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Dry Run & First Flush 2011 Monitoring Report

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Introduction

Urban pollutants that are deposited on hard surfaces during dry weather are then washed away in winter rainstorms into rivers, storm drains and the ocean. The first winter rainstorm can have the highest concentration of pollutants because it is flushing months of built up pollutants that accumulate during the dry weather. These pollutants can be from sources such as brake dust, emissions from cars, animal waste, detergents from car washing, pesticides and fertilizers, among other chemicals commonly found in and around homes and businesses. By monitoring the water quality of the first rain event, it can give an indication of pollution sources and pollution loads going into the ocean.

The Monterey Bay National Marine Sanctuary (MBNMS), the Coastal Watershed Council (CWC) and the San Mateo County Resource Conservation District (SMCRCD) teamed up with volunteers to monitor a dry weather event called the Dry Run and the water flowing into the ocean during the first major rain storm called the First Flush. The geographic scope of this program extends from Montara in coastal San Mateo County in the north, to the Carmel River in Monterey County in the south (Fig. 1).

The Monterey Bay National Marine Sanctuary (MBNMS) was responsible for monitoring 23 sites for the Monterey Regional Storm Water Monitoring Program (MRSWMP). The Coastal Watershed Council (CWC) coordinated the monitoring in Santa Cruz County and the San Mateo County Resource Conservation District (SMRCD), coordinated the events in Coastal San Mateo County.

For the past twelve years, volunteers have braved winter weather and early morning hours to collect samples of water at storm drain outfalls in cities on the Central California coast. Volunteers are on call twenty-four hours a day seven days a week. Having willing and trained volunteers is critical for a program with this range and scope. Samples are analyzed for common urban pollutants: bacteria (*Eschericia coli* (*E. coli*) and enterococcus), nutrients (nitrate, phosphate and urea), metals (total copper, total lead, total zinc) and total suspended solids.

The Dry Run was conducted on September 10th in Santa Cruz County, September 17th in San Mateo County and September 18th in Monterey County. The First Flush occurred late at night on October 4th in San Mateo and Santa Cruz counties and early in the morning of October 5th in Monterey County. In all, forty storm drain outfalls were monitored by seventy-seven extraordinary volunteers.

First Flush Sites 2011



Figure 1. 2011 Dry Run and First Flush Sites

Methods

In mid-September volunteers were trained to follow standardized procedures using field equipment and to collect water samples for laboratory analysis. Following the classroom training, field training was conducted at a local outfall, and focused on a demonstration of field measurements and sample collection. This field training and sample collection day during the dry weather is known as the Dry Run. After the demonstration, teams of volunteers went to their respective sites for area familiarization, took field measurements, and collected water samples prior to the arrival of the first storm of the season. The Dry Run is conducted well ahead of any predicted rain and provides the volunteers with a chance to test equipment at their specific sites without the added stress of storms or darkness of night. The same analytes that are measured for the First Flush program were tested for the Dry Run. They include: nutrients (nitrate, orthophosphate, urea), bacteria (*E. coli* and enterococcus), metals (copper, lead and zinc), hardness, and total suspended solids. Field measurements were taken of water temperature, pH, electrical conductivity, and transparency.

After the Dry Run and leading up to the First Flush event, the coordinators from the SMCRCD, CWC and MBNMS closely monitored the weather, notifying volunteers of approaching storms. When a storm had the potential to generate enough rainfall for First Flush mobilization, the coordinators placed the volunteers on standby until established criteria were met. Mobilization criteria includes sheeting water on roadways, heavy flow through the storm drain system and conductivity levels less than 1000 micro Siemens (μS) and declining.

Conductivity was measured using an Oakton EC Tester; water temperature was measured using a spirit bulb or digital thermometer. Transparency and pH were not measured this year because we mobilized at night and daylight is required for these measurements. Physical observations such as trash, odor, bubbles, scum, and oil sheen were also recorded on the data sheet.

All results (field and lab) are compared to receiving water standards set for particular beneficial uses in a stream, lake, or ocean—they are not meant for end-of-pipe discharges. However, lacking any other effluent standard, they provide some context for the results. Dilution and/or mixing is expected to occur in the receiving waters within a short distance of each outfall. Metal results are compared to the Central Coast Basin Plan's Water Quality Objectives (WQO) for the protection of marine aquatic life. Nitrate, orthophosphate, and total suspended solids results are compared with the Central Coast Ambient Monitoring Program's (CCAMP) attention levels (see Table 1). For all analytes, Minimum Detection Limits (MDL) are noted. The MDL is the minimum concentration that a lab instrument can detect for a given analyte. For sites that have a non-detect listed, it is placed on the graph at half the MDL, however the value is somewhere between zero and the MDL.

Table 1: Water Quality Objectives (Urea is not listed)

| <u>Parameter (reporting units)</u> | <u>Water Quality Criterion</u> | <u>Source of criterion</u> |
|---|---|---|
| pH | Not lower than 6.5 or greater than 8.5 | Basin Plan Objectives |
| Water Temperature (°C) | Not more than 21¹ | Central Coast Water Board |
| Transparency (cm) | Not less than 20² | Central Coast Water Board |
| Turbidity (NTU) | Not greater than 25³ | Central Coast Water Board |
| Nitrate as N (ppm) | Not to exceed 2.25⁴ | Central Coast Water Board |
| Orthophosphate as P (ppm) | Not to exceed 0.12⁵ | Central Coast Water Board |
| <i>E. coli</i> (MPN/100ml) | Not to exceed 235⁶ | EPA Ambient Water Quality Criteria |
| Enterococcus (MPN/100ml) | Not to exceed 104 | EPA Ambient Water Quality Criteria |
| Zinc (ppb) | Not to exceed 200⁷ | Basin Plan Objective |
| Copper (ppb) | Not to exceed 30⁷ | Basin Plan Objective |
| Lead (ppb) | Not to exceed 30⁷ | Basin Plan Objective |
| Total Suspended Solids (TSS) (ppm) | Not to exceed 500⁸ | Central Coast Water Board |

Results/Discussion

Dry Run samples were collected in the Santa Cruz area on September 10th, the Monterey area on September 17th, and the coastal San Mateo County area on September 18th. All sites were visited for the Dry Run but only 13 of the 38 sites had enough flow to be sampled (Appendix 1).

Dry Run monitoring results are from a single sample in comparison to First Flush sampling results, which are either one sample (San Mateo County, Santa Cruz, and Soquel), or two time series samples separated by 30 minutes (Monterey County, Seaside, Monterey, Pacific Grove, and Carmel), or two time series samples separated by 60 minutes (Capitola).

¹ 303(d) Listing guideline value, based on Moyle, P. 1976. Inland Fisheries of California. Univ. of California Press.

² Based on equivalent turbidity guideline value used for 303(d) Listing Guideline Value (Sigler et al., 1985)

(http://www.secchidipin.org/Transparency_Tube.htm)

⁴ 303(d) Listing guideline value, based on Sigler et al., 1985

⁵ Central Coast Ambient Monitoring Program, Pajaro River Watershed Characterization Report 1998, rev 2003.

