Florida Aquarium Parking Lot

a Treatment Train Approach for Stormwater Management

Swales

Strands

Wet Detention Ponds

Cover: Views of the three elements in the treatment train – the swales, the strand and the pond. Locations in parentheses are noted on the site plant (Figure 1a).

Swales:

A view of the basin without a planted swale (F2) and a view of the porous pavement basin with a planted swale (F6). The small garden areas and sampling equipment are shown in the foreground.

Strand:

A view of the strand after the berm repair showing the newly installed side bank filter that discharges into the wet-detention pond (S10) and a view of a different section of the strand before the berm was blown out and before the vegetation was well established (S9).

Wet Detention Pond:

A view of the wet detention pond taken during the winter with the outfall structure in the fore ground (P12) and a view taken in the summer with the inflow structure in the foreground (P11).

Cover Design: Allen Yarbrough

FINAL REPORT

FLORIDA AQUARIUM PARKING LOT

A TREATMENT TRAIN APPROACH
TO STORMWATER MANAGEMENT

December 2001

FDEP CONTRACT NUMBER WM 662

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Brooksville, Florida

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Acknowledgements

This project, including the preparation of this report has been funded in part by a Section 319 Nonpoint Source Management Program grant from the U. S. Environmental Protection Agency (US EPA) through a contract with the Stormwater/Nonpoint Source Management Section of the Florida Department of Environmental Protection. The total estimated cost of the monitoring project is $328,327 of which $196,996 was provided by the US EPA. Eric Livingston and David Worley at FDEP provided support and guidance. The parking lot design was prepared by Art Woodworth, Jr., Engineer, Florida Technical Services and Thomas Levin, Environmental Planner, Ekistics Design Studio, Inc. The Southwest Florida Water Management District laboratory staff was indispensable in carefully analyzing samples that could never be collected on a pre-determined schedule. Innumerable interns kept samplers iced, entered data into tables and collected samples. Allen Yarbrough designed the cover of the report, the site plan and parking lot swale diagrams. The Finance Department and especially Donna Farrell tracked our budgets, submitted invoices and kept us posted about our expenditures. Chuck Tornabene, our librarian, and his staff edited the report and also Dr. Tricia Dooris, Manager of the Environmental Section. A special thanks to the very careful review provided by Dr Woo-Jun Kang, one of our laboratory scientist, who gave special scrutiny and advice about the sediment and water quality data, an area of expertise where he is especially well-qualified. Everyone receives our grateful appreciation.

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Executive Summary

An innovative parking lot at the Florida Aquarium in Tampa was used as a research site and demonstration project to show how small alterations to parking lot designs can dramatically decrease runoff and pollutant loads. Over two years of data were collected which included most storm events that produced enough flow to collect water samples. A total of 59 rain events are included in the data set and represent storms which produced as little as 0.15 cm (0.37 in) of rain to a maximum amount of 1.15 cm (2.91 in). Three paving surfaces were compared as well as basins with and without swales to measure pollutant concentrations and estimate infiltration. To determine how these modifications and paving types might change runoff amounts and pollutant concentrations, both water quality and quantity were measured in eight small basins in the parking lot. To evaluate long term consequences and estimate maintenance requirements sediment samples were collected. To better understand conditions that influence pollutant concentrations, rainfall characteristics, vegetated areas and paving types were analyzed. Once the berm was repaired, water quality, sediment samples, and flow measurements were collected in the strand and wet detention pond to estimate what additional stormwater treatment they might provide. Finally the data were evaluated with statistical procedures to determine differences between years, differences between basins and relationships between variables. In this report, swales are defined as vegetated open channels that infiltrate and transport runoff water while strands are larger vegetated channels collecting runoff after treatment by swales.

Hydrology

Rainfall during both years of the study was considerably below normal, but lack of rain was much more severe during the second year. Normal rainfall for central Florida is usually about 20.5 cm (52 in) and rain measured at the site for year one was 106 cm (42in) and for year two, 86 cm (34 in). Drought conditions also reduced the amount of runoff for the parking lot and results might not have been as dramatic for a normal rainfall year, but even so, the data demonstrated that runoff volume can be reduced by even the small swales and garden areas in a parking lot. The runoff coefficient is one measure for judging the amount of runoff reduction that can be provided by increasing small depressions in parking lots. The runoff coefficient is a ratio that can be converted to a percentage. For traditional parking lots a typical range for this coefficient estimates that 70 to 90 percent of rain falling on the site would run off, but at our site even the basins with only small garden areas and no swales measured the yearly average runoff at about 55 percent. The basins with swales and paved in asphalt or concrete reduced runoff to 30 percent and porous paving, to about 16 percent. The basins with larger garden areas, about the size of one parking space, reduced runoff by an additional 50 percent. Swales and garden areas are most effective for small storms while large storms show about the same amount of runoff for all basins.

When the volume of water discharged from all the different elements in the treatment train (the swales, the strand and the pond) are compared, calculations showed almost all the runoff was retained on site. Although the year sampled was during an extreme drought, it is still remarkable that stormwater was discharged from the site only once and even in a normal rainfall year discharge would probably have only taken place about four or five times and the amount would have been greatly reduced.

Water Quality Concentrations

The individual basins in the parking lot and the various elements in the treatment train had significantly different water quality concentrations measured in their runoff. For inorganic nitrogen, nitrate levels were highest in the parking lot and much lower once water collected in the strand and pond. Although ammonia was higher in the swales, especially in the basins paved in asphalt, it was about the same as nitrate in the strand and pond. At least some of the ammonia concentrations can be attributed to the stagnant conditions in the strand and pond since these systems seldom discharged. The highest concentrations of phosphorus were measured in basins where runoff had traveled through vegetated areas. Some of the high concentrations in the strand and pond may have been caused by one of several conditions: mulch added to the system, filter material in the under drain, or grass clippings in the mowed areas. Some metals in runoff reflected the type of paving material it traveled over. Iron, manganese, lead, copper and zinc were measured at concentrations over twice as high in the basins paved with asphalt compared to the basins paved with concrete products.

The first flush effect is important because it is believed that the beginning of storms carry the most pollutants, therefore, this concept is the basis for many stormwater treatment designs. Total suspended solids and some metals demonstrated a definite first flush effect in the asphalt basins while the basins paved with concrete products exhibit no consistent pattern. Although all the nine storms sampled for discrete events were large storms, the storms greater than 5 cm (2 in) exhibited the greatest first flush effect. Nitrogen and phosphorus did not have a first flush effect.

Water Quality Loads

A more reliable measurement than pollutant concentrations for understanding the impact of stormwater on receiving waters is to evaluate pollutant loads. The most effective method for reducing pollutant loads is to keep runoff on site and allow time for infiltration as well as for chemical, biological and hydrological processes to take place. This is the rationale behind the design for the Florida Aquarium parking lot as well as low impact developments in general. Annual loads discharged from each basin type were calculated for each pollutant and since more runoff was discharged from the basins without swales they usually had higher loads for all the constituents except for phosphorus. For metal constituents and some nutrients, loads were greater for year one, as was expected, since year one had more rainfall and larger storms. Opportunities for infiltration do no reduce runoff as much for large storms as for small storms and since there were more large storms in year one, there was more runoff contributing pollutant loads. In almost all cases the larger garden areas typical of the odd numbered basins reduced loads by a considerable amount in addition to the reduction provided by the planted swales. The effect was more dramatic for metals than for nutrients, probably a result of vegetative die back, although larger garden areas appear to ameliorate this effect somewhat.

Load efficiencies were calculated to quantify how much pollutant loads can be reduced by infiltration with vegetated depressions. Loads in the basins with swales were compared to the basins without swales since the latter are typical of most parking lots. Basins paved with porous pavement had the best percent removal, with many removal rates for metals greater than 75 percent in the basin with a smaller garden area and greater than 90 percent with larger gardens. Inorganic nitrogen was reduced by 60 to 90 percent, but total nitrogen was only reduced by about 50 percent in the basins with smaller garden areas; this was improved to 70 to 80 percent with larger gardens. More phosphorus loads were discharged from basins with vegetated swales than from basins with no swales. This was expected since there are few sources for phosphorus in paved areas. For example, there is not much phosphorus in rainfall, asphalt or automobile residues, but there is phosphorus in vegetation and especially in soils. It should be emphasized here that even with some poor removal rates by the swales for phosphorus, when the entire system is evaluated, efficiency is good since the site only discharged to the receiving waters once during the year it was evaluated.

Sediment Samples

Sediment samples were collected in front of the outfall drop box in each swale as well as two locations in the strand and the pond. For basins without swales, the sediments that had accumulated in the asphalt depressions were analyzed. For metals, fairly consistent results were seen, with concentrations usually measured higher in basins paved in asphalt when compared to basins paved with concrete products. Aluminum, iron and copper concentrations measured in the strand and pond only occasionally showed concentrations as high or higher than the asphalt basins in the parking lot even though most of the 10 acre parking lot is paved in asphalt. This indicates that swales are effective for sequestering metals near the source. The strand concentrations were much lower in 2000 as a result of the berm repair which uncovered deeper cleaner soils and these were the source for our sediment samples. The higher concentrations of copper measured in the pond when compared to the other locations is probably the result of algicide treatment for nuisance plants, although there was a hot spot detected in the pond, left from previous industrial uses of the site, which may also have contributed to higher concentrations.

One concern about using the process of sedimentation to remove pollutants is the fear of groundwater contamination. Samples were collected at two depths to test if contamination might be a problem. Lower concentrations in the deeper sediments did not always hold true in 1998, but by the year 2000 all samples in the deeper soils were less than the surface soil indicating that metals washed into the swales and incorporated in the sediments were not migrating to the deeper strata, at least during the three years of the study. The results for copper and zinc indicate no migration, while the results for aluminum, iron, lead and cadmium are not as clear cut.

Total phosphorus and Kjeldahl nitrogen measured in the soils indicate an increase in most locations from 1998 to 2000, especially for nitrogen. Usually nutrients are quite low for the basin without a swale which has no vegetation or deeper soils to contribute nutrients. The pond showed a considerable increase in phosphorus and nitrogen from 1998 to 2000. Total phosphorus in the deeper sediments also showed an increase for 2000, but a corresponding increase in nitrogen was not usually seen.

Polycyclic aromatic hydrocarbons (PAHs) were detected in the soils at the site and some approached the significantly toxic levels while one, benzo(b)fluoranthene, reached the probably toxic level. Gasoline pollution from previous industrial uses has been identified in the soils at the site and this may have contributed to some of the concentrations. The highest percentage of detection was found at the deeper depths also implicating previous hydrocarbon contamination. The least number of samples with hydrocarbon detection occurred in the surface soils in 2000 indicating that PAH contamination may be decreasing. The most frequently measured hydrocarbon was fluoranthene and it was detected in at least 50 percent of the samples collected in each category (surface soils, deeper soils and drop boxes). Chrysene and pyrene were also frequently detected followed by the benzo-series. PAHs are a concern since they are suspected of causing cancer in humans, are bioaccumulative, do not break down easily in the environment and are subject to long range air transport.

Pesticides were also measured at the site. Chlordane was the pesticide most often detected in measurable quantities and it was found at all locations but three. Unlike the PAH data where concentrations in the boxes were low, the drop boxes measured the highest percent detection for pesticides. These concentrations must be from past land uses since most persistent pesticides have been banned or restricted and pesticides were detected more frequently in 1998 than in 2000. However, chlordane was detected more often in the surface sediments than in the deeper sediments. DDT and its daughter products were detected at almost all locations and DDE was found in measurable quantities, but the quantities were in the non-toxic to amphipod survival range. DDT and DDD were more often measured in the deeper soil profile and DDE in the surface soils.

Particle size measurements in 1998 showed that the highest percentages (27% to 61%) were measured in an intermediate size range described as medium sand. Although this intermediate size range also characterized a large percentage of samples in 2000, for these more recent measurements more were in the largest size ranges. Most sites exhibited a similar pattern for particle size and there were no obvious differences between paving types or the pond and the strand. Both years had the least percentage of particles in the two smallest size ranges. Percent organic matter ranged from 2 to 9 percent in the samples collected.

Introduction

Impervious surfaces, such as parking lots and roof tops, cause more stormwater runoff and pollutant loads than any other type of land use. As little as ten percent impervious surfaces in the watershed can begin to impact downstream rivers, lakes and estuaries (Shaver *et al.* 1995, Horner *et al.* 2001). These hard surfaces which often replace natural vegetative cover increase both the volume and peak rate of runoff and also provide a place for traffic-generated residues and airborne pollutants to accumulate and become available for washoff. Additionally, urban runoff management as it is practiced today, increases flooding during wet years and decreases base flow during dry years by reducing infiltration and soil storage while increasing evapotranspiration (Ferguson and Suckling 1990).

Stormwater management has often focused on end-of-the-pipe treatment using structural Best Management Practices (BMPs) such as ponds, infiltration basins and sand filters. These methods have an emphasis on trying to reduce peak flow instead of trying to mimic some of the processes of natural systems which would also reduce the volume and timing of flow. In addition, there has been little relationship between these practices and ecological requirements or even any assessment of how well they work to sustain the biological communities in the receiving waters they are supposed to protect. The few studies that have been conducted, have concluded that appropriately sited and designed BMPs provide some mitigation of stormwater impacts, but that the resulting biologic communities downstream were still greatly altered from those in undeveloped watersheds (Horner *et al.* 2001). One piece that has been missing in our assessment of stormwater management is the linkage between landscapes and aquatic habitats; and lacking this systematic picture, management efforts have not been broadly successful in fulfilling the Federal Clean Water Acts' stipulation to protect the biological integrity of the nation's waters (Horner *et al.* 1999). It is obvious that stormwater management practices in use today can be improved and more thought has to be placed in reducing storm volume, restoring soil structure and maintaining vegetative buffers. Also more data are needed to evaluate how well our man-made systems are able to protect the natural environment when land development does occur.

Low Impact Development (LID 1999) design criteria developed in Prince George's County, Maryland, are alternatives that have been successful in reducing runoff and pollution while protecting natural streams in the rapidly growing Washington, DC area (LID 1999). Techniques include reducing imperviousness, conserving ecosystems, maintaining natural drainage courses, reducing the use of pipes and minimizing clearing and grading. Providing storage opportunities within the entire drainage basin disperses runoff uniformly throughout a site's landscape by using a variety of detention, retention, and other practices. These landscape depressions can help maintain pre-development time of concentrations by routing flows with techniques designed to maintain travel time and by controlling the rate of discharge. This practice in itself has also been noted to decrease nonpoint source pollution. These design alternatives can also be effective by recreating vegetative structure when there are no natural systems left to conserve.

Some of these low impact development ideas were incorporated in the parking lot design at the Florida Aquarium. Instead of relying solely on end-of-the pipe treatment such as stormwater ponds or effluent filtration ponds, stormwater treatment began as soon as rain hit the ground. Some of the methods used included lengthening the stormwater flow path, providing landscape depressions and increasing vegetative treatment. Small depressions (swales) were left between parking rows and garden areas were left at the ends of each parking lane. These shallow depressions were designed to collect and store runoff before it was discharged to the next element (treatment train) in the stormwater system. The driving lanes were designed with the crown of the road in the center of the lane instead of letting the center act as the collection system for storm runoff that would then be rapidly sent to a storm drain – the practice used in most parking lots. The next design element in the Florida Aquarium parking lot was a forested strand surrounding part of the site which collected runoff after it had passed through the garden areas and swales. The final treatment for storm runoff was a small wet detention pond that acted much like a cypress dome by drying out during the dry season and storing water during the wet season. This low impact development design required a much smaller detention pond. As a comparison, the parking lot pond required only 0.008 ha (0.12 ac) to treat a 4.3 ha (10.65 ac) drainage basin while an effluent filtration pond on site required 0.133 ha (0.33 ac) to treat 4.2 ha (10.4 ac) of city streets and parking garages.

To have swales in the parking lot without reducing the number of parking spaces, local ordinances had to be altered. Changing the rules by making each parking space 61 cm (2 ft) shorter provided drainage depressions between parking rows and allowed the front end of vehicles to hang over a 122 centimeter-wide (4 ft) grassed swale instead of pavement. (In this report, swales are defined as vegetated open channels that infiltrate and transport runoff waters and strands are larger vegetated channels collecting runoff after treatment by swales).

The parking lot was monitored for a two-year period to quantify how much runoff and pollutant loads can be reduced by using swales and landscaped depressions. To determine how these modifications and paving types might affect water quality and quantity, eight small basins in the parking lot were monitored during storm events. To evaluate long term consequences and estimate maintenance requirements: sediment samples were collected. To better understand conditions that influence pollutant concentrations, rainfall characteristics, vegetated areas and paving types were analyzed. During the final year of the study: water quality, sediment samples and flow measurements were also taken to estimate the additional stormwater treatment by the strand and wet detention pond. Some measurements were taken during the summer and fall of 2001 to compare with a similar time period for three other years. This additional data analysis is included as an addendum in the appendix section.

Methods

Site Description

The parking lot design for the Florida Aquarium uses the entire drainage basin for low-impact stormwater treatment. The study site is a 4.65 hectare (11.25 acre) parking lot serving 700,000 visitors annually. The research is designed to determine pollutant load reductions measured from three elements in the treatment train: different treatment types in the parking lot, a planted strand with native wetland trees, and a small pond used for final treatment (Figure 1). The final treatment pond discharges directly to Tampa Bay (HUC 03100206) an Estuary of National Significance included in the National Estuary Program, and identified as a water body in need of attention (Section 19, Township 29, Range 19, Hillsborough County).

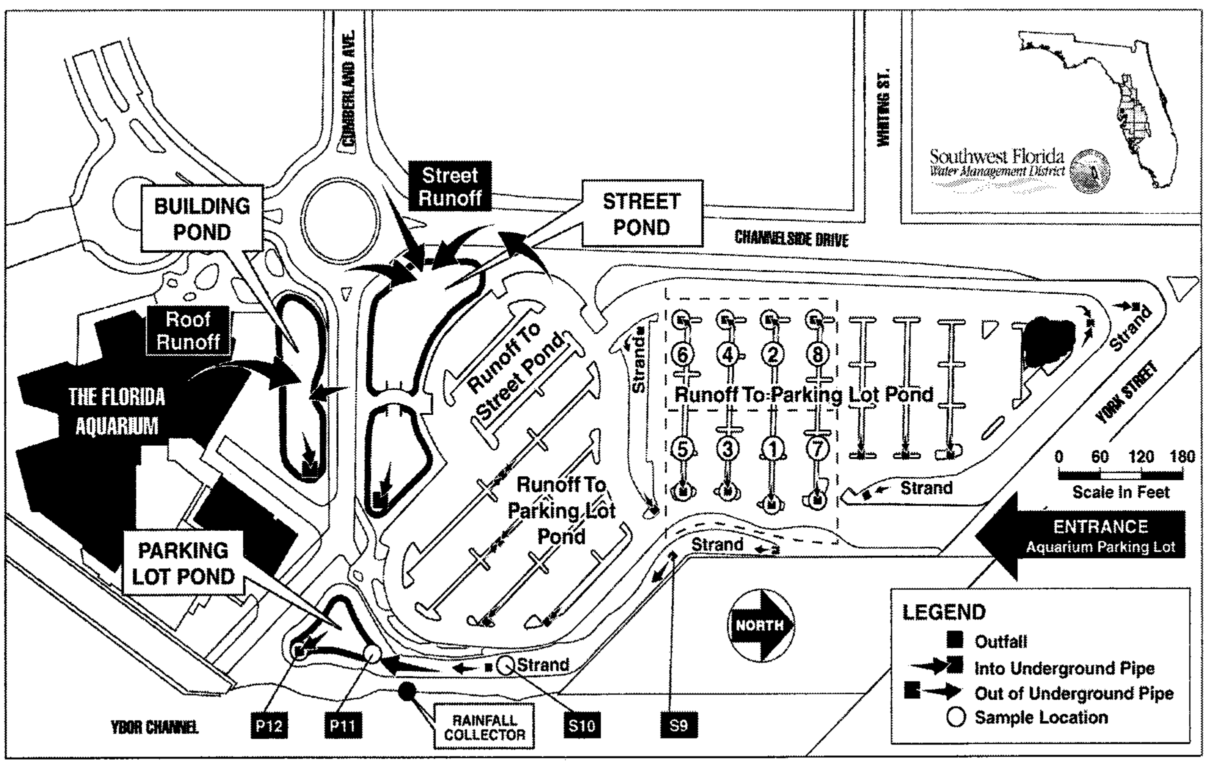


Figure 1a. Site Plan of the Parking Lot Demonstration Project showing sampling locations. The eight drainage basins evaluated in the parking lot are outlined by the dotted lines and shown in more detail in the next diagram. Numbered black boxes indicate sampling locations in the strand and the pond.

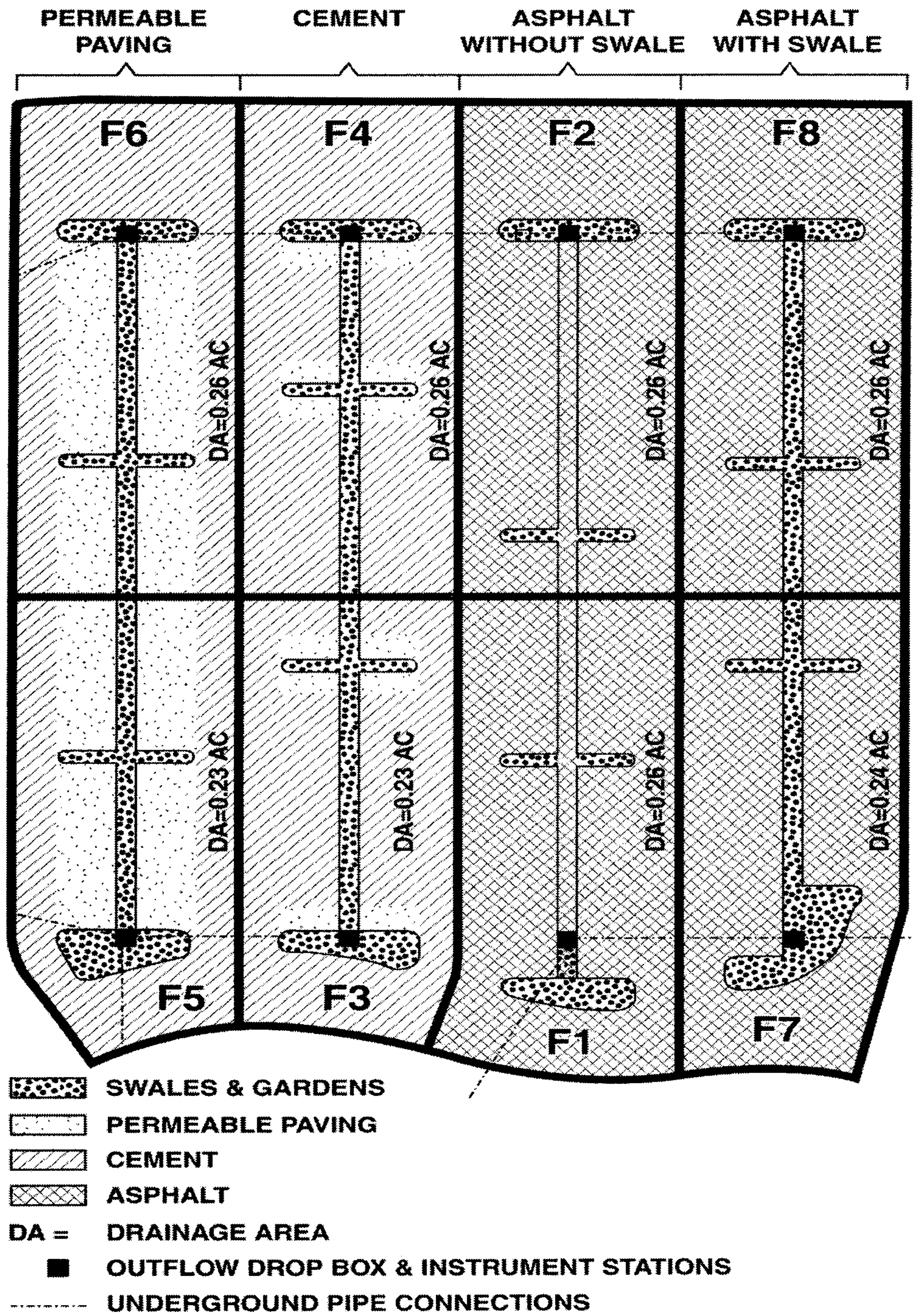


Figure 1b. Site plan of the parking lot swales delineated by the dotted lines in Fig 1a.

Based on the "Soils Survey of Hillsborough County, Florida", published by the United States Department of Agriculture's Soil Conservation Service (SCS 1958 now NRCS), the on-site soils consist of urban land use. Urban lands are classified by SCS as areas so much modified by urban development that they cannot be identified. The land also falls under the classification of made land built up by dredgings taken from the bottom of the bay. This material consists of sand and shell, which was pumped into low-lying areas when nearby channels were constructed or made deeper. A geotechnical exploration of the site was conducted for WilsonMiller (2000), and indicated that the on-site soils consist of slightly silty to slightly clayey fine sands with the groundwater table elevations tidally influence and ranging from 2 to 6 feet below existing grade. Other data at the site indicates the surface soils are limestone and shell fill. When we tried to install wells at the site, we found great hunks of asphalt, concrete and rebar making the installation of wells impossible with our equipment.

The pond used for final treatment (parking lot pond, Fig 1a) has a large outcropping consisting of a mass of concrete over 10 feet thick as a result of waste left by a concrete plant that was once located at the site. The pond has an impermeable liner to keep pollutants found at the site from migrating through the pond bottom and causing contamination to Ybor channel or the groundwater. Sections of the parking lot included in our study (area C) are also contaminated. The delineation of the petroleum contaminated areas are shown in Figure 2 (Environmental Consulting and Technology, Inc., personal communication). Information in the permit indicates there were 4 or 5 monitoring wells (12 to 14 ft deep with 10 ft screens) still in place.

Experimental Design

The experimental design in the parking lot allowed for the testing of three paving surfaces as well as basins with and without swales creating four treatment types with two replicates of each type. The eight basins were instrumented to measure discharge volumes and take flow-weighted water quality samples during storm events. The four treatment types include: 1) asphalt paving with no swale (typical of most parking lots), 2) asphalt paving with a swale, 3) concrete (cement) paving with a swale, and 4) porous (permeable) paving with a swale. The swales are planted with native vegetation. The basins without swales still had depressions similar to the rest of the parking lot, but the depressions were covered over with asphalt. All basins also had some landscaped garden areas providing opportunities for runoff to infiltrate. The comparative size of the garden areas can be seen in Figure 1b. Three different breaches through the berm that was located between the strand and Ybor Channel interfered with collecting data in the strand and pond as planned, but even so, over one year of data were collected and analyzed once the problem was corrected in July 1999.

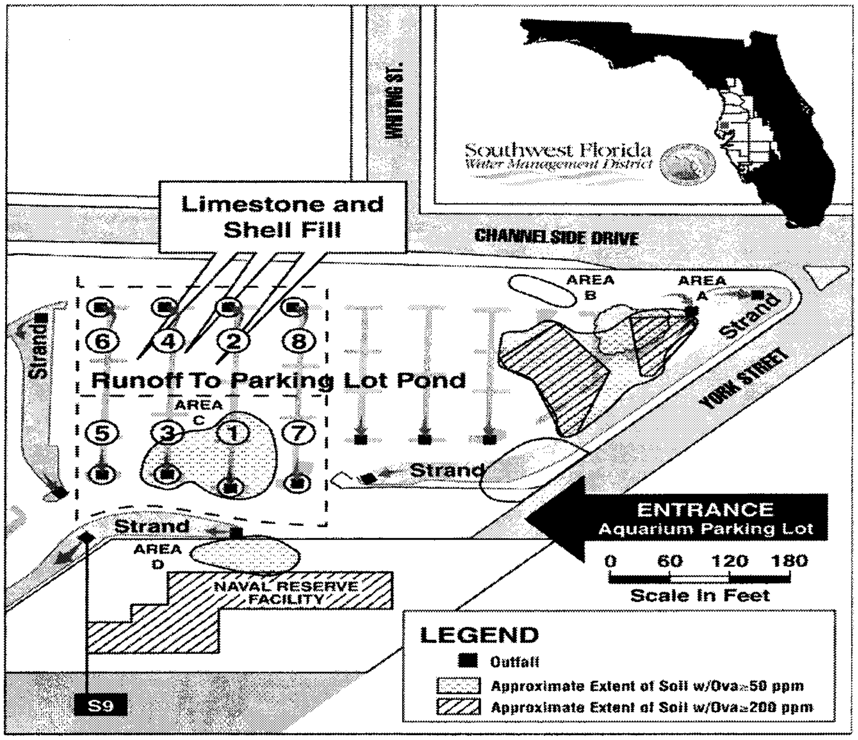


Figure 2. Identification of soils contaminated with subsurface petroleum products.

Hydrology Measurements

Flow out of each of the eight small parking lot drainage basins (0.09 to 0.105 ha) was measured using identical H-type flumes and shaft encoders (float and pulleys) connected to four Campbell Scientific CR10™ data loggers. The data loggers were programmed to take readings every minute and averaged these for 15 minute intervals. The data loggers also stored two other reports, 1) a daily summary and 2) a storm event report. The fifteen minute report recorded average, maximum and minimum water levels and flows as well as cumulative flows. These data were used to make comparison graphs, collect flow weighted water quality samples and calculate pollutant loads for storm events. An instrument shelter, located at the parking lot pond, stored data for the strand, the pond and rainfall using data loggers and a similar routine as that described for the parking lot. The major differences at the pond site compared to the parking lot were the primary measuring devices which used weirs instead of flumes. Problems with breaches in the berm limited the amount of quantifiable strand and pond data collected in this part of the treatment train until after July 1999. Since the strand, the under drain and the pond rarely discharged, grab samples taken during rain events were used to characterize the water quality at these locations. Diagrams of the weir structures and the formulas used for estimating flow are located in Appendix A. In addition, the berm repair required a side bank filter in the strand, and a Thelmar™ weir was installed in the under drain pipe to estimate this flow into the pond.

Rainfall amounts were calculated with a tipping bucket rain gauge, summed over 15 minute intervals and stored in Campbell Scientific CR10™ data loggers.

Rainfall was characterized by calculating total rainfall, duration, inter-event dry period, and rainfall intensity using the following formulas:

Rainfall (cm, in)	= rainfall amounts for each event >0.40 cm (0.15 in)
Inter-event dry (hr)	= time period since previous rain event (> 6 hours separates storms).
Duration (hr)	= period of active rainfall
Average Intensity	= total event rainfall / duration of storm (cm/hr, in/hr)
Maximum intensity	= a one hour period during the storm with the highest total maximum intensity (cm/hr, in/hr)
Runoff coefficient	= inflow(m^3, ft^3) / (rain amount(m,ft) * basin area (m^2, ft^2))

Runoff coefficients (RC), LOADS, and LOAD EFFICIENCY were calculated using the following formulas:

RC = (volume discharged) / ((basin size)*(rainfall amount))
LOADS (kg/ha-yr) = ((concentrations)*(volume discharged))/(basin size)
LOAD EFFICIENCY (%) = ((Sum of Loads (SOL) in - SOL out)/SOL in)*100

Summary tables in the report are given in metric units or both metric and English and the data in the appendices are in English units.

Water Quality Measurements

Water quality samples were collected on a flow-weighted basis and stored in iced ISCO samplers until picked up, fixed with preservatives and transported to the Southwest Florida Water Management District (SWFWMD) laboratory. Samples were analyzed according to the guidelines published in their Quality Assurance Plan (SWFWMD 1998). Duplicate samples and blanks were periodically collected for quality assurance. De-ionized water (blanks) were run through the equipment when the tubing was changed to check for possible equipment contamination. Results show that the tubing sometimes contaminated the sample in this worst case scenario, but sample concentrations were still much lower than the average values measured during storm events. (See quality assurance appendix A). Samples for the analysis of total nitrogen, ammonia, nitrate-nitrite, orthophosphorus and total phosphorus were stored in 500 ml polyethylene bottles and preserved with the addition of sufficient concentrated sulfuric acid to lower the sample pH below 2.0. Samples for the analysis of metals were collected in 250 ml EPA approved pre-washed bottles and preserved with the addition of sufficient nitric acid to lower the sample pH below 2.0. Samples for the analysis of total suspended solids, and hardness were collected in 1 liter polyethylene bottles for TSS and 500 ml polyethylene bottles for major ions. All samples were placed with ice in coolers and transported to the SWFWMD Laboratory for analysis using standard methods (Table 2). Grab samples were collected in the strand, the pond and in the under drain pipe once the berm repairs were made.

Table 2. Description of laboratory analyses for parameters measured in stormwater study. References refer to section in Standard Methods (APHA 1992) or (US EPA 1983) where more detailed descriptions can be found. When values were below the laboratory detection limit, one half the detection limit was substituted for statistical analysis.

Parameter	Method	Det. Limit	Reference.
Suspended Solids	Total filterable residue dried at 103-105^{O}	0.05 mg/l	SM 2540
Total lead	Electrothermal atomic absorption spectrometry	0.001 mg/l	SM 3113 B
Total copper	Electrothermal atomic absorption spectrometry	0.001 mg/l	SM 3113 B
Total cadmium	Electrothermal atomic absorption spectrometry	0.0003 mg/l	SM 3113 B
Total chromium	Electrothermal atomic absorption spectrometry	0.002 mg/l	SM 3113 B
Total zinc	Direct aspiration into air-acetylene flame	0.015 mg/l	SM 3111 B
Total iron	Direct aspiration into air-acetylene flame	0.025 mg/l	SM 3111 B
Ammonia-N	Automated phenate	0.1 mg/l	SM4500
Organic nitrogen	Semi Automatic Block Digestor	0.01 mg/l	EPA 351.2
Nitrate-nitrite-N	Cadmium reduction	0.01 mg/l	EPA 353.2
Total Phosphorus	Colorimetric automated block digester	0.01 mg/l	EPA 365.1
Ortho-phosphorus		0.01 mg/l	SM 4500-P
Chlorophyll	Spectrophotometric	1.0 ug/l	SM 10002G
Bacteria	Membrane Filtration	1.0 cfu/100ml	
Priority Pollutants	Standard	variable	

Rainfall water quality was collected using an Aerochem Metrics™ model 301 wet/dry precipitation collector. A sensor detected precipitation and activated a motor which removed the lid from the wet bucket and transferred it to the dry bucket. When the rain stopped the cycle was reversed. A small refrigerator was mounted under the collector to immediately store the sample until it could be fixed with the appropriate preservatives and transported to the laboratory. Dryfall was not measured

Sediment Samples

Sediment samples were collected right in front of the outfall (drop box) in each of the swales, and also at two locations in the strand and two locations in the pond during the fall of 1998 and again in the fall of 2000 (see Figure 1). Samples were extracted intact from the sediments using a two-inch diameter hand driven stainless steel corer. Cores were collected at two depths, representing sediments in the top 2.54 cm (1 in) layer and sediments 10 to 13 cm (5 to 6 in) below the surface. Residue in the drop boxes used to transport stormwater to the strand were also collected in 1998. To collect enough sample to analyze, four to five cores in the same vicinity were necessary and each was tested for particle size, metals, nutrients, pesticides and polycyclic aromatic hydrocarbons. Cores at each location were mixed using the four corners method and other procedures outlined in the laboratory's approved Comprehensive Quality Assurance Plan (SWFWMD 1998). Sediment samples were analyzed by the Department of Environmental Protection laboratory in Tallahassee by the methods outlined in their approved Comprehensive Quality Assurance plan (FDEP 1996) for total Kjeldahl nitrogen, total phosphorus, priority organic pollutants, particle size and percent organic matter.

Discrete Samples

Most of the water quality samples in the parking lot were composite samples collected in one bottle on a flow-weighted basis. However, the ISCO model 3700 used for the even numbered basins was outfitted with a 4-bottle (1 gallon) configuration which allowed for the analysis of discrete samples for some of the larger rain events. These were composited on a flow weighted basis depending on how the sampler was programmed. Since each sampler was programmed to put about the same number of aliquots in each bottle for the four-bottle configuration, comparable discrete samples could be collected. To compare these samples to the composite samples the individual samples were combined on a flow-weighted basis. The individual samples were also analyzed to determine if there was a first flush effect. The difference in magnitude of each storm and the different amount of runoff in each basin makes exact measurements over the hydrograph difficult, but comparisons for time collected in each basin for the data recorded to the data logger approximated the shape of the hydrograph and these are identified as the rising limb, the top, the falling limb and sometimes the tail of the storm.

Statistical Analysis

Statistical computations were performed using the SAS system, version 8.1, to determine significant differences and to analyze relationships between variables. Most statistical tests assume the variables are from an independent and normally distributed population and that the variances are homogeneous. This is rarely the case for water quality data, and even log transformations did not improve the distribution enough to make at least half the samples suitable for parametric procedures according to the Shapiro-Wilk Statistic (W) calculated using PROC UNIVARIATE. Other methods for assessing the normality of the data were investigated; these included skewness and kurtosis and these results are presented in table form. Results for all the data used in the univariate analysis to verify the data and also to find possible transcription errors are available, but are not included in the report because of space constraints.

To investigate the relationship between variables, non-parametric correlations were run using the Spearman rank correlation procedure with PROC CORR SPEARMAN. With Spearman's method differences between data values ranked further apart are given more weight, similar to the signed-rank test. It is perhaps easiest to understand as the linear correlation coefficient computed on the ranks of the data (Helsel and Hirsch 1992). Spearman's rho is best suited for large sample sizes (n>20) and the 58 storm events sampled in this study met this criterion.

To determine significant differences between years and between basins, the Wilcoxon Rank Sum Test was run using PROC NPAR1WAY WILCOXON for a one tailed test. Since this procedure only tests for the difference between two samples and we were interested in comparing all of the even numbered basins, an analysis of variance procedure for multiple comparisons was made using PROC MEANS/DUNCAN and the differences between two means by that test were further evaluated. The Wilcoxon rank sum test and Kruskal-Wallis chi-square test were then used to determine significant differences. Since it is easier to show differences with the Duncan output, these results are the ones shown in the report.

Results and Discussion:

Data for the two-year study are reported here with emphasis on rainfall characteristics, hydrology, water quality, sediment analyses and statistical verification.

Hydrology

Rainfall Characteristics - The type of storms and the amount of rainfall are relevant not only to water quantity issues where they affect flooding, volume of runoff and peak discharge, but also to water quality results where they may influence constituent concentrations and removal efficiency. Antecedent conditions (inter-event dry period) and rainfall intensity increase pollutant concentrations by providing time for pollutant accumulation on land surfaces as well as the rain energy to flush pollutants through the system. Also wet and dry years affect input and output concentrations by changing subsurface flow and evapotranspiration. Rainfall during both years of the study experienced drought conditions, but lack of rain was much more severe during the second year (Table 3).

Table 3. Comparison of rainfall characteristics between years (August through July of each year). The long term average for the region is 127.0 to 137.7 cm per year. The data include all storm events greater than 0.40 cm. (See Appendix B for complete data).

STATISTICS	RAIN (cm)	INTER-EVENT (hrs)	DURATION (hrs)	MAX. INT, (cm/hr)	AVG. INT, (cm/hr)
Year One Summary Data	Total rain 105.83 cm Number of storms 60				
Average	1.79	143.78	2.58	1.23	1.02
Median	1.30	70.25	1.50	0.94	0.93
Maximum	6.45	921.25	20.50	3.73	4.11
Minimum	0.38	3.75	0.25	0.28	0.15
Std.Dev.	1.35	194.36	3.05	0.85	0.75
C.V.	0.75	1.35	1.18	0.69	0.73
Year Two Summary Data	Total rain 86.30 cm Number of storms 48				
Average	1.76	155.13	3.07	1.16	0.95
Median	1.09	50.50	2.25	0.71	0.79
Maximum	7.39	1723.00	12.75	5.05	5.05
Minimum	0.41	6.00	0.25	0.23	0.09
Std.Dev.	1.51	284.70	2.89	1.13	0.88
C.V.	0.89	1.84	0.95	0.97	0.92

Area newspapers reported that not only was the drought in central Florida the worst in the nation during 1999 and 2000, but it was considered "exceptional". The drought center, along with the National Oceanic and Atmospheric Administration and the National Weather Service, put together a U.S. Drought Monitor web site to track dry weather and Central Florida was ranked a level 4 (**U.S. Drought Monitor 2001**). This is the level that might be expected twice a century. The Southwest Florida Water Management District also reported extreme conditions where the aquifer measured two feet below where it should be and lakes measured three to five feet below normal.

Runoff - Drought conditions also reduced the amount of runoff and the runoff coefficients for the parking lot. But even with drought conditions, the calculation of runoff coefficients for each basin demonstrates the reductions that can result from even small swales and garden areas.

The runoff coefficient (Table 4 and Appendix C) accounts for the integrated effect of rainfall interception, infiltration, depression storage, evaporation and temporary storage in transit. Engineers use conservative runoff coefficients for sizing conveyance pipes and have developed typical ranges for various land uses; the range for pavement such as parking lots is 0.70 to 0.95 (ASCE/WEF 1992). A basin similar to ours, that also had 90 percent imperviousness, calculated a median value for a runoff coefficient of 0.61 (Driscal *et al.* 1990), comparable to our median value of about 0.55. If all the rain falling on a drainage basin ran off, the coefficient would be 1.0 or 100 percent. Except for basin F1, the odd numbered basins are slightly smaller and have larger recessed garden areas than the even numbered basins. The larger garden areas (about the size of one parking space) in the odd numbered basins accounts for their 40 to 50 percent lower runoff coefficients. Another factor that may account for the good infiltration rate is the soil structure. From soil analysis, the Florida Aquarium parking lot had a high gravel content (average 9.9% for soil particles > 2 mm) and it usually took a rain event of at least 0.84 cm (0.33 in) to produce enough flow to collect samples, especially in the basins with swales. Also the data suggest that for large rain events, basin F2 overflows its boundaries and some of its runoff is actually discharged from basin F1. This accounts for the smaller runoff coefficient for both years in basin 2 despite the similarity between the two basins..

For runoff amounts (Table 5 and Appendix D), the summary statistics for each year are similar and also exhibit a consistent pattern. For all basins, runoff from basins with swales was significantly less than in the basins without swales. The concrete and the asphalt basins with swales (F8 and F4), which also have the same size garden areas, both produced about the same amount of total runoff each year. Porous pavement with swales had the least amount of runoff, but the size of the larger garden areas in the odd-numbered basins (F7 and F3) often decreased runoff as much as the porous pavement (F6). Therefore, the larger garden area found in F7, F3 and F5 were the most effective technique for reducing runoff with about 40 to 50 percent less total runoff in basins with larger garden areas compared to similar basins (F8, F4 and F6) with smaller garden areas. The increased size of the garden area was about the same size as one parking space, except in F7 where it was about the size of two parking spaces. For comparable basins (F2, F8, F4 and F6) the swales reduced runoff for the concrete and asphalt basins by over 30 percent in year one and over 20 percent in year two when compared to the basin (F2) without a planted swale, while porous pavement decreased runoff by about 50 percent for both years.

Table 4 . Summary of runoff coefficients for the eight basins in the Florida Aquarium Parking Lot calculated for two different years. All the data are found in Appendix C. Rainfall amounts included for comparison.

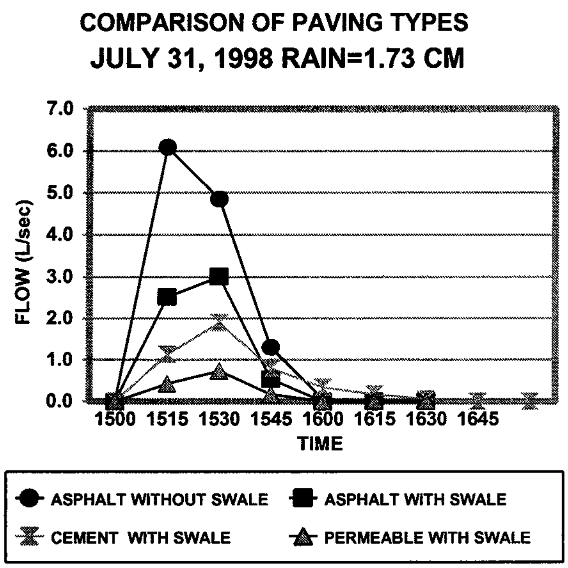
SAMPLE DATE	RAIN AMOUNT cm	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
YEAR ONE									
TOTALS	87.71								
STATISTICS									
Average	2.66	0.58	0.50	0.15	0.31	0.19	0.29	0.09	0.17
Median	2.08	0.57	0.48	0.12	0.30	0.13	0.25	0.02	0.14
max	6.60	0.97	0.86	0.43	0.78	0.67	0.75	0.51	0.59
Stddev	1.57	0.18	0.17	0.12	0.19	0.19	0.22	0.12	0.17
c.v.	0.59	0.31	0.33	0.83	0.60	1.01	0.76	1.44	0.98
YEAR TWO									
TOTALS	77.22								
STATISTICS									
Average	3.09	0.50	0.43	0.15	0.29	0.17	0.27	0.10	0.15
Median	2.72	0.53	0.46	0.08	0.29	0.06	0.26	0.04	0.13
max	7.49	0.78	0.67	0.53	0.74	0.65	0.72	0.56	0.72
Stddev	1.55	0.18	0.15	0.15	0.18	0.20	0.18	0.15	0.17
c.v.	0.50	0.36	0.34	1.00	0.63	1.18	0.66	1.49	1.09

The garden areas would probably reduce runoff even more if they had been constructed with proper soils according to the low impact development design criteria which are identified by them as bioretention areas (LID 1999). Bioretention is a practice to manage and treat stormwater runoff by using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression. Bioretention criteria combine physical filtering and adsorption with biological processes. The system can include the following components: a pretreatment filter strip of grass channel inlet area, a shallow surface water ponding area, a bioretention planting area, a soil zone, an underdrain system, and an overflow outlet structure (LID 1999). The garden areas in our study included existing soil and were only slightly recessed below grade when compared to the surrounding parking lot, instead of the 16 to 20 cm (6 to 8 in) maximum suggested in the manual and the garden depressions were not as deep as the swales.

Table 5 . Summary comparison data for rainfall and runoff amounts for the two years. Also included are comparison data corrected for volume if all storms had produced runoff as well as estimates for runoff if the average amount of rain had occurred and produced runoff.

YEAR ONE	RAIN AMOUNT	ASPHALT WO/SWALE		ASPHALT W/SWALE		CONCRETE W/SWALE		POROUS W/SWALE	
		F1	F2	F7	F8	F3	F4	F5	F6
	cm	cu meter	cu meter	cu meter	cu meter	cu meter	cu meter	cu meter	cumeter
TOTALS	87.71	581	499	169	343	221	347	111	225
STATISTICS									
Average	2.66	17.61	15.11	5.11	10.39	6.70	10.51	3.35	6.82
Median	2.08	13.25	11.37	2.12	6.74	1.78	6.26	0.53	2.35
Max	6.60	55.37	43.47	26.45	38.26	37.50	43.75	29.99	38.69
Std.dev.	1.57	13.37	10.93	6.42	9.81	8.91	11.06	6.13	8.93
c.v.	0.59	0.76	0.72	1.26	0.94	1.33	1.05	1.83	1.31
BASIN SIZE									
hectare		0.105	0.105	0.097	0.105	0.093	0.105	0.093	0.105
YEARLY RUNOFF FOR SAMPLES TAKEN									
(M3/ha)		5522	4740	1736	3259	2376	3296	1188	2140
YEARLY RUNOFF IF ALL STORMS > 0.40 CM (0.15 IN) HAD RUNOFF AND HAD BEEN SAMPLED									
(18% MORE RAIN INCLUDED)									
(M3/ha)		6516	5593	2049	3846	2803	3889	1402	2525
YEARLY RUNOFF IF NORMAL RAINFALL YEAR AND ALL STORMS HAD RUNOFF (32% MORE RAIN									
(M3/ha)		7289	6257	2292	4302	3136	4351	1569	2825
YEAR TWO		F1	F2	F7	F8	F3	F4	F5	F6
	cm	cu meter	cu meter	cu meter	cu meter	cu meter	cu meter	cu meter	cu meter
TOTALS	77.22	452	387	152	300	185	276	90	181
STATISTICS									
Average	3.09	18.07	15.50	6.10	11.99	7.42	11.03	3.60	7.23
Median	2.72	12.63	10.28	1.93	6.94	1.56	5.64	1.22	3.91
max	7.49	61.82	53.02	35.43	58.14	45.62	56.81	31.69	57.06
Stddev	1.55	14.69	12.02	8.94	13.49	11.86	12.65	6.95	12.00
c.v.	0.50	0.88	0.83	1.47	1.13	1.60	1.15	1.93	1.66
BASIN SIZE									
hectare		0.105	0.105	0.097	0.105	0.093	0.105	0.093	0.105
YEARLY RUNOFF FOR SAMPLES TAKEN									
(M3/ha)		4305	3685	1570	2849	1992	2621	968	1717
YEARLY RUNOFF IF ALL STORMS > 0.40 CM (0.15 IN) HAD RUNOFF AND HAD BEEN SAMPLED									
(20% MORE RAIN INCLUDED)									
(M3/ha)		5166	4422	1883	3418	2391	3145	1161	2060
YEARLY RUNOFF IF NORMAL RAINFALL YEAR AND ALL STORMS HAD RUNOFF (40% MORE RAIN									
(M3/ha)		6027	5159	2197	3988	2789	3669	1355	2404

Swales and garden areas are most effective for small storms while large storms show about the same amount of runoff for all storms. One example shows this effect in Figure 3. For these comparisons only the even numbered basins were used because they are all the same size and have the same size garden areas. Instead of a grassed swale, the basin without a swale has a recessed asphalt area the same size as the planted swales in the other treatments, but it also has recessed garden areas similar to the rest of the basins. The garden areas probably account for its relatively low runoff coefficient (0.51 and 0.40) for a parking lot as well as the fact that this basin overflows into basin F1 during large storm events. These results demonstrate that even small areas in parking lots can increase infiltration rates. A comparison of the hydrographs for the even numbered basins for all storms are found in Appendix E.



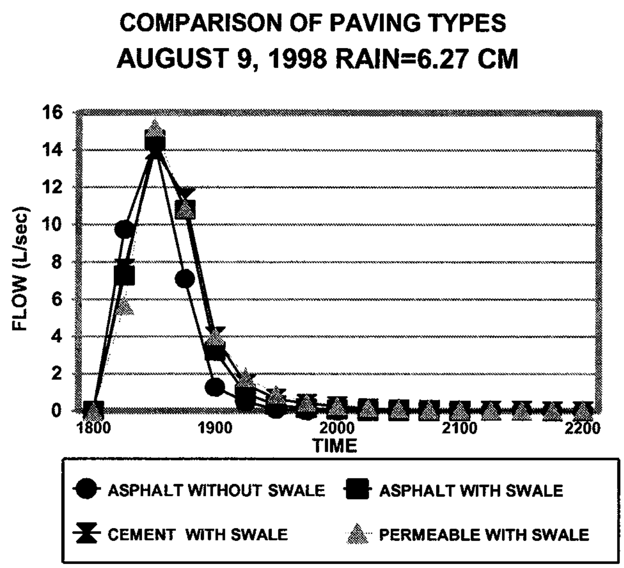


Figure 3. Comparison of storm runoff amounts with the amount of rainfall showed that swales reduced runoff for all events, and that paving type, especially permeable paving, was effective in reducing runoff from storms with less than two cm of rainfall (Cement with swale also has a few parking spaces with permeable paving). Note: Graphs have different scales. (See Appendix E for graphs of all rain events greater than 0.94 cm (0.37 in)).

Comparison of Flow One of the major advantages of low impact development for parking lots is the reduction in the volume of water discharged from the site. When the volume of water discharged from the different elements of the treatment train at the Florida Aquarium site are compared, the results show almost all runoff was retained on site (Table 6). Although the year sampled was during an extreme drought, still it is remarkable that stormwater was discharged for only one storm event. The data represent almost all major storms that produced significant flow for a one year period.

Table 6. Discharge data collected for four basins with paving similar to the rest of the 4.65 hectare parking lot compared to the measured flow from the strand, under drain and out of the pond. Since the four basins included in the analysis represent about 8.8% of the parking lot that ratio was used to estimate the total discharge from all basins.

SAMPLE DATE	RAIN AMOUNT	ASPHALT W/SWALE		CONCRETE W/SWALE		SUM 4 BASINS	ESTIMATE ALL PARKING	STRAND OVER WEIR	UNDER DRAIN	POND
		F7	F8	F3	F4	8.8%	100%			
	cm	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3	m^3
11/01/99	4.14	7.22	16.25	6.09	12.94	42.50	374.04	0.00	248.68	0.00
12/17/99	1.91	0.00	0.42	0.00	0.14	0.57	4.98	0.00	0.00	0.00
01/06/00	2.01	1.76	6.48	0.88	4.36	13.48	118.62	0.00	0.00	0.00
01/24/00	1.73	0.00	1.81	0.00	1.70	3.51	30.90	0.00	0.00	0.00
01/31/00	1.78	0.31	3.45	0.00	2.52	6.29	55.32	0.00	0.00	0.00
06/13/00	3.28	1.61	5.41	1.56	9.74	18.32	161.23	0.00	0.00	0.00
06/22/00	0.99	0.06	0.57	0.00	0.17	0.79	6.98	0.00	0.00	0.00
06/*/00**	3.53	0.28	3.43	0.06	2.89	6.65	58.56	0.00	0.00	0.00
06/29/00	1.80	1.16	5.01	1.05	4.47	11.70	102.92	0.00	0.00	0.00
07/01/00	2.06	0.82	4.53	0.48	4.81	10.65	93.70	0.00	34.04	0.00
07/04/00	4.95	16.99	30.78	25.26	30.95	103.98	915.04	0.00	381.89	0.00
07/08/00	2.72	8.50	12.74	3.26	11.44	35.93	316.23	0.00	0.00	0.00
07/15/00	5.03	17.67	28.09	21.32	24.64	91.72	807.14	0.00	211.67	0.00
07/26/00	3.15	2.15	4.87	0.65	5.01	12.69	111.64	0.00	0.00	0.00
07/31/00	6.83	35.43	36.50	35.93	31.86	139.72	1229.52	0.00	413.94	19.65
08/29/00	3.05	7.82	13.79	11.04	13.90	46.55	409.67	0.00	5.18	0.00
09/07/00	4.98	13.76	23.08	18.04	22.14	77.02	677.80	0.00	182.82	0.00
09/17/00	5.21	12.03	19.88	12.12	23.73	67.76	596.32	0.00	173.47	0.00
09/24/00	2.95	7.08	11.30	7.31	10.59	49.81	438.33	0.00	60.23	0.00
11/26/00	3.48	5.04	10.00	6.26	6.20	27.50	242.00	0.00	79.35	0.00

Water Quality

The concentration of pollutants is useful for looking at processes taking place in stormwater systems, while pollutant loads are more appropriate for assessing impacts to downstream habitats where cumulative effects are important considerations. Both types are discussed below.

Concentrations - The average concentrations of constituents measured in each of the basins for all storms sampled showed some differences between paving types as well as other variables. Appendix F summarizes the water quality data and Appendix G presents all the data. A comparison of constituents for all storms (Figure 4) indicates some of the processes taking place in the parking lot, the strand, the under drain and the pond.

For inorganic nitrogen, nitrate levels were highest in the parking lot and much lower once water collected in the strand and pond. High concentrations were also measured in rainfall. Ammonia reflects almost the same pattern as nitrates except it shows about the same concentration as nitrate in the strand and pond and measures higher concentrations in the basins paved with asphalt. At least some of the higher than expected ammonia concentrations in the strand and pond can be attributed to stagnant conditions they seldom discharged. The lowest concentrations of organic nitrogen were measured in rainfall and also the basins without a planted swale. This may reflects the transformation of nitrates in rainfall to organic nitrogen as runoff traveled through the vegetated system. However, median values of total nitrogen fluctuated within a narrow range between 0.40 and 0.60 mg/L, which is low when compared to most stormwater ponds in Florida (Rushton 1997, Carr and Rushton 1995, Rushton 2001, Harper 1993).

Phosphorus concentrations were much lower in rainfall and only somewhat higher than rainfall in the basins without planted swales (F1, F2). The highest concentrations of phosphorus were measured in basins where runoff had traveled through grassed areas (F3, F4, F5, F6, F7, F8) and in the vegetated strand. Even higher concentrations were measured in the underdrain and in the pond. These may have been caused by mulch that was applied when the pond and strand were constructed and by the filter material used in the under drain when it was installed.

The major ions (Figure 4), represented by sulfate and chloride, varied within a narrow range in the parking lot. The slightly higher concentrations in the strand and under drain were caused by residual salt water that entered through the third breach in the berm. The much higher concentrations in the pond represent not only the breaches through the berm, but backflow into the pond during several hurricanes.

Some metals in runoff reflected the type of paving material it traveled over (Figure 4). Iron, manganese, lead, copper and zinc were measured at concentrations over twice as high in the basins paved with asphalt (F1, F2, F7, F8) compared to the basins paved with concrete products (F3, F4, F5, F6). Other researchers have also measured increased metal contaminant loading from asphalt streets compared to concrete pavement (Sartor *et al.* 1974). Suspended solids were usually higher in basins paved with asphalt, although TSS was measured at low levels when compared to other stormwater studies (Harper 1994). Copper is an exception to higher concentrations only in the basins paved with asphalt since it also had elevated levels in the strand and pond. A hot spot with higher sediment concentrations of metals was noted in the sediment samples in the pond as will be discussed later and may have contributed to higher concentrations in the pond, or pond maintenance, higher salinity and other processes may have contributed to these results.

Nitrates were evaluated with regression graphs. The results indicate that the concentration of nitrate discharged from the parking lot reflected the amount of nitrate measured in rainfall. The relationship was strongest for the basin without a swale, but also helped explain elevated concentrations measured in the other basins (Figure 5).

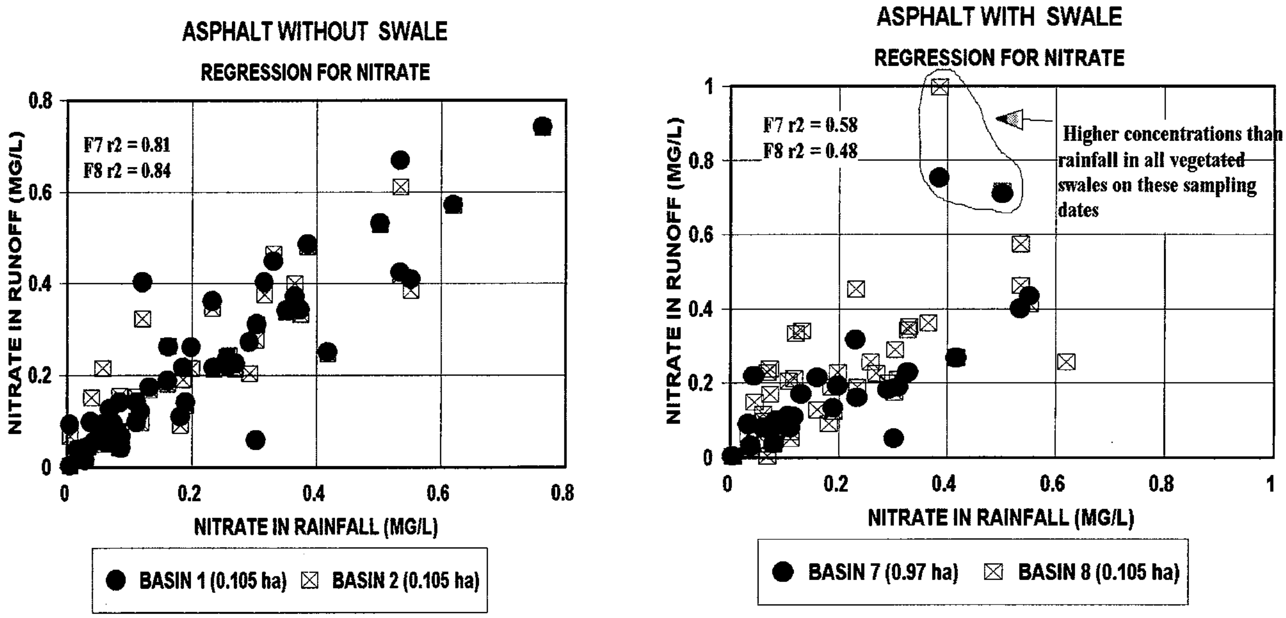


Figure 5. Relationships between nitrate measured in rainfall and nitrate measured in runoff for two basin types.

When the regression graphs are analyzed in the basins without a swale, there is a much better relationship (1:1 ratio) between concentrations of nitrate in rainfall and runoff compared to basins with a swale. This is expected if no residual nitrates are deposited from automobiles or dry atmospheric deposition. Similar concentrations between basin 1 and basin 2 are also evident. The basins with swales demonstrate lower nitrate levels than rainfall, especially when both have high concentrations, indicating the garden vegetation or infiltration by soil is reducing nitrate concentrations. This trend is not as evident for basin 8 with more values actually above the 1:1 ratio line; it will be remembered this basin also has a smaller garden area. For two sampling dates, concentrations in the swales were significantly greater than expected; probably caused by landscape practices. (It should be noted that two sampling dates were removed from the regression because rainfall as well as all the basins sampled had nitrate levels above 1 mg/L. These outliers skewed the data enough that no visual analysis for the rest of the storms could be detected).

Metals were also evaluated with regression graphs (Figure 6). The results show many metals tend to vary together and also vary with total suspended solids. In this study, this relationship is more obvious in the basins without swales. Other regression graphs are in Appendix H.

Concentrations were also compared between years (Figure 7). The results demonstrate a

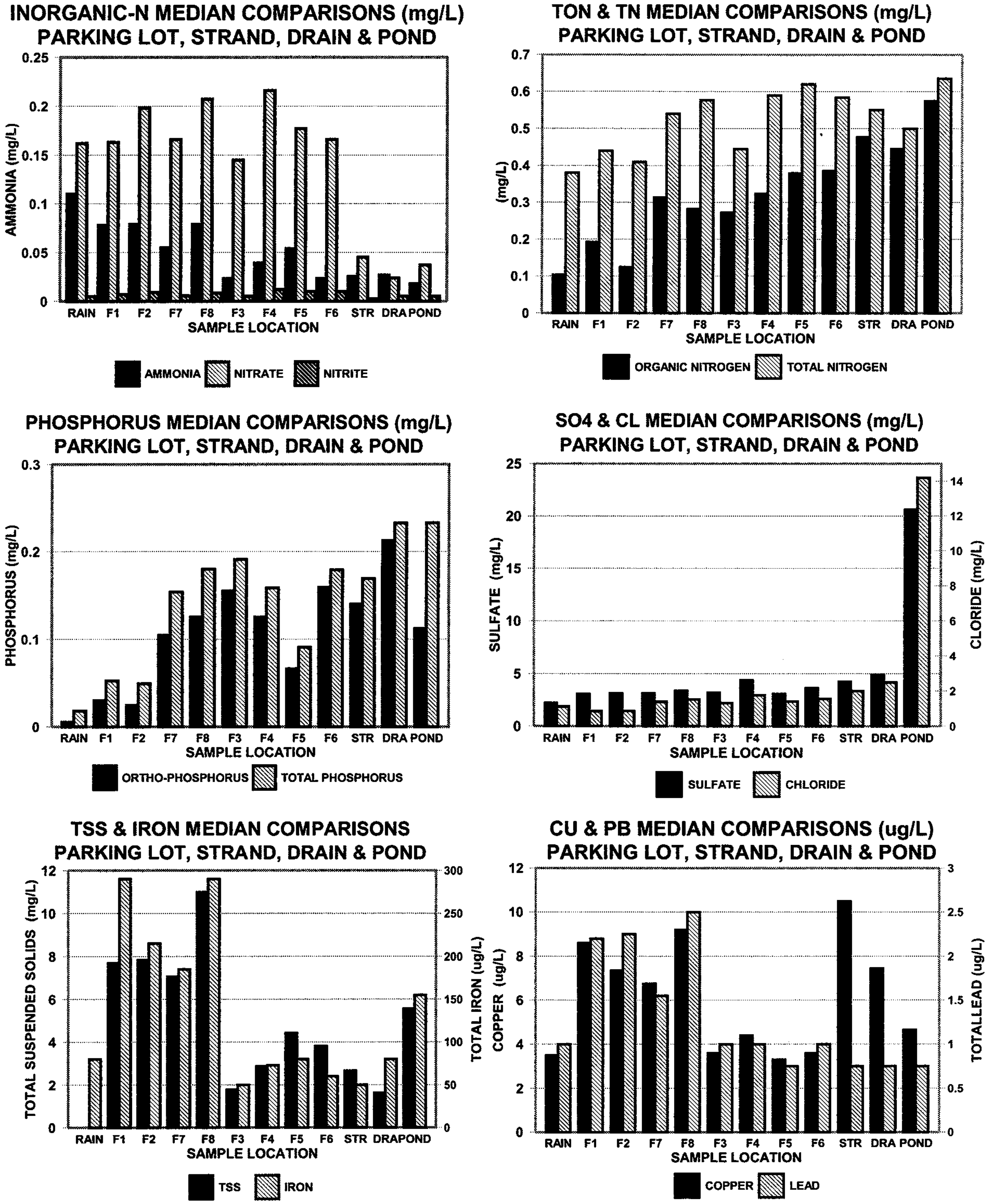


Figure 4. Comparison of median water quality concntrations for selected constituents measured at different outflows in the stormwater treatment train. These include the outflow of each of the basins as well as the strand, the under drain pipe into the pond and near the outfall of the pond. (see Figure 2 for sampling locations. Abbreviations: STR=strand, DRA=under drain, POND=pond

close relationship between years, except that concentrations were usually higher during the second drier year. All the data are in Appendix G-2. The higher concentrations in year two were probably the result of drier conditions, but higher concentrations could also be attributed to pollutant build up in the soils as the system ages. The increase is more pronounced for nutrients than metals which may be the result of more mature vegetation.

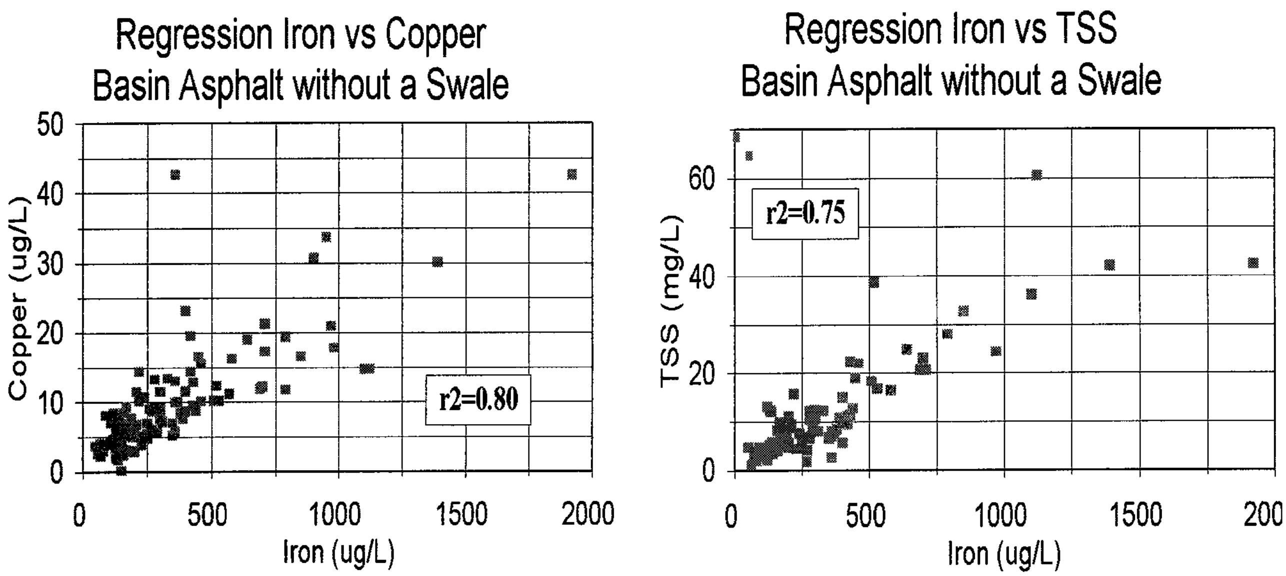


Figure 6. Metals often vary with iron and total suspended solids. The regression was strongest in the basins without a vegetated swale. (Also see Appendix H).

First Flush Effect - Individual samples representing the rising limb, the top, and the falling limb or tail of the hydrograph were collected for nine storm events (Appendix I) and seven of these are shown in bar graphs in Figures 8a - 8f. Some metals and total suspended solids demonstrate a definite first flush effect in the asphalt basins while the basins with swales exhibit no consistent pattern. Although all the storms sampled for discrete events were large storms (> 3.56 cm 1.40 in), the storms greater than 5 cm (2 in) exhibited the greatest first flush effect. Nitrogen and phosphorus did not have a first flush effect.

First Flush is important because it is believed that the beginning of storms carry the most pollutants, therefore, this concept is the basis for many stormwater treatment designs that are sized to treat the first inch or half-.inch of runoff. The theory assumes that pollutant concentrations are highest early in the runoff process and that as rainfall continues, the surface pollutant accumulation is washed out of the system and dilution by the larger flow will reduce pollutant concentrations.

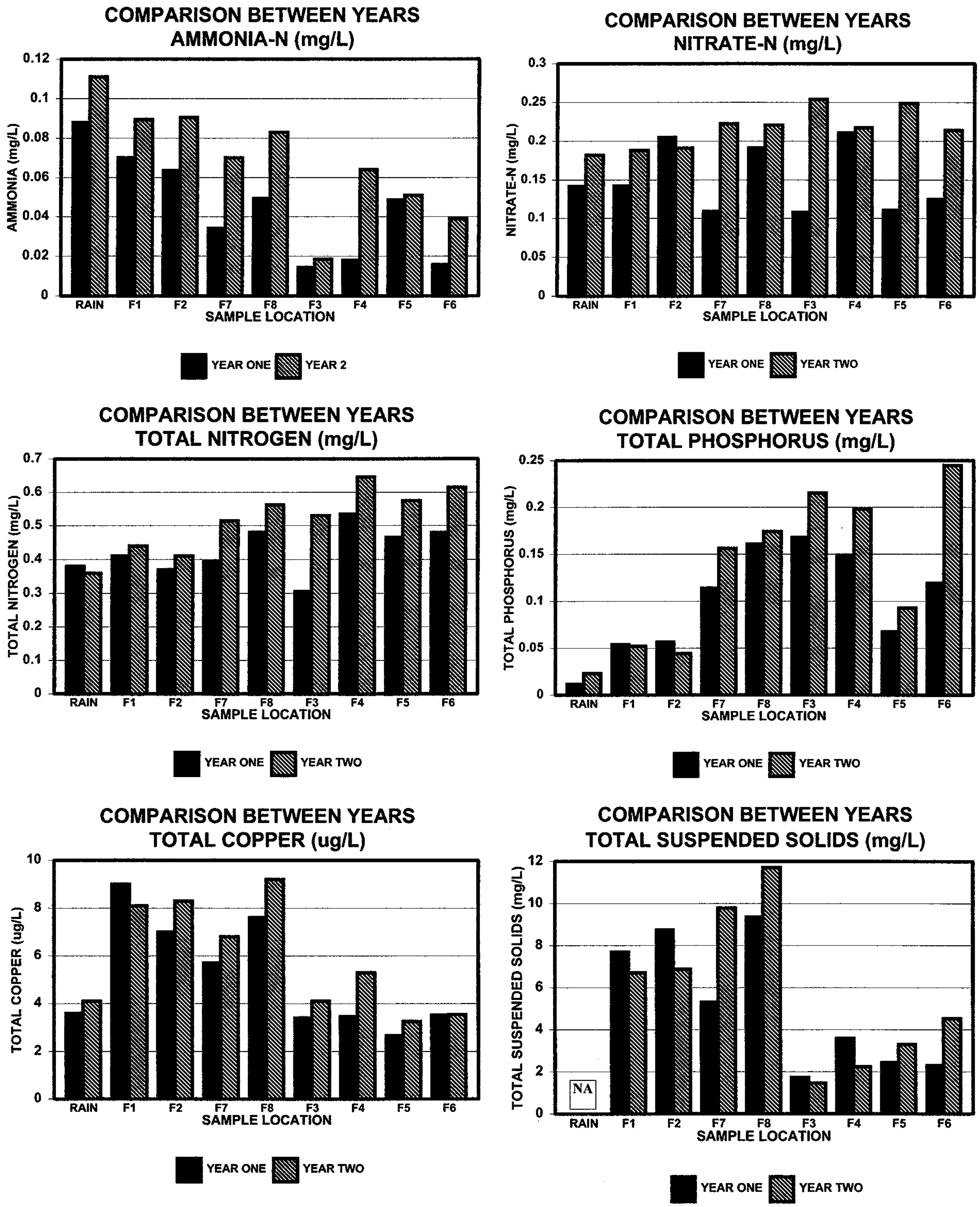


Figure 7. Comparison of median concentrations between years. For most constituents concentrations were higher during YEAR TWO which had less rainfall.

