooms, four basket strainers, and four horizontal sand strainers. The ozone contact basin would be buried below the building in a concrete structure. Additionally, on the west side of the facility, outside of the building, the project would include a subsurface wet well, subsurface detention basin, and a subsurface valve vault. Moreover, the County has proposed to restack the existing riprap to prevent Salt Creek's flows from eroding the beach. The overall project, once completed, will capture up to 1,000 gallons per minute of urban runoff, treat it, and direct it back into the flows at the Salt Creek outlet.

Both ozonation and ultraviolet (UV) light methods were considered for the Salt Creek Strom Drain Treatment Project because of their effectiveness and biologically friendly attributes. A comparative evaluation of both ozone and ultraviolet light disinfection was conducted to determine the most favorable disinfection method to meet the City's goals. For this project, ozone was determined to be more reliable and cost effective for several reasons. Initial sampling of the urban runoff in the Salt Creek Storm Drain shows there are high concentrations of total hardness, iron, turbidity, and total suspended solids (TSS). These levels were much higher than thoe levels typically used for UV disinfection. When the runoff was tested after filtration by a 1.5 micron filter, the UV transmission rate was only 46 to 55 percent. Based on discussions with UV manufacturers, it was determined that reliability for disinfection of bacteria was low for transmission rates in this range, without additional treatment methods. The additional treatment methods would likely include the oxidation and removal of iron and manganese, plus a greater amount of filtration to handle the high solids loading. These treatment processes, in addition to the UV disinfection system would be extremely costly.

The City of Dana Point is very committed to reducing beach closures at Salt Creek and Monarch Beach.

The City is also very committed to doing so in a cost effective and reliable manner. Ozone is one of the strongest disinfectants currently being used in the water treatment industry, and its ability to inactivate bacteria, protozoa, and viruses is highly reliable. Although ozone treatment involves more mechanical equipment compared to UV disinfection, it has been proven to be a highly reliable disinfection system for variable water quality as observed in Salt Creek. Keeping the watersheds and beaches clean and safe for public use is one of the top priorities for the City of Dana Point. The Salt Creek Storm Drain Treatment Project is another major step towards improving water quality.

Clean Beaches Initiative
Urban Runoff/Water Quality Improvement Projects

City: **City of Dana Point**
Project Name: **Salt Creek Ozone Treatment Facility Project**

Project Description/Purpose: Salt Creek Beach and Monarch Beach are extremely popular beach locations in the City of Dana Point. A small, offshore reef creates some of the best left swells along the entire coastline. Swimming, body surfing, sunbathing and tidepool exploration are among other popular beach activities. These beaches however are currently subject to numerous closures during dry weather periods due to high levels of bacteria. The proposed Salt Creek Storm Drain Treatment Facility will provide an advanced storm water treatment facility to reduce bacteria levels in the Salt Creek dry-weather flows just prior to discharge into the ocean. The City believes that this project in combination with the County of Orange's efforts to maintain the outlet/beach adjacent to Salt Creek will greatly improve ocean water quality and reduce the number of closures and postings. The project involves the construction of a 2,000 square foot ozone storm water treatment facility to be located adjacent to the Salt Creek storm drain outlet in the City of Dana Point. The proposed facility will be located at the outlet of Salt Creek as well as on the third hole of the Monarch Beach Golf Links. Flows will be captured at the outlet and pumped to the treatment facility that is over 1500 feet away on the golf course. The treatment facility will be housed within a reinforced concrete building and will include both ozone and electrical equipment rooms, four basket strainers, and four horizontal sand strainers. The ozone contact basin would be buried below the building in a concrete structure. Additionally, on the west side of the facility, outside of the building, the project would include a subsurface wet well, subsurface detention basin, and a subsurface valve vault. Moreover, the County has proposed to restack the existing riprap to prevent Salt Creek's flows from eroding the beach. The County has actually commenced that work effective August 16, 2004 due to the hard work of County staff to secure permits.