⁶ Williamson, "The Establishment of Nutrient Objectives, Sources, Impacts and Best Management Practices for the Pajaro River and Llagas Creek", 1994.

⁶ Environmental Protection Agency, Updated WQO.

⁷ Basin Plan Cold Water Objective for hard water.

⁸ Central Coast Ambient Monitoring Program, Salinas River Watershed Characterization Report 1999, rev. 2000.

The First Flush occurred on October 4th and 5th, 2011 during a storm that extended from coastal San Mateo County to the Monterey Peninsula. At 11:00 pm on October 4th, eight San Mateo County volunteers mobilized to collect samples at nine sites; twenty-nine volunteers mobilized to collect samples at eleven sites in Santa Cruz County. Monterey County volunteers mobilized in the early hours of October 5th when forty volunteers sampled twenty sites starting at 2 am. A total of forty sites were monitored for the First Flush 2011.

Two sites monitored for the MRSWMP program have had name changes: Jack/El Dorado is now known as Majors Creek; Library is now known as Hartnell Gulch Trib. These name changes reflect the City of Monterey’s work in tracking these sites.

During the dry weather months the City of Pacific Grove has a system for diverting any water within the storm drain system into the sanitary system. This diversion extends from 8th Street to 17th Street along Ocean View Blvd. This year the City of Pacific Grove left the diversion on during the First Flush, five sites were not monitored because the outfalls were not flowing to the ocean. Those five sites were: 8th Street, 15th Street, Fountain Avenue, Grand Avenue, and Forest Avenue. One site in Pacific Grove (17th) is part of the diverted section but did have some water flowing from it for a short period of time so a single sample was collected. In Monterey, due to human error, Twins was only monitored once at the beginning of the storm.

Table 2: Range of results for Dry Run and First Flush 2011:

| Parameter | Dry Run 2011 | First Flush 2011 |
|-------------------------------------|------------------------|--------------------------|
| Conductivity | 360 - >1990 μ S | 40 - 1480 μ S |
| Transparency | 22 - >120 cm | |
| Water temperature | 14.4 – 19.3 °C | 15.8 - 19 °C |
| pH | 6.5- 7.72 | |
| Urea | ND - 35 μ g/L | ND - 547 μ g/L |
| Nitrate as N | ND – 4.3 mg-N/L | ND – 0.98 mg-N/L |
| Orthophosphate as P | ND – 0.26 mg-P/L | ND – 0.98 mg-P/L |
| Total Copper | ND - 12 μ g/L | 6 - 165 μ g/L |
| Total Zinc | ND – 50 μ g/L | 11 - 354 μ g/L |
| Total Lead | ND | ND - 60 μ g/L |
| Total Suspended Solids (TSS) | ND - 20 mg/L | 11 – 557 mg/L |
| Escherichia coli (<i>E. coli</i>) | <20 – 12,263 MPN/100ml | 273 – >241,960 MPN/100ml |
| Enterococcus | <20 – 16,328 MPN/100ml | 344 – 241,957 MPN/ 100ml |

Nutrients

Nitrate

Although nitrate and phosphate are needed for plant growth, they are not normally found in elevated concentrations in aquatic systems. Nitrate as with other nutrients can lead to algal blooms that degrade water quality as those plants die off and consume oxygen in their decomposition. Nitrate sources include runoff from fertilized lawns, agricultural and pasture lands, construction sites and septic/sewer systems. The CCAMP attention level for nitrate as N ($\text{NO}_3\text{-N}$) is 2.25 mg-N/L. The minimum detection limit (MDL) is 0.05 mg-N/L.

For the **Dry Run**, two of the thirteen sites monitored (15%) were above the attention level for nitrate. The highest result was in Santa Cruz (Merced) with a value of 4.3 mg-N/L (Fig. 2). Three sites had non-detects, one in Seaside (Hotel) and two in Monterey (Steinbeck and Majors Creek).

During the **First Flush**, none of the forty monitored sites were above the attention level for nitrate. The highest concentration was in Santa Cruz (Bay Street) with a time series average of 0.98 mg-N/L (Fig. 2). Sites with non-detects were spread across the region from Moss Beach (West Point), Capitola (Creekside-Upper, Soquel Creek Mouth), Seaside (Hotel), and Pacific Grove (17th Avenue). As in previous First Flush events, nitrate concentrations were typically below the attention level.

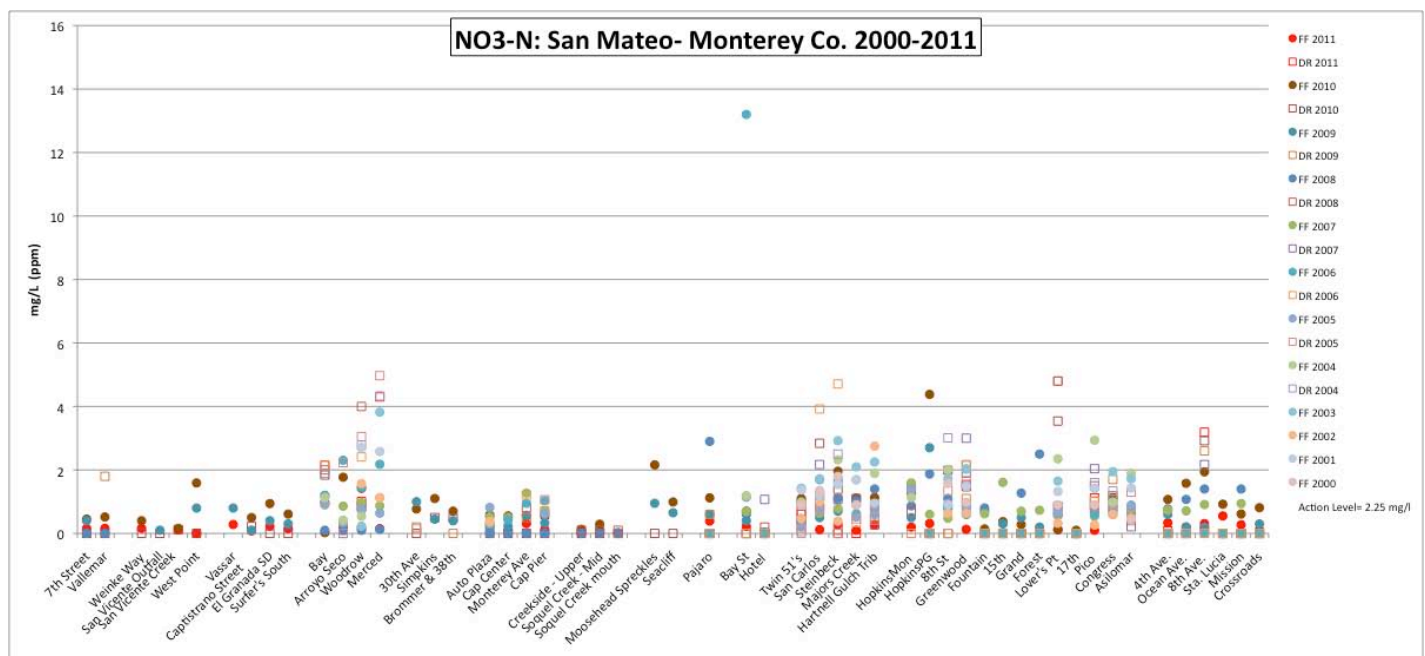


Figure 2. Results for Nitrate-N for the Dry Run and time series averages for First Flush. For two sites, Twins in Monterey and 17th in Pacific Grove, results are based upon one sample. All sites grouped by city from north to south- Montara, Moss Beach, El Granada, Santa Cruz, Capitola, Pajaro (Monterey County), Seaside, Monterey, Pacific Grove and Carmel.

