

“TESTING THE WATERS”: THE ORANGE COUNTY HEALTH CARE AGENCY

SUMMARY

Huge numbers of tourist dollars and many local jobs are put at risk when beach water is considered unsafe for recreational use. A few simple facts tell a big story:

- For a total of 231 days in 1999, a beach or string of beaches along the 42-mile coastline of Orange County was declared closed to water-contact sports.
- It is estimated that 37 million people go to Orange County beaches each year.
- The average net benefit of a beach day is valued at \$15/per person to the local economy (established through litigation following a 1990 oil spill).
- A healthy coast and ocean contribute an estimated \$17 billion dollars to the state’s economy annually, and provide 370,000 jobs statewide.

Orange County beaches are closed or restricted by the Health Care Agency/Environmental Health Division based on elevated bacterial levels measured in ocean- and harbor-water samples by the County’s three sanitation districts and by the Public Health Lab. The causes of beach contamination range from sewage spills, pipeline breaks, and pump-station failures to urban runoff. The question: Who will be able to take the lead in investigating the causes of beach contamination? is the subject of this report.

It is the opinion of the 1999–2000 Grand Jury that Orange County government is moving in the right direction in confronting the problems of urban runoff. There is a new street-sweeping program in unincorporated areas. There is funding to divert summer-season urban runoff into the sewer system. There is ongoing stenciling of the street curbs above storm-drain openings with the phrase “No Dumping—Drains to Ocean.” And there are commendable ongoing efforts to educate all inland and coastal citizens that their own daily habits are the ultimate cause of beach pollution.

However, more must be accomplished as we move into the summer of 2000, with memories very much intact of the events of the summer of 1999, when eight miles of the famous beaches of Huntington Beach were closed to water-contact sports. The urgency of the

situation is palpable among County officials since, at the time of this writing, the causes of last year's beach contamination are still not definitive. There is a need to augment the scientific staff, their statistical and research-evaluation abilities, and the computer data-handling capabilities of County Public Health and Environmental Health. These two divisions of the County Health Care Agency are the nexus where decisions are made whether or not to close the beaches. There is also a need to augment the Health Care Agency's abilities to post timely, easily accessible, water-quality data on its website (and perhaps to eventually predict anticipated ocean-water closures). These changes will enable Orange County to take a leadership role whenever elevated bacteria levels indicate there is a pollution problem at our beaches or in our harbors.

INTRODUCTION AND PURPOSE

All citizens, inland and coastal, need to learn that their own daily habits are the ultimate cause of beach pollution.

Southern California has always been famous for its beaches. Over the last few decades, however, beach postings and closures have become almost commonplace. Historically famous beaches on Santa Monica Bay have recently been declared off-limits due to pollution, as have the ocean waters just south of the city of San Diego.

The story is no different in south Orange County. Aliso Beach closures have frequently been in the news the past few years, as have closures of Doheny Beach. Baby Beach in Dana Point has made headlines for its 18-month closure and the intensive search attempting to find the sources of pollution.

(The term "beach closure," used throughout this report and in the press, might be better expressed as "beach-water closures." In the Health Agency's directives, the sand and shoreline remain open for use even though the ocean water is closed to recreation.)

Beach closures can sometimes be directly attributed to sewage spills. Far too often, however, beach closures are the result of the regular practices that Americans have become accustomed to as they go about their daily lives in and around their homes.

The nearly summer-long beach closures in Huntington Beach have arguably had the greatest effect on local attitudes. In spite of a massive, expensive, and most-cooperative search for the causes, it is still unclear at the time this report is being written, what the actual pollution sources were that caused the summer of 1999's elevated bacterial levels. This series of events resulted in eight miles of beach being closed by the County Health Care Agency and will be referred to in this report as the "Event."

It is imperative that steps be taken immediately to augment the Orange County Public Health Lab's testing capacities, the data-analysis capacities of the County's Environmental Health Division, and the information-technology capabilities of the County's Health Care Agency.

These steps are needed to help assure that our County will be in a leadership position during future pollution events.

