

# **2004 Urban Watch Storm Drain Monitoring Program City of Capitola, California**

**A Program Administered by:**

Tamara Doan, Coastal Watershed Council

**Report prepared by:**

Amity Wood, Coastal Watershed Council

**For:**

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# City of Capitola

## Urban Watch Monitoring Program

### PROGRAM OVERVIEW

The City of Capitola's Urban Watch storm drain monitoring program was initiated in August 2000 as a collaborative effort between the Coastal Watershed Council (CWC), the City of Capitola, and the Water Quality Protection Program of the Monterey Bay National Marine Sanctuary. The purpose of this project is twofold; first is to serve as a tool for education and community outreach regarding the impacts that the citizens have on local water quality, and secondly, to collect useful data to support local environmental management decisions. This is achieved through the use of trained volunteers to monitor dry-season storm drain discharges at selected outflow areas of Soquel Creek from September through October of each monitoring year.

The Coastal Watershed Council and a representative of the City of Capitola chose five sampling sites based on drainage basin and safe access for volunteers (Figure 1). The monitoring sites established for this program are referred to as: (1) **Capitola Village Bridge**, right bank drain at base of NW end of bridge at corner of East Cliff Dr. and Wharf Dr.; (2) **Nob Hill**, left bank drain from parking lot and loading areas behind Nob Hill Market and Longs Drugs; (3) **Upper Nob Hill**, left bank drain from area behind commercial area, upstream of the Nob Hill parking lot; (4) **Auto Plaza**, right bank outfall with dissipater draining Auto Plaza Road; and (5) **Creekside Plaza**, left bank drain behind Creekside plaza parking lot.

### PROGRAM DESIGN

The program used the storm drain monitoring kit manufactured by the LaMotte Company (SSDK 7446) and designed in association with the City of Ft. Worth, Texas. The Urban Watch monitoring kit is designed to provide a method for volunteers to monitor dry-season storm drain discharges to identify common urban pollutants and contaminants within the study area. The kit was developed according to National Pollutant Discharge Elimination System (NPDES) Phase I dry weather monitoring requirements and is designed to detect illegal storm drain connections and discharges. To this pre-assembled kit we added the Oakton 'ECTestr' conductivity meters and replaced the Oakton 'pHTestr' meter with pH strips for ease of use by volunteers.

Following a one-day training, volunteers were instructed to conduct sampling on a weekly schedule. Samples were randomized through a flexible biweekly schedule with the volunteers, and scheduling of field time was left up to the monitoring teams. Volunteers were divided into four teams of 3-5 members each. Parameters monitored included detergent surfactants, ammonia nitrogen, nitrates/nitrites, copper, chlorine, turbidity, pH, conductivity, water and air temperature, odor, and color. Volunteers also noted if there was oil sheen, sewage, trash, and surface scum present at the storm drain site. They also determined sample turbidity (or "visibility") visually using a "Low-Medium-High" designation, as well as any other observations of note. Table 1 includes information on each of the parameters monitored and methods used for monitoring.

Due to the delay in contracting the 2004 Capitola Urban Watch Program, monitoring did not begin until September 28, 2004, approximately four months behind the rest of the Monterey Bay Regional Urban Watch-First Flush Program. Therefore, the dataset presented in this report is significantly reduced.