Orthophosphate

Phosphate, like nitrate, is also necessary for plant growth. As with nitrate, phosphate can lead to degradation of water as plants grow uncontrolled, complete their life cycle, and decompose, taking up oxygen in the process. Sources of phosphate are similar to those for nitrate: leaks in sewer or septic systems, excess fertilizers from urban or agricultural areas, and detergents. The CCAMP attention level for orthophosphate (PO₄-P) is 0.12 mg-P/L. The MDL is 0.05 mg-P/L.

For the **Dry Run**, three of the thirteen sites monitored (23%) were at or above the attention level of 0.12 mg-P/L. The highest value was in Santa Cruz (Merced) with a result of 0.26 mg-P/L (Fig. 3). Non-detects were reported for eight sites across the region: Moss Beach (San Vicente Creek Mouth), Monterey (San Carlos, Steinbeck and Majors Creek), Pacific Grove (Greenwood Park and Pico) and Carmel (4th and 8th Avenues).

During the **First Flush**, twenty-eight sites (70%) monitored were at or above the attention level for orthophosphate. Monterey (Steinbeck) had the highest average time series concentration for orthophosphate with a result of 0.98 mg-P/L (Fig. 3). Non-detects were noted for multiple sites across the region: Moss Beach (West Point), Santa Cruz (Bay Street), Monterey (Majors Creek), and Pacific Grove (17th Street).

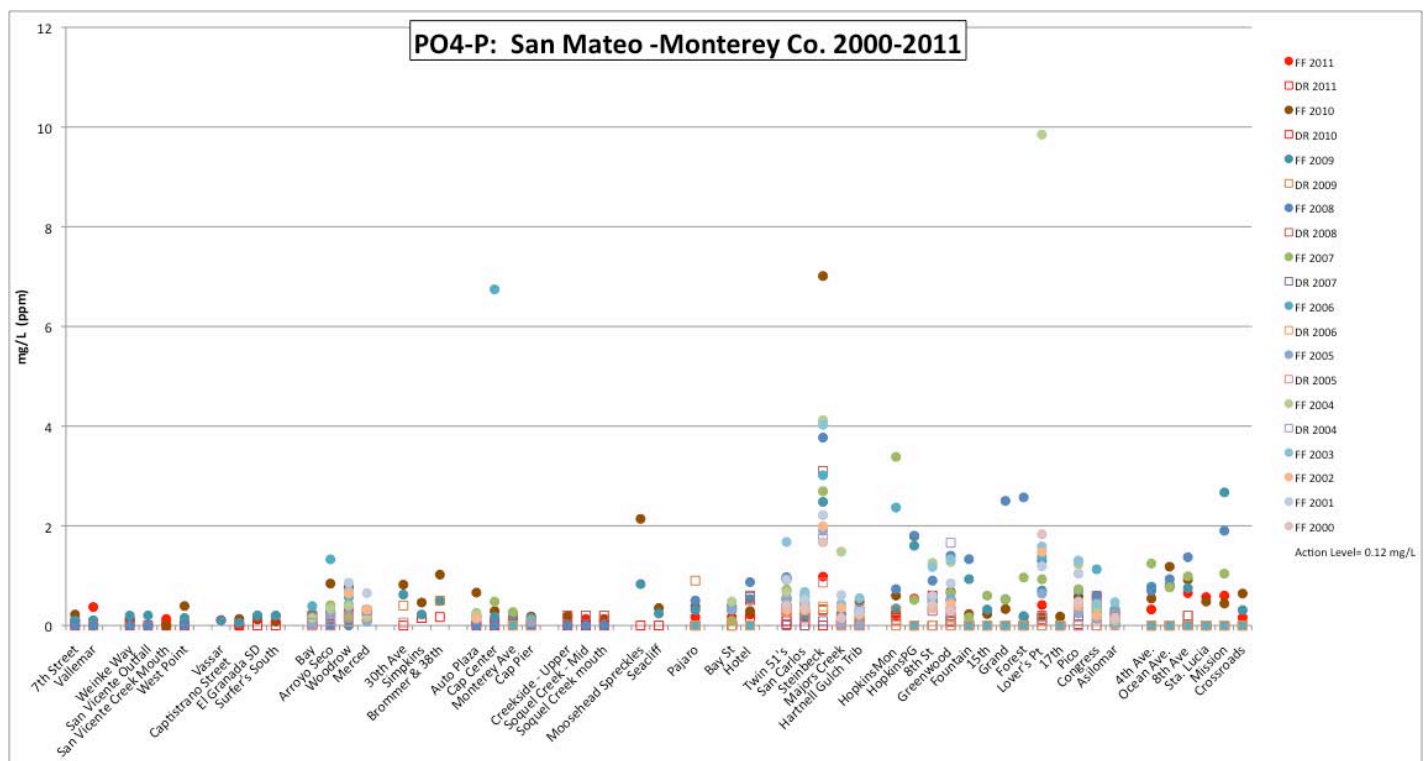


Figure 3. Results for Orthophosphate-P for the Dry Run and time series averages for First Flush. For two sites, Twins in Monterey and 17th in Pacific Grove, results are based upon one sample. All sites grouped by city from north to south- Montara, Moss Beach, El Granada, Santa Cruz, Capitola, Pajaro (Monterey County), Seaside, Monterey, Pacific Grove and Carmel.

Urea

Urea is an organic compound that is soluble in water; therefore it is an excellent fertilizer and is often used for agricultural applications. There are many sources of urea including fire retardants, cigarettes, fertilizers, animal feeds, detergents, and mammalian urine. This was the fifth year that urea was analyzed for this program. While there is no water quality objective for urea, values are noted and compared to previous year's results in order to monitor trends. Urea was only collected during the first time series at all sites. The MDL is 10 µg/L.

For the **Dry Run**, the highest urea result was in Monterey (Twins) with a concentration of 35 µg/L (Fig. 4).

During the **First Flush**, urea was only measured during the first time series. Carmel (8th Avenue) had the highest result of 547 µg/L (Fig. 4).