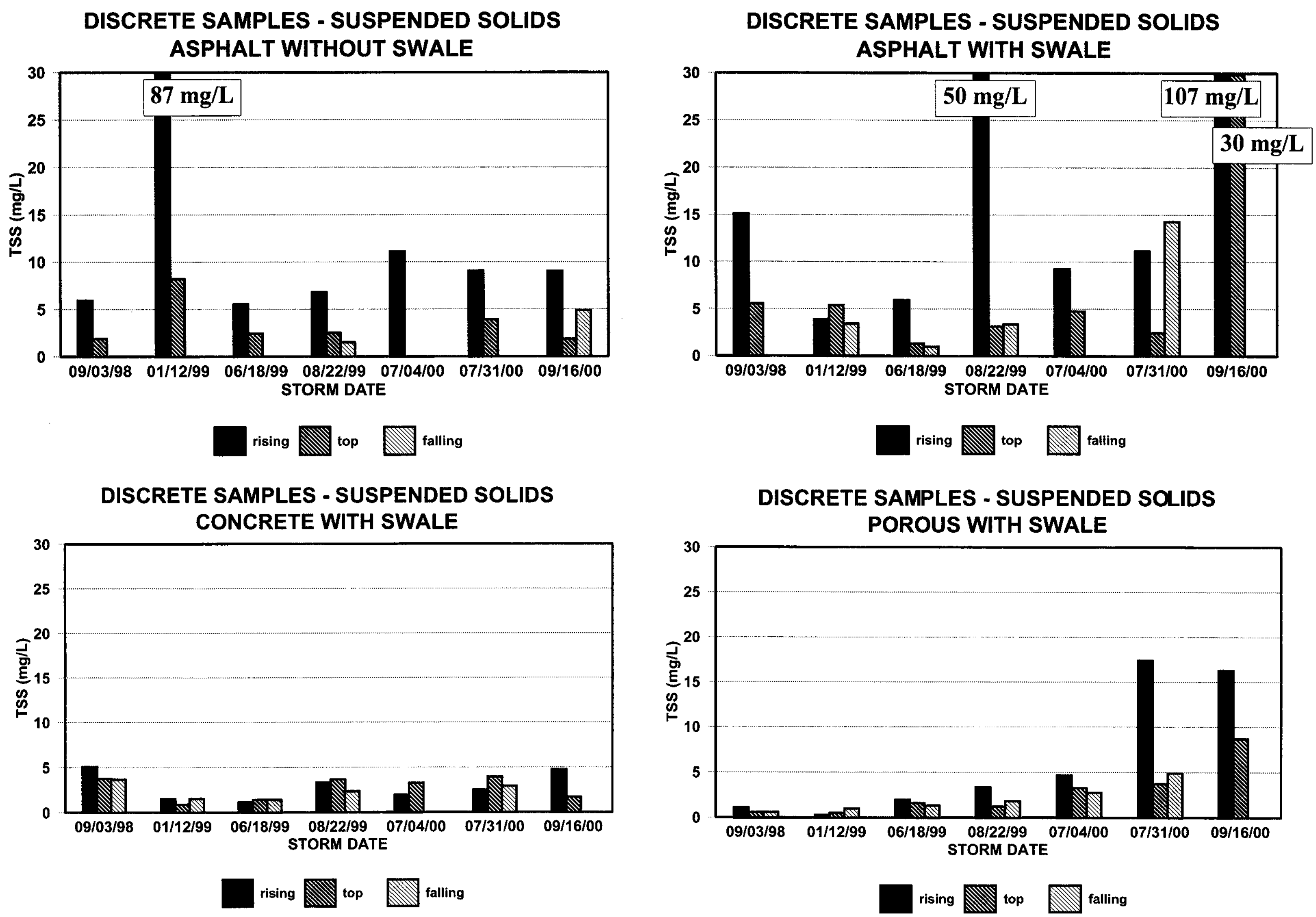


Figure 8a. Discrete samples taken over the hydrograph for suspended solids show a first flush effect for all storms in the basin without a swale and for most storms in the other basins. The asphalt basins have higher TSS than basins paved with cement products. For some sampling dates the tail end is included with the top of the hydrograph.

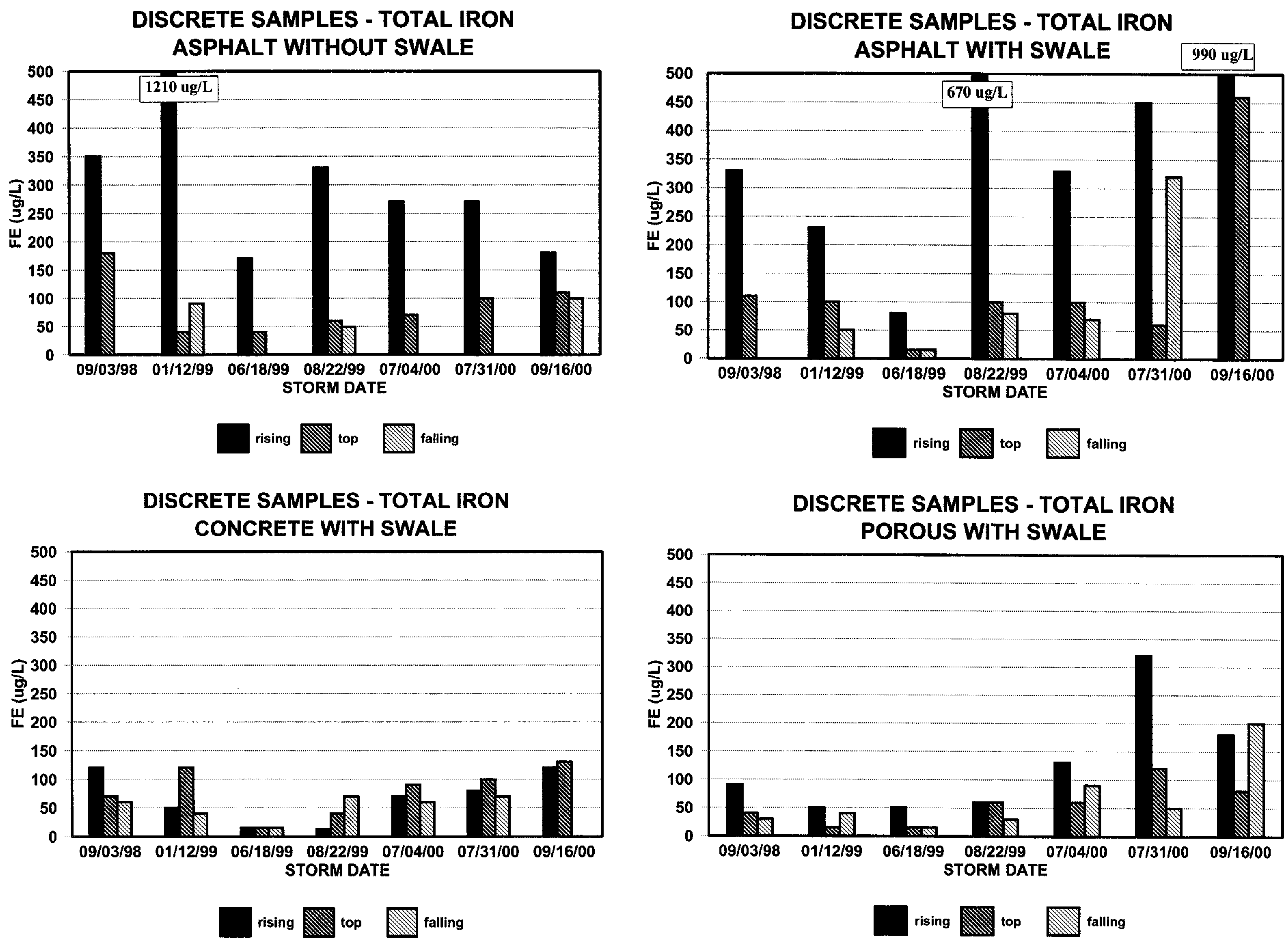
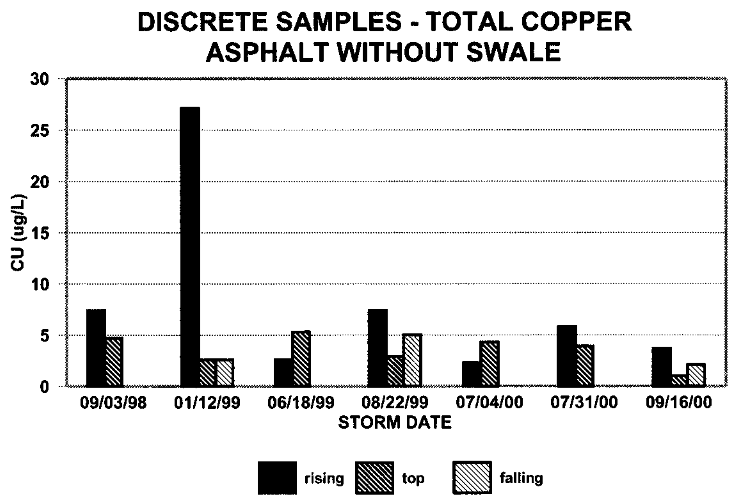
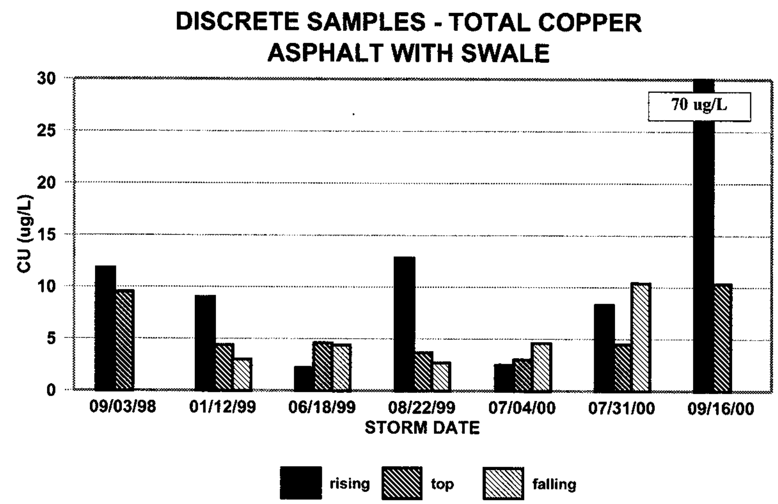
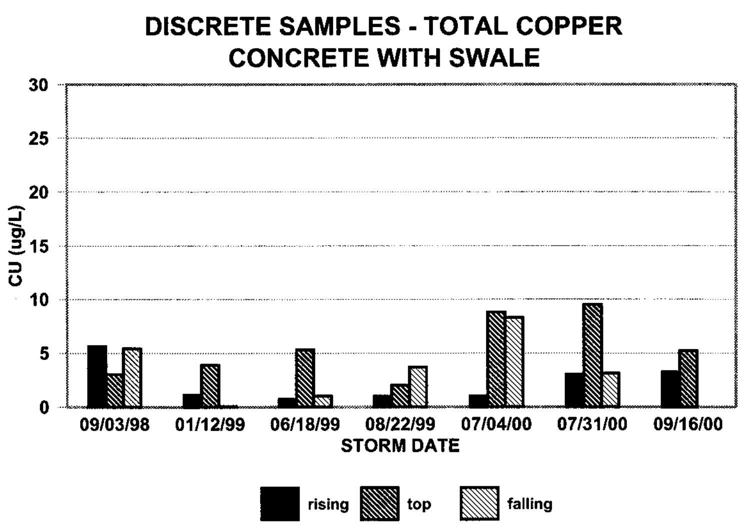


Figure 8b. Discrete samples taken over the hydrograph for total iron does show a first flush effect. Especially for the basins paved in asphalt. Many other metals tend to follow the same trend as iron.







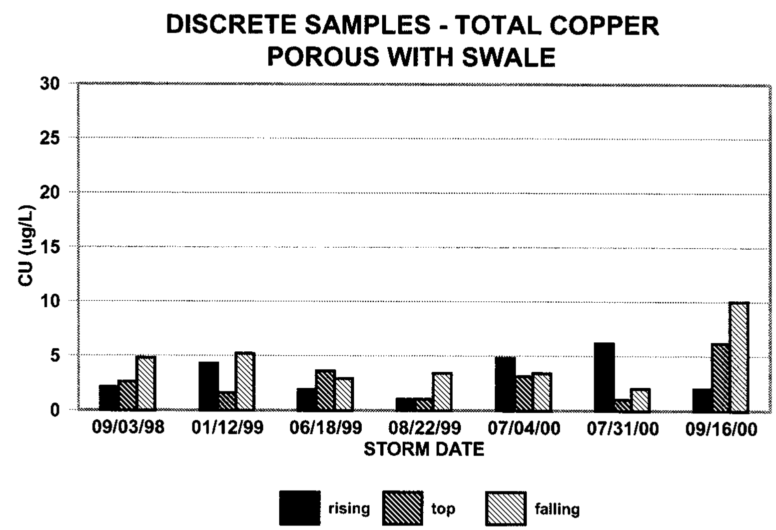


Figure 8c. Discrete samples taken over the hydrograph for total copper do show a first flush effect for the basins paved in asphalt, but the much lower levels measured in the basins paved with concrete product do not. (It should be noted that the laboratory detection limit is 2 ug/L and many of the samples were below this level.

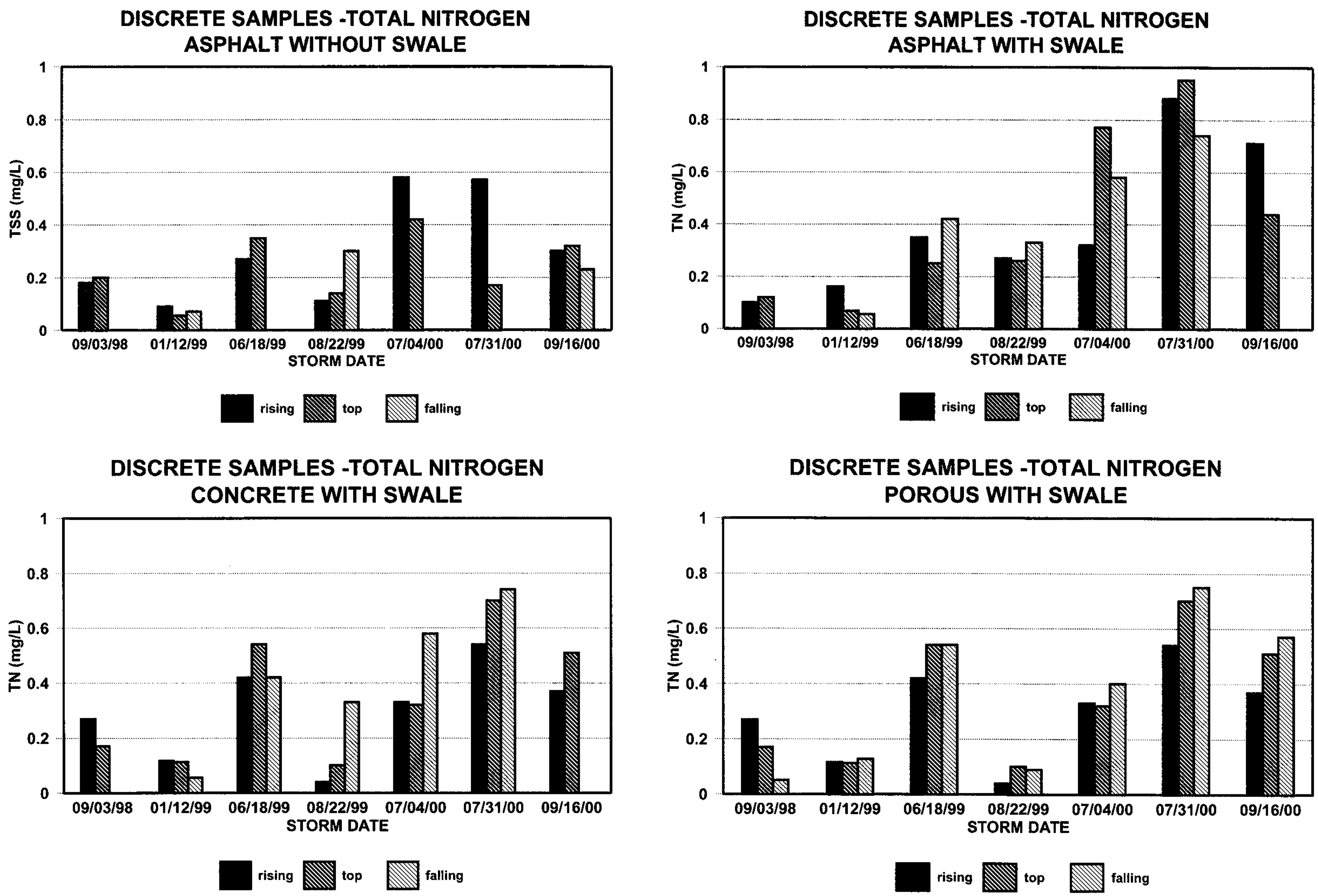


Figure 8d. Discrete samples taken over the hydrograph for total nitrogen does not show a first flush effect

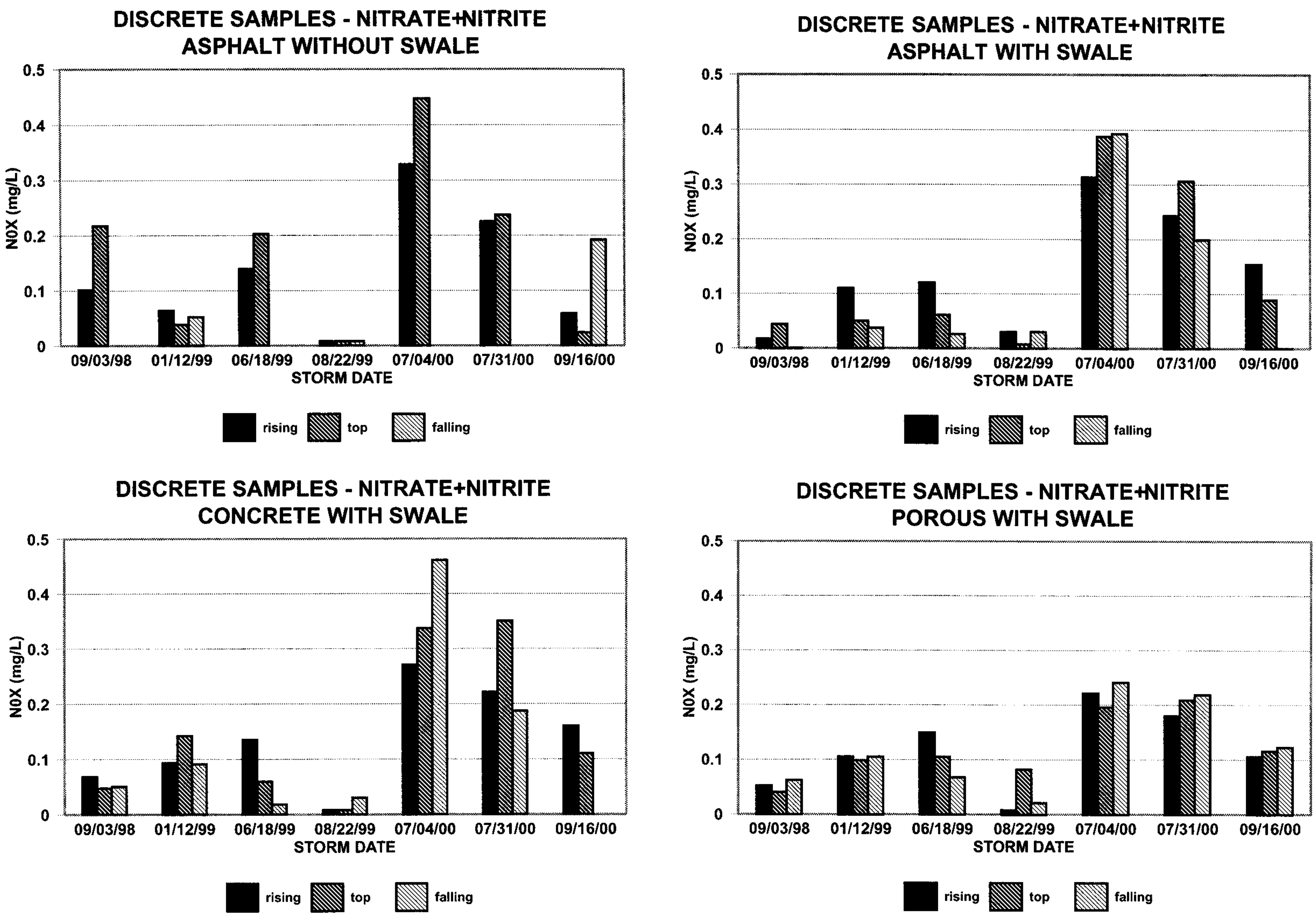


Figure 8e. Discrete samples taken over the hydrograph for nitrate+nitrite nitrogen does not show a first flush effect

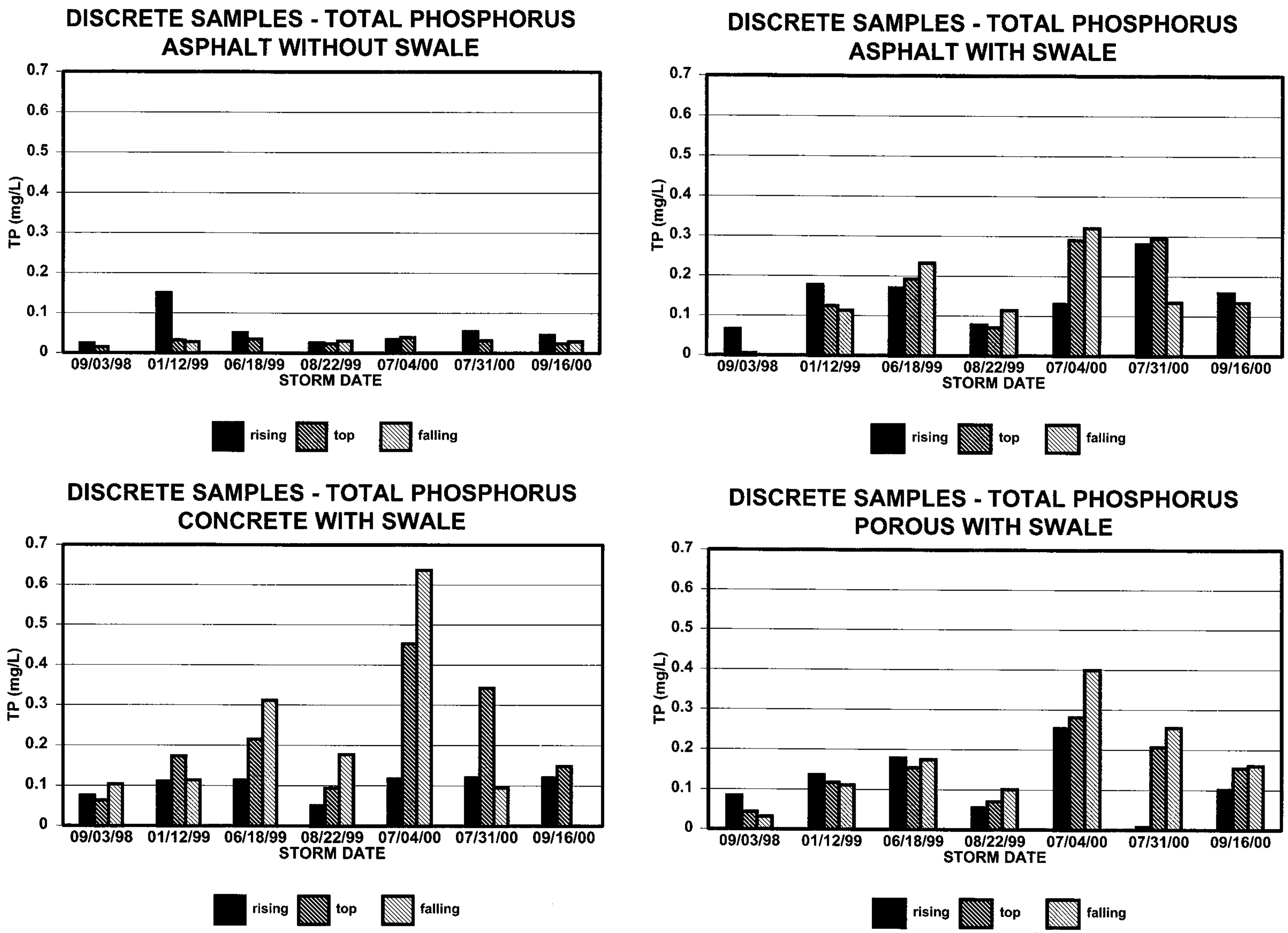


Figure 8f. Discrete samples taken over the hydrograph for total phosphorus does not show a first flush effect. In fact, it appears to increase during the last part of the storm.

Certain conditions enhance a first flush effect. Since the effect is the result of pollutants that have accumulated since the last storm and then are washed off by rainfall, the results are site specific. A direct correspondence between pollutant concentrations and start of the storm generally diminish as the size of the drainage basin increases and the percent impervious decreases **(Livingston 1988).** This is demonstrated in this parking lot study with the decreased effect in the basins with less impervious area. Also the first flush is strongest if the runoff flow time is short and that describes the characteristics of runoff from these small basins. Also the first flush is reduced when directly connected impervious areas are reduced and more vegetation intercepts stormwater runoff, a characteristic exhibited by the basins with swales.

Water Quality Loads - A more reliable measurement than pollutant concentrations for understanding the impact of stormwater on receiving waters is to evaluate pollutant loads. Pollutant loads include in the calculations, both the volume of water discharged and the concentration of pollution measured. The most effective method for reducing pollutant loads is to keep runoff on site and allow time for infiltration as well as for chemical, biological and hydrological processes to take place. This is the rationale behind the design for the Florida Aquarium parking lot and low impact development in general. Some background information about LID development is reviewed first (also see the introduction section) followed by the results of how these concepts reduced pollutant loads at the Florida Aquarium.

Bioretention practices are soil and plant-based stormwater management practices employed to reduce and filter runoff when land is being developed or runoff infrastructure retrofitted. Typically, bioretention depressions are integrated throughout a land development project and are strategically placed to intercept runoff near the source. Originally designed to provide an element of water quality control, recent studies have shown that attenuation can be achieved as well. Also known as rain gardens, bioretention systems function similar to infiltration/filtration practices with the added advantage of aesthetically pleasing landscaping in the form of a dense vegetative cover. Bioretention systems can be designed to mimic nature's hydrologic processes found in woodland areas which absorb and filter water through evapotranspiration and soil mechanisms. As discussed above, the Florida Aquarium parking lot was designed to measure the differences achieved using some of these concepts. Although the garden areas were not designed using bioretention criteria, they still proved effective, but would probably have been even better able to infiltrate storm water if they had included the restoring of soils and other elements of low impact criteria.

The positive effect of the low impact development design features is demonstrated with summary data in Figure 9a and 9b (the complete data set is in appendix J). Annual loads discharged from each basin type were calculated for each pollutant. Since more runoff was discharged from the basins without swales (F1, F2), they usually had much higher loads for all the constituents except phosphorus. See Table 5 for the amount of runoff discharged from each basin during the years of study and you will notice that the basins with larger garden areas (F7, F3, and F5) also have much lower runoff amounts. This demonstrates the value of providing recessed areas to allow opportunities for runoff to infiltrate in much the same manner as it did before development. These

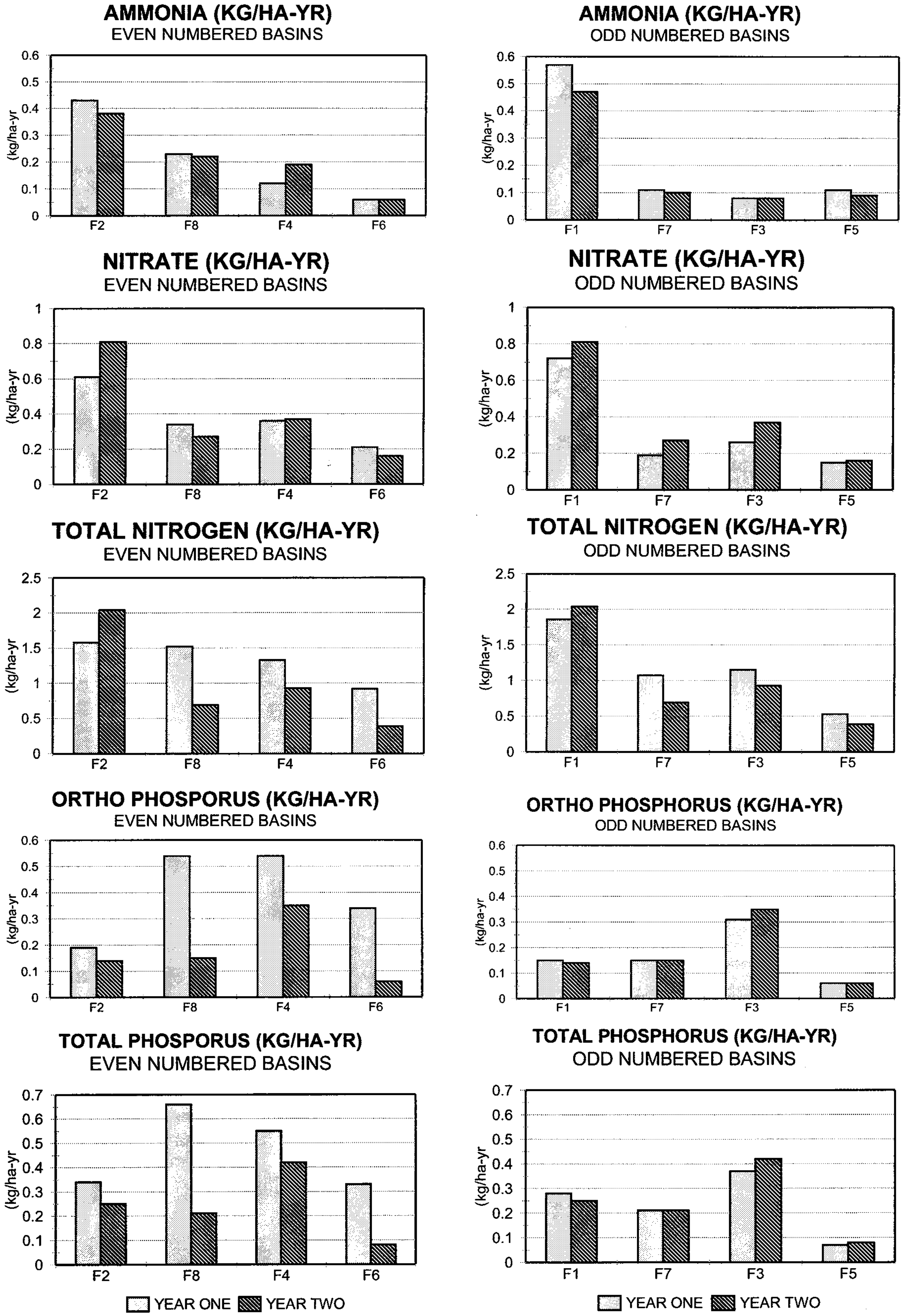


Figure 9a. Comparison of nutrient loads in each of the basins. For basins with swales, the odd numbered basins (F7, F3, F5) have larger garden areas, especially F7.

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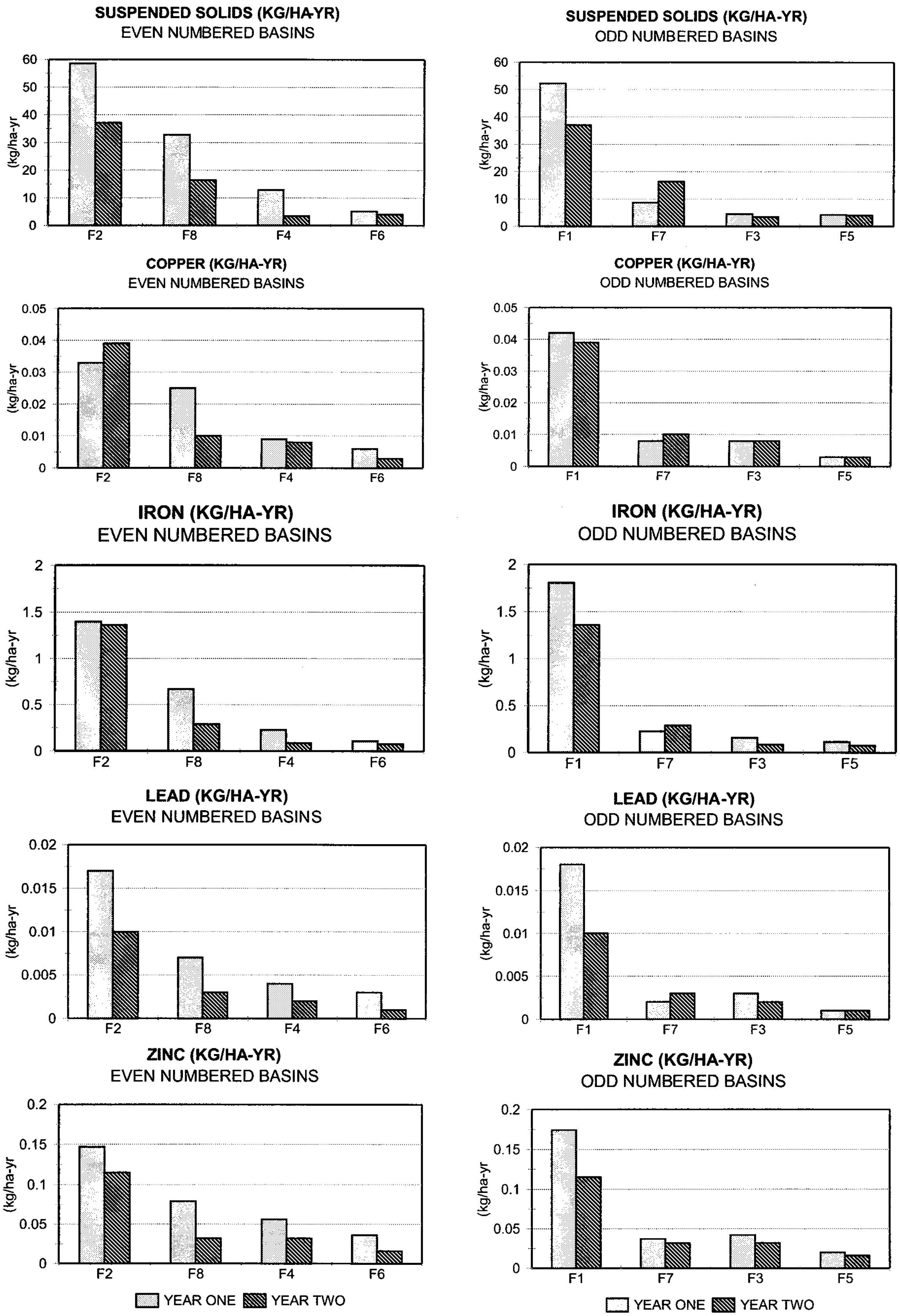

Figure 9b. Comparison of metals and suspended solids loads in each of the basins. For basins with swales, the odd numbered basins (F7, F3, F5) have larger garden areas, especially F7.

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garden areas also make more attractive parking lots with less pavement to act as heat sinks. Although it is important to reduce pollutant concentrations, it is an even better strategy to reduce runoff volume using low impact development concepts.

Other observations from a comparison of the load data in Figure 9 are the similarities of most constituents for both years (i.e. basin loads for each year are usually more like each other than like the other basins). For metal constituents and some nutrients, loads were greater for year one, as was expected, since year one had more rainfall (see Table 3). Also the higher median rainfall amounts listed in Table 3 indicate more large storms and, as shown in Figure 3, large storms are not as effective in reducing runoff amounts as smaller storms. The higher phosphorous loads in the even numbered basins were probably caused by much higher phosphorus concentrations (>2mg/L) measured in the vegetated basins in March 1999 and the somewhat higher concentrations that persisted into June 1999 (see Appendix G 6a). In almost all cases the larger garden areas in the odd numbered basins (F7, F3 and F5) reduced loads by a considerable amount in addition to the reduction of concentrations provided by the planted swales. The effect was more dramatic for metals than for nutrients, probably a result of vegetative die back, although larger garden areas appear to ameliorate this effect.

When the load data from the Florida Aquarium parking lot are compared to other low-intensity commercial developments, the pollution loads from runoff were usually less than data measured in other studies, even for the basin without a swale (Harper 1994). In addition to the low impact design features, other factors may have contributed to these low loads: 1) rainfall was much less than normal for the years of study, 2) this part of the parking lot is not used as much as other areas and is often empty, 3) all basins have recessed gardens and the average runoff coefficient, even for the basin without a swale, is much less than the average parking lot, and 4) the study included all storms that produced runoff, therefore, many small storms with low runoff coefficients were included in the medians and averages, while the comparison studies often used large events and extrapolated these values to the entire year. The parking lot is receiving much more use during the summer of 2001 and data are being collected to compare the summer and fall data for 1998, 1999, 2000 and 2001. These data are being analyzed and some appear in the addendum to this report.

Load Efficiencies - Load efficiencies were calculated to quantify how much pollutant loads can be reduced by infiltration with vegetated depressions (Table 7a and 7b). The low impact design produced impressive reduction for most constituents, especially in the basins with larger garden areas (Table 7b). Also basins paved with porous pavement had the best per cent removal, with most removal rates greater than 75%. Phosphorus is a notable exception to this pattern of increased efficiency in basins with swales. More phosphorus loads were discharged from basins with vegetated swales than from the basins with no swales. This might be expected since there is not much phosphorus in rainfall, asphalt or automobile residues, but there is phosphorus in vegetation and especially in soils. Also total nitrogen was not removed as well as other pollutants. As will be discussed later, larger garden areas tend to improve this result.

In general, efficiency was much better for the first year than for the second year. This is probably the result of more runoff during the first year (see Table 5), but perhaps, the storage capacity in the swales had been decreased by the second year caused by increased vegetative mass when the grass in the swales was replaced with shrubs. Reduced efficiency was most noticeable in the asphalt basin with a swale (F8). In contrast, efficiency of total nitrogen was usually improved during the second year especially in basins with larger garden areas Some of the low reduction in phosphorus loads may be attributed to landscaping practices since high concentrations, some greater than 1 mg/L, were sometimes measured in the basins with swales during the spring (see Appendix G - 6a & 6b).

Table 7a. Load efficiency (% reduction) of pollutants for the even numbered basins. The basins with swales (F4, F6, F8) were compared to the basin (F2) without a swale to determine the amount of reduction in pollutant loads that are possible using these small alterations.

Constituents	Asphalt with swale F8		Concrete with Swale F4		Porous w/swale F6	
	YEAR 1	YEAR 2	YEAR 1	YEAR 2	YEAR 1	YEAR 2
Ammonia	46%	42%	73%	49%	85%	75%
Nitrate	44%	21%	41%	22%	66%	60%
Total Nitrogen	4%	12%	16%	8%	42%	55%
*Ortho Phosphorus	-180%	-230%	-180%	-337%	-74%	-153%
*Total Phosphorus	-94%	-157%	-62%	-216%	3%	-77%
Suspended Solids	46%	-11%	78%	78%	91%	71%
Copper	23%	14%	72%	60%	81%	82%
Iron	52%	-16%	84%	83%	92%	87%
Lead	59%	28%	78%	75%	85%	83%
Manganese	40%	15%	68%	76%	92%	91%
Zinc	46%	15%	62%	50%	75%	41%

* Notice that some efficiencies are negative, indicating an increase in loads in the basins with a swale.

Additional infiltration capacity such as porous paving or larger garden areas (F5, F3, F7) improved efficiency, indicating both infiltration and more mature vegetation is improving total nitrogen efficiency (Table 7b). In no place was this more evident than the porous pavement with both a swale and larger garden area (F5). This basin reduced by over 80 percent almost all constituents except phosphorus. Eighty percent removal of pollutant loads, especially for TSS, is a state water quality goal.

Table 7b. Load efficiency (% reduction) of pollutants for the odd numbered basins. Basins with swales and larger garden areas (F7, F3, F5) were compared to the basin (F1) without a swale and garden area the same size as the even numbered basins to determine the amount of reduction in pollutant loads that are possible using these small alterations.

Constituents	Asphalt with swale F7		Concrete w/ Swale F3		Porous w/swale F5	
	YEAR 1	YEAR 2	YEAR 1	YEAR 2	YEAR 1	YEAR 2
Ammonia	80%	79%	86%	83%	80%	90%
Nitrate	73%	67%	64%	55%	79%	80%
Total Nitrogen	58%	66%	58%	54%	71%	81%
Ortho Phosphorus	-1%	-4%	-105%	-149%	-61%	55%
Total Phosphorus	-26%	16%	-32%	-69%	76%	66%
Suspended Solids	83%	56%	91%	91%	92%	89%
Copper	81%	75%	81%	79%	94%	94%
Iron	87%	79%	91%	94%	94%	94%
Lead	87%	73%	83%	85%	93%	94%
Manganese	83%	75%	90%	90%	93%	95%
Zinc	79%	72%	76%	72%	89%	86%

* Notice that some efficiencies are negative, indicating an increase in loads in the basins with a swale.

Sediment Samples

Soil samples were collected in the swales, the strand and the pond in 1998 and again in 2000. Samples were collected at two depths, the top 2.54 cm (1 inch) of sediments and in the deeper soils between 10.16 cm to 12.7cm (5 to 6 inches). For 1998, samples were also collected in the drop boxes that received runoff from the swales. For the basins without swales, the sediments that had accumulated in the asphalt depressions were analyzed and there were no deeper soils to sample. Metals and nutrients will be discussed first and then the priority pollutants will be analyzed (Figure 10a and 10b; also see Appendix K for the entire data set).

Metals - The heavy metals in stormwater that are of most environmental concern for contamination of groundwater are aluminum, arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel and zinc (Pitt *et al.* 1996). Of these, all except arsenic and mercury were analyzed for the site. Samples were collected in front of the outfall in each swale as well as sites in the strand and the wet detention pond (see Figure 1 for site locations). For metals (Figures 10a and 10b), fairly consistent results were seen for 1998, with concentrations of metals usually measured at higher concentrations in basins paved in asphalt (F1, F2, F7, F8) compared to basins paved with concrete (F3, F4) or porous paving (F7, F8). Aluminum, iron and copper concentrations measured in the strand and pond only occasionally showed concentrations as high or higher than the asphalt basins in the parking lot even though most of the 10 acre parking lot is paved in asphalt. An indication that the swales, strand and pond are effective for sequestering metals near the source.

When the metal concentrations in 1998 in the swales are compared to 2000, values are about the same or only marginally higher in 2000 when considering the inherent variability that is characteristic of soils. The possible exception of comparable concentrations is porous pavement (F5, F6) which almost always had higher concentrations in 2000. When the site in the strand in 1998 (S10) is compared to values in 2000, the year 2000 concentrations are usually significantly lower which can be explained by the berm repair. All of the soils in the strand were excavated during berm construction, so these data are the result of deeper, cleaner soils. When the Pond data are compared between years, the concentrations are much higher in 2000, probably the result of Ybor channel water pumped into the pond during the repair and the subsequent inflow of stormwater into the pond through the under drain. The higher concentrations of copper measured in the pond when compared to the other sites may have been caused by algicide treatment for nuisance plants in the pond or the higher salinity in the pond. The high concentration of lead in the strand in 2000 was probably an artifact of the berm construction.

One concern about using the process of sedimentation to remove pollutants is the fear that pollutants might contaminate ground water. But since metal concentrations were usually higher in the surface sediments compared to the deeper sediments (note that no deeper sediments were collected for F1 and F2) this does not appear to be a problem for metals at this site. Lower concentrations did not always hold true in 1998, but by the year 2000, all samples in the deeper soils were less than the surface soil. This indicates that metals washed into the swales and incorporated in the sediments were not migrating to the deeper sediments, at least during the two years of this study. The results for copper and zinc indicate no migration, while the results for aluminum, iron, lead and cadmium are not quite as clear cut.

Other researchers have also investigated the possibility of contamination of groundwater by treating stormwater using infiltration practices. The consensus is that the majority of metals, with the consistent exception of zinc, are mostly found associated with the particulate solids in stormwater and are thus relatively easy to remove through sedimentation (Pitt *et al.*1996). The author further explained that recharge basins receiving large metal loads usually successfully removed metals either in the basin sediments or in the vadose zone while dissolved metal ions such as zinc are removed

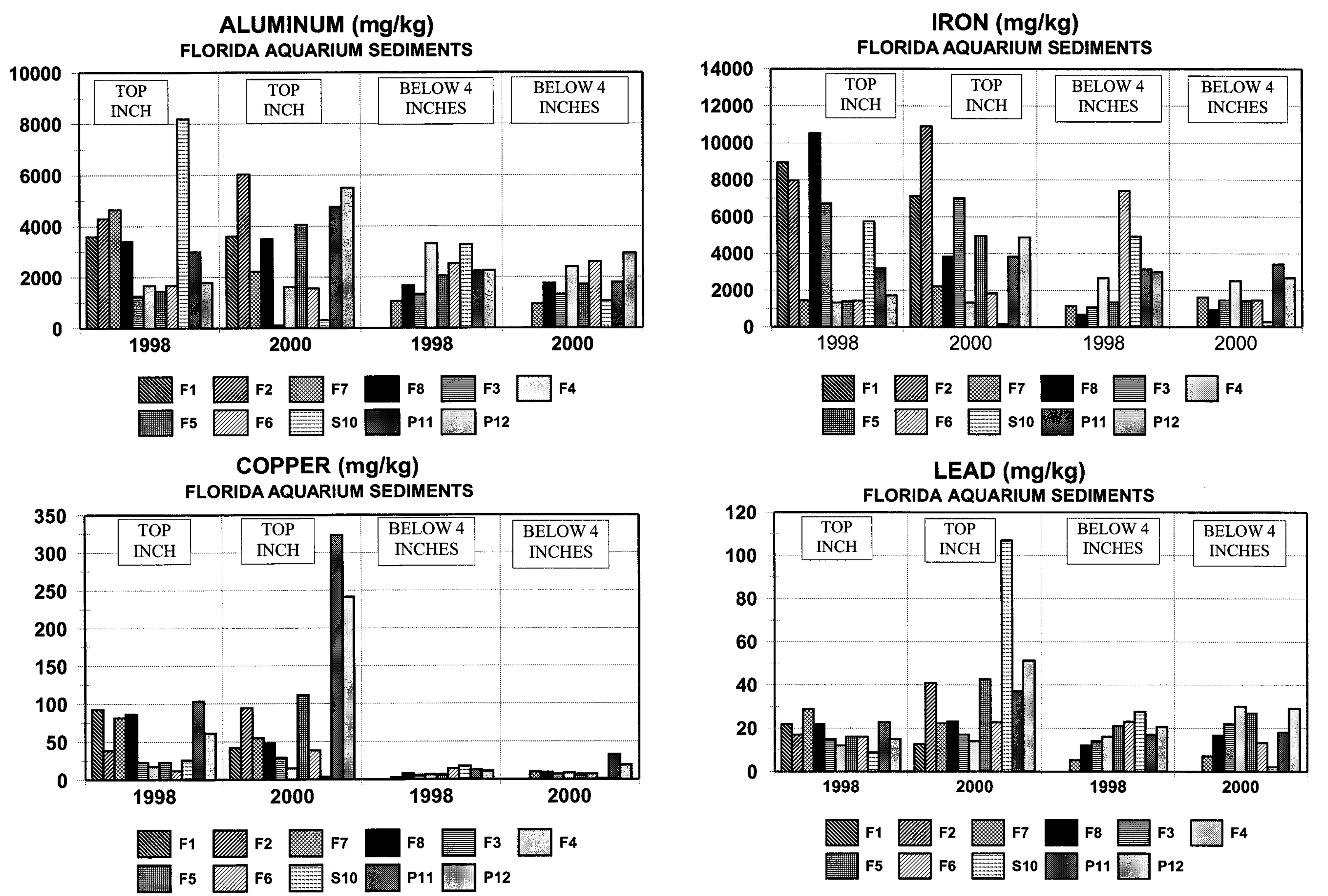

Figure 10a. Sediment samples collected in 1998 and again in 2000 at the outfall of each drainage basin as well as in the swale and in the pond. Surface samples were collected as well as samples 4 to 5 inches below the surface to compare to each other. (See Figure 1 for site locations)

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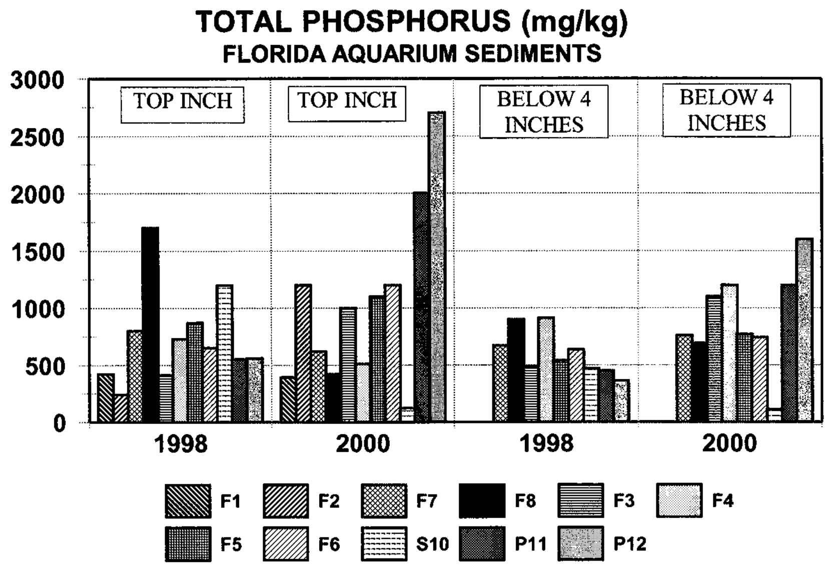

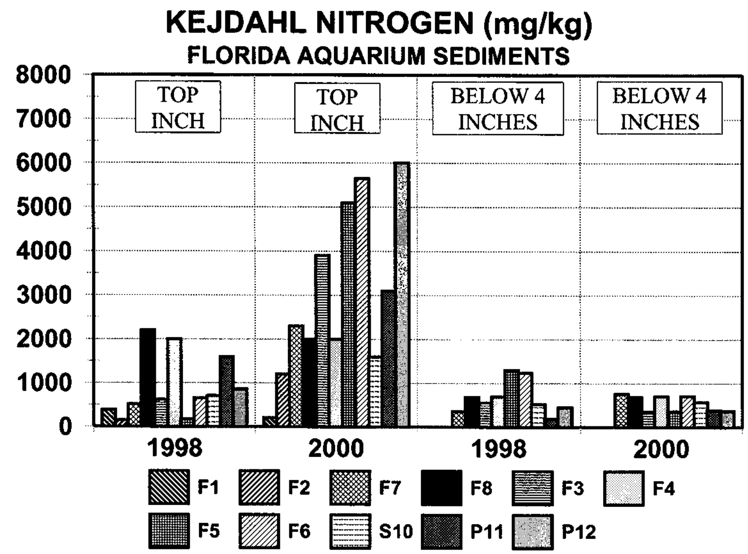

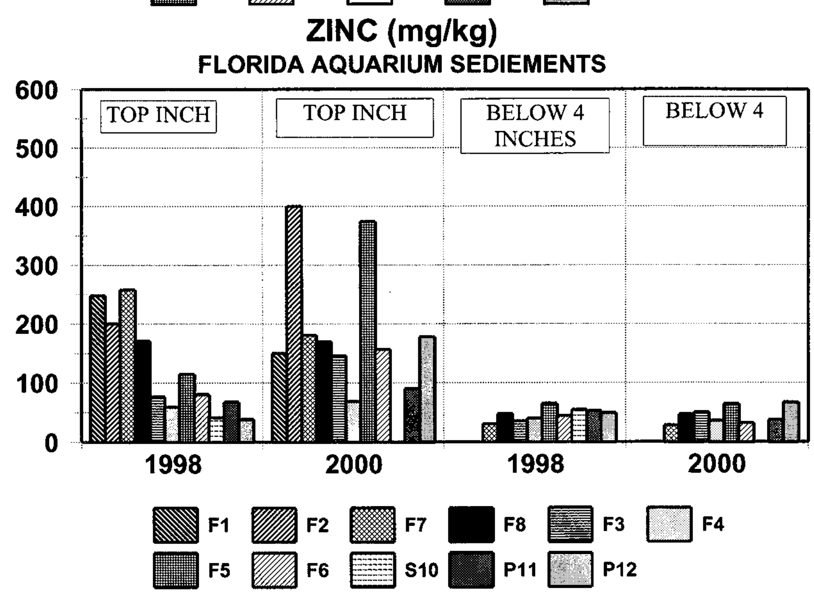

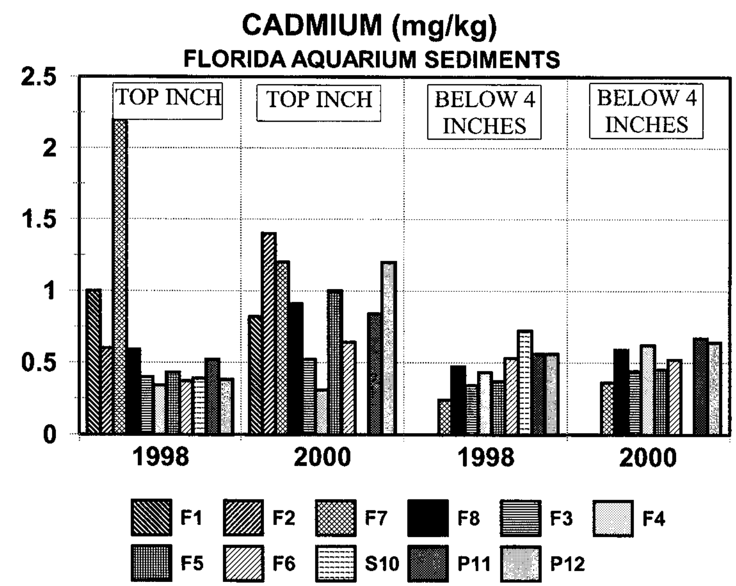

Figure 10b. Sediment samples collected in 1998 and again in 2000 at the outfall of each drainage basin as well as in the swale and in the pond. Surface samples were collected as well as samples 4 to 5 inches below the surface to compare to each other. (See Figure 1 for site locations)

during infiltration by adsorption on near-surface soil particles. These findings substantiate the results measured at the Florida Aquarium site. The Pitt (1996) report further explained that the use of percolation devices such as swales and ponds with substantial thickness of underlying soils above the groundwater are preferable to infiltration devices such as dry wells and french drains since surface devices take greater advantage of natural soil pollutant removal processes.

A major concern with stormwater runoff is that it will affect habitat values or will harm micro-organisms necessary to transform or rid the system of toxins. Although not strictly comparable, it is reassuring to note that concentrations in the sediments would not necessarily be toxic to marine biota. When metals measured in the sediments were compared to chemical toxicity guidelines developed for marine sediments by the Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA), none of the samples exceeded the level where toxicity to organisms is probable. However, concentrations of copper and zinc were above the level where toxicity is possible. The level below which sediment is unlikely to be toxic is 34 ug/g for copper and 150 ug/g for zinc (Long *et al.* 1995). Sediment contamination indicates swales may have to be cleaned out and depression storage renewed on a regular basis.

Nutrients - Total phosphorus and Kjeldahl nitrogen measured in the soils showed an increase in most basins from 1998 to 2000, especially for nitrogen (Figures 10 a and 10b). Usually nutrients are quite low for the basin without a swale which has no vegetation or deeper soils to cycle nutrients. Although roadway runoff can contain phosphorus from motor oil use or residue such as bird droppings (Schiffer 1989) and road residue can adsorb nitrogen in rainfall, only low levels of nitrogen and phosphorus were measured in the basins without a swale. Nitrogen, and to a certain extent phosphorus, increased in the swales from 1998 to 2000. The pond showed a considerable increase in phosphorus and nitrogen from 1998 to 2000. Total phosphorus in the deeper sediments also increased by 2000, but a corresponding increase in nitrogen in the deeper sediments was not usually seen.

Nitrogen is of particular concern since nitrogen-containing compounds in contact with soils have a potential for leaching into groundwater. Nitrate is highly soluble and will stay in solution after percolation through the root zone (Pitt et al.1996) and a nitrate increase has been measured in the Aquifer and springs of Florida according to SWFWMD's data collection program. In a study of highway runoff both nitrate nitrogen and phosphorus concentrations were highest in groundwater near swales and exfiltration pipes; and the Kjeldahl nitrogen was highest near ponds (Schiffer 1989). Although the results of the other studies cited measured groundwater, not sediments, they are relevant since the natural processes occurring in soils that attenuate organic constituents prior to reaching groundwater also have the potential for releasing inorganic nitrogen to the receiving groundwater (Schiffer 1989).

Polycyclic Aromatic hydrocarbons (PAHs) - The increasing dependence of today's society on technology derived from organic chemicals has led to widespread hydrocarbon pollution in stormwater runoff. Some of the many pathways available for PAHs to enter the environment are air pollution, exhausts from automobiles and trucks, and from asphalt paving material (ATSDR 2001). PAHs do not easily dissolve in water and those present in air as vapors and stuck to the surfaces of small solid particles settle to the bottoms of rivers or lakes. Breakdown in soil and water generally takes weeks to months and is caused primarily by the actions of microorganisms (ATSDR 2001).

Sediment samples were tested for more than 100 organic pollutants, but only those listed in Table 8 were detected at the site and only those found in the top 2.5 cm of soil are discussed here. The PAHs detected were the same ones that were found in a study of sediment toxicity in Tampa Bay (Long *et al.* 1994). In that study the most toxic sites found in the Tampa Bay area were in the vicinity of the Florida Aquarium. The high concentrations found in both the Long (1994) study cited above and this study indicate that most of the hydrocarbon pollutants may come from atmospheric deposition. Pitt and Barron (1990) also concluded that urban runoff PAHs were probably associated more with atmospheric fallout processes and regional air pollutant emissions than with direct source area sheetflow. Also, increased PAH air pollution has been documented in emissions from incinerators (Yasuda and Takahashi 1998) and an incinerator is located adjacent to the site.

Although the soils sampled at the Florida Aquarium site, except for the pond, were not considered aquatic habitats, they were compared to aquatic standards to estimate if they might be detrimental to organisms that transform pollutant concentrations to non-toxic compounds such as carbon dioxide and water. When these results are compared to the toxic and non-toxic concentrations in amphipod tests conducted for marine sediments, most of the results are below the significantly toxic levels as identified by Long *et al.* (1995). The exception is the concentration for Benzo(b)fluoranthene where the concentrations were sometimes above the significantly toxic level of 2958 ug/kg. Other concentrations approached significantly toxic levels and these pollutants need careful study since they are harmful to man and animals. Gasoline pollution has been identified in the soils at the site (see Figure 2) and this may have contributed to the higher concentrations measured in 1998, but another site identified at F3, does not appear to be contaminated any more than the the rest of the surface soils. By 2000, no greater number of PAH detections were found at the locations identified in Figure 2 than at any of the other sites (Appendix K).

Concentrations Measured at Different Depths - The Polycyclic Aromatic Hydrocarbons (PAHs) are compared by percentages in Table 9. The highest percentage of detection was found at the deeper depths implicating previous hydrocarbon contamination at the site (see Figure 2). The least number of samples with hydrocarbon detection occurred in the surface soils in 2000. In 1998 more sites detected PAHs in the soils than in 2000 indicating that hydrocarbon pollution may be decreasing at the site. Although two years of data can hardly detect trends for these long lived pollutants, when the PAHs are compared by the percentage found at each depth, and for 1998 also in the drop boxes, more detections of hydrocarbons were measured in the soils than in the drop boxes. The most frequently measured hydrocarbon was fluoranthene and it was detected in at least 50 percent of the samples collected in each category. Chrysene and pyrene were also frequently detected, followed by the benzo-series (Table 9 and Appendix K). PAHs are a concern since they are suspected of causing cancer in humans, are bioaccumulative, do not break down easily in the environment, and are subject to long range air transport (US EPA 2001).

Table 8. The Polycyclic Aromatic Hydrocarbons (PAH'S) measured in the sediments. F1 through F8 represent basins in the parking lot and the other samples were collected in the strand and the pond. Data represent PAH's found in the top 2.5 cm (1 inch) of sediments and are reported in ug/kg.

POLYCYCLIC AROMATIC HYDROCARBONS		Asphalt no swale		Asphalt with swale		Concrete with swale		Porous with swale		Strand		Pond	
		F1	F2	F7	F8	F3	F4	F5	F6	S9	S10	P11	P12
Acenaphthene	yr 1	U	U	U	U	U	U	U	U	U	U	U	U
	yr 2	U	U	U	U	U	U	U	U	U	U	U	U
Anthracene	yr 1	U	U	U	U	U	U	U	U	U	U	U	U
	yr 2	U	U	U	U	U	det	U	U	U	U	U	U
Benzo(a)anthracene	yr 1	det	U	**290**	det	det	det	det	U	U	det	det	det
	yr 2	U	U	U	det	U	det	det	det	U	U	U	U
Benzo(a)pyrene	yr 1	det	det	**380**	det	det	det	U	U	U	det	det	det
	yr 2	U	det	U	U	det	det	det	det	U	U	U	U
Benzo(b)fluoranthene	yr 1	**2100**	det	**940**	det	U	det	det	det	det	**2300**	**3300**	det
	yr 2	**3900**	U	det	det	U	det	U	det	U	U	U	U
Benzo(k)fluoranthene	yr 1	**730**	U	**290**	det	U	det	U	U	U	det	det	U
	yr 2	U	det	U	U	U	det	det	det	U	U	U	U
Benzo(g,h,i)perylene	yr 1	U	det	det	det	U	U	U	U	U	det	U	U
	yr 2	U	U	U	U	U	det	det	U	U	U	U	U
Bis(2-ethylhexyl)phthalate	yr 1	U	U	U	U	U	U	U	U	U	U	U	U
	yr 2	U	U	U	U	U	U	U	U	U	U	U	U
Butyl benzyl phthalate	yr 1	U	U	det	U	U	U	U	U	U	U	U	U
	yr 2	U	U	U	U	U	U	U	U	U	U	U	U
Chrysene	yr 1	**1300**	det	**470**	det	U	det	U	U	U	**1400**	det	det
	yr 2	U	det	U	det	det	det	det	U	U	U	U	U
Di-n-octyl phthalate	yr 1	U	U	det	U	U	U	U	U	U	U	U	U
	yr 2	U	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	yr 1	**1900**	det	**640**	**1700**	U	**1700**	det	U	U	**2600**	**2800**	det
	yr 2	U	**3800**	U	1500	det	**1500**	U	U	U	det	U	U
Fluorene	yr 1	U	U	U	U	U	U	U	U	U	U	U	U
	yr 2	U	U	U	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	yr 1	U	U	det	det	U	U	U	U	U	det	det	U
	yr 2	U	det	U	U	U	U	U	U	U	U	U	U
Phenanthrene	yr 1	det	det	**310**	det	det	det	U	det	U	det	det	det
	yr 2	U	det	U	U	U	**1300**	det	det	U	U	U	U
Pyrene	yr 1	**1900**	det	**670**	det	det	**1300**	det	det	U	**2400**	**2100**	det
	yr 2	U	det	**790**	**1100**	det	**1400**	det	det	U	U	U	U

Abbreviations include: U=sediment was analyzed for but not detected, det=constituent was detected but was less than the minimum quantification limit.

Table 9. Percentage of samples that detected pollutants in each of the soil strata for each of the eleven sampling sites. See figure 1 for sampling locations. Soils were sampled for the top 2.54 cm (1 inch), the deeper strata 10.16 cm (4 inches) below the surface and for 1998 in the drop boxes at the swale sites.

PAH SEMI-VOLATILE ORGANIC		1998 TOP	1998 DEEP	1998 BOX	2000 TOP	2000 DEEP
Acenaphthene	ug/kg	0	20	25	0	17
Acenaphthylene	ug/kg	0	0	0	0	17
Anthracene	ug/kg	0	17	25	0	17
Benzo(a)anthracene	ug/kg	67	70	38	40	70
Benzo(a)pyrene	ug/kg	75	70	38	33	60
Benzo(b)fluoranthene	ug/kg	42	70	25	17	70
Benzo(k)fluoranthene	ug/kg	50	50	25	17	20
Benzo(g,h,i)perylene	ug/kg	17	30	13	17	20
Bis(2-ethylhexyl)phthalate	ug/kg	8	0	0	0	10
Butyl benzyl phthalate	ug/kg	0	0	50	0	10
Chrysene	ug/kg	67	70	38	50	70
Di-n-octyl phthalate	ug/kg	8	0	0	0	10
Dibenzo(a,h)anthracene	ug/kg	0	0	0	0	10
Diethyl phthalate	ug/kg	0	0	0	0	10
Fluoranthene	ug/kg	75	100	63	50	80
Fluorene	ug/kg	17	0	13	0	10
Indeno(1,2,3-cd)pyrene	ug/kg	17	30	25	17	30
Phenanthrene	ug/kg	75	70	25	25	40
Pyrene	ug/kg	83	90	50	58	80
PESTICIDES						
Chlorpyrifos Ethyl	ug/kg	0	0	25	0	0
Diazanon	ug/kg	10	0	50	0	0
Parathion Methyl	ug/kg	0	10	0	0	10
Aldrin	ug/kg	8	0	0	0	10
Chlordane	ug/kg	75	40	63	25	10
DDD-p,p'	ug/kg	17	30	13	8	20
DDE-p,p'	ug/kg	83	60	50	66	30
DDT-p,p'	ug/kg	33	50	12	42	50
Dieldrin	ug/kg	0	20	63	0	8
Endosulfan Sulfate	ug/kg	0	0	8	42	10
Endrin Aldehyde	ug/kg	0	0	0	8	0
Methoxychlor	ug/kg	0	0	0	17	8
PCB-1248	ug/kg	8	0	13	0	0
PCB-1260	ug/kg	33	70	38	17	20

Pesticides & PCB's - At most sites pesticides and polychlorinated biphenyls (PCBs) were undetected but there were some exceptions (Table 9 and Appendix K). Chlordane was the pesticide most often detected in measurable quantities and it was found at all locations but three. Unlike the

PAH data where concentrations in the boxes were low, the drop boxes measured the highest percent detection of pesticides. These concentrations must be from past land uses since most persistent pesticides have been banned or restricted. Chlordane was used in the United States from 1948 to 1978 as a pesticide and fumigating agent. In 1978, EPA canceled its use on food crops and phased out other above ground use except to control termites. In 1988, all approved uses of chlordane in the United States were terminated (US EPA 2001). In soil, chlordane attaches strongly to particles in the upper layers of soil and is unlikely to enter into groundwater (ATSDR 2001). It is not known whether chlordane breaks down in most soils, but if it does it must be slow since it has remained in some soils for over 20 years (ATSDR 2001). One pathway out of the system is by evaporation to the atmosphere where evaporation is more rapid from light, sandy soils than from heavy soils and may evaporate in 2 or 3 days. It is not known whether much breakdown occurs in water or in sediments (ATSDR 2001). Chlordane followed these patterns at the Florida Aquarium site where it had a greater percent detection in 1998 than in 2000 amd chlordane was detected more often in the surface sediments than the deeper sediments.

Dichlorodiphenyltrichloroethane (DDT) and its daughter products were measured at almost all locations and DDE was found in measurable quantities, but the quantities were in the non-toxic to amphipod survival range for marine environments. In 1972, EPA banned all uses of DDT, except in cases of public health emergencies, because amounts were building up in the environment and possibly hurting wildlife (ATSDR 2001). Once in the environment, DDT in soil lasts for a long time. Although some studies show that half the DDT in soil breaks down within 2 years, other researches report that it takes more than 15 years (ATSDR 2001). DDT in soil usually breaks down to form DDE or DDD. In surface water it either evaporates into the air or the sun and microorganisms break down the DDT left in the water (ATSDR 2001). At the Florida Aquarium, DDT and DDD were more often measured in the deeper soil profile and DDE in the surface soils.

Polychlorinated biphenyl (PCB-1260) was frequently detected in the soils and it was more often detected in the deeper sediments than in the surface soils. PCBs are synthetic organic chemicals comprising 209 individual chlorinated biphenyl compounds (known as congeners) (ATSDR 2001). Although PCBs are banned or tightly restricted in almost all industrial and commercial uses because of their persistence and high toxicity, they still reside in sediments, hazardous waste sites, and other areas as a result of past use and disposal practices. PCBs were used in the production of dielectric fluids for transformers and capacitors because of their unique properties, such as low conductivity, high boiling point, chemical stability and flame retardant properties. The most significant health consequence is associated with consumption of large amounts of fish in PCB contaminated waters.

Particle Size Analysis - Soil particles are composed of widely varying sizes and shapes which influence their sedimentation rate. The size of sediment particles also affects the removal of pollutants in stormwater runoff by sedimentation. Usually the smaller the particle size, the greater the attachment of metal ions to the soil particle and the longer it takes for it to settle out of suspension in the water column.

Table 10. Percent particle size and percent organic matter for sediment sampling sites. Sediments were well mixed samples that included the entire top 14 cm (5.5 in) of soil. In 2000, F6D was a duplicate sample and no samples were taken in the strand and pond.

1998

Sediment Particle Size	asphalt no swale		asphalt with swale		concrete with swale		porous with swale		strand		pond	
	F1	F2	F7	F8	F3	F4	F5	F6	S9	S10	P11	P12
>2.0 mm	2	16	13	3	11	10	21	3	4	2	20	2
0.5 - 2.0 mm	7	28	16	5	8	11	9	8	5	7	11	12
0.25 - 0.5 mm	22	17	13	12	13	15	11	15	23	22	16	16
0.125 - 0.25 mm	32	27	43	61	40	43	38	46	39	32	40	51
0.063 - 0.125 mm	14	7	10	14	11	12	11	21	10	14	8	13
< 0.063 mm	24	5	5	5	17	10	9	8	19	24	5	5
% ORGANIC	8.4	5.5	2.5	8.4	5.8	5.8	5.5	4.4	3.2	6.2	2.9	1.6

2000

Sediment Particle Size	asphalt no swale		asphalt with swale		cement with swale			porous with swale	
	F1	F2	F3	F4	F5	F6	F6 D	F7	F8
>2.0 mm	15	17	14	21	22	31	20	25	11
0.5 - 2.0 mm	50	50	26	21	30	21	17	26	32
0.25 - 0.5 mm	25	16	28	17	17	19	19	20	19
0.125 - 0.25 mm	17	13	31	31	25	30	30	32	28
0.063 - 0.125 mm	4	8	11	13	10	13	15	10	11
< 0.063 mm	4	12	14	19	18	17	20	12	11
% ORGANIC	2.6	7.7	4.1	3.9	6.5	7.3	7.1	5.9	4.5

NOTES:

Units = % dry weight

For all sites sampledat the Florida Aquarium in 1998, the highest percentage (27 to 61 percent) of sediment was measured in an intermediate size range (0.125 to 0.25 mm) described as medium sand

(Table 10 and Appendix L). Although this intermediate size range also characterized a large percentage of the sites in 2000, most of the particles were measured in the largest size ranges from 0.25 to greater than 2 millimeters. Most sites exhibited a similar pattern for particle size and there were no obvious differences between paving types or the pond and the strand. Both years had the least percentage of particles in the two smallest size ranges.

Percent Organic Matter - Organic matter improves soil structure and provides conditions conducive to healthy soil microbes. These microbes are important for transformation and degradation processes that remove pollutants. Also, the behavior of metals in aquatic ecosystems is connected to the role of organic matter in processes such as sorption and/or chelation/complexation of metals. Complexation is the single most important abiotic factor in reducing metal toxicity (Guilizzoni 1991). Once the metals are bound with organic and inorganic compounds they can settle rapidly and become incorporated in the sediments removing them from the water column and possible transport out of the system. Microorganisms further eliminate pollutants by tranformation processes. For suitable soil structure a minimum of 2 to 4 percent organic matter is desirable in even the sandiest soils (Pritchett 1979). This percentage is available in the soils in the Florida Aquarium stormwater system (Table 10 and Appendix K).

Statistical Analysis (SAS v 8.1)

Statistical analyses were performed for the entire data set (59 storms) to further verify some of our conclusions. A few storms with questionable data were removed from this data set, otherwise all storms for the two years and four months of data collection are included and the data are the same as discussed in the previous sections. Summary statistics, tests for normality, significant differences between years, significant differences between basins and some correlation analysis are all part of this section.

Tests for Normality - A summary of all the data with descriptive statistics is shown in Table 11 and all the data are printed out in Appendix M-1. The summary data are identified by their abbreviation and also with a descriptive name. The basin number or rain gives the sample location or type (see Figure 1). Hydrology data include the amount of rainfall for each event, the inter-event dry period, the storm duration and the maximum intensity for a one hour period for each storm. The remaining parameters describe the water quality data from each basin and also in rainfall. N represents the number of observations used in the computation and NMISS is the number of observations with missing values. The basins with swales and larger garden areas have fewer data points since they had less runoff. MIN represents the lowest value for the data while MAX is the maximum value. This information is useful for detecting outliers. The Coefficient of Variation (CV) is the standard deviation divided by the mean and in SAS is multiplied by 100 and presented as a percentage. The CV is a useful measure for evaluating results from data collected by different experimenters, but to know if a particular CV is unusually large or small requires experience with similar data (Steel and Torrie 1960). Water quality in the stormwater samples we collect usually vacillates in a fairly wide range around 1.0 when presented as a ratio or around 100 when given as

Table 11. Summary statistics for the hydrology and water quality data used for statistical analysis.