The overall project, once completed, will capture up to 1,000 gallons per minute of urban runoff, treat it, and direct it back into the flows at the Salt Creek outlet. Both ozonation and ultraviolet (UV) light methods were considered for the Salt Creek Strom Drain Treatment Project because of their effectiveness and biologically friendly attributes. A comparative evaluation of both ozone and ultraviolet light disinfection was conducted to determine the most favorable disinfection method to meet the City's goals. For this project, ozone was determined to be more reliable and cost effective for several reasons. Initial sampling of the urban runoff in the Salt Creek Storm Drain shows there are high concentrations of total hardness, iron, turbidity, and total suspended solids (TSS). These levels were much higher than thoe levels typically used for UV disinfection. When the runoff was tested after filtration by a 1.5 micron filter, the UV transmission rate was only 46 to 55 percent. Based on discussions with UV manufacturers, it was determined that reliability for disinfection of bacteria was low for transmission rates in this range, without additional treatment methods. The additional treatment methods would likely include the oxidation and removal of iron and manganese, plus a greater amount of filtration to handle the high solids loading. These treatment processes, in addition to the UV disinfection system would be extremely costly.

Other Public Agency/Private Partners: State of California Water Resources Control Board, City of Dana Point, South Coast Water District, South Orange County Wastewater Authority, County of Orange, Makar Properties, Troon Golf

Project Cost: **$6,700,000**

Project Funding Sources: City of Dana Point, State Water Resources Control Board (SWRCB), MiOcean (non-profit organization)

Clean Beaches Initiative Funding: **$4,000,000**

Project Status: **In construction. Tentative completion date is June 2005.**

Project Outcomes/Effectiveness/Benefits: The anticipated project outcomes and benefits is that this project will reduce the number of beach postings. The City will monitor the storm drain outlet and the surf zone for bacteria for one year after construction is complete. Additionally, this project will take a significant step in improving local ocean water quality. A secondary benefit to this project that the City Council hopes to deliver is that the treated urban runoff can be reused for irrigation purposes. This is still being studied, but the City is optimistic that this will be possible.

Other Comments:
The project will treat up to 1.5 million gallons per day in urban runoff during non-storm events year round.

Clean Beaches Initiative
Urban Runoff/Water Quality Improvement Projects

City: **City of Dana Point**
Project Name: **Salt Creek Ozone Treatment Facility Project**

Project Description/Purpose: Salt Creek Beach and Monarch Beach are extremely popular beach locations in the City of Dana Point. A small, offshore reef creates some of the best left swells along the entire coastline. Swimming, body surfing, sunbathing and tidepool exploration are among other popular beach activities. These beaches however are currently subject to numerous closures during dry weather periods due to high levels of bacteria. The proposed Salt Creek Storm Drain Treatment Facility will provide an advanced storm water treatment facility to reduce bacteria levels in the Salt Creek dry-weather flows just prior to discharge into the ocean. The City believes that this project in combination with the County of Orange's efforts to maintain the outlet/beach adjacent to Salt Creek will greatly improve ocean water quality and reduce the number of closures and postings. The project involves the construction of a 1,700 square foot ozone treatment facility to be located adjacent to the Salt Creek storm drain outlet in the City of Dana Point. Flows will be captured at the outlet and pumped to the treatment facility that is over 600 feet away on the golf course, adjacent to the tee box of Hole 3 on the Monarch Beach Golf Linx. The treatment facility will be housed within a masonry block building and will include ozone and electrical equipment rooms, four basket strainers, and four horizontal sand strainers. The ozone contact basin would be buried below the building in a concrete structure. Additionally, on the west side of the facility, outside of the building, the project would include a subsurface wet well, subsurface detention basin, and a subsurface valve vault.

With regard to the Salt Creek outlet, the County has aided in the project effort by restacking the existing riprap to prevent Salt Creek's flows from eroding the beach. The restacking was completed in August 2004 and will be done again in late September 2005.

The overall project, once completed, will capture up to 1,000 gallons per minute of urban runoff, treat it, and direct it back into the flows at the Salt Creek outlet. Both ozonation and ultraviolet (UV) light methods were considered for the Salt Creek Storm Drain Treatment Project because of their effectiveness and biologically friendly attributes. A comparative evaluation of both ozone and ultraviolet light disinfection was conducted to determine the most favorable disinfection method to meet the City's goals. For this project, ozone was determined to be more reliable and cost effective for several reasons. The construction of the Salt Creek Storm Drain Facility is 95% complete at this time. Staff will begin start up activities in September 2005 and hope to finalize this project by the end of the month. A grand opening is currently scheduled for October 17, 2005.

Once the project is complete and operational, the City will start a comprehensive monitoring program reflective of the prepared Monitoring Plan. One of the keys to the monitoring effort is to verify project effectiveness to meet the goal of reducing beach postings.