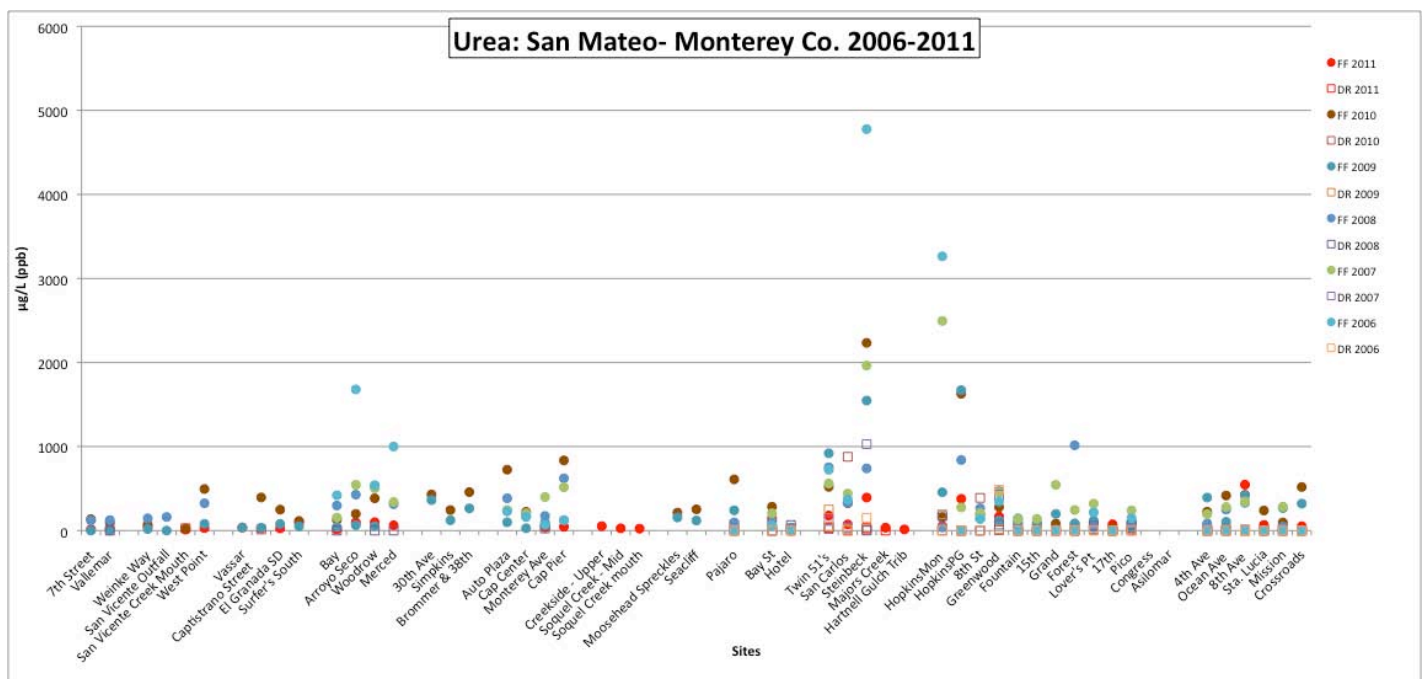


Figure 4. Urea results for the Dry Run and First Flush. All sites grouped by city from north to south- Montara, Moss Beach, El Granada, Santa Cruz, Capitola, Pajaro (Monterey County), Seaside, Monterey, Pacific Grove and Carmel.

Bacteria

Escherichia coli (*E. coli*) and enterococcus are two types of fecal indicator bacteria. *E. coli* and enterococcus, found in the intestines of warm blooded animals, make their way into waterways and the ocean from wildlife populations, through improper domestic animal waste disposal, as well as sewer or septic systems. While these bacteria don't necessarily cause disease in humans, their presence does indicate the potential for other human specific pathogens to be present. The U.S. Environmental Protection Agency water quality criterion for grab samples for *E. coli* is 400 MPN/100 ml and for enterococcus, 104 MPN/100 ml. The MQL for both *E.coli* and enterococcus is 1 MPN/100ml.

For the **Dry Run**, six of the thirteen sites (46%) monitored were above the WQO for *E. coli*. The highest *E. coli* result was 12,263 MPN/100 ml Carmel (8th Avenue) (Fig. 5). For enterococcus, nine of the thirteen sites (69%) were above the WQO of 104 MPN/100 ml. The highest enterococcus result was 16,328 MPN/ 100 ml in Monterey (Steinbeck) (Fig. 6).

During the **First Flush** both types of bacteria were high in all cities and at most sites; thirty-nine of the forty sites monitored (98%) were above the WQO for *E.coli* and all forty (100%) were above the WQO for enterococcus. The highest average result for *E.coli* was >241,960 MPN/100 ml in Monterey (Steinbeck). The highest average result for enterococcus was 241,957 MPN/100 ml in Monterey (Steinbeck) and Pacific Grove (HopkinsPG) (Fig. 5 and 6).

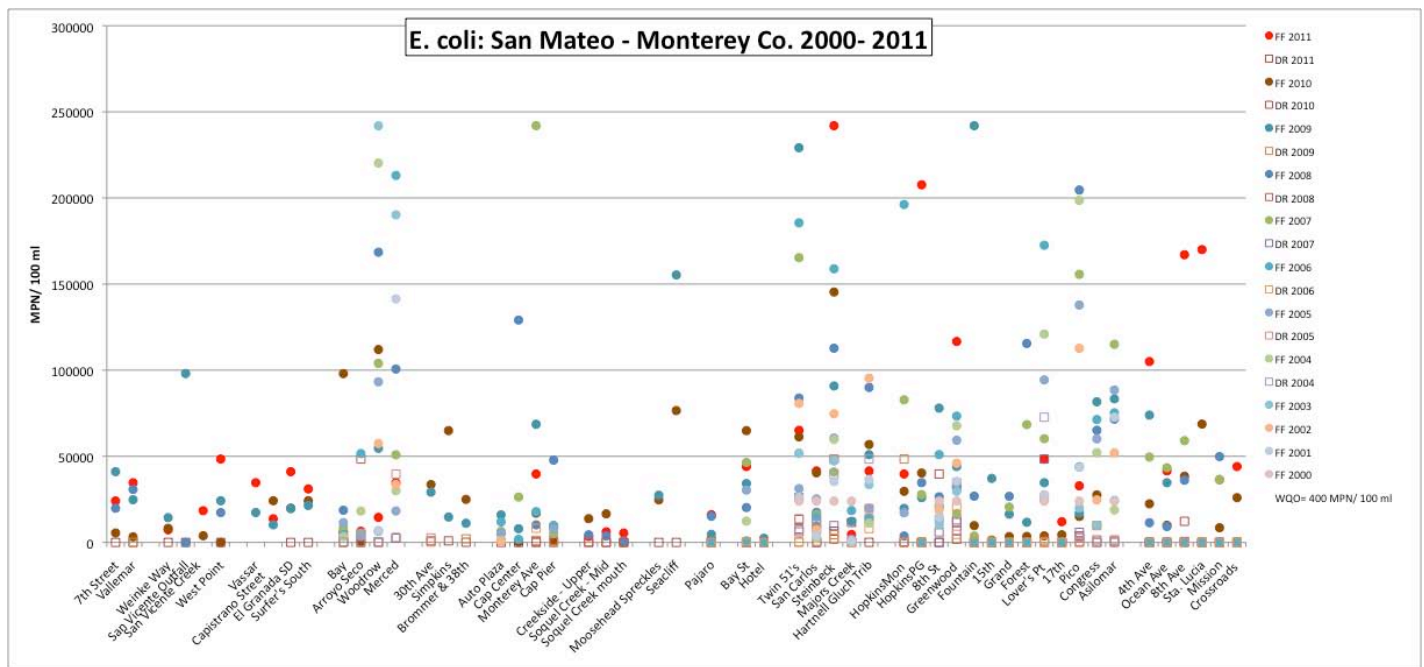


Figure 5. *E.coli* results for the Dry Run and time series averages for First Flush. For two sites, Twins in Monterey and 17th in Pacific Grove, results are based upon one sample. All sites grouped by city from north to south- Montara, Moss Beach, El Granada, Santa Cruz, Capitola, Pajaro (Monterey County), Seaside, Monterey, Pacific Grove and Carmel.