Vari-able	Parameter Identity	Basin	Units	N	N Miss	Mean	Std Error	Min	Max	Coeff of Variation	Skew-ness	Kurtosis
RA1	Rain Amount	rain	inches	59	6	1.172	0.079	0.370	2.910	51.7	0.950	0.553
ANTE	Inter-event dry	rain	hour	57	8	146.123	24.153	3.750	921.250	124.8	2.556	7.390
DURA	Duration	rain	hour	57	8	4.535	0.570	0.750	20.500	94.9	1.936	3.945
MAXI	Max Intensity	rain	in/hr	57	8	0.696	0.060	0.100	1.990	65.4	0.934	0.323
FF1	Flow	1	cu ft	59	6	698.416	64.131	131.000	2183.000	70.5	1.172	0.789
FF2	Flow	2	cu ft	59	6	599.391	52.443	97.000	1872.000	67.2	1.123	0.683
FF3	Flow	3	cu ft	59	6	274.838	47.073	0.000	1611.000	131.6	1.888	3.512
FF4	Flow	4	cu ft	59	6	418.249	53.479	0.525	2006.000	98.2	1.640	3.146
FF5	Flow	5	cu ft	59	6	136.920	29.947	0.000	1119.000	168.0	2.778	8.730
FF6	Flow	6	cu ft	59	6	267.668	47.407	0.000	2015.000	136.0	2.602	9.066
FF7	Flow	7	cu ft	59	6	220.572	34.818	0.000	1251.000	121.2	1.823	3.547
FF8	Flow	8	cu ft	59	6	428.697	52.251	15.000	2053.000	93.6	1.678	3.649
SS1	Susp. Solids	1	mg/L	48	17	10.590	1.230	1.920	42.467	80.5	2.071	4.477
SS2	Susp. Solids	2	mg/L	48	17	11.476	1.682	1.090	60.619	101.5	2.423	6.786
SS3	Susp. Solids	3	mg/L	30	35	2.754	0.713	0.160	21.867	141.7	4.337	21.138
SS4	Susp. Solids	4	mg/L	39	26	4.571	0.893	1.270	29.510	122.0	3.449	12.689
SS5	Susp. Solids	5	mg/L	21	44	7.212	1.957	1.380	41.613	124.3	3.129	11.289
SS6	Susp. Solids	6	mg/L	34	31	5.530	0.741	0.507	15.310	78.1	0.799	-0.591
SS7	Susp. Solids	7	mg/L	27	38	16.415	5.026	0.000	121.076	159.1	3.106	10.278
SS8	Susp. Solids	8	mg/L	40	25	16.021	2.255	2.710	77.035	89.0	2.435	7.703
NHR	Ammonia	rain	mg/L	56	9	0.140	0.018	0.005	0.761	94.3	2.341	8.208
NH1	Ammonia	1	mg/L	56	9	0.114	0.014	0.005	0.506	94.5	1.602	3.340
NH2	Ammonia	2	mg/L	55	10	0.111	0.015	0.005	0.567	102.4	1.982	4.923
NH3	Ammonia	3	mg/L	35	30	0.058	0.018	0.005	0.577	184.4	3.719	16.195
NH4	Ammonia	4	mg/L	52	13	0.069	0.010	0.005	0.293	109.0	1.462	1.227
NH5	Ammonia	5	mg/L	29	36	0.083	0.013	0.005	0.291	83.5	1.556	2.200
NH6	Ammonia	6	mg/L	39	26	0.049	0.011	0.005	0.345	136.3	3.036	10.567
NH7	Ammonia	7	mg/L	33	32	0.104	0.021	0.005	0.482	117.1	1.922	3.266
NH8	Ammonia	8	mg/L	47	18	0.112	0.017	0.005	0.475	101.9	1.739	2.575
NOR	Nitrate	rain	mg/L	55	10	0.235	0.034	0.005	1.530	106.2	2.917	12.627
NO1	Nitrate	1	mg/L	55	10	0.212	0.023	0.005	0.742	81.9	1.166	0.926
NO2	Nitrate	2	mg/L	55	10	0.242	0.035	0.005	1.650	106.6	3.298	15.907
NO3	Nitrate	3	mg/L	35	30	0.237	0.044	0.005	1.310	109.4	2.612	8.319
NO4	Nitrate	4	mg/L	51	14	0.253	0.031	0.005	1.270	88.2	2.247	7.955
NO5	Nitrate	5	mg/L	29	36	0.253	0.052	0.005	1.520	110.5	3.550	15.600
NO6	Nitrate	6	mg/L	38	27	0.221	0.036	0.005	1.094	99.3	2.265	6.270
NO7	Nitrate	7	mg/L	33	32	0.230	0.041	0.005	1.080	103.5	2.051	4.630
NO8	Nitrate	8	mg/L	47	18	0.264	0.051	0.005	2.200	131.8	4.118	21.258
TNR	Total N	rain	mg/L	54	11	0.467	0.056	0.000	2.200	88.2	2.253	6.946
TN1	Total N	1	mg/L	54	11	0.482	0.048	0.030	1.600	73.8	1.147	1.161
TN2	Total N	2	mg/L	54	11	0.511	0.060	0.025	2.100	85.7	1.789	3.551
TN3	Total N	3	mg/L	34	31	0.629	0.098	0.070	2.500	91.1	1.899	3.291
TN4	Total N	4	mg/L	51	14	0.684	0.066	0.055	2.000	68.7	1.369	1.547
TN5	Total N	5	mg/L	28	37	0.654	0.083	0.060	1.800	67.0	1.348	1.745
TN6	Total N	6	mg/L	37	28	0.639	0.078	0.080	2.400	74.4	2.093	5.359
TN7	Total N	7	mg/L	32	33	0.669	0.095	0.080	2.400	80.1	1.721	2.925
TN8	Total N	8	mg/L	44	21	0.737	0.090	0.110	2.500	81.1	1.650	2.251
OPR	Ortho-P	rain	mg/L	56	9	0.019	0.005	0.005	0.260	208.1	5.015	27.348
OP1	Ortho-P	1	mg/L	55	10	0.043	0.012	0.005	0.690	210.3	6.870	49.254
OP2	Ortho-P	2	mg/L	55	10	0.047	0.010	0.005	0.401	153.4	3.725	14.894
OP3	Ortho-P	3	mg/L	35	30	0.184	0.019	0.037	0.603	61.0	1.898	5.005

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Table 11. Summary statistics for the hydrology and water quality data used for statistical analysis.

Vari-able	Parameter Identity	Basin	Units	N	N Miss	Mean	Std Error	Min	Max	Coeff of Variation	Skew-ness	Kurtosis
OP4	Ortho-P	4	mg/L	52	13	0.203	0.036	0.036	1.780	127.7	4.837	27.809
OP5	Ortho-P	5	mg/L	29	36	0.076	0.007	0.015	0.207	52.4	1.226	2.930
OP6	Ortho-P	6	mg/L	39	26	0.195	0.028	0.012	0.922	89.9	2.294	7.177
OP7	Ortho-P	7	mg/L	33	32	0.108	0.009	0.034	0.263	49.7	1.157	1.834
OP8	Ortho-P	8	mg/L	46	19	0.192	0.042	0.023	1.900	149.4	4.998	28.994
TPR	Total Phos	rain	mg/L	56	9	0.024	0.003	0.005	0.123	95.9	2.140	6.012
TP1	Total Phos	1	mg/L	55	10	0.081	0.017	0.010	0.972	160.1	6.295	43.425
TP2	Total Phos	2	mg/L	54	11	0.082	0.014	0.008	0.513	121.4	3.036	9.730
TP3	Total Phos	3	mg/L	35	30	0.221	0.021	0.050	0.652	57.1	1.676	3.247
TP4	Total Phos	4	mg/L	52	13	0.253	0.045	0.058	2.190	127.0	4.784	26.729
TP5	Total Phos	5	mg/L	29	36	0.110	0.012	0.023	0.286	58.8	1.355	1.721
TP6	Total Phos	6	mg/L	39	26	0.237	0.035	0.035	1.270	93.0	3.077	12.477
TP7	Total Phos	7	mg/L	33	32	0.157	0.013	0.046	0.394	48.1	1.306	2.689
TP8	Total Phos	8	mg/L	47	18	0.267	0.051	0.040	2.330	130.3	4.811	27.583
CUR	Copper	rain	ug/L	56	9	5.127	0.778	0.150	32.700	113.5	2.477	8.426
CU1	Copper	1	ug/L	55	10	9.745	0.945	0.150	42.600	72.0	2.531	9.063
CU2	Copper	2	ug/L	55	10	9.929	1.103	1.750	42.700	82.4	2.011	4.877
CU3	Copper	3	ug/L	35	30	4.794	0.556	0.900	15.100	68.6	1.733	3.575
CU4	Copper	4	ug/L	51	14	4.892	0.414	0.150	16.100	60.4	1.413	3.594
CU5	Copper	5	ug/L	30	35	4.578	0.725	0.150	18.700	86.7	2.099	5.242
CU6	Copper	6	ug/L	39	26	4.083	0.391	0.150	14.200	59.8	2.010	7.040
CU7	Copper	7	ug/L	33	32	8.505	1.130	0.150	26.700	76.3	1.328	1.455
CU8	Copper	8	ug/L	47	18	12.701	1.582	0.151	46.851	85.4	1.659	2.334
FER	Iron	rain	ug/L	56	9	90.268	10.552	12.500	380.000	87.5	1.989	4.512
FE1	Iron	1	ug/L	55	10	368.545	42.694	60.000	1920.000	85.9	2.706	10.078
FE2	Iron	2	ug/L	55	10	328.929	38.975	50.000	1390.000	87.9	1.817	3.277
FE3	Iron	3	ug/L	35	30	67.000	11.735	12.500	370.000	103.6	2.695	10.037
FE4	Iron	4	ug/L	52	13	85.400	9.487	3.500	280.000	80.1	1.344	1.400
FE5	Iron	5	ug/L	31	34	116.290	21.747	12.500	550.000	104.1	2.396	6.089
FE6	Iron	6	ug/L	39	26	87.731	12.710	3.800	350.000	90.5	1.565	2.654
FE7	Iron	7	ug/L	33	32	242.409	39.742	9.500	980.000	94.2	1.603	2.338
FE8	Iron	8	ug/L	47	18	431.667	60.398	15.200	1800.000	95.9	1.930	3.461
PBR	Lead	rain	ug/L	57	8	1.245	0.114	0.750	5.200	69.3	2.995	10.171
PB1	Lead	1	ug/L	55	10	3.225	0.394	0.750	14.200	90.6	1.982	3.823
PB2	Lead	2	ug/L	55	10	3.433	0.426	0.750	12.300	92.1	1.414	1.027
PB3	Lead	3	ug/L	35	30	1.117	0.109	0.750	3.400	57.5	2.408	5.384
PB4	Lead	4	ug/L	52	13	1.142	0.091	0.743	3.200	57.2	2.074	3.448
PB5	Lead	5	ug/L	30	35	1.086	0.139	0.230	4.600	70.3	3.647	15.950
PB6	Lead	6	ug/L	39	26	1.297	0.126	0.743	4.000	60.5	1.957	3.330
PB7	Lead	7	ug/L	33	32	2.421	0.371	0.750	8.600	88.0	1.463	1.331
PB8	Lead	8	ug/L	47	18	3.420	0.423	0.750	13.300	84.7	1.978	4.361
ZNR	Zinc	rain	ug/L	56	9	28.839	4.149	7.500	180.000	107.7	2.941	10.479
ZN1	Zinc	1	ug/L	54	11	36.296	3.955	7.500	130.000	80.1	1.661	2.709
ZN2	Zinc	2	ug/L	55	10	35.009	3.573	7.500	130.000	75.7	1.725	3.164
ZN3	Zinc	3	ug/L	34	31	18.382	2.055	7.500	60.000	65.2	2.016	4.448
ZN4	Zinc	4	ug/L	51	14	20.804	1.588	7.500	70.000	54.5	2.284	7.134
ZN5	Zinc	5	ug/L	29	36	19.397	2.465	7.500	60.000	68.4	1.870	3.268
ZN6	Zinc	6	ug/L	38	27	22.122	4.381	7.500	173.540	122.1	5.036	28.234
ZN7	Zinc	7	ug/L	34	31	30.956	3.532	7.500	100.000	66.5	1.647	2.757
ZN8	Zinc	8	ug/L	46	19	40.064	4.532	11.806	140.000	76.7	1.676	2.540

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a percentage. Skewness and Kurtosis indicate whether the data are from a normal (bell-shaped distribution). For a normal distribution, the skewness is zero, and also, as calculted in SAS, the kurtosis for a normal distribution is zero (Schlotzhauer and Littell 1997). Since the distribution of the data is important in selecting the correct statistical test and both the skewness and the kurtosis values indicated the data were not from a normal distribution, more information was necessary before doing any hypothesis testing.

The Univariate procedure provides a wealth of data for analyzing the pattern of data including whether it is normally distributed. Some of the measures for normality (Schlotzhauer and Littell 1997) are analyzed as follows: 1) The mean, mode, and median should be nearly equal. For our data the mean and the median were sometimes nearly equal but the mode rarely was. 2) The shape of the graph should be symmetric and smooth instead of skewed. The stem-leaf diagram and the box plot showed our data was usually strongly right skewed 3) Kurtosis should be near zero; instead the large values typical of our data describe a heavy tail. The procedure also has several formal tests for normality and the Shapiro-Wilk or W statistic is appropriate for our data. A W value very close to 0 indicates the data are not a sample from a normal distribution. The results from the W statistic showed that 91 percent of the p-values (Pr<W) were <0.0001, therefore, it was further concluded that nonparametric statistics would have to be used for any hypothesis testing. The largest Pr<W value was 0.026 and was measured for ortho phosphorus in basin 5, but this value is still near zero.

The extreme observation section in the Univariate procedure is a useful tool for locating erroneous values. It gives the 5 maximum and 5 minimum values for each variable. Most of the extreme values in our data set were checked and were either corrected or found to be reasonable when compared to values reported by the laboratory or analyzed with regressions. Most of the highest values occurred in four storm events (5/21/99, 6/13/00, 9/24/00, 11/25/00) which are identified as obs 18, 45, 58, and 59 (see Appendix M-1). These storms all had over an inch of rainfall and at least three occurred after a long dry period. But other storms with equally as much rain and dry periods did not have extreme values.

Differences Between Years - Since most of the data previously discussed in this report have been divided into yearly data, we wanted to test if there were any significant differences between years. Also of interest was the idea that constituent concentrations might increase as the system aged. Both the Duncan Multiple Range test and the Kruskal-Wallis test were run to help determine statistical differences (Appendix M-2). Although there was a general tendency for concentrations to increase during the second year, the majority of constituents revealed no differences between years. None of the hydrology parameters were significantly different and only 13 percent of the 90 water quality samples were measured significantly higher in the second year ($p > 0.05$ Kruskal-Wallis chi-square). No differences between years were noted in basins 1 and 2, the basins without a planted swale. But some interesting differences were noted in the other basins. Phosphorus is not usually detected in rainfall, but in this case a significant increase occurred in year two. The median concentrations rose from a barely detectable level (0.008 mg/L) in year one to 0.023 mg/L in year two. Total phosphorus was also increased significantly in basins 3, 4, 5 and 6 for year two. All of these basins have planted swales and were paved in concrete products. It should be noted, phosphorus is a constituent of concrete paving materials. The combination of increased atmospheric input, vegetation and the concrete source may have contributed to this increase. Iron and zinc were significantly higher in the second year in basin 8 (paved in asphalt) and suspended solids were higher in basins 4 and 7. Since there were few differences between years and data analysis is more reliable with a larger data set, all 59 of the storms sampled were combined for testing differences between basins.

Differences Between Basins - The basins exhibited at least one significant difference for all parameters except nitrate (Table 12). Some of the patterns can be explained by basin characteristics. For example, the basins paved in asphalt had significantly higher concentrations of metals and total suspended solids which may be increased by the paving material itself. Higher phosphorus concentrations were measured in basins with planted swales, probably a result of the vegetation and soil particles as well as the increase in atmospheric ortho-phosphorus. Inorganic nitrogen is usually measured at relatively high levels in rainfall and some of these transformations may explain the differences measured in runoff from the various basins. Vegetation in the basins with swales may also explain some differences. To test this theory further, correlations were run to detect any connections.

Table 12. Significant differences between basins for water quality parameters. Only the even numbered basins were used for the analysis. Data from the Duncan Multiple Range Test and significant differences calculated by the Kruskal-Wallis test.

Parameter	Pr>Chi-Square	Asphalt wo/ swale	Asphalt with swale	Concrete with swale	Porous with swale
		F2	F8	F4	F6
Ammonia	0.0004	0.111 a	0.112 a	0.069 b	0.049 b
Nitrate	0.76 ns	0.264 a	0.263 a	0.242 a	0.221 a
Total Nitrogen	0.05	0.511 b	0.737 a	0.684 ab	0.639 ab
Ortho-Phosphorus	< 0.0001	0.047 b	0.192 a	0.203 a	0.195 a
Total Phosphorus	< 0.0001	0.082 b	0.267 a	0.253 a	0.237 a
Total Copper	< 0.0001	12.70 a	9.929 a	4.892 b	4.08 b
Total Iron	< 0.0001	431.67 a	328.93 a	85.40 b	87.73 b
Total Lead	< 0.0001	3.43 a	3.42 a	1.14 b	1.30 b
Total Zinc	< 0.0001	40.62 a	35.01 a	20.80 b	22.12 b
Total Susp. Solids	< 0.0001	16.02 a	11.48 a	4.70 b	5.53 b

Correlations - The small basin size and the short time of concentration contributed to close correlations between the nitrates measured in rainfall and the nitrate measured in runoff from each of the basins. The Spearman method was used to compute correlation coefficients (Table 13). The Spearman coefficient not only makes no assumption of a normal or linear distribution, but it also gives more reliable information if the data possess a distinct curvilinear relationship (Walpole and Myers 1972). This describes our data well. A major pathway for the nitrate and ammonia found in rainfall comes from the transformation of nitrogen oxides. Anthropogenic sources of nitrogen oxide contribute a large amount of nitrogen to the atmosphere. Florida has been listed as one of the largest oxide emitting states based on national rankings of total emissions. In Florida in 1989, from the total amount of nitrogen oxide discharged, vehicular traffic contributed 50 percent, utilities 35 percent and other industrial sources 5 to 10 percent (Rogers 1990).

The results of the correlations show the closest relationship with the asphalt basins without a swale, the next highest correlations were the basins with smaller garden areas (F4 is an exception) and the least relationship in the basins with larger garden areas. This demonstrated the effect of vegetation and also to some extent the porous pavement in transforming the nitrogen found in rainfall.

Table 13. Correlations between nitrates measured in rainfall and nitrates measured in runoff from the basins. Results listed in order of decreasing correlation coefficient. SM=small garden LG=large garden

	Site Description	N	Prob > r	Coefficient
F1	Asphalt without a swale (SM)	51	< 0.001	0.924
F2	Asphalt without a swale (SM)	52	< 0.001	0.908
F6	Porous with swale (SM)	35	< 0.001	0.855
F8	Asphalt with swale (SM)	43	< 0.001	0.821
F3	Concrete with swale (LG)	32	< 0.001	0.799
F7	Asphalt with swale (LG)	30	< 0.001	0.789
F4	Concrete with swale (SM)	47	< 0.001	0.700
F5	Porous with swale (LG)	27	0.004	0.632

This rainfall analysis emphasizes the need to reduce anthropogenic air pollution to help clean up nitrification of receiving waters. Nitrogen oxides are emitted into the atmosphere primarily through the combustion processes used in transportation, fossil fuel energy production and waste incineration. The results also point out the importance of vegetated areas in drainage basin to help utilize and transform nitrogen before it reaches surface waters. In the short term, these small garden areas may have increased nitrogen and phosphorus, but as the vegetation in the strand and with the processes in the pond these concentrations should be reduced. More studies need to be conducted to test this theory, but for this parking lot, it is unimportant since most of the runoff is retained on site.

Conclusions

The whole basin approach for the parking lot was an excellent design alternative. Changing regulations by making parking spaces 0.62 meters (2 feet) shorter provided land for the swales without reducing the number of parking spaces. It also did not compromise parking since the design has the front end of the car hanging over the swale rather than impermeable paving. Other sensible innovative strategies need to be implemented by incorporating every opportunity in the drainage basin for stormwater treatment. Although the garden areas and the strand occupied land that could have been used for parking spaces, this was offset by the smaller size needed for the pond.

Summary of Results

RAINFALL

- Rainfall was below normal for the region during both years, but a record drought occurred during year two (Table 3).

STORM RUNOFF

- On average, pervious paving with a swale (F6) reduced runoff by over 60% compared to asphalt paving with no swale (F2) (Table 4).

- Pervious paving with a swale (F6) reduced the average amount of runoff by 41% compared with the other basins with swales (F8, F4) (Table 4).

- Basins paved in asphalt (F8) or concrete (F4) and also having a planted swale produced about 38% less runoff than the asphalt basin with no planted swale (F2) (Table 4).

- The larger garden areas in the odd numbered basins with swales reduced runoff by an additional 50% when compared to the even numbered basins with swales (Table 4).

- Pervious paving with swales is most effective for small storms and does not reduce runoff as much during storms with high rainfall intensity and saturated soil conditions (Figure 3 and Appendix E).

WATER QUALITY - CONCENTRATIONS

- Inorganic nitrogen concentrations are highest in the parking lot and much reduced by the time runoff reaches the strand and pond (Figure 4).

- Ammonia and total suspended solids concentrations are significantly higher in basins paved with asphalt (Table 12).

- Organic nitrogen increases after runoff travels through a planted swale and and reaches the strand and the pond (Figure 4).

- Phosphorus concentrations are significantly higher in the basins with planted swales as well as in the strand and the pond (Figure 4 and Table 12).

- Metals have significantly higher concentrations in the basins paved in asphalt than in the basins paved with concrete products. Copper is an exception in the strand and pond (Figure 4 and Table 12).

- Nitrate and ammonia enter the system directly in rainfall with coefficients of determination (r^2) between 0.53 and 0.92 for nitrates. The lower correlations are for vegetated basins and especially for basins with larger garden areas (Figure 5 and Table 13).

- Regression analysis showed metals tend to vary together and also vary with total suspended solids. The relationship is strongest with iron (Figure 6 and Appendix H).

- Only a very few significant differences were detected in concentrations between years, but year two often had slightly higher levels than year one for nutrients (Figure 7 and Appendicies F-4 and M-2)

- Some metals and total suspended solids demonstrated a definite first flush effect in the asphalt basins, while the basins with planted swales exhibit no consistent pattern (Figure 8a-8f and Appendix I).

WATER QUALITY - LOADS

- Since more runoff was discharged from the basins without planted swales (F1, F2), they had much higher loads for all the pollutants except for phosphorus (Figure 9a-9b and Appendix J).

- Year one had better pollutant load reductions than year two and the basins with larger garden areas had the best load reductions, total nitrogen is sometimes an exception (Table 7a-7b and Appendix J).

- Phosphorus loads were actually increased when compared to basins without a planted swale (Table 7a-7b).

- Pervious pavement with swales and larger garden areas had the best load reduction; 80% to 95% for all pollutants except for phosphorus (Table 7).

- Storm runoff was only discharged from the site once during the year it was evaluated which indicates an almost 100% load efficiency for pollution reduction when the entire treatment train is considered (Table 6).

SEDIMENT SAMPLES

- Most metal pollutants are contained in the upper one inch of sediments and should present no problem as far as contaminating the water table (Figure 10a-10b and Appendix K).

- PAHs were detected in the sediments in all the basins, but concentrations were higher in basins paved with asphalt and in those basins some values approached toxic levels (Table 8, Table 9 and Appendix K).

- Pesticides were detected in the sediments in all the basins, especially DDT and its daughter products (Table 9 and Appendix L-3).

- Most sediment particle sizes were measured in the medium to large size ranges. All sites exhibited a similar patten for particle size with no obvious differences between paving types or the pond and the strand (Table 10 and Appendix L).

- For the basins in the parking lot, percent organic matter in the sediments ranged from a low of 1.6 to a high of 8.4 with an average of 5.8 in 1998 and 5.5 in 2000 (Table 10).

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ADDENDUM

COMPARISON OF FOUR YEARS OF WATER QUALITY DATA COLLECTED IN THE PARKING LOT FROM JULY TO DECEMBER 1998 to 2001

ADDITIONAL DATA COLLECTED FOR THE EVEN NUMBERED SWALES
JULY THROUGH DECEMBER - 1998 TO 2001

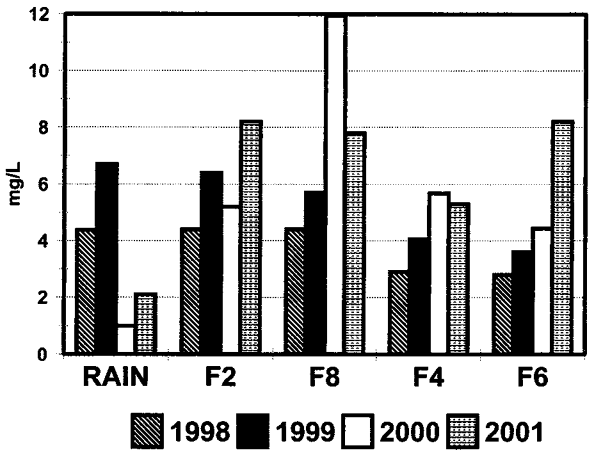
Data collection continued for the even numbered basins at the Florida Aquarium parking lot after the formal completion of the project. This provides four years of comparison data to try to better understand how well the swales would function with time. For the final year, 2001, much of the parking lot was under construction to make way for cruise ship terminals and a downtown trolley. This construction activity not only impacted the site directly, but also resulted in the parking lot becoming more heavily used. Comparison of stormwater concentrations for the four years not only provides some insight for the parking lot swales over time, but also, the impact of nearby construction activity on runoff concentrations. Year 2001 also represents the concentrations to be expected from a heavily used parking lot. The impacts seen in 2001 affected metal and suspended solids concentrations, but wet deposition is a better predictor for the concentrations for inorganic nitrogen (ammonia and nitrate).

In general, metal and total suspended solids median concentrations were increasing each year, but there was a big increase in 2001 with the construction activity and greater use as a parking lot. To rule out atmospheric deposition, the increase in concentrations was not noted in rainfall. Total phosphorus was also gradually increasing for the first three years except for the basin without a planted swale (F2), but the fourth year, 2001, shows a decrease in concentration. Also the concentrations measured in rainfall were decreasing for phosphorus over time and this probably explains the decrease in F2 until the final year. The inorganic nitrogen in the swales appears to track the nitrogen measured in rainfall and is most probably influenced by that source.

Hydrology and additional measurements for discrete samples were also collected, but the data have not been processed yet.

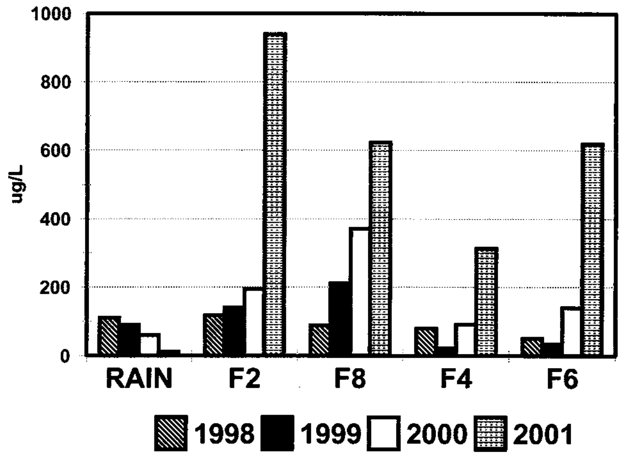
COMPARISON BETWEEN YEARS

MEDIANS - RECOVERABLE COPPER



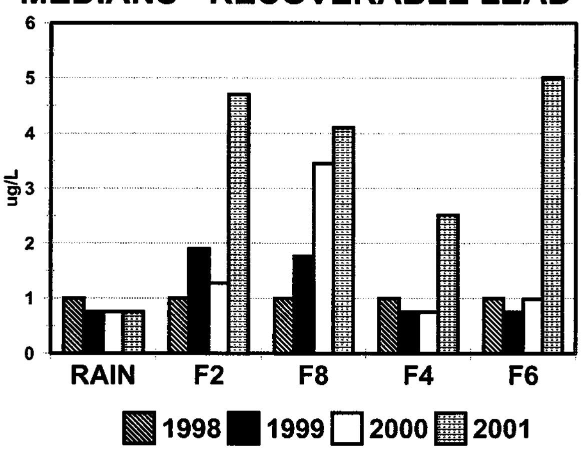
COMPARISON BETWEEN YEARS

MEDIANS - RECOVERABLE IRON



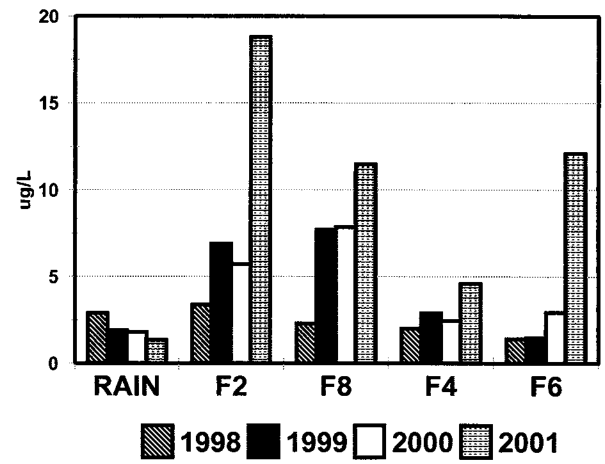
COMPARISON BETWEEN YEARS

MEDIANS - RECOVERABLE LEAD



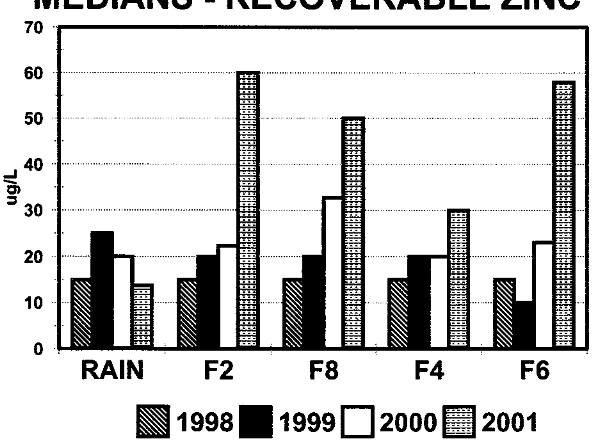
COMPARISON BETWEEN YEARS

MEDIANS - RECOVERABLE MANGANESE



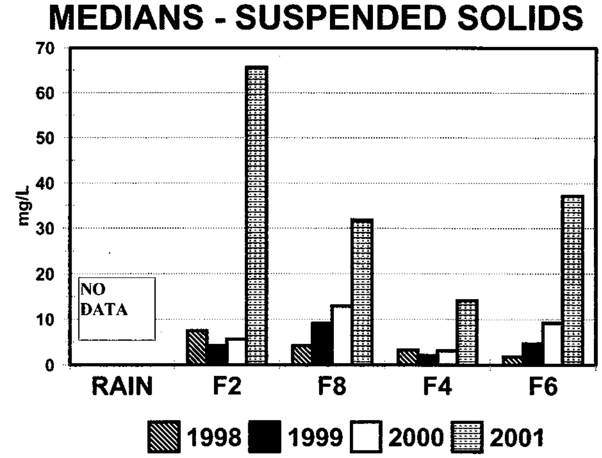
COMPARISON BETWEEN YEARS

MEDIANS - RECOVERABLE ZINC

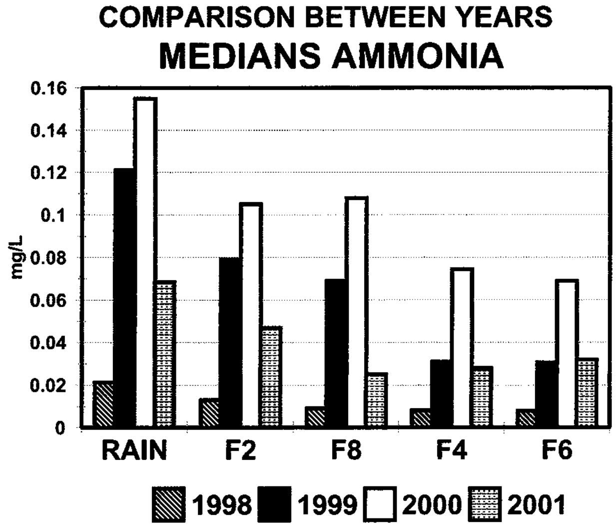


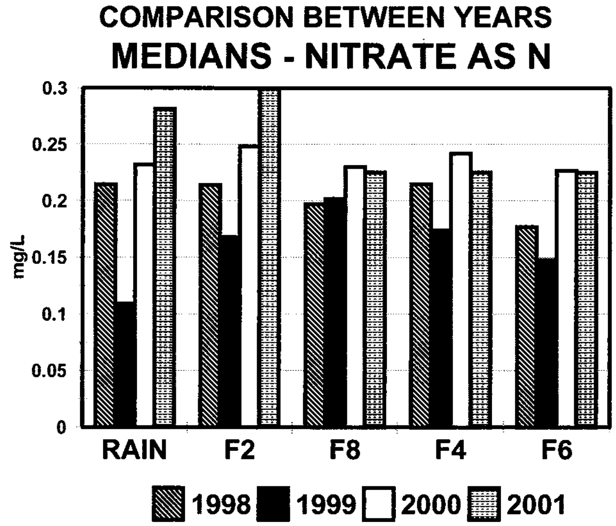
COMPARISON BETWEEN YEARS

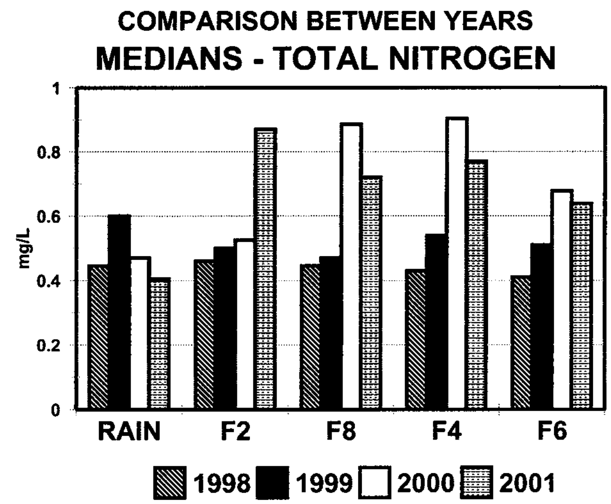
MEDIANS - SUSPENDED SOLIDS

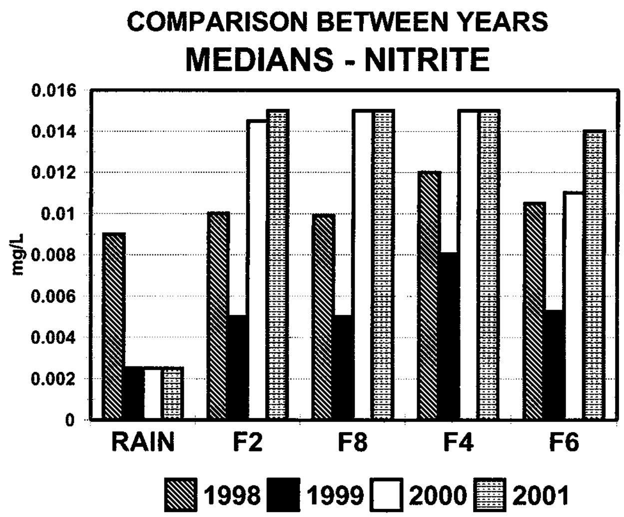


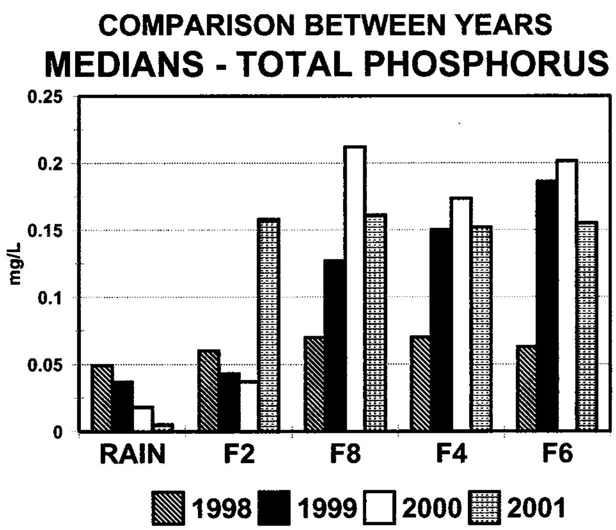
Comparison of median concentrations between July and December for four years

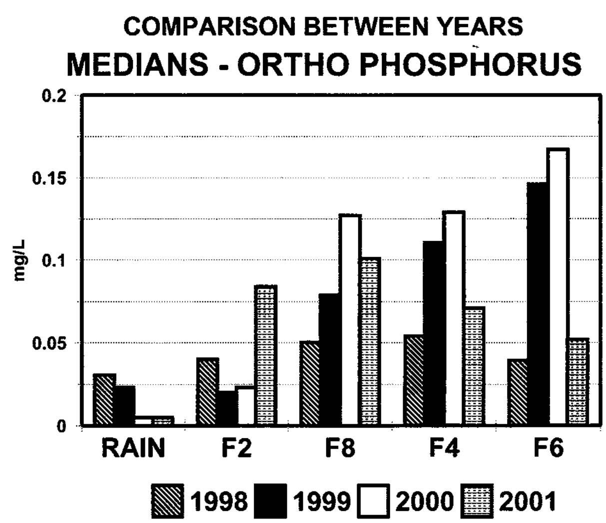












Comparison of median concentrations between July and December for four years

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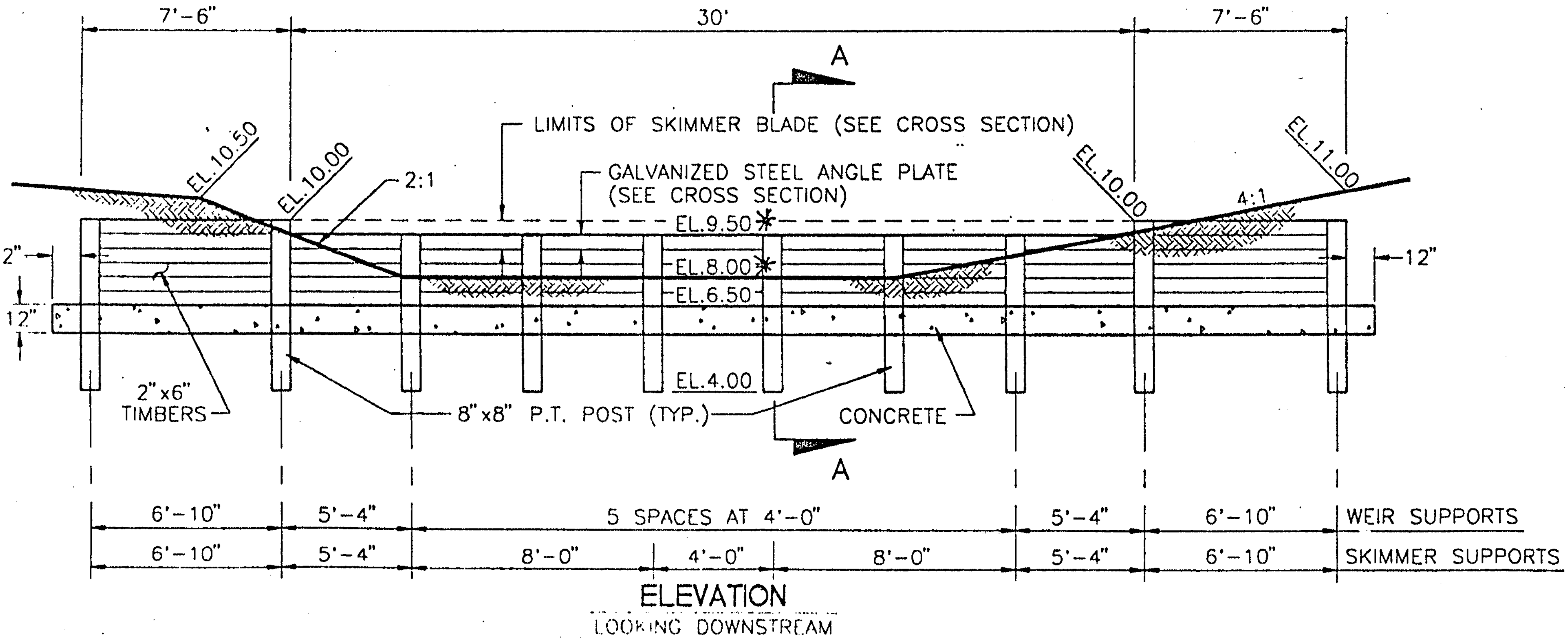
APPENDIX A

QUALITY ASSURANCE INFORMATION
AND
DESIGN PARMETERS

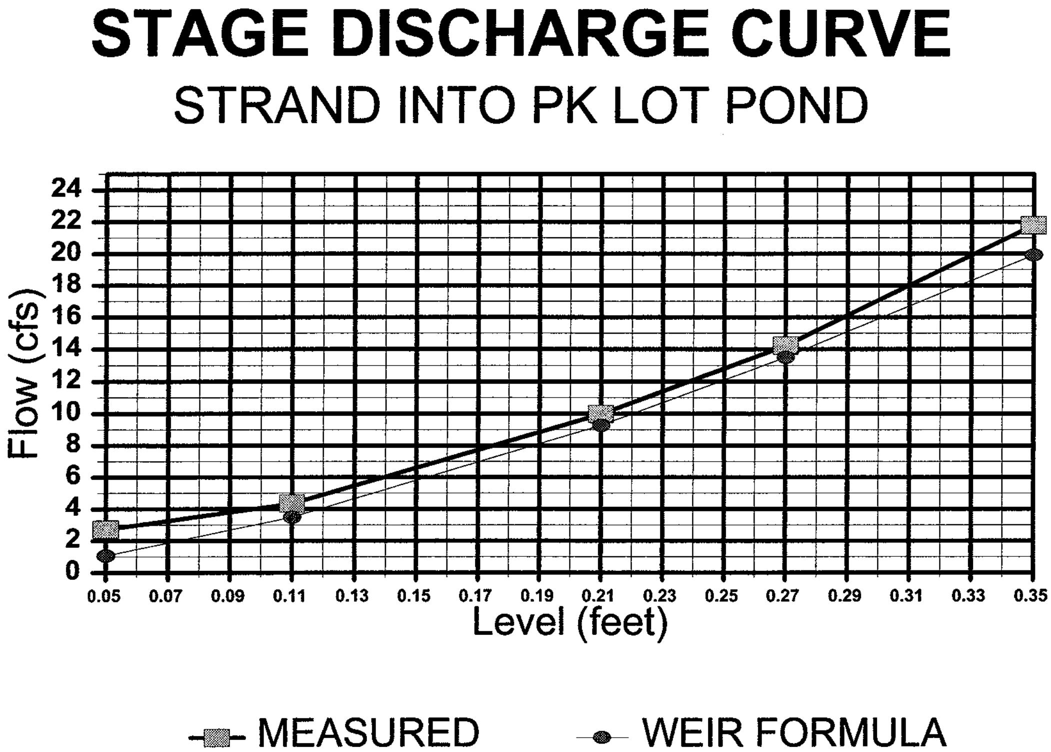


CONTROL STRUCTURE SD-25

1" = 5'

Inflow weir into the parking lot pond.

COMPARISON OF STANDARD WEIR FORMULA WITH MEASUREMENTS TAKEN DURING A STORM WITH A VELOCITY METER FOR INFLOW INTO THE PARKING LOT POND

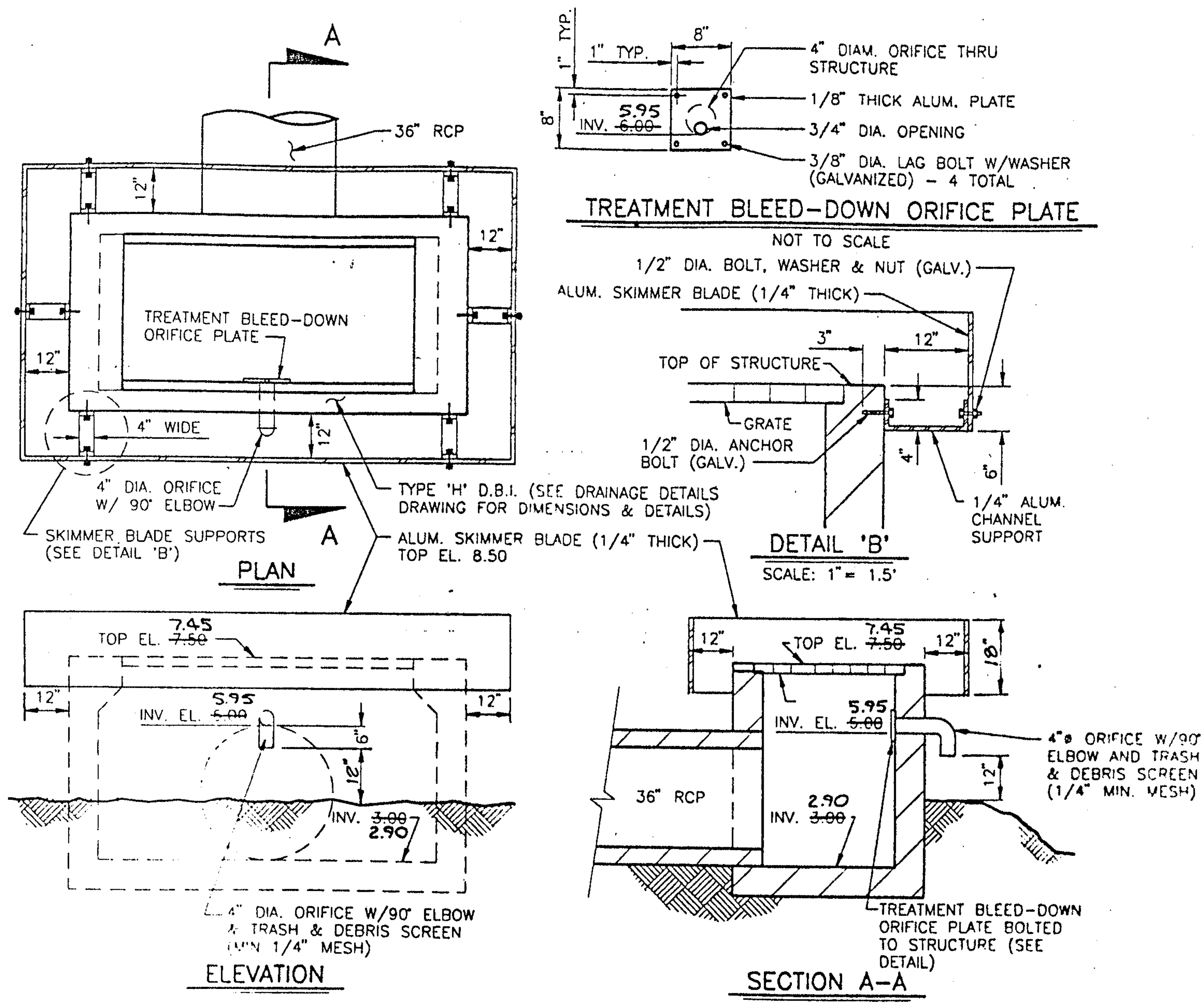


STAGE DISCHARGE CURVE FOR THE FLORIDA AQUARIUM STRAND

(3.33*((29-(0.2*(H)))*((H^1.5))))=WEIR FORMULA FOR RECTANGULAR WEIR
(1.86+(9.156*H)+(135.87*(H^2)))=CURVE FIT FORMULA
H=HEAD

	HEAD FT	WEIR FORMULA CFS	CURVE FIT FORMULA CFS	MEASURED CFS
max	**0.50**	**34.0249**	**40.4055**	
	0.05	1.0793	2.6575	2.7200
	0.11	3.5205	4.5112	4.3630
	0.21	9.2799	9.7746	9.9720
	0.27	13.5232	14.2370	14.2360
	0.35	19.9478	21.7087	21.8280

Since the weir configuration into the pond does not meet many of the requirements for a standard rectangular weir formula, measurements were also made using a velocity meter. A comparison of the two methods is shown in the figure and table. Considering the weir leaks the fit looks pretty good.



CONTROL STRUCTURE SD-26

Outflow weir structure from the parking lot pond

CALCULATING FLOW FOR THE OUTFLOW WEIR TABLE

PIPE FORMULA

Q=C*a*(@sqrt(2*g*h))

Q=flow cfs
C=0.67 for 3/4" pipe (Brater and King)
a=area of pipe
g=32.2 ft/sec2
h=head

Oriface through structure=4 inch diameter oriface
Pipe diameter=3/4 inch diameter opening
Top of weir elevation=7.45 FT
Invert of Pipe=5.95 FT

Pipe formula=0.0165*H^0.5 (calculated from above formula)
Weir formula=(3.33*(((9*(0.7))-(0.2*(H-1.5))*((H-1.5)^1.5))*2)+(3.33*(((4.33*0.7))-(0.2*H))*(H^1.5))*2)
Simplify=(2*3.33*(6.3-(0.2*(H-1.5)))*((H-1.5)^1.5))+(2*3.33*(3.031-(0.2*(H-1.5)))*((H-1.5)^1.5))

HEAD	FLOW		HEAD	FLOW		HEAD	FLOW
feet	cfs		feet	cfs		feet	cfs
0.00	0.0000		1.00	0.0165		2.00	21.5005
0.05	0.0037		1.05	0.0169		2.05	24.7505
0.10	0.0052		1.10	0.0173		2.10	28.1393
0.15	0.0064		1.15	0.0177		2.15	31.6592
0.20	0.0074		1.20	0.0181		2.20	35.3035
0.25	0.0083		1.25	0.0184		2.25	39.0663
0.30	0.0090		1.30	0.0188		2.30	42.9420
0.35	0.0098		1.35	0.0192		2.35	46.9257
0.40	0.0104		1.40	0.0195		2.40	51.0128
0.45	0.0111		1.45	0.0199		2.45	55.1990
0.50	0.0117		1.50	0.0202		2.50	59.4805
0.55	0.0122		1.55	0.6933		2.55	63.8535
0.60	0.0128		1.60	1.9568		2.60	68.3147
0.65	0.0133		1.65	3.5871		2.65	72.8607
0.70	0.0138		1.70	5.5107		2.70	77.4887
0.75	0.0143		1.75	7.6848		2.75	82.1957
0.80	0.0148		1.80	10.0801		2.80	86.9790
0.85	0.0152		1.85	12.6747		2.85	91.8360
0.90	0.0157		1.90	15.4519		2.90	96.7644
0.95	0.0161		1.95	18.3976		2.95	101.7616

METHOD TO MEASURE UNDER DRAIN FLOW

A Thelmar weir was installed to measure the under drain flow into the pond, but since it was easily clogged with debris and did not appear to provide accurate measurements for this small pipe a different method was used to estimate flow using the following formula.

(Change in pond level * area of pond) - (discharge from the pond + rainfall on the pond).

This method also accounted for unmeasured flow coming into the pond from a low spot, the runoff from the banks around the pond and the leaks through the inflow weir.

Appendix A. Duplicate samples for quality assurance. All samples with greater than ten percent differences are shown in bold type. Most of the differences are for samples with low concentrations. BD=Below laboratory detection limit

		SITE F1 August 7, 1998				SITE F7 August 9, 1998				SITE F5 August 9, 1998				SITE F5 September 3, 1998				SITE F7 September 3, 1998			
CONSTITUENT	UNITS	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG
AMMONIA	mg/L	0.237	0.233	1.7	0.235	0.146	0.141	3.4	0.144	0.205	0.209	-2.0	0.207	0.021	0.034	**-61.9**	0.028	0.025	0.024	4.0	0.025
NITRITE	mg/L	0.011	0.011	0.0	0.011	0.010	0.010	0.0	0.010	0.012	0.013	-8.3	0.013	BD	BD	BD	BD	BD	BD	BD	BD
NITRATE	mg/L	0.218	0.218	0.0	0.218	0.206	0.206	0.0	0.206	0.211	0.211	0.0	0.211	0.102	0.096	5.9	0.099	0.037	0.027	**27.0**	0.032
TOTAL-N	mg/L	0.60	0.60	0.0	0.60	0.62	0.65	-4.8	0.64	0.62	0.64	-3.2	0.63	0.16	0.18	**-12.5**	0.17	0.19	0.16	**15.8**	0.18
ORTHO-P	mg/L	0.031	0.028	9.7	0.030	0.034	0.034	0.0	0.034	0.014	0.015	-7.1	0.015	ND	0.012	ND	0.012	0.08	0.079	ND	0.012
TOTAL-P	mg/L	0.039	0.036	7.7	0.038	0.052	0.05	3.8	0.051	0.029	0.026	10.3	0.028	0.024	0.022	8.3	0.023	0.11	0.109	0.9	0.110
CADMIUM	ug/L	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD
COPPER	ug/L	BD	3.8	BD	BD	2.2	1.6	BD	BD	1.3	BD	BD	BD	4.5	2.6	**42.2**	3.6	8.4	6.4	**23.8**	7.4
IRON	ug/L	150	150	0.0	150	110	100	9.1	105	80	70	12.5	75	110	110	0.0	110	250	220	**12.0**	235
LEAD	ug/L	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	2.4	BD	BD	BD
MANGANESE	ug/L	4.8	4.8	0.0	4.8	3.3	2.8	**15.2**	3.1	2.2	2.1	4.5	2.2	2.5	2.4	4.0	2.5	6.3	6.3	0.0	6.3
ZINC	ug/L	BD	30	BD	BD	30	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	40	30	BD	BD
CHLORIDE	mg/L	0.70	0.68	2.9	0.69	0.51	0.50	2.0	0.51	0.47	0.73	**-55.3**	0.60	2.07	2.07	0.0	2.07	2.67	2.62	1.9	2.65
POTASSIUM	mg/L	0.24	0.18	**25.0**	0.21					0.84	0.88	-4.8	0.86	1.59	1.33	**16.4**	1.46	0.56	0.64	**-14.3**	0.60
SODIUM	mg/L	0.25	0.39	**-56.0**	0.32	0.33	0.36	-9.1	0.35	0.41	0.43	-4.9	0.42	1.71	1.17	**31.6**	1.44	1.76	1.54	**12.5**	1.65
SULFATE	mg/L	4.49	4.34	3.3	4.42	2.80	2.68	4.3	2.74	2.40	3.43	**-42.9**	2.92	2.16	2.75	**-27.3**	2.46	2.37	2.12	**10.5**	2.25
CALCIUM	mg/L	7.81	7.50	4.0	7.66	6.25	6.08	2.7	6.17	24.40	25.00	-2.5	24.70	42.20	42.00	0.5	42.10	8.20	7.47	8.9	7.83
MAGNESIUM	mg/L	0.13	0.12	7.7	0.13	0.21	0.22	-4.8	0.22	0.15	0.15	0.0	0.15	0.20	0.14	**30.0**	0.17	0.37	0.29	**21.6**	0.33
HARDNESS	mg/L	20.03	19.22	4.0	19.63	16.47	16.08	2.4	16.28	61.54	63.04	-2.4	62.29	106.00	105.45	0.5	105.73	21.90	19.84	9.4	20.87
TSS	mg/L	4.63	5.03	-8.6	4.83	6.14	4.37	**28.8**	5.26	4.77	4.99	-4.6	4.88	1.94	0.98	**49.5**	1.46	7.10	6.55	7.7	6.83

		SITE F1 September 3, 1998				SITE F3 September 3, 1998				SITE F1 September 26, 1998				SITE F8 January 4, 1999				SITE F5 AUGUST 23, 1999			
CONSTITUENT	UNITS	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG
AMMONIA	mg/L	0.043	0.044	-2.3	0.044	BD	BD	BD	BD	BD	BD	BD	BD	0.045	0.045	0.0	0.045	0.02	0.024	-20.0	0.022
NITRITE	mg/L	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	0.04	*0.005*	**87.5**	0.023
NITRATE	mg/L	0.094	0.104	**-10.6**	0.099	0.164	0.126	**23.2**	0.145	0.084	0.086	-2.4	0.085	0.148	0.153	-3.4	0.151	BD	BD	BD	BD
TOTAL-N	mg/L	0.33	0.22	**33.3**	0.28	0.25	0.2	**20.0**	0.23	0.12	0.09	**25.0**	0.105	0.54	0.35	**35.2**	0.445	0.06	0.05	**16.7**	0.055
ORTHO-P	mg/L	0.016	0.015	6.3	0.016	0.072	0.072	0.0	0.072	BD	BD	BD	BD	0.126	0.128	-1.6	0.127	0.042	0.044	-4.8	0.043
TOTAL-P	mg/L	0.026	0.033	**-26.9**	0.030	0.079	0.081	-2.5	0.080	0.015	0.021	**-40.0**	0.018	0.166	0.193	**-16.3**	0.180	0.062	0.061	1.6	0.062
CADMIUM	ug/L	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	*0.15*	*0.15*	0.0	0.150
COPPER	ug/L	6.1	7.9	**-29.5**	7.0	4.7	4.2	**10.6**	4.5	5.6	6.2	**-10.7**	5.9	12.2	13	-6.6	12.600	1	*1*	0.0	1.000
IRON	ug/L	360	340	5.6	350	80	90	**-12.5**	85	110	290	**-163.6**	200	410	490	**-19.5**	450	40	50	**-25.0**	45.000
LEAD	ug/L	2.1	2.3	-9.5	2.20	BD	BD	BD	BD	BD	BD	BD	BD	5.3	6.2	-17.0	5.750	*0.75*	*0.75*	0.0	0.750
MANGANESE	ug/L	7.1	7.4	-4.2	7.3	2.4	2.2	8.3	2.3	3.4	5.6	**-64.7**	4.5	9.9	10.9	**-10.1**	10	0.5	0.5	0.0	0.500
ZINC	ug/L	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	50	50	0.0	50	20	*7.5*	**62.5**	13.750
CHLORIDE	mg/L	2.53	2.45	3.2	2.49	2.17	2.11	2.8	2.14	0.62	0.61	1.6	0.62	1.55	1.58	-1.9	1.57	0.48	0.47	2.1	0.475
POTASSIUM	mg/L	0.19	0.18	5.3	0.19	1.89	1.76	6.9	1.83	0.10	0.09	10.0	0.10	1.1	1.08	1.8	1.09	0.25	0.26	-4.0	0.255
SODIUM	mg/L	1.68	1.31	**22.0**	1.50	1.51	1.41	6.6	1.46	0.38	0.45	**-18.4**	0.42	0.81	0.78	3.7	0.80	0.36	0.43	**-19.4**	0.395
SULFATE	mg/L	3.02	1.92	**36.4**	2.47	2.62	2.36	9.9	2.49	1.47	1.45	1.4	1.46	3.52	3.5	0.6	3.51	2.5	2.43	2.8	2.465
CALCIUM	mg/L	5.97	6.19	-3.7	6.08	5.03	4.43	**11.9**	4.73	6.45	6.4	0.8	6.43	6.54	6.71	-2.6	6.63	23.3	23.6	-1.3	23.450
MAGNESIUM	mg/L	0.16	0.20	**-25.0**	0.18	0.19	0.18	5.3	0.19	0.09	0.06	**33.3**	0.08	0.33	0.33	0.0	0.33	0.21	0.21	0.0	0.210
HARDNESS	mg/L	15.56	16.28	-4.6	15.92	13.34	11.8	**11.5**	12.6	16.47	6.22	**62.2**	11.35	17.69	18.11	-2.4	17.90	59.04	59.79	-1.3	59.415
TSS	mg/L	5.49	7.59	**-38.3**	6.54	0.68	0.54	20.6	0.61	2.25	7.16	**-218.2**	4.71	14.48	30.15	**-108.2**	22.32	1.38	1.69	**-22.5**	1.535

Appendix A. Duplicate samples for quality assurance. All samples with greater than ten percent differences are shown in bold type. Most of the differences are for samples with low concentrations. BD=Below laboratory detection limit.

		SITE F4 JUNE 13,1999				SITE F6 JUNE 13,1999				SITE F8 JUNE 13, 1999				SITE F6 AUGUST 14, 1999 dup. to check mix				SITE F3 AUGUST 23, 1999		
CONSTITUENT	UNITS	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg
AMMONIA	mg/L	0.047	0.020	**57.4**	0.034	0.023	0.011	**52.2**	0.017	0.900	0.092	**89.8**	0.496	0.025	0.024	4.0	0.025	BD	BD	BD
NITRITE	mg/L	0.013	0.013	0.0	0.013	0.013	0.013	0.0	0.013	0.013	0.013	0.0	0.013	0.378	0.392	-3.7	0.385	BD	BD	BD
NITRATE	mg/L	0.123	0.159	**-29.3**	0.141	0.159	0.069	**56.6**	0.114	0.214	0.213	0.5	0.214	0.010	0.010	0.0	0.010	BD	BD	BD
TOTAL-N	mg/L	0.740	0.810	-9.5	0.775	0.840	0.940	**-11.9**	0.89	1.600	1.700	-6.2	1.650	0.510	0.470	7.8	0.490	0.19	0.11	**42.1**
ORTHO-P	mg/L	0.272	0.272	0.0	0.272	0.36	0.359	0.3	0.360	0.318	0.319	-0.3	0.319	0.105	0.105	0.0	0.105	0.125	0.126	-0.8
TOTAL-P	mg/L	0.325	0.331	-1.8	0.328	0.423	0.423	0.0	0.423	0.379	0.372	1.8	0.376	0.144	0.141	2.1	0.143	0.141	0.141	0.0
CADMIUM	ug/L	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	*0.15*	*0.15*	0.0
COPPER	ug/L	BD	BD	BD	BD	BD	BD	BD	BD	10.2	10.8	-5.9	10.5	3.6	2.7	**25.0**	3.2	2.6	3.0	**-15.4**
IRON	ug/L	50	60	**-20.0**	55	50	30	**40.0**	40	350	320	8.6	335.0	*12.5*	*12.5*	0.0	12.5	*12.5*	*12.5*	0.0
LEAD	ug/L	BD	BD	BD	BD	BD	BD	BD	BD	2.5	2.6	-4.0	2.6	BD	BD	BD	BD	BD	BD	BD
MANGANESE	ug/L	5.2	5.2	0.0	5.2	2.0	2.2	**-10.0**	2.1	10.1	9.8	3.0	10.0	BD	BD	BD	BD	BD	BD	BD
ZINC	ug/L	BD	BD	BD	BD	BD	BD	BD	BD	40	40	0.0	40.0	BD	BD	BD	BD	*7.5*	*7.5*	0.0
CHLORIDE	mg/L	2.09	2.10	-0.5	2.10	2.05	2.05	0.0	2.05	1.76	1.75	0.6	1.76	0.73	0.71	2.7	0.72	0.71	0.75	-5.6
POTASSIUM	mg/L	3.18	3.18	0.0	3.18	5.04	5.06	-0.4	5.05	1.34	1.36	-1.5	1.35	1.02	0.86	**15.7**	0.94	1.1	1.33	**-20.9**
SODIUM	mg/L	1.11	1.12	-0.9	1.12	0.93	0.93	0.0	0.93	0.86	0.85	1.2	0.86	0.6	0.55	8.3	0.58	0.52	0.56	-7.7
SULFATE	mg/L	6.33	6.37	-0.6	6.35	6.03	5.97	1.0	6.00	6.03	6.04	-0.2	6.04	5.74	5.67	1.2	5.71	3.35	3.24	3.3
CALCIUM	mg/L	8.31	8.39	-1.0	8.35	9.76	9.72	0.4	9.74	10.50	10.50	0.0	10.50	12.9	13.2	-2.3	13.05	12.8	12.6	1.6
MAGNESIUM	mg/L	0.60	0.62	-3.3	0.61	0.56	0.56	0.0	0.56	0.75	0.75	0.0	0.75	0.48	0.49	-2.1	0.49	0.76	0.79	-3.9
HARDNESS	mg/L	23.22	23.50	-1.2	23.36	26.68	26.58	0.4	26.63	29.31	29.31	0.0	29.31	34.18	34.97	-2.3	34.58	35.09	34.71	1.1
TSS	mg/L	3.56	3.05	**14.3**	3.31	2.97	3.20	-7.7	3.09	NA	6.75	NA	3.38	9.03	2.6	**71.2**	5.82	1.08	1.16	-7.4

		SITE F3 August 11, 2000				SITE F6 September 7, 2000				SITE F7 September 7, 2000				SITE F6 September 25, 2000			
CONSTITUENT	UNITS	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG	1	2	%chg	AVG
AMMONIA	mg/L	0.044	0.041	6.8	0.043	0.045	0.081	**-80.0**	0.063	0.117	0.081	**30.8**	0.099	0.236	0.243	-3.0	0.240
NITRITE	mg/L	0.006	0.007	**-16.7**	0.007	0.017	0.012	29.4	0.015	0.010	0.013	**-30.0**	0.012	0.036	0.034	5.6	0.035
NITRATE	mg/L	0.151	0.154	-2.0	0.153	0.223	0.225	-0.9	0.224	0.268	0.174	**35.1**	0.221	1.094	1.756	**-60.5**	1.425
TOTAL-N	mg/L	0.63	0.85	**-34.9**	0.740	0.76	0.70	7.9	0.730	0.61	0.79	**-29.5**	0.700	7.50	2.40	**68.0**	4.950
ORTHO-P	mg/L	0.152	0.154	-1.3	0.153	0.15	0.149	0.7	0.150	0.103	0.091	**11.7**	0.097	0.242	0.092	**62.0**	0.167
TOTAL-P	mg/L	0.172	0.174	-1.2	0.173	0.222	0.208	6.3	0.215	0.153	0.183	**-19.6**	0.168	0.311	0.197	**36.7**	0.254
CADMIUM	ug/L	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD	BD
COPPER	ug/L	3.5	3.3	5.7	3.4	3.1	4.1	**-32.3**	3.6	6.6	8.3	**-25.8**	7.5	14.2	21.7	**-52.8**	18.0
IRON	ug/L	80	70	**12.5**	75.0	120	170	**-41.7**	145.0	220	260	**-18.2**	240.0	300	610	**-103.3**	455.0
LEAD	ug/L	0.75	0.75	0.0	0.750	0.75	0.75	0.0	0.750	1.9	2.2	**-15.8**	2.050	3.1	6.4	**-106.5**	4.8
MANGANESE	ug/L	1.8	1.8	0.0	1.800	2.4	2.9	**-20.8**	2.650	6.4	6.8	**-6.2**	6.600	4.7	11.8	**-151.1**	8.3
ZINC	ug/L	7.5	7.5	0.0	7.500	20	20	0.0	20.0	30	40	**-33.3**	35.0	40	60	**-50.0**	50.0
CHLORIDE	mg/L	1.79	1.79	0.0	1.790	2.17	2.16	0.5	2.165	2.06	2.06	0.0	2.060	3.59	3.44	4.2	3.5
POTASSIUM	mg/L	1.32	1.32	0.0	1.320	2.09	2.09	0.0	2.090	0.76	0.76	0.0	0.760	2.12	1.67	**21.2**	1.9
SODIUM	mg/L	0.07	0.08	**-14.3**	0.075	0.51	0.50	2.0	0.505	0.37	0.37	0.0	0.370	1.85	1.60	**13.5**	1.7
SULFATE	mg/L	1.99	2.01	-1.0	2.000	2.86	2.86	0.0	2.860	2.43	2.43	0.0	2.430	7.52	6.96	7.4	7.2
CALCIUM	mg/L	5.77	5.63	2.4	5.700	13.50	13.30	1.5	13.400	9.50	9.58	-0.8	9.540	na	na	na	na
MAGNESIUM	mg/L	BD	BD	BD	BD	0.33	0.34	-3.0	0.335	0.22	0.22	0.0	0.220	na	na	na	na
HARDNESS	mg/L	14.41	14.06	2.4	14.23	35.07	34.61	1.3	34.84	24.63	24.83	-0.8	24.73	na	na	na	na
TSS	mg/L	1.70	1.56	8.4	1.63	7.96	6.73	**15.4**	7.35	12.46	12.62	-1.3	12.54	12.22	46.27	**-278.8**	29.2

APPENDIX B

RAINFALL CHARACTERISTICS

Appendix B-1 Rainfall intensity, inter-event dry period, and storm duration calculated f individual storm events > than 0.4 cm (0.157 inches)

YEAR ONE

START DATE	END DATE	YEAR	DAY Julian	START TIME hhmm	STOP TIME hhmm	TOTAL RAIN (in)	INTER-EVENT (hrs)	DURA-TION (hrs)	MAX. INT, (in/hr)	AVG. INT, (in/hr)
07/31/98	07/31/98	1998	212	1345	1500	0.68	118.50	1.50	0.66	0.45
08/05/98	08/05/98	1998	217	1900	2000	0.56	123.75	1.25	0.51	0.41
08/06/98	08/06/98	1998	218	1845	1945	0.67	22.50	1.25	0.66	0.53
08/07/98	08/07/98	1998	219	1600	2115	1.30	20.00	5.50	0.30	0.05
08/08/98	08/08/98	1998	220	1800	1845	0.43	20.50	1.00	0.43	0.43
08/09/98	08/09/98	1998	221	1645	1830	2.43	21.75	1.50	1.47	0.98
08/16/98	08/16/98	1998	228	1930	2015	0.25	167.00	1.25	0.25	0.20
08/19/98	08/19/98	1998	231	1530	1600	0.31	64.00	0.75	0.31	0.41
08/20/98	08/20/98	1998	232	1245	1400	0.67	20.50	1.50	0.59	0.39
08/31/98	08/31/98	1998	243	1545	1630	0.54	265.50	1.00	0.54	0.54
09/01/98	09/01/98	1998	244	1815	1915	0.48	25.50	1.25	0.46	0.37
09/03/98	09/03/98	1998	246	445	1130	1.97	33.25	7.25	1.09	0.15
09/04/98	09/04/98	1998	247	445	700	0.28	17.00	1.50	0.27	0.18
09/04/98	09/04/98	1998	247	1945	2045	0.55	12.50	1.25	0.54	0.43
09/06/98	09/06/98	1998	249	1900	2130	1.21	46.00	2.75	1.05	0.38
09/07/98	09/07/98	1998	250	1500	1915	0.64	17.25	4.50	0.33	0.07
09/17/98	09/17/98	1998	260	915	945	0.49	229.75	1.00	0.49	0.49
09/18/98	09/18/98	1998	261	1545	2030	0.58	28.75	5.75	0.22	0.04
09/19/98	09/19/98	1998	262	1215	1500	0.53	13.75	3.00	0.26	0.09
09/24/98	09/24/98	1998	267	1315	1415	0.17	118.00	1.25	0.16	0.13
09/25/98	09/25/98	1998	268	1045	1230	0.15	20.25	1.25	0.15	0.12
09/25/98	09/26/98	1998	269	1630	45	1.36	3.75	8.50	0.24	0.03
11/04/98	11/05/98	1998	309	1015	630	1.20	921.25	20.50	0.20	0.01
11/18/98	11/18/98	1998	322	2315	2400	0.43	328.50	1.00	0.43	0.43
12/13/98	12/13/98	1998	347	1230	1500	0.37	588.25	2.75	0.29	0.11
12/29/98	12/29/98	1998	363	1330	1415	0.27	382.25	1.00	0.27	0.27
01/02/99	01/03/99	1999	3	2300	100	1.22	104.50	2.25	1.06	0.47
01/09/99	01/09/99	1999	9	1745	2000	0.46	160.50	2.50	0.42	0.17
01/23/99	01/24/99	1999	24	2015	115	2.54	336.00	5.25	1.29	0.25
02/02/99	02/02/99	1999	33	1100	1245	0.47	225.50	2.00	0.13	0.07
02/28/99	02/28/99	1999	59	1345	1415	0.36	624.75	0.75	0.36	0.48
03/14/99	03/14/99	1999	73	1215	1515	0.80	333.75	3.25	0.44	0.14
04/17/99	04/17/99	1999	107	830	1330	0.50	785.00	2.25	0.28	0.12
05/11/99	05/11/99	1999	131	1600	1630	0.17	578.25	0.75	0.17	0.23
05/14/99	05/14/99	1999	134	1615	1700	0.27	71.50	1.00	0.27	0.27
05/18/99	05/18/99	1999	138	1715	1745	0.17	96.00	0.75	0.17	0.23
05/21/99	05/21/99	1999	141	1500	1700	1.34	69.00	2.25	1.23	0.55
05/30/99	05/30/99	1999	150	1615	1730	0.39	215.00	1.50	0.38	0.25
06/05/99	06/05/99	1999	156	1430	1515	0.44	140.75	1.00	0.44	0.44
06/09/99	06/09/99	1999	160	1545	1715	0.81	96.25	1.75	0.69	0.39
06/13/99	06/13/99	1999	164	1815	2030	1.20	96.75	1.25	1.20	0.96
06/15/99	06/15/99	1999	166	1645	1800	0.43	44.00	1.50	0.22	0.15
06/16/99	06/16/99	1999	167	1215	2300	1.64	18.00	4.75	1.09	0.23
06/17/99	06/17/99	1999	168	1145	1700	0.75	12.50	5.50	0.43	0.08
06/18/99	06/18/99	1999	169	445	515	0.18	11.50	0.75	0.18	0.24
06/18/99	06/18/99	1999	169	1630	1730	1.40	11.00	1.25	1.17	0.94
06/19/99	06/19/99	1999	170	1845	2115	0.22	25.00	1.25	0.23	0.18
06/23/99	06/23/99	1999	174	1430	1500	0.48	89.00	0.75	0.48	0.64
06/25/99	06/25/99	1999	176	1245	1315	0.31	45.50	0.75	0.31	0.41