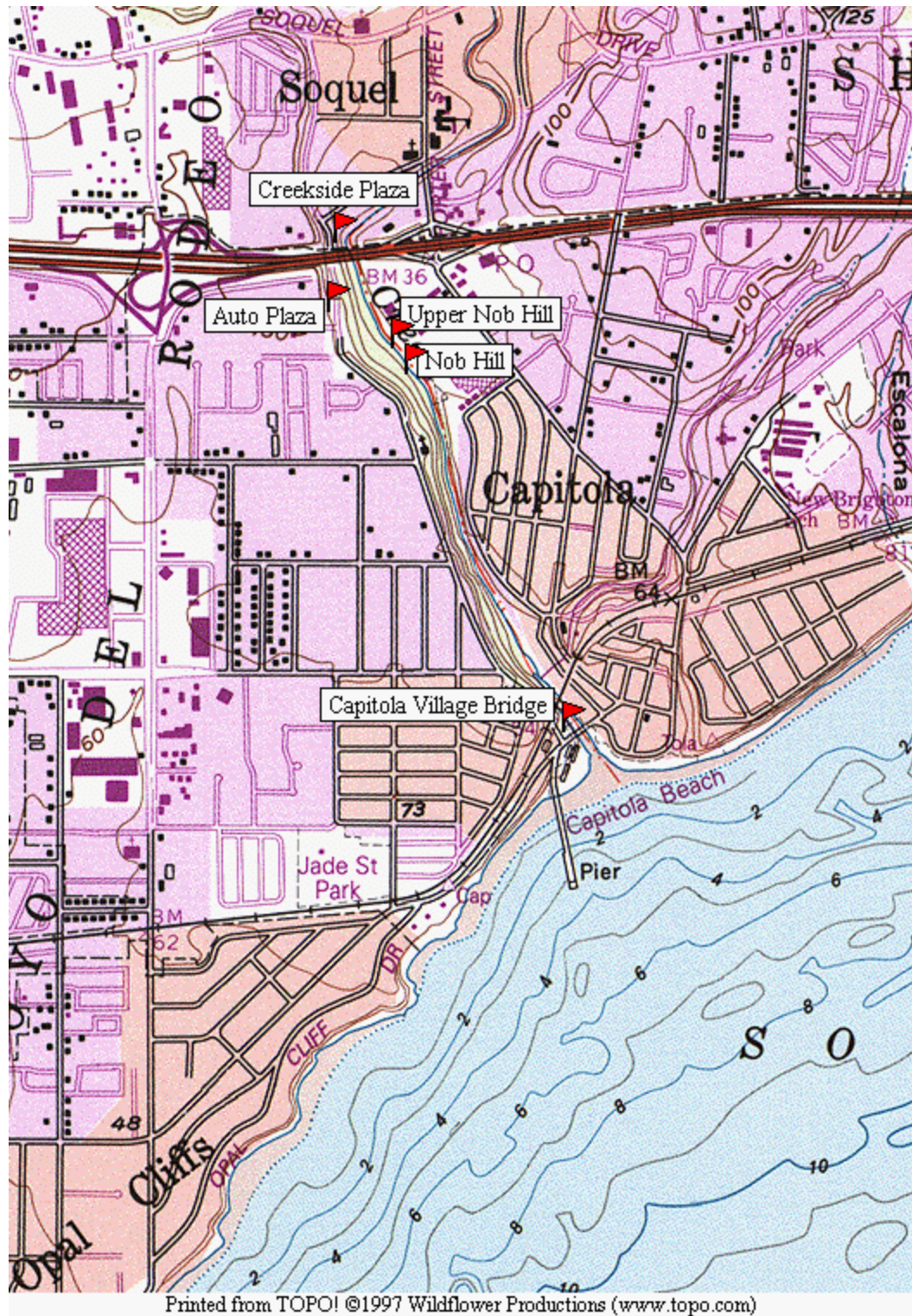


Figure 1. Locations of monitoring sites in the City of Capitola -Soquel Creek Urban Watch Program.