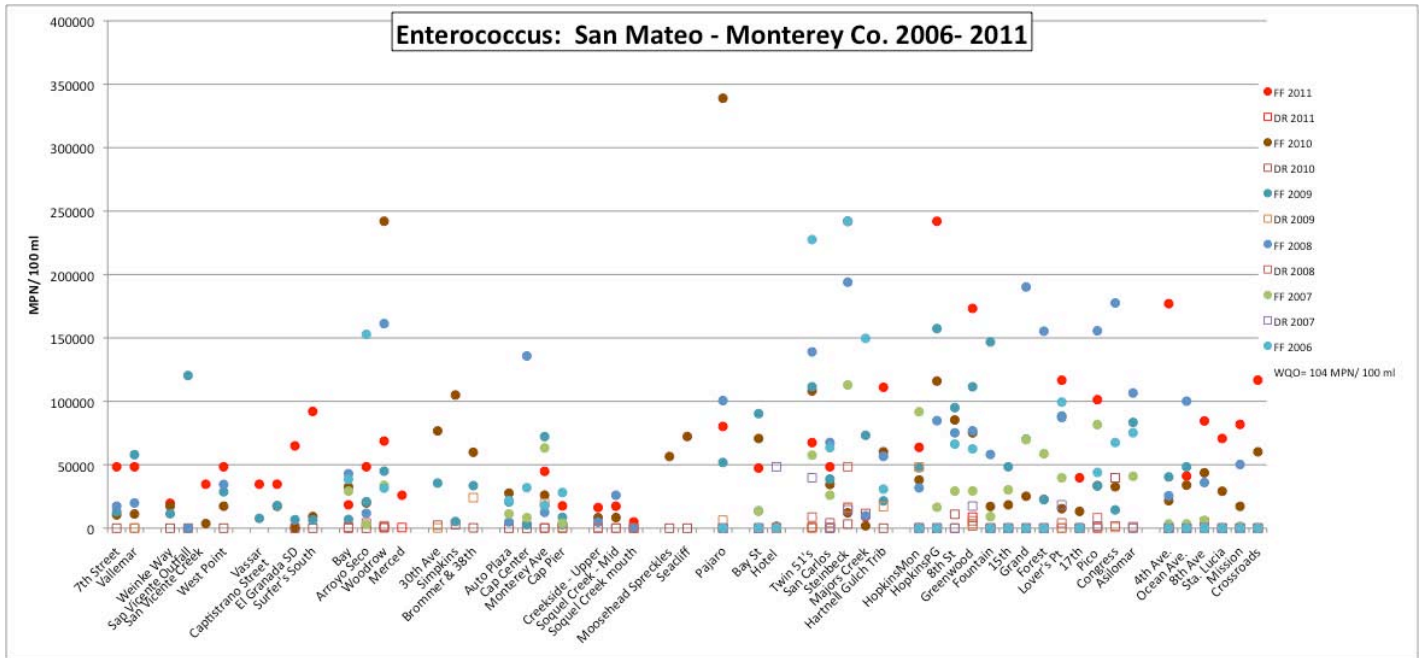


Figure 6. Results for enterococcus for the Dry Run and time series averages for First Flush. For two sites, Twins in Monterey and 17th in Pacific Grove, results are based upon one sample. All sites grouped by city from north to south- Montara, Moss Beach, El Granada, Santa Cruz, Capitola, Pajaro (Monterey County), Seaside, Monterey, Pacific Grove and Carmel.

Metals

Storm water runoff in coastal urban areas is known to contain trace metals from sources such as automobile brake pads, tires, industrial waste, and metal roofs or downspouts. Very low concentrations in the marine environment can cause reduced reproduction, developmental deformities, and mortality. For the Dry Run and First Flush, samples were analyzed for total zinc (Zn), total copper (Cu), and total lead (Pb).

Zinc

The Basin Plan WQO for Zn is $<200 \mu\text{g/L}$; and the MDL for zinc is 10 mg/L .

For the **Dry Run**, zinc concentrations were all below the WQO of $200 \mu\text{g/L}$ for all sites (Fig. 7).

For the **First Flush**, ten of the forty sites (25%) were above the WQO for zinc. The highest average zinc concentration was $354 \mu\text{g/L}$ in Carmel (Ocean Avenue) (Fig. 7).