Appendix B-1 Rainfall intensity, inter-event dry period, and storm duration calculated f individual storm events > than 0.4 cm (0.157 inches)

YEAR ONE

START DATE	END DATE	YEAR	DAY Julian	START TIME hhmm	STOP TIME hhmm	TOTAL RAIN (in)	INTER-EVENT (hrs)	DURA-TION (hrs)	MAX. INT, (in/hr)	AVG. INT, (in/hr)
07/01/99	07/01/99	1999	182	1445	2045	1.52	145.25	6.25	0.60	0.10
07/03/99	07/03/99	1999	184	1500	1515	0.32	42.25	0.25	0.32	1.28
07/07/99	07/07/99	1999	188	2100	2215	0.81	101.50	1.50	0.36	0.24
07/09/99	07/09/99	1999	190	1430	1545	1.17	40.00	1.50	0.11	0.07
07/12/99	07/12/99	1999	193	1215	1245	0.36	68.25	0.75	0.36	0.48
07/13/99	07/13/99	1999	194	1430	2115	0.52	25.50	7.00	0.42	0.06
07/14/99	07/14/99	1999	195	1430	2045	0.69	17.00	6.50	0.33	0.05
07/15/99	07/15/99	1999	196	1645	1900	0.30	19.75	2.50	0.21	0.08
07/20/99	07/20/99	1999	201	1715	1800	0.88	118.00	1.00	0.88	0.88
07/26/99	07/26/99	1999	207	545	600	0.22	131.50	0.50	0.22	0.44
07/30/99	07/30/99	1999	211	745	815	0.47	97.50	0.75	0.47	0.63

YEAR ONE

START DATE	END DATE	YEAR	DAY Julian	START TIME hhmm	STOP TIME hhmm	TOTAL RAIN (in)	INTER-EVENT (hrs)	DURA-TION (hrs)	MAX. INT, (in/hr)	AVG. INT, (in/hr)
Summary Data	**Number of Storms 60**					**Total Rain**		**42.33 inches**		
Average						0.71	143.78	2.58	0.48	0.33
Median						0.51	70.25	1.50	0.37	0.25
Maximum						2.54	921.25	20.50	1.47	1.28
Minimum						0.15	3.75	0.25	0.11	0.01
Std.Dev.						0.53	194.36	3.05	0.33	0.27
C.V.						0.75	1.35	1.18	0.69	0.81

Appendix B-2 Rainfall intensity, inter-event dry period, and storm duration calculated for individual storm events > than 0.4 cm (0.157 inches)

YEAR TWO

START DATE	END DATE	YEAR	DAY Julian	START TIME hhmm	STOP TIME hhmm	TOTAL RAIN (in)	INTER-EVENT (hrs)	DURA-TION (hrs)	MAX. INT, (in/hr)	AVG. INT, (in/hr)
08/06/99	08/06/99	1999	218	730	1215	1.13	167.00	2.50	0.88	0.45
08/10/99	08/10/99	1999	222	1100	1130	0.25	94.50	0.75	0.25	0.33
08/11/99	08/11/99	1999	223	2115	2230	0.29	33.75	1.25	0.28	0.23
08/12/99	08/12/99	1999	224	730	1230	0.70	8.75	5.25	0.41	0.13
08/13/99	08/13/99	1999	225	2245	2315	0.38	34.00	0.75	0.38	0.51
08/14/99	08/15/99	1999	227	2400	100	1.23	24.50	1.25	0.51	0.98
08/17/99	08/17/99	1999	229	1445	1515	0.27	61.50	0.75	0.27	0.36
08/19/99	08/19/99	1999	231	1645	1745	0.90	49.25	1.25	0.84	0.72
08/21/99	08/21/99	1999	233	15	330	0.45	30.25	3.50	0.28	0.13
08/22/99	08/22/99	1999	234	1745	2200	2.91	38.00	3.75	0.63	0.78
09/06/99	09/06/99	1999	249	630	1430	0.34	342.75	8.25	0.12	0.04
09/07/99	09/07/99	1999	250	800	830	0.17	17.25	0.75	0.17	0.23
09/11/99	09/11/99	1999	254	1800	2000	0.84	105.25	2.25	0.69	0.37
09/18/99	09/18/99	1999	261	1845	1945	0.43	166.50	1.25	0.39	0.34
09/19/99	09/19/99	1999	262	2100	2330	0.85	25.00	2.75	0.21	0.31
09/20/99	09/20/99	1999	263	1530	1815	0.26	15.75	2.50	0.16	0.10
09/25/99	09/25/99	1999	268	1445	1600	1.37	116.25	1.50	1.30	0.91
10/03/99	10/03/99	1999	276	1430	1800	1.21	190.25	2.25	0.44	0.54
10/04/99	10/05/99	1999	278	1930	515	0.82	24.25	12.75	0.21	0.06
10/11/99	10/11/99	1999	284	2045	2100	0.25	146.25	0.50	0.25	0.50
10/20/99	10/20/99	1999	293	2045	2230	0.16	215.50	2.00	0.15	0.08
11/01/99	11/02/99	1999	306	1645	215	1.63	293.00	9.75	0.74	0.17
11/24/99	11/24/99	1999	328	1845	1900	0.19	544.25	0.50	0.19	0.38
12/13/99	12/14/99	1999	348	2315	200	0.24	460.00	3.00	0.12	0.08
12/17/99	12/18/99	1999	352	1830	615	0.43	88.25	12.00	0.10	0.04
12/18/99	12/18/99	1999	352	1245	1700	0.30	6.25	4.50	0.09	0.07
01/06/00	01/07/00	2000	2230	330	0.01	0.79	461.5	5	0.64	0.16
01/10/00	01/10/00	2000	1700	1830	0.02	0.42	85.5	1.5	0.29	0.19
01/24/00	01/24/00	2000	30	1145	0.01	0.68	318	11.25	0.13	0.06
01/31/00	01/31/00	2000	945	1845	0.01	0.62	166	6.5	0.26	0.10
02/14/00	02/14/00	2000	45	2030	2030	0.22	334.00	3.75	0.09	0.06
03/27/00	03/27/00	2000	87	1515	1630	0.32	1002.50	1.50	0.16	0.21
06/07/00	06/07/00	2000	159	1145	1415	0.44	1723.00	2.75	0.19	0.16
06/13/00	06/13/00	2000	165	1800	1945	1.29	147.50	2.00	1.27	0.65
06/17/00	06/17/00	2000	169	1845	2330	0.20	94.75	5.00	0.17	0.04
06/19/00	06/19/00	2000	171	2045	2100	0.37	45.00	0.50	0.37	0.74
06/20/00	06/21/00	2000	173	2045	15	0.24	23.50	3.75	0.17	0.06
06/22/00	06/22/00	2000	174	1445	1515	0.39	38.25	0.75	0.39	0.52
06/23/00	06/23/00	2000	175	2015	2345	0.22	28.75	3.75	0.19	0.06
06/24/00	06/24/00	2000	176	1645	1700	0.21	17.00	0.25	0.21	0.84
06/26/00	06/26/00	2000	178	1345	1645	0.61	44.50	3.25	0.37	0.19
06/29/00	06/29/00	2000	181	845	1215	0.71	63.75	3.75	0.62	0.19
07/01/00	07/01/00	2000	183	515	1130	0.81	40.75	6.5	0.33	0.12
07/04/00	07/04/00	2000	186	1900	2130	1.95	79.25	2.75	1.91	0.71
07/06/00	07/06/00	2000	188	1515	1545	0.26	41.5	0.75	0.26	0.35
misses data										
07/13/00	07/13/00	2000	195	1245	1345	0.34	na	1.25	0.32	0.27
07/15/00	07/15/00	2000	197	745	1530	1.98	45.25	8	1.55	0.25
07/21/00	07/21/00	2000	203	1415	1445	0.36	142.5	0.75	0.36	0.48
07/23/00	07/23/00	2000	205	1500	1600	0.46	48	1.25	0.31	0.37
07/24/00	07/24/00	2000	206	930	1530	0.67	17.25	6.25	0.19	0.11
07/26/00	07/26/00	2000	208	1930	2145	1.24	51.75	2.5	0.14	0.50

07/31/00	07/31/00	2000	213	1645	1730	1.99	114.75	1	1.99	1.99
07/31/00	07/31/00	2000	213	2200	2245	0.7	4.25	1	0.7	0.70

YEAR TWO

START DATE	END DATE	YEAR	DAY Julian	START TIME hhmm	STOP TIME hhmm	TOTAL RAIN (in)	INTER-EVENT (hrs)	DURA-TION (hrs)	MAX. INT, (in/hr)	AVG. INT, (in/hr)

Summary Data **Number of storms 49** **Total rain 33.98 inches**

	TOTAL RAIN (in)	INTER-EVENT (hrs)	DURATION (hrs)	MAX. INT, (in/hr)	AVG. INT, (in/hr)
Average	**0.69**	**163.02**	**3.30**	**0.45**	**0.36**
Median	**0.44**	**62.63**	**2.50**	**0.28**	**0.25**
Maximum	**2.91**	**1723.00**	**12.75**	**1.99**	**1.99**
Minimum	**0.16**	**0.00**	**0.25**	**0.09**	**0.04**
Std.Dev.	**0.57**	**278.01**	**3.04**	**0.43**	**0.34**
C.V.	**0.83**	**1.71**	**0.92**	**0.97**	**0.95**

c.v.=standard deviation/mean

Appendix B-3 Rainfall intensity, inter-event dry period, and storm duration calculated for individual storm events > than 0.4 cm (0.157 inches)

YEAR THREE (FOUR MONTHS)

START DATE	END DATE	YEAR	DAY Julian	START TIME hhmm	STOP TIME hhmm	TOTAL RAIN (in)	INTER-EVENT (hrs)	DURA-TION (hrs)	MAX. INT, (in/hr)	AVG. INT, (in/hr)
08/09/00	08/09/00	2000	222	1515	1845	0.16	216.25	3.75	0.02	0.04
08/12/00	08/12/00	2000	225	215	715	1.07	55.25	5.25	1.03	0.20
08/12/00	08/12/00	2000	225	1030	1545	1.17	3.25	5.25	0.57	0.22
08/13/00	08/13/00	2000	226	430	530	0.16	12.5	1.25	0.15	0.13
08/14/00	08/14/00	2000	227	1100	1130	0.18	29.5	0.5	0.18	0.36
08/15/00	08/15/00	2000	228	1200	1215	0.18	12.25	0.5	0.18	0.36
08/22/00	08/22/00	2000	235	1400	1515	0.53	169.5	1.5	0.52	0.35
08/26/00	08/26/00	2000	239	1645	2115	0.49	97.25	4.75	0.14	0.10
08/29/00	08/29/00	2000	242	1045	1230	1.18	61.25	2	0.75	0.59
09/01/00	09/01/00	2000	245	400	500	0.23	39.25	1.25	0.12	0.18
09/07/00	09/07/00	2000	251	1900	2245	1.96	157.75	4	1.32	0.49
09/17/00	09/17/00	2000	261	130	1515	2.04	218.75	18.5	0.73	0.11
09/19/00	09/19/00	2000	263	1900	2000	0.91	51.5	1.25	0.81	0.73
09/24/00	09/24/00	2000	268	1400	1630	1.16	113.75	2.75	1.12	0.42
11/10/00	11/10/00	2000	315	545	730	0.16	1117	2	0.09	0.08
11/25/00	11/25/00	2000	330	2030	2115	0.93	372.75	1	0.93	0.93
11/26/00	11/26/00	2000	331	930	1245	0.36	12	3.5	0.18	0.10

YEAR THREE (FOUR MONTHS)

START DATE	END DATE	YEAR	DAY Julian	START TIME hhmm	STOP TIME hhmm	TOTAL RAIN (in)	INTER-EVENT (hrs)	DURA-TION (hrs)	MAX. INT, (in/hr)	AVG. INT, (in/hr)
Summary Data			**Number of storms 17**			**Total rain 12.87**				
Average						**0.76**	**161.16**	**3.47**	**0.52**	**0.32**
Median						**0.53**	**61.25**	**2.00**	**0.52**	**0.22**
Maximum						**2.04**	**1117.00**	**18.50**	**1.32**	**0.93**
Minimum						**0.16**	**3.25**	**0.50**	**0.02**	**0.04**
Std.Dev.						**0.60**	**257.60**	**4.07**	**0.41**	**0.24**
C.V.						**0.79**	**1.60**	**1.17**	**0.79**	**0.76**

APPENDIX C

RUNOFF COEFFICIENTS FOR BASIN IN THE PARKING LOT

Appendix C-1. Runoff coefficients for eight basins in the Florida Aquarium Parking Lot Calculated for 33 rain events occurring between August 1, 1998 to August 1, 1999.

YEAR ONE

SAMPLE DATE	RAIN AMOUNT INCHES	ASPHALT WO/SWALE F1 cu feet	F2 cu feet	ASPHALT W/SWALE F7 cu feet	F8 cu feet	CONCRETE W/SWALE F3 cu feet	F4 cu feet	POROUS W/SWALE F5 cu feet	F6 cu feet
08/05/98	0.57	0.73	0.78	0.16	0.44	0.13	0.41	0.05	0.15
08/06/98	0.68	0.52	0.48	0.14	0.29	0.19	0.36	0.08	0.17
08/07/98	1.30	0.52	0.50	0.18	0.32	0.26	0.45	0.13	0.28
08/09/98	2.47	0.84	0.66	0.45	0.58	0.64	0.66	0.51	0.59
08/20/98	0.68	0.84	0.79	0.33	0.71	0.45	0.75	0.12	0.41
09/03/97	1.97	0.83	0.67	0.33	0.48	0.45	0.57	0.27	0.40
09/17/98	0.49	0.60	0.53	0.08	0.23	0.04	0.17	0.01	0.07
09/18/98	0.66	0.43	0.40	0.02	0.12	0.03	0.20	0.00	0.04
09/19/98	0.75	0.40	0.39	0.05	0.16	0.08	0.24	0.00	0.07
09/20/98	1.85	0.66	0.61	0.21	0.39	0.31	0.58	0.08	0.34
09/26/98	1.64	0.62	0.61	0.18	0.35	0.25	0.46	0.06	0.27
11/05/98	1.20	0.35	0.35	0.01	0.04	0.00	0.03	0.00	0.00
12/13/98	0.37	0.39	0.36	0.06	0.11	0.00	0.01	0.00	0.00
01/03/99	1.23	0.76	0.56	0.30	0.46	0.18	0.38	0.18	0.24
01/23/99	2.60	0.63	0.53	0.35	0.43	0.38	0.43	0.21	0.32
03/14/99	0.82	0.62	0.41	0.07	0.22	0.03	0.14	0.01	0.03
04/17/99	0.54	0.35	0.40	0.02	0.06	0.00	0.00	0.00	0.00
05/11/99	0.17	0.49	0.36	0.02	0.04	0.00	0.00	0.00	0.00
05/14/99	0.28	0.44	0.34	0.03	0.11	0.01	0.01	0.00	0.00
05/21/99	1.36	0.56	0.47	0.14	0.34	0.14	0.25	0.02	0.14
05/30/99	0.39	0.69	0.64	0.05	0.29	0.02	0.06	0.00	0.01
06/05/99	0.44	0.30	0.26	0.04	0.10	0.02	0.02	0.00	0.00
06/09/99	0.81	0.57	0.53	0.11	0.31	0.09	0.22	0.01	0.08
06/12/99	0.12	0.53	0.33	0.05	0.07	0.00	0.00	0.00	0.00
06/13/99	1.32	0.73	0.64	0.29	0.53	0.37	0.51	0.19	0.36
06/16/99	1.68	0.79	0.60	0.33	0.57	0.53	0.56	0.26	0.44
06/17/99	0.77	0.64	0.51	0.15	0.38	0.29	0.37	0.07	0.21
06/18/99	1.40	0.97	0.86	0.45	0.78	0.66	0.67	0.39	0.53
07/01/99	1.53	0.47	0.40	0.13	0.28	0.20	0.26	0.05	0.15
07/07/99	0.81	0.47	0.42	0.07	0.26	0.08	0.19	0.01	0.07
07/09/99	1.17	0.59	0.41	0.18	0.36	0.35	0.33	0.12	0.23
07/14/99	1.58	0.43	0.36	0.03	0.20	0.04	0.13	0.00	0.02
07/20/99	0.88	0.43	0.40	0.06	0.23	0.06	0.17	0.01	0.05
TOTALS	inches 34.53								
STATISTICS									
Average	1.05	0.58	0.50	0.15	0.31	0.19	0.29	0.09	0.17
Median	0.82	0.57	0.48	0.13	0.29	0.13	0.25	0.02	0.14
maximum	2.60	0.97	0.86	0.45	0.78	0.66	0.75	0.51	0.59
Stddev	0.62	0.18	0.17	0.13	0.19	0.19	0.22	0.12	0.17
c.v.	0.59	0.31	0.33	0.83	0.60	1.01	0.76	1.44	0.98

Appendix C-2. coefficients for eight basins in the Florida Aquarium Parking Lot
Calculated for 33 rain events occurring between August 1, 1999 to August 1, 2000.

YEAR TWO

SAMPLE DATE	RAIN AMOUNT INCHES	ASPHALT WO/SWALE F1 cu feet	ASPHALT WO/SWALE F2 cu feet	ASPHALT W/SWALE F7 cu feet	ASPHALT W/SWALE F8 cu feet	CONCRETE W/SWALE F3 cu feet	CONCRETE W/SWALE F4 cu feet	POROUS W/SWALE F5 cu feet	POROUS W/SWALE F6 cu feet
08/06/99	1.29	0.49	0.43	0.15	0.31	0.17	0.26	0.06	0.15
08/12/99	0.70	0.59	0.45	0.11	0.35	0.14	0.30	0.02	0.12
08/15/99	1.23	0.67	0.46	0.29	0.47	0.44	0.42	0.16	0.33
08/19/99	0.90	0.76	0.64	0.23	0.56	0.37	0.48	0.11	0.31
08/22/99	2.95	0.78	0.67	0.35	0.74	0.65	0.72	0.45	0.72
09/11/99	0.84	0.47	0.44	0.07	0.24	0.03	0.17	0.07	0.17
09/18/99	0.85	0.27	0.24	0.02	0.10	0.00	0.02	0.00	0.00
09/25/99	1.37	0.38	0.46	0.31	0.39	0.30	0.36	0.12	0.25
10/03/99	1.22	0.56	0.48	0.19	0.34	0.16	0.31	0.04	0.17
10/04/99	0.98	0.28	0.21	0.01	0.12	0.02	0.15	0.00	0.00
11/01/99	1.63	0.60	0.46	0.18	0.37	0.16	0.30	0.03	0.13
12/17/99	0.75	0.27	0.16	0.00	0.02	0.00	0.01	0.00	0.00
01/06/00	0.79	0.22	0.43	0.09	0.31	0.05	0.21	0.01	0.05
01/24/00	0.68	0.36	0.28	0.00	0.10	0.00	0.09	0.00	0.00
01/31/00	0.70	0.41	0.35	0.02	0.18	0.00	0.13	0.00	0.00
06/13/00	1.29	0.64	0.60	0.05	0.16	0.05	0.28	0.04	0.13
06/22/00	0.39	0.36	0.26	0.01	0.05	0.00	0.02	0.01	0.00
06/*/00**	1.39	0.16	0.23	0.01	0.09	0.00	0.08	0.01	0.00
06/29/00	0.71	0.57	0.51	0.07	0.26	0.06	0.24	0.04	0.07
07/01/00	0.81	0.58	0.47	0.04	0.21	0.03	0.22	0.02	0.03
07/04/00	1.95	0.73	0.66	0.35	0.59	0.55	0.59	0.35	0.37
07/08/00	1.07	0.66	0.58	0.10	0.39	0.13	0.40	0.10	0.18
07/15/00	1.98	0.72	0.65	0.36	0.53	0.46	0.47	0.26	0.31
07/26/00	1.24	0.38	0.25	0.07	0.15	0.02	0.15	0.01	0.03
07/31/00	2.69	0.72	0.51	0.53	0.34	0.57	0.44	0.56	0.34
TOTALS	inches 30.4								
STATISTICS									
Average	1.22	0.51	0.44	0.14	0.30	0.17	0.27	0.10	0.15
Median	1.07	0.56	0.46	0.09	0.31	0.06	0.26	0.04	0.13
maximum	2.95	0.78	0.67	0.53	0.74	0.65	0.72	0.56	0.72
Stddev	0.61	0.18	0.15	0.15	0.18	0.20	0.18	0.15	0.17
c.v.	0.50	0.36	0.34	1.00	0.63	1.18	0.66	1.49	1.09

*** June 27 and 28, 2000

7/8/00 F7 & F8 and 7/15/00 F1 & F2 substituted comparable storm for missing data

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APPENDIX D

RUNOFF AMOUNTS
FOR BASINS IN THE PARKING LOT

Appendix D-1. Runoff amounts (cubic feet) for eight basins in the Florida Aquarium Parking Lot Calculated for 33 rain events occurring between August 1, 1998 to August 1, 1999.

YEAR ONE

SAMPLE DATE	RAIN AMOUNT INCHES	ASPHALT WO/SWALE F1 cu feet	F2 cu feet	ASPHALT W/SWALE F7 cu feet	F8 cu feet	CONCRETE W/SWALE F3 cu feet	F4 cu feet	POROUS W/SWALE F5 cu feet	F6 cu feet
08/05/98	0.57	391	417	75	238	61	221	25	83
08/06/98	0.68	331	310	80	189	110	228	44	112
08/07/98	1.30	638	610	191	396	281	554	141	338
08/09/98	2.47	1955	1535	934	1351	1324	1545	1059	1366
08/20/98	0.68	539	509	189	458	254	481	66	*260*
09/03/97	1.97	1539	1239	538	890	744	1064	442	742
09/17/98	0.49	276	246	33	107	17	77	3	32
09/18/98	0.66	266	248	9	74	16	127	0	23
09/19/98	0.75	281	274	30	112	51	171	0	51
09/20/98	1.85	1161	1064	320	673	474	1012	119	595
09/26/98	1.64	959	949	250	540	337	711	79	419
11/05/98	1.20	395	400	10	40	0	34	0	0
12/13/98	0.37	137	125	20	39	1	3	0	0
01/03/99	1.23	877	649	306	532	181	436	185	276
01/23/99	2.60	1552	1299	754	1049	833	1047	454	788
03/14/99	0.82	476	320	48	168	20	106	4	20
04/17/99	0.54	179	204	8	33	0	1	0	0
05/11/99	0.17	78	57	3	6	0	0	0	0
05/14/99	0.28	117	90	8	29	2	2	0	0
05/21/99	1.36	718	598	164	440	164	321	19	183
05/30/99	0.39	254	236	18	106	8	23	0	3
06/05/99	0.44	125	108	15	40	7	9	1	2
06/09/99	0.81	439	401	72	238	63	172	6	64
06/12/99	0.12	60	37	5	8	0	0	0	0
06/13/99	1.32	911	802	314	659	405	640	207	449
06/16/99	1.68	1256	957	457	903	748	887	359	694
06/17/99	0.77	468	374	95	278	185	268	44	154
06/18/99	1.40	1286	1134	529	1030	777	887	460	696
07/01/99	1.53	684	581	160	405	250	377	63	218
07/07/99	0.81	358	321	49	195	56	145	5	53
07/09/99	1.17	657	450	180	398	344	369	113	258
07/14/99	1.58	635	540	45	297	48	192	4	28
07/20/99	0.88	357	331	47	190	47	138	4	44
TOTALS	inches	cu feet	cu feet	cu feet	cu feet	cu feet	cu feet	cu feet	cu feet
	34.53	20,356	17,416	5,955	12,110	7,808	12,247	3,906	7,950
STATISTICS									
Average	1.05	617	528	180	367	237	371	118	241
Median	0.82	468	401	75	238	63	221	19	83
maximum	2.60	1955	1535	934	1351	1324	1545	1059	1366
Stddev	0.62	472	386	227	346	315	391	216	315
c.v.	0.59	0.76	0.72	1.26	0.94	1.33	1.05	1.83	1.31

	F1	F2	F7	F8	F3	F4	F5	F6
BASIN SIZE								
acres	0.26	0.26	0.24	0.26	0.23	0.26	0.23	0.26
YEARLY RUNOFF FOR SAMPLES TAKEN								
(ft3/ac)	78,914	67,733	24,812	46,577	33,948	47,102	16,982	30,578
YEARLY RUNOFF IF ALL STORMS > 0.40 CM (0.15 IN) HAD RUNOFF AND HAD BEEN SAMPLED (18% MORE RAIN INCLUDED)								
(ft3/ac)	93,119	79,925	29,278	54,961	40,059	55,581	20,039	36,082
YEARLY RUNOFF IF NORMAL RAINFALL YEAR AND ALL STORMS HAD RUNOFF=32% MORE RAIN								
(ft3/ac)	104,167	89,408	32,752	61,482	44,812	62,175	22,417	40,362

Appendix D-2. Runoff amounts (cubic feet) for eight basins in the Florida Aquarium Parking Lot Calculated for 33 rain events occurring between Aug. 1, 1999 to Aug 1, 2000

YEAR TWO

SAMPLE DATE	RAIN AMOUNT INCHES	ASPHALT WO/SWALE F1 cu feet	ASPHALT WO/SWALE F2 cu feet	ASPHALT W/SWALE F7 cu feet	ASPHALT W/SWALE F8 cu feet	CONCRETE W/SWALE F3 cu feet	CONCRETE W/SWALE F4 cu feet	POROUS W/SWALE F5 cu feet	POROUS W/SWALE F6 cu feet
08/06/99	1.29	601	529	168	383	180	311	62	185
08/12/99	0.70	392	299	68	233	80	199	12	77
08/15/99	1.23	778	538	313	542	456	488	160	387
08/19/99	0.90	644	547	178	474	276	406	81	262
08/22/99	2.95	2183	1872	897	2053	1611	2006	1119	2015
09/11/99	0.84	370	345	50	192	49	138	19	23
09/18/99	0.40	220	190	12	77	0	16	0	0
09/25/99	1.37	489	595	367	509	340	468	136	319
10/03/99	1.22	641	551	206	395	161	355	45	191
10/04/99	0.98	263	197	11	115	16	137	0	0
11/01/99	1.63	922	713	255	574	215	457	47	197
12/17/99	0.75	192	115	0	15	0	5	0	0
01/06/00	0.79	162	321	62	229	31	154	7	38
01/24/00	0.68	230	180	0	64	0	60	0	0
01/31/00	0.70	270	233	11	122	0	89	0	0
06/13/00	1.29	784	734	57	191	55	344	43	160
06/22/00	0.39	131	97	2	20	0	6	2	0
06/*/00**	1.39	210	306	10	121	2	102	6	2
06/29/00	0.71	385	344	41	177	37	158	24	45
07/01/00	0.81	441	363	29	160	17	170	14	25
07/04/00	1.95	1348	1222	600	1087	892	1093	574	680
07/08/00	1.07	665	590	95	398	115	404	90	182
07/15/00	1.98	1348	1222	624	992	753	870	429	585
07/26/00	1.24	446	293	76	172	23	177	9	35
07/31/00	2.69	1836	1286	1251	1289	1269	1125	999	856
TOTALS	inches	cu feet	cu feet	cu feet	cu feet	cu feet	cu feet	cu feet	cu feet
	30.4	15951	13682	5383	10584	6578	9738	3878	6264
STATISTICS									
Average	1.22	638	547	212	408	262	390	127	255
Median	1.07	446	363	62	192	55	199	43	138
maximum	2.95	2183	1872	1251	2053	1611	2006	1119	2015
Stddev	0.61	519	424	311	474	419	447	246	424
c.v.	0.50	0.81	0.78	1.47	1.16	1.60	1.15	1.93	1.66
BASIN SIZE									
acres		0.26	0.26	0.24	0.26	0.23	0.26	0.23	0.26
YEARLY RUNOFF FOR SAMPLES TAKEN									
(ft3/ac)		61,350	52,623	22,079	39,235	28,470	37,454	13,830	24,535
YEARLY RUNOFF IF ALL STORMS > 0.40 CM (0.15 IN) HAD RUNOFF AND HAD BEEN SAMPLED (20% MORE RAIN INCLUDED)									
(ft3/ac)		73,620	63,148	26,495	47,082	34,163	44,945	16,597	29,442
YEARLY RUNOFF IF NORMAL RAINFALL YEAR AND ALL STORMS HAD RUNOFF (40% MORE RAIN)									
(ft3/ac)		85,890	73,672	30,911	54,928	39,857	52,435	19,363	34,348

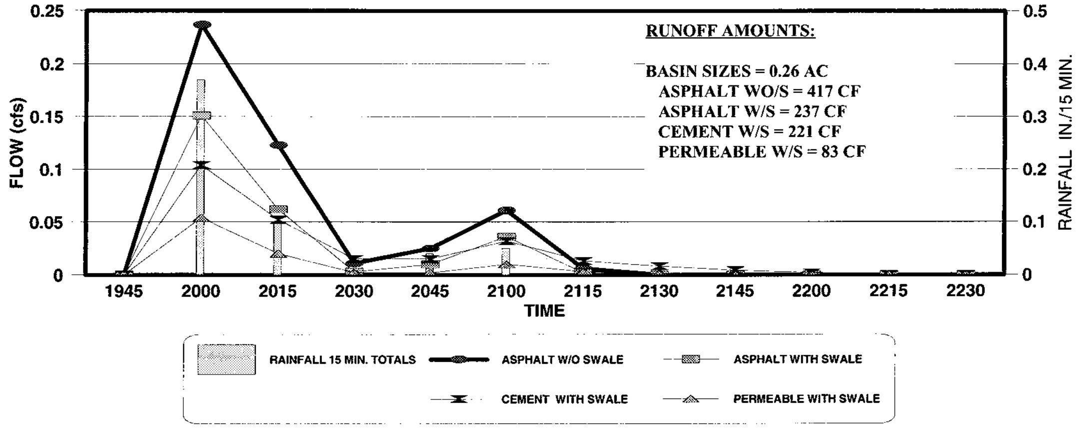
*** June 27 and 28, 2000

7/8/00 F7 & F8 and 7/15/00 F1 & F2 substituted comparable storm for missing data

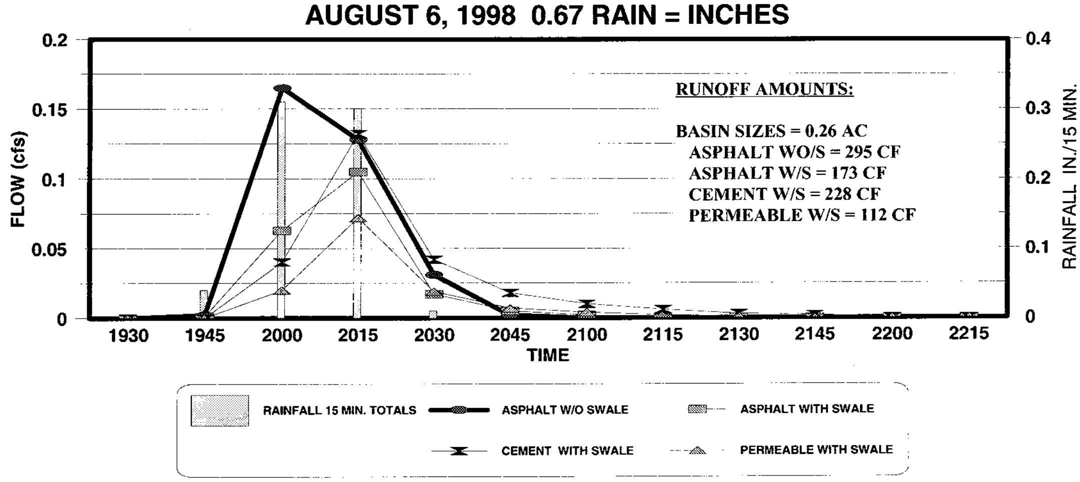
APPENDIX E

HYDROGRAPHS
FOR EVEN NUMBERED BASINS IN THE PARKING LOT

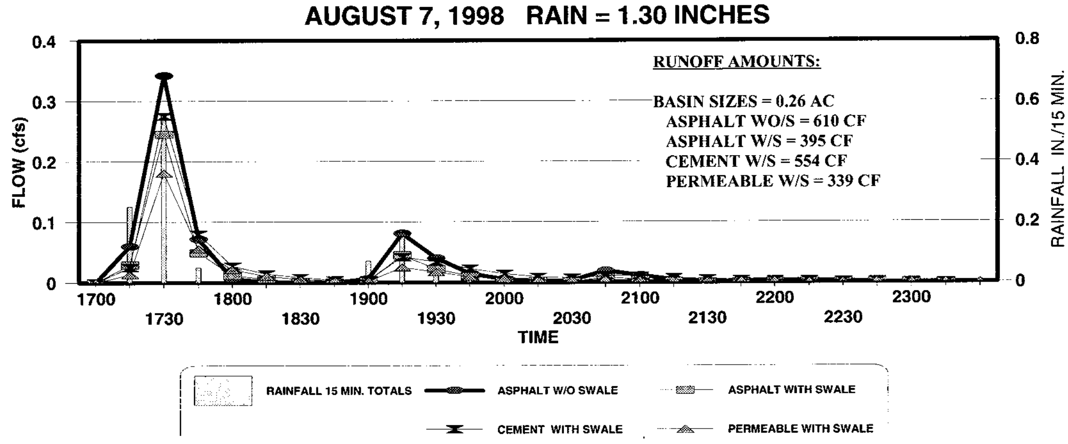
COMPARISON OF PAVING TYPES
AUGUST 5, 1998 RAIN = 0.56 INCHES



COMPARISON OF PAVING TYPES
AUGUST 6, 1998 0.67 RAIN = INCHES

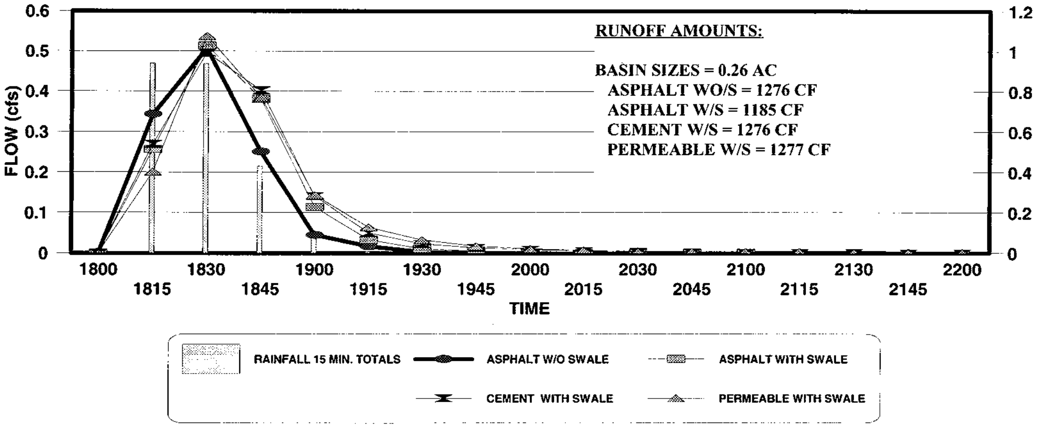


COMPARISON OF PAVING TYPES
AUGUST 7, 1998 RAIN = 1.30 INCHES



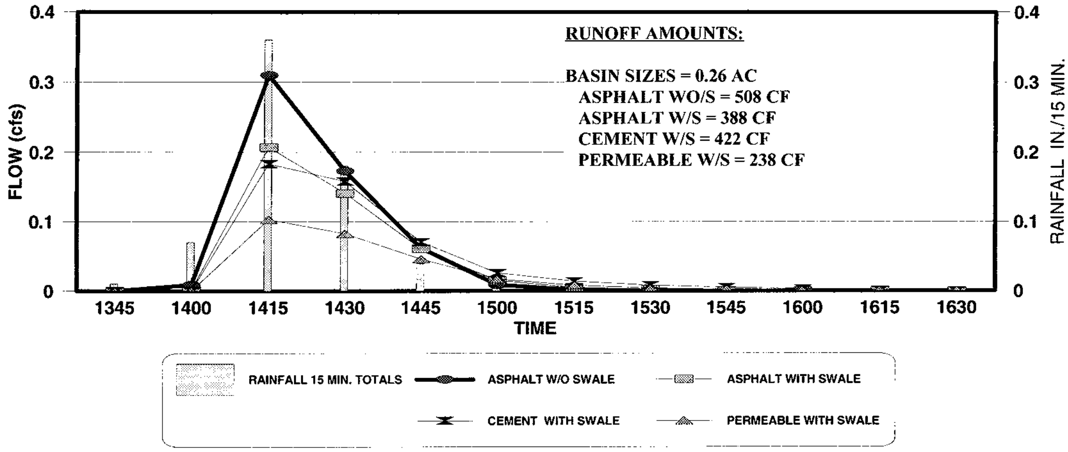
COMPARISON OF PAVING TYPES

AUGUST 9, 1998 RAIN = 2.47 INCHES



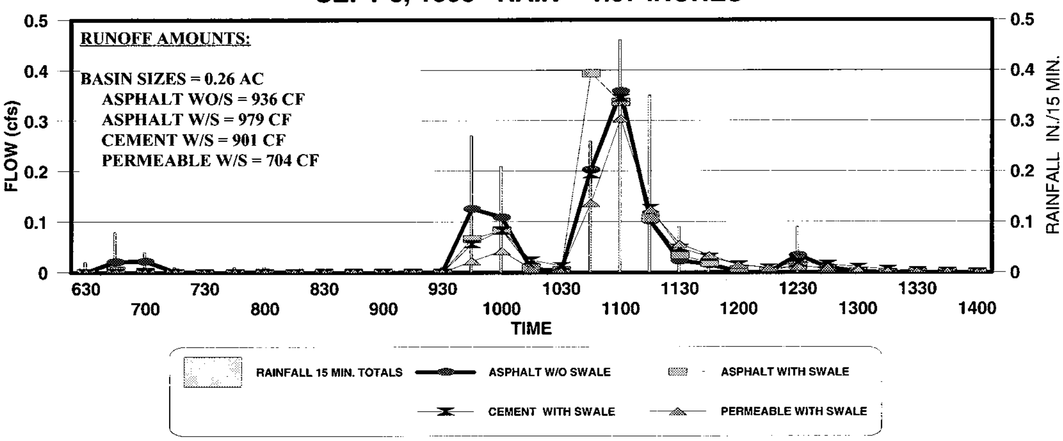
COMPARISON OF PAVING TYPES

AUGUST 20, 1998 RAIN = 0.68 INCHES

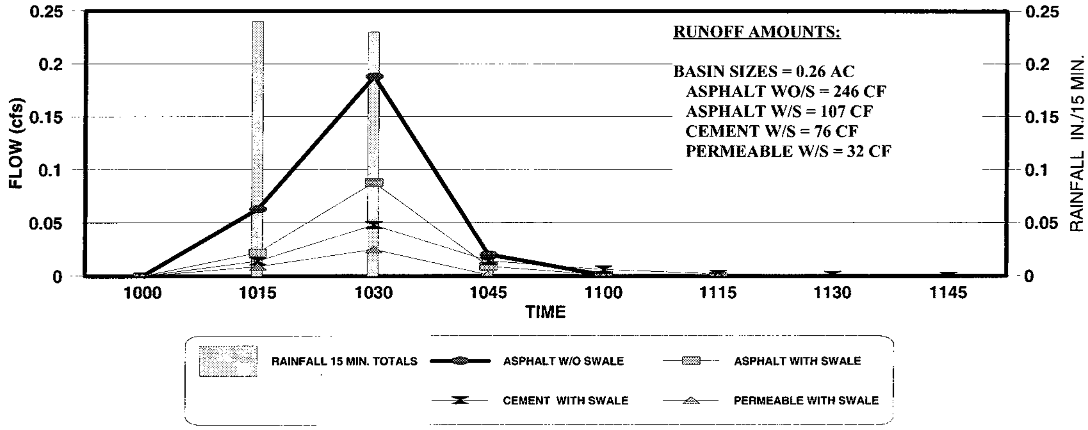


COMPARISON OF PAVING TYPES

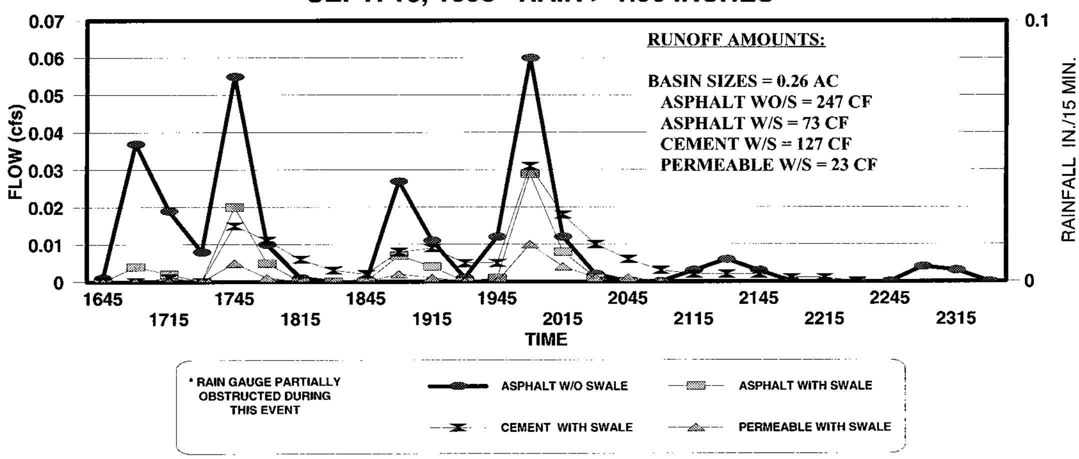
SEPT 3, 1998 RAIN = 1.97 INCHES



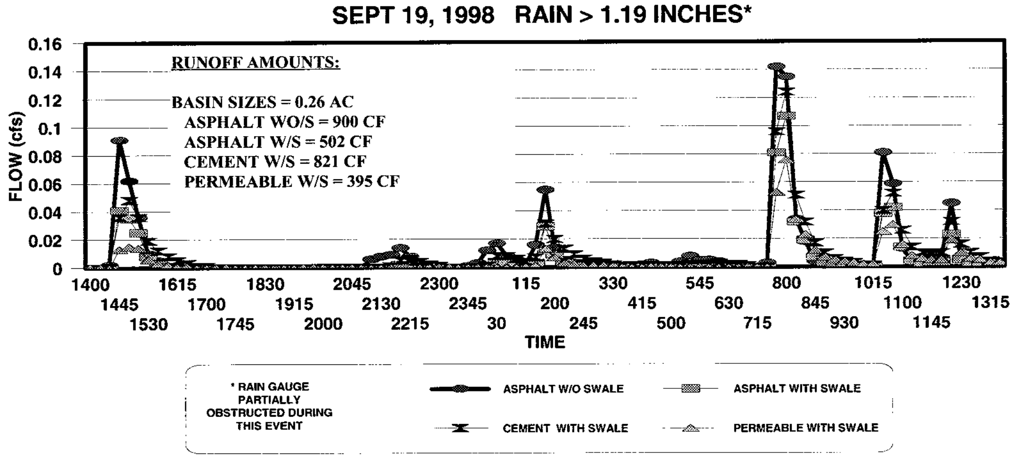
COMPARISON OF PAVING TYPES
SEPTEMBER 17, 1998 RAIN= 0.68 INCHES



COMPARISON OF PAVING TYPES
SEPT. 18, 1998 RAIN > 1.96 INCHES*

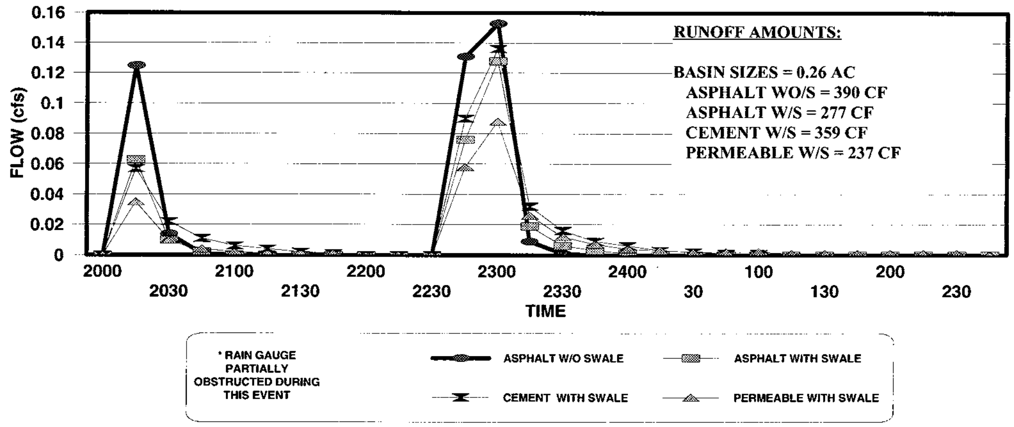


COMPARISON OF PAVING TYPES
SEPT 19, 1998 RAIN > 1.19 INCHES*



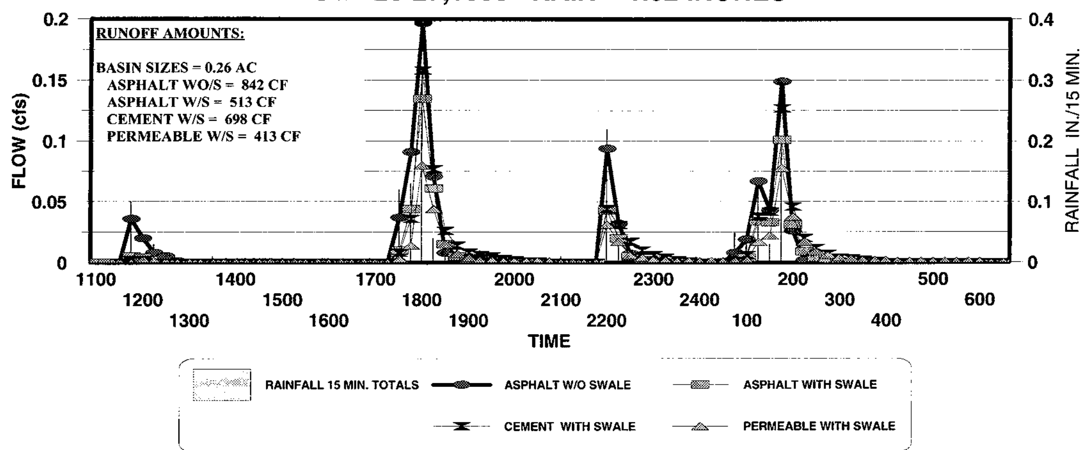
COMPARISON OF PAVING TYPES

SEPT 20, 1998   RAIN >1.85 INCHES*



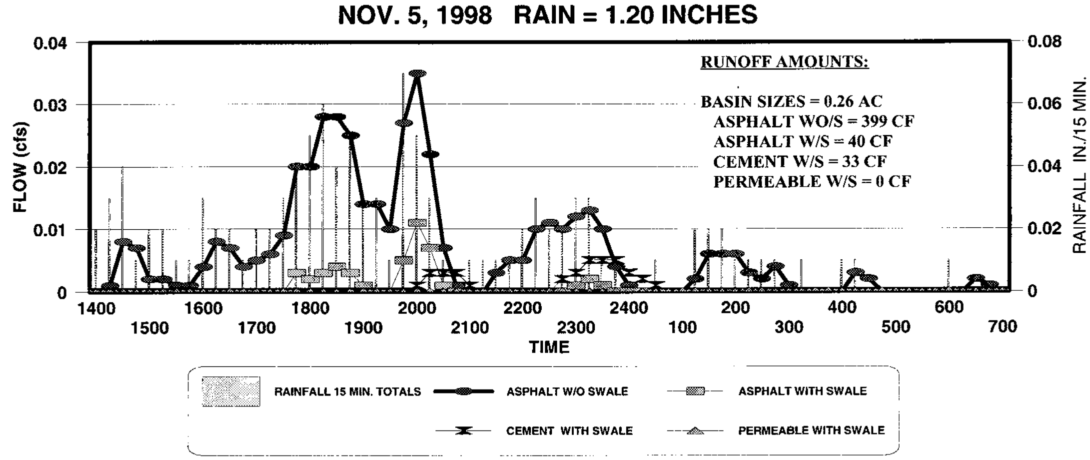
COMPARISON OF PAVING TYPES

SEP 26-27,1998   RAIN = 1.52 INCHES

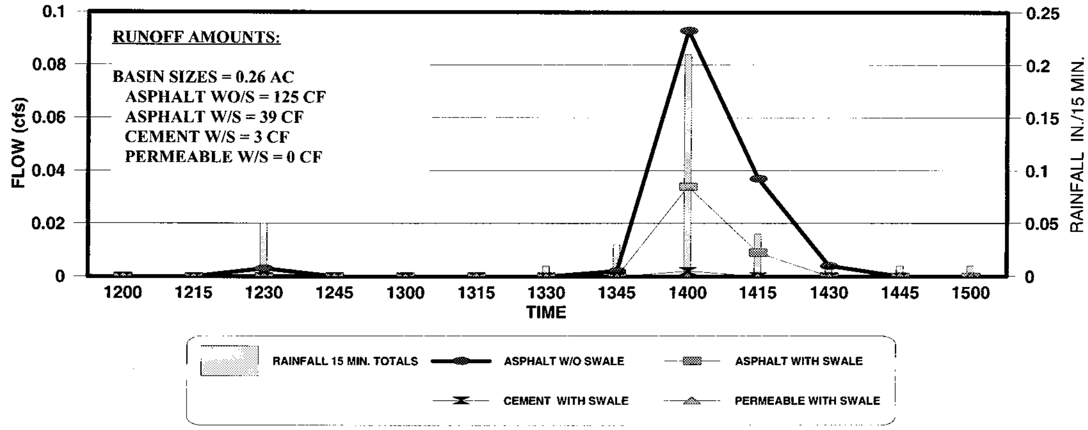


COMPARISON OF PAVING TYPES

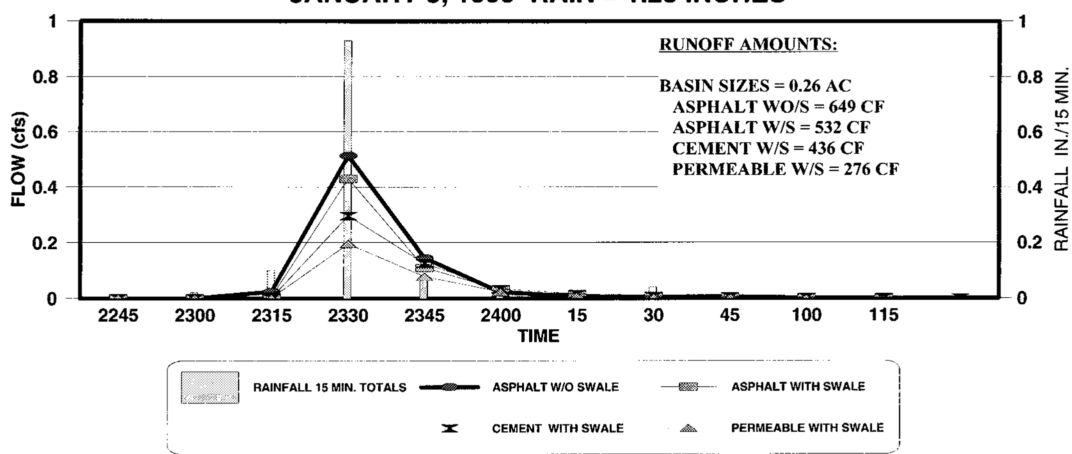
NOV. 5, 1998   RAIN = 1.20 INCHES



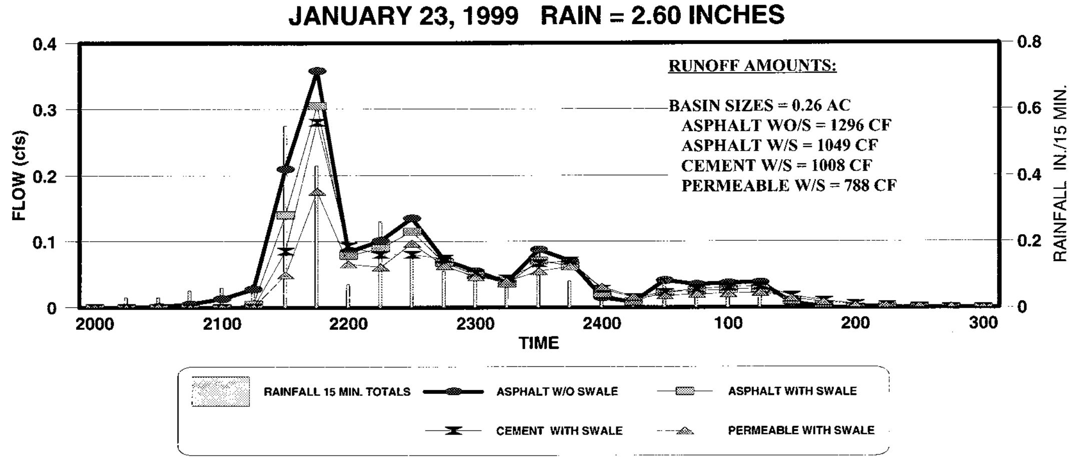
COMPARISON OF PAVING TYPES
DEC 13, 1998 RAIN = 0.37 INCHES



COMPARISON OF PAVING TYPES
JANUARY 3, 1999 RAIN = 1.23 INCHES



COMPARISON OF PAVING TYPES
JANUARY 23, 1999 RAIN = 2.60 INCHES



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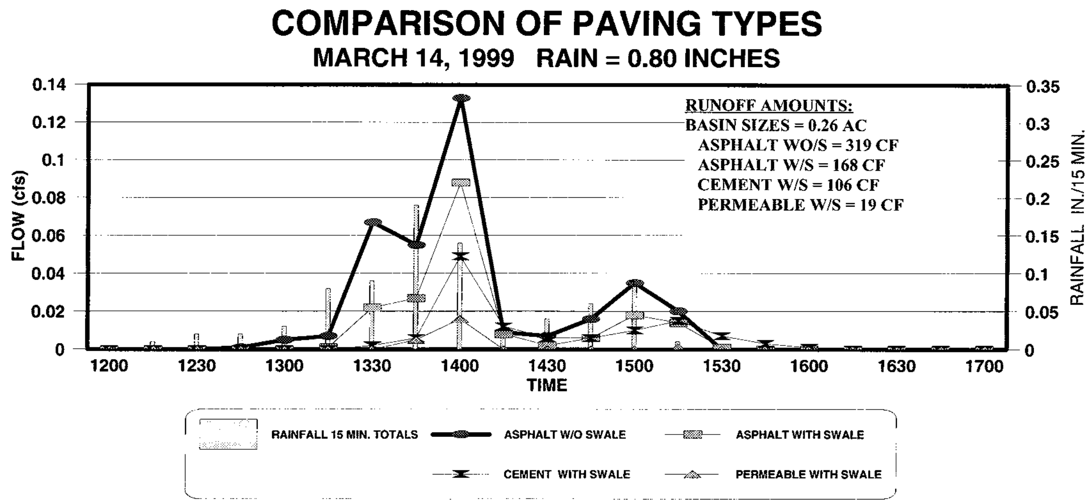
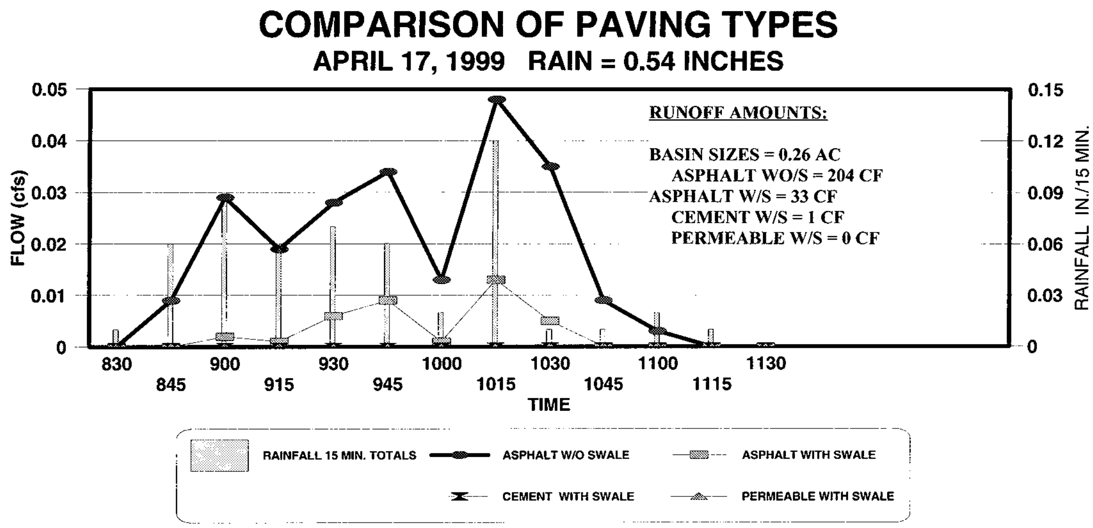
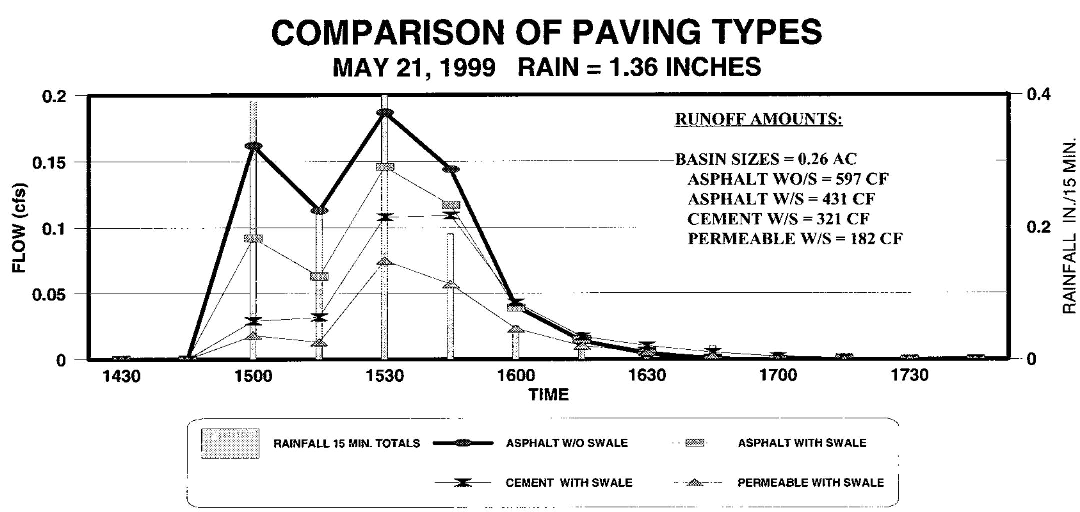
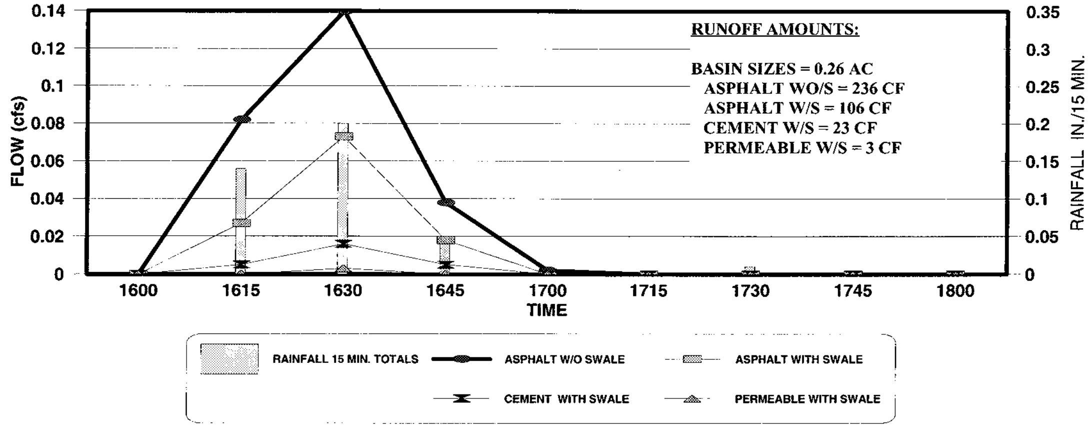

COMPARISON OF PAVING TYPES
MARCH 14, 1999 RAIN = 0.80 INCHES
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 319 CF
ASPHALT W/S = 168 CF
CEMENT W/S = 106 CF
PERMEABLE W/S = 19 CF
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE

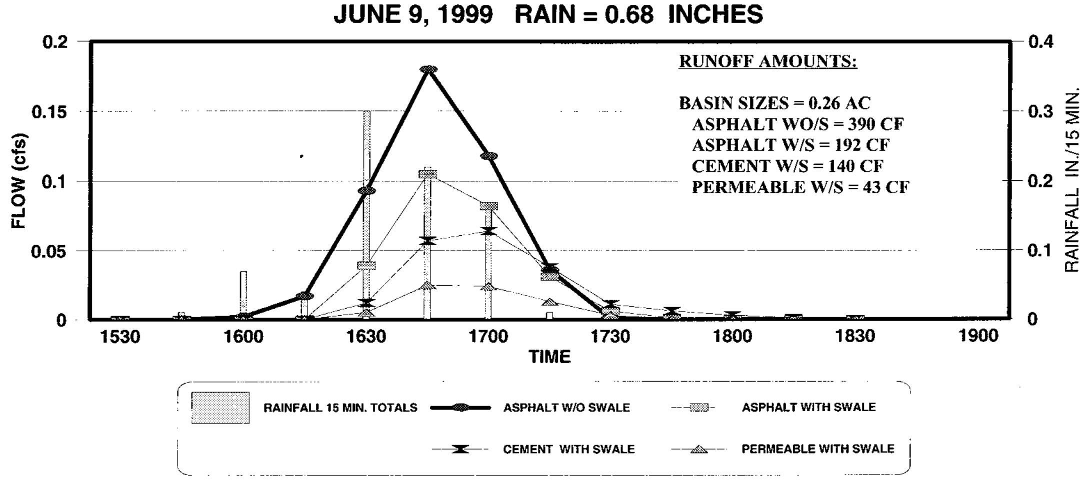

COMPARISON OF PAVING TYPES
APRIL 17, 1999 RAIN = 0.54 INCHES
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 204 CF
ASPHALT W/S = 33 CF
CEMENT W/S = 1 CF
PERMEABLE W/S = 0 CF
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE


COMPARISON OF PAVING TYPES
MAY 21, 1999 RAIN = 1.36 INCHES
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 597 CF
ASPHALT W/S = 431 CF
CEMENT W/S = 321 CF
PERMEABLE W/S = 182 CF
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE

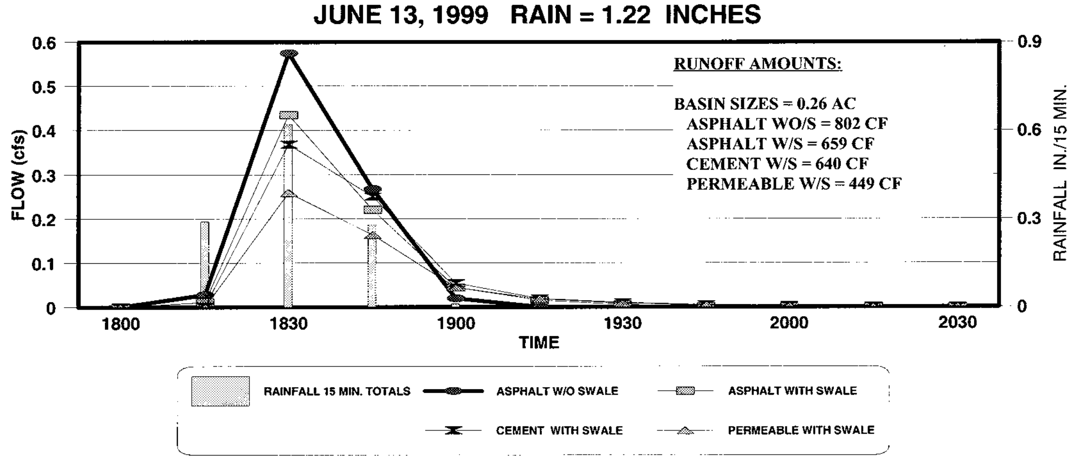
COMPARISON OF PAVING TYPES
MAY 30, 1999 RAIN = 0.39 INCHES



COMPARISON OF PAVING TYPES
JUNE 9, 1999 RAIN = 0.68 INCHES

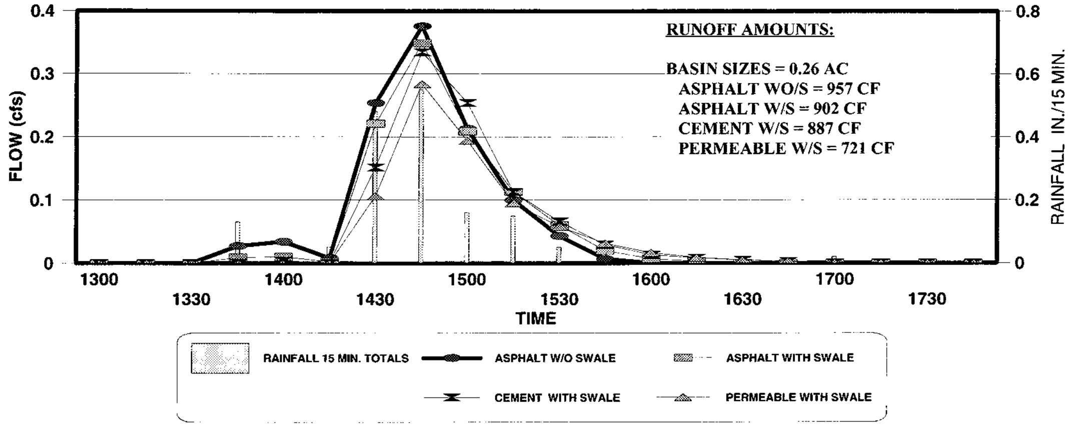


COMPARISON OF PAVING TYPES
JUNE 13, 1999 RAIN = 1.22 INCHES



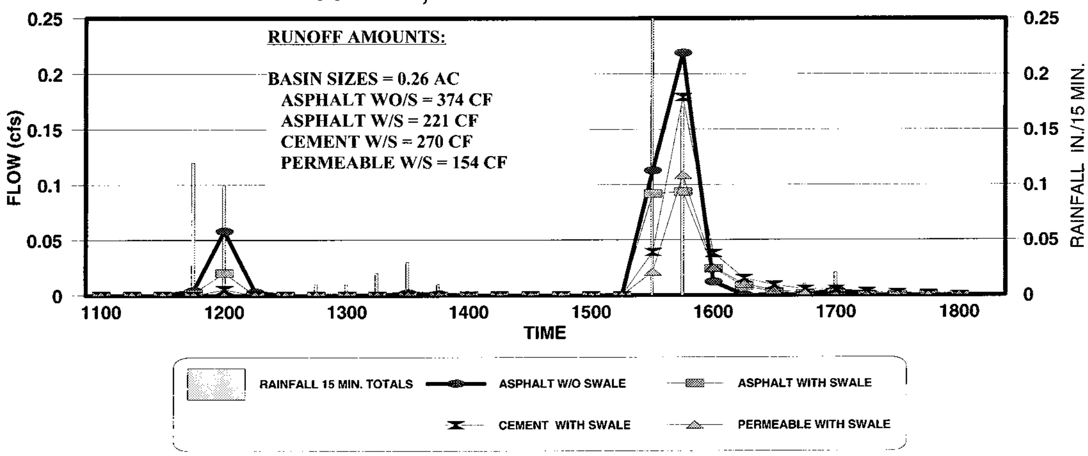
COMPARISON OF PAVING TYPES

JUNE 16, 1999 RAIN = 1.68 INCHES



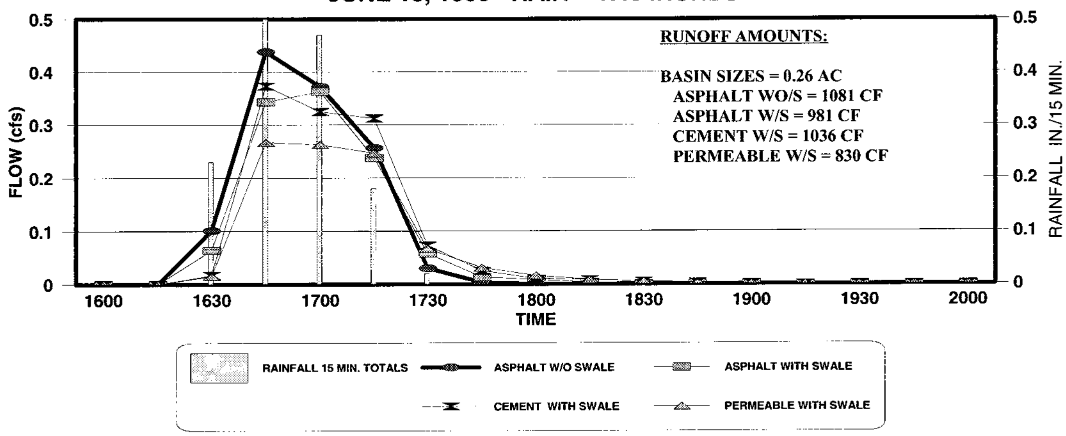
COMPARISON OF PAVING TYPES

JUNE 17, 1999 RAIN = 0.77 INCHES



COMPARISON OF PAVING TYPES

JUNE 18, 1999 RAIN = 1.40 INCHES



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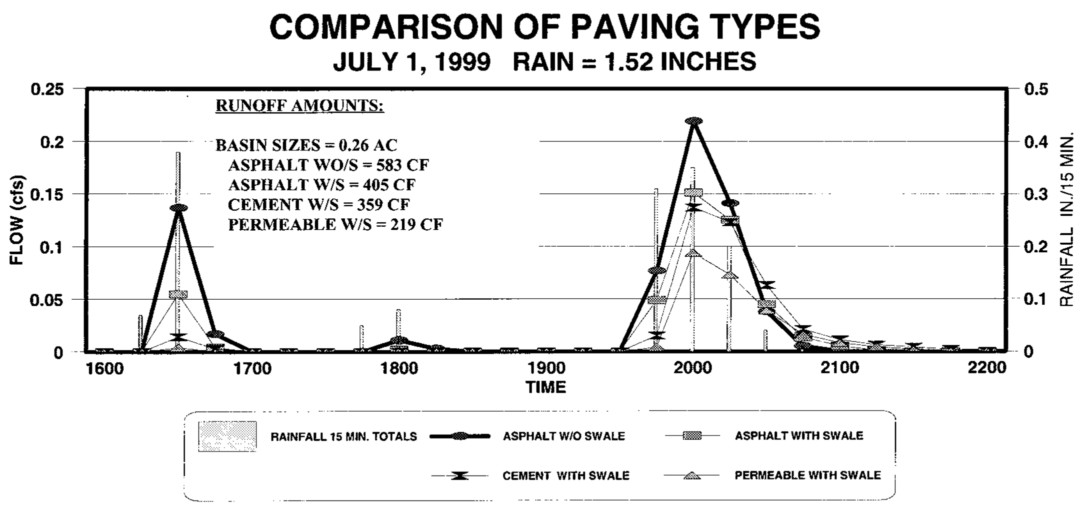
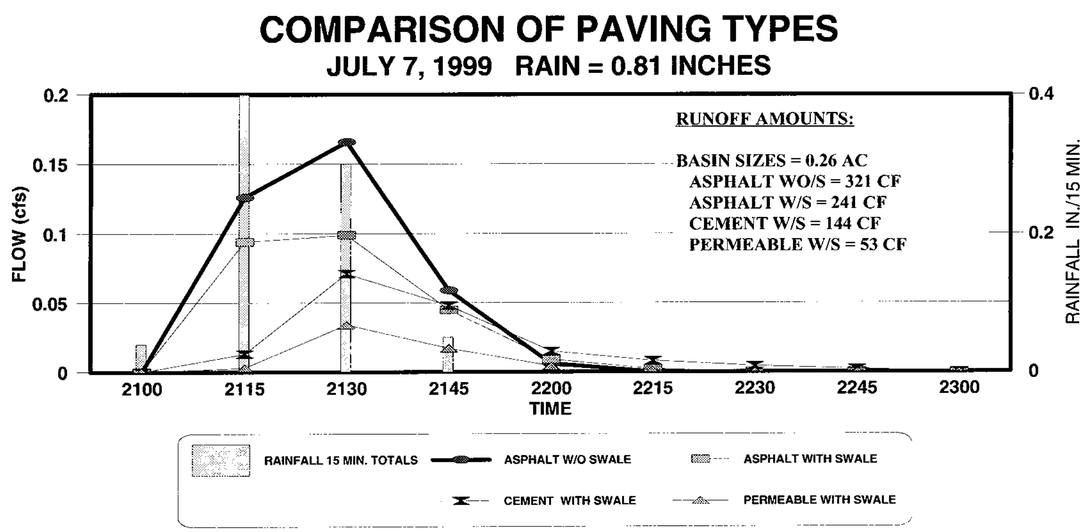
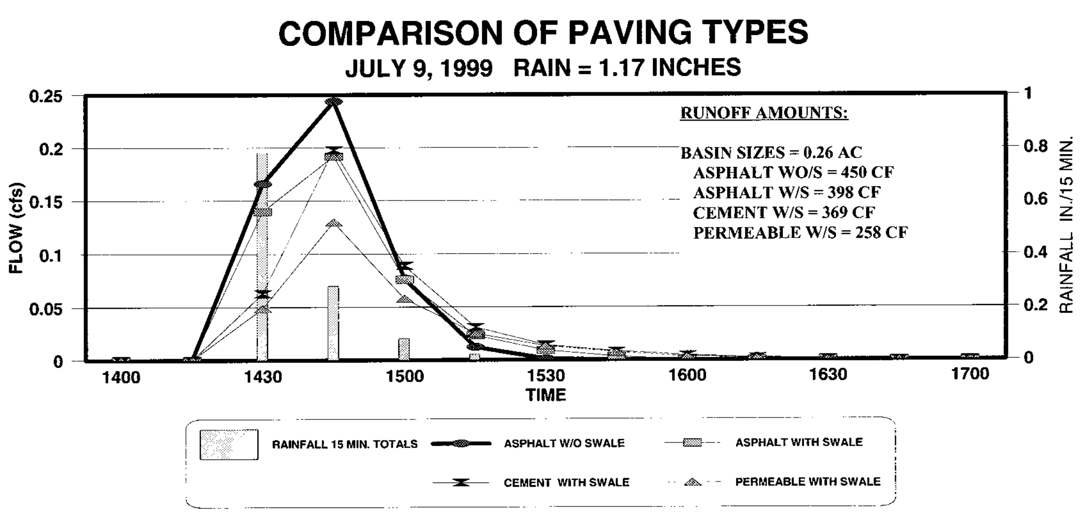