**Table 1: Water Quality Parameters  
Urban Watch Monitoring Program**

<b>Parameter</b>	<b>Possible Sources</b>	<b>Associated Problems</b>	<b>Method/Accuracy</b>
Temperature	Illegal discharges	Affects rates of chemical and biochemical reactions in water.	Method - Digital thermometer Accuracy $\pm 1\%$ full scale
Turbidity	Microorganisms, Sediment, erosion	Interferes with fish and other aquatic life	Method - Visual Octa-Slide Viewer against turbidity standard slide bar
pH	Aerosols and dust in air, Mineral substances, sewer overflows, animal wastes, pesticides & fertilizers, photosynthesis	Interferes with fish and other aquatic life	Method – MacHery-Nagel pH-Fix 4.5-10.0 color-fixed indicator strips Accuracy $\pm 0.25$ units Min detection: 4.5
Detergent surfactants	Illegal or unintended discharges, car washing, cleaning of screens and grills, leaking sanitary sewers	Can be toxic to many aquatic insects, plants, and fish; can lower dissolved oxygen available to aquatic life	Method - solvent extraction/ bromphenal blue indicator Accuracy $\pm 0.1$ ppm Min detection: $>0.1$ ppm
Copper	Illegal discharges into the storm drain system; also can occur naturally in surface waters	Concentrations over 0.025 parts per million are toxic to most freshwater fish	Method-Diethyldithiocarbamate Octa-Slide Comparator against color standard. Accuracy $\pm 10\%$ Min detection: $>0.0$ ppm
Nitrate/Nitrite	Direct discharge from treated wastewater and sewer overflows, and agricultural and urban runoff	Can be toxic to many aquatic insects, plants, and fish	Method: HACH Nitrate/nitrite test strips Cat. 27454-25 Min. detection: 0
Chlorine	Illegal or unintended connections to a Storm drain or draining of a swimming pool	Toxic to aquatic life, can create a "sterile" environment	Method – DPD Octa-Slide Comparator against color standard. Accuracy $\pm 10\%$ Min detection: $>0.2$ ppm
Ammonia Nitrogen	Illegal connections to Storm drain systems, poorly functioning septic systems, wildlife	At certain concentrations can be toxic to aquatic organisms	LaMotte Code 5864 Colo-Ruler against a color standard Min detection: $>0.1$ ppm
Conductivity	Discharges high in salts and minerals or metals, water moving through local geology	Possible agricultural, industrial or municipal wastewater runoff	Method –Electrode probe module. Accuracy $\pm 1\%$ Min detection: 10 $\mu$ S
Color	Dyes or chemicals	Interferes with aquatic Insects	Method - Visual Borger Color System
Odor	Illegal discharges or product of decomposition; "clean" drainage water should have no distinctive odor	Can indicate presence of contaminants	Method - Scent
Oil sheen	Hydrocarbons such as oil, gasoline, and grease; leaking underground petroleum storage tanks	Toxic to aquatic organisms	Method - Visual
Trash, sewage, scum	Illegal discharges or illegal dumping	Interferes with fish and other aquatic life	Method - Visual

The Urban Watch Program culminates with the First Flush monitoring wherein the volunteers capture water samples from the storm drains monitored for the Urban Watch program during the first significant rain of the wet season. This rain washes the streets and cleans the gutters and storm drains of collected materials and pollutants that accumulate throughout the dry-season. Infield measurements of water temperature, conductivity, pH, and an assessment of transparency are taken by volunteers at the site, and samples are collected and sent to a professional lab where analysis for nitrate, orthophosphate, zinc, copper, lead, total coliform, *E. coli.*, total dissolved solids, and total suspended solids are performed. The results are compared to the Central Coast Ambient Monitoring Program's (CCAMP) Action Levels. These action levels are not for regulatory purposes. Rather, they provide guidance on potential impacts to the health of the marine ecosystem. First Flush reports can be downloaded from the Internet at: <http://www.mbnms.nos.noaa.gov/monitoringnetwork/events.html>

### **VOLUNTEER TRAINING**

Tamara Doan of the Coastal Watershed Council (CWC) and Bridget Hoover of the Monterey Bay Sanctuary Citizen Monitoring Network (MBSCMN) provided a three-hour hands-on training for Urban Watch and First Flush volunteers. Volunteers were presented with training materials detailing site locations, procedural instructions and test protocols, as well as ancillary information on the subject of urban pollutants. Topics emphasized by the CWC included monitoring concepts, sampling procedures, test protocols, the meaning of each parameter monitored, use of kits in the field, and safety procedures. Training for the First Flush event also consisted of providing an in-field "dry run" training. Volunteers were placed in teams and scheduled for Urban Watch monitoring over the program duration and/or First Flush response teams. A CWC staff person accompanied each Urban Watch team in the field until the groups had a full understanding of the sampling methodology, data recording and analytical skills outlined in the training packet given to them.

Randomized sample collections were achieved by incorporating a flexible weekly schedule with volunteers. Volunteers sampled during daylight hours both on weekdays and weekends. A monitoring event consisted of two observations within the 24-hour period. One data sheet per each site was recorded for each of the two visits whether or not there was flow from the storm drain outfall on that occasion.

### **QUALITY ASSURANCE/QUALITY CONTROL PROGRAM**

The Quality Assurance/Quality Control (QA/QC) program included the following components:

- Training on monitoring concepts, safety, sampling methods, and hands-on use of equipment.
- Training in use of data sheets and data entry for volunteers.
- Periodic calibration of test equipment, calibration records are available.
- Use of Instrument ID numbers to track equipment used by teams
- Monitoring of reagent stores and expiration dates, waste management.
- Periodic review of data sheets to determine inconsistency in data entry.
- Continued supervision until the trainer was confident in the volunteers' sampling and analysis skills.
- CWC prepared a Standard Operation Procedure for volunteers to use in the field while monitoring.
- Processing and analysis of data for report.