METHOD OF STUDY

The Grand Jury visited and/or interviewed the following: the Orange County Sanitation District; the Irvine Ranch Water District; the Aliso Wastewater Management Agency; the Orange County Health Care Agency's Environmental Health Division and Public Health Lab; the State Water Quality Resources Board, Santa Ana Region; a University of Southern California SeaGrant-sponsored conference; the Orange County Public Facilities and Resources Department, Harbors, Beaches and Parks Division; the Surfrider



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Foundation; the Coastal Coalition; the Newport Bay Coordinating Committee; and the cities of Huntington Beach, Newport Beach, Laguna Beach, Dana Point, and San Clemente. There was a wealth of relevant material on the Internet, plus material prepared at the University of California, Irvine on behalf of the National Water Resources Institute, and for the cities of Huntington Beach, Fountain Valley, Costa Mesa, Santa Ana, and Newport Beach.

BACKGROUND

When it rains in Southern California, all manner of things natural and man-made are swept to the sea. The natural conduits to the coast are the rivers and streams, but they are helped in their traditional clean-up duties by flood-control channels and by devices known as catch basins and storm drains. Many of the drainage conduits installed in the curbs in most cities and in the County have the stenciled phrase: "No Dumping—Drains to the Ocean." Because

of inadequate gradient, some of these man-made conduits require an occasional boost from pump stations (a fact whose importance will be reviewed later in this report) so they can fulfill their purpose of sending their accumulated contents to the appropriate receiving water body, be it a river, marsh, wetland, harbor, or the ocean itself.

In addition to relatively little rainwater, the content of urban runoff comprises all manner of compounds pertaining to the life-styles of Americans: hydrocarbons from autos and gas stations; Styrofoam from fast-food restaurants; animal droppings; improperly disposed-of human waste; detergents from car-washing; lawn-mowings, fertilizers, and pesticides; all sorts of paper and plastic goods; medical waste; copper from brake shoes, etc. As a result of such things getting swept to the sea, as well as the elevated bacteria count, beach-goers are routinely advised by the Health Care Agency not to swim or surf for three days following a storm. For the same reason, swimmers and waders are advised to avoid the waters flowing out of storm drains year-round.

Something alarmingly different, however, occurred during the summer of 1999. Although there had not been measurable rain for months, high bacteria levels began to show up in ocean-water samples routinely gathered and tested by the Orange County Sanitation District and the Public Health Lab. It is certainly possible that the same levels of bacteria have, since time-immemorial, been a characteristic of ocean water and that fact had simply not been detected before the implementation of new testing standards mandated by Assembly Bill 411 (AB411), Chapter 765, statutes of 1997. Notwithstanding this possibility, County health officials duly noted the elevated bacterial levels in the spring of 1999, knew they had to comply with the new state law, and moved with appropriately measured steps to restrict public access to a six- to eight-mile stretch of the historic beaches of Huntington Beach.

The beach closures in Huntington Beach during the summer of '99 made the public aware of the term "urban runoff."

What actually caused the bacteria levels to become elevated during the low-runoff summer season is a topic still being discussed among experts. The bacterial source could have been animal waste, soil and decaying vegetation, or human waste. What is well known, however, is that the beach closures from July 1 through Labor Day had a significant negative impact on the coastal economy. And the intense media focus during the summer of 1999 on the beach closures in Huntington Beach has led to a much-enhanced public awareness of a complicated process known as urban runoff.

AB411—WATER-TESTING STANDARDS

Since 1978, it had been considered standard practice in most coastal counties that public health labs tested recreational ocean-water samples on a weekly basis for the presence of bacteria known as total coliform. AB411 was passed by the state legislature in October 1997, and it went into effect in 1999. This legislation changed the Health and Safety Code for ocean water-quality monitoring, sewage-spill responses, ocean-water swimming standards, and public

"Technology to measure harmful microbes in the environment and eliminate them from water is in its infancy,"
Orange County Register,
April 11, 2000.

notification. It required that water-quality testing, from April through October, be changed to include two additional tests for bacteria in water-contact sports areas, i.e., fecal coliform/*E. coli* and enterococcus, and to add one new analysis, a ratio of total coliform to fecal coliform.

The expanded water-quality monitoring is now required at all beaches in the state that serve 50,000 visitors per year and those beaches adjacent to storm drains that flow into the ocean during summer months.

The three bacteria included in AB411's new test standard—total coliform, fecal coliform/*E. coli*, and enterococcus—are referred to as “indicator bacteria,” because research has indicated that their presence in water may be indicative of the presence of other more dangerous, but much harder to detect, micro-organisms that may cause human disease.