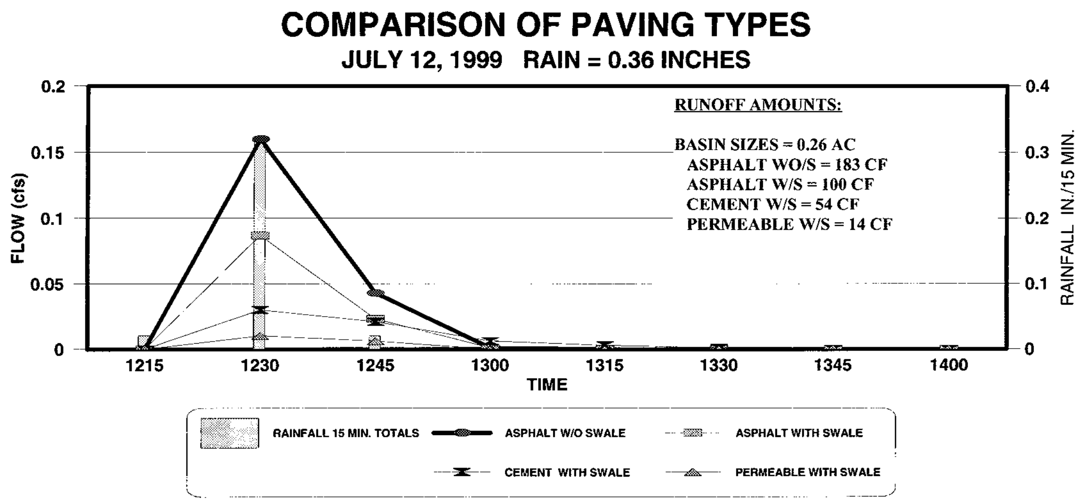
COMPARISON OF PAVING TYPES
JULY 1, 1999 RAIN = 1.52 INCHES
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 583 CF
ASPHALT W/S = 405 CF
CEMENT W/S = 359 CF
PERMEABLE W/S = 219 CF
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE

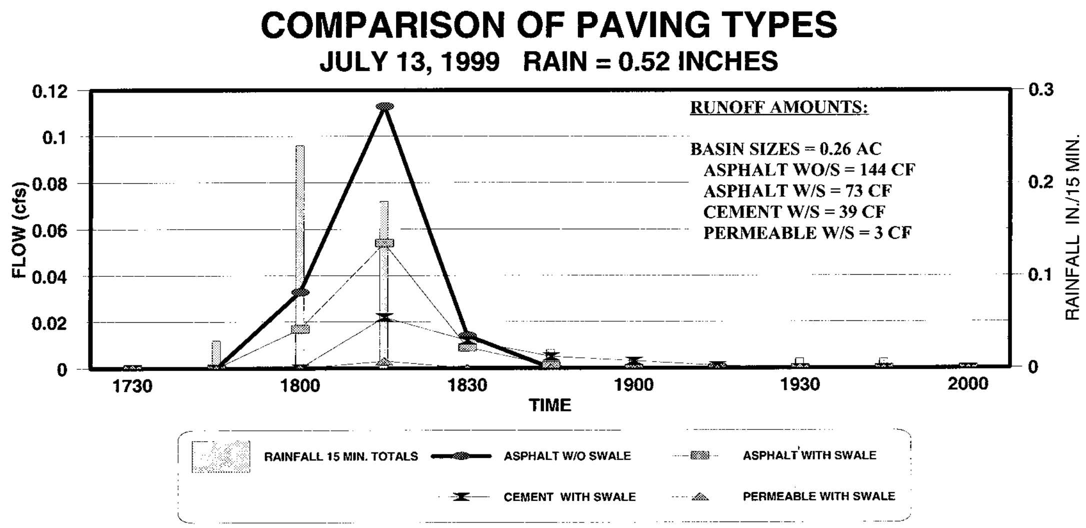


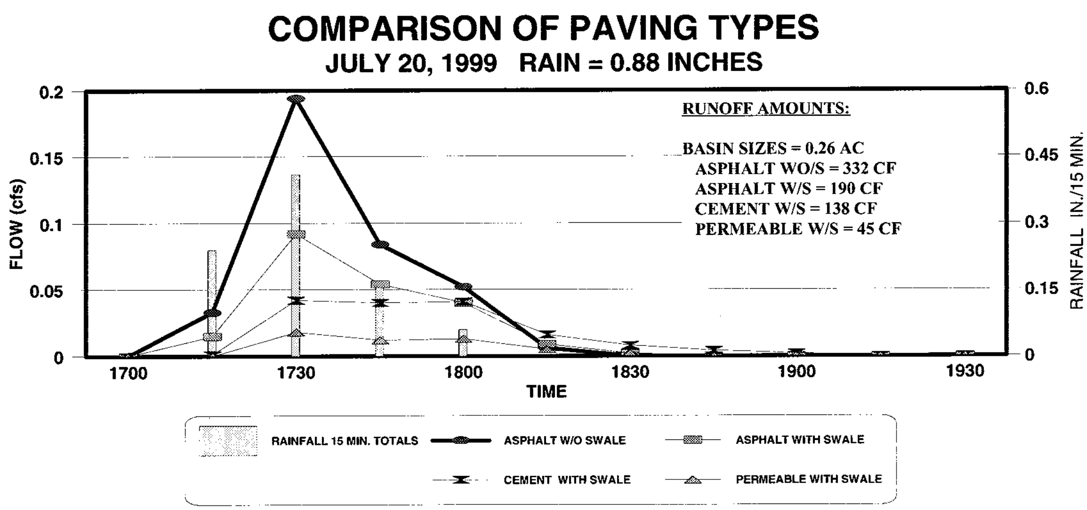
COMPARISON OF PAVING TYPES
JULY 7, 1999 RAIN = 0.81 INCHES
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 321 CF
ASPHALT W/S = 241 CF
CEMENT W/S = 144 CF
PERMEABLE W/S = 53 CF
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE



COMPARISON OF PAVING TYPES
JULY 9, 1999 RAIN = 1.17 INCHES
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 450 CF
ASPHALT W/S = 398 CF
CEMENT W/S = 369 CF
PERMEABLE W/S = 258 CF
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE

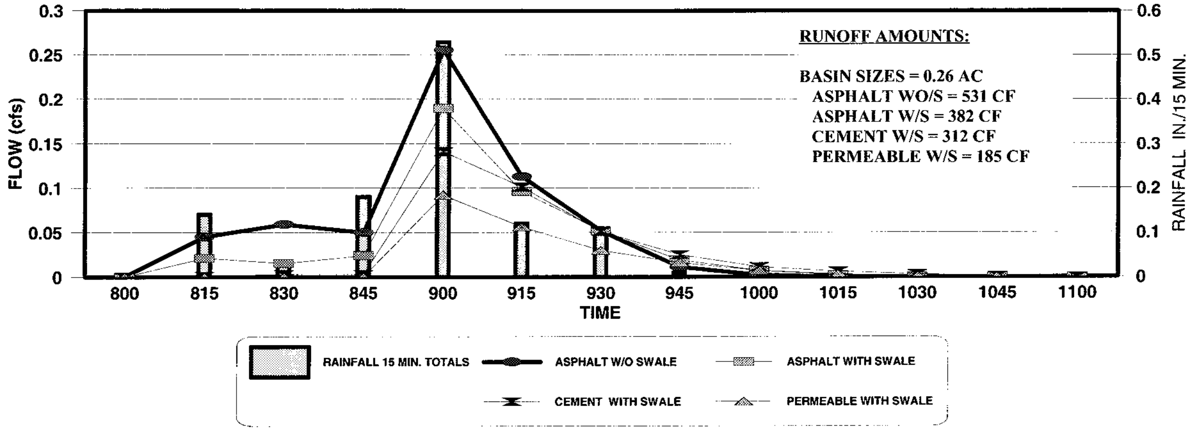

COMPARISON OF PAVING TYPES
JULY 12, 1999 RAIN = 0.36 INCHES
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 183 CF
ASPHALT W/S = 100 CF
CEMENT W/S = 54 CF
PERMEABLE W/S = 14 CF
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE


COMPARISON OF PAVING TYPES
JULY 13, 1999 RAIN = 0.52 INCHES
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 144 CF
ASPHALT W/S = 73 CF
CEMENT W/S = 39 CF
PERMEABLE W/S = 3 CF
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE


COMPARISON OF PAVING TYPES
JULY 20, 1999 RAIN = 0.88 INCHES
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 332 CF
ASPHALT W/S = 190 CF
CEMENT W/S = 138 CF
PERMEABLE W/S = 45 CF
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE

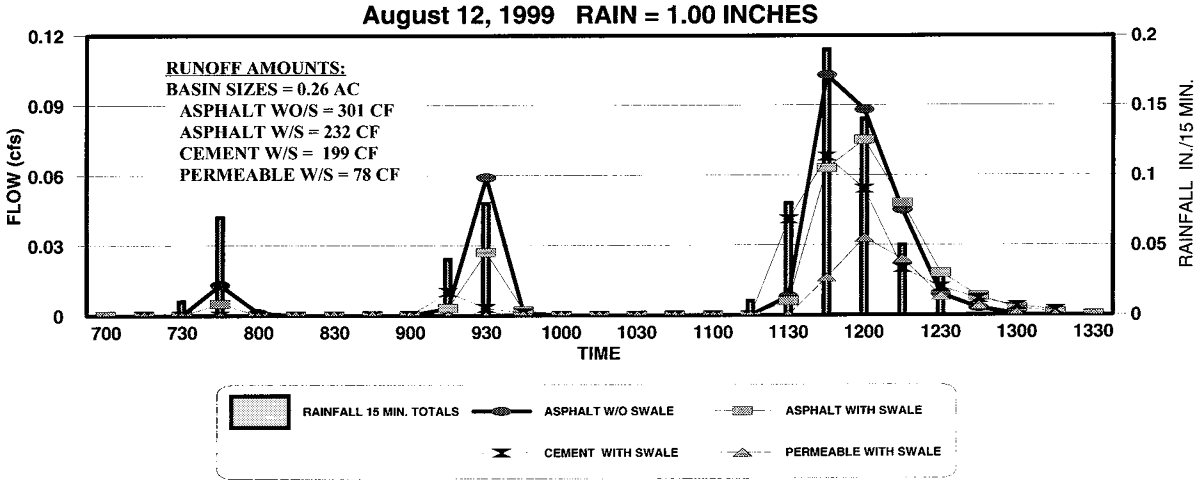
COMPARISON OF PAVING TYPES

August 6, 1999 RAIN = 1.13 INCHES



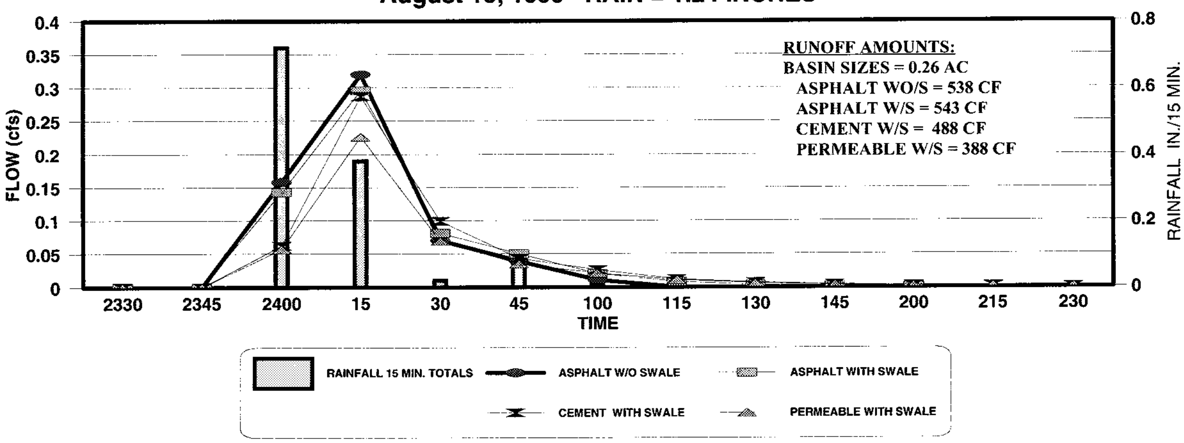
COMPARISON OF PAVING TYPES

August 12, 1999 RAIN = 1.00 INCHES



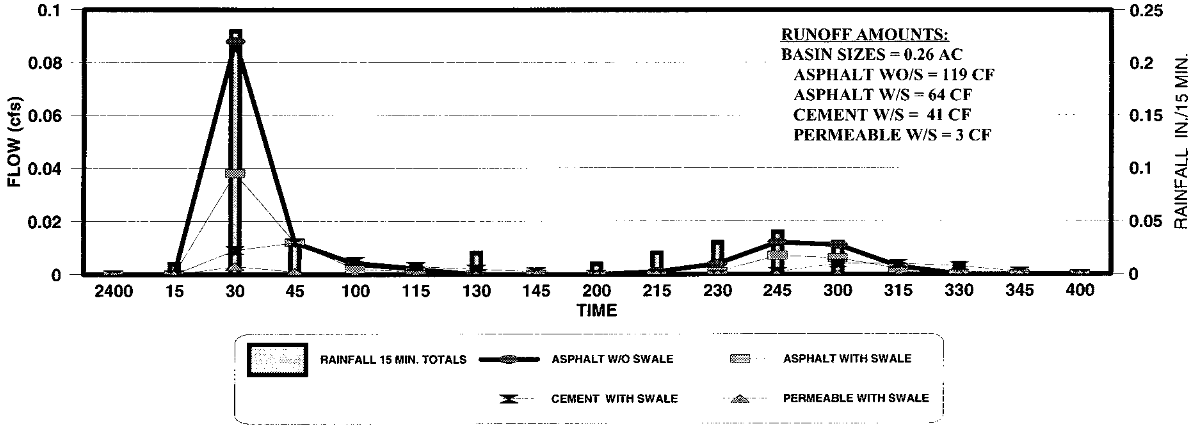
COMPARISON OF PAVING TYPES

August 15, 1999 RAIN = 1.24 INCHES



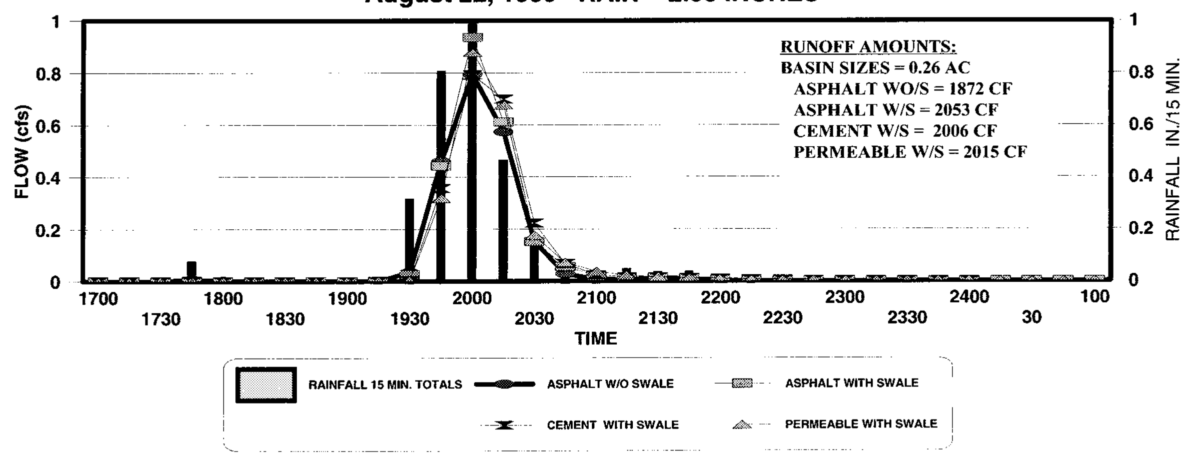
COMPARISON OF PAVING TYPES

August 21, 1999 RAIN = 0.45 INCHES



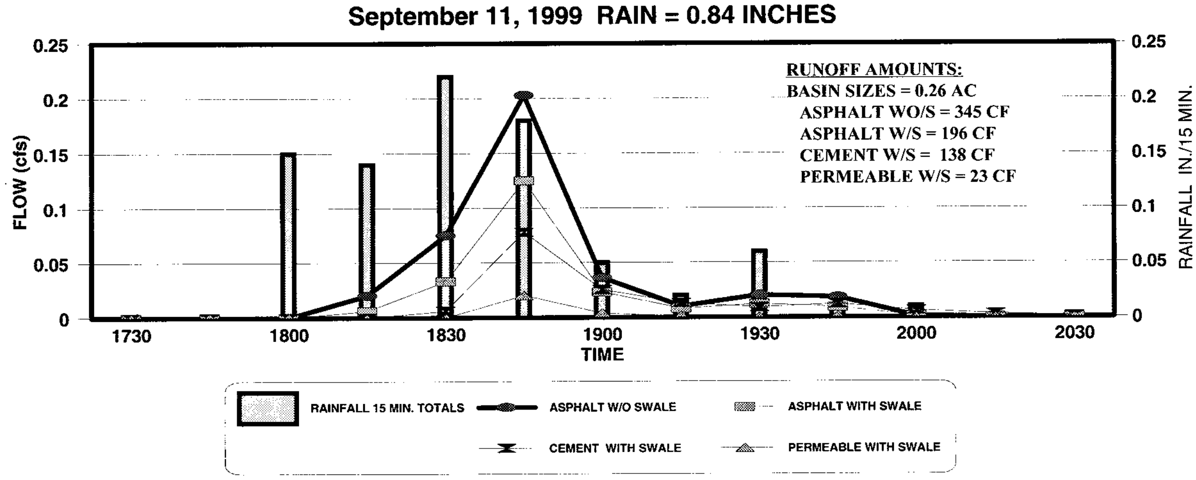
COMPARISON OF PAVING TYPES

August 22, 1999 RAIN = 2.95 INCHES



COMPARISON OF PAVING TYPES

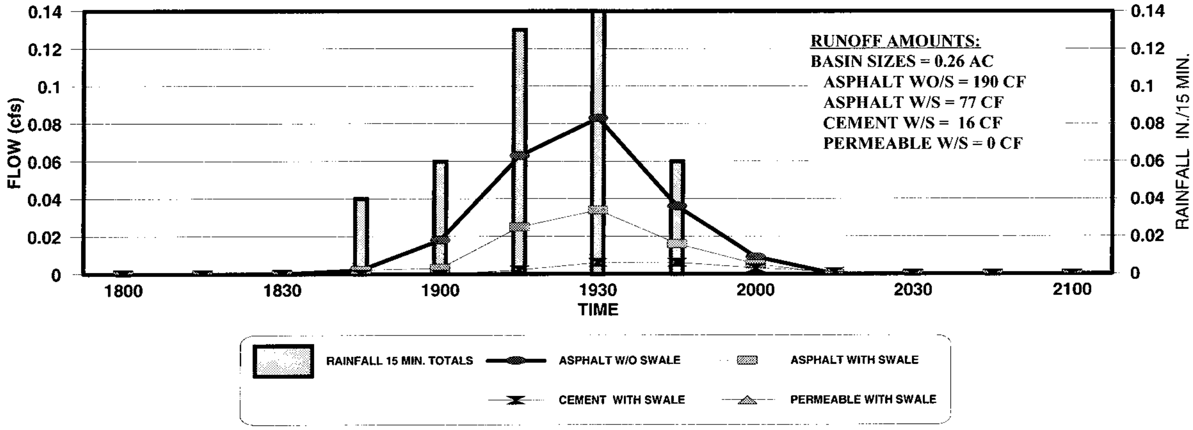
September 11, 1999 RAIN = 0.84 INCHES



2000 report graphsdk.wb3, 19-Jun-01

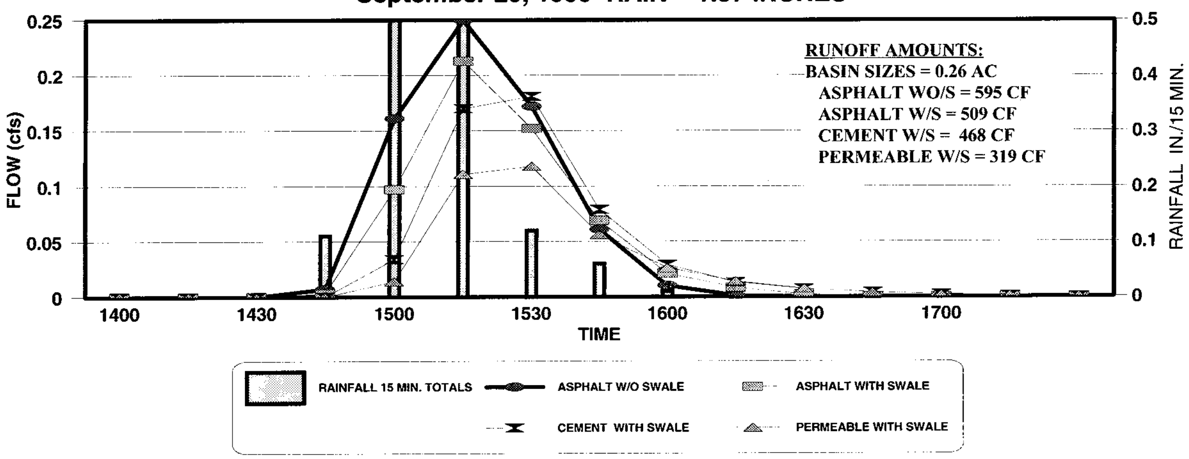
COMPARISON OF PAVING TYPES

September 18, 1999 RAIN = 0.4 INCHES



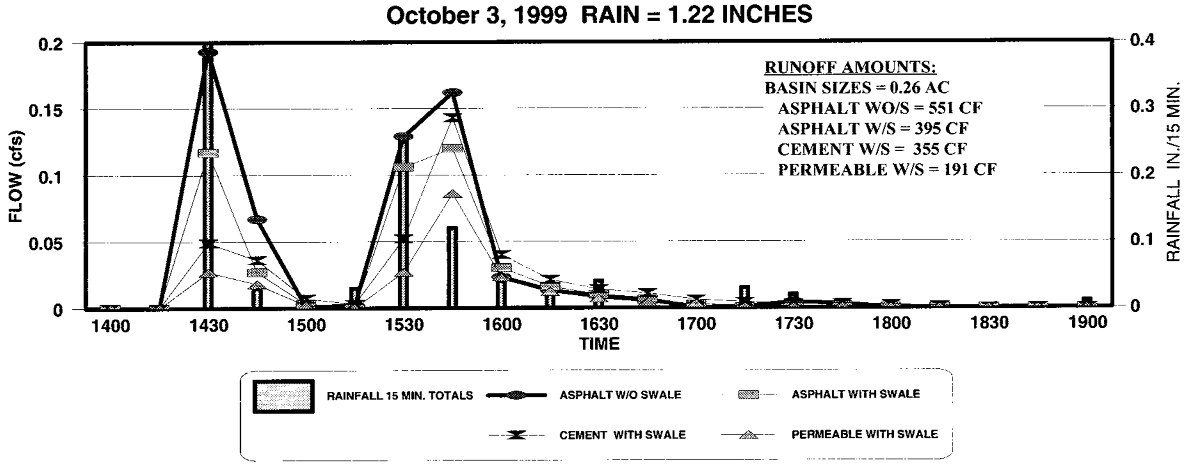
COMPARISON OF PAVING TYPES

September 25, 1999 RAIN = 1.37 INCHES



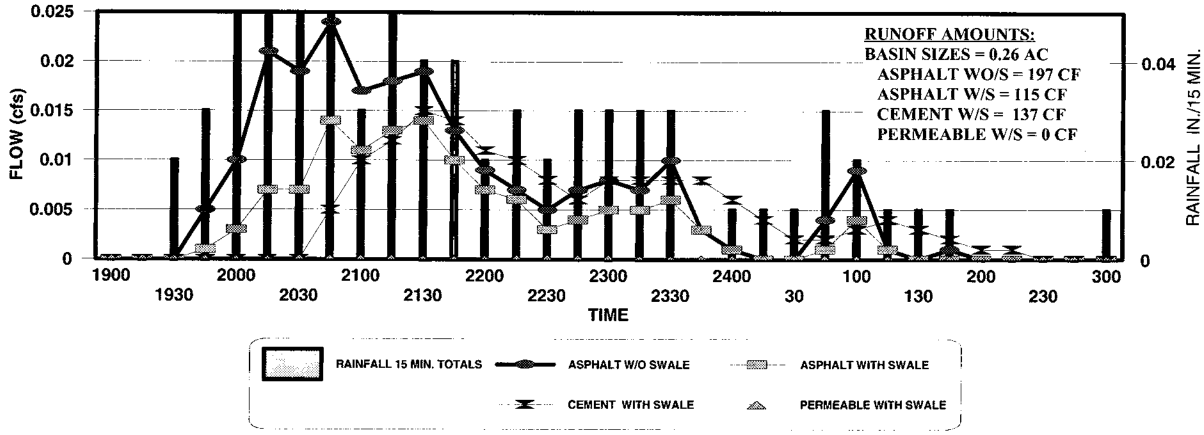
COMPARISON OF PAVING TYPES

October 3, 1999 RAIN = 1.22 INCHES



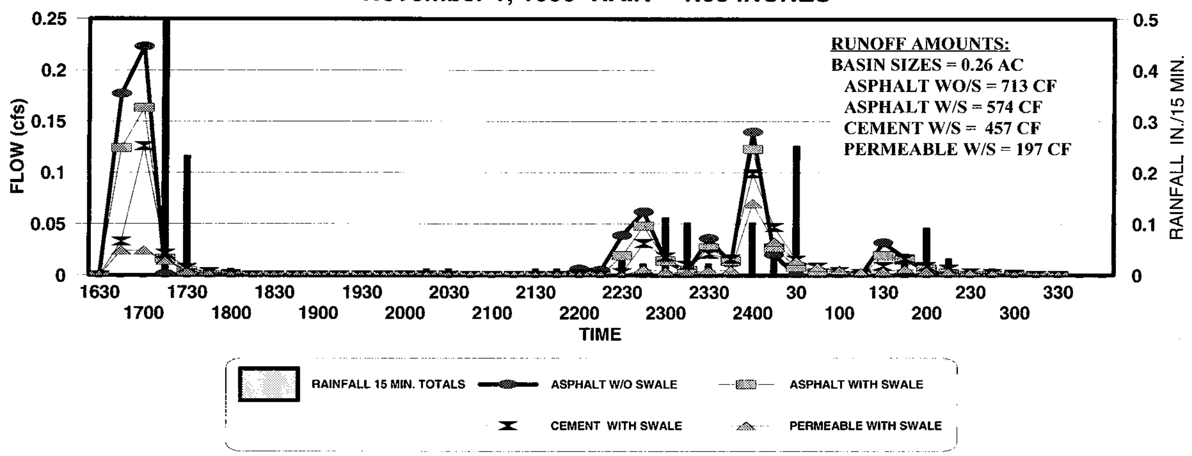
COMPARISON OF PAVING TYPES

October 4, 1999 RAIN = 0.98 INCHES



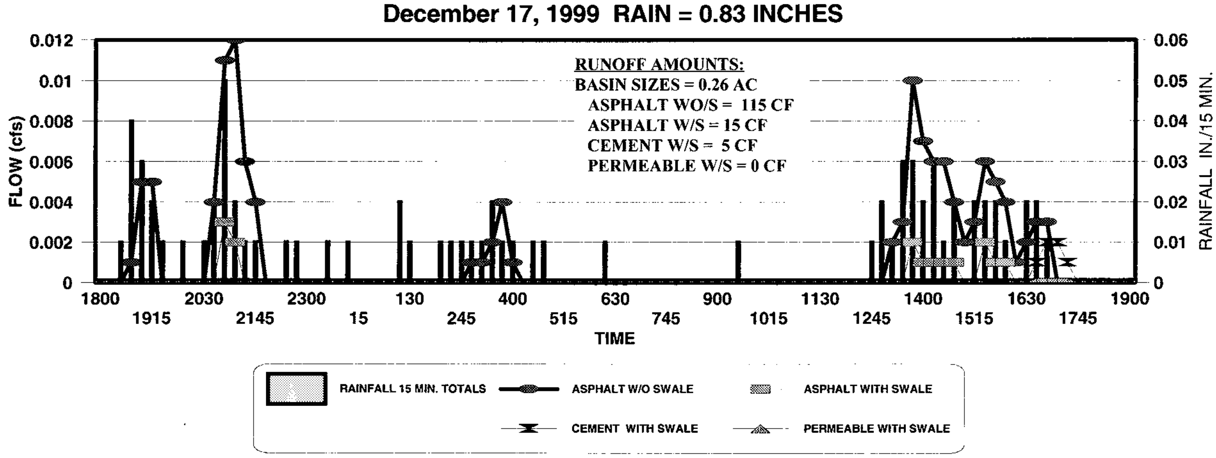
COMPARISON OF PAVING TYPES

November 1, 1999 RAIN = 1.63 INCHES



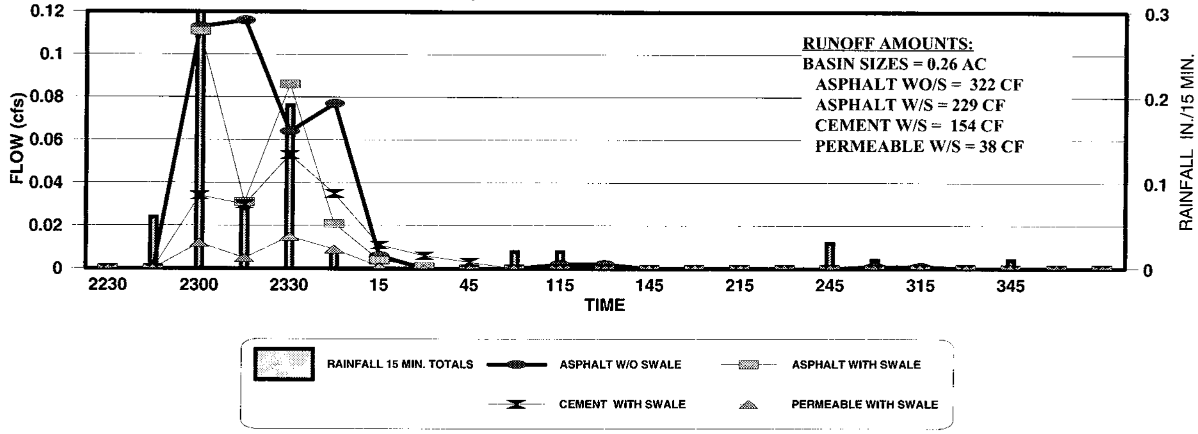
COMPARISON OF PAVING TYPES

December 17, 1999 RAIN = 0.83 INCHES



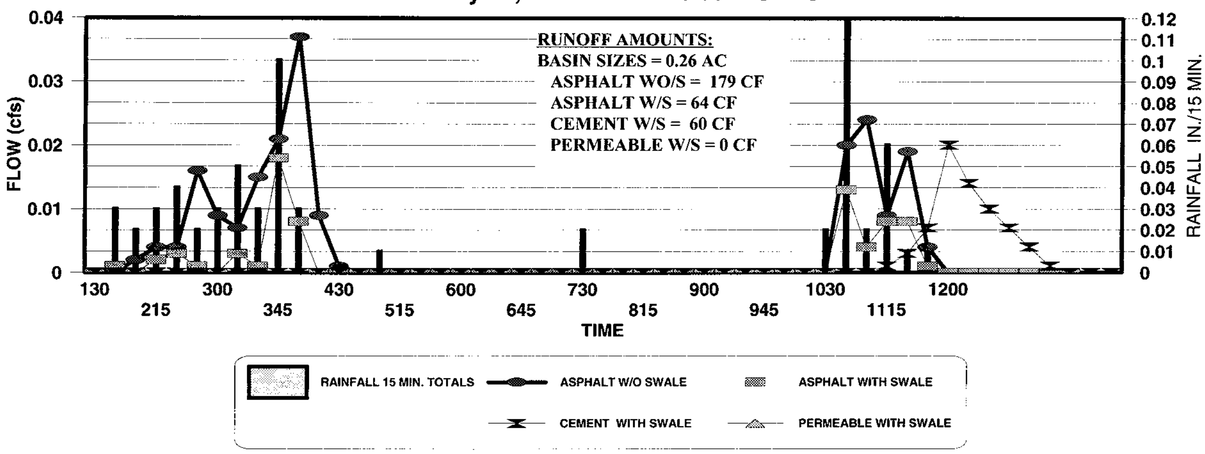
COMPARISON OF PAVING TYPES

January 6, 2000 RAIN = 0.79 INCHES



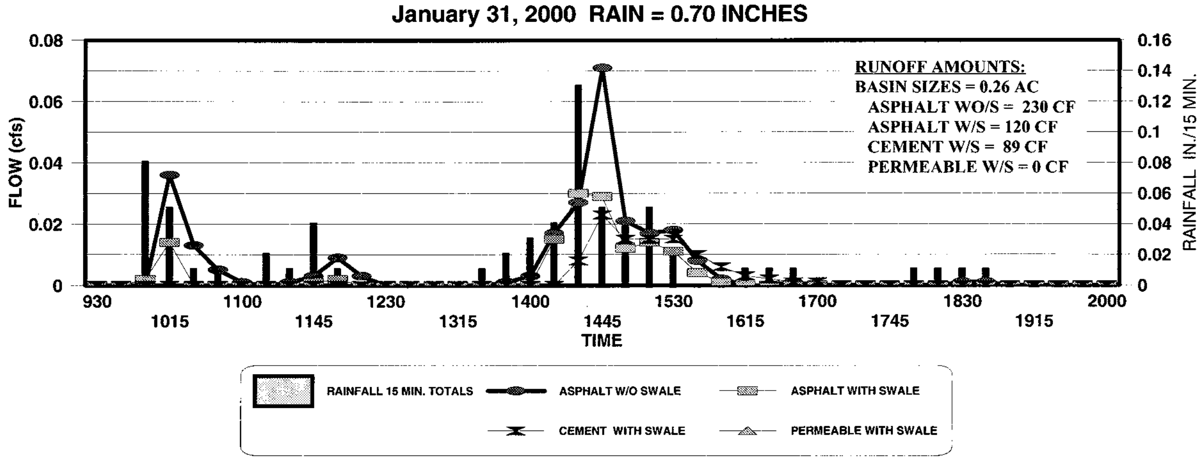
COMPARISON OF PAVING TYPES

January 24, 2000 RAIN = 0.68 INCHES



COMPARISON OF PAVING TYPES

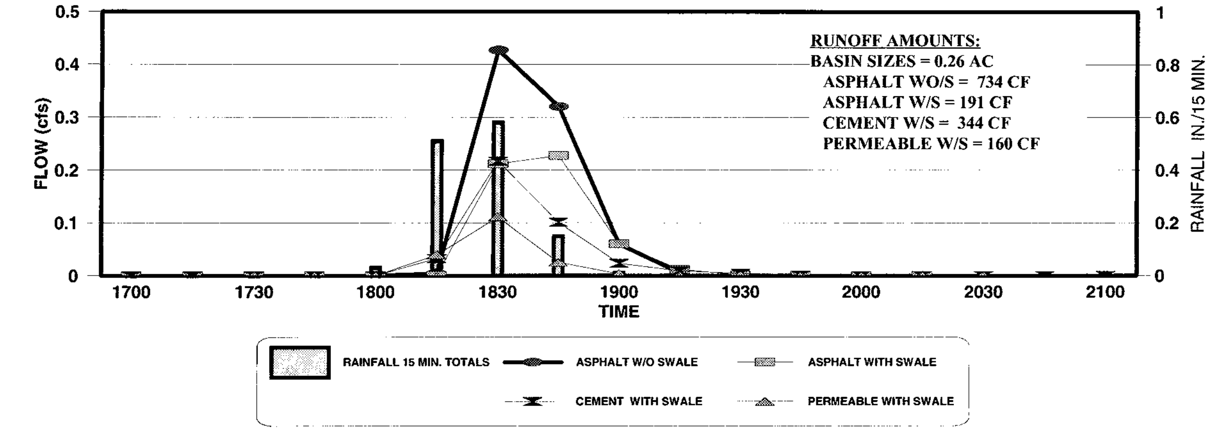
January 31, 2000 RAIN = 0.70 INCHES



2000 report graphsdk.wb3, 19-Jun-01

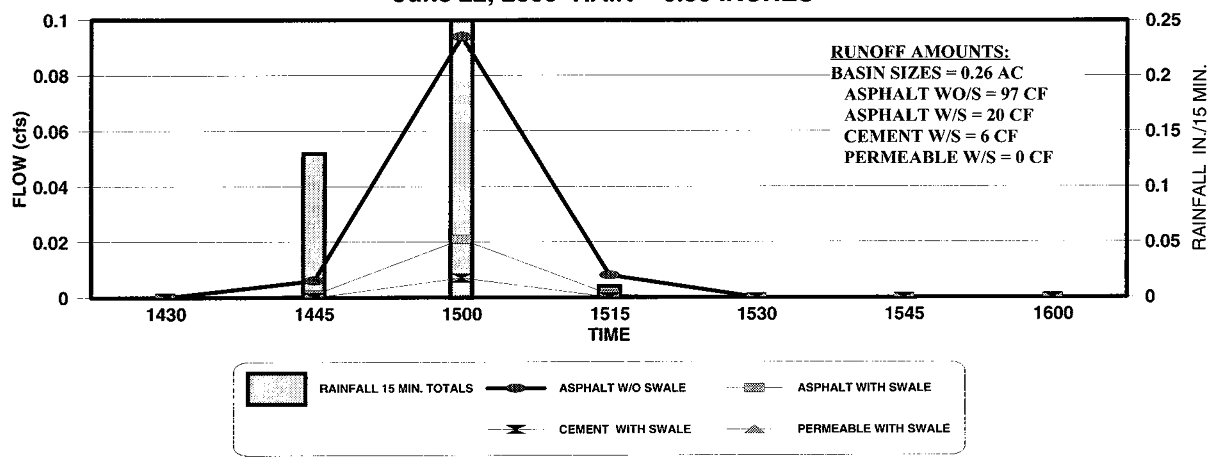
COMPARISON OF PAVING TYPES

June 13, 2000 RAIN = 1.29 INCHES



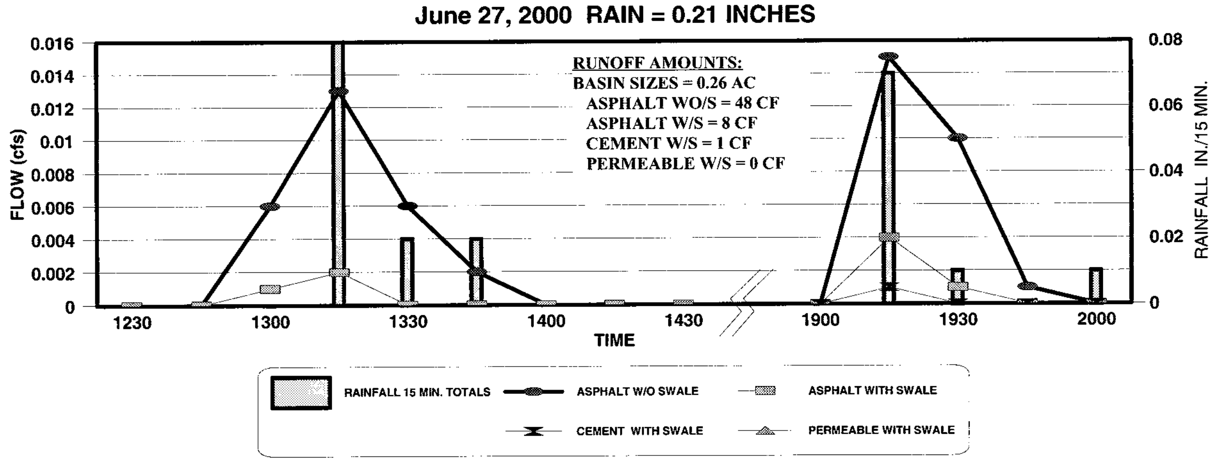
COMPARISON OF PAVING TYPES

June 22, 2000 RAIN = 0.39 INCHES



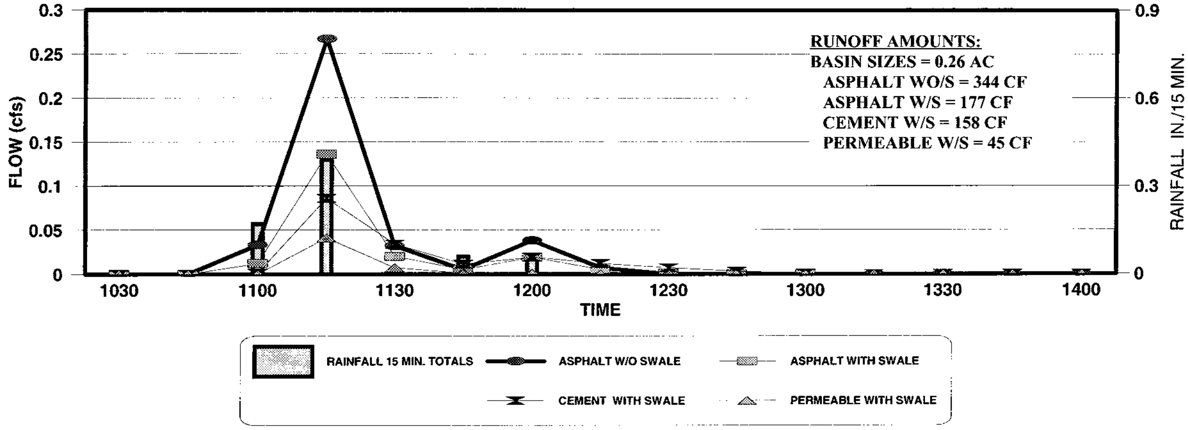
COMPARISON OF PAVING TYPES

June 27, 2000 RAIN = 0.21 INCHES



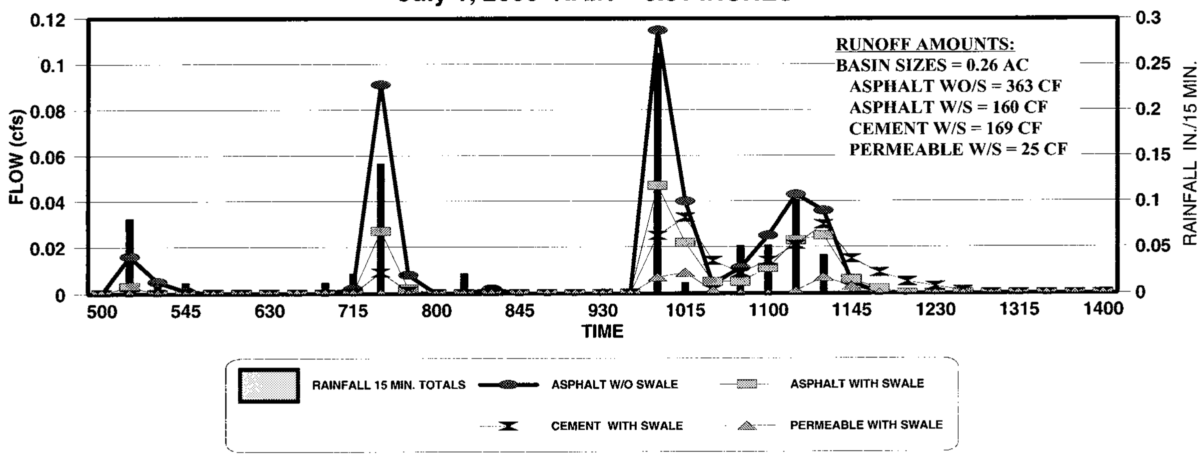
COMPARISON OF PAVING TYPES

June 29, 2000 RAIN = 0.71 INCHES



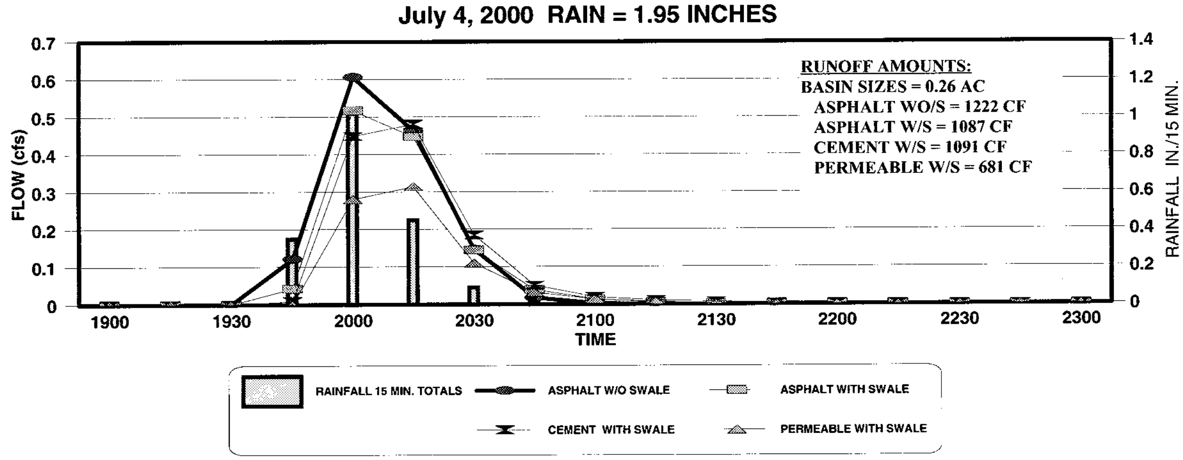
COMPARISON OF PAVING TYPES

July 1, 2000 RAIN = 0.81 INCHES



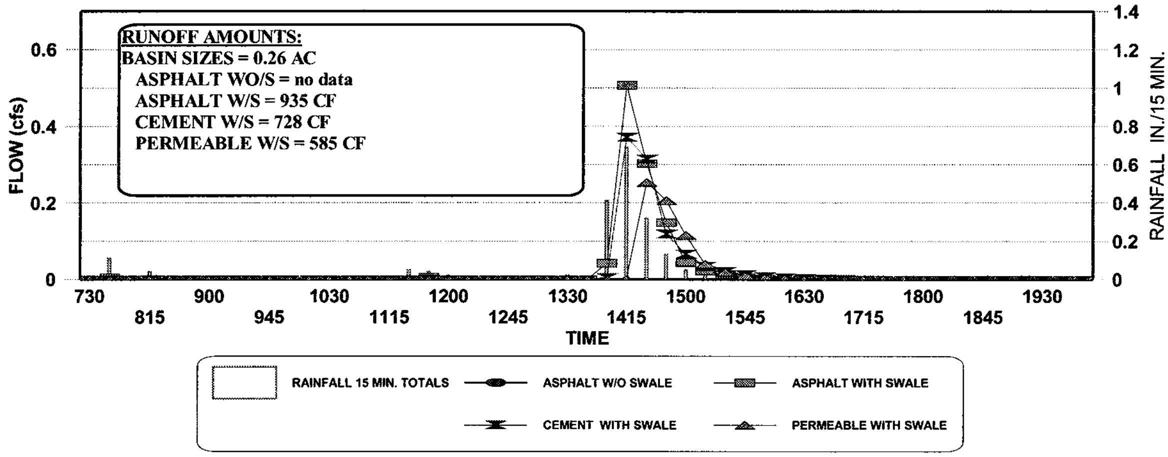
COMPARISON OF PAVING TYPES

July 4, 2000 RAIN = 1.95 INCHES



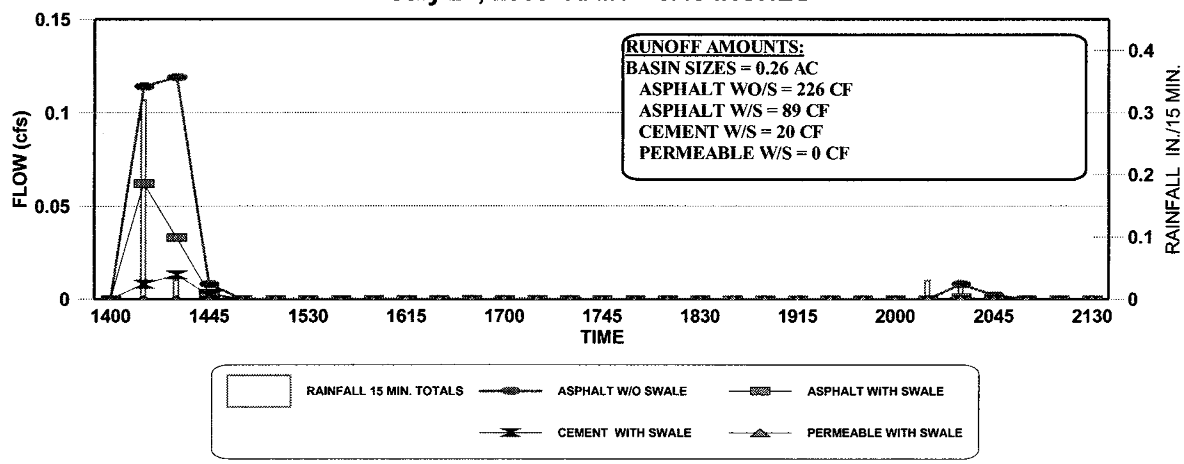
COMPARISON OF PAVING TYPES

July 15, 2000 RAIN = 1.98 INCHES



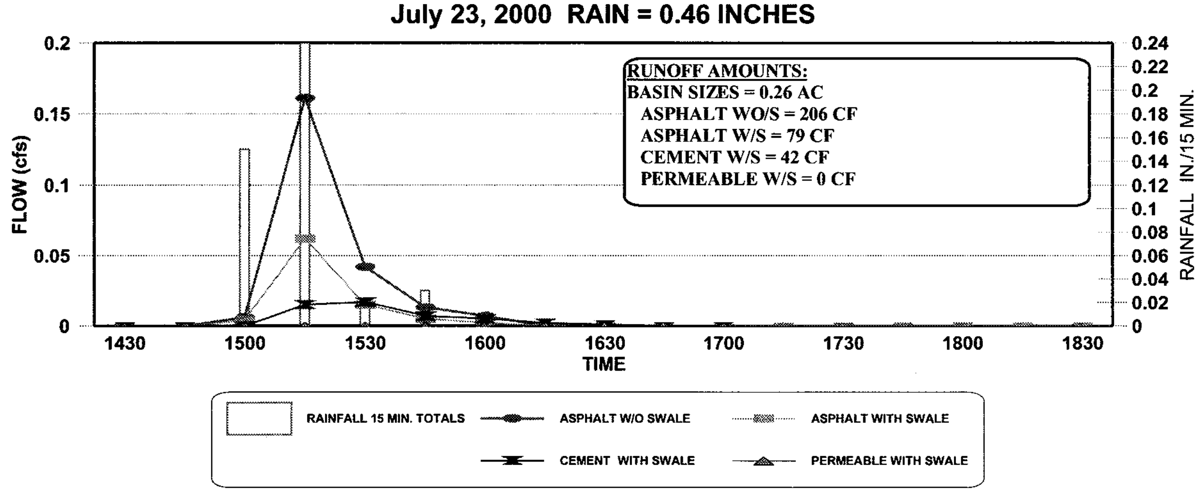
COMPARISON OF PAVING TYPES

July 21, 2000 RAIN = 0.43 INCHES



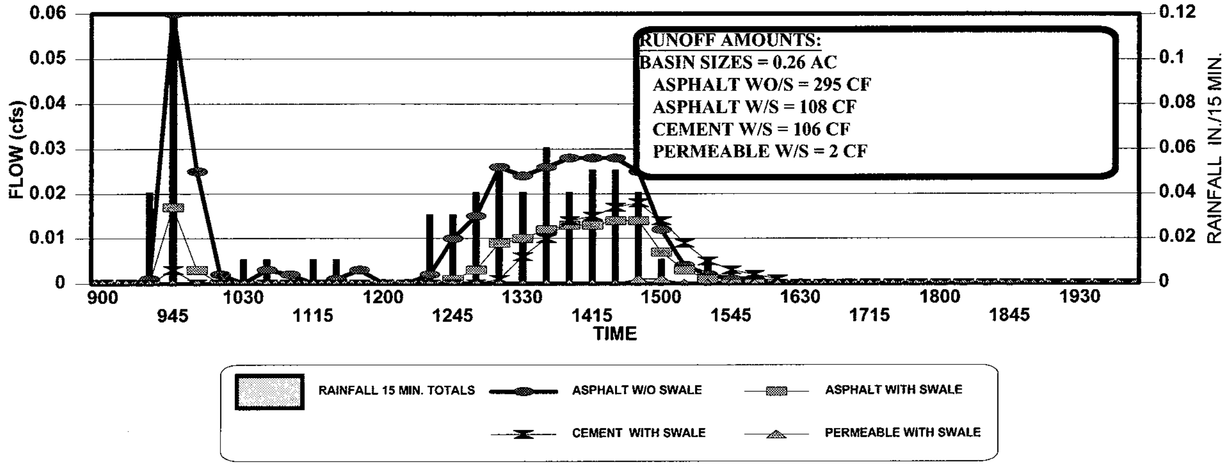
COMPARISON OF PAVING TYPES

July 23, 2000 RAIN = 0.46 INCHES



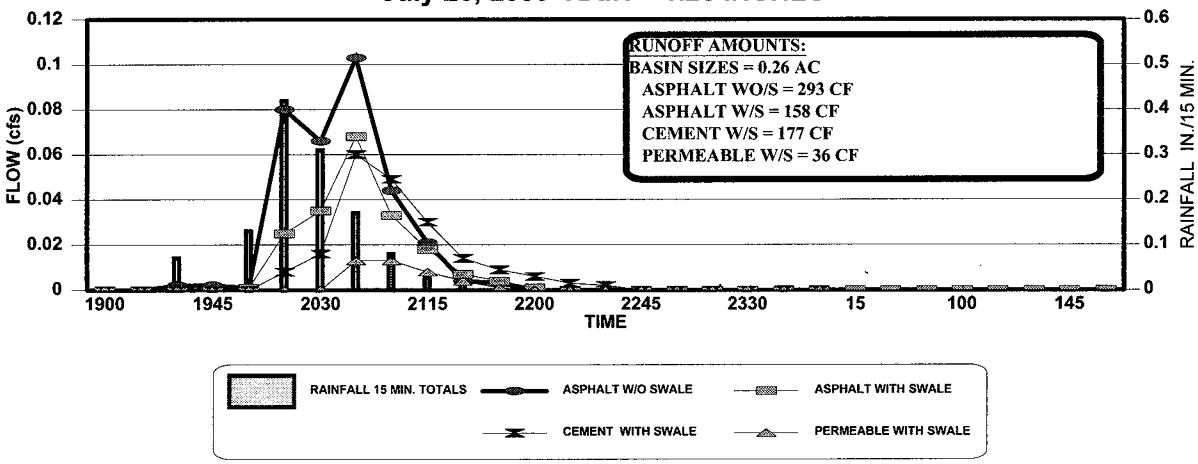
COMPARISON OF PAVING TYPES

July 24, 2000 RAIN = 0.67 INCHES



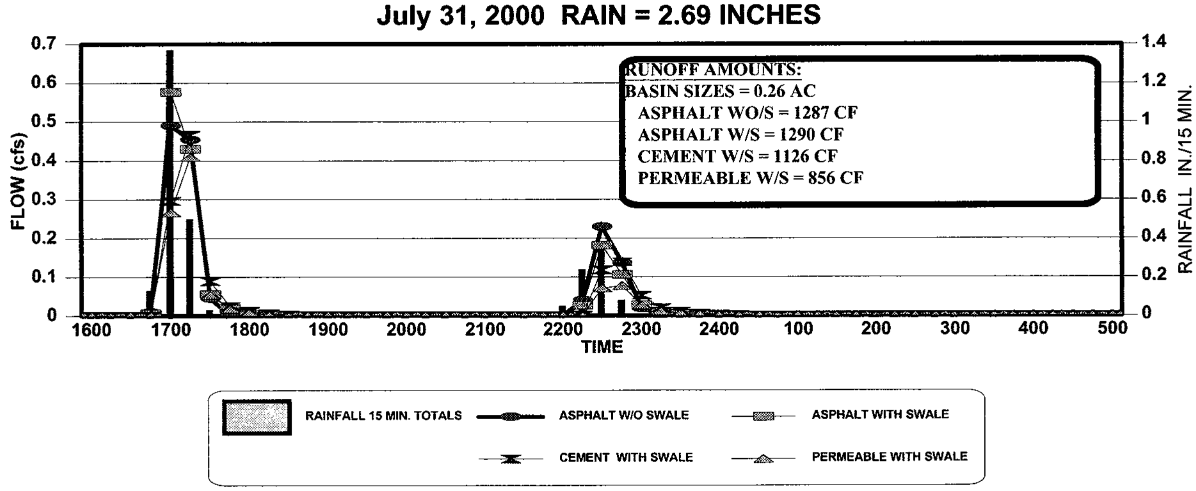
COMPARISON OF PAVING TYPES

July 26, 2000 RAIN = 1.26 INCHES

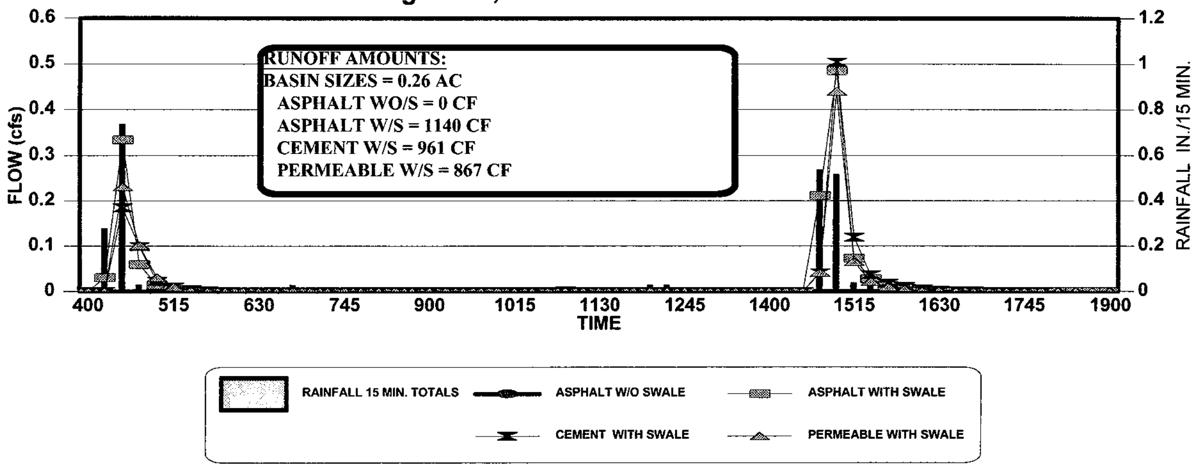


COMPARISON OF PAVING TYPES

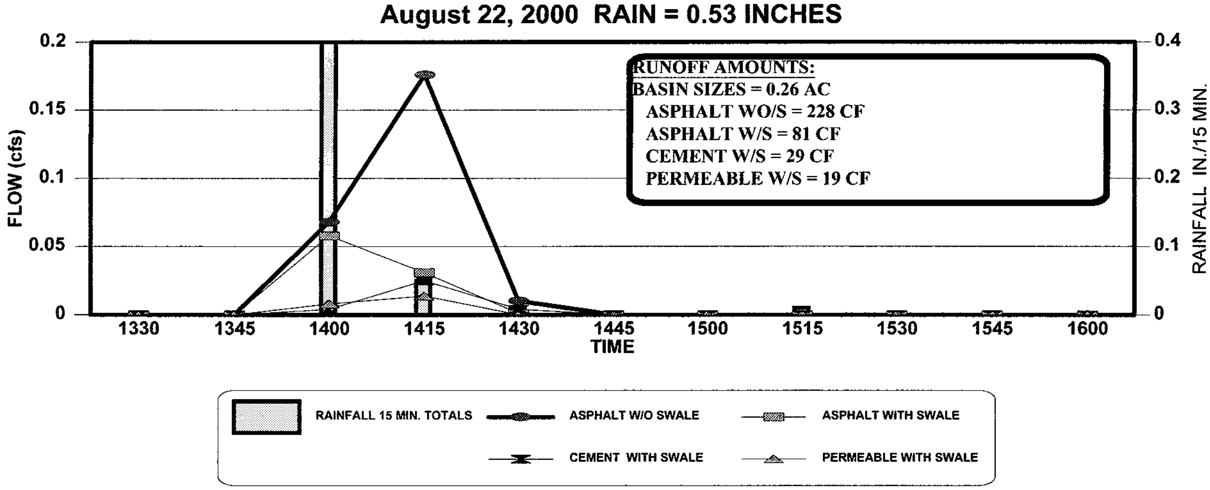
July 31, 2000 RAIN = 2.69 INCHES



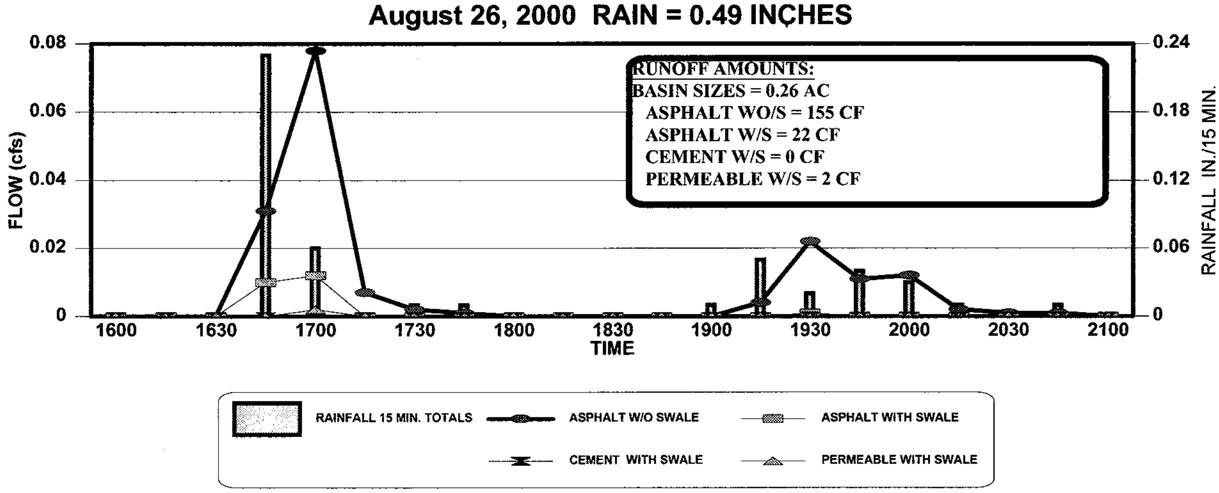
COMPARISON OF PAVING TYPES
August 12, 2000 RAIN = 2.25 INCHES



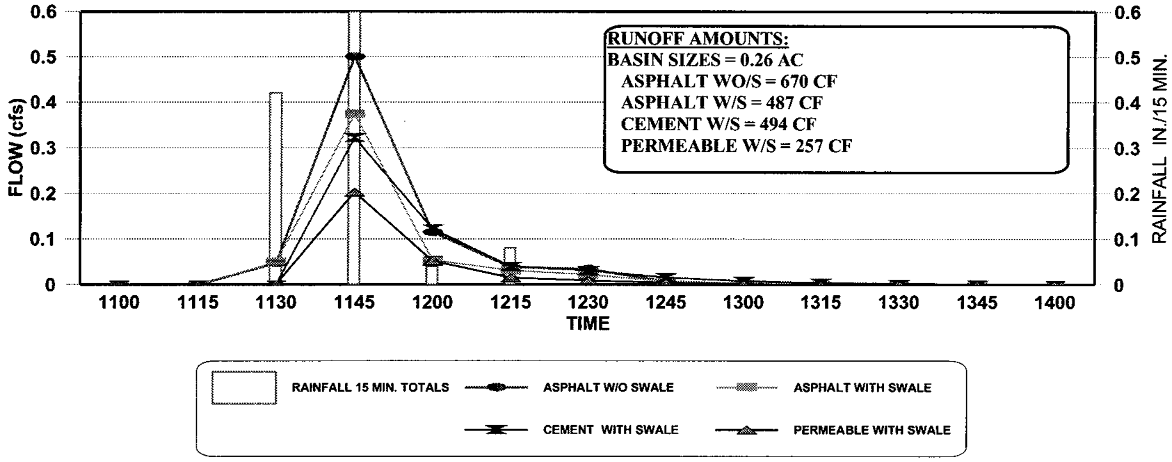
COMPARISON OF PAVING TYPES
August 22, 2000 RAIN = 0.53 INCHES



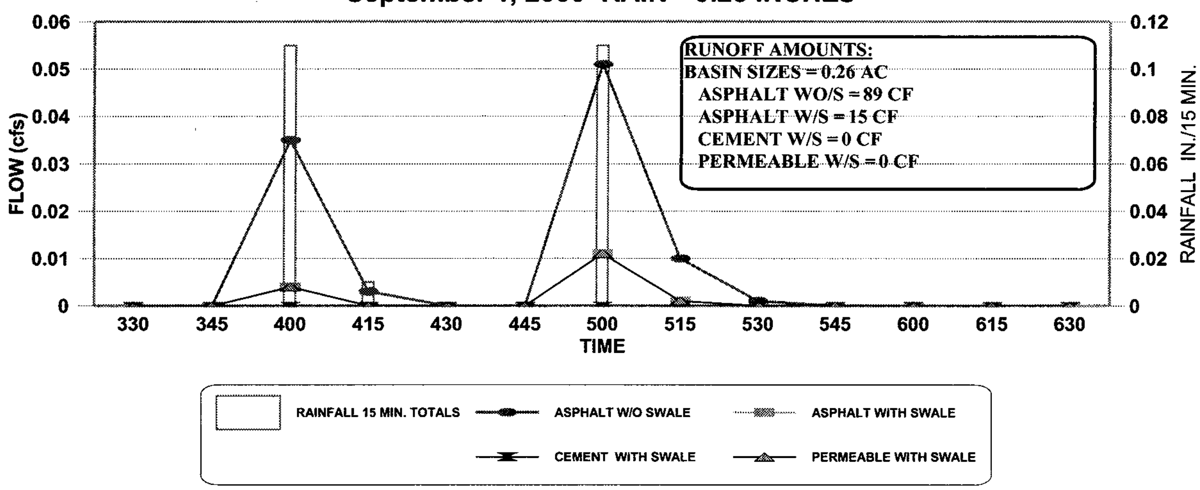
COMPARISON OF PAVING TYPES
August 26, 2000 RAIN = 0.49 INCHES



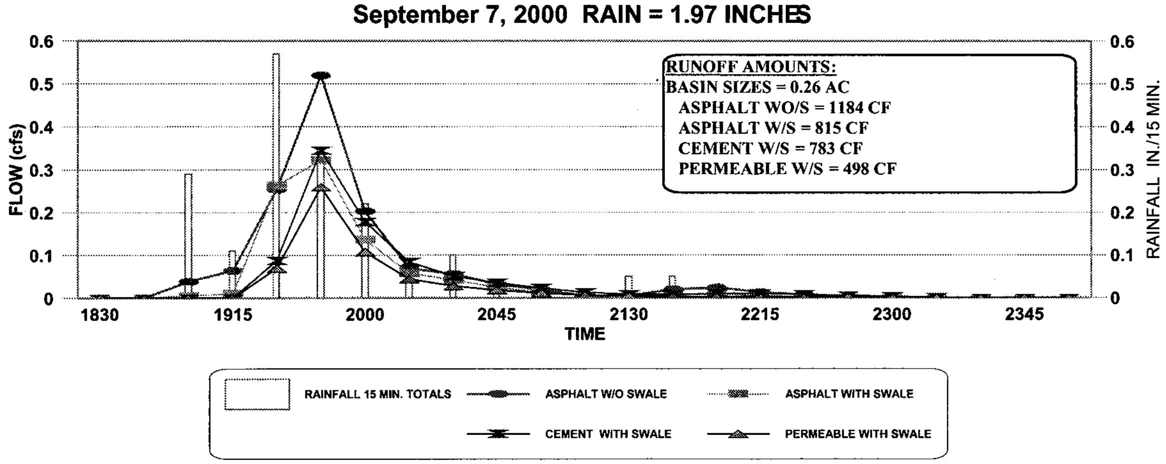
COMPARISON OF PAVING TYPES
August 29, 2000 RAIN = 1.18 INCHES