## **RESULTS**

### **I. Quantitative Parameters**

The parameters listed below were analyzed in the field using the LaMotte kit described above. Over the period of September 28, 2004 through October 15, 2004, monitoring took place at the five designated sites six times and a total of 30 individual monitoring events. Volunteer availability and other influencing factors were taken into consideration throughout the program and not every parameter was tested on every site visit. Please see Appendix 1 for Summary Tables 1 - 5, which provide averages, minimum-maximum values, and frequency of parameters encountered. Appendix 2 presents all raw data collected in the field. Monitoring protocols are available upon request.

Of the five sites monitored throughout the duration of the program, four sites consistently exhibited no flow to be measured during the six monitoring events. The only site to consistently produce flow was Creekside Plaza. Therefore, the following results only reflect measurements taken at one sampling site.

#### **Detergent Surfactants**

No detergent surfactants were detected on volunteer site visits during the six week monitoring period.

#### **Nitrates/Nitrites**

No significant levels of nitrates or nitrites were detected on volunteer site visits during the six week monitoring period.

#### **Ammonia Nitrogen**

No ammonia nitrogen was detected on volunteer site visits during the six week monitoring period.

#### **Copper**

No copper was detected on volunteer site visits during the six week monitoring period.

#### **Chlorine**

No chlorine was detected on volunteer site visits during the six week monitoring period.

### **II. Measured Values**

The following parameters were measured in the field during the 30 individual monitoring events. Please see Appendix 1 for Summary Tables 1 - 5, which provide averages, minimum-maximum values, and frequency of parameters encountered. Appendix 2 presents all raw data collected in the field.

#### **Flow**

In the five storm drains sampled, flow was only detected during 6 of the 30 observations. Flow was present during all visits to the Creekside Plaza site, where it was collected in 100% of the sampling events. No flow was detected at any of the other four sites (Appendix 2-1).

#### **Air Temperature**

Air temperature averaged between 16.9°C (Nob Hill) and 18.6°C (Stockton Bridge) for all sites throughout the program. The lowest recorded temperature was 12°C at Creekside Plaza site at 8:25 am on 10/15/04, and the highest recorded temperature was 23°C at Creekside Plaza site at 11:01 am on 10/08/04.

### **Water Temperature**

Water temperature averaged at 14.3°C for Creekside Plaza which produced the only flow during the monitoring events. The highest was measured at 15.0°C, and the lowest was 13.0°C. No water temperatures were collected for the Auto Plaza, Upper Nob Hill, Nob Hill and Capitola Village Bridge sites due to lack of flow.

### **Conductivity**

Conductivity measurements were taken with the Oakton ECTester low range meter (0-1990 µS) and with the Oakton ECTester high range meter (0-19.90 mS) to ensure no readings would be out of range. Conductivity was measured in 100% of all site visits to Creekside, which averaged 615 µS. The highest was measured at 650 µS, and the lowest was 530 µS. No conductivity measurements were collected for the Auto Plaza, Upper Nob Hill, Nob Hill and Capitola Village Bridge sites due to lack of flow.

### **pH**

pH values throughout the entire program averaged 7.5 for the Creekside Plaza site. No pH readings were taken for Auto Plaza,, Upper Nob Hill, Nob Hill and Capitola Village Bridge sites due to lack of flow.

## **III. Qualitative Parameters**

Volunteers were asked to make ‘presence or absence’ observations of the following parameters. More detailed descriptions were noted on the data sheet, and can be provided upon request. Site observations may have been recorded when a water sample was not collected. “Frequency” therefore is the relationship of the number of times the parameter was recorded as other than normal, out of the number of times an observation for that parameter was recorded throughout the program. Over the period of September 28, 2004 through October 15, 2004, monitoring took place at the five designated sites six times and a total of 30 individual monitoring events. Please see Appendix 1 for Summary Table 4, which provides frequency of parameters encountered. Appendix 2 presents all raw data collected in the field.