Dogs are a major source of fecal coliform, giardia, and salmonella.

AB411—BEACH CLOSURES VS. POSTINGS

Another stipulation of AB411 is that beaches will be closed to water-contact sports by the County Health Officer when there is a presumption that measured bacterial levels have been caused by human sewage. When a survey of the situation points to factors other than human sewage, the Health Officer may choose to post the beach rather than close it.

The changes to the Health and Safety Code are based on the presumption, not yet completely scientifically validated, that recreational waters polluted by human sewage are more dangerous for human contact than are waters polluted by fecal-waste coming from other warm-blooded animals, such as birds, dogs, and livestock.

Beaches must be closed when there is a presumption of sewage-contamination. Beaches may be posted when contamination sources are ambiguous.

What is needed is more science to help identify the sources of pollution and their relative impact on human health. There are as yet no reliable and timely tests available to discriminate between water-pollution caused by human sewage and that caused by animal waste and urban runoff.

A first step toward the development of new methodologies would be to conduct more research into the various “fingerprints” of fecal-waste coming from local warm-blooded animals in Orange County. A library of slides containing the fecal-isolates and related bacteria of expected hosts would enable researchers to develop a source-tracking database, useful to their efforts in determining pollution sources.

Also needed is the availability of staff time to evaluate studies coming from the federal government and from academic researchers, to locate any new methodologies that might prove relevant to Orange County. The goal should be not only to find the sources of water contamination but also to figure out how to solve the problem.

As currently performed, water-testing procedures give health officials and the public only a snapshot of the overall health risks of a beach. In no way is current testing yet able to predict the health risks of any particular beach on any given day. However, some day soon,

researchers expect that a real-time test will be developed wherein something can be stuck into a water sample and the colored read-out will indicate whether or not it is safe to dive into the waves.

NEW RESEARCH POSSIBILITIES

Orange County is in a unique position to evaluate new testing methods—stemming from federally funded research and/or academic research—which may just show more accurately the source of water contamination, whether it comes from humans or from other warm-blooded animals. Orange County is in a unique position, as it's one of relatively few temperate climate areas where large amounts of runoff flow across relatively flat land before hitting a coastline renowned for its recreational activities.

Water samples currently take 24-48 hours to culture. As a result, water-test data is, at best, two days after the fact.

If the polluted water sample contains caffeine and/or detergent by-products, the source may be human, not animal.

Candidate methodologies the Orange County Public Health Lab microbiologists might evaluate are:

- DNA fingerprinting of fecal-materials from expected local warm-blooded animals, a process that is expensive.
- Biochemical methods (i.e., testing fecal-isolates for relative antibiotic resistance in humans and animals).
- Chemical methods that look for compounds normally associated with humans (e.g., caffeine and detergent by-products known as optical-brighteners).

THE “EVENT”—SUMMER OF 1999

On July 1, 1999, the Orange County Health Care Agency's (OCHCA) Health Officer closed a portion of Huntington State Beach due to elevated bacteria levels indicative of sewage contamination. Closures continued throughout the summer, affecting up to eight miles of state and city beaches in Huntington Beach. The last section of beach was reopened on September 3, 1999.

The initial beach closure by OCHCA triggered a three-month long, nearly \$2 million investigation led by the Orange County Sanitation District. Other agencies that participated in the investigation included the OCHCA, the California State Department of Parks and Recreation, the City of Huntington Beach, and the State Water Quality Control Board, Santa Ana Region 8. The primary suspicion was human sewage.

After eliminating sewage contamination as the problem, however, the investigation began to focus on urban runoff in late August 1999. It is important to note that, as time had progressed over the summer, the profile of the bacteria found at the beach had changed. While high levels of total coliform, fecal coliform, and enterococci were found initially, over time only high levels of enterococci persisted. Higher amounts of enterococci suggest a higher probability that the contamination was coming from urban runoff rather than from sewage.

Conditions along the beach and in the watershed also varied during the summer of 1999. There were times when a waterway known as the Talbert Channel was bermed (dammed up), so that its waters could not reach the ocean. There was also a late-summer decision to divert the waters of the Talbert Channel into the sewer system. Bacteria levels rose, fell, and changed proportion, but not in a way that led to any firm conclusions as to cause.