COMPARISON OF PAVING TYPES
September 1, 2000 RAIN =0.23 INCHES



COMPARISON OF PAVING TYPES
September 7, 2000 RAIN = 1.97 INCHES



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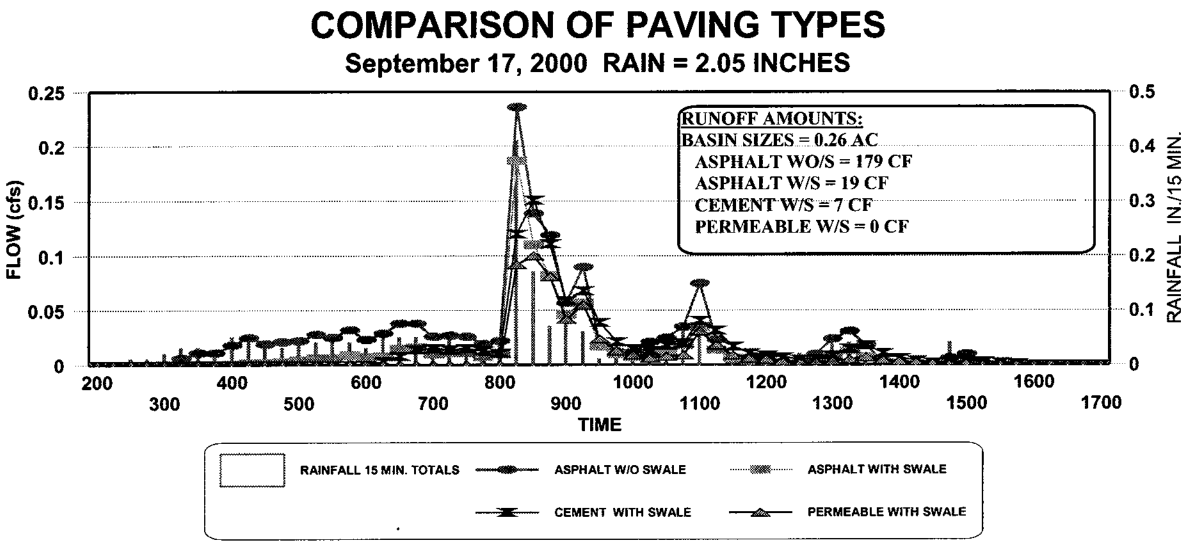
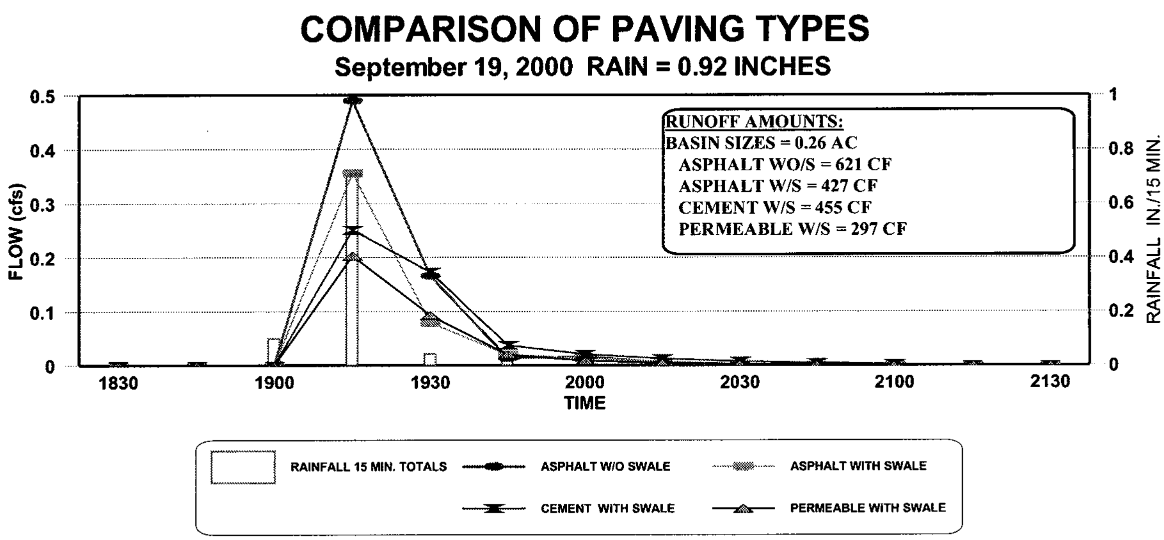
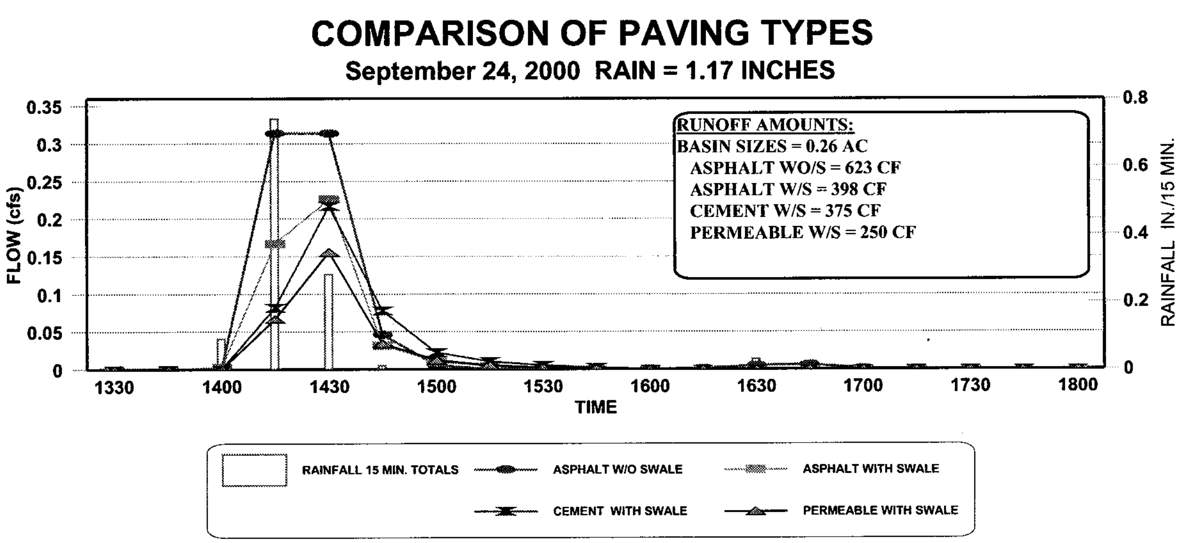
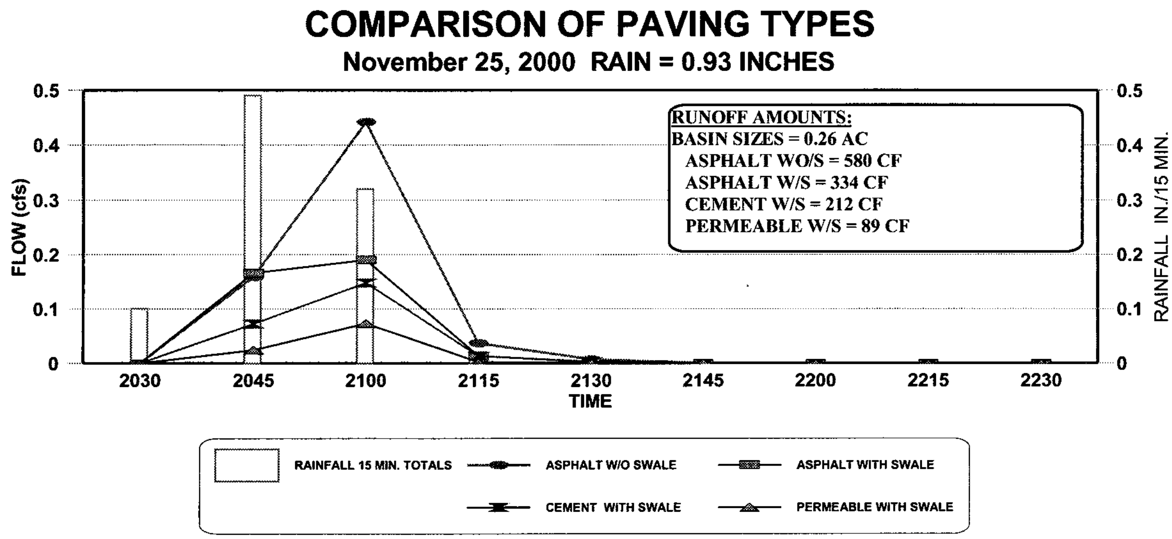
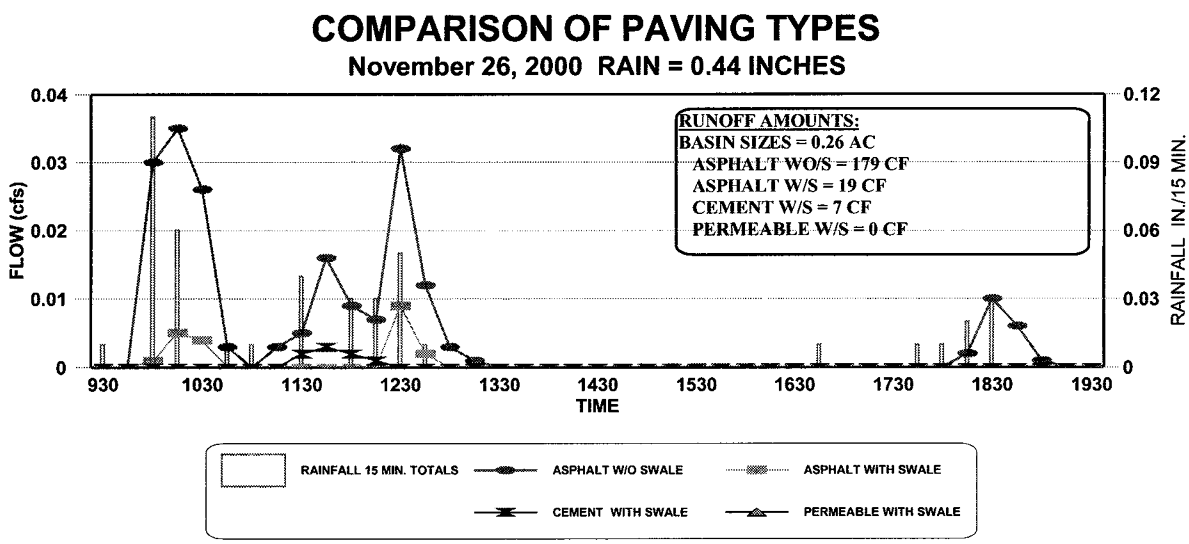

COMPARISON OF PAVING TYPES
September 17, 2000 RAIN = 2.05 INCHES
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 179 CF
ASPHALT W/S = 19 CF
CEMENT W/S = 7 CF
PERMEABLE W/S = 0 CF
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE


COMPARISON OF PAVING TYPES
September 19, 2000 RAIN = 0.92 INCHES
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 621 CF
ASPHALT W/S = 427 CF
CEMENT W/S = 455 CF
PERMEABLE W/S = 297 CF
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE


COMPARISON OF PAVING TYPES
September 24, 2000 RAIN = 1.17 INCHES
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 623 CF
ASPHALT W/S = 398 CF
CEMENT W/S = 375 CF
PERMEABLE W/S = 250 CF
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE


COMPARISON OF PAVING TYPES
November 25, 2000 RAIN = 0.93 INCHES
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 580 CF
ASPHALT W/S = 334 CF
CEMENT W/S = 212 CF
PERMEABLE W/S = 89 CF
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE


COMPARISON OF PAVING TYPES
November 26, 2000 RAIN = 0.44 INCHES
FLOW (cfs)
RAINFALL IN./15 MIN.
TIME
RUNOFF AMOUNTS:
BASIN SIZES = 0.26 AC
ASPHALT WO/S = 179 CF
ASPHALT W/S = 19 CF
CEMENT W/S = 7 CF
PERMEABLE W/S = 0 CF
RAINFALL 15 MIN. TOTALS
ASPHALT W/O SWALE
ASPHALT WITH SWALE
CEMENT WITH SWALE
PERMEABLE WITH SWALE

APPENDIX F

WATER QUALITY DATA SUMMARIES

Appendix F-1. Summary statistics for the water quality data collected for the parking lot low impact stormwater system at the Florida aquarium

NUTRIENT DATA		ASPHALT WO/SWALE		ASPHALT W/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		REST OF TREATMENT TRAIN		
	RAIN MG/L	F1 MG/L	F2 MG/L	F7 MG/L	F8 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
AMMONIA - N												
No.Obs.	59	59	57	35	50	37	54	30	41	31	14	15
Average	0.140	0.113	0.110	0.099	0.111	0.056	0.068	0.082	0.049	0.041	0.044	0.047
Median	0.110	0.078	0.079	0.055	0.079	0.023	0.039	0.054	0.023	0.025	0.027	0.018
St.Dev.	0.130	0.107	0.112	0.119	0.112	0.105	0.075	0.069	0.066	0.040	0.043	0.065
C.V.	0.931	0.946	1.016	1.201	1.009	1.859	1.101	0.834	1.349	0.995	0.964	1.389
Maximum	0.761	0.506	0.567	0.482	0.475	0.577	0.293	0.291	0.345	0.156	0.137	0.221
Minimum	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.005	0.005	0.003	0.005	0.005
NITRATE - N												
No.Obs.	59	59	58	36	51	37	54	30	40	15	14	29
Average	0.259	0.247	0.270	0.266	0.293	0.230	0.290	0.250	0.221	0.100	0.065	0.062
Median	0.162	0.163	0.198	0.166	0.207	0.145	0.216	0.177	0.166	0.045	0.024	0.037
St.Dev.	0.319	0.271	0.323	0.353	0.399	0.254	0.368	0.275	0.214	0.133	0.069	0.070
C.V.	1.232	1.098	1.194	1.328	1.362	1.108	1.267	1.101	0.970	1.341	1.060	1.125
Maximum	1.830	1.770	1.790	1.830	2.200	1.310	2.430	1.520	1.094	0.426	0.207	0.215
Minimum	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.003
NITRITE - N												
No.Obs.	60	57	58	34	50	37	55	29	40	15	14	30
Average	0.008	0.012	0.023	0.008	0.024	0.008	0.026	0.011	0.015	0.010	0.007	0.012
Median	0.005	0.007	0.009	0.006	0.009	0.005	0.012	0.010	0.010	0.003	0.005	0.005
St.Dev.	0.034	0.029	0.081	0.005	0.081	0.006	0.061	0.006	0.033	0.016	0.006	0.023
C.V.	4.063	2.378	3.480	0.695	3.356	0.686	2.312	0.579	2.183	1.624	0.887	1.979
Maximum	0.270	0.226	0.591	0.025	0.540	0.027	0.357	0.028	0.212	0.066	0.022	0.129
Minimum	0.003	0.003	0.002	0.002	0.003	0.002	0.003	0.003	0.002	0.003	0.003	0.002
TOTAL NITROGEN												
No.Obs.	58	58	57	35	48	36	54	29	39	15	13	28
Average	0.499	0.549	0.555	0.714	0.782	0.617	0.725	0.679	0.667	0.536	0.534	0.670
Median	0.380	0.440	0.410	0.540	0.577	0.445	0.590	0.620	0.584	0.550	0.500	0.635
St.Dev.	0.466	0.475	0.511	0.602	0.620	0.561	0.533	0.452	0.493	0.305	0.416	0.366
C.V.	0.934	0.866	0.921	0.843	0.793	0.910	0.736	0.666	0.739	0.569	0.779	0.546
Maximum	2.300	2.700	2.600	2.500	2.500	2.500	2.700	1.800	2.400	1.200	1.800	1.700
Minimum	0.000	0.030	0.025	0.080	0.110	0.070	0.055	0.060	0.080	0.080	0.120	0.080
ORTHO-PHOSPHORUS												
No.Obs.	60	59	58	36	50	37	55	30	40	15	14	30
Average	0.019	0.046	0.049	0.112	0.188	0.179	0.198	0.075	0.193	0.205	0.292	0.152
Median	0.005	0.030	0.025	0.105	0.126	0.155	0.125	0.066	0.159	0.140	0.213	0.112
St.Dev.	0.039	0.090	0.072	0.061	0.276	0.111	0.253	0.040	0.174	0.145	0.190	0.127
C.V.	2.001	1.960	1.474	0.548	1.465	0.617	1.275	0.540	0.904	0.708	0.653	0.832
Maximum	0.260	0.690	0.401	0.301	1.900	0.603	1.780	0.207	0.922	0.516	0.836	0.427
Minimum	0.005	0.005	0.003	0.034	0.023	0.037	0.036	0.015	0.012	0.055	0.138	0.005
TOTAL PHOSPHORUS												
No.Obs.	59	58	56	35	50	37	54	30	41	15	14	31
Average	0.024	0.084	0.084	0.156	0.263	0.216	0.248	0.109	0.232	0.255	0.338	0.309
Median	0.018	0.053	0.049	0.154	0.180	0.191	0.159	0.091	0.179	0.169	0.233	0.233
St.Dev.	0.022	0.130	0.101	0.074	0.339	0.126	0.317	0.065	0.217	0.178	0.215	0.289
C.V.	0.948	1.540	1.202	0.476	1.288	0.582	1.276	0.601	0.934	0.699	0.638	0.937
Maximum	0.123	0.972	0.513	0.394	2.330	0.652	2.190	0.286	1.270	0.664	0.936	1.430
Minimum	0.005	0.010	0.008	0.046	0.040	0.050	0.058	0.023	0.035	0.070	0.159	0.053

Appendix F-2. Summary statistics for the water quality data collected for the parking lot low impact stormwater system at the Florida aquarium. Abbreviation:na=not applicable

METAL DATA		ASPHALT WO/SWALE		ASPHALT W/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		REST OF TREATMENT TRAIN		
	RAIN	F1	F2	F7	F8	F3	F4	F5	F6	STRAND	UNDER DRAIN	POND
TOTAL SUSPENDED SOLIDS (mg/L)												
No.Obs.	na	50	50	29	42	32	41	22	36	14	13	30
Average	na	10.69	11.55	16.32	15.80	2.69	4.50	7.21	5.46	3.18	2.92	18.64
Median	na	7.69	7.83	7.05	10.98	1.77	2.86	4.42	3.81	2.66	1.62	5.55
St.Dev.	na	8.50	11.54	25.30	13.95	3.78	5.45	8.80	4.26	2.14	3.55	45.88
C.V.	na	0.79	1.00	1.55	0.88	1.41	1.21	1.22	0.78	0.67	1.22	2.46
Maximum	na	42.47	60.62	121.08	77.04	21.87	29.51	41.61	15.31	7.12	13.50	253.58
Minimum	na	1.92	1.09	0.00	2.71	0.16	1.27	1.38	0.51	0.73	0.26	1.07
TOTAL COPPER (ug/L)												
No.Obs.	60	59	58	36	51	37	55	31	41	15	14	30
Average	5.23	10.47	10.37	9.37	13.60	4.72	4.94	4.58	4.09	12.08	9.54	9.79
Median	3.50	8.60	7.35	6.75	9.20	3.60	4.40	3.30	3.60	10.50	7.45	4.65
St.Dev.	5.74	7.75	8.58	7.92	12.12	3.21	3.04	3.92	2.40	7.00	4.94	19.02
C.V.	1.10	0.74	0.83	0.85	0.89	0.68	0.62	0.86	0.59	0.58	0.52	1.94
Maximum	32.70	42.60	42.70	38.00	55.50	15.10	16.10	18.70	14.20	31.30	20.30	106.00
Minimum	0.15	0.15	1.75	0.15	0.15	0.90	0.15	0.15	0.15	3.80	4.70	0.15
TOTAL IRON (ug/L)												
No.Obs.	60	59	58	36	51	37	55	32	41	15	14	30
Average	92.1	408.3	356.0	281.9	461.7	67.2	91.9	119.8	88.5	59.7	94.6	603.3
Median	80.0	290.0	215.0	185.0	290.0	50.0	73.0	80.0	60.0	50.0	80.0	155.0
St.Dev.	77.9	352.4	327.2	295.4	463.9	67.5	81.1	121.7	78.5	34.8	64.6	1998.8
C.V.	0.85	0.86	0.92	1.05	1.00	1.01	0.88	1.02	0.89	0.58	0.68	3.31
Maximum	380.0	1920.0	1390.0	1430.0	2120.0	370.0	430.0	550.0	350.0	140.0	240.0	11100
Minimum	12.5	60.0	50.0	9.5	15.2	12.5	3.5	12.5	3.8	15.0	15.0	50.0
TOTAL LEAD (ug/L)												
No.Obs.	61	59	58	36	51	37	55	31	41	15	13	29
Average	1.23	3.50	3.61	2.72	3.59	1.09	1.16	1.06	1.26	0.71	1.03	1.50
Median	1.00	2.20	2.25	1.55	2.50	1.00	1.00	0.75	1.00	0.75	0.75	0.75
St.Dev.	0.84	3.16	3.40	3.02	3.06	0.64	0.67	0.76	0.78	0.14	0.74	1.77
C.V.	0.68	0.90	0.94	1.11	0.85	0.59	0.58	0.71	0.62	0.20	0.72	1.18
Maximum	5.20	14.20	14.20	15.60	13.30	3.40	3.20	4.60	4.00	0.75	3.30	9.90
Minimum	0.75	0.75	0.75	0.50	0.75	0.40	0.74	0.23	0.50	0.19	0.75	0.75
TOTAL MANGANESE (ug/L)												
No.Obs.	60	59	58	36	51	37	55	31	41	15	13	31
Average	2.14	9.77	10.47	7.18	12.92	2.23	5.04	2.97	2.32	9.42	22.24	16.69
Median	1.90	7.40	7.25	5.75	7.85	1.80	2.80	2.30	1.80	7.70	19.60	10.70
St.Dev.	1.63	7.32	9.09	5.69	11.61	2.15	8.94	3.01	1.57	6.50	21.08	15.27
C.V.	0.76	0.75	0.87	0.79	0.90	0.97	1.77	1.01	0.68	0.69	0.95	0.91
Maximum	10.40	35.60	37.90	27.90	58.40	10.00	61.20	13.80	7.20	29.60	69.60	57.80
Minimum	0.30	2.70	0.50	1.50	2.36	0.05	0.07	0.50	0.50	3.50	0.50	3.40
TOTAL ZINC (ug/L)												
No.Obs.	60	58	58	37	50	36	54	30	40	15	13	30
Average	30.71	41.21	37.64	33.04	42.91	17.85	20.83	19.58	21.89	16.83	8.46	19.33
Median	17.50	30.00	30.00	30.00	30.00	15.00	20.00	15.00	15.00	20.00	7.50	11.25
St.Dev.	35.24	35.92	31.19	22.78	34.48	11.85	11.56	13.02	26.33	11.78	3.47	20.04
C.V.	1.15	0.87	0.83	0.69	0.80	0.66	0.55	0.66	1.20	0.70	0.41	1.04
Maximum	180.00	160.00	160.00	100.00	150.00	60.00	70.00	60.00	173.54	50.00	20.00	80.00
Minimum	7.50	7.50	7.50	7.50	11.81	7.50	4.00	7.50	7.50	7.50	7.50	0.00

Appendix F-3. Summary statistics for the water quality data collected for the parking lot low impact stormwater system at the Florida aquarium

MAJOR ION DATA		ASPHALT WO/SWALE		ASPHALT W/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		REST OF TREATMENT TRAIN		
	RAIN	F1	F2	F7	F8	F3	F4	F5	F6	TRAN	UNDER DRAIN	POND
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
HARDNESS												
No.Obs.	58	59	55	32	47	36	53	28	39	13	13	29
Average	4.176	25.935	26.344	24.164	29.120	19.832	31.707	46.625	31.445	28.313	48.256	129.552
Median	2.258	27.200	25.716	23.259	28.750	19.295	28.494	43.190	31.780	30.220	50.160	114.510
St.Dev.	10.086	8.441	7.024	7.117	9.001	6.859	12.907	26.002	8.954	10.061	23.748	85.666
C.V.	2.415	0.325	0.267	0.295	0.309	0.346	0.407	0.558	0.285	0.355	0.492	0.661
Maximum	75.080	46.550	47.720	42.008	54.820	37.210	80.640	105.730	47.790	44.732	106.100	432.560
Minimum	0.000	0.112	14.430	0.117	0.157	0.083	3.080	0.105	0.927	0.161	0.036	0.066
CHLORIDES												
No.Obs.	59	59	56	33	47	37	54	30	40	14	14	31
Average	1.277	1.213	1.203	1.610	1.787	1.495	1.962	1.384	1.619	2.085	3.414	27.636
Median	1.110	0.850	0.860	1.380	1.522	1.310	1.769	1.400	1.545	1.995	2.490	14.200
St.Dev.	0.734	0.795	0.767	0.914	1.267	0.893	1.164	0.676	0.901	0.829	2.956	55.295
C.V.	0.575	0.656	0.638	0.568	0.709	0.597	0.593	0.489	0.557	0.397	0.866	2.001
Maximum	3.200	3.550	2.940	4.140	6.330	4.530	6.700	3.070	4.550	3.250	13.200	314.000
Minimum	0.200	0.200	0.200	0.510	0.130	0.390	0.610	0.480	0.468	0.600	1.460	1.110
POTASSIUM												
No.Obs.	59	59	56	32	47	37	54	30	40	14	14	30
Average	0.174	0.273	0.281	0.888	1.053	2.616	2.579	1.509	2.829	2.496	3.749	6.639
Median	0.080	0.260	0.165	0.625	0.660	1.890	2.000	1.495	2.080	1.275	2.915	5.665
St.Dev.	0.238	0.212	0.310	0.874	1.371	1.701	1.892	0.614	2.143	2.642	2.823	6.375
C.V.	1.370	0.776	1.103	0.984	1.302	0.650	0.733	0.407	0.758	1.058	0.753	0.960
Maximum	1.500	1.180	1.560	4.230	7.820	8.870	11.000	3.070	11.200	10.200	10.300	24.100
Minimum	0.020	0.020	0.020	0.025	0.020	1.020	0.470	0.250	0.260	0.350	1.120	0.025
SODIUM												
No.Obs.	59	59	56	33	46	37	54	30	40	14	14	31
Average	0.732	0.695	0.716	0.659	0.874	0.825	1.184	0.801	0.943	0.908	2.837	25.359
Median	0.410	0.410	0.400	0.460	0.562	0.700	1.022	0.740	0.705	1.015	1.625	8.650
St.Dev.	2.060	1.658	1.861	0.432	1.196	0.420	0.613	0.424	1.094	0.416	4.993	42.984
C.V.	2.813	2.388	2.598	0.655	1.369	0.509	0.518	0.529	1.161	0.458	1.760	1.695
Maximum	16.100	13.000	14.200	1.650	8.140	2.090	2.930	1.650	7.200	1.410	20.000	174.000
Minimum	0.030	0.170	0.130	0.030	0.156	0.070	0.189	0.030	0.100	0.110	0.120	0.760
CALCIUM												
No.Obs.	58	59	55	32	47	36	53	28	39	13	13	30
Average	1.421	10.431	10.285	9.351	11.064	7.574	11.827	18.945	12.160	10.787	18.138	46.513
Median	0.800	10.600	10.200	9.015	10.885	7.190	10.657	18.400	12.430	10.600	17.500	40.300
St.Dev.	3.517	2.832	2.722	2.113	3.445	2.159	4.700	9.814	3.400	2.036	6.579	26.655
C.V.	2.475	0.271	0.265	0.226	0.311	0.285	0.397	0.518	0.280	0.189	0.363	0.573
Maximum	25.800	17.800	18.500	15.900	20.800	13.700	25.700	42.100	18.300	16.100	38.000	148.000
Minimum	0.000	5.260	5.650	6.170	0.030	3.360	0.830	6.350	0.190	8.160	10.500	14.000
SULFATE												
No.Obs.	57	57	54	32	46	36	52	28	38	14	14	29
Average	2.417	3.330	3.509	3.534	3.828	3.560	4.515	3.464	3.815	4.476	9.104	47.557
Median	2.200	3.050	3.121	3.115	3.345	3.185	4.360	3.055	3.620	4.195	4.845	20.600
St.Dev.	1.366	1.866	2.116	1.720	1.886	1.758	1.784	1.279	1.763	1.361	14.617	65.730
C.V.	0.565	0.560	0.603	0.487	0.493	0.494	0.395	0.369	0.462	0.304	1.605	1.382
Maximum	5.930	9.010	11.900	9.370	9.260	9.650	10.500	7.110	10.100	7.050	59.400	338.000
Minimum	0.440	0.510	0.390	1.560	0.005	1.020	0.360	1.690	0.005	2.390	2.460	4.370
MAGNESIUM												
No.Obs.	57	58	54	32	46	36	52	28	39	13	13	29
Average	0.162	0.175	0.654	0.382	0.426	0.355	0.537	0.193	0.377	0.934	1.506	4.870
Median	0.080	0.155	0.160	0.390	0.400	0.340	0.459	0.200	0.410	1.030	1.490	2.760
St.Dev.	0.345	0.128	2.557	0.152	0.216	0.178	0.530	0.103	0.191	0.526	0.871	5.562
C.V.	2.127	0.728	3.912	0.397	0.507	0.501	0.988	0.535	0.507	0.563	0.578	1.142
Maximum	2.590	0.510	15.700	0.720	0.950	0.740	4.000	0.450	0.860	2.090	3.030	20.200
Minimum	0.000	0.000	0.000	0.000	0.020	0.000	0.005	0.000	0.000	0.020	0.120	0.000

Appendix F-4. Comparison of median concentrations between years. The number of samples taken is also included. Basins with swales and/or larger garden areas had less runoff and fewer samples taken when compared to basins without swales. Once the berm was repaired samples were also collected in the strand, under drain pipe and pond. (bd=below detection limit, na=not available)

			ASPHALT WO/SWALE		ASPHALT W/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		REST OF TREATMENT TRAIN		
CONSTITUENT		RAIN	F1	F2	F7	F8	F3	F4	F5	F6	STRAND	UNDER DRAIN	POND
		MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
AMMONIA - N (mg/L)													
median	year one	0.088	0.070	0.063	0.034	0.049	0.015	0.018	0.049	0.016	na	na	0.027
median	year two	0.111	0.090	0.091	0.070	0.083	0.019	0.064	0.051	0.039	0.012	0.017	0.016
count	year one	30	31	30	17	22	18	25	12	20	0	1	13
count	year two	23	24	22	13	23	14	23	13	16	10	9	13
NITRATE (mg/L)													
median	year one	0.142	0.142	0.205	0.109	0.191	0.108	0.211	0.111	0.125	na	na	0.025
median	year two	0.182	0.188	0.191	0.223	0.221	0.254	0.217	0.249	0.214	0.045	0.025	0.046
count	year one	30	32	31	18	23	18	26	12	20	0	1	11
count	year two	29	27	27	18	28	19	28	18	20	15	13	18
TOTAL NITROGEN (mg/L)													
median	year one	0.38	0.41	0.37	0.40	0.48	0.31	0.54	0.47	0.48	na	na	0.66
median	year two	0.36	0.44	0.41	0.52	0.56	0.53	0.65	0.58	0.62	0.34	0.37	0.45
count	year one	30	32	31	18	23	18	26	12	20	0	1	11
count	year two	22	22	21	12	20	13	22	12	14	10	8	12
ORTHO-PHOSPHORUS (mg/L)													
median	year one	0.005	0.033	0.027	0.097	0.134	0.135	0.122	0.049	0.097	na	na	0.099
median	year two	0.005	0.026	0.024	0.111	0.108	0.182	0.151	0.069	0.181	0.167	0.249	0.150
count	year one	31	32	31	18	23	18	26	12	20	0	1	12
count	year two	23	23	22	13	22	14	23	13	15	10	9	13
TOTAL PHOSPHORUS (mg/L)													
median	year one	0.012	0.054	0.057	0.114	0.161	0.168	0.149	0.068	0.120	na	na	0.286
median	year two	0.023	0.052	0.044	0.156	0.174	0.215	0.198	0.093	0.245	0.193	0.357	0.238
count	year one	30	31	30	17	22	18	25	12	20	0	1	12
count	year two	23	23	21	13	23	14	23	13	16	10	9	14
TOTAL COPPER (ug/L)													
median	year one	3.6	9.0	7.0	5.7	7.6	3.4	3.5	2.7	3.5	na	na	7.4
median	year two	4.1	8.1	8.3	6.8	9.2	4.1	5.3	3.3	3.5	10.1	7.7	4.8
count	year one	31	32	31	18	23	18	26	12	20	0	1	12
count	year two	23	23	22	13	23	14	23	14	16	10	9	13
TOTAL IRON (ug/L)													
median	year one	90	335	250	135	240	55	72	78	48	na	na	200
median	year two	60	270	210	180	323	45	70	70	70	50	80	150
count	year one	31	32	31	18	23	18	26	12	20	0	1	12
count	year two	23	23	22	13	23	14	23	15	16	10	9	13
TOTAL LEAD (ug/L)													
median	year one	bd	2.70	2.70	bd	2.60	bd	bd	bd	bd	na	na	1.00
median	year two	0.75	2.00	2.25	1.5	2.1	bd	bd	bd	bd	0.75	0.75	0.75
count	year one	32	32	31	18	23	18	26	12	20	0	0	11
count	year two	23	23	22	13	23	14	23	14	16	10	9	13
TOTAL MANGANESE (ug/L)													
median	year one	2.0	8.0	8.1	4.4	6.4	1.5	3.1	2.3	1.6	na	na	15.8
median	year two	1.8	6.5	7.0	5.6	7.9	2.0	2.8	2.0	1.7	9.4	19.6	7.8
count	year one	31	32	31	18	23	18	26	12	20	0	0	13
count	year two	23	23	22	13	23	14	23	14	16	10	9	13
TOTAL ZINC (ug/L)													
median	year one	bd	30.0	30.0	30.0	20.0	bd	bd	bd	bd	na	na	15.0
median	year two	20.0	20.0	30.0	20.0	31.2	7.5	20.0	7.5	10.0	7.5	7.5	7.5
count	year one	32	32	31	19	23	18	26	12	20	0	1	13
count	year two	22	22	22	13	22	13	22	13	15	10	8	12
TOTAL SUSPENDED SOLIDS (mg/L)													
median	year one	na	7.69	8.73	5.31	9.35	1.74	3.59	2.45	2.30	na	na	10.79
median	year two	na	6.70	6.86	9.79	11.71	1.47	2.23	3.31	4.53	2.99	1.70	5.80
count	year one	na	28	27	14	18	17	20	9	19	0	1	12
count	year two	na	19	18	10	19	10	15	8	12	10	9	13

APPENDIX G

ALL THE WATER QUALITY DATA

APPENDIX G - 1a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

AMMONIA AS N (LABORATORY DETECTION LIMIT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	*0.005*	0.048	0.035	na	*0.005*	na	na	na	na	na	na	na
08/06/98	0.68	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	na	*0.005*	na	*0.005*	0.109	na	na
08/07/98	1.30	0.218	0.235	0.220	0.005	0.037	0.110	0.010	0.111	0.195	na	na	na
08/09/98	2.47	0.296	0.265	0.204	0.098	0.079	0.207	0.074	0.144	na	na	na	na
08/20/98	0.68	0.079	0.062	0.044	0.028	0.013	na	*0.005*	0.032	*0.005*	na	na	na
09/03/98	1.97	0.051	0.044	0.013	0.005	*0.008*	0.028	0.017	0.025	0.028	*0.005*	na	na
09/***/98	1.85	0.208	*0.003*	0.067	*0.003*	0.006	0.052	*0.006*	*0.003*	0.025	*0.003*	na	na
09/17/98	0.49	0.024	0.040	*0.005*	na	na	na	na	na	na	na	na	na
09/18/98	0.66	0.017	0.013	*0.005*	na	*0.005*	na	na	na	na	*0.005*	na	na
09/19/98	0.75	*0.005*	0.005	0.008	*0.005*	*0.005*	na	*0.005*	*0.005*	na	*0.005*	na	na
09/20/98	1.85	0.064	0.074	0.060	*0.005*	*0.005*	0.087	0.012	0.014	0.046	na	na	na
09/26/98	1.64	na	0.005	*0.005*	*0.005*	*0.005*	na	*0.005*	*0.005*	*0.005*	na	na	na
11/05/98	1.20	*0.005*	0.033	0.021	na	na	na	na	na	na	na	na	na
12/13/98	0.37	0.077	*0.005*	na	na	na	na	na	*0.005*	na	na	na	na
01/03/99	1.23	0.050	0.025	0.033	*0.005*	0.050	0.033	*0.005*	0.048	0.045	na	na	na
01/23/99	2.60	0.032	0.016	0.021	0.011	0.034	0.039	0.015	0.018	0.031	0.019	na	na
02/28/99	0.36	0.106	0.175	0.100	na	na	na	na	na	0.142	*0.005*	na	na
03/14/99	0.80	0.128	0.119	0.163	na	0.293	na	na	na	0.351	0.074	na	na
04/17/99	0.54	0.127	0.216	0.223	na	na	na	na	na	na	na	na	na
05/21/99	1.34	0.496	0.506	0.567	0.202	0.237	na	0.163	0.482	0.475	na	na	na
05/30/99	0.39	0.357	0.467	0.462	na	na	na	na	na	0.320	na	na	na
06/09/99	0.81	0.040	*0.005*	0.016	na	*0.005*	na	0.011	na	0.019	na	na	na
06/13/99	1.22	0.183	0.103	0.181	0.024	0.047	0.128	0.023	0.100	0.090	na	na	na
06/16/99	1.68	0.096	0.070	0.069	0.027	0.030	0.039	0.017	0.055	0.052	0.148	na	na
06/17/99	0.77	0.102	0.039	0.050	0.018	0.060	na	0.021	na	0.152	na	na	na
06/18/99	1.60	0.113	0.092	0.094	*0.023*	0.025	0.045	0.035	0.034	0.026	na	na	na
07/01/99	1.53	0.223	0.178	0.110	0.045	0.005	0.033	0.038	0.078	0.091	0.073	na	na
07/07/99	0.81	0.149	0.187	0.180	na	0.019	na	na	na	0.137	na	na	na
07/09/99	1.17	0.067	0.073	0.045	0.025	0.033	0.056	0.018	0.054	0.037	0.027	0.027	na
07/13/99	1.58	0.080	0.177	0.128	na	0.011	na	na	na	0.078	0.052	na	na
07/20/99	0.88	0.184	0.200	0.079	na	0.018	na	0.096	na	na	0.039	na	na
RAIN TOTAL	35.79												
No.Obs.		30	31	30	18	25	12	20	17	22	13	na	na
Average		0.120	0.112	0.107	0.030	0.042	0.071	0.029	0.071	0.107	0.043	na	na
Median		0.088	0.070	0.063	0.015	0.018	0.049	0.016	0.034	0.049	0.027	na	na
St.Dev.		0.114	0.127	0.131	0.049	0.071	0.054	0.040	0.114	0.126	0.046	na	na
C.V.		0.950	1.132	1.225	1.623	1.697	0.750	1.364	1.592	1.176	1.063	na	na
Maximum		0.496	0.506	0.567	0.202	0.293	0.207	0.163	0.482	0.475	0.148	na	na
Minimum		0.005	0.003	0.005	0.003	0.005	0.028	0.005	0.003	0.005	0.003	na	na

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.

7/13/99 Includes several days of rainfall

APPENDIX G - 1b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

AMMONIA AS N (LABORATORY DETECTION LIMIT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	*0.005*	*0.005*	*0.005*	0.016	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	0.012	*0.005*
08/12/99	0.70	0.164	0.142	0.079	*0.005*	0.029	na	0.017	na	0.069	na	na	na
08/14/99	1.23	0.310	0.145	0.116	0.017	0.061	0.092	0.025	0.105	0.083	0.021	0.017	0.023
08/19/99	0.90	na	0.045	0.030	0.018	0.048	0.017	0.021	0.056	0.018	0.024	0.113	0.016
08/22/99	2.95	0.110	0.078	0.062	*0.005*	0.018	0.020	0.040	*0.005*	0.023	*0.005*	na	0.014
09/11/99	0.84	0.212	0.301	0.195	na	0.064	na	na	na	0.245	na	na	0.025
09/18/99	0.85	0.121	*0.005*	*0.005*	*0.005*	0.039	na	0.021	*0.005*	*0.005*	*0.005*	*0.005*	0.011
09/25/99	1.37	0.047	0.056	0.036	*0.005*	0.028	0.020	0.038	0.051	0.068	*0.005*	*0.005*	*0.005*
10/03/99	1.22	0.184	0.094	0.131	0.019	0.035	0.043	0.036	0.070	0.068	0.018	0.017	0.025
10/04/99	0.98	0.013	0.021	0.013	na	0.059	na	na	na	0.107	*0.005*	0.137	0.156
11/01/99	1.63	0.052	0.014	na	0.032	0.185	0.051	0.047	na	0.069	na	0.084	0.063
12/17/99	0.75	0.036	0.032	0.066	na	na	na	na	na	na	na	na	na
01/06/00	0.79	0.178	0.200	0.239	na	0.175	na	na	na	0.163	na	na	na
01/24/00	0.68	0.099	0.075	0.084	na	0.205	na	na	na	0.080	na	na	na
01/31/00	0.70	0.087	0.080	0.062	na	0.223	na	na	na	0.112	na	na	na
06/13/00	1.29	0.293	0.240	0.279	0.577	0.260	na	0.345	0.412	0.410	na	na	na
06/22/00	0.39	0.174	0.178	0.243	na	na	na	na	na	0.207	na	na	na
06/***/00	1.39	0.095	0.143	0.135	na	0.127	0.291	na	na	na	na	na	na
06/29/00	0.71	0.046	0.085	0.066	na	0.145	0.058	0.022	na	0.065	na	na	na
07/01/00	0.81	0.111	0.179	0.116	na	0.072	na	na	0.288	0.102	na	na	na
07/04/00	1.95	0.151	0.179	0.097	0.091	0.103	0.107	0.095	0.114	0.112	na	na	na
07/08/00	1.07	0.320	0.232	0.208	0.093	0.077	0.093	0.062	0.143	0.176	0.061	na	0.011
07/15/00	1.98	0.103	na	na	0.029	0.094	0.045	0.061	0.043	0.050	na	na	*0.005*
07/26/00	1.24	na	0.130	na	na	0.039	na	0.072	na	0.108	na	na	na
07/31/00	2.69	0.222	0.047	0.105	0.058	0.060	0.084	0.047	0.081	0.109	0.086	0.047	0.057
08/12/00	2.41	0.054	0.074	na	0.044	0.051	0.052	0.079	0.050	0.093	0.017	0.026	0.049
08/29/00	1.20	0.267	0.226	0.126	0.026	0.017	0.108	0.005	0.164	0.026	*0.005*	0.012	0.070
09/07/00	1.96	0.155	0.112	0.074	0.083	0.106	0.105	0.066	0.117	0.125	0.161	0.036	0.066
09/17/00	2.05	0.157	na	0.079	na	0.082	na	0.085	na	0.067	0.06	na	0.050
09/24/00	1.16	0.761	na	0.358	0.188	0.212	0.242	0.236	0.384	0.410	0.221	0.081	0.045
11/26/00	0.93	0.121	0.045	0.053	0.238	*0.005*	0.178	na	0.167	na	na	na	na
TOTAL RAIN	40.11												
No.Obs.		29	28	27	19	29	18	21	18	28	15	13	18
Average		0.160	0.113	0.113	0.082	0.090	0.090	0.068	0.126	0.113	0.047	0.046	0.039
Median		0.121	0.090	0.084	0.029	0.064	0.071	0.047	0.093	0.088	0.018	0.026	0.025
St.Dev.		0.144	0.080	0.088	0.136	0.072	0.078	0.080	0.121	0.101	0.065	0.044	0.037
C.V.		0.898	0.709	0.776	1.665	0.792	0.868	1.182	0.968	0.892	1.389	0.967	0.959
Maximum		0.761	0.301	0.358	0.577	0.260	0.291	0.345	0.412	0.410	0.221	0.137	0.156
Minimum		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 2a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

NITRATE AS N (LABORATORY DETECTION LIMIT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.162	0.262	0.264	na	0.337	na	na	na	na	na	na	na
08/06/98	0.68	0.374	0.343	0.334	0.284	0.372	na	0.298	na	0.311	na	na	0.111
08/07/98	1.30	0.235	0.218	0.214	0.215	0.231	0.249	0.203	0.161	0.191	na	na	na
08/09/98	2.47	0.256	0.235	0.241	0.202	0.227	0.211	0.215	0.206	na	na	na	na
08/20/98	0.68	0.190	0.142	0.136	0.137	0.161	na	0.115	0.134	0.125	na	na	na
09/03/98	1.97	0.039	0.099	0.152	0.145	0.051	0.099	0.043	0.032	0.026	na	na	0.192
09/***/98	1.85	0.303	0.059	0.278	0.042	0.220	0.186	0.152	0.052	0.176	na	na	na
09/17/98	0.49	0.057	0.093	0.215	na	na	na	na	na	na	na	na	na
09/18/98	0.66	0.017	0.039	0.040	na	*0.005*	na	na	na	na	na	na	*0.005*
09/19/98	0.75	0.030	0.016	0.017	*0.005*	0.011	na	*0.005*	0.011	na	na	na	*0.005*
09/20/98	1.85	0.081	0.074	0.080	0.034	0.045	0.048	0.049	0.038	0.062	na	na	na
09/26/98	1.64	na	0.085	0.031	0.010	*0.005*	na	*0.005*	*0.005*	*0.005*	na	na	na
11/05/98	1.20	*0.005*	0.093	0.068	na	na	na	na	na	na	na	na	na
12/13/98	0.37	0.105	0.163	na	na	na	na	na	0.056	na	na	na	na
01/03/99	1.23	0.045	0.056	0.051	0.135	0.202	0.103	0.134	0.219	0.151	na	na	na
01/23/99	2.60	0.034	0.044	0.046	0.082	0.099	0.119	0.090	0.090	0.064	na	na	0.076
02/28/99	0.36	0.121	0.403	0.324	na	na	na	na	na	0.335	na	na	*0.005*
03/14/99	0.80	0.069	0.128	0.123	na	0.325	na	na	na	0.230	na	na	0.089
04/17/99	0.54	0.316	0.403	0.376	na	na	na	na	na	na	na	na	na
05/21/99	1.34	0.502	0.532	0.529	0.641	0.237	na	0.585	0.710	0.718	na	na	na
05/30/99	0.39	0.331	0.449	0.467	na	na	na	na	na	0.354	na	na	na
06/09/99	0.81	0.270	0.226	0.214	na	0.278	na	0.212	na	0.227	na	na	na
06/13/99	1.22	0.118	0.122	0.097	0.107	0.123	0.065	0.159	0.111	0.214	na	na	na
06/16/99	1.68	0.111	0.099	0.101	0.101	0.081	0.118	0.059	0.080	0.052	na	na	0.210
06/17/99	0.77	0.068	0.059	0.059	0.044	0.350	na	0.038	na	0.039	na	na	na
06/18/99	1.60	0.111	0.142	0.155	0.099	0.076	0.045	0.107	0.107	0.071	na	na	na
07/01/99	1.53	0.292	0.272	0.205	0.154	0.176	*0.005*	0.139	0.183	0.202	na	na	0.025
07/07/99	0.81	0.365	0.372	0.400	na	0.342	na	na	na	0.363	na	na	na
07/09/99	1.17	na	0.125	0.101	0.109	0.126	0.150	0.101	0.113	0.106	na	0.012	na
07/13/99	1.58	0.620	0.572	0.571	na	0.381	na	na	na	0.259	na	na	*0.005*
07/20/99	0.88	0.763	0.742	0.740	na	0.683	na	0.672	na	na	na	na	*0.005*
RAIN TOTAL	35.79												
No.Obs.		29	31	30	18	25	12	20	17	22	0	1	11
Average		0.207	0.215	0.221	0.141	0.206	0.117	0.169	0.136	0.195	na	na	0.066
Median		0.121	0.142	0.180	0.108	0.202	0.111	0.125	0.107	0.183	na	na	0.025
St.Dev.		0.188	0.181	0.180	0.145	0.157	0.073	0.175	0.162	0.161	na	na	0.077
C.V.		0.909	0.842	0.816	1.022	0.764	0.622	1.035	1.191	0.825	na	na	1.166
Maximum		0.763	0.742	0.740	0.641	0.683	0.249	0.672	0.710	0.718	na	na	0.763
Minimum		0.005	0.016	0.017	0.005	0.005	0.005	0.005	0.005	0.005	na	na	0.005

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.

7/13/99 Includes several days of rainfall

APPENDIX G - 2b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

NITRATE AS N (LABORATORY DETECTION LIMIT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	0.063	0.055	0.060	0.132	0.159	0.168	0.086	0.081	0.100	0.045	0.025	0.062
08/12/99	0.70	0.304	0.312	0.311	0.138	0.172	na	0.136	na	0.290	na	na	na
08/14/99	1.23	0.552	0.410	0.385	0.334	0.430	0.514	0.378	0.435	0.414	0.25	0.145	0.144
08/19/99	0.90	na	0.308	0.371	0.296	0.298	0.314	0.282	0.298	0.317	*0.005*	0.005	0.108
08/22/99	2.95	*0.005*	*0.005*	*0.005*	*0.005*	0.005	0.040	0.027	*0.005*	*0.005*	*0.005*	na	*0.005*
09/11/99	0.84	0.069	0.062	0.052	na	0.099	na	na	na	*0.005*	na	na	*0.005*
09/18/99	0.85	0.084	0.051	0.044	0.084	0.077	na	0.156	0.085	0.080	*0.005*	0.019	*0.005*
09/25/99	1.37	0.132	0.175	0.168	0.149	0.177	0.157	0.173	0.171	0.343	*0.005*	*0.005*	0.056
10/03/99	1.22	0.086	0.068	0.079	0.057	0.105	0.129	0.036	0.101	0.077	*0.005*	*0.005*	0.010
10/04/99	0.98	0.080	0.078	0.078	na	0.030	na	na	na	0.039	*0.005*	0.022	0.059
11/01/99	1.63	0.073	0.087	n/a	0.144	0.222	0.204	0.209	na	0.238	na	0.137	0.215
12/17/99	0.75	0.087	0.043	0.054	na	na	na	na	na	na	na	na	na
01/06/00	0.79	0.259	0.220	0.244	na	0.441	na	na	na	0.257	na	na	na
01/24/00	0.68	0.182	0.110	0.092	na	0.331	na	na	na	0.091	na	na	na
01/31/00	0.70	0.074	0.095	0.066	na	0.196	na	na	na	0.172	na	na	na
06/13/00	1.29	0.386	0.487	0.481	0.826	0.782	na	0.659	0.754	0.998	na	na	na
06/22/00	0.39	0.535	0.669	0.612	na	na	na	na	na	0.575	na	na	na
06/***/00	1.39	0.351	0.341	0.338	na	0.457	0.327	na	na	na	na	na	na
06/29/00	0.71	0.186	0.218	0.191	na	0.281	0.164	0.274	na	0.190	na	na	na
07/01/00	0.81	0.161	0.188	0.182	na	na	na	na	0.215	0.130	na	na	na
07/04/00	1.95	0.328	na	0.353	0.254	0.336	0.238	0.219	0.230	0.344	na	na	na
07/08/00	1.07	0.535	0.425	0.418	0.402	0.397	0.460	0.422	0.401	0.462	0.328	na	0.204
07/15/00	1.98	0.310	na	na	0.197	0.191	0.259	0.227	0.190	0.212	na	na	*0.005*
07/26/00	1.24	na	0.014	na	na	0.021	na	na	na	0.016	na	na	na
07/31/00	2.69	0.199	0.261	0.216	0.274	0.242	0.230	0.191	0.193	0.230	0.073	0.109	0.037
08/12/00	2.41	0.107	0.670	na	0.157	0.131	0.152	0.285	0.113	0.207	0.099	0.132	0.069
08/29/00	1.20	0.232	0.362	0.346	0.346	0.381	0.381	0.281	0.317	0.454	0.005	0.005	*0.0025*
09/07/00	1.96	0.418	0.251	0.248	0.291	0.212	0.327	0.198	0.268	0.270	0.14	0.207	0.055
09/17/00	2.05	0.061	na	0.067	na	0.129	na	0.109	na	0.119	0.097	na	*0.0025*
09/24/00	1.16	1.530	na	1.650	1.310	1.270	1.520	1.094	1.080	2.200	0.426	0.077	0.0290
11/26/00	0.93	0.084	0.142	0.156	0.560	0.531	0.508	na	0.502	na	na	na	na
TOTAL RAIN	40.11												
No.Obs.		29	27	27	19	28	18	20	18	28	15	13	18
Average		0.258	0.226	0.269	0.313	0.289	0.338	0.272	0.302	0.316	0.100	0.069	0.060
Median		0.182	0.188	0.191	0.254	0.217	0.249	0.214	0.223	0.221	0.045	0.025	0.046
St.Dev.		0.291	0.187	0.317	0.308	0.260	0.324	0.241	0.265	0.424	0.133	0.070	0.067
C.V.		1.131	0.825	1.179	0.981	0.897	0.956	0.884	0.877	1.344	1.341	1.013	1.129
Maximum		1.530	0.670	1.650	1.310	1.270	1.520	1.094	1.080	2.200	0.426	0.207	0.215
Minimum		0.005	0.005	0.005	0.005	0.005	0.040	0.027	0.005	0.005	0.005	0.005	0.003

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 3a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

NITRITE AS N (LABORATORY DETECTION LIMIT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.005	0.005	0.011	na	0.022	na	na	na	na	na	na	na
08/06/98	0.68	0.005	0.010	0.010	0.016	0.017	na	0.015	na	0.010	na	na	0.022
08/07/98	1.30	0.005	0.011	0.013	0.015	0.018	0.015	0.016	0.023	0.010	na	na	na
08/09/98	2.47	0.005	0.010	0.011	0.010	0.013	0.013	0.012	0.010	na	na	na	na
08/20/98	0.68	0.005	0.005	0.005	0.005	0.005	na	0.005	0.005	0.005	na	na	na
09/03/98	1.97	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	na	na	0.005
09/***/98	1.85	0.003	0.005	0.009	0.002	0.009	0.005	0.009	0.002	0.010	na	na	0.002
09/17/98	0.49	0.005	0.005	0.005	na	na	na	na	na	na	na	na	na
09/18/98	0.66	0.005	0.005	0.005	na	0.005	na	na	na	na	na	na	0.005
09/19/98	0.75	0.005	0.005	0.005	0.005	0.005	na	0.005	0.005	na	na	na	0.005
09/20/98	1.85	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	na	na	na
09/26/98	1.64	na	0.005	0.005	0.005	0.005	na	0.005	0.005	0.005	na	na	na
11/05/98	1.20	0.005	0.014	0.005	na	na	na	na	na	na	na	na	na
12/13/98	0.37	0.005	0.005	na	na	na	na	na	0.005	na	na	na	na
01/03/99	1.23	0.005	0.005	0.005	0.005	0.005	0.011	0.01	0.005	0.005	na	na	na
01/23/99	2.60	0.005	0.005	0.005	0.005	0.012	0.012	0.013	0.005	0.005	na	na	0.005
02/28/99	0.36	0.005	0.015	0.015	na	na	na	na	na	0.013	na	na	0.005
03/14/99	0.80	0.005	0.01	0.012	na	0.024	na	na	na	0.013	na	na	0.021
04/17/99	0.54	0.005	0.022	0.024	na	na	na	na	na	na	na	na	na
05/21/99	1.34	0.005	0.013	0.013	0.019	0.023	na	0.021	0.015	0.017	na	na	na
05/30/99	0.39	0.005	0.015	0.014	na	na	na	na	na	0.011	na	na	na
06/09/99	0.81	0.270	0.226	0.214	na	0.278	na	0.212	na	0.227	na	na	na
06/13/99	1.22	0.005	0.011	0.01	0.005	0.013	0.012	0.013	0.005	0.013	na	na	na
06/16/99	1.68	0.005	0.005	0.005	0.005	0.005	0.005	0.008	0.005	0.005	na	na	0.129
06/17/99	0.77	0.005	0.005	0.005	0.005	0.005	na	0.005	na	0.005	na	na	na
06/18/99	1.60	0.005	0.005	0.005	0.005	0.005	na	0.005	na	0.005	na	na	na
07/01/99	1.53	0.005	0.005	0.005	0.008	0.007	0.020	0.012	0.013	0.008	na	na	0.025
07/07/99	0.81	0.005	0.007	0.009	na	0.018	na	na	na	0.01	na	na	na
07/09/99	1.17	0.005	0.007	0.005	0.011	0.013	0.01	0.013	0.006	0.006	na	0.02	0.016
07/13/99	1.58	0.005	0.014	0.016	na	0.022	na	na	na	0.005	na	na	0.012
07/20/99	0.88	0.006	0.019	0.022	na	0.035	na	0.021	na	na	na	na	0.005
RAIN TOTAL	35.79												
No.Obs.		30	31	30	18	25	11	20	16	22	0	1	13
Average		0.014	0.016	0.016	0.008	0.023	0.010	0.020	0.007	0.018	na	na	0.020
Median		0.005	0.005	0.007	0.005	0.012	0.011	0.011	0.005	0.007	na	na	0.005
St.Dev.		0.048	0.039	0.038	0.005	0.054	0.005	0.045	0.005	0.047	na	na	0.034
C.V.		3.507	2.519	2.371	0.624	2.342	0.479	2.214	0.718	2.588	na	na	1.707
Maximum		0.270	0.226	0.214	0.019	0.278	0.020	0.212	0.023	0.227	na	na	0.129
Minimum		0.003	0.005	0.005	0.002	0.005	0.005	0.005	0.002	0.005	na	na	0.002

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 3b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

NITRITE AS N (LABORATORY DETECTION LIMIT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	0.0025	0.0025	0.0025	0.0025	0.0025	0.009	0.0025	0.0025	0.0025	0.0025	0.022	na
08/12/99	0.70	0.0025	0.0025	0.0025	0.0025	0.0025	na	0.0025	na	0.0025	na	na	na
08/14/99	1.23	0.0025	0.01	0.008	0.009	0.01	0.009	0.01	0.007	0.009	0.008	0.009	0.014
08/19/99	0.90	na	0.008	0.009	0.012	0.012	0.013	0.012	0.008	0.008	0.0025	0.005	0.011
08/22/99	2.95	0.0025	0.0025	0.0025	0.0025	0.008	0.0025	0.002	0.0025	0.014	0.0025	na	0.0025
09/11/99	0.84	0.0025	0.012	0.016	na	0.022	na	na	na	0.016	na	na	0.0025
09/18/99	0.85	0.0025	0.0025	0.0025	0.0025	0.0025	na	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
09/25/99	1.37	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
10/03/99	1.22	0.0025	0.0025	0.0025	0.0025	0.0025	0.008	0.0025	0.0025	0.0025	0.0025	0.005	0.0025
10/04/99	0.98	0.0025	0.0025	0.0025	na	0.0025	na	an	na	0.0025	0.0025	0.006	0.0025
11/01/99	1.63	0.0025	0.0025	na	0.005	0.008	0.005	0.008	na	0.005	na	0.0025	0.005
12/17/99	0.75	0.0025	0.0025	0.0025	na	na	na	na	na	na	na	na	na
01/06/00	0.79	0.0025	*0.018	*0.016	na	0.024	na	na	na	0.015	na	na	na
01/24/00	0.68	0.0025	0.010	0.010	na	0.006	na	na	na	0.003	na	na	na
01/31/00	0.70	0.0025	0.010	0.009	na	0.140	na	na	na	0.010	na	na	na
06/13/00	1.29	0.0025	0.012	0.015	0.019	0.015	na	0.015	0.014	0.019	na	na	na
06/22/00	0.39	0.0025	0.008	0.0025	na	na	na	na	na	na	na	na	na
06/23-27/0	1.39	0.0025	0.012	0.014	na	0.023	0.028	na	na	na	na	na	na
06/29/00	0.71	0.005	0.009	0.008	na	0.014	0.012	0.016	na	0.007	na	na	na
07/01/00	0.81	0.0025	0.007	0.011	na	0.012	na	na	na	0.012	na	na	na
07/04/00	1.95	0.009	na	0.016	0.01	0.014	0.008	0.010	0.009	0.015	na	na	na
07/08/00	1.07	0.0025	0.007	0.009	0.010	0.012	0.014	0.009	0.009	0.008	0.012	na	0.0025
07/15/00	1.98	0.0025	na	na	0.010	0.016	0.009	0.011	0.008	0.010	na	na	0.007
07/26/00	1.24	na	na	0.591	na	0.357	na	na	na	0.54	na	na	na
07/31/00	2.69	0.0025	0.013	0.015	0.014	0.018	0.014	0.014	0.012	0.020	0.013	0.006	0.011
08/12/00	2.41	0.0025	0.012	na	0.006	0.005	0.0025	0.0025	0.0025	0.005	0.007	0.005	0.005
08/29/00	1.20	0.0025	0.012	0.014	0.011	0.017	0.011	0.013	0.011	0.016	0.006	0.005	0.0025
09/07/00	1.96	0.0025	0.014	0.015	0.014	0.018	0.013	0.014	0.010	0.017	0.018	0.005	0.010
09/17/00	2.05	0.0025	na	0.003	na	0.006	na	0.003	na	0.005	0.0025	na	0.0025
09/24/00	1.16	0.006	na	0.039	0.027	0.031	0.026	0.036	0.025	0.027	0.066	0.0025	0.007
11/26/00	0.93	0.006	0.009	0.010	0.009	0.014	0.010	na	0.009	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	25	27	19	29	18	20	17	27	15	13	17
Average		0.003	0.008	0.031	0.009	0.028	0.011	0.009	0.008	0.029	0.010	0.006	0.005
Median		0.003	0.008	0.009	0.009	0.012	0.010	0.010	0.008	0.009	0.003	0.005	0.003
St.Dev.		0.002	0.004	0.112	0.007	0.068	0.007	0.008	0.006	0.102	0.016	0.005	0.004
C.V.		0.496	0.560	3.631	0.726	2.413	0.638	0.852	0.721	3.470	1.624	0.859	0.710
Maximum		0.009	0.014	0.591	0.027	0.357	0.028	0.036	0.025	0.540	0.066	0.022	0.014
Minimum		0.003	0.003	0.002	0.003	0.003	0.003	0.002	0.003	0.003	0.003	0.003	0.003

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

* 1/6/00 Nitrite sample analysis performed beyond hold time.
Nitrite result subtracted from Nitrate was not determined within sample hold time.

APPENDIX G - 4a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL NITROGEN AS N (LABORATORY DETECTION LIMIT=0.05 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.17	0.54	0.65	na	0.73	na	na	na	na	na	na	na
08/06/98	0.68	0.38	0.40	0.39	0.43	0.56	na	0.43	na	0.46	na	na	0.57
08/07/98	1.30	0.57	0.60	0.71	0.53	0.60	0.66	0.64	0.650	0.72	na	na	na
08/09/98	2.47	0.82	0.45	0.50	0.35	0.36	0.63	0.33	0.64	na	na	na	na
08/20/98	0.68	0.32	0.25	0.22	0.38	0.36	na	0.39	0.40	0.300	na	na	na
09/03/98	1.97	0.12	0.28	0.19	0.23	0.15	0.17	0.19	0.18	0.11	na	na	na
09/***/98	1.85	0.73	0.41	0.46	0.19	0.62	0.60	0.65	0.30	0.60	na	na	0.66
09/17/98	0.49	0.10	0.15	0.22	na	na	na	na	na	na	na	na	na
09/18/98	0.66	0.04	0.09	0.04	na	0.38	na	na	na	na	na	na	0.32
09/19/98	0.75	0.40	0.03	0.03	0.07	0.06	na	0.08	0.08	na	na	na	0.27
09/20/98	1.85	0.25	0.15	0.21	0.12	0.08	0.15	0.13	0.09	0.19	na	na	na
09/26/98	1.64	na	0.11	0.08	0.07	0.09	na	0.17	0.23	0.15	na	na	na
11/05/98	1.20	0.10	0.32	0.24	na	na	na	na	na	na	na	na	na
12/13/98	0.37	0.32	0.59	na	na	na	na	na	0.84	na	na	na	na
01/03/99	1.23	0.15	0.15	0.17	0.42	0.63	0.52	0.52	0.74	0.45	na	na	na
01/23/99	2.60	0.11	0.07	0.10	0.24	0.39	0.41	0.46	0.35	0.16	na	na	0.46
02/28/99	0.36	0.29	1.30	0.96	na	na	na	na	na	1.30	na	na	0.72
03/14/99	0.80	0.29	0.59	0.57	na	1.30	na	na	na	1.30	na	na	1.20
04/17/99	0.54	0.50	1.40	1.60	na	na	na	na	na	na	na	na	na
05/21/99	1.34	0.98	1.20	1.30	1.40	1.70	na	1.60	1.80	1.70	na	na	na
05/30/99	0.39	0.72	0.96	0.93	na	na	na	na	na	0.82	na	na	na
06/09/99	0.81	0.40	0.23	0.25	na	0.53	na	0.60	na	0.46	na	na	na
06/13/99	1.22	0.38	0.51	0.57	0.72	0.74	0.72	0.84	0.91	1.60	na	na	na
06/16/99	1.68	0.40	0.10	0.155	0.30	0.429	0.40	0.584	0.33	0.364	na	na	0.70
06/17/99	0.77	0.22	0.11	0.16	0.25	0.43	na	0.34	na	0.51	na	na	na
06/18/99	1.60	0.23	0.23	0.30	0.31	0.36	0.33	0.50	0.39	0.32	na	na	na
07/01/99	1.53	0.60	0.51	0.37	0.46	0.58	0.65	0.64	0.57	0.48	na	na	0.72
07/07/99	0.81	0.97	0.76	0.70	na	0.65	na	na	na	0.65	na	na	na
07/09/99	1.17	na	0.41	0.23	0.28	0.36	0.23	0.35	0.26	0.26	na	0.38	na
07/13/99	1.58	0.80	0.82	0.75	na	0.54	na	na	na	0.74	na	na	1.00
07/20/99	0.88	0.96	0.95	0.93	na	1.00	na	0.99	na	na	na	na	0.64
RAIN TOTAL	35.79												
No.Obs.		29	31	30	18	25	12	20	17	22	0	1	11
Average		0.425	0.473	0.466	0.375	0.545	0.456	0.522	0.515	0.620	na	na	0.660
Median		0.380	0.410	0.333	0.305	0.530	0.465	0.480	0.390	0.470	na	na	0.660
St.Dev.		0.286	0.377	0.385	0.303	0.368	0.203	0.344	0.416	0.463	na	na	0.271
C.V.		0.674	0.796	0.827	0.809	0.675	0.445	0.659	0.807	0.747	na	na	0.410
Maximum		0.980	1.400	1.600	1.400	1.700	0.720	1.600	1.800	1.700	na	na	1.200
Minimum		0.040	0.030	0.025	0.070	0.055	0.150	0.080	0.080	0.110	na	na	0.270

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 4b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL NITROGEN AS N (LABORATORY DETECTION LIMIT=0.05 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	0.08	0.59	0.50	0.47	0.73	0.53	0.53	0.54	0.47	0.61	0.78	0.08
08/12/99	0.70	0.52	0.50	0.52	0.53	0.52	na	0.41	na	0.49	na	na	na
08/14/99	1.23	0.87	0.57	0.59	0.53	0.5	0.65	0.51	0.44	0.5	0.31	0.2	0.63
08/19/99	0.90	na	0.35	0.41	0.32	0.43	0.37	0.33	0.35	0.42	0.08	0.12	0.58
08/22/99	2.95	0.16	0.21	0.19	0.19	0.11	0.06	0.08	0.26	0.30	0.27	na	0.20
09/11/99	0.84	0.74	0.60	0.56	na	0.66	na	na	na	0.66	na	na	0.4
09/18/99	0.85	0.35	0.12	0.23	0.89	0.72	na	0.95	0.53	0.39	1.2	1.8	0.73
09/25/99	1.37	0.82	0.8	0.52	0.63	0.79	0.49	0.63	0.58	0.8	0.24	0.31	0.34
10/03/99	1.22	0.37	0.21	0.22	0.25	0.32	0.28	0.41	0.28	0.2	0.3	0.36	0.41
10/04/99	0.98	0.08	0.15	0.14	na	0.29	na	na	na	0.23	0.55	0.5	0.44
11/01/99	1.63	*	*	*	*	*	*	*	*	*	*	*	*
12/17/99	0.75	0.15	0.27	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	0.38	0.44	0.64	na	0.54	na	na	na	0.41	na	na	na
01/24/00	0.68	0.00	0.12	0.03	na	0.48	na	na	na	1.10	na	na	na
01/31/00	0.70	0.27	0.24	0.25	na	0.29	na	na	na	0.62	na	na	na
06/13/00	1.29	0.82	1.20	1.20	2.50	1.90	na	1.90	2.40	2.40	na	na	na
06/22/00	0.39	0.53	0.92	1.10	na	na	na	na	na	na	na	na	na
06/23-27/0	1.39	0.27	0.38	0.41	na	1.10	1.10	na	na	na	na	na	na
06/29/00	0.71	0.29	0.46	0.40	na	0.88	0.40	0.98	na	0.57	na	na	na
07/01/00	0.81	0.07	0.19	0.19	na	0.48	na	na	na	0.33	na	na	na
07/04/00	1.95	0.30	na	0.53	0.36	0.66	0.62	0.60	0.34	0.55	na	na	na
07/08/00	1.07	1.90	1.60	1.80	1.90	2.00	1.80	1.00	1.20	2.30	0.36	na	0.45
07/15/00	1.98	0.69	na	na	0.69	0.97	0.72	0.74	0.50	0.71	na	na	1.40
07/26/00	1.24	na	0.89	na	na	1.60	na	na	na	1.50	na	na	na
07/31/00	2.69	0.52	0.44	0.39	0.60	0.63	0.64	0.68	0.71	0.86	0.56	0.38	0.75
08/12/00	2.41	0.42	1.40	na	0.63	0.93	1.40	1.70	0.80	0.89	0.72	0.53	1.10
08/29/00	1.20	0.47	0.80	0.77	0.94	0.88	1.30	0.65	1.00	1.30	0.81	0.56	1.70
09/07/00	1.96	0.56	0.60	0.59	0.64	0.74	0.86	0.61	0.61	1.00	0.63	0.50	0.80
09/17/00	2.05	0.17	na	0.30	na	0.46	na	0.46	na	0.58	0.40	na	0.49
09/24/00	1.16	2.20	na	2.10	2.00	1.90	1.80	2.40	1.80	2.50	1.00	0.52	1.00
11/26/00	0.93	0.34	0.43	0.47	1.40	1.30	1.20	na	1.40	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		28	26	26	18	28	17	19	17	25	15	12	17
Average		0.512	0.557	0.579	0.859	0.814	0.836	0.819	0.808	0.864	0.536	0.547	0.676
Median		0.375	0.450	0.485	0.630	0.692	0.650	0.630	0.580	0.620	0.550	0.500	0.580
St.Dev.		0.498	0.391	0.485	0.658	0.506	0.516	0.583	0.589	0.662	0.305	0.432	0.424
C.V.		0.973	0.701	0.839	0.765	0.621	0.617	0.712	0.729	0.767	0.569	0.790	0.627
Maximum		2.200	1.600	2.100	2.500	2.000	1.800	2.400	2.400	2.500	1.200	1.800	1.700
Minimum		0.000	0.120	0.030	0.190	0.107	0.060	0.082	0.260	0.200	0.080	0.120	0.080

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.
* Total nitrogen not tested - lab error

APPENDIX G - 5a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

ORTHO-PHOSPHORUS (LABORATORY DETECTION LIMIT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	*0.005*	0.036	0.027	na	0.116	na	na	na	na	na	na	na
08/06/98	0.68	0.011	0.025	0.022	0.135	0.098	na	0.054	na	0.040	na	na	0.027
08/07/98	1.30	0.017	0.030	0.032	0.107	0.072	0.040	0.055	0.054	0.049	na	na	na
08/09/98	2.47	0.005	0.017	0.010	0.037	0.040	0.015	0.024	0.034	na	na	na	na
08/20/98	0.68	0.005	0.025	0.016	0.115	0.065	na	0.046	0.094	0.056	na	na	na
09/03/98	1.97	*0.005*	0.016	*0.005*	0.072	0.150	0.060	0.012	0.040	0.030	na	na	0.038
09/***/98	1.85	0.015	*0.005*	*0.003*	0.063	0.052	0.021	0.033	0.063	0.031	na	na	na
09/17/98	0.49	*0.005*	0.037	0.013	na	na	na	na	na	na	na	na	na
09/18/98	0.66	*0.005*	0.018	*0.005*	na	0.085	na	na	na	na	na	na	0.037
09/19/98	0.75	*0.005*	0.010	*0.005*	0.108	0.052	na	0.038	0.058	na	na	na	0.023
09/20/98	1.85	*0.005*	*0.005*	*0.005*	0.055	0.039	0.017	0.029	0.041	0.023	na	na	na
09/26/98	1.64	na	*0.005*	0.072	0.037	0.036	na	0.048	0.040	0.037	na	na	na
11/05/98	1.20	*0.005*	0.035	0.023	na	na	na	na	na	na	na	na	na
12/13/98	0.37	*0.005*	0.012	na	na	na	na	na	0.119	na	na	na	na
01/03/99	1.23	*0.005*	0.016	0.022	0.175	0.149	0.051	0.129	0.194	0.127	na	na	na
01/23/99	2.60	0.011	0.031	0.026	0.175	0.392	0.033	0.464	0.147	0.155	na	na	0.112
02/28/99	0.36	0.030	0.163	0.129	na	na	na	na	na	0.259	na	na	0.069
03/14/99	0.80	0.013	0.089	0.401	na	1.780	na	na	na	1.900	na	na	0.241
04/17/99	0.54	0.017	0.135	0.349	na	na	na	na	na	na	na	na	na
05/21/99	1.34	0.022	0.070	0.170	0.413	0.605	na	0.596	0.244	0.596	na	na	na
05/30/99	0.39	*0.005*	0.065	0.147	na	na	na	na	na	0.394	na	na	na
06/09/99	0.81	*0.005*	0.031	0.054	na	0.295	na	0.311	na	0.348	na	na	na
06/13/99	1.22	*0.005*	0.035	0.042	0.353	0.272	0.100	0.360	0.143	0.318	na	na	na
06/16/99	1.68	*0.005*	0.036	0.037	0.179	0.213	0.090	0.276	0.118	0.227	na	na	0.427
06/17/99	0.77	*0.005*	0.022	0.032	0.176	0.166	na	0.216	na	0.271	na	na	na
06/18/99	1.60	*0.005*	0.019	0.022	0.152	0.145	0.046	0.121	0.071	0.147	na	na	na
07/01/99	1.53	0.038	0.042	0.028	0.187	0.160	0.079	0.183	0.122	0.149	na	na	0.086
07/07/99	0.81	0.260	0.042	0.041	na	0.125	na	na	na	0.092	na	na	na
07/09/99	1.17	*0.005*	0.035	0.020	0.134	0.119	0.062	0.146	0.099	0.096	na	0.4	0.353
07/13/99	1.58	0.016	0.040	0.041	na	0.059	na	na	na	0.079	na	na	0.394
07/20/99	0.88	0.019	0.039	0.022	na	0.099	na	0.073	na	na	na	na	0.422
RAIN TOTAL	35.79												
No.Obs.		30	31	30	18	25	12	20	17	22	0	1	12
Average		0.019	0.038	0.061	0.149	0.215	0.051	0.161	0.099	0.247	na	na	0.186
Median		0.005	0.031	0.027	0.135	0.119	0.049	0.097	0.094	0.137	na	na	0.099
St.Dev.		0.046	0.035	0.095	0.099	0.350	0.028	0.164	0.059	0.397	na	na	0.169
C.V.		2.487	0.919	1.564	0.669	1.627	0.551	1.019	0.598	1.612	na	na	0.908
Maximum		0.260	0.163	0.401	0.413	1.780	0.100	0.596	0.244	1.900	na	na	0.427
Minimum		0.005	0.005	0.003	0.037	0.036	0.015	0.012	0.034	0.023	na	na	0.023

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 5b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