### **Odors**

No odors were noted for any sites during the monitoring period.

### **Color**

Volunteers matched water samples to a Borger Color System (BCS) booklet used to identify colors in nature. Six of the six samples where color was observed were colorless (BCS-93) from Creekside Plaza site. No water color samples were taken for Auto Plaza, Upper Nob Hill, Nob Hill and Capitola Village Bridge sites due to lack of flow.

### **Oil sheen**

No oil sheens were observed during the 30 individual monitoring events.

### **Sewage**

The only reported observation of ‘sewage sighted’ or ‘sewage smell’ was at the Auto Plaza site on 10/08/04 at 10:49 am. No other sewage sightings were observed during the remaining monitoring events.

### **Surface scum**

No surface scum was observed during the 30 individual monitoring events.

### **Trash**

Trash was found at all sites except Auto Plaza, in 11 of 30 observations (37%). The highest frequency was recorded at Creekside Plaza, where trash was detected during 83% of the visits. At Nob Hill, trash was recorded in 50% of site visits, Upper Nob Hill found trash on 33% of site visits, and at Capitola

Village Bridge, trash was recorded in 16% of the six site visits. The most common observations included paper, plastics, Styrofoam, and cans and glass bottles.

### **Turbidity**

Turbidity was consistently “low” for the Creekside Plaza sites during the monitoring period. No turbidity readings were taken for the Upper Nob Hill, Nob Hill and Capitola Village Bridge sites due to lack of flow.

## **IV. Additional Data**

### **Day of Week/Time of Day**

A total of six volunteer monitoring events occurred on Tuesdays (2), Fridays (3), and Sunday (1). The monitoring times varied; however, they were more frequently in the afternoon hours for six monitoring events. The earliest monitoring time was 8:13 am (Nob Hill, 10/12/04), and the latest was 3:10 pm (Nob Hill, 10/01/04).

### **Parameters tested at the Lab**

Field samples were collected from Creekside Plaza during two separate monitoring events on 10/17 and 11/8/2004. Once the samples were collected, they were sent to Santa Cruz County Department of Environmental Health Services Water Quality Laboratory to be tested for bacteria counts (*E.coli*), total coliform, nitrates, orthophosphates, and ammonium nitrogen.

Results from the lab indicated the presence of *E.coli* and total coliform to be under the water quality objective in two samples tested (100%). The values for *E.coli* ranged from 5 MPN/100ml to 20 MPN/100ml, well below the water quality objective of = 400 MPN/100ml. The values for total coliform ranged from 4242 MPN/100ml to 8164 MPN/100ml, well below the water quality objective of = 10,000 MPN/100ml.

Also tested in the lab were nitrates, orthophosphates, and ammonium nitrogen. High concentrations of nitrates were found to be above the water quality objective of < 2.25 mg/L, ranging from 1.5 – 4.0 mg/L (averaging 3.3 mg/L). The values for ammonium nitrogen and orthophosphates were found to be well below their water quality objectives.

## **V. First Flush Event**

The First Flush monitoring event occurred on Sunday, October 17, 2004, and was held in the cities of Monterey, Pacific Grove, Capitola, and Santa Cruz. For the 2004 Capitola First Flush event, seven trained volunteers participated in the collection of samples along Soquel Creek. The actual First Flush monitoring event began to take place at approximately 6:00 pm.

Storm drain outfalls were monitored for conductivity, water temperature, pH, transparency, and field samples were collected for analysis of nitrate, orthophosphates, zinc, copper, lead, total coliform, *E. coli.*, total dissolved solids, and total suspended solids. The results were compared to the Central Coast Ambient Monitoring Program’s (CCAMP) Action Levels. These action levels are not for regulatory purposes; rather they provide guidance on potential impacts to the health of the marine ecosystem.

A separate report has been written for the 2004 First Flush monitoring event and sent to local area governments and agencies. First Flush results illustrate the impact of non-point source pollution generated through our daily interactions in the environment. The pollutants detected, in part, are a result of the daily activities of the local population as well as the many visitors that come to this region each year - high metal concentrations can be attributed to car brake linings, high nutrient concentrations can be linked to

fertilizers, and high bacteria concentrations are generated by failing sewer and septic lines, wildlife and pet waste.