Other Public Agency/Private Partners: State of California Water Resources Control Board, City of Dana Point, South Coast Water District, South Orange County Wastewater Authority, County of Orange, Makar Properties, Troon Golf
Project Cost: **$6,700,000**

Project Funding Sources: **City of Dana Point, State Water Resources Control Board (SWRCB), MiOcean (non-profit organization)**

Clean Beaches Initiative Funding: **$4,000,000**

Project Status: **In construction. Tentative completion date is October 2005.**

Project Outcomes/Effectiveness/Benefits: The anticipated project outcomes and benefits is that this project will reduce the number of beach postings. The City will monitor the storm drain outlet and the surf zone for bacteria for one year after construction is complete. Additionally, this project will take a significant step in improving local ocean water quality. A secondary benefit to this project that the City Council hopes to deliver is that the treated urban runoff can be reused for irrigation purposes. This is still being studied, but the City is optimistic that this will be possible.

Other Comments:
The project will treat up to 1.5 million gallons per day in urban runoff during non-storm events year round.

Clean Beaches Initiative
Urban Runoff/Water Quality Improvement Projects

City: **City of Dana Point**
Project Name: **Salt Creek Ozone Treatment Facility Project**

Project Description/Purpose: Salt Creek Beach and Monarch Beach are extremely popular beach locations in the City of Dana Point. A small, offshore reef creates some of the best left swells along the entire coastline. Swimming, body surfing, sunbathing and tidepool exploration are among other popular beach activities. These beaches however are currently subject to numerous closures during dry weather periods due to high levels of bacteria. The Salt Creek Storm Drain Treatment Facility provides an advanced storm water treatment facility to reduce bacteria levels in the Salt Creek dry-weather flows just prior to discharge into the ocean. This project in combination with the County of Orange's efforts to maintain the outlet/beach adjacent to Salt Creek has greatly improved ocean water quality and reduce the number of postings during its first year of operation. The project involved the construction of a 1,700 square foot ozone treatment facility located adjacent to the Salt Creek storm drain outlet in the City of Dana Point. Dry weather flows are captured at the outlet and pumped to the treatment facility that is approximately 800 feet away on the golf course, adjacent to the tee box of Hole 3 on the Monarch Beach Golf Linx. The treatment facility is housed within an aesthetically pleasing masonry block building that includes ozone (ozone generators, contact chamber, etc.) and electrical equipment rooms, two basket strainers, and six horizontal media filters. The City has contracted with South Coast Water District (SCWD) to operation and maintain the plant and they have been instrumental in the plant's success.

With regard to the Salt Creek outlet, the County has aided in the project effort by restacking the existing riprap to prevent Salt Creek's flows from eroding the beach.

The ozone treatment plants capture up to 1,000 gallons per minute of urban runoff, treats it, and then directs it back down to Salt Creek outlet where it naturally meanders toward the beach. Both ozonation and ultraviolet (UV) light methods were considered for the Salt Creek Storm Drain Treatment Project because of their effectiveness and biologically friendly attributes. A comprehensive comparative evaluation of both ozone and ultraviolet light disinfection was conducted to determine the most favorable disinfection method to meet the City's goals. For this project, ozone was determined to be more reliable and cost effective for several reasons. The construction was completed in November and the official start-up began on November 14, 2006.

The City is implementing a comprehensive monitoring program reflective of the prepared Monitoring Plan. One of the keys to the monitoring effort is to verify project effectiveness to meet the goal of reducing beach postings. To date, it is documented that beach postings have been reduced. The final report will be prepared in early 2007.

Other Public Agency/Private Partners: State of California Water Resources Control Board, City of Dana Point, South Coast Water District, South Orange County Wastewater Authority, County of Orange, Makar Properties, Troon Golf, MiOcean

Project Cost: **$6,700,000**

Project Funding Sources: **City of Dana Point, State Water Resources Control Board (SWRCB), MiOcean (non-profit organization)**

Clean Beaches Initiative Funding: **$4,000,000**

Project Status: **Complete. In last month of one year monitoring phase.**

Project Outcomes/Effectiveness/Benefits: The anticipated project outcomes and benefits is that this project will reduce the number of beach postings. The City is monitoring the storm drain outlet and the surf zone for bacteria for one year after construction is complete. The one-year monitoring program will be complete in November 2006. Additionally, this project will take a significant step in improving local ocean water quality. A secondary benefit to this project that the City Council hopes to deliver is that the treated urban runoff can be reused for irrigation purposes. This is still being studied, but the City is optimistic that this will be possible.

Other Comments:
The project will treat up to 1.44 million gallons per day in urban runoff during non-storm events year round.