ORTHO-PHOSPHORUS (LABORATORY DETECTION LIMIT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	0.013	0.018	0.025	0.202	0.113	0.055	0.145	0.133	0.103	0.498	0.836	0.209
08/12/99	0.70	*0.005*	0.016	0.015	0.241	0.089	na	0.094	na	0.067	na	na	na
08/14/99	1.23	0.012	0.022	0.013	0.141	0.095	0.063	0.105	0.083	0.071	0.113	0.188	*0.005*
08/19/99	0.90	na	0.023	0.018	0.133	0.102	0.061	0.120	0.097	0.089	0.116	0.198	0.010
08/22/99	2.95	0.160	0.022	0.017	0.125	0.100	0.042	0.055	0.056	0.070	0.055	na	0.013
09/11/99	0.84	0.023	0.026	0.016	na	0.151	na	na	na	0.082	na	na	0.101
09/18/99	0.85	0.042	0.021	0.021	0.300	0.144	na	0.198	0.114	0.064	0.516	0.508	0.150
09/25/99	1.37	0.029	0.030	0.018	0.155	0.108	0.069	0.169	0.129	0.069	0.217	0.249	0.173
10/03/99	1.22	0.043	0.026	0.023	0.192	0.113	0.045	0.181	0.110	0.061	0.272	0.352	0.020
10/04/99	0.98	*0.005*	0.016	0.016	na	0.102	na	na	na	0.056	0.357	0.317	0.308
11/01/99	1.63	0.041	0.033	na	0.353	0.316	0.119	0.292	na	0.213	na	0.169	0.191
12/17/99	0.75	*0.005*	0.026	0.035	na	na	na	na	na	na	na	na	na
01/06/00	0.79	*0.005*	0.690	0.077	na	0.220	na	na	na	0.089	na	na	na
01/24/00	0.68	*0.005*	0.034	0.038	na	0.330	na	na	na	0.327	na	na	na
01/31/00	0.70	*0.005*	0.016	0.027	na	0.244	na	na	na	0.177	na	na	na
06/13/00	1.29	0.021	0.054	0.122	0.603	0.739	na	0.922	0.263	0.557	na	na	na
06/22/00	0.39	*0.005*	0.040	0.121	na	na	na	na	na	na	na	na	na
06/***/00	1.39	*0.005*	0.040	0.055	na	0.288	0.207	na	na	na	na	na	na
06/29/00	0.71	*0.005*	0.030	0.045	na	0.274	0.047	0.403	na	0.192	na	na	na
07/01/00	0.81	*0.005*	0.028	0.031	na	0.230	na	na	0.119	0.131	na	na	na
07/04/00	1.95	0.028	na	0.019	0.268	0.312	0.113	0.290	0.111	0.225	na	na	na
07/08/00	1.07	*0.005*	0.025	0.023	0.155	0.123	0.104	0.245	0.097	0.125	0.098	na	0.193
07/15/00	1.98	*0.005*	na	na	0.151	0.167	0.073	0.155	0.073	0.127	na	na	0.257
07/26/00	1.24	na	0.032	na	na	0.106	na	0.249	na	0.112	na	na	na
07/31/00	2.69	0.026	0.022	0.027	0.171	0.161	0.113	0.163	0.113	0.169	0.113	0.14	0.115
08/12/00	2.41	*0.005*	0.046	na	0.152	0.114	0.090	0.168	0.095	0.171	0.162	0.21	0.198
08/29/00	1.20	*0.005*	0.023	0.008	0.170	0.147	0.099	0.127	0.106	0.188	0.193	0.215	0.105
09/07/00	1.96	*0.005*	0.023	0.022	0.140	0.111	0.110	0.166	0.103	0.126	0.14	0.163	0.112
09/17/00	2.05	0.005	na	0.020	na	0.102	na	0.103	na	0.095	0.112	na	0.075
09/24/00	1.16	0.027	na	0.024	0.096	0.086	0.086	0.242	0.061	0.106	0.106	0.138	0.106
11/26/00	0.93	0.016	0.030	0.041	0.220	0.135	0.127	na	0.173	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	27	19	29	18	20	18	27	15	13	18
Average		0.019	0.052	0.034	0.209	0.184	0.090	0.225	0.113	0.143	0.205	0.283	0.130
Median		0.005	0.026	0.023	0.170	0.135	0.088	0.169	0.108	0.112	0.140	0.210	0.114
St.Dev.		0.030	0.128	0.029	0.115	0.132	0.040	0.183	0.046	0.104	0.145	0.195	0.087
C.V.		1.545	2.443	0.856	0.552	0.718	0.445	0.812	0.408	0.729	0.708	0.690	0.673
Maximum		0.160	0.690	0.122	0.603	0.739	0.207	0.922	0.263	0.557	0.516	0.836	0.308
Minimum		0.005	0.016	0.008	0.096	0.086	0.042	0.055	0.056	0.056	0.055	0.138	0.005

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 6a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL PHOSPHORUS (LABORATORY DETECTION LIMIT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.025	0.061	0.059	na	0.158	na	na	na	na	na	na	na
08/06/98	0.68	0.019	0.027	0.031	0.170	0.116	na	0.070	na	0.046	na	na	0.080
08/07/98	1.30	0.018	0.038	0.040	0.123	0.104	0.058	0.077	0.068	0.080	na	na	na
08/09/98	2.47	0.005	0.033	0.018	0.050	0.058	0.028	0.035	0.051	na	na	na	na
08/20/98	0.68	0.005	0.033	0.026	0.129	0.086	na	0.066	0.114	0.087	na	na	na
09/03/98	1.97	*0.005*	0.030	0.020	0.080	0.070	0.023	0.060	0.110	0.040	na	na	0.069
09/***/98	1.85	0.014	0.020	0.016	0.068	0.092	0.032	0.053	0.093	0.060	na	na	na
09/17/98	0.49	*0.005*	0.972	0.041	na	na	na	na	na	na	na	na	na
09/18/98	0.66	*0.005*	0.033	0.032	na	0.114	na	na	na	na	na	na	0.479
09/19/98	0.75	*0.005*	0.010	0.008	0.128	0.067	na	0.054	0.083	na	na	na	0.084
09/20/98	1.85	*0.005*	0.029	0.028	0.087	0.062	0.041	0.056	0.070	0.058	na	na	na
09/26/98	1.64	na	0.018	0.104	0.098	0.066	na	0.062	0.046	0.076	na	na	na
11/05/98	1.20	0.018	0.054	0.057	na	na	na	na	na	na	na	na	na
12/13/98	0.37	0.018	0.118	na	na	na	na	na	0.191	na	na	na	na
01/03/99	1.23	*0.005*	0.029	0.080	0.186	0.171	0.085	0.167	0.235	0.180	na	na	na
01/23/99	2.60	*0.005*	0.048	0.078	0.198	0.134	0.059	0.122	0.186	0.141	na	na	0.165
02/28/99	0.36	0.052	0.318	0.258	na	na	na	na	na	0.321	na	na	0.102
03/14/99	0.80	*0.005*	0.170	0.513	na	2.190	na	na	na	2.330	na	na	0.406
04/17/99	0.54	0.015	0.212	0.460	na	na	na	na	na	na	na	na	na
05/21/99	1.34	*0.072*	0.146	0.312	0.512	0.761	na	0.708	0.394	0.734	na	na	na
05/30/99	0.39	*0.020*	0.127	0.240	na	na	na	na	na	0.457	na	na	na
06/09/99	0.81	*0.005*	0.079	0.076	na	0.352	na	0.397	na	0.429	na	na	na
06/13/99	1.22	*0.005*	0.077	0.082	0.404	0.325	0.137	0.423	0.192	0.379	na	na	na
06/16/99	1.68	*0.005*	0.050	0.056	0.195	0.242	0.112	0.330	0.154	0.274	na	na	1.430
06/17/99	0.77	*0.011*	0.052	0.091	0.227	0.210	na	0.274	na	0.336	na	na	na
06/18/99	1.60	*0.005*	0.042	0.046	0.191	0.194	0.076	0.168	0.105	0.191	na	na	na
07/01/99	1.53	0.046	0.068	0.048	0.222	0.204	0.107	0.241	0.170	0.190	na	na	0.154
07/07/99	0.81	0.037	0.067	0.101	na	0.186	na	na	na	0.138	na	na	na
07/09/99	1.17	0.012	0.062	0.040	0.165	0.159	0.086	0.193	0.142	0.129	na	0.454	0.484
07/13/99	1.58	0.022	0.066	0.075	na	0.086	na	na	na	0.095	na	na	0.537
07/20/99	0.88	0.037	0.066	0.053	na	0.149	na	0.117	na	na	na	na	0.820
RAIN TOTAL	35.79												
No.Obs.		30	31	30	18	25	12	20	17	22	0	1	12
Average		0.017	0.102	0.103	0.180	0.254	0.070	0.184	0.141	0.308	na	na	0.401
Median		0.012	0.054	0.057	0.168	0.149	0.068	0.120	0.114	0.161	na	na	0.286
St.Dev.		0.017	0.174	0.127	0.116	0.428	0.037	0.172	0.086	0.484	na	na	0.403
C.V.		0.990	1.710	1.229	0.646	1.685	0.519	0.935	0.605	1.571	na	na	1.005
Maximum		0.072	0.972	0.513	0.512	2.190	0.137	0.708	0.394	2.330	na	na	1.430
Minimum		0.005	0.010	0.008	0.050	0.058	0.023	0.035	0.046	0.040	na	na	0.069

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 6b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL PHOSPHORUS (LABORATORY DETECTION LIM IT=0.01 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	0.013	0.028	0.027	0.217	0.137	0.088	0.179	0.192	0.133	0.554	0.936	0.812
08/12/99	0.70	0.015	0.046	0.015	0.268	0.108	na	0.125	na	0.097	na	na	na
08/14/99	1.23	0.02	0.045	0.048	0.172	0.151	0.085	0.144	0.124	0.112	0.14	0.21	0.077
08/19/99	0.90	na	0.042	0.043	0.164	0.148	0.081	0.160	0.134	0.127	0.15	0.225	0.053
08/22/99	2.95	0.123	0.030	0.026	0.141	0.109	0.062	0.083	0.072	0.091	0.07	na	0.119
09/11/99	0.84	0.045	0.052	0.044	na	0.198	na	na	na	0.151	na	na	0.333
09/18/99	0.85	0.073	0.039	0.026	0.364	0.171	na	0.246	0.165	0.104	0.664	0.599	0.233
09/25/99	1.37	0.072	0.095	0.087	0.237	0.325	0.114	0.276	0.172	0.180	0.232	0.371	0.242
10/03/99	1.22	0.058	0.024	0.028	0.213	0.128	0.061	0.244	0.156	0.098	0.332	0.357	0.058
10/04/99	0.98	0.014	0.036	0.027	na	0.140	na	na	na	0.088	0.49	0.407	0.415
11/01/99	1.63	0.049	0.071	na	0.429	0.388	0.286	0.305	na	0.340	na	0.194	0.232
12/17/99	0.75	*0.005*	0.046	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	0.019	0.099	0.138	na	0.296	na	na	na	0.267	na	na	na
01/24/00	0.68	0.022	0.103	0.060	na	0.385	na	na	na	0.407	na	na	na
01/31/00	0.70	0.024	0.048	0.064	na	0.267	na	na	na	0.342	na	na	na
06/13/00	1.29	0.016	0.195	0.246	0.652	1.040	na	1.270	0.347	0.738	na	na	na
06/22/00	0.39	0.025	0.120	0.177	na	na	na	na	na	0.616	na	na	na
06/***/00	1.39	0.037	0.073	0.092	na	0.335	0.269	na	na	na	na	na	na
06/29/00	0.71	0.023	0.078	0.077	na	0.358	0.069	0.540	na	0.285	na	na	na
07/01/00	0.81	0.015	0.040	0.050	na	0.334	na	na	0.145	0.174	na	na	na
07/04/00	1.95	0.042	na	0.036	0.342	0.388	0.103	0.328	0.157	0.233	na	na	na
07/08/00	1.07	0.014	0.054	0.026	0.151	0.117	0.149	0.251	0.116	0.135	0.153	na	0.263
07/15/00	1.98	0.028	na	na	0.171	0.200	0.093	0.173	0.121	0.142	na	na	0.319
07/26/00	1.24	na	0.053	na	na	0.146	na	0.321	na	0.232	na	na	0.285
07/31/00	2.69	0.018	0.056	0.044	0.197	0.196	0.174	0.174	0.163	0.237	0.119	0.167	0.191
08/12/00	2.41	0.010	0.117	na	0.172	0.136	0.118	0.214	0.174	0.212	0.211	0.223	0.252
08/29/00	1.20	*0.005*	0.040	0.018	0.203	0.189	0.136	0.189	0.195	0.262	0.262	0.24	0.444
09/07/00	1.96	0.010	0.046	0.037	0.193	0.158	0.160	0.179	0.153	0.203	0.169	0.184	0.155
09/17/00	2.05	0.018	na	0.033	na	0.134	na	0.133	na	0.141	0.137	na	0.112
09/24/00	1.16	0.049	na	0.062	0.136	0.131	0.128	0.311	0.190	0.231	0.135	0.159	0.162
11/26/00	0.93	0.032	0.069	0.073	0.331	0.235	0.235	na	0.272	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	26	19	29	18	21	18	28	15	13	19
Average		0.031	0.065	0.062	0.250	0.243	0.134	0.278	0.169	0.228	0.255	0.329	0.250
Median		0.022	0.052	0.044	0.203	0.189	0.116	0.214	0.160	0.192	0.169	0.225	0.233
St.Dev.		0.026	0.037	0.053	0.128	0.180	0.068	0.248	0.061	0.153	0.178	0.221	0.176
C.V.		0.832	0.578	0.857	0.510	0.741	0.510	0.891	0.359	0.671	0.699	0.674	0.702
Maximum		0.123	0.195	0.246	0.652	1.040	0.286	1.270	0.347	0.738	0.664	0.936	0.812
Minimum		0.005	0.024	0.015	0.136	0.108	0.061	0.083	0.072	0.088	0.070	0.159	0.053

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 7a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples w ere collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm betw een the strand and the pond interfered w ith collecting strand and pond data until the second set of data.

TOTAL COPPER (LABORATORY DETECTION LIMIT=3 uG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/05/98	0.57	1.4	11.6	7.7	na	6.7	na	na	na	na	na	na	na
08/06/98	0.68	4.8	2.4	3.0	7.7	2.9	na	4.6	na	6.8	na	na	8.3
08/07/98	1.30	2.3	0.15	1.9	2.4	1.8	2.7	2.1	4.2	7.9	na	na	na
08/09/98	2.47	0.5	4.7	1.8	3.9	*0.15*	*0.15*	*0.15*	*0.15*	na	na	na	na
08/20/98	0.68	4.0	6.2	5.4	6.9	4.2	na	4.7	12.8	12.3	na	na	na
09/03/98	1.97	15.4	7.0	6.1	4.5	4.4	3.6	2.8	7.4	10.7	na	na	3.2
09/***/98	1.85	11.5	5.8	4.4	3.2	4.4	2.4	2.8	8.3	7.6	na	na	na
09/17/98	0.49	11.4	10.0	7.0	na	na	na	na	na	na	na	na	na
09/18/98	0.66	8.4	5.8	7.0	na	1.85	na	na	na	na	na	na	12.60
09/19/98	0.75	2.2	3.0	3.1	3.20	*0.15*	na	*0.15*	6.70	na	na	na	*0.15*
09/20/98	1.85	4.4	5.2	5.4	5.50	5.50	2.60	4.00	0.92	6.90	na	na	na
09/26/98	1.64	na	5.9	5.2	3.40	3.50	na	4.20	4.00	7.80	na	na	na
11/05/98	1.20	5.4	8.4	11.5	na	na	na	na	na	na	na	na	na
12/13/98	0.37	3.6	14.4	na	na	na	na	na	17.2	na	na	na	na
01/03/99	1.23	1.0	5.0	16.6	3.6	5.9	4.1	6.8	7.8	12.6	na	na	na
01/23/99	2.60	0.6	8.7	12.4	1.8	1.9	1.2	3.5	4.8	5.8	na	na	13.2
02/28/99	0.36	4.1	34.3	31.7	na	na	na	na	na	23.3	na	na	25.1
03/14/99	0.80	*0.5*	17.3	19.4	na	11.9	na	na	na	15.6	na	na	106.0
04/17/99	0.54	*5.9*	30.8	33.7	na	na	na	na	na	na	na	na	na
05/21/99	1.34	*2.2*	14.7	14.8	6.20	6.5	na	6.50	13.10	9.6	na	na	na
05/30/99	0.39	*3.4*	11.8	17.8	na	na	na	na	na	4.4	na	na	na
06/09/99	0.81	1.4	12.2	8.8	na	2.7	na	4.10	na	6.70	na	na	na
06/13/99	1.22	*2.1*	21.0	9.5	2.40	3.4	3.40	3.60	5.40	10.2	na	na	na
06/16/99	1.68	*0.15*	2.80	3.12	0.90	1.37	0.80	2.78	4.80	5.32	na	na	16.7
06/17/99	0.77	2.3	7.2	10.2	3.40	1.3	na	0.90	na	3.5	na	na	na
06/18/99	1.60	*0.15*	4.5	3.5	2.40	2.6	1.50	2.8	0.90	3.6	na	na	
07/01/99	1.53	12.9	14.4	6.2	3.2	3.8	3.30	3.1	4.70	5.5	na	na	3.5
07/07/99	0.81	6.2	10.8	6.4	na	2.5	na	na	na	*1.0*	na	na	na
07/09/99	1.17	3.0	9.3	3.7	3.8	3.3	14.2	4.2	6.0	5.5	na	12.5	6.5
07/13/99	1.58	6.7	10.1	10.1	na	4.5	na	na	na	10.0	na	na	3.8
07/20/99	0.88	5.1	13.4	8.5	na	5.6	na	8.0	na	na	na	na	2.7
RAIN TOTAL	35.79												
No.Obs.		30	31	30	18	25	12	20	17	22	0	1	12
Average		4.433	10.285	9.527	3.800	3.712	3.329	3.587	6.422	8.303	na	na	16.813
Median		3.500	8.700	7.000	3.400	3.400	2.650	3.534	5.400	7.250	na	na	7.400
St.Dev.		3.980	7.591	7.827	1.777	2.492	3.631	2.021	4.529	4.773	na	na	28.985
C.V.		0.898	0.738	0.822	0.468	0.671	1.091	0.563	0.705	0.575	na	na	1.724
Maximum		15.40	34.30	33.70	7.70	11.90	14.20	8.00	17.20	23.30	na	na	106.00
Minimum		0.150	0.150	1.750	0.900	0.150	0.150	0.150	0.150	1.000	na	na	0.150

9/***/98 Includes 2 storm s for September 6 (1.21 in) and 7 (.64in), 1998, and the sam ples not picked up until Septem ber 8th.

7/13/99 Includes several days of rainfall

APPENDIX G - 7b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL COPPER (LABORATORY DETECTION LIMIT=3 uG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/06/99	1.29	*1.0*	6.0	2.2	2.0	2.5	3.8	3.6	4.4	5.3	14.4	10.5	3.0
08/12/99	0.70	3.1	9.0	13.3	5.8	3.4	na	3.0	na	9.2	na	na	na
08/14/99	1.23	4.1	8.6	8.8	3.6	5.0	3.2	3.6	4.5	5.7	7.6	7.7	8.9
08/19/99	0.90	na	8.6	6.6	3.6	4.2	3.8	3.0	4.4	4.3	9	20.3	6.1
08/22/99	2.95	6.2	3.8	5.0	2.6	3.0	*1.0*	2.7	2.2	5.3	3.8	na	5.0
09/11/99	0.84	8.0	6.8	6.5	na	5.3	na	na	na	0.2	na	na	4.8
09/18/99	0.85	12.7	6.2	13.0	4.6	3.5	na	3.8	9.5	15.2	23.3	17.7	*1.0*
09/25/99	1.37	32.7	6.7	4.7	5.0	3.9	3.1	4.6	7.4	22.6	11.1	6	3.3
10/03/99	1.22	19.2	4.5	2.6	4.6	4.2	2.7	3.5	5.7	8.2	15.5	7.7	2.8
10/04/99	0.98	13.3	3.2	4.0	na	5.3	na	na	na	5.9	31.3	14.9	3.2
11/01/99	1.63	13.1	8.1	na	8.4	6.9	7.3	3.9	na	17.2	na	7.2	17.9
12/17/99	0.75	*1.0*	7.7	7.8	na	na	na	na	na	na	na	na	na
01/06/00	0.79	7.8	12.0	16.3	na	7.8	na	na	na	24.3	na	na	na
01/24/00	0.68	*1.0*	15.6	10.2	na	7.7	na	na	na	33.8	na	na	na
01/31/00	0.70	*1.0*	11.2	42.7	na	5.1	na	na	na	44.2	na	na	na
06/13/00	1.29	5.3	42.6	30.1	14.8	11.8	na	8.5	20.8	25.5	na	na	na
06/22/00	0.39	12.7	21.3	19.0	na	na	na	na	na	34.2	na	na	na
06/***/00	1.39	2.6	9.2	12.9	na	8.6	5.9	na	na	na	na	na	na
06/29/00	0.71	*1.0*	7.6	10.2	na	6.4	3.3	3.5	na	32.8	na	na	na
07/01/00	0.81	2.4	3.9	11.5	na	8.3	5.8	na	24.6	12.0	na	na	na
07/04/00	1.95	5.2	na	3.0	*1.0*	5.9	3.2	3.6	4.6	3.1	na	na	na
07/08/00	1.07	*1.0*	9.2	5.2	*1.0*	*1.0*	*1.0*	2.0	11.0	7.8	7.5	na	9.0
07/15/00	1.98	*1.0*	na	na	2.5	4.0	2.7	3.2	13.5	9.1	na	na	6.9
07/26/00	1.24	na	5.8	na	na	6.8	na	7.1	na	16.3	na	na	na
07/31/00	2.69	*1.0*	8.9	5.0	8.5	5.5	8.3	2.6	6.8	7.7	6.8	6.0	4.5
08/12/00	2.41	*1.0*	21.1	na	3.5	3.8	5.6	5.6	10.2	10.1	11.4	6.9	4.3
08/29/00	1.20	*1.0*	8.4	3.9	4.6	5.9	6.1	5.0	14.3	13.1	8.8	6.1	2.3
09/07/00	1.96	*1.0*	5.7	6.8	6.8	4.4	7.5	3.9	6.6	11.9	8.8	5.4	2.7
09/17/00	2.05	*1.0*	na	2.3	na	4.2	na	5.0	na	46.9	10.5	na	*1.0*
09/24/00	1.16	6.6	na	23.2	8.1	6.3	9.1	14.2	26.7	23.5	11.4	4.7	5.2
11/26/00	0.93	3.7	16.6	19.6	15.1	16.1	18.7	na	12.8	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	27	19	29	19	21	18	28	15	13	18
Average		5.886	10.307	10.976	5.584	5.753	5.374	4.567	10.556	16.261	12.080	9.315	5.106
Median		3.100	8.400	7.800	4.600	5.300	3.800	3.600	8.450	11.969	10.500	7.200	4.400
St.Dev.		7.149	7.981	9.415	4.004	2.936	3.984	2.678	7.166	12.612	6.996	5.067	3.930
C.V.		1.214	0.774	0.858	0.717	0.510	0.741	0.586	0.679	0.776	0.579	0.544	0.770
Maximum		32.700	42.600	42.700	15.100	16.100	18.700	14.200	26.700	46.851	31.300	20.300	17.900
Minimum		1.000	3.200	2.200	1.000	1.000	1.000	2.000	2.200	0.151	3.800	4.700	1.000

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 8a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL IRON (LABORATORY DETECTION LIMIT=30 uG/L & 1/2 DL USED IN TABLES)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/05/98	0.57	40	400	300	na	210	na	na	na	na	na	na	na
08/06/98	0.68	380	160	170	120	80	na	110	na	240	na	na	90
08/07/98	1.30	40	150	130	70	80	80	15	130	290	na	na	na
08/09/98	2.47	110	250	136	130	88	75	44	105	na	na	na	na
08/20/98	0.68	90	170	140	110	80	na	80	220	200	na	na	na
09/03/98	1.97	110	350	268	85	89	110	57	235	220	na	na	50
09/***/98	1.85	100	340	118	60	88	60	45	310	209	na	na	na
09/17/98	0.49	90	360	250	na	na	na	na	na	na	na	na	na
09/18/98	0.66	*15*	160	110	na	70	na	na	na	na	na	na	180
09/19/98	0.75	*15*	80	70	*15*	33	na	*15*	150	na	na	na	90
09/20/98	1.85	70	350	250	60	130	50	90	80	260	na	na	na
09/26/98	1.64	na	200	180	*15*	50	na	30	100	210	na	na	na
11/05/98	1.20	40	120	210	na	na	na	na	na	na	na	na	na
12/13/98	0.37	*15*	220	na	na	na	na	na	490	na	na	na	na
01/03/99	1.23	*15*	220	850	50	130	120	210	190	450	na	na	na
01/23/99	2.60	*15*	400	518	120	73	120	34	140	137	na	na	80
02/28/99	0.36	60	1120	1220	na	na	na	na	na	560	na	na	220
03/14/99	0.80	50	710	790	na	280	na	na	na	480	na	na	1200
04/17/99	0.54	100	900	950	na	na	na	na	na	na	na	na	na
05/21/99	1.34	120	1100	1120	100	270	na	140	410	390	na	na	na
05/30/99	0.39	110	790	980	na	na	na	na	na	370	na	na	na
06/09/99	0.81	70	700	440	na	70	na	60	na	290	na	na	na
06/13/99	1.22	100	970	430	30	50	110	50	80	350	na	na	na
06/16/99	1.68	90	200	166	30	45	70	34	90	131	na	na	11100
06/17/99	0.77	330	310	510	40	40	na	50	na	100	na	na	na
06/18/99	1.60	40	150	127	*15*	*15*	40	28	80	40	na	na	
07/01/99	1.53	230	420	140	*15*	*15*	30	40	120	130	na	na	150
07/07/99	0.81	90	240	190	na	40	na	na	na	80	na	na	na
07/09/99	1.17	80	170	50	*15*	30	450	30	100	90	na	120	500
07/13/99	1.58	100	370	460	*na*	40	na	na	na	270	na	na	710
07/20/99	0.88	130	330	160	na	*15*	na	100	na	na	na	na	720
RAIN TOTAL	35.79												
No.Obs.		30	31	30	18	25	12	20	17	22	0	1	12
Average		95	400	381	60	84	110	63	178	250	na	na	1258
Median		90	330	230	55	70	78	48	130	230	na	na	200
St.Dev.		84	298	338	42	72	112	48	121	139	na	na	3120
C.V.		0.889	0.745	0.888	0.693	0.848	1.018	0.757	0.681	0.557	na	na	2.481
Maximum		380	1120	1220	130	280	450	210	490	560	na	na	11100
Minimum		15	80	50	15	15	30	15	80	40	na	na	50

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 8b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL IRON (LABORATORY DETECTION LIMIT=30 uG/L & 1/2 DL USED IN TABLES)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/06/99	1.29	110	170	70	*12.5*	*12.5*	*12.5*	*12.5*	30	230	*15*	220	580
08/12/99	0.70	30	260	280	*12.5*	*12.5*	*12.5*	*12.5*	na	160	na	na	na
08/14/99	1.23	*12.5*	280	270	*12.5*	*12.5*	*12.5*	*12.5*	30	110	*15*	50	60
08/19/99	0.90	na	270	140	*12.5*	*12.5*	*12.5*	*12.5*	50	1540	50	240	80
08/22/99	2.95	30	70	136	*12.5*	34	40	*40*	70	223	*15*	na	150
09/11/99	0.84	50	210	150	na	60	na	na	na	390	na	na	160
09/18/99	0.85	50	130	360	60	3.5	na	3.8	9.5	15.2	70	120	210
09/25/99	1.37	110	160	120	80	80	70	70	210	640	50	80	150
10/03/99	1.22	100	110	60	50	70	60	70	120	210	50	90	130
10/04/99	0.98	50	60	70	na	50	na	na	na	80	40	60	120
11/01/99	1.63	100	90	na	*12.5*	*12.5*	80	40	na	540	na	15	50
12/17/99	0.75	*12.5*	190	140	na	na	na	na	na	na	na	na	na
01/06/00	0.79	110	690	580	na	130	na	na	na	890	na	na	na
01/24/00	0.68	*12.5*	460	220	na	210	na	na	na	1120	na	na	na
01/31/00	0.70	*12.5*	570	360	na	120	na	na	na	1650	na	na	na
06/13/00	1.29	160	1920	1390	190	170	na	350	980	1800	na	na	na
06/22/00	0.39	140	710	640	na	na	na	na	na	1120	na	na	na
06/***/00	1.39	70	300	430	na	120	70	na	na	na	na	na	na
06/29/00	0.71	80	390	530	na	90	120	180	na	650	na	na	na
07/01/00	0.81	40	230	300	na	70	50	na	580	280	na	na	na
07/04/00	1.95	330	na	201	50	74	110	80	250	185	na	na	na
07/08/00	1.07	60	280	140	50	70	90	130	510	290	80	na	180
07/15/00	1.98	50	na	na	40	100	110	114	380	323	na	na	170
07/26/00	1.24	na	360	na	na	70	na	140	na	760	na	na	na
07/31/00	2.69	120	290	194	90	85	290	138	180	273	50	50	100
08/12/00	2.41	100	1200	na	80	98	250	160	410	371	140	60	220
08/29/00	1.20	210	380	105	140	224	250	205	670	420	60	100	210
09/07/00	1.96	50	290	154	40	50	150	153	220	415	60	40	110
09/17/00	2.05	50	na	136	na	125	na	140	na	767	100	na	150
09/24/00	1.16	180	na	400	90	100	180	300	690	480	100	80	180
11/26/00	0.93	40	450	420	370	250	550	na	300	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	27	19	29	20	21	18	28	15	13	18
Average		85	390	296	74	87	126	113	316	569	60	93	167
Median		60	280	201	50	74	85	114	235	403	50	80	150
St.Dev.		70	390	272	86	64	130	94	276	483	35	67	114
C.V.		0.82	1.00	0.92	1.16	0.74	1.03	0.84	0.87	0.85	0.58	0.72	0.68
Maximum		330	1920	1390	370	250	550	350	980	1800	140	240	580
Minimum		13	60	60	13	4	13	4	10	15	15	15	50

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX B - 9a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL LEAD (LABORATORY DETECTION LIMIT=2 uG/L & 1/2 DL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/05/98	0.57	*1.0*	**3.7**	**2.9**	na	*1.0*	na	na	na	na	na	na	na
08/06/98	0.68	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	na	*1.0*	na	*1.0*	na	na	*1.0*
08/07/98	1.30	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	**3.1**	na	na	na
08/09/98	2.47	*1.0*	**2.2**	**1.5**	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	na	na	na	na
08/20/98	0.68	*1.0*	**2.5**	*1.0*	*1.0*	*1.0*	na	*1.0*	**2.5**	**3.0**	na	na	na
09/03/98	1.97	*1.0*	**2.2**	**2.0**	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	na	na	*1.0*
09/*/98**	1.85	1.3	2.3	1.4	0.4	0.8	0.7	0.5	0.5	1.5	na	na	na
09/17/98	0.49	*1.0*	**3.9**	**3.4**	na	na	na	na	na	na	na	na	na
09/18/98	0.66	*1.0*	*1.0*	*1.0*	na	*1.0*	na	na	na	na	na	na	*1.0*
09/19/98	0.75	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	na	*1.0*	*1.0*	na	na	na	*1.0*
09/20/98	1.85	*1.0*	**2.7**	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	na	na	na
09/26/98	1.64	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	na	*1.0*	*1.0*	**2.3**	na	na	na
11/05/98	1.20	*1.0*	*1.0*	*1.0*	na	na	na	na	na	na	na	na	na
12/13/98	0.37	*1.0*	**2.9**	na	na	na	na	na	**5.9**	na	na	na	na
01/03/99	1.23	*1.0*	**2.8**	**10.4**	*1.0*	**2.4**	**2.0**	**3.1**	**2.8**	**5.8**	na	na	na
01/23/99	2.60	*1.0*	**8.0**	**9.8**	**2.9**	**1.4**	*1.0*	*1.0*	**2.2**	**2.9**	na	na	*1.0*
02/28/99	0.36	*1.0*	**13.0**	**14.2**	na	na	na	na	na	**8.2**	na	na	**2.2**
03/14/99	0.80	*1.0*	**7.7**	**10.2**	na	**3.1**	na	na	na	**5.8**	na	na	**9.9**
04/17/99	0.54	**2.2**	**8.6**	**10.7**	na	na	na	na	na	na	na	na	na
05/21/99	1.34	**2.2**	**9.5**	**11.1**	*1.0*	*1.0*	na	*1.0*	**5.1**	**4.5**	na	na	na
05/30/99	0.39	1.0	**5.8**	**8.3**	na	na	na	na	na	**3.5**	na	na	na
06/09/99	0.81	**2.0**	**9.3**	**6.4**	na	**3.2**	na	**2.4**	na	**5.7**	na	na	na
06/13/99	1.22	**5.2**	**11.6**	**6.6**	**2.5**	*1.0*	*1.0*	*1.0*	*1.0*	**2.5**	na	na	na
06/16/99	1.68	*1.0*	*1.0*	**6.5**	*1.0*	*1.0*	*1.0*	1.6	*1.0*	**3.9**	na	na	na
06/17/99	0.77	*1.0*	**2.2**	**4.5**	*1.0*	*1.0*	na	*1.0*	na	*1.0*	na	na	na
06/18/99	1.60	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	na	na	na
07/01/99	1.53	*1.0*	*1.0*	*1.0*	**1.50**	*1.0*	**1.50**	*1.0*	**1.60**	**2.40**	na	na	*1.0*
07/07/99	0.81	*1.0*	**2.7**	**1.9**	na	*1.0*	na	na	na	*1.0*	na	na	na
07/09/99	1.17	*1.0*	**2.0**	*1.0*	**2.0**	*1.0*	*1.0*	**4.0**	*1.0*	0.8	na	na	2.0
07/13/99	1.58	**1.8**	**2.9**	**4.0**	na	**0.8**	*na*	na	na	**2.6**	na	na	**2.7**
07/20/99	0.88	**2.7**	**3.8**	**2.7**	na	**0.8**	na	**2.3**	na	na	na	na	**3.2**
RAIN TOTAL	**35.79**												
No.Obs.		**31**	**31**	**30**	**18**	**25**	**12**	**20**	**17**	**22**	**0**	**1**	**11**
Average		**1.335**	**3.913**	**4.315**	**1.239**	**1.219**	**1.100**	**1.395**	**1.800**	**2.930**	**na**	**na**	**2.364**
Median		**1.000**	**2.700**	**2.350**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**2.550**	**na**	**na**	**1.000**
St.Dev.		**0.850**	**3.455**	**4.029**	**0.616**	**0.657**	**0.333**	**0.875**	**1.531**	**2.019**	**na**	**na**	**2.625**
C.V.		**0.636**	**0.883**	**0.934**	**0.497**	**0.539**	**0.303**	**0.627**	**0.850**	**0.689**	**na**	**na**	**1.111**
Maximum		**5.200**	**13.000**	**14.200**	**2.900**	**3.200**	**2.000**	**4.000**	**5.900**	**8.200**	**na**	**na**	**9.900**
Minimum		**1.000**	**1.000**	**1.000**	**0.400**	**0.750**	**0.700**	**0.500**	**0.500**	**0.750**	**na**	**na**	**1.000**

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 9b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL LEAD (LABORATORY DETECTION LIMIT=2 uG/L & 1/2 DL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/06/99	1.29	*0.75*	1.7	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	1.8	2.9
08/12/99	0.70	*0.75*	2.0	2.0	*0.75*	*0.75*	na	*0.8*	na	1.5	na	na	na
08/14/99	1.23	*0.75*	2.1	2.7	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*
08/19/99	0.90	na	2.2	1.9	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*
08/22/99	2.95	*0.75*	*0.75*	1.33	*0.75*	0.743	*0.75*	0.743	*0.75*	1.763	*0.75*	na	*0.75*
09/11/99	0.84	2.4	2.4	2.5	na	*0.75*	na	na	na	4.2	na	na	1.9
09/18/99	0.85	*0.75*		3.7	*0.75*	*0.75*	na	0.75	0.75	2.1	*0.75*	*0.75*	1.5
09/25/99	1.37	1.5	2.1	1.6	*0.75*	*0.75*	*0.75*	*0.75*	2.1	2.1	*0.75*	*0.75*	*0.75*
10/03/99	1.22	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	2.2	*0.75*	*0.75*	*0.75*
10/04/99	0.98	*0.75*	*0.75*	*0.75*	na	*0.75*	na	na	na	*0.75*	*0.75*	*0.75*	*0.75*
11/01/99	1.63	*0.75*	*0.75*	na	*0.75*	*0.75*	*0.75*	*0.75*	na	2	na	3.3	*0.75*
12/17/99	0.75	*0.75*	1.9	1.9	na	na	na	na	na	na	na	na	na
01/06/00	0.79	0.75	5.5	5.4	na	2	na	na	na	4.4	na	na	na
01/24/00	0.68	*0.75*	1.7	2.5	na	*0.75*	na	na	na	4.6	na	na	na
01/31/00	0.70	*0.75*	3.8	3.8	na	*0.75*	na	na	na	13.3	na	na	na
06/13/00	1.29	1.6	14.2	12.3	1.8	3.1	na	2.5	6.1	13	na	na	na
06/22/00	0.39	2.7	5.8	6.2	na	na	na	na	na	10.6	na	na	na
06/***/00	1.39	*0.75*	3.2	4.1	na	1.8	*0.75*	na	na	na	na	na	na
06/29/00	0.71	*0.75*	2.2	3.8	na	*0.75*	*0.75*	1.8	na	7.2	na	na	na
07/01/00	0.81	*0.75*	2.0	3.7	na	2	*0.75*	na	8.6	3.8	na	na	na
07/04/00	1.95	1.8	na	1.240	*0.75*	0.750	*0.75*	0.966	1.8	1.282	na	na	na
07/08/00	1.07	1.6	1.8	*0.75*	*0.75*	*0.75*	*0.75*	*0.75*	3.9	2.4	*0.75*	na	*0.75*
07/15/00	1.98	*0.75*	na	na	*0.75*	0.750	*0.75*	1.009	4.3	1.979	na	na	*0.75*
07/26/00	1.24	na	2.7	na	na	*0.75*	na	*0.75*	na	6.4	na	na	na
07/31/00	2.69	*0.75*	1.8	1.278	*0.75*	0.748	0.2	1.193	1.5	1.995	*0.75*	*0.75*	*0.75*
08/12/00	2.41	*0.75*	6.3	na	*0.75*	0.750	*0.75*	*0.75*	1.8	1.643	*0.75*	*0.75*	*0.75*
08/29/00	1.20	*0.75*	2.3	0.750	*0.75*	1.928	1.9	2.133	4.6	3.450	0.193	*0.75*	*0.75*
09/07/00	1.96	*0.75*	2.2	1.306	*0.75*	0.750	*0.75*	1.273	1.9	3.701	*0.75*	*0.75*	*0.75*
09/17/00	2.05	*0.75*	na	0.750	na	0.750	na	0.955	na	4.932	*0.75*	na	*0.75*
09/24/00	1.16	4.5	na	3.1	*0.75*	*0.75*	1.8	3.1	7.3	4.1	*0.75*	*0.75*	*0.75*
11/26/00	0.93	*0.75*	4	4.1	3.4	2.4	4.6	na	3.2	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	27	19	29	19	21	18	28	15	13	18
Average		1.124	2.876	2.776	0.945	1.051	1.041	1.139	2.867	3.844	0.713	1.027	0.975
Median		0.750	2.100	2.000	0.750	0.750	0.750	0.750	1.850	2.300	0.750	0.750	0.750
St.Dev.		0.837	2.710	2.433	0.641	0.634	0.940	0.673	2.447	3.442	0.144	0.742	0.574
C.V.		0.745	0.942	0.876	0.679	0.603	0.903	0.590	0.853	0.895	0.202	0.723	0.588
Maximum		4.500	14.200	12.300	3.400	3.100	4.600	3.100	8.600	13.300	0.750	3.300	2.900
Minimum		0.750	0.750	0.750	0.750	0.743	0.230	0.743	0.750	0.750	0.193	0.750	0.750

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 10a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

MANGANESE (LABORATORY DETECTION LIMIT=0.6 uG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/05/98	0.57	2.2	10.5	10.1	na	5.3	na	na	na	na	na	na	na
08/06/98	0.68	3.6	5.7	6.0	2.8	3.1	na	2.4	na	6.4	na	na	18.3
08/07/98	1.30	1.0	4.8	4.9	1.8	2.2	2.5	1.3	4.0	6.8	na	na	na
08/09/98	2.47	1.9	5.4	4.0	2.5	1.6	2.2	1.2	3.1	na	na	na	na
08/20/98	0.68	2.0	5.8	5.5	2.4	0.1	na	2.0	8.4	5.4	na	na	na
09/03/98	1.97	2.7	7.3	6.8	2.3	2.4	2.5	1.5	6.3	4.8	na	na	4.1
09/***/98	1.85	3.3	7.1	3.4	1.6	2.1	1.5	0.9	6.9	4.5	na	na	3.4
09/17/98	0.49	3.9	9.9	7.8	na	na	na	na	na	na	na	na	na
09/18/98	0.66	1.3	5.4	6.2	na	2.0	na	na	na	na	na	na	13.30
09/19/98	0.75	0.7	3.2	3.5	0.9	1.5	na	1.1	5.3	na	na	na	6.4
09/20/98	1.85	1.9	8.4	6.4	1.3	2.6	1.1	2.0	2.3	6.2	na	na	na
09/26/98	1.64		4.5	4.5	*0.3*	1.0	na	0.8	2.8	5.0	na	na	na
11/05/98	1.20	1.1	8.6	10.5	na	na	na	na	na	na	na	na	na
12/13/98	0.37	1.3	14.1	na	na	na	na	na	16.1	na	na	na	na
01/03/99	1.23	*0.3*	5.6	17.4	1.7	3.7	3.9	3.8	6.2	10.0	na	na	na
01/23/99	2.60	*0.3*	7.7	11.4	4.3	2.6	2.7	1.1	4.7	4.9	na	na	15.8
02/28/99	0.36	2.0	33.9	33.5	na	na	na	na	na	20.8	na	na	15.7
03/14/99	0.80	2.9	17.1	29.4	na	61.2	na	na	na	48.1	na	na	48.5
04/17/99	0.54	3.4	25.9	37.9	na	na	na	na	na	na	na	na	na
05/21/99	1.34	2.3	24.4	30.9	4.3	32.2	na	5.0	13.1	29.0	na	na	na
05/30/99	0.39	3.6	26.2	37.5	na	na	na	na	na	28.1	na	na	na
06/09/99	0.81	0.9	11.8	10.0	na	10.0	na	1.8	na	14.2	na	na	na
06/13/99	1.22	1.2	13.5	9.4	1.2	5.2	2.3	2.0	3.0	10.1	na	na	na
06/16/99	1.68	1.5	5.0	5.9	1.2	5.2	1.7	1.5	2.7	5.5	na	na	43.6
06/17/99	0.77	2.5	5.9	11.4	1.1	3.6	na	1.4	na	6.0	na	na	na
06/18/99	1.60	*0.3*	3.7	5.2	*0.3*	2.9	1.0	1.1	2.0	2.4	na	na	na
07/01/99	1.53	4.4	8.1	4.8	1.3	3.6	1.2	1.8	3.4	5.8	na	na	5.7
07/07/99	0.81	2.0	7.9	8.1	na	4.2	na	na	na	6.4	na	na	na
07/09/99	1.17	1.9	6.5	2.0	*0.1*	3.1	13.8	1.7	3.8	5.1	na	na	38.7
07/13/99	1.58	4.6	9.6	12.7	na	2.2	na	na	na	8.5	na	na	45.3
07/20/99	0.88	2.9	11.5	8.9	na	3.2	na	7.2	na	na	na	na	57.8
RAIN TOTAL	35.79												
No.Obs.		30	31	30	18	25	12	20	17	22	0	1	13
Average		2.130	10.484	11.862	1.742	6.666	3.033	2.077	5.535	11.089	na	na	24.354
Median		2.000	7.900	7.950	1.450	3.100	2.250	1.607	4.000	6.300	na	na	15.800
St.Dev.		1.206	7.529	10.597	1.205	12.895	3.490	1.568	3.885	11.056	na	na	19.458
C.V.		0.566	0.718	0.893	0.692	1.934	1.150	0.755	0.702	0.997	na	na	0.799
Maximum		4.600	33.900	37.900	4.300	61.200	13.800	7.200	16.100	48.100	na	na	57.800
Minimum		0.300	3.200	2.000	0.050	0.065	1.000	0.800	2.000	2.364	na	na	3.400

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 10b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

MANGANESE (LABORATORY DETECTION LIMIT=0.6 uG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/06/99	1.29	1.1	5.2	3.7	*0.5*	2.8	1.1	*0.5*	2.0	5.8	29.6	69.6	37.8
08/12/99	0.70	1.8	6.5	9.7	1.4	2.8	na	1.5	na	7.7	na	na	na
08/14/99	1.23	1.4	7.0	7.4	*0.5*	2.5	1.6	1.0	2.5	5.4	5.5	10.8	9.2
08/19/99	0.90	na	5.7	4.8	*0.5*	2.2	*0.5*	1.0	2.7	7.9	14	42.8	11.0
08/22/99	2.95	*0.5*	2.7	7.1	*0.5*	1.4	*0.5*	0.5	1.5	5.5	5.5	na	5.7
09/11/99	0.84	2.6	7.4	6.9	na	3.1	na	na	na	14.7	na	na	6.4
09/18/99	0.85	1.2	4.0	10.7	2.6	3.2	na	1.4	5.9	14.4	11	13.5	4.8
09/25/99	1.37	1.5	5.2	4.2	2.1	2.7	1.9	1.6	6.5	21.6	11.6	19.6	6.9
10/03/99	1.22	1.9	3.9	3.5	2.4	3.3	1.2	1.4	4.5	9.4	7	28.9	19.4
10/04/99	0.98	0.5	2.8	3.6	na	1.4	na	na	na	3.4	11.3	21.4	17.8
11/01/99	1.63	2.1	4.1	na	3.8	3.0	2.6	1.7	na	13.2	na	3.7	5.8
12/17/99	0.75	1.1	3.8	6.7	na	na	na	na	na	na	na	na	na
01/06/00	0.79	1.9	14.2	15.2	na	5.0	na	na	na	23.0	na	na	na
01/24/00	0.68	0.3	11.2	8.5	na	5.2	na	na	na	28.7	na	na	na
01/31/00	0.70	*0.5*	7.8	9.8	na	3.2	na	na	na	40.2	na	na	na
06/13/00	1.29	3.0	35.6	31.7	10.0	12.1	na	3.8	5.6	5.7	na	na	na
06/22/00	0.39	3.9	14.3	13.9	na	na	na	na	na	24.9	na	na	na
06/***/00	1.39	2.8	9.3	11.2	na	7.6	3.4	na	na	na	na	na	na
06/29/00	0.71	2.5	8.1	10.4	na	2.7	2.3	5.2	na	16.1	na	na	na
07/01/00	0.81	1.2	5.0	5.8	na	1.7	*0.5*	na	12.7	6.8	na	na	na
07/04/00	1.95	6.8	na	4.8	2.1	2.0	2.0	2.0	6.0	4.1	na	na	na
07/08/00	1.07	1.8	6.8	5.2	1.9	2.5	2.3	2.6	11.5	7.2	7.7	na	7.8
07/15/00	1.98	1.8	na	na	1.7	2.9	2.7	2.3	10.9	7.9	na	na	20.0
07/26/00	1.24	na	8.1	na	na	2.4	na	5.7	na	18.0	na	na	na
07/31/00	2.69	2.8	6.3	6.0	2.6	2.5	7.2	3.1	5.4	7.3	4.6	1.3	5.9
08/12/00	2.41	1.6	13.4	na	1.8	2.6	2.6	2.7	6.5	5.1	5.2	1.6	7.9
08/29/00	1.20	1.9	9.5	3.9	2.9	6.1	5.3	5.2	16.5	11.6	10.4	48.9	10.8
09/07/00	1.96	1.0	6.4	5.7	1.6	2.0	3.3	3.2	6.4	11.8	3.6	*0.5*	5.9
09/17/00	2.05	1.2	na	0.5	na	1.6	na	2.4	na	18.5	3.5	na	7.0
09/24/00	1.16	2.0	na	9.0	2.2	1.7	2.5	4.7	19.0	10.9	10.8	26.5	10.7
11/26/00	0.93	1.4	10.3	11.6	10.0	9.2	12.1	na	10.3	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	27	19	29	19	21	18	28	15	13	18
Average		1.87	8.32	8.20	2.69	3.50	2.93	2.55	7.58	12.74	9.42	22.24	11.16
Median		1.80	6.80	6.90	2.10	2.70	2.30	2.32	6.20	10.15	7.70	19.60	7.85
St.Dev.		1.26	6.35	5.83	2.72	2.45	2.76	1.58	4.94	8.67	6.50	21.08	8.18
C.V.		0.68	0.76	0.71	1.01	0.70	0.94	0.62	0.65	0.68	0.69	0.95	0.73
Maximum		6.80	35.60	31.70	10.00	12.10	12.10	5.70	19.00	40.20	29.60	69.60	37.80
Minimum		0.30	2.70	0.50	0.50	1.38	0.50	0.50	1.50	3.40	3.50	0.50	4.80

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 11a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL ZINC (LABORATORY DETECTION LIMIT=30 uG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/05/98	0.57	15	50	40	na	30	na	na	na	na	na	na	na
08/06/98	0.68	15	15	15	15	15	na	15	na	15	na	na	70
08/07/98	1.30	15	15	30	15	15	15	15	15	30	na	na	na
08/09/98	2.47	30	30	21	30	15	15	15	15	na	na	na	na
08/20/98	0.68	15	30	30	30	15	na	15	40	15	na	na	na
09/03/98	1.97	40	15	33	15	15	15	15	15	15	na	na	15
09/***/98	1.85	20	30	17.9	10	4	20	15	40	20	na	na	0
09/17/98	0.49	70	40	30	na	na	na	na	na	na	na	na	na
09/18/98	0.66	15	15	15	na	15	na	na	na	na	na	na	15
09/19/98	0.75	15	15	15	15	15	na	15	15	na	na	na	15
09/20/98	1.85	15	15	15	15	15	15	15	15	15	na	na	na
09/26/98	1.64	15	15	15	15	15	na	15	15	15	na	na	na
11/05/98	1.20	15	40	50	na	na	na	na	na	na	na	na	na
12/13/98	0.37	110	70	na	na	na	na	na	70	na	na	na	na
01/03/99	1.23	15	15	60	15	30	15	40	40	50	na	na	na
01/23/99	2.60	15	30	57	15	15	15	15	30	41	na	na	15
02/28/99	0.36	170	160	160	na	na	na	na	na	100	na	na	15
03/14/99	0.80	80	90	100	na	70	na	na	na	80	na	na	50
04/17/99	0.54	30	130	130	na	na	na	na	na	na	na	na	na
05/21/99	1.34	70	90	80	15	30	na	15	60	50	na	na	na
05/30/99	0.39	15	70	90	na	na	na	na	na	40	na	na	na
06/09/99	0.81	15	60	40	na	15	na	15	15	15	na	na	na
06/13/99	1.22	110	100	40	15	15	30	30	30	40	na	na	na
06/16/99	1.68	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	na	na	80
06/17/99	0.77	15	15	15	15	15	na	15	na	15	na	na	na
06/18/99	1.60	*15*	*15*	*15*	*15*	25	*15*	*15*	*15*	*15*	na	na	na
07/01/99	1.53	15	40	15	15	15	15	15	30	30	na	na	15
07/07/99	0.81	40	40	30	*na*	*20*	*na*	*na*	*na*	*20*	na	na	na
07/09/99	1.17	60	*20*	*15*	*15*	*20*	50	*20*	30	*20*	na	*7.5*	50
07/13/99	1.58	40	40	40	*na*	*20*	na	*na*	na	30	na	na	20
07/20/99	0.88	30	30	20	na	*15*	na	20	na	na	na	na	*15*
RAIN TOTAL	35.79												
No.Obs.		31	31	30	18	25	12	20	18	22	0	1	13
Average		37.258	43.710	41.637	16.389	19.560	19.583	17.500	28.056	31.182	na	na	28.846
Median		15.000	30.000	30.000	15.000	15.000	15.000	15.000	22.500	20.000	na	na	15.000
St.Dev.		37.234	36.855	36.603	5.089	12.035	10.544	6.387	16.728	22.694	na	na	24.929
C.V.		0.999	0.843	0.879	0.311	0.615	0.538	0.365	0.596	0.728	na	na	0.864
Maximum		170.000	160.000	160.000	30.000	70.000	50.000	40.000	70.000	100.000	na	na	80.000
Minimum		15.000	15.000	15.000	10.000	4.000	15.000	15.000	15.000	15.000	na	na	0.000

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 11b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

TOTAL ZINC (LABORATORY DETECTION LIMIT=30 uG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN uG/L	F1 uG/L	F2 uG/L	F3 uG/L	F4 uG/L	F5 uG/L	F6 uG/L	F7 uG/L	F8 uG/L	STRAND uG/L	UNDER DRAIN uG/L	POND uG/L
08/06/99	1.29	*7.5*	20	20	*7.5*	20	*7.5*	*7.5*	20	20	*7.5*	*7.5*	*7.5*
08/12/99	0.70	40	30	40	20	20	na	20	na	20	na	na	na
08/14/99	1.23	180	20	20	*8*	*8*	*8*	*8*	20	20	20	*7.5*	50
08/19/99	0.90	na	30	40	*7.5*	20	20	*7.5*	20	20	*7.5*	20	30
08/22/99	2.95	*7.5*	*7.5*	11.2	*7.5*	11	20	10	20	19	20	na	*7.5*
09/11/99	0.84	40	20	40	na	20	na	na	na	60	na	na	*7.5*
09/18/99	0.85	20	*7.5*	30	*7.5*	*7.5*	na	*7.5*	20	40	20	*7.5*	*7.5*
09/25/99	1.37	*7.5*	*7.5*	*7.5*	20	20	20	20	30	80	*7.5*	*7.5*	*7.5*
10/03/99	1.22	20	*7.5*	*7.5*	*7.5*	*7.5*	*7.5*	*7.5*	20	30	*7.5*	*7.5*	*7.5*
10/04/99	0.98	*7.5*	*7.5*	*7.5*	na	20	na	na	na	20	30	*7.5*	*7.5*
11/01/99	1.63	*	*	*	*	*	*	*	*	*	*	*	*
12/17/99	0.75	*7.5*	40	30	na	na	na	na	na	na	na	na	na
01/06/00	0.79	20	70	60	na	30	na	na	na	90	na	na	na
01/24/00	0.68	*7.5*	60	40	na	30	na	na	na	100	na	na	na
01/31/00	0.70	*7.5*	40	50	na	20	na	na	na	130	na	na	na
06/13/00	1.29	30	130	110	50	50	na	50	100	140	na	na	na
06/22/00	0.39	40	50	60	na	na	na	na	na	90	na	na	na
06/***/00	1.39	*7.5*	*7.5*	*7.5*	na	*7.5*	*7.5*	na	na	na	na	na	na
06/29/00	0.71	20	20	30	na	30	20	20	na	40	na	na	na
07/01/00	0.81	*7.5*	20	20	na	20	*7.5*	na	20	30	na	na	na
07/04/00	1.95	20	na	12	*7.5*	20	*7.5*	8	20	20	na	na	na
07/08/00	1.07	20	20	20	*7.5*	20	*7.5*	*7.5*	40	20	*7.5*	na	*7.5*
07/15/00	1.98	*7.5*	na	na	20	20	20	15	40	32	na	na	*7.5*
07/26/00	1.24	na	30	na	na	*8*	na	30	na	60	na	na	na
07/31/00	2.69	20	30	30	40	34	50	174	*8*	12	*7.5*	*7.5*	*7.5*
08/12/00	2.41	*7.5*	140	na	*8*	20	20	20	30	33	20	*7.5*	*7.5*
08/29/00	1.20	30	40	22	20	28	30	28	60	46	20	*7.5*	*20*
09/07/00	1.96	*7.5*	30	24	20	16	20	23	30	35	*7.5*	*7.5*	*7.5*
09/17/00	2.05	*7.5*	na	15	na	20	na	23	na	63	20	na	*7.5*
09/24/00	1.16	30	na	40	30	20	20	40	70	40	50	*7.5*	*7.5*
11/26/00	0.93	30	50	60	60	50	60	na	50	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		28	26	27	18	28	18	20	18	27	15	12	17
Average		23.5	36.0	31.6	19.3	21.3	19.6	26.3	34.3	48.5	16.8	8.5	12.1
Median		20.0	30.0	30.0	13.8	20.0	20.0	20.0	25.0	34.6	20.0	7.5	7.5
St.Dev.		32.7	33.7	22.7	16.1	10.9	14.7	36.6	23.0	35.1	11.8	3.6	11.5
C.V.		1.39	0.94	0.72	0.83	0.51	0.75	1.39	0.67	0.72	0.70	0.42	0.95
Maximum		180	140	110	60	50	60	174	100	140	50	20	50
Minimum		7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	11.8	7.5	7.5	7.5

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.
* Zinc quality control out of limits

APPENDIX G - 12a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

SUSPENDED SOLIDS (LABORATORY DETECTION LIMIT=0.05 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	na	9.7	11.3	na	29.5	na	na	na	na	na	na	na
08/06/98	0.68	na	5.6	9.2	na	na	na	9.9	na	13.0	na	na	2.5
08/07/98	1.30	na	4.8	12.4	2.0	11.5	6.8	2.3	6.16	13.0	na	na	na
08/09/98	2.47	0.35	6.2	12.0	4.6	2.9	4.9	1.1	5.3	na	na	na	na
08/20/98	0.68	na	6.0	5.9	2.8	3.6	na	3.0	7.1	14.08	na	na	na
09/03/98	1.97	na	6.5	1.9	0.6	4.3	1.5	0.8	6.8	10.3	na	na	1.1
09/***/98	1.85	0.79	5.7	5.3	1.7	4.2	2.5	1.4	5.4	9.6	na	na	2.6
09/17/98	0.49	na	8.1	5.9	na	na	na	na	na	na	na	na	na
09/18/98	0.66	na	4.5	2.9	na	na	na	na	na	na	na	na	21.45
09/19/98	0.75	na	1.9	3.8	1.9	3.6	na	1.3	7.0	na	na	na	4.8
09/20/98	1.85	na	6.8	6.5	1.1	6.2	na	1.6	0.0	7.9	na	na	na
09/26/98	1.64	na	4.7	7.5	0.5	4.8	na	1.9	na	27.3	na	na	na
11/05/98	1.20	na	13.1	8.7	na	na	na	na	na	na	na	na	na
12/13/98	0.37	na	na	na	na	na	na	na	na	na	na	na	na
01/03/99	1.23	na	15.7	32.8	2.5	5.0	6.6	4.1	3.6	22.3	na	na	na
01/23/99	2.60	na	15.0	38.8	0.2	1.3	4.0	0.5	3.0	4.3	na	na	2.4
02/28/99	0.36	na	na	na	na	na	na	na	na	na	na	na	10.5
03/14/99	0.80	na	na	na	na	na	na	na	na	na	na	na	43.4
04/17/99	0.54	na	na	na	na	na	na	na	na	na	na	na	na
05/21/99	1.34	na	36.3	60.6	5.2	6.1	na	14.5	7.1	12.1	na	na	na
05/30/99	0.39	na	28.1	na	na	na	na	na	na	na	na	na	na
06/09/99	0.81	na	23.0	12.7	na	4.0	na	na	na	8.0	na	na	na
06/13/99	1.22	na	24.4	11.4	1.8	3.6	2.4	3.0	4.3	na	na	na	na
06/16/99	1.68	na	5.7	9.9	1.0	1.9	2.1	1.7	3.9	9.1	na	na	253.6
06/17/99	0.77	na	8.1	18.3	1.1	1.5	na	3.9	na	7.8	na	na	na
06/18/99	1.60	na	5.3	4.50	1.7	1.3	2.1	1.7	11.3	3.0	na	na	na
07/01/99	1.53	7.4	9.4	3.5	2.4	2.7	na	5.5	na	5.7	na	na	na
07/07/99	0.81	na	7.6	8.3	na	na	na	na	na	11.5	na	na	na
07/09/99	1.17	na	5.2	4.7	0.6	2.3	na	5.9	3.6	4.1	na	6.02	11.1
07/13/99	1.58	na	7.8	22.0	na	2.0	na	na	na	8.6	na	na	13.3
07/20/99	0.88	na	12.2	8.2	na	na	na	7.2	na	na	na	na	36.8
RAIN TOTAL	35.79												
No.Obs.		3	27	26	17	20	9	19	14	18	0	1	12
Average		2.838	10.655	12.649	1.868	5.113	3.645	3.751	5.315	10.657	na	na	33.624
Median		0.790	7.630	8.525	1.740	3.591	2.450	2.300	5.310	9.353	na	na	10.793
St.Dev.		3.934	8.270	13.120	1.364	6.195	2.021	3.582	2.639	6.117	na	na	70.637
C.V.		1.386	0.776	1.037	0.730	1.212	0.555	0.955	0.497	0.574	na	na	2.101
Maximum		7.374	36.280	60.619	5.179	29.510	6.800	14.481	11.306	27.340	na	na	253.580
Minimum		0.350	1.920	1.860	0.160	1.270	1.460	0.507	0.000	2.996	na	na	1.070

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 12b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

SUSPENDED SOLIDS (LABORATORY DETECTION LIMIT=0.05 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	na	5.7	3.5	na	1.9	na	2.0	na	10.1	43.8	13.5	3.8
08/12/99	0.70	na	6.7	12.3	na	1.3	na	na	na	9.7	na	na	na
08/14/99	1.23	na	10.3	7.0	1.5	2.3	2.0	9.0	6.5	2.7	9.4	4.1	1.8
08/19/99	0.90	na	4.2	3.8	1.1	2.2	na	2.5	3.5	7.2	4.3	3.3	0.9
08/22/99	2.95	na	2.5	3.4	1.1	2.9	1.4	2.3	3.0	15.1	7.4	na	0.7
09/11/99	0.84	na	9.4	5.9	na	na	na	na	na	35.2	17.9	na	na
09/18/99	0.85	na	5.3	2.7	na	1.9	na	na	na	17.5	17.4	2.2	6.5
09/25/99	1.37	na	4.0	2.2	1.4	1.6	2.5	2.3	9.8	7.2	5.8	1.7	2.8
10/03/99	1.22	na	4.4	1.1	1.8	2.0	na	10.3	9.8	7.2	1.9	1.6	7.1
10/04/99	0.98	na	na	na	na	na	na	na	na	na	8.7	1.5	3.6
11/01/99	1.63	na	4.8	na	2.3	2.7	3.6	3.7	na	11.7	3.0	1.0	na
12/17/99	0.75	na	na	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	na	20.7	16.4	na	na	na	na	na	32.0	na	na	na
01/24/00	0.68	na	na	na	na	na	na	na	na	na	na	na	na
01/31/00	0.70	na	na	na	na	na	na	na	na	na	na	na	na
06/13/00	1.29	na	42.5	42.1	na	8.8	na	10.5	121.1	24.8	na	na	na
06/22/00	0.39	na	20.7	24.9	na	na	na	na	na	na	na	na	na
06/***/00	1.39	na	10.6	22.3	na	na	na	na	na	na	na	na	na
06/29/00	0.71	na	10.8	16.8	na	na	na	na	na	32.7	na	na	na
07/01/00	0.81	na	4.4	12.4	na	na	na	na	na	28.9	na	na	na
07/04/00	1.95	8.7	na	11.1	2.1	1.5	5.6	3.5	12.1	7.0	na	na	na
07/08/00	1.07	na	6.6	3.7	1.5	1.8	3.0	5.3	29.2	8.3	3.4	na	3.1
07/15/00	1.98	na	na	na	1.2	4.1	5.1	9.2	18.7	12.9	5.1	na	na
07/26/00	1.24	na	7.1	na	na	2.3	na	na	na	44.0	na	na	na
07/31/00	2.69	na	10.1	6.8	2.8	3.1	16.3	11.0	7.9	9.2	5.0	1.0	1.3
08/12/00	2.41	na	na	na	1.7	2.1	9.2	7.3	24.6	13.0	5.3	1.2	6.7
08/29/00	1.20	na	8.4	2.8	6.1	7.4	14.2	15.3	16.9	10.7	9.4	0.7	2.5
09/07/00	1.96	na	8.2	4.2	2.3	2.0	7.9	6.6	12.5	11.3	2.1	na	na
09/17/00	2.05	na	na	5.3	na	3.2	na	12.4	na	77.0	2.3	na	1.8
09/24/00	1.16	na	na	5.7	5.6	4.5	13.5	12.2	71.5	36.2	3.7	0.3	1.9
11/26/00	0.93	na	19.1	11.2	21.9	22.7	41.6	na	51.7	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		1	22	23	15	21	13	17	15	24	18	12	14
Average		8.710	10.286	9.881	3.619	3.917	9.686	7.377	26.583	19.651	8.655	2.663	3.178
Median		8.710	7.624	5.870	1.800	2.271	5.560	7.271	12.461	12.305	5.221	1.540	2.663
St.Dev.		ERR	8.888	9.588	5.275	4.706	10.804	4.239	32.243	16.824	9.929	3.577	2.143
C.V.		ERR	0.864	0.970	1.458	1.202	1.115	0.575	1.213	0.856	1.147	1.343	0.674
Maximum		8.710	42.467	42.071	21.867	22.731	41.613	15.310	121.076	77.035	43.770	13.500	7.120
Minimum		8.710	2.510	1.090	1.080	1.270	1.380	1.950	3.010	2.710	1.860	0.256	0.730

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 13a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

CHLORIDES (LABORATORY DETECTION LIMIT=0.052 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.59	0.72	0.67	na	1.31	na	na	na	na	na	na	na
08/06/98	0.68	0.64	0.75	0.51	0.89	1.16	na	0.75	na	0.63	na	na	314.00
08/07/98	1.30	0.65	0.69	0.67	0.83	0.93	0.61	0.74	0.76	0.71	na	na	na
08/09/98	2.47	1.14	0.41	0.45	0.39	0.61	0.60	0.50	0.51	na	na	na	na
08/20/98	0.68	1.22	1.70	0.94	1.39	0.99	na	1.54	1.38	0.94	na	na	na
09/03/98	1.97	2.82	2.49	2.41	2.14	2.65	2.07	2.40	2.68	2.74	na	na	9.32
09/***/98	1.85	1.44	1.39	1.26	2.53	1.69	1.14	1.34	2.53	1.36	na	na	33.70
09/17/98	0.49	0.89	1.00	0.82	na	na	na	na	na	na	na	na	na
09/18/98	0.66	0.59	0.71	0.64	na	1.85	na	na	na	na	na	na	39.1
09/19/98	0.75	0.48	0.50	0.47	0.81	0.88	na	0.71	0.65	na	na	na	34.1
09/20/98	1.85	1.11	0.94	1.04	0.68	1.01	0.69	1.26	0.92	0.93	na	na	na
09/26/98	1.64	na	0.62	0.55	0.99	0.91	1.04	1.04	0.84	na	na	na	na
11/05/98	1.20	1.04	1.47	1.24	na	na	na	na	na	na	na	na	na
12/13/98	0.37	1.32	2.60	na	na	na	na	na	na	na	na	na	na
01/03/99	1.23	0.56	0.83	0.71	1.55	2.14	1.66	2.19	2.77	1.57	na	na	na
01/23/99	2.60	0.59	0.65	0.63	1.09	1.34	1.09	1.30	1.76	1.17	na	na	27.20
02/28/99	0.36	1.56	3.55	2.31	na	na	na	na	na	2.67	na	na	55.00
03/14/99	0.80	3.20	2.79	2.70	na	5.15	na	na	na	6.33	na	na	71.60
04/17/99	0.54	1.05	1.94	1.98	na	na	na	na	na	na	na	na	na
05/21/99	1.34	1.13	1.21	1.19	3.38	4.09	na	3.74	3.17	3.09	na	na	na
05/30/99	0.39	1.19	1.16	1.22	na	na	na	na	na	1.24	na	na	na
06/09/99	0.81	0.71	0.53	0.57	na	1.67	na	1.63	na	1.23	na	na	na
06/13/99	1.22	na	1.51	1.26	2.28	2.09	1.8	2.05	2.2	1.76	na	na	na
06/16/99	1.68	0.47	0.41	0.87	0.63	1.90	0.72	1.87	0.66	1.52	na	na	6.64
06/17/99	0.77	0.37	0.33	0.35	0.48	1.90	na	0.62	na	0.13	na	na	na
06/18/99	1.60	0.77	0.47	0.80	0.71	1.88	0.82	1.8	0.76	1.51	na	na	na
07/01/99	1.53	0.98	0.85	0.67	1.05	1.57	1.05	1.37	1.13	1.23	na	na	11.2
07/07/99	0.81	0.86	0.85	0.87	na	1.13	na	na	na	1.00	na	na	na
07/09/99	1.17	0.87	0.52	0.45	0.72	1.03	0.92	1.12	1.02	0.87	na	2.61	8.34
07/13/99	1.58	0.95	0.98	0.85	na	0.98	na	na	na	na	na	na	9.07
07/20/99	0.88	0.61	0.57	0.58	na	1.09	na	0.79	na	na	na	na	10.70
RAIN TOTAL	35.79												
No.Obs.		29	31	30	18	25	13	20	16	20	0	1	13
Average		1.028	1.134	0.989	1.252	1.678	1.093	1.440	1.484	1.632	na	na	48.459
Median		0.890	0.850	0.809	0.940	1.340	1.040	1.320	1.075	1.235	na	na	27.200
St.Dev.		0.630	0.796	0.609	0.818	1.027	0.471	0.773	0.897	1.325	na	na	82.315
C.V.		0.613	0.702	0.616	0.654	0.612	0.431	0.537	0.604	0.812	na	na	1.699
Maximum		3.200	3.550	2.700	3.380	5.150	2.070	3.740	3.170	6.330	na	na	314.000
Minimum		0.370	0.330	0.350	0.390	0.610	0.600	0.500	0.510	0.130	na	na	6.640

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 13b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

CHORIDES (LABORATORY DETECTION LIMIT=0.052 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	*0.20*	*0.20*	na	0.74	0.74	0.52	0.66	0.60	0.57	na	3.42	27.50
08/12/99	0.70	0.54	0.52	0.41	1.31	1.21	na	0.84	na	0.74	na	na	na
08/14/99	1.23	0.84	0.49	0.46	0.69	0.74	0.74	0.73	0.77	0.71	1.15	1.46	18.60
08/19/99	0.90	na	0.53	0.62	0.84	0.88	0.77	0.90	0.76	0.74	1.14	1.56	14.40
08/22/99	2.95	1.02	0.81	0.77	0.71	1.080	0.48	0.47	0.56	0.74	0.6	na	1.11
09/11/99	0.84	1.44	0.55	0.48	na	1.48	na	na	na	0.78	na	na	1.32
09/18/99	0.85	1.52	0.67	0.65	1.58	1.62	na	1.60	1.23	0.88	3.25	4.17	3.26
09/25/99	1.37	0.82	0.72	0.60	0.83	0.93	0.51	0.95	0.83	0.81	1.37	2.03	8.97
10/03/99	1.22	1.40	0.74	0.74	1.13	1.16	na	1.35	1.13	0.88	1.96	2.73	9.71
10/04/99	0.98	0.47	*0.20*	0.20	na	1.12	na	na	na	0.57	2.42	2.37	9.78
11/01/99	1.63	1.68	0.77	na	1.75	2.56	1.99	1.55	na	1.99	na	13.2	15.80
12/17/99	0.75	0.67	0.56	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	1.72	1.56	1.64	na	3.22	na	na	na	1.84	na	na	na
01/24/00	0.68	0.58	0.76	0.62	na	na	na	na	na	na	na	na	na
01/31/00	0.70	*0.20*	0.53	0.44	na	2.67	na	na	na	1.79	na	na	na
06/13/00	1.29	2.34	2.43	2.61	4.53	6.70	na	4.55	4.14	6.12	na	na	na
06/22/00	0.39	2.43	2.48	2.68	na	na	na	na	na	na	na	na	na
06/***/00	1.39	2.53	2.36	2.54	na	4.26	2.28	na	na	na	na	na	na
06/29/00	0.71	2.34	2.25	2.20	na	3.08	1.77	2.61	na	2.73	na	na	na
07/01/00	0.81	1.83	1.76	1.86	na	2.58	na	na	na	2.14	na	na	na
07/04/00	1.95	1.83	na	1.87	1.95	2.31	1.82	1.89	1.90	2.03	na	na	na
07/08/00	1.07	2.17	1.79	1.83	1.89	1.97	1.87	1.88	1.93	1.97	2.00	na	15.50
07/15/00	1.98	2.24	na	na	1.87	2.30	1.93	1.96	2.12	2.09	na	na	16.80
07/26/00	1.24	na	2.06	na	na	2.52	na	na	na	2.35	na	na	na
07/31/00	2.69	2.10	2.32	2.25	2.16	2.49	2.10	2.25	2.29	2.50	2.39	2.28	12.90
08/12/00	2.41	1.64	2.56	na	1.79	1.96	1.71	2.00	1.79	2.11	1.99	2.02	11.10
08/29/00	1.20	1.69	1.86	1.84	1.93	2.32	1.82	1.88	2.02	2.41	2.97	3.33	17.20
09/07/00	1.96	1.90	2.11	2.16	2.07	2.30	1.98	1.94	2.06	2.25	1.80	2.17	12.80
09/17/00	2.05	2.53	na	2.28	na	2.60	na	2.39	na	2.32	2.96	na	14.20
09/24/00	1.16	2.84	na	2.94	3.02	3.23	3.07	3.59	2.82	3.36	3.19	4.45	15.80
11/26/00	0.93	1.11	1.42	1.48	1.98	2.78	1.96	na	2.43	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	25	19	28	17	20	17	26	14	13	18
Average		1.539	1.297	1.447	1.725	2.243	1.607	1.799	1.728	1.823	2.085	3.476	12.597
Median		1.680	0.810	1.640	1.790	2.305	1.820	1.878	1.900	1.980	1.995	2.370	13.550
St.Dev.		0.761	0.814	0.881	0.921	1.241	0.736	1.001	0.940	1.188	0.829	3.067	6.462
C.V.		0.495	0.628	0.609	0.534	0.553	0.458	0.557	0.544	0.652	0.397	0.882	0.513
Maximum		2.840	2.560	2.940	4.530	6.700	3.070	4.550	4.140	6.120	3.250	13.200	27.500
Minimum		0.200	0.200	0.200	0.690	0.740	0.480	0.468	0.560	0.570	0.600	1.460	1.110