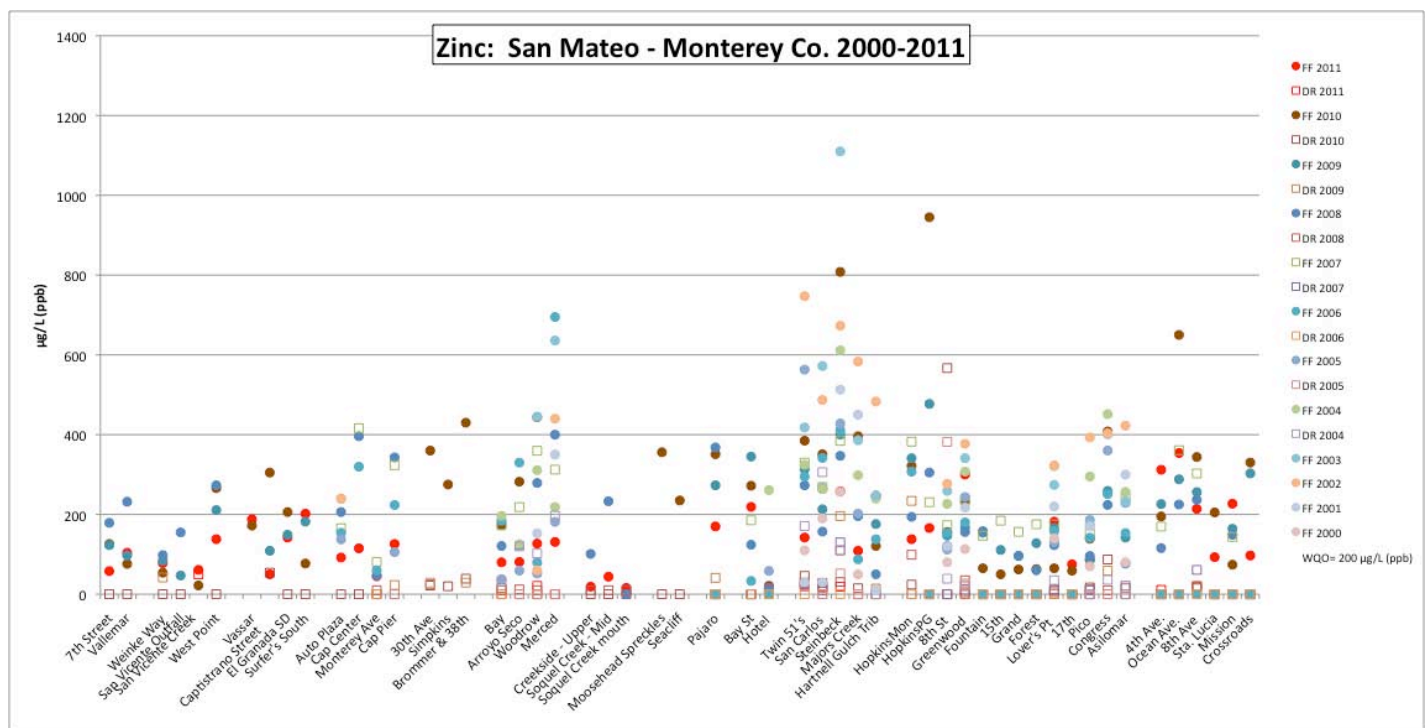


Figure 7. Total zinc results for all sites for Dry Run and time series averages for First Flush. For two sites, Twins in Monterey and 17th in Pacific Grove, results are based upon one sample. All sites grouped by city from north to south- Montara, Moss Beach, El Granada, Santa Cruz, Capitola, Pajaro (Monterey County), Seaside, Monterey, Pacific Grove and Carmel.

Copper

The Basin Plan WQO established for total Cu is 30 µg/L; the MDL for copper is 4.0 µg/L.

For the **Dry Run**, copper concentrations were all below the WQO (Fig. 8).

During the **First Flush**, twenty of the forty monitored sites (50%) were above the WQO. The highest copper concentration was in Carmel (Ocean Avenue) with an average of 165 µg/L (Fig. 8). Of the sites over the WQO, 80% were in Monterey County.

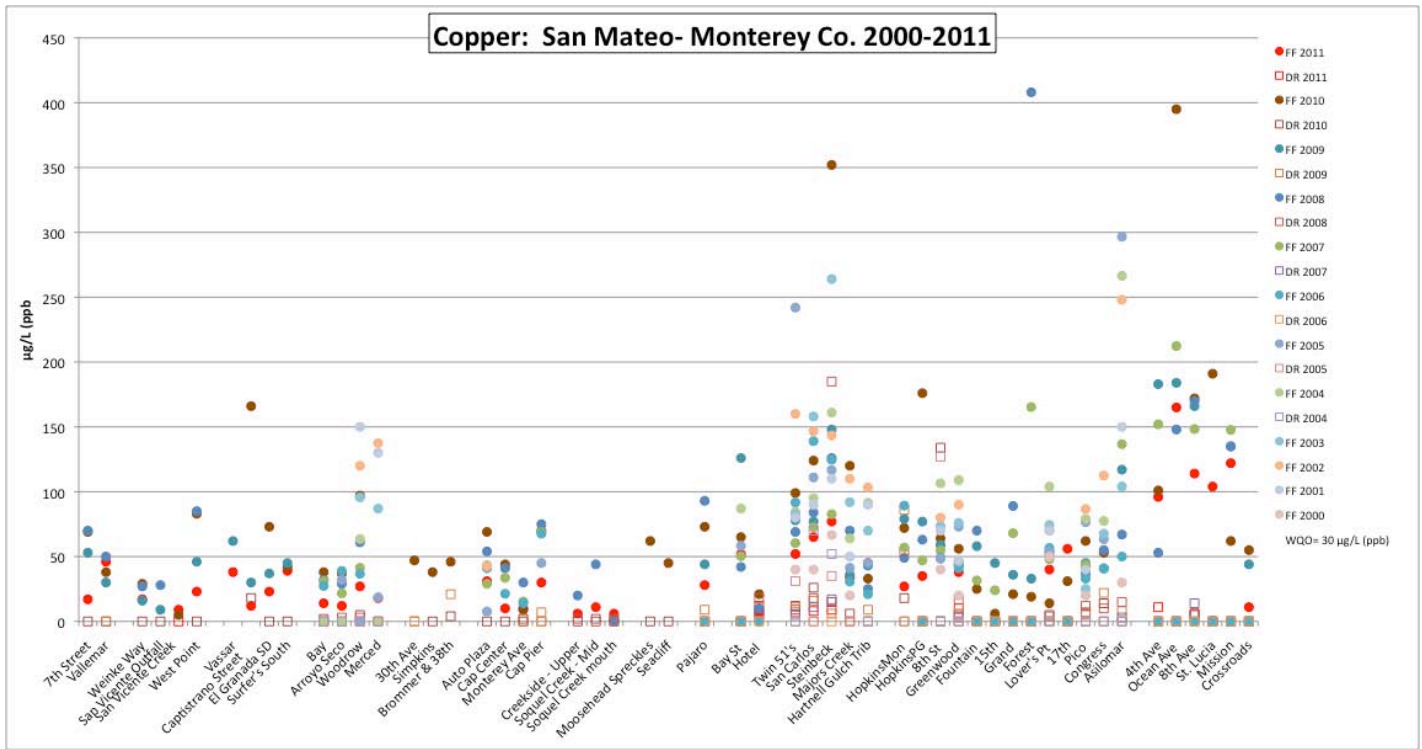


Figure 8. Total copper results for the Dry Run and time series averages for First Flush. For two sites, Twins in Monterey and 17th in Pacific Grove, results are based upon one sample. All sites grouped by city from north to south- Montara, Moss Beach, El Granada, Santa Cruz, Capitola, Pajaro (Monterey County), Seaside, Monterey, Pacific Grove and Carmel.

Lead

The Basin Plan WQO for total lead (Pb) is 30 $\mu\text{g/L}$. The MDL for lead is 5 $\mu\text{g/L}$.

For the **Dry Run**, lead concentrations for all sites were below the WQO (Fig. 9).

For the **First Flush**, three sites of the forty monitored (8%) were above the WQO. Carmel (4th Avenue) had the highest average of any monitored site at 60 $\mu\text{g/L}$ (Fig. 9).