Some of the most notable findings from the Capitola First Flush results revealed that Capitola sites, in general, had very low concentrations of *E. coli*, metals, nutrients and TSS during the First Flush. However, the Capitola Village Bridge site, in the two years that lead was monitored, had higher lead concentrations than the majority of sites and averaged above the Basin Plan WQO.

This data is available to interested organizations, and will be used to assess the pollutant load in the waters flowing into the Monterey Bay National Marine Sanctuary. The results of First Flush are available by contacting Bridget Hoover, Coordinator of the Monterey Bay Sanctuary Citizen Watershed Monitoring Network at (831) 883-9303. Previous First Flush reports can be downloaded from the Internet at: <http://www.mbnms.nos.noaa.gov/monitoringnetwork/events.html>

## **DISCUSSION**

Due to the fact that the 2004 Urban Watch Program was severely reduced in duration length, these results are only a reflection of sampling at one site (the only site to consistently exhibit flow) on six individual monitoring events. Therefore, these results that follow will act as “baseline conditions” for the Capitola Urban Watch Program.

Of the five sites visited during the 2004 Urban Watch monitoring period, only Creekside Plaza dispersed enough water flow to obtain data. The remaining sites, Auto Plaza, Upper Nob Hill, Nob Hill and Capitola Village Bridge, consistently exhibited no flow during each of the monitoring events. Results did not reveal any significant levels of detergents, ammonia nitrogen, nitrates, nitrites, copper or chlorine detected in the samples collected at Creekside Plaza. Turbidity was consistently ‘low’ for measurable sites during the 2004 program.

## **CONCLUSIONS AND RECOMMENDATIONS**

The 2004 Urban Watch season for the City of Capitola was limited to six individual monitoring events. Results from the data collected showed that trash is the most common contaminant entering storm drains within the study area. No detectable amounts of detergent surfactants, ammonium nitrogen, chlorine, copper, nitrates, and nitrites were found in any of the samples collected at Creekside Plaza. Additionally, sewage odors were noted at the Auto Plaza site once and no oil sheen and surface scum were reported during the six monitoring events.

Trash proved to be a consistent pollutant along the stream banks and in the water. Trash was found in 37% of all visits to all sites, and occurring in 83% of the site visits to Creekside Plaza. Trash proved to be the most prevalent and obvious ‘public’ pollutant in the study area. Encouragement of frequent community ‘Stream Clean-Up’ days, or targeted notices posted to point out the problem could be beneficial in trash abatement. As is true in most urban environments, the presence or absence of trash receptacles directly affects the amount of trash pollution in a given area. Locating and maintaining the presence of trashcans in the areas where the community use is obvious, as well as making sure they are emptied, is an important component in reducing trash as a pollutant in our waterways and to the ocean. Other ideas may include working with local newspapers to publish weekly monitoring results from the Urban Watch program, and working with the Chamber of Commerce or other business associations to promote clean water practices. Development of a Public Service Announcement for the local cable channel detailing information about storm water and urban runoff pollution is another possible avenue for outreach to a wider audience.

The 2000 City of Capitola Urban Watch Monitoring Program joined the ongoing efforts of the cities of Pacific Grove and Monterey in looking at non-point source pollutants entering the waterways of the Monterey Bay. The LaMotte Urban Watch kit, which was used by volunteers to monitor dry-weather storm drain flow, is easy to use and provides consistent data for cities and interested parties. It provides a vehicle for community involvement in data collection, which contributes critical data not otherwise collected by other programs in the City of Capitola. The data results continue to show the need for continued public outreach for urban runoff control within the city limits as well as in the neighborhoods that feed these drains. The continuation of this program in 2005 will add to the data presented in this report and provide further information regarding the state of water health in Soquel Creek.

The First Flush event proved a useful event for data collection and showed a great need to do further monitoring in the systems now looked at with the Urban Watch monitoring. This program also is a great tool for volunteers to see what the storm drain system is meant to do.

In conclusion, the City of Capitola is commended for continuing the Urban Watch monitoring program for a third season to augment the data presented here. Recommendation for the 2005 program include: 1) assess upstream sources of illicit discharges and pollutant sources; 2) support the investigation of additional parameters for study; and 3) continue outreach programs targeting local businesses, schools and residents to further reduce detergent concentrations and other sources of pollution from entering the Monterey Bay National Marine Sanctuary.

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