COASTAL RUNOFF STUDY, JANUARY 2000

From November 1, 1999 to January 8, 2000, two bio-engineers from the University of California, Irvine investigated the indicator-bacterial levels of runoff in the Talbert Watershed. This watershed encompasses 12 square miles in Huntington Beach and Fountain Valley, an area that is primarily residential in nature, although portions are zoned either for industrial or agricultural uses. There are three tidally influenced flood-control channels in the watershed, meaning that ocean water flows into the channels during flood tides and back out during ebb tides. A primary objective of this experiment was to test whether tide-induced transport of water in the channels may be impacting water quality at the beach, by acting as a mechanism for carrying watershed runoff to the nearby shore.

The Talbert Watershed may not be the only source of beach contamination. Could the Santa Ana River be an even bigger contaminator?

The City of Huntington Beach operates seven pumping stations, and the Public Facilities and Resources Department of Orange County operates one station in the watershed. Runoff drains from the street into a pump-station forebay whereupon it is transferred into the channel network. Then it travels under gravitational and tidal forces toward the coast, passing through a constructed wetland—the Talbert Marsh—before it enters the ocean approximately 1000 feet up-coast of the Santa Ana River.

The tidal-exchange experiment found that:

- Pump-station discharges increased the levels of total coliform during the study period.
- The Talbert Marsh appears to be a significant source of occasional high pulses of enterococcus bacteria.
- The Talbert Watershed is not the only source of *E.coli* and enterococcus bacteria on the beach.

The University of California, Irvine *Coastal Runoff Impact Study* (prepared for the National Water Research Institute, the County of Orange, and the cities of Huntington Beach, Fountain Valley, Costa Mesa, Santa Ana, and Newport Beach) did not come to any easy conclusion that the Talbert Watershed was to blame for the “Event” of 1999. Instead, the study found that the watershed was only one of the sources of elevated bacterial levels along the beaches. Future studies were indicated, with a focus on ebb and “neap” (or the lowest) tides and their stirring up of sediment and on bacterial levels in water entering the ocean from the nearby Santa Ana River.

AB411—EFFECTS ON THE PUBLIC HEALTH LAB

In Orange County, water testing is done cooperatively by the Health Care Agency (HCA) and by three sanitation districts, Aliso Water Management Agency, South East Regional Reclamation Authority, and the Orange County Sanitation District. There are 150 sampling stations between Seal Beach and San Clemente. Water samples are also collected in Huntington Harbour, Newport Bay, and Dana Point Harbor. It takes 24–48 hours to culture each water sample.

Gearing up to meet the standards of AB411 in the spring of 1999, staff at the Public Health Lab found that the workload had more than doubled. An extra Lab Assistant was hired to handle the state’s new testing standards, and an additional Environmental Health Specialist was added to the staff at Environmental Health (EHD). The data-handling of the water tests continued to be performed manually whereupon it was faxed to the EHD where the figures were typed into a spreadsheet. There was no analyst at EHD to help analyze the raw data faxed from the Lab. Even with these two new employees, requests to perform water-quality testing for other locations in the County, e.g., Aliso Creek, had to be refused. There was no staff time available for any research and development or literature-review pertinent to new testing procedures.

Decisions whether to post the beaches or to close them continue to be made by County health officers based on tabular information contained in a series of spreadsheets laid out around tables in the EHD conference room. Health officers plot bacteria levels—whether they exceed the established state standard—with a felt-tipped pen. And even though confidence is expressed that all the elements are present to make correct decisions, computer software that could plot the cumulative bacterial data more succinctly and graphically might well aid the decision-making process (and reduce the possibility for human error).

It is also hoped that research on the contaminating effects of ebb and neap tides might soon result in the daily publication of a swimmer’s advisory—a prediction ahead of time, of days when water contact might be ill-advised—over the Internet.

Whether to post or to close the beaches?¾It’s a decision worth millions of dollars to our coastal economy.

The OCHCA, only recently considered a full decade behind on the subject of computer knowledge and technology, is now playing a fast and most commendable game of catch-up, due in large part to enlightened new leadership. It is hoped that very soon, water-test data from the Public Health Lab will be electronically available almost immediately to the EHD, to the Health Care Agency’s website, and thus to all interested decision-makers.