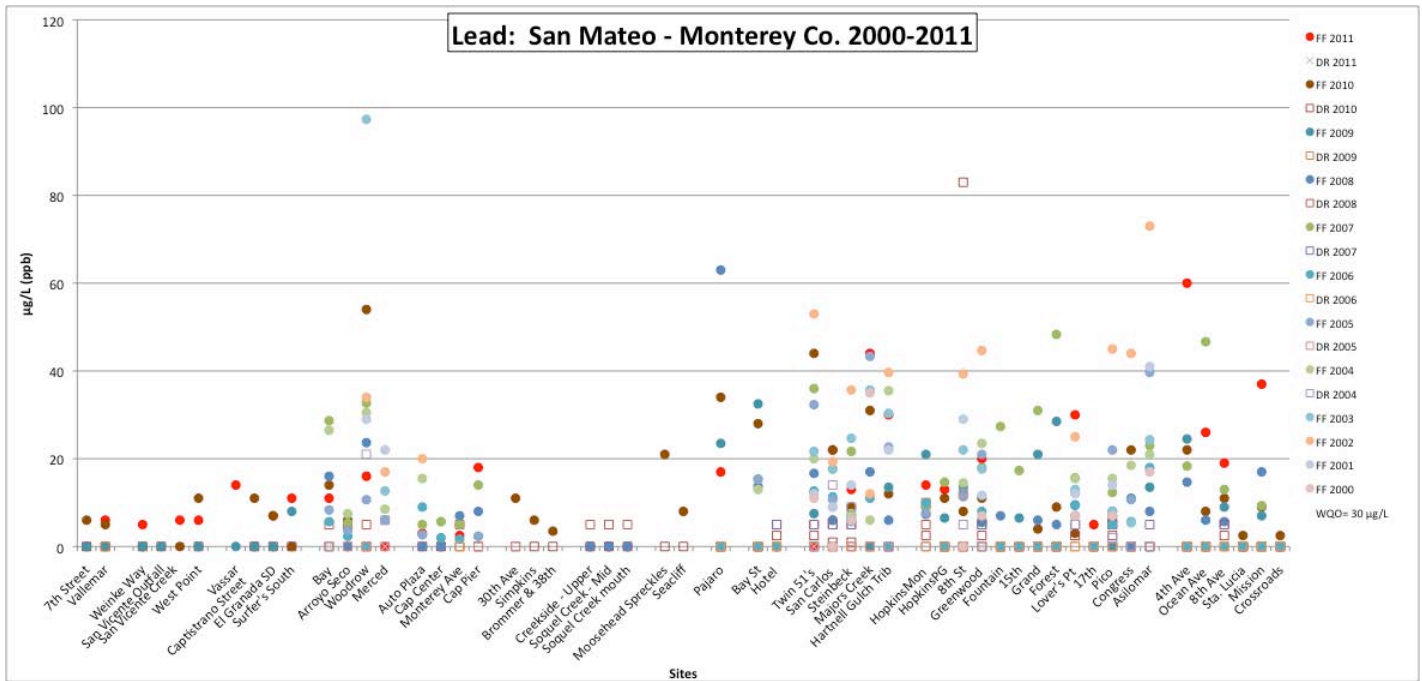


Figure 9. Total lead results for all sites for Dry Run and time series averages for First Flush. For two sites, Twins in Monterey and 17th in Pacific Grove, results are based upon one sample. All sites grouped by city from north to south- Montara, Moss Beach, El Granada, Santa Cruz, Capitola, Pajaro (Monterey County), Seaside, Monterey, Pacific Grove and Carmel.

Total Suspended Solids (TSS)

TSS are particulate matter in water that attract charged particles which can often be pesticides and metals. TSS can additionally impact the environment through sedimentation and reduction in the ability of marine organisms to respire. Some sources of TSS are construction sites with improper sediment control, bank erosion from rivers or streams, runoff from agricultural fields, and over irrigation in urban areas. The attention level for TSS is 500 mg/L, with an MDL of 5 mg/L.

For the **Dry Run**, none of the sites were above the WQO (Fig. 10).

For the **First Flush**, one site of the forty monitored (3%) was above the attention level. That site was in Carmel (4th Avenue) with a result of 557 mg/L (Fig. 10).

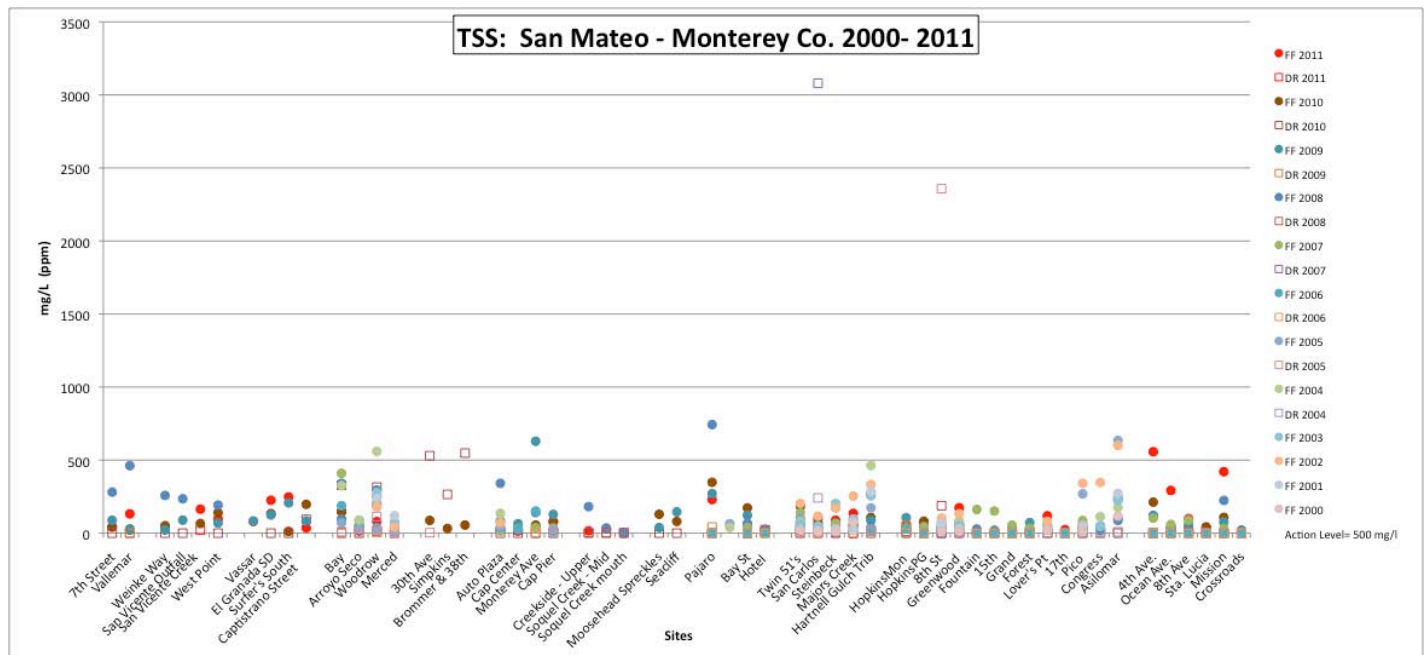


Figure 10. TSS results for all sites for Dry Run and time series averages for First Flush. For two sites, Twins in Monterey and 17th in Pacific Grove, results are based upon one sample. All sites grouped by city from north to south- Montara, Moss Beach, El Granada, Santa Cruz, Capitola, Pajaro (Monterey County), Seaside, Monterey, Pacific Grove and Carmel.

At each site during the First Flush 2011, volunteers recorded the presence of trash, sewage (sited or smelled), oil sheen, and scum (Table 3).

Table 3: Visual Observations

| | Trash | Oil Sheen | Signs of Sewage | Scum and/or Bubbles | | Trash | Oil Sheen | Signs of Sewage | Scum and/or Bubbles |
|--------------------------------------|-------|-----------|-----------------|---------------------|---|-------|-----------|-----------------|---------------------|
| 7 th Street (Montara) | | | | ✓ | Pajaro (Monterey County) | | | | ✓ |
| Vallemar (Montara) | | | | ✓ | Bay Street (Seaside) | ✓ | | | ✓ |
| Weinke Way (Moss Beach) | | | ✓ | ✓ | Hotel (Seaside) | | | | |
| San Vicente Creek Mouth (Moss Beach) | | | ✓ | | Majors Creek, (Monterey) | | | | ✓ |
| West Point (Moss Beach) | | | | | Hartnell Gulch Tributary (Monterey) | ✓ | | | ✓ |
| Vassar (El Granada) | | | | | Twins (Monterey) | | | | ✓ |
| Capistrano Street (El Granada) | | | | | San Carlos (Monterey) | | | | ✓ |
| El Granada SD (El Granada) | | | | | Steinbeck (Monterey) | ✓ | | | |
| Surfer's South (El Granada) | | | | | HopkinsMon (Pacific Grove) | | | | ✓ |
| Bay Street (Santa Cruz) | | | | | HopkinsPG (Pacific Grove) | | | | ✓ |
| Arroyo Seco (Santa Cruz) | ✓ | | ✓ | ✓ | Greenwood Park (Pacific Grove) | | ✓✓ | | ✓ |
| Woodrow (Santa Cruz) | ✓ | | | | Lover's (Pacific Grove) | | | | |
| Merced (Santa Cruz) | ✓ | | | ✓ | 17 th and Ocean View (Pacific Grove) | | | | |
| Auto Plaza (Capitola) | ✓ | | | ✓ | Pico (Pacific Grove) | | | | ✓ |
| Capitola Center (Capitola) | ✓ | | | ✓ | 4 th Street (Carmel) | | | | ✓ |
| Monterey Ave (Capitola) | | | | | Ocean Avenue (Carmel) | | | | ✓ |
| Capitola Pier (Capitola) | ✓ | | | | 8 th Street (Carmel) | | | | ✓ |
| Creekside- Upper (Soquel) | ✓ | | | | Santa Lucia and Scenic (Carmel) | | | | ✓ |
| Soquel Creek- Mid (Soquel) | ✓ | | | | Mission (Carmel) | | | | |
| Soquel Creek Mouth (Capitola) | | | | | Crossroads (Monterey County) | | | | |

✓✓= water smelled of oil or chemicals

Conclusion

For the past twelve years, the Dry Run and First Flush have provided Central California coastal area residents and municipalities with valuable information about the quality of water running from the storm drains to the ocean. Results from this event provide managers and researchers with pollutant concentrations during two critical times: late season dry weather and the initial flushing events when the most polluted water is expected. Results from the 2011 events show that:

- Nitrate concentrations are generally higher during the dry weather monitoring, yet still below the attention level. Nitrate concentrations were below the attention level during the First Flush at 100% of the sites. This is consistent with historical results.
- Orthophosphate results continue to be above the action level for the First Flush: In Monterey County 90% of the sites, in Santa Cruz County 55% of sites, in San Mateo County 40% of the sites and were over the attention level.
- Overall, copper and zinc concentrations appear to be consistently higher at sites in the southern half of the Monterey Bay region.
- Lead concentrations were primarily below the WQO during both wet and dry weather events.
- As in previous years, *E. coli* and enterococcus results during First Flush were above the WQO. In 2011, 98% of the sites for *E. coli* and 100% for enterococcus exceeded the WQO.

First Flush data helps us to better understand what *our* pollutants of concern are over a very large area through the help of many courageous volunteers. First Flush data identify where concentrations are highest and help to target practices to address those specific contaminants. First Flush does not necessarily inform us as to whether our efforts are improving water quality. That requires a different monitoring design that uses the information provided by the First Flush event to prioritize problem watersheds, and inform the design of a monitoring program that identifies potential sources and determines effectiveness of particular practices. Local cities have used First Flush information and addressed pollutant concentrations by cleaning out storm drains prior to the rains, installing dry weather diversions and CDS units (litter/debris removal systems) as well as identifying opportunities to slow down runoff through vegetation and permeable surfaces. By addressing these issues on a watershed level more water quality improvements may be accomplished.

Appendix 1: Sites monitored for the Dry Run and First Flush

| Sites | Type- Outfall (O) Receiving Water (RW) | Dry Run | First Flush | Sites | Type- Outfall (O) Receiving Water (RW) | Dry Run | First Flush |
|--------------------------------------|---|------------|----------------|---|---|------------|----------------|
| 7 th Street (Montara) | O | | ✓ | Majors Creek (Monterey) | RW | ✓ | ✓ |
| Vallemar (Montara) | O | | ✓ | Hartnell Gulch Tributary (Monterey) | RW | | ✓ |
| Weinke Way (Moss Beach) | O | | ✓ | Twins (Monterey) | O | ✓ | ✓ |
| San Vicente Creek Mouth (Moss Beach) | RW | ✓ | ✓ | San Carlos (Monterey) | O | ✓ | ✓ |
| West Point (Moss Beach) | O | | ✓ | Steinbeck (Monterey) | O | ✓ | ✓ |
| Vassar (El Granada) | O | | ✓ | HopkinsMon (Pacific Grove) | O | | ✓ |
| Captistrano Street (El Granada) | O | | ✓ | HopkinsPG (Pacific Grove) | O | | ✓ |
| El Granada SD (El Granada) | O | | ✓ | 8 th Street (Pacific Grove) | O | | |
| Surfer's South (El Granada) | O | | ✓ | Greenwood Park (Pacific Grove) | O | ✓ | ✓ |
| Bay Street (Santa Cruz) | O | ✓ | ✓ | 15 th Street (Pacific Grove) | O | | |
| Arroyo Seco (Santa Cruz) | O | | ✓ | Fountain Avenue (Pacific Grove) | O | | |
| Woodrow (Santa Cruz) | RW | ✓ | ✓ | Grand Avenue (Pacific Grove) | O | | |
| Merced (Santa Cruz) | O | ✓ | ✓ | Forest Avenue (Pacific Grove) | O | | |
| Auto Plaza (Capitola) | O | | ✓ | Lover's (Pacific Grove) | O | | ✓ |
| Capitola Center (Capitola) | O | | ✓ | 17 th and Ocean View (Pacific Grove) | O | | ✓ |
| Monterey Avenue (Capitola) | O | | ✓ | Pico (Pacific Grove) | O | ✓ | ✓ |
| Capitola Pier (Capitola) | O | | ✓ | 4 th Street (Carmel) | O | | ✓ |
| Creekside-Upper (Soquel) | RW | | ✓ | Ocean Avenue (Carmel) | O | | ✓ |
| Soquel Creek-Mid (Soquel) | RW | | ✓ | 8 th Street (Carmel) | O | ✓ | ✓ |
| Soquel Creek Mouth (Soquel) | RW | | ✓ | Santa Lucia and Scenic (Carmel) | O | | ✓ |
| Pajaro (Monterey County) | O | | ✓ | Mission (Carmel) | O | | ✓ |
| Bay Street (Seaside) | O | | ✓ | Crossroads (Monterey County) | O | | ✓ |
| Hotel (Seaside) | RW | ✓ | ✓ | | | | |