FINDINGS

In accordance with *California Penal Code* Sections 933 and 933.05, responses are required to all findings. The 1999–2000 Orange County Grand Jury has arrived at the following findings:

1. Since AB411 went into effect in 1999, the workload in the water-quality testing facility at the Orange County Public Health Lab has more than doubled. Even though one additional employee was hired, the Lab is currently staffed to accomplish regulatory testing only. Requests to assist other County agencies' needs for water testing have had to be refused, and there is no staff time available to conduct research and development or to evaluate any promising new testing procedures.

A response to Finding 1 is required from the **Board of Supervisors** and requested from the **Orange County Health Care Agency**.

2. There is no staff time available at the Orange County Public Health Lab to establish a source-tracking database of the fecal-indicator bacteria of local warm-blooded hosts in Orange County. County officials are hampered in their ability to respond effectively during pollution events.

A response to Finding 2 is required from the **Board of Supervisors** and requested from the **Orange County Health Care Agency**.

3. Raw test-data from the Orange County Public Health Lab and from the three sanitation districts is transmitted by fax to the Health Care Agency/Environmental Health Division, where the data is typed into a series of spreadsheets. There is no on-staff analyst to help with the analysis of test data and thus to facilitate health officers' decisions whether to post or close or re-open County beaches.

A response to Finding 3 is required from the **Board of Supervisors** and requested from the **Orange County Health Care Agency**.

4. Existing information systems linking the Public Health Lab and the Health Care Agency are outmoded.

A response to Finding 4 is required from the **Board of Supervisors** and requested from the **Orange County Health Care Agency**.

5. Information systems that the Health Care Agency uses to advise the public are inadequate, so information regarding beach postings and closures and beach re-openings is not easily accessible on the Agency's website. Information available to the public is not always current or accurate.

A response to Finding 5 is required from the **Board of Supervisors** and requested from the **Orange County Health Care Agency**.

RECOMMENDATIONS

In accordance with *California Penal Code* Sections 933 and 933.05, each recommendation must be responded to by the government entity to which it is addressed. These responses are submitted to the Presiding Judge of the Superior Court. Based on the findings, the 1999–2000 Orange County Grand Jury recommends that:

1. An additional lead microbiologist experienced in program development, management, and research evaluation be added to the staff at the Orange County Public Health Lab to conduct research and development and to work in conjunction with other agencies in applying new promising testing procedures.

A response to Recommendation 1 is required from the **Board of Supervisors** and requested from the **Orange County Health Care Agency**.

2. An experienced microbiologist be added to the staff at the Orange County Public Health Lab to develop a source-tracking database of fecal-isolates common to the Orange County population of warm-blooded animals, to enable public-health officials to more quickly identify the sources of water pollution.

A response to Recommendation 2 is required from the **Board of Supervisors** and requested from the **Orange County Health Care Agency**.

3. An analyst be added to the staff of the Environmental Health Division to help analyze ocean-water test data emanating from the Public Health Lab and the sanitation districts.

A response to Recommendation 3 is required from the Board of Supervisors and requested from the Orange County Health Care Agency.

4. The appropriate information systems (data-handling and statistical-analysis technology) be installed in the Public Health Lab and the Environmental Health Division of the Health Care Agency in order that health officials are better able to evaluate and act decisively during future pollution events.

A response to Recommendation 4 is required from the **Board of Supervisors** and requested from the **Orange County Health Care Agency**.

5. Up-do-date information systems be added to the Health Care Agency's Information Technology Division to help ensure that the Agency's website provides the most current beach closure, posting, and beach re-opening information available.

A response to Recommendation 5 is required from the **Board of Supervisors** and requested from the **Orange County Health Care Agency**.

COMMENDATIONS

To the Orange County Public Health Lab for its “testing of the waters” under pressured conditions of new state legislation.

To Public Health and Environmental Health staff for their dutiful adherence to the law on beach advisories, in the face of immense pressures.

To the Orange County Sanitation District for its cooperative leadership during the “Event” of summer 1999.

To Dr. Jack and his wife Nancy Skinner for their long devotion to water-quality issues in Orange County.

To Pam Winters for permission to reprint her futuristic cartoon on ocean-water quality.

To Dr. Stanley Grant for his cutting-edge research on the water-quality of the Talbert Marsh.