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 14a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

POTASSIUM (LABORATORY DETECTION LIMIT=0.05 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.03	0.36	0.13	na	1.79	na	na	na	na	na	na	na
08/06/98	0.68	0.03	0.21	0.10	2.34	1.69	na	1.93	na	0.05	na	na	8.68
08/07/98	1.30	0.03	0.21	0.22	2.09	1.75	1.50	1.98	0.55	0.33	na	na	na
08/09/98	2.47	0.06	0.20	0.11	1.07	1.03	0.86	1.03	na	na	na	na	na
08/20/98	0.68	0.08	0.29	0.16	1.87	1.19	na	1.45	0.64	0.36	na	na	na
09/03/98	1.97	*0.03*	0.19	0.13	1.83	2.00	1.46	2.09	0.60	0.31	na	na	4.08
09/***/98	1.85	0.04	0.13	0.14	1.72	1.69	0.92	1.56	0.49	0.20	na	na	7.49
09/17/98	0.49	*0.03*	0.14	0.08	na	na	na	na	na	na	na	na	na
09/18/98	0.66	*0.03*	0.44	0.14	na	1.91	na	na	na	na	na	na	7.37
09/19/98	0.75	0.48	0.09	0.05	2.58	2.01	na	2.18	0.26	na	na	na	6.60
09/20/98	1.85	*0.03*	0.07	0.07	1.63	1.28	1.49	1.54	0.23	0.16	na	na	na
09/26/98	1.64	na	0.10	0.11	1.72	3.28	1.91	0.37	0.23	na	na	na	na
11/05/98	1.20	0.43	0.26	0.16	na	na	na	na	na	na	na	na	na
12/13/98	0.37	*0.03*	0.97	na	na	na	na	na	na	na	na	na	na
01/03/99	1.23	0.08	0.21	0.11	3.51	3.06	2.39	5.21	2.20	1.09	na	na	na
01/23/99	2.60	0.05	0.20	0.09	3.17	2.25	2.06	4.18	1.14	0.53	na	na	15.20
02/28/99	0.36	0.10	1.18	0.70	na	na	na	na	na	1.42	na	na	24.10
03/14/99	0.80	0.08	0.39	1.56	na	11.00	na	na	na	7.82	na	na	20.20
04/17/99	0.54	*0.03*	0.34	1.15	na	na	na	na	na	na	na	na	na
05/21/99	1.34	*0.03*	0.12	0.51	8.87	8.12	na	11.20	2.50	3.24	na	na	na
05/30/99	0.39	0.06	0.27	0.65	na	na	na	na	na	1.71	na	na	na
06/09/99	0.81	*0.03*	0.09	0.17	na	3.53	na	5.21	na	1.55	na	na	na
06/13/99	1.22	na	0.67	0.31	5.34	3.18	2.20	5.04	1.34	1.34	na	na	na
06/16/99	1.68	0.07	0.26	0.12	2.03	2.28	1.70	3.98	0.48	0.78	na	na	na
06/17/99	0.77	0.07	0.26	0.12	1.74	4.62	na	1.30	na	0.66	na	na	na
06/18/99	1.60	0.06	0.22	0.14	1.62	1.41	1.00	1.53	0.27	0.41	na	na	
07/01/99	1.53	*0.03*	*0.03*	*0.03*	1.02	1.02	0.91	1.57	*0.03*	*0.03*	na	na	*0.03*
07/07/99	0.81	0.05	0.12	0.12	na	1.71	na	na	na	0.36	na	na	na
07/09/99	1.17	*0.02*	0.25	0.06	1.69	1.49	1.27	2.14	0.40	0.38	na	2.7	8.70
07/13/99	1.58	*0.02*	0.11	0.10	na	1.04	na	na	na	na	na	na	9.34
07/20/99	0.88	1.50	0.12	0.12	na	1.72	na	0.26	na	na	na	na	11.10
RAIN TOTAL	35.79												
No.Obs.		29	31	30	18	25	13	20	15	20	0	1	12
Average		0.122	0.274	0.255	2.547	2.642	1.513	2.788	0.757	1.136	na	na	10.240
Median		0.040	0.210	0.125	1.850	1.790	1.490	1.955	0.490	0.470	na	na	8.690
St.Dev.		0.286	0.251	0.344	1.872	2.298	0.516	2.503	0.734	1.752	na	na	6.699
C.V.		2.339	0.915	1.347	0.735	0.870	0.341	0.898	0.969	1.543	na	na	0.654
Maximum		1.500	1.180	1.560	8.870	11.000	2.390	11.200	2.500	7.820	na	na	24.100
Minimum		0.020	0.025	0.025	1.020	1.020	0.860	0.260	0.025	0.025	na	na	0.025

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 14b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

POTASSIUM (LABORATORY DETECTION LIMIT=0.05 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	0.02	0.12	na	2.87	1.61	2.02	2.81	0.95	0.43	na	10.30	10.00
08/12/99	0.70	0.02	0.02	0.02	3.28	1.05	na	1.65	na	0.02	na	na	na
08/14/99	1.23	0.33	0.02	0.02	1.49	0.47	0.47	1.02	0.04	0.02	0.55	1.63	5.74
08/19/99	0.90	na	0.05	0.02	1.70	1.17	0.75	1.56	0.13	0.09	0.35	1.20	7.28
08/22/99	2.95	0.02	0.02	0.02	1.10	0.77	0.25	1.01	0.37	0.33	0.74	na	0.23
09/11/99	0.84	0.27	0.26	0.23	na	3.26	na	na	na	0.54	na	na	0.06
09/18/99	0.85	0.59	0.62	0.21	5.70	2.92	na	6.66	0.94	0.44	10.20	8.79	0.17
09/25/99	1.37	0.25	0.32	0.10	2.95	2.00	2.08	4.29	4.23	3.98	4.26	5.20	20.60
10/03/99	1.22	0.51	0.02	0.17	3.16	2.02	na	3.89	0.69	0.40	3.84	5.25	2.15
10/04/99	0.98	0.09	0.18	0.12	na	2.74	na	na	na	0.19	4.75	4.09	3.62
11/01/99	1.63	0.27	0.27	na	4.74	4.19	3.07	5.38	na	1.53	na	3.63	3.97
12/17/99	0.75	0.05	0.27	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	0.10	0.32	0.39	na	3.69	na	na	na	0.67	na	na	na
01/24/00	0.68	0.02	0.29	0.27	na	na	na	na	na	na	na	na	na
01/31/00	0.70	0.02	0.23	0.26	na	3.97	na	na	na	1.19	na	na	na
06/13/00	1.29	0.43	0.37	0.96	6.96	7.44	na	6.15	2.37	4.42	na	na	na
06/22/00	0.39	0.26	0.53	1.22	na	na	na	na	na	na	na	na	na
06/***/00	1.39	0.23	0.44	0.59	na	5.43	2.45	na	na	na	na	na	na
06/29/00	0.71	0.25	0.33	0.44	na	3.60	1.22	5.26	na	1.53	na	na	na
07/01/00	0.81	0.27	0.32	0.39	na	3.73	na	na	na	1.49	na	na	na
07/04/00	1.95	0.29	na	0.30	2.68	3.10	1.73	3.11	0.70	1.06	na	na	na
07/08/00	1.07	0.56	0.31	0.30	1.94	1.76	1.56	2.18	0.55	0.63	1.10	na	5.59
07/15/00	1.98	0.20	na	na	1.89	2.35	1.39	2.07	0.68	0.67	na	na	7.20
07/26/00	1.24	na	0.26	na	na	2.44	na	na	na	0.59	na	na	na
07/31/00	2.69	0.14	0.26	0.30	1.71	1.24	1.45	1.52	0.79	0.96	1.19	1.12	3.30
08/12/00	2.41	0.12	0.29	na	1.32	1.08	0.89	1.25	0.61	0.77	1.49	1.61	2.73
08/29/00	1.20	0.02	0.35	0.34	2.48	2.13	1.57	2.16	1.19	1.73	2.87	3.13	1.11
09/07/00	1.96	0.21	0.29	0.27	1.78	1.69	1.49	1.68	0.76	0.95	1.36	1.64	1.28
09/17/00	2.05	0.24	na	0.28	na	1.58	na	1.62	na	0.56	1.06	na	0.73
09/24/00	1.16	0.29	na	0.32	1.59	1.54	1.52	2.12	0.54	0.72	1.18	2.20	0.52
11/26/00	0.93	0.10	0.23	0.25	1.61	1.84	1.69	na	1.51	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	25	19	28	17	20	17	26	14	13	18
Average		0.213	0.259	0.312	2.682	2.529	1.506	2.870	1.003	0.996	2.496	3.830	4.238
Median		0.230	0.270	0.274	1.940	2.074	1.520	2.141	0.700	0.668	1.275	3.130	3.015
St.Dev.		0.163	0.149	0.276	1.571	1.524	0.695	1.776	0.989	1.056	2.642	2.922	5.004
C.V.		0.766	0.576	0.884	0.586	0.603	0.461	0.619	0.986	1.061	1.058	0.763	1.181
Maximum		0.590	0.620	1.220	6.960	7.440	3.070	6.660	4.230	4.420	10.200	10.300	20.600
Minimum		0.020	0.020	0.020	1.100	0.470	0.250	1.010	0.040	0.020	0.350	1.120	0.060

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 15a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

SODIUM (LABORATORY DETECTION LIMIT=0.06 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.39	0.50	0.52	na	1.06	na	na	na	na	na	na	na
08/06/98	0.68	0.14	0.17	0.13	0.70	0.98	na	0.54	na	0.16	na	na	174.00
08/07/98	1.30	0.25	0.32	0.25	2.09	1.75	1.5	1.98	0.35	0.33	na	na	na
08/09/98	2.47	0.55	0.31	0.44	0.47	0.53	0.42	0.44	0.35	na	na	na	na
08/20/98	0.68	0.66	0.59	0.48	0.88	0.73	na	0.71	0.93	0.46	na	na	na
09/03/98	1.97	1.23	1.5	1.63	1.46	1.91	1.44	1.28	1.65	1.36	na	na	8.41
09/***/98	1.85	0.32	0.31	0.38	1.43	1.01	0.41	0.7	1.4	0.36	na	na	21.9
09/17/98	0.49	0.23	0.28	0.27	na	na	na	na	na	na	na	na	na
09/18/98	0.66	0.20	0.86	0.33	na	1.22	na	na	na	na	na	na	24.6
09/19/98	0.75	0.19	0.19	0.21	0.68	1.24	na	0.44	0.27	na	na	na	22.00
09/20/98	1.85	0.43	0.57	0.79	0.86	0.78	1.65	0.87	0.49	0.77	na	na	na
09/26/98	1.64	na	0.42	0.29	0.83	0.41	0.87	0.75	0.43	na	na	na	na
11/05/98	1.20	0.21	0.47	0.39	na	na	na	na	na	na	na	na	na
12/13/98	0.37	0.73	1.43	na	na	na	na	na	na	na	na	na	na
01/03/99	1.23	0.37	0.50	0.40	0.88	1.14	1.28	1.01	1.35	0.80	na	na	na
01/23/99	2.60	0.24	0.36	0.29	0.77	0.92	0.83	0.78	0.87	0.64	na	na	20.00
02/28/99	0.36	1.06	13.00	14.20	na	na	na	na	na	1.64	na	na	42.40
03/14/99	0.80	1.69	1.62	1.59	na	2.49	na	na	na	3..28	na	na	45.10
04/17/99	0.54	0.56	1.18	1.31	na	na	na	na	na	na	na	na	na
05/21/99	1.34	0.43	0.49	0.47	1.56	2.37	na	1.79	1.53	1.71	na	na	na
05/30/99	0.39	0.52	0.51	0.52	na	na	na	na	na	0.71	na	na	na
06/09/99	0.81	0.25	0.19	0.22	na	1.14	na	0.96	na	0.63	na	na	na
06/13/99	1.22	na	0.63	0.47	1.02	1.11	0.89	0.93	0.88	0.86	na	na	na
06/16/99	1.68	0.14	0.17	0.15	0.45	0.67	0.41	0.48	0.34	0.40	na	na	4.95
06/17/99	0.77	0.16	0.22	0.18	0.54	0.66	na	7.2	na	8.14	na	na	na
06/18/99	1.60	0.38	0.22	0.25	0.57	0.62	0.48	0.38	0.39	0.41	na	na	na
07/01/99	1.53	0.31	0.27	0.18	0.61	0.82	0.63	0.6	0.41	0.38	na	na	16.6
07/07/99	0.81	0.44	0.38	0.39	na	0.85	na	na	na	0.43	na	na	na
07/09/99	1.17	0.27	0.29	0.26	0.56	0.70	0.7	0.7	0.47	0.40	na	1.8	3.97
07/13/99	1.58	0.49	0.66	0.50	na	0.79	na	na	na	na	na	na	4.28
07/20/99	0.88	16.10	0.35	0.40	na	0.92	na	0.46	na	na	na	na	6.39
RAIN TOTAL	35.79												
No.Obs.		29	31	30	18	25	13	20	16	19	0	1	13
Average		0.998	0.934	0.929	0.909	1.073	0.885	1.150	0.757	1.083	na	na	30.354
Median		0.380	0.420	0.390	0.800	0.922	0.830	0.730	0.480	0.630	na	na	20.000
St.Dev.		2.925	2.273	2.535	0.447	0.531	0.444	1.487	0.481	1.764	na	na	45.226
C.V.		2.931	2.434	2.728	0.492	0.495	0.501	1.292	0.636	1.628	na	na	1.490
Maximum		16.100	13.000	14.200	2.090	2.490	1.650	7.200	1.650	8.140	na	na	174.000
Minimum		0.140	0.170	0.130	0.450	0.410	0.410	0.378	0.270	0.160	na	na	3.970

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 15b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

SODIUM (LABORATORY DETECTION LIMIT=0.06 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	0.15	0.17	na	0.5	0.65	0.59	0.5	0.35	0.35	na	1.62	11.60
08/12/99	0.70	0.41	0.42	0.35	1.05	1.38	na	0.81	na	0.53	na	na	na
08/14/99	1.23	0.59	0.34	0.31	0.60	0.78	0.78	0.60	0.46	0.48	0.94	1.11	131.00
08/19/99	0.90	na	0.31	0.34	0.62	0.64	0.66	0.60	0.37	0.38	0.77	1.01	143.00
08/22/99	2.95	0.38	0.31	0.26	0.52	0.607	0.36	0.40	0.23	0.35	0.39	na	0.76
09/11/99	0.84	0.90	0.48	0.40	na	1.24	na	na	na	0.52	na	na	1.01
09/18/99	0.85	0.83	0.49	0.41	1.04	1.25	na	0.86	0.71	0.51	1.37	2.32	1.84
09/25/99	1.37	0.32	0.27	0.19	0.54	0.64	0.79	0.50	0.38	0.31	0.82	1.63	4.66
10/03/99	1.22	0.88	0.54	0.52	0.86	0.99	na	0.89	0.66	0.58	1.11	2.15	5.42
10/04/99	0.98	0.21	0.25	0.24	na	1.53	na	na	na	0.40	1.40	1.89	5.38
11/01/99	1.63	1.12	0.57	na	1.04	1.75	1.36	1.07	na	1.06	na	20.00	21.40
12/17/99	0.75	0.30	0.37	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	1.01	0.86	0.96	na	2.19	na	na	na	1.06	na	na	na
01/24/00	0.68	0.45	0.62	0.55	na	na	na	na	na	na	na	na	na
01/31/00	0.70	0.15	0.41	0.43	na	2.51	na	na	na	1.33	na	na	na
06/13/00	1.29	0.46	0.40	0.54	1.68	2.93	na	1.26	1.50	2.82	na	na	na
06/22/00	0.39	0.51	0.60	0.78	na	na	na	na	na	na	na	na	na
06/***/00	1.39	0.44	0.38	0.59	na	2.51	0.85	na	na	na	na	na	na
06/29/00	0.71	0.64	0.67	0.64	na	2.02	0.61	1.05	na	1.09	na	na	na
07/01/00	0.81	0.32	0.34	0.41	na	1.84	na	na	na	0.85	na	na	na
07/04/00	1.95	0.22	na	0.41	0.50	1.03	0.45	0.54	0.40	0.67	na	na	na
07/08/00	1.07	0.55	0.40	0.31	0.55	0.77	0.55	1.03	0.53	0.53	0.47	na	9.98
07/15/00	1.98	0.87	na	na	0.87	1.31	0.81	0.83	0.84	0.87	na	na	9.97
07/26/00	1.24	na	0.28	na	na	1.07	na	na	na	0.53	na	na	na
07/31/00	2.69	*0.03*	0.44	0.35	0.41	0.68	0.32	0.42	0.40	0.58	0.48	0.20	6.47
08/12/00	2.41	*0.03*	0.41	na	0.07	0.19	*0.03*	0.10	*0.03*	0.16	0.11	0.12	5.78
08/29/00	1.20	*0.03*	0.19	0.17	0.36	0.68	0.34	0.30	0.30	0.74	1.26	1.59	9.68
09/07/00	1.96	0.22	0.27	0.31	0.49	0.68	1.49	0.41	0.37	0.55	1.09	1.54	7.21
09/17/00	2.05	0.77	na	0.57	na	0.95	na	0.68	na	0.68	1.41	na	7.73
09/24/00	1.16	0.64	na	1.05	1.28	1.43	1.29	1.85	0.90	1.28	1.09	2.74	8.65
11/26/00	0.93	0.38	0.69	0.69	1.17	1.48	1.25	na	1.21	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	25	19	28	17	20	17	26	14	13	18
Average		0.476	0.425	0.472	0.745	1.276	0.737	0.735	0.567	0.739	0.908	2.917	21.752
Median		0.440	0.400	0.410	0.600	1.155	0.660	0.642	0.400	0.562	1.015	1.620	7.470
St.Dev.		0.305	0.164	0.223	0.388	0.682	0.409	0.395	0.371	0.522	0.416	5.188	42.235
C.V.		0.640	0.385	0.472	0.521	0.534	0.555	0.538	0.654	0.706	0.458	1.779	1.942
Maximum		1.120	0.860	1.050	1.680	2.930	1.490	1.850	1.500	2.820	1.410	20.000	143.000
Minimum		0.030	0.170	0.174	0.070	0.189	0.030	0.100	0.030	0.156	0.110	0.120	0.760

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 16a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

CALCIUM (LABORATORY DETECTION LIMIT=0.04 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.36	7.47	8.15	na	12.30	na	na	na	na	na	na	na
08/06/98	0.68	0.28	6.69	7.55	8.65	11.60	na	12.20	na	7.43	na	na	23.70
08/07/98	1.30	0.19	7.66	9.00	7.90	24.50	23.30	13.80	8.52	8.75	na	na	na
08/09/98	2.47	0.48	5.77	6.31	4.96	9.40	24.70	7.89	6.17	na	na	na	na
08/20/98	0.68	0.01	5.26	5.65	6.46	7.97	na	11.00	8.10	7.06	na	na	na
09/03/98	1.97	0.22	6.08	6.86	4.73	8.64	42.10	12.43	7.83	6.68	na	na	36.40
09/***/98	1.85	0.20	7.14	7.32	4.54	10.78	18.60	14.59	8.47	8.80	na	na	35.80
09/17/98	0.49	0.32	6.97	6.60	na	na	na	na	na	na	na	na	na
09/18/98	0.66	0.20	7.65	8.35	na	15.80	na	na	na	na	na	na	39.00
09/19/98	0.75	0.00	7.02	7.28	10.30	21.45	na	17.50	10.30	na	na	na	37.00
09/20/98	1.85	0.14	6.47	6.23	6.04	8.58	30.30	14.30	8.85	7.35	na	na	na
09/26/98	1.64	na	6.43	6.72	7.36	25.70	na	16.50	10.50	11.40	na	na	na
11/05/98	1.20	0.38	10.70	11.10	na	na	na	na	na	na	na	na	na
12/13/98	0.37	0.69	10.40	na	na	na	na	na	na	na	na	na	na
01/03/99	1.23	0.28	5.87	7.38	3.36	4.92	13.70	6.63	6.62	6.63	na	na	na
01/23/99	2.60	0.19	6.07	7.03	5.22	9.06	37.20	15.35	7.12	7.28	na	na	83.10
02/28/99	0.36	0.83	17.80	18.50	na	na	na	na	na	13.50	na	na	110.00
03/14/99	0.80	1.12	10.70	11.20	na	8.80	na	na	na	11.10	na	na	148.00
04/17/99	0.54	1.18	14.40	15.20	na	na	na	na	na	na	na	na	na
05/21/99	1.34	1.17	14.60	13.50	10.60	11.80	na	14.50	13.50	13.30	na	na	na
05/30/99	0.39	1.57	14.30	15.70	na	na	na	na	na	11.80	na	na	na
06/09/99	0.81	0.60	10.20	9.80	na	9.21	na	15.70	na	9.60	na	na	na
06/13/99	1.22	na	11.40	10.20	6.77	8.31	12.80	9.76	7.39	10.50	na	na	na
06/16/99	1.68	0.54	8.82	9.13	7.01	9.06	18.20	10.29	7.70	10.09	na	na	47.60
06/17/99	0.77	0.81	9.76	8.94	7.01	0.83	na	0.19	na	0.03	na	na	na
06/18/99	1.60	0.50	7.99	8.81	6.30	8.02	19.10	8.81	6.30	8.75	na	na	na
07/01/99	1.53	0.82	8.53	7.41	8.15	9.44	35.80	13.40	8.54	9.27	na	na	25.80
07/07/99	0.81	0.95	9.89	9.80	na	10.90	na	na	na	10.30	na	na	na
07/09/99	1.17	1.08	11.70	9.09	8.03	9.64	15.70	12.10	9.67	10.10	na	17.4	49.60
07/13/99	1.58	1.70	11.60	11.50	na	10.90	na	na	na	na	na	na	55.60
07/20/99	0.88	25.80	12.30	11.20	na	13.20	na	12.70	na	na	na	na	65.10
RAIN TOTAL	35.79												
No.Obs.		29	31	30	18	25	12	20	16	21	0	1	13
Average		1.469	9.279	9.384	6.855	11.233	24.292	11.982	8.474	9.035	na	na	58.208
Median		0.500	8.530	8.875	6.890	9.440	21.200	12.565	8.285	9.270	na	na	47.600
St.Dev.		4.701	3.127	3.064	1.926	5.539	9.853	3.999	1.860	2.890	na	na	36.105
C.V.		3.200	0.337	0.327	0.281	0.493	0.406	0.334	0.220	0.320	na	na	0.620
Maximum		25.800	17.800	18.500	10.600	25.700	42.100	17.500	13.500	13.500	na	na	148.000
Minimum		0.000	5.260	5.650	3.360	0.830	12.800	0.190	6.170	0.030	na	na	23.700

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 16b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

CALCIUM (LABORATORY DETECTION LIMIT=0.04 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	2.28	9.60	na	8.46	9.58	30.50	13.00	9.60	11.20	na	19.10	53.70
08/12/99	0.70	0.93	11.10	12.00	13.70	13.10	na	18.30	na	14.20	na	na	na
08/14/99	1.23	0.81	11.70	11.00	8.68	20.10	20.10	12.90	10.30	12.10	10.30	14.60	23.10
08/19/99	0.90	na	11.90	11.80	8.94	10.60	18.90	13.70	10.70	12.20	10.60	16.80	26.70
08/22/99	2.95	1.23	13.30	13.67	12.80	13.29	23.30	17.55	8.96	15.52	10.90	na	14.00
09/11/99	0.84	1.47	11.40	10.40	na	12.90	na	na	na	13.00	na	na	33.40
09/18/99	0.85	1.60	9.78	9.01	9.76	12.10	na	13.90	10.70	10.70	8.87	17.50	39.20
09/25/99	1.37	1.01	10.60	8.62	7.51	8.11	20.40	12.00	9.68	10.40	9.62	17.50	38.00
10/03/99	1.22	1.50	9.61	8.66	8.82	9.36	na	14.00	10.50	9.63	8.92	19.60	43.50
10/04/99	0.98	1.11	11.80	11.40	na	23.80	na	na	na	18.90	11.60	17.50	42.40
11/01/99	1.63	1.39	9.32	na	8.43	12.00	29.70	14.70	na	12.80	na	38.00	42.40
12/17/99	0.75	2.63	12.70	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	2.15	10.80	11.10	na	9.88	na	na	na	11.40	na	na	na
01/24/00	0.68	1.58	12.60	12.40	na	na	na	na	na	na	na	na	na
01/31/00	0.70	1.80	11.00	11.90	na	15.10	na	na	na	20.80	na	na	na
06/13/00	1.29	0.74	14.20	14.60	9.63	9.92	na	10.30	15.90	17.60	na	na	na
06/22/00	0.39	0.80	14.80	14.60	na	na	na	na	na	na	na	na	na
06/***/00	1.39	0.54	11.90	12.60	na	16.50	14.10	na	na	na	na	na	na
06/29/00	0.71	0.52	9.85	10.20	na	9.43	6.35	10.90	na	10.60	na	na	na
07/01/00	0.81	0.00	9.85	11.40	na	15.30	na	na	na	13.90	na	na	na
07/04/00	1.95	9.83	na	11.03	6.83	10.66	9.13	9.98	8.64	10.89	na	na	na
07/08/00	1.07	0.70	10.60	10.80	6.64	8.83	10.70	11.10	11.50	10.30	8.16	na	52.40
07/15/00	1.98	0.30	na	na	7.02	14.18	10.60	11.25	10.00	11.81	na	na	50.40
07/26/00	1.24	na	12.40	na	na	15.60	na	na	na	17.10	na	na	na
07/31/00	2.69	0.00	11.40	9.41	5.78	9.50	9.41	10.15	8.14	10.60	11.30	12.00	26.70
08/12/00	2.41	0.04	16.90	na	5.77	8.04	6.72	7.11	7.36	8.83	9.66	10.50	34.70
08/29/00	1.20	0.80	12.00	10.98	6.21	10.47	9.57	9.65	9.07	11.73	16.10	19.80	41.40
09/07/00	1.96	0.79	13.00	12.16	7.53	11.52	11.20	10.64	9.50	11.01	11.80	15.50	33.30
09/17/00	2.05	0.79	na	9.81	na	13.38	na	13.47	na	11.39	12.40	na	43.40
09/24/00	1.16	*	*	*	*	*	*	*	*	*	*	*	*
11/26/00	0.93	0.89	10.10	9.81	6.78	6.50	8.28	na	13.10	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		28	27	24	18	27	16	19	16	25	13	12	17
Average		1.365	11.637	11.223	8.294	12.212	14.935	12.347	10.228	12.744	10.787	18.200	37.571
Median		0.910	11.400	11.065	7.980	11.517	10.950	12.000	9.840	11.731	10.600	17.500	39.200
St.Dev.		1.786	1.769	1.642	2.188	3.821	7.884	2.731	2.031	3.039	2.036	6.867	10.675
C.V.		1.308	0.152	0.146	0.264	0.313	0.528	0.221	0.199	0.238	0.189	0.377	0.284
Maximum		9.830	16.900	14.600	13.700	23.800	30.500	18.300	15.900	20.800	16.100	38.000	53.700
Minimum		0.000	9.320	8.620	5.770	6.500	6.350	7.110	7.360	8.826	8.160	10.500	14.000

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.
* Calcium analysis rejected by laboratory

APPENDIX G - 17a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

SULFATE (LABORATORY DETECTION LIMIT=0.052 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.98	2.30	3.05	na	3.11	na	na	na	na	na	na	na
08/06/98	0.68	2.70	3.44	3.06	3.66	4.84	na	4.20	na	2.95	na	na	51.20
08/07/98	1.30	3.49	4.42	4.92	4.44	5.12	4.90	5.47	3.95	4.42	na	na	na
08/09/98	2.47	2.25	2.84	2.34	2.75	3.18	2.92	2.82	2.74	na	na	na	na
08/20/98	0.68	1.21	1.65	1.40	1.99	2.25	na	2.21	2.35	1.89	na	na	na
09/03/98	1.97	2.12	2.47	1.80	2.49	2.86	2.46	2.54	2.25	2.78	na	na	48.60
09/***/98	1.85	3.66	3.71	3.76	2.07	4.34	3.64	4.20	2.13	3.46	na	na	59.70
09/17/98	0.49	2.14	3.46	3.48	na	na	na	na	na	na	na	na	na
09/18/98	0.66	1.20	2.05	1.86	na	4.98	na	na	na	na	na	na	74.80
09/19/98	0.75	1.08	1.40	1.15	2.70	2.73	na	2.50	1.56	na	na	na	68.60
09/20/98	1.85	3.31	3.05	2.76	3.97	3.67	2.95	4.15	3.43	2.79	na	na	na
09/26/98	1.64	na	1.46	1.42	1.82	2.17	na	2.31	1.67	1.41	na	na	na
11/05/98	1.20	0.84	2.23	1.81	na	na	na	na	na	na	na	na	na
12/13/98	0.37	3.04	5.55	na	na	na	na	na	na	na	na	na	na
01/03/99	1.23	0.73	1.91	1.55	3.25	4.74	3.09	4.97	5.85	3.51	na	na	na
01/23/99	2.60	0.92	1.20	1.22	1.02	2.92	2.59	3.36	3.61	2.58	na	na	180.00
02/28/99	0.36	3.75	9.01	8.51	na	na	na	na	na	7.19	na	na	52.40
03/14/99	0.80	2.04	3.71	3.26	na	5.68	na	na	na	5.33	na	na	338.00
04/17/99	0.54	2.20	6.33	6.21	na	na	na	na	na	na	na	na	na
05/21/99	1.34	4.90	5.98	5.69	9.65	10.50	na	10.10	9.37	9.26	na	na	na
05/30/99	0.39	2.62	0.51	4.71	na	na	na	na	na	3.34	na	na	na
06/09/99	0.81	na	na	na	na	na	na	na	na	na	na	na	na
06/13/99	1.22	na	5.79	5.28	6.48	6.33	5.33	6.03	5.06	6.03	na	na	na
06/16/99	1.68	2.40	2.46	2.31	2.55	3.52	2.53	2.94	2.42	2.90	na	na	na
06/17/99	0.77	1.56	2.07	1.78	2.40	0.36	na	0.01	na	0.01	na	na	na
06/18/99	1.60	1.09	1.56	1.80	2.14	2.82	2.11	1.92	1.72	1.84	na	na	na
07/01/99	1.53	na	na	na	na	na	na	na	na	na	na	na	na
07/07/99	0.81	0.44	3.88	0.39	na	4.38	na	na	na	4.18	na	na	na
07/09/99	1.17	1.90	3.08	2.65	2.82	4.04	3.16	3.52	3.23	3.17	na	4.49	16.40
07/13/99	1.58	4.25	0.66	4.88	na	4.14	na	na	na	na	na	na	16.20
07/20/99	0.88	3.72	4.43	4.45	na	5.40	na	4.61	na	na	na	na	17.80
RAIN TOTAL	35.79												
No.Obs.		27	29	28	17	23	11	18	15	19	0	1	11
Average		2.242	3.193	3.125	3.306	4.091	3.244	3.770	3.423	3.634	na	na	83.973
Median		2.140	2.840	2.705	2.700	4.040	2.950	3.442	2.740	3.170	na	na	52.400
St.Dev.		1.203	1.927	1.871	2.049	1.942	1.015	2.140	2.060	2.136	na	na	95.667
C.V.		0.536	0.603	0.599	0.620	0.475	0.313	0.568	0.602	0.588	na	na	1.139
Maximum		4.900	9.010	8.510	9.650	10.500	5.330	10.100	9.370	9.260	na	na	338.000
Minimum		0.440	0.510	0.390	1.020	0.360	2.110	0.005	1.560	0.005	na	na	16.200

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 17b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

SULFATE (LABORATORY DETECTION LIMIT=0.052 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	0.69	1.78	na	2.15	2.26	2.41	2.05	1.77	1.84	na	4.06	28.10
08/12/99	0.70	1.65	2.23	2.01	4.29	3.74	na	3.01	na	2.87	na	na	na
08/14/99	1.23	5.55	4.30	4.51	5.06	5.87	5.87	5.74	5.99	5.39	6.75	7.03	44.20
08/19/99	0.90	na	3.67	3.87	3.84	4.31	3.68	4.34	3.58	3.71	3.74	4.37	46.80
08/22/99	2.95	2.99	3.64	3.65	3.35	3.343	2.50	3.41	2.40	3.38	2.82	na	4.37
09/11/99	0.84	3.42	3.59	3.45	na	5.70	na	na	na	4.09	na	na	6.29
09/18/99	0.85	1.67	2.25	2.27	4.36	4.75	na	4.86	3.59	2.68	5.4	6.68	12.70
09/25/99	1.37	2.79	4.27	3.62	4.64	4.51	3.72	4.08	4.23	3.98	4.26	5.20	20.60
10/03/99	1.22	1.97	2.04	2.32	2.61	3.29	na	3.93	2.98	2.62	5.72	3.49	16.80
10/04/99	0.98	0.92	1.01	0.93	na	4.14	na	na	na	1.76	3.76	3.97	16.80
11/01/99	1.63	1.28	1.63	na	3.19	4.41	3.93	3.72	na	3.35	na	59.40	67.60
12/17/99	0.75	0.94	1.37	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	1.16	2.57	2.93	na	5.09	na	na	na	3.55	na	na	na
01/24/00	0.68	1.72	2.35	2.07	na	na	na	na	na	na	na	na	na
01/31/00	0.70	1.03	1.62	11.90	na	5.36	na	na	na	3.29	na	na	na
06/13/00	1.29	2.98	4.36	4.62	7.48	7.04	na	5.91	6.28	7.93	na	na	na
06/22/00	0.39	4.22	5.39	5.16	na	na	na	na	na	na	na	na	na
06/***/00	1.39	3.82	4.80	4.85	na	9.20	4.92	na	na	na	na	na	na
06/29/00	0.71	2.46	3.10	2.89	na	5.49	2.07	4.82	na	3.34	na	na	na
07/01/00	0.81	2.36	2.26	2.27	na	5.45	na	na	na	3.07	na	na	na
07/04/00	1.95	3.04	na	3.55	3.18	4.66	3.02	3.17	2.93	3.61	na	na	na
07/08/00	1.07	5.04	3.67	3.87	3.40	4.04	3.59	3.92	3.78	4.15	3.67	na	62.40
07/15/00	1.98	2.88	na	na	2.80	4.26	2.97	3.08	3.00	3.32	na	na	38.60
07/26/00	1.24	na	5.61	na	na	6.60	na	na	na	6.16	na	na	na
07/31/00	2.69	3.16	4.01	4.20	3.53	4.61	3.65	3.85	3.79	4.56	4.13	4.07	18.30
08/12/00	2.41	1.15	8.47	na	1.99	2.51	1.69	2.17	1.78	2.81	2.39	2.46	12.60
08/29/00	1.20	1.98	3.16	3.18	2.58	3.95	2.46	2.70	2.90	4.52	4.91	5.55	15.50
09/07/00	1.96	2.22	2.82	2.84	2.47	3.35	2.68	2.50	2.43	3.13	4.44	5.89	13.30
09/17/00	2.05	1.32	na	1.54	na	2.71	na	2.33	na	2.17	3.62	na	14.00
09/24/00	1.16	5.93	na	7.67	6.88	7.18	7.11	7.52	6.30	7.59	7.05	10.80	16.50
11/26/00	0.93	1.25	2.98	3.51	4.17	5.05	5.05	na	4.01	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		29	27	25	19	28	17	20	17	26	14	13	18
Average		2.47	3.29	3.75	3.79	4.74	3.61	3.86	3.63	3.80	4.48	9.46	25.30
Median		2.22	3.10	3.51	3.40	4.56	3.59	3.79	3.58	3.36	4.20	5.20	16.80
St.Dev.		1.41	1.60	2.18	1.47	1.52	1.43	1.40	1.41	1.53	1.36	15.15	18.71
C.V.		0.57	0.48	0.58	0.39	0.32	0.40	0.36	0.39	0.40	0.30	1.60	0.74
Maximum		5.93	8.47	11.90	7.48	9.20	7.11	7.52	6.30	7.93	7.05	59.40	67.60
Minimum		0.69	1.01	0.93	1.99	2.26	1.69	2.05	1.77	1.76	2.39	2.46	4.37

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

APPENDIX G - 18a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

MAGNESIUM (LABORATORY DETECTION LIMIT=0.006 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	0.06	0.15	0.13	na	0.26	na	na	na	na	na	na	na
08/06/98	0.68	0.03	0.11	0.10	0.26	0.26	na	0.20	na	0.14	na	na	20.20
08/07/98	1.30	0.04	0.13	0.16	0.22	0.36	0.15	0.25	0.24	0.21	na	na	na
08/09/98	2.47	0.08	0.10	0.09	0.17	0.20	0.15	0.16	0.15	na	na	na	na
08/20/98	0.68	0.07	0.12	0.08	0.19	0.17	na	0.15	0.29	0.23	na	na	na
09/03/98	1.97	0.18	0.18	0.21	0.19	0.31	0.17	0.18	0.33	0.17	na	na	2.77
09/***/98	1.85	0.06	0.10	0.11	0.16	0.19	0.09	0.52	0.27	0.13	na	na	3.82
09/17/98	0.49	0.04	0.10	0.07	na	na	na	na	na	na	na	na	na
09/18/98	0.66	0.05	0.23	0.14	na	0.33	na	na	na	na	na	na	3.91
09/19/98	0.75	0.01	0.06	0.05	0.22	0.28	na	0.15	0.27	na	na	na	3.96
09/20/98	1.85	0.07	0.08	0.16	0.20	0.06	0.01	0.14	0.26	0.22	na	na	na
09/26/98	1.64		0.08	0.06	0.24	4.00	na	0.16	0.33	0.07	na	na	na
11/05/98	1.20	0.06	0.20	0.20	na	na	na	na	na	na	na	na	na
12/13/98	0.37	0.11	0.30	na	na	na	na	na	na	na	na	na	na
01/03/99	1.23	0.05	0.14	0.13	0.21	0.28	0.23	0.24	0.45	0.33	na	na	na
01/23/99	2.60	0.19	0.10	0.09	0.27	0.27	0.15	0.24	0.50	0.36	na	na	7.83
02/28/99	0.36	0.16	0.51	0.37	na	na	na	na	na	0.50	na	na	15.50
03/14/99	0.80	0.28	0.34	0.38	na	0.82	na	na	na	0.95	na	na	15.30
04/17/99	0.54	0.11	0.32	0.44	na	na	na	na	na	na	na	na	na
05/21/99	1.34	0.11	0.16	0.20	0.63	0.94	na	0.79	0.72	0.91	na	na	na
05/30/99	0.39	0.16	0.16	15.70	na	na	na	na	na	0.55	na	na	na
06/09/99	0.81	0.06	0.09	0.15	na	0.65	na	0.86	na	0.57	na	na	na
06/13/99	1.22	na	0.16	0.16	0.54	0.60	0.28	0.56	0.47	0.75	na	na	na
06/16/99	1.68	0.06	0.09	0.12	0.42	0.60	0.20	0.54	0.46	0.65	na	na	na
06/17/99	0.77	0.20	0.11	11.00	0.39	0.42	na	0.11	na	0.02	na	na	na
06/18/99	1.60	0.10	0.10	0.14	0.38	0.46	0.21	0.37	0.33	0.54	na	na	na
07/01/99	1.53	0.07	0.09	0.08	0.35	0.46	0.20	0.46	0.35	0.38	na	na	1.35
07/07/99	0.81	0.12	0.13	0.16	na	0.54	na	na	na	0.40	na	na	na
07/09/99	1.17	0.07	0.18	0.15	0.39	0.49	0.22	0.47	0.44	0.47	na	1.65	2.76
07/13/99	1.58	0.22	0.21	0.23	na	0.44	na	na	na	na	na	na	2.95
07/20/99	0.88	2.59	0.46	0.43	na	0.62	na	0.58	na	na	na	na	3.93
RAIN TOTAL	35.79												
No.Obs.		29	31	30	18	25	12	20	16	21	0	1	12
Average		0.187	0.171	1.050	0.302	0.560	0.172	0.356	0.366	0.407	na	na	7.023
Median		0.070	0.130	0.150	0.250	0.420	0.185	0.246	0.330	0.380	na	na	3.920
St.Dev.		0.467	0.110	3.402	0.134	0.746	0.071	0.227	0.136	0.263	na	na	6.314
C.V.		2.502	0.643	3.241	0.443	1.332	0.411	0.637	0.371	0.646	na	na	0.899
Maximum		2.590	0.510	15.700	0.630	4.000	0.280	0.860	0.720	0.950	na	na	20.200
Minimum		0.010	0.060	0.050	0.160	0.060	0.010	0.110	0.150	0.020	na	na	1.350

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 18b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

MAGNESIUM (LABORATORY DETECTION LIMIT=0.006 MG/L & 1/2 MDL USED FOR CALCS)

YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	0.35	0.22	na	0.41	0.48	0.24	0.44	0.54	0.48	na	3.03	4.35
08/12/99	0.70	0.15	0.23	0.26	0.73	0.62	na	0.51	na	0.56	na	na	na
08/14/99	1.23	0.14	0.27	0.20	0.46	0.34	0.34	0.48	0.53	0.44	1.03	1.3	12.90
08/19/99	0.90	na	0.30	0.22	0.54	0.57	0.28	0.56	0.57	0.58	1.21	1.49	17.10
08/22/99	2.95	0.15	0.32	0.27	0.74	0.555	0.21	0.52	0.55	0.71	0.73	na	0.72
09/11/99	0.84	0.23	0.30	0.18	na	0.51	na	na	na	0.40	na	na	1.04
09/18/99	0.85	0.28	0.24	0.17	0.51	0.51	na	0.46	0.49	0.37	2.09	2.37	1.56
09/25/99	1.37	0.13	0.20	0.12	0.34	0.38	0.20	0.41	0.43	0.35	1.18	1.57	1.79
10/03/99	1.22	0.31	0.23	0.18	0.45	0.42	na	0.46	0.48	0.34	1.08	1.84	2.40
10/04/99	0.98	0.14	0.23	0.18	na	0.72	na	na	na	0.55	1.49	1.36	2.58
11/01/99	1.63	0.36	0.29	na	0.46	0.55	0.25	0.49	na	0.57	na	2.73	2.94
12/17/99	0.75	0.37	0.51	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	0.40	0.31	0.34	na	0.57	na	na	na	0.45	na	na	na
01/24/00	0.68	0.30	0.42	0.35	na	na	na	na	na	na	na	na	na
01/31/00	0.70	0.20	0.24	0.28	na	0.74	na	na	na	0.70	na	na	na
06/13/00	1.29	0.04	0.11	0.19	0.73	0.73	na	0.58	0.56	0.80	na	na	na
06/22/00	0.39	0.00	0.12	0.25	na	na	na	na	na	na	na	na	na
06/***/00	1.39	0.00	0.05	0.12	na	0.94	0.37	na	na	na	na	na	na
06/29/00	0.71	0.00	0.00	0.06	na	0.42	0.00	0.42	na	0.25	na	na	na
07/01/00	0.81	0.00	0.00	0.09	na	0.70	na	na	na	0.45	na	na	na
07/04/00	1.95	0.00	na	0.05	0.34	0.46	0.12	0.37	0.26	0.42	na	na	na
07/08/00	1.07	0.00	0.00	0.00	0.24	0.35	0.20	0.39	0.32	0.32	0.47	na	0.00
07/15/00	1.98	0.06	na	na	0.47	0.82	0.27	0.53	0.47	0.65	na	na	2.74
07/26/00	1.24	na	0.00	na	na	0.65	na	na	na	0.37	na	na	na
07/31/00	2.69	0.00	0.00	0.02	0.22	0.35	0.14	0.28	0.28	0.35	0.51	0.17	1.08
08/12/00	2.41	0.00	0.00	na	0.00	0.01	0.00	0.00	0.00	0.04	0.02	0.12	1.15
08/29/00	1.20	0.00	0.00	0.01	0.18	0.37	0.13	0.20	0.17	0.35	1.10	1.15	1.85
09/07/00	1.96	0.00	0.00	0.00	0.20	0.37	0.14	0.22	0.22	0.31	0.66	0.80	1.25
09/17/00	2.05	0.17	na	0.00	na	0.40	na	0.27	na	0.22	0.57	na	1.49
09/24/00	1.16	*	*	*	*	*	*	*	*	*	*	*	*
11/26/00	0.93	0.05	0.29	0.26	0.32	0.37	0.45	na	0.49	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		28	27	24	18	27	16	19	16	25	13	12	17
Average		0.137	0.181	0.158	0.408	0.514	0.209	0.399	0.398	0.441	0.934	1.494	3.349
Median		0.135	0.230	0.180	0.430	0.510	0.205	0.440	0.475	0.423	1.030	1.425	1.790
St.Dev.		0.139	0.147	0.110	0.203	0.191	0.122	0.147	0.169	0.171	0.526	0.908	4.559
C.V.		1.015	0.816	0.697	0.497	0.371	0.585	0.369	0.425	0.387	0.563	0.608	1.361
Maximum		0.400	0.510	0.350	0.740	0.940	0.450	0.580	0.570	0.800	2.090	3.030	17.100
Minimum		0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.038	0.020	0.120	0.000

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

* Magnesium analysis rejected by laboratory

APPENDIX G - 19a PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

HARDNESS (LABORATORY DETECTION LIMIT=0.02 MG/L & 1/2 MDL USED FOR CALCS)

YEAR ONE 1998-99			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/05/98	0.57	1.15	7.47	20.88	na	31.78	na	na	na	na	na	na	na
08/06/98	0.68	0.82	17.16	19.26	22.67	30.04	na	31.29	na	19.13	na	na	142.36
08/07/98	1.30	0.64	19.63	23.13	20.63	62.65	58.80	35.48	22.26	22.71	na	na	na
08/09/98	2.47	1.53	14.82	16.09	13.09	24.29	62.29	17.78	16.28	na	na	na	na
08/20/98	0.68	0.31	13.62	14.43	16.91	20.60	na	28.08	21.41	18.57	na	na	na
09/03/98	1.97	1.29	15.92	17.98	12.60	22.84	105.73	31.78	20.87	17.37	na	na	102.29
09/***/98	1.85	0.75	18.24	18.72	11.99	27.63	34.11	22.73	22.52	22.52	na	na	105.00
09/17/98	0.49	0.96	17.81	16.77	na	na	na	na	na	na	na	na	na
09/18/98	0.66	0.71	20.05	21.43	na	40.81	na	na	na	na	na	na	113.48
09/19/98	0.75	0.04	17.78	18.38	26.62	54.71	na	44.32	26.83	na	na	na	108.70
09/20/98	1.85	0.64	16.48	16.22	15.91	21.67	75.70	36.28	23.17	19.25	na	na	na
09/26/98	1.64	na	11.35	17.02	19.36	80.64	na	41.85	27.58	28.75	na	na	na
11/05/98	1.20	1.19	27.54	28.54	na	na	na	na	na	na	na	na	na
12/13/98	0.37	2.18	27.20	na	na	na	na	na	na	na	na	na	na
01/03/99	1.23	0.91	15.23	18.96	9.25	13.43	35.16	17.54	18.38	17.90	na	na	na
01/23/99	2.60	0.90	15.57	17.95	14.14	23.70	93.50	39.28	19.84	19.66	na	na	239.70
02/28/99	0.36	2.73	46.55	47.72	na	na	na	na	na	35.77	na	na	338.50
03/14/99	0.80	3.94	28.11	29.53	na	25.35	na	na	na	31.62	na	na	432.56
04/17/99	0.54	3.40	37.27	39.77	na	na	na	na	na	na	na	na	na
05/21/99	1.34	3.37	37.12	34.53	29.06	33.34	na	39.46	36.67	36.96	na	na	na
05/30/99	0.39	4.58	36.37	40.23	na	na	na	na	na	31.73	na	na	na
06/09/99	0.81	1.74	25.84	25.09	na	25.67	na	42.74	na	26.32	na	na	na
06/13/99	1.22	na	29.12	26.13	19.13	23.22	33.11	26.68	20.39	29.31	na	na	na
06/16/99	1.68	1.60	22.39	23.29	19.23	25.09	46.27	27.91	21.12	27.87	na	na	na
06/17/99	0.77	2.85	24.82	22.78	19.11	3.08	na	0.93	na	0.16	na	na	na
06/18/99	1.60	1.66	20.36	22.32	17.30	21.94	48.56	23.53	17.09	24.09	na	na	na
07/01/99	1.53	2.34	21.67	18.83	21.79	25.47	90.22	35.35	22.67	24.71	na	na	69.98
07/07/99	0.81	2.86	25.23	25.12	na	29.44	na	na	na	27.36	na	na	na
07/09/99	1.17	2.98	29.95	23.31	21.68	26.09	40.11	32.15	25.96	27.16	na	50.24	135.21
07/13/99	1.58	5.15	29.82	29.66	na	29.02	na	na	na	na	na	na	150.98
07/20/99	0.88	75.08	32.60	29.73	na	35.51	na	34.10	na	na	na	na	178.73
RAIN TOTAL	35.79												
No.Obs.		29	31	30	18	25	12	20	16	21	0	1	12
Average		4.424	23.326	24.126	18.359	30.320	60.296	30.463	22.690	24.234	na	na	176.457
Median		1.595	21.670	22.546	19.120	25.670	53.679	31.965	21.835	24.710	na	na	138.785
St.Dev.		13.652	8.791	7.994	5.109	15.677	25.414	10.430	4.895	7.950	na	na	108.655
C.V.		3.086	0.377	0.331	0.278	0.517	0.421	0.342	0.216	0.328	na	na	0.616
Maximum		75.080	46.550	47.720	29.060	80.640	105.730	44.320	36.670	36.960	na	na	432.560
Minimum		0.041	7.470	14.430	9.250	3.080	33.110	0.927	16.280	0.157	na	na	69.980

9/***/98 Includes 2 storms for September 6 (1.21 in) and 7 (.64in), 1998, and the samples not picked up until September 8th.
7/13/99 Includes several days of rainfall

APPENDIX G - 19b PARKING LOT WATER QUALITY DATA. Flow-weighted samples were collected at the outflow of the basins in the parking lot and for rainfall. Grab samples were collected, when possible, in the pond, strand and under drain. Numbers in italics are below the laboratory limit of detection. The abbreviation "na" means data were not available usually because there was too little flow for a sample. The data are divided into two data sets of about 30 storms each. Breaches through the berm between the strand and the pond interfered with collecting strand and pond data until the second set of data.

HARDNESS (LABORATORY DETECTION LIMIT=0.02 MG/L & 1/2 MDL USED FOR CALCS)

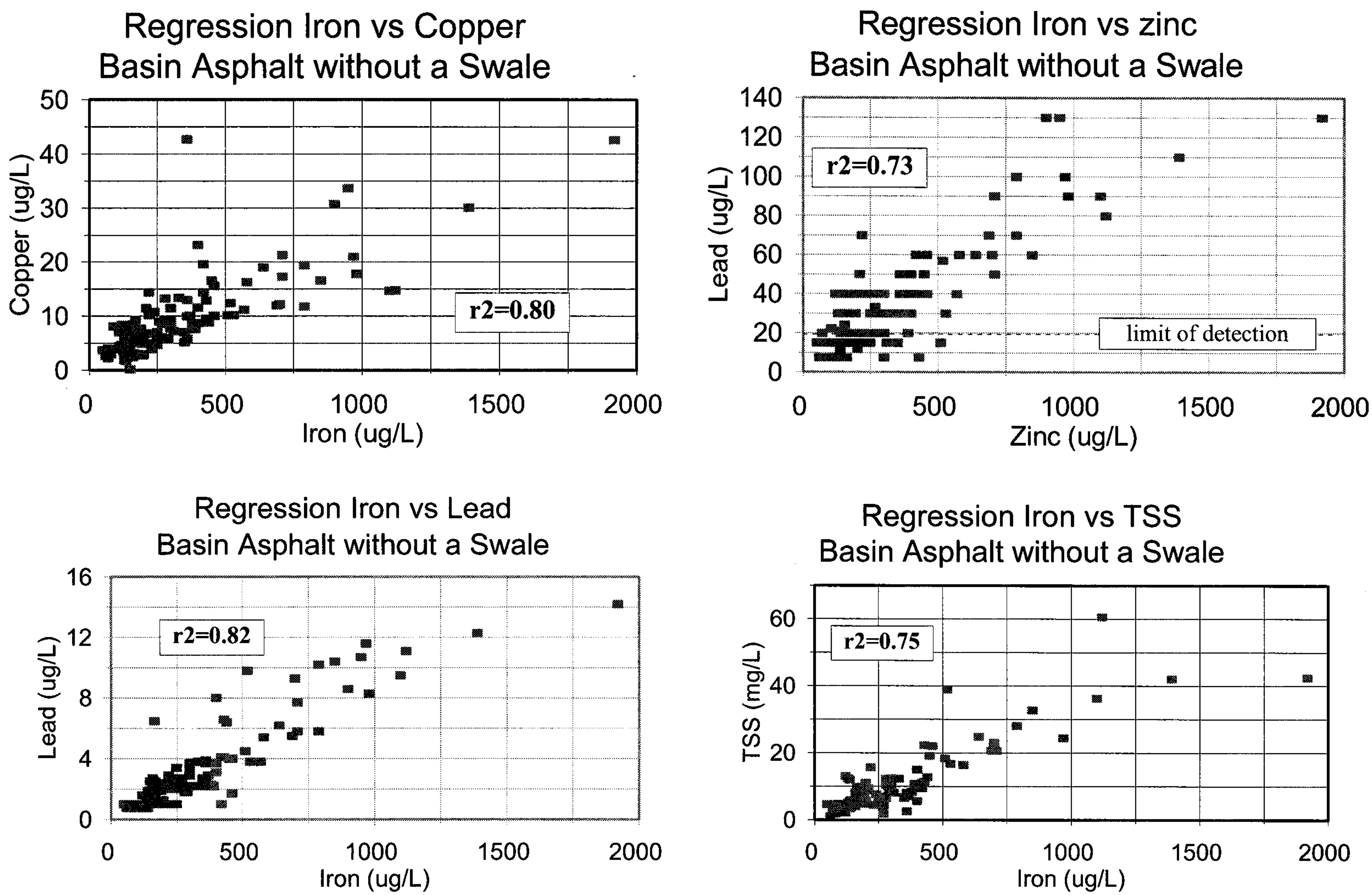
YEAR TWO plus 4 mo 1999-00			ASPHALT WO/SWALE		CONCRETE W/SWALE		POROUS W/SWALE		ASPHALT W/SWALE		REST OF TREATMENT TRAIN		
DATE	RAIN AMOUNT IN.	RAIN MG/L	F1 MG/L	F2 MG/L	F3 MG/L	F4 MG/L	F5 MG/L	F6 MG/L	F7 MG/L	F8 MG/L	STRAND MG/L	UNDER DRAIN MG/L	POND MG/L
08/06/99	1.29	7.13	24.88	na	22.81	25.89	77.15	34.27	26.19	29.94	na	60.17	152.00
08/12/99	0.70	2.93	28.66	31.03	37.21	35.26	na	47.79	na	37.76	na	na	na
08/14/99	1.23	2.60	30.30	28.29	23.56	51.58	51.58	34.18	27.90	32.02	29.96	41.80	9.44
08/19/99	0.90	na	30.90	30.30	24.50	28.80	48.30	36.50	29.00	32.80	31.40	48.00	137.00
08/22/99	2.95	3.68	34.52	35.25	35.09	35.45	59.04	46.06	24.63	33.96	30.22	na	37.92
09/11/99	0.84	4.62	29.70	26.71	na	34.31	na	na	na	34.11	na	na	87.68
09/18/99	0.85	5.14	25.40	23.19	26.47	32.31	na	36.60	28.73	28.24	30.75	53.45	104.30
09/25/99	1.37	3.05	27.29	22.01	20.15	21.81	51.76	31.65	25.94	27.41	28.88	50.16	102.25
10/03/99	1.22	5.02	24.94	22.37	23.88	25.10	na	36.85	28.19	25.45	26.72	56.52	118.50
10/04/99	0.98	3.35	30.41	29.20	na	62.39	na	na	na	49.46	35.10	49.30	116.50
11/01/99	1.63	4.95	24.46	na	22.94	32.20	75.19	38.72	na	34.30	na	106.10	117.90
12/17/99	0.75	8.09	33.80	na	na	na	na	na	na	na	na	na	na
01/06/00	0.79	7.02	28.24	29.12	na	27.02	na	na	na	30.32	na	na	na
01/24/00	0.68	5.18	33.19	32.40	na	na	na	na	na	na	na	na	na
01/31/00	0.70	5.32	28.46	30.87	na	40.75	na	na	na	54.82	na	na	na
06/13/00	1.29	2.01	35.91	37.24	27.05	27.78	na	28.11	42.01	47.24	na	na	na
06/22/00	0.39	2.00	37.45	37.49	na	na	na	na	na	na	na	na	na
06/***/00	1.39	1.35	29.92	31.96	na	45.07	36.73	na	na	na	na	na	na
06/29/00	0.71	1.30	24.60	25.72	na	25.28	15.86	28.95	na	27.50	na	na	na
07/01/00	0.81	0.00	24.60	28.84	na	41.09	na	na	na	36.56	na	na	na
07/04/00	1.95	24.55	na	27.73	18.45	28.49	23.29	26.45	22.64	25.29	na	na	na
07/08/00	1.07	1.75	26.47	26.97	17.57	23.49	27.54	29.32	30.03	27.04	22.31	na	130.84
07/15/00	1.98	1.00	na	na	19.46	38.77	27.58	30.25	26.91	32.14	na	na	137.13
07/26/00	1.24	na	30.96	na	na	41.63	na	na	na	44.22	na	na	na
07/31/00	2.69	0.00	28.47	23.58	15.34	25.14	24.07	26.51	21.48	27.91	30.32	30.66	71.12
08/12/00	2.41	0.10	42.20	na	14.41	20.11	16.78	17.75	18.38	22.20	24.20	26.71	91.38
08/29/00	1.20	2.00	29.96	27.47	16.25	27.66	24.43	24.92	23.35	30.75	44.73	54.18	110.99
09/07/00	1.96	0.16	0.11	30.37	0.08	30.28	0.11	27.46	0.12	28.76	0.16	0.04	0.07
09/17/00	2.05	2.67	na	24.49	na	35.05	na	34.76	na	29.35	33.31	na	114.51
09/24/00	1.16	*	*	*	*	*	*	*	*	*	*	*	*
11/26/00	0.93	2.43	26.41	25.57	18.25	17.75	22.53	na	34.73	na	na	na	na
RAIN TOTAL	40.11												
No.Obs.		31	28	27	24	18	27	16	19	16	25	13	12
Average		1.294	3.906	28.600	28.673	21.304	32.610	36.371	32.478	25.639	33.182	28.313	48.091
Median		1.200	2.800	28.660	28.563	21.480	30.281	27.561	31.650	26.548	30.752	30.220	49.730
St.Dev.		0.629	4.617	7.155	4.277	8.134	9.976	21.948	7.226	8.722	8.031	10.061	24.796
C.V.		0.486	1.182	0.250	0.149	0.382	0.306	0.603	0.222	0.340	0.242	0.355	0.516
Maximum		2.950	24.546	42.199	37.486	37.210	62.390	77.150	47.790	42.008	54.820	44.732	106.100
Minimum		0.390	0.000	0.112	22.010	0.083	17.754	0.105	17.754	0.117	22.195	0.161	0.036

6/***/00 Includes several storms from 6/23 to 6/27 and samples not picked up until the 27th.

* Hardness analysis rejected by laboratory

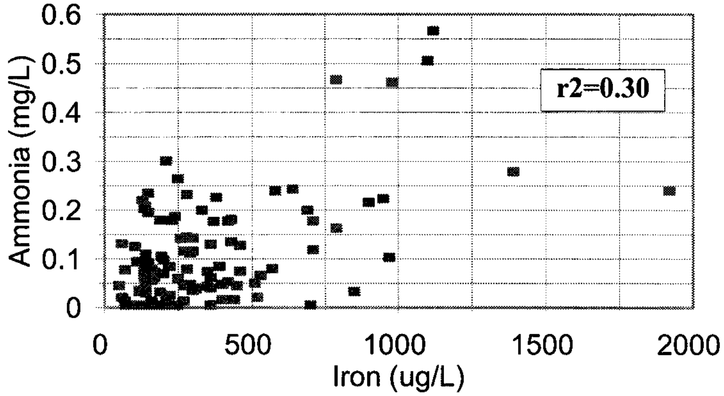
APPENDIX H

REGRESSION EQUATIONS IN ASPHALT BASINS WITHOUT A SWALE

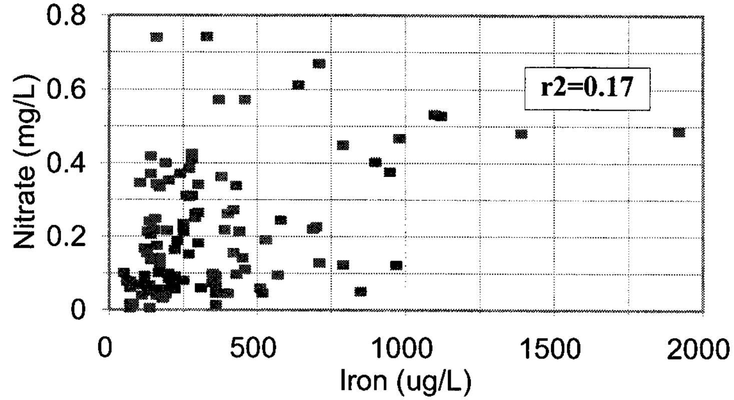


Appendix H-1. Regressions of iron concentrations with other metals.

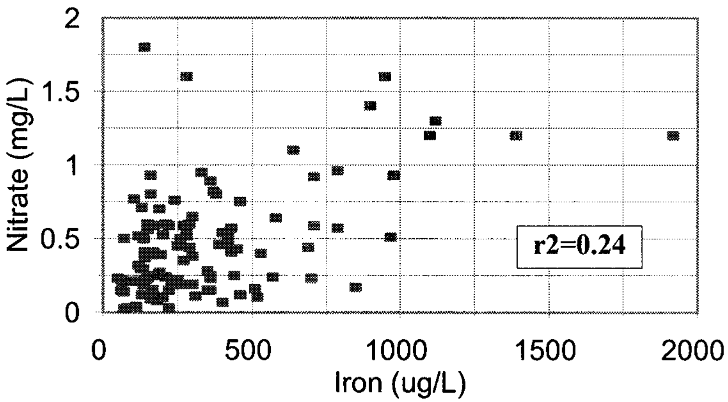
Regression Iron vs Ammonia
Basin Asphalt without a Swale



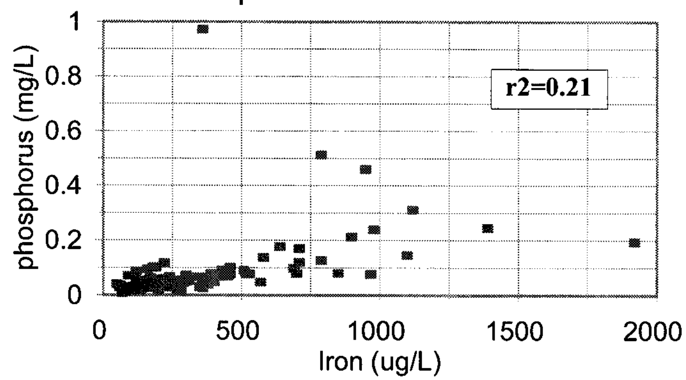
Regression Iron vs Nitrate
Basin Asphalt without a Swale



Regression Iron vs Total Nitrogen
Basin Asphalt without a Swale



Regression Iron vs Total Phosphorus
Basin Asphalt without a Swale



Appendix H-2. Regression of iron concentrations with nutrients.

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APPENDIX I

WATER QUALITY DISCRETE SAMPLES

Appendix I-1. Discrete samples taken at intervals across the hydrograph for the August 9, 1998 storm at the Florida Aquarium parking lot. One pavement type, asphalt with swale was not sampled. Rain amount was 2.47 inches in about an hour and antecedent dry conditions were less than a day. Numbers not in bold type were below the laboratory detection limit and one half the detection limit was used.

August 9, 1998		Asphalt wo/ swale (F2)				Cement w/ swale (F4)					Permeable paving with swale (F6)				
CONCENTRATIONS	UNITS	rising 38%	top 38%	falling 24%	weighted average	rising 25%	top 25%	top 25%	falling 25%	weighted average	rising 25%	top 25%	top 25%	falling 25%	weighted average
AMMONIA	mg/L	0.088	0.322	0.199	0.204	0.027	0.101	0.017	0.17	0.079	0.085	0.057	0.002	0.153	0.074
NITRITE	mg/L	0.013	0.010	0.010	0.011	0.015	0.011	0.016	0.012	0.013	0.01	0.013	0.014	0.011	0.012
NITRATE	mg/L	0.331	0.187	0.183	0.241	0.192	0.184	0.32	0.211	0.227	0.172	0.205	0.278	0.205	0.215
TOTAL-N	mg/L	0.560	0.490	0.410	0.497	0.36	0.38	0.41	0.37	0.380	0.32	0.32	0.31	0.38	0.333
ORTHO-P	mg/L	0.005	0.012	0.013	0.010	0.059	0.037	0.036	0.029	0.040	0.024	0.03	0.022	0.018	0.024
TOTAL-P	mg/L	0.018	0.018	0.019	0.018	0.076	0.049	0.065	0.042	0.058	0.032	0.041	0.041	0.026	0.035
CADMIUM	ug/L	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
COPPER	ug/L	3.8	0.5	0.5	1.75	0.5	0.5	0.5	0.5	0.50	0.5	0.5	0.5	0.5	0.50
IRON	ug/L	180	120	90	136	80	40	140	90	88	15	30	90	40	44
LEAD	ug/L	2.3	1.0	1.0	1.494	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
MANGANESE	ug/L	5.2	3.5	3.0	4.026	1.6	1.1	2.8	1.8	1.8	0.8	0.9	1.8	1.3	1.2
ZINC	ug/L	30	15	15	21	15	15	15	15	15	15	15	15	15	15
CHLORIDE	mg/L	0.72	0.32	0.22	0.45	0.5	0.46	0.96	0.52	0.61	0.35	0.57	0.74	0.34	0.50
POTASSIUM	mg/L	0.12	0.09	0.11	0.11	1.29	0.84	1.16	0.82	1.03	0.9	1.23	1.15	0.85	1.03
SODIUM	mg/L	0.46	0.56	0.20	0.44	0.52	0.41	0.8	0.4	0.53	0.34	0.44	0.62	0.35	0.44
SULFATE	mg/L	2.81	2.06	2.02	2.34	4.43	2.68	3.32	2.28	3.18	2.51	2.84	3.75	2.16	2.82
CALCIUM	mg/L	7.98	4.85	5.96	6.31	20	4.77	7.82	5.02	9.40	6.46	13.5	6.61	5	7.89
MAGNESIUM	mg/L	0.11	0.06	0.09	0.09	0.31	0.17	0.18	0.13	0.20	0.15	0.21	0.15	0.12	0.16
HARDNESS	mg/L	20.35	12.35	15.25	16.09	51.21	12.61	20.26	13.07	24.29	6.46	34.57	17.12	12.98	17.78
TSS	mg/L	19.84	10.71	1.51	11.97	2.47	2.29	3.62	3.06	2.86	0.83	0.84	1.87	0.77	1.08
MASS															
VOLUME (cu ft)		742.5	742.5	469.0	1954.0	319.0	319.0	319.0	319.0	1276.0	319.0	319.0	319.0	319.0	1277.0
AMMONIA	grams	1.85	6.77	2.64	11.26	0.24	0.91	0.15	1.54	2.85	0.77	0.51	0.02	1.38	2.68
NITRITE	grams	0.27	0.21	0.13	0.62	0.14	0.10	0.14	0.11	0.49	0.09	0.12	0.13	0.10	0.43
NITRATE	grams	6.96	3.93	2.43	13.32	1.73	1.66	2.89	1.91	8.19	1.55	1.85	2.51	1.85	7.77
TOTAL-N	grams	11.78	10.30	5.45	27.52	3.25	3.43	3.70	3.34	13.73	2.89	2.89	2.80	3.43	12.02
ORTHO-P	grams	0.11	0.25	0.17	0.53	0.53	0.33	0.33	0.26	1.45	0.22	0.27	0.20	0.16	0.85
TOTAL-P	grams	0.38	0.38	0.25	1.01	0.69	0.44	0.59	0.38	2.10	0.29	0.37	0.37	0.23	1.26
CADMIUM	grams	0.0032	0.0032	0.0032	0.009	0.0014	0.0014	0.0014	0.0014	0.005	0.0014	0.0014	0.0014	0.0014	0.005
COPPER	grams	0.0799	0.0105	0.0105	0.101	0.0045	0.0045	0.0045	0.0045	0.018	0.0045	0.0045	0.0045	0.0045	0.018
IRON	grams	3.7850	2.5233	1.8925	8.201	0.7227	0.3614	1.2648	0.8131	3.162	0.1355	0.2710	0.8131	0.3614	1.581
LEAD	grams	0.0484	0.0210	0.0210	0.090	0.0090	0.0090	0.0090	0.0090	0.036	0.0090	0.0090	0.0090	0.0090	0.036
MANGANESE	grams	0.1093	0.0736	0.0631	0.246	0.0145	0.0099	0.0253	0.0163	0.066	0.0072	0.0081	0.0163	0.0117	0.043
ZINC	grams	0.6308	0.3154	0.3154	1.262	0.1355	0.1355	0.1355	0.1355	0.542	0.1355	0.1355	0.1355	0.1355	0.542
CHLORIDE	grams	15.14	6.73	2.92	24.79	4.52	4.16	8.67	4.70	22.04	3.16	5.15	6.69	3.07	18.07
POTASSIUM	grams	2.52	1.89	1.46	5.88	11.65	7.59	10.48	7.41	37.13	8.13	11.11	10.39	7.68	37.31
SODIUM	grams	9.67	11.78	2.66	24.10	4.70	3.70	7.23	3.61	19.24	3.07	3.97	5.60	3.16	15.81
SULFATE	grams	59.09	43.32	26.83	129.23	40.02	24.21	29.99	20.60	114.82	22.68	25.66	33.88	19.51	101.72
CALCIUM	grams	167.80	101.98	79.16	348.95	180.68	43.09	70.65	45.35	339.77	58.36	121.96	59.72	45.17	285.21
MAGNESIUM	grams	2.31	1.26	1.20	4.77	2.80	1.54	1.63	1.17	7.14	1.36	1.90	1.36	1.08	5.69
HARDNESS	grams	427.91	259.69	202.55	890.15	462.64	113.92	183.03	118.08	877.66	58.36	312.31	154.66	117.26	642.59
TSS	grams	417.19	225.21	20.06	662.45	22.31	20.69	32.70	27.64	103.35	7.50	7.59	16.89	6.96	38.94

Appendix I-2. Discrete samples taken at intervals across the hydrograph for the September 3, 1998 storm at the Florida Aquarium parking lot. Rain amount was 1.97 inches in about four hours and antecedent dry conditions were 30 hours with no significant rainfall. Rain (0.47 inches) fell on September 1st. Numbers in italics were below the laboratory detection limit and one half the detection limit was used in calculations.

September 3, 1998		Asphalt without swale (F2)				Cement with swale (F4)				Permeable paving w/ swale (F6)				Asphalt paving with swale (F8)			
					weighted				weighted				weighted				weighted
	UNITS	rising	top	falling	average	rising	top	falling	average	rising	top	falling	average	rising	top	falling	average
PERCENTAGE		52%	48%	0%		40%	45%	15%		38%	44%	19%		50%	50%	0%	
AMMONIA	mg/L	0.010	0.017		0.013	*0.005*	0.011	*0.005*	0.008	0.033	*0.005*	0.013	0.017	*0.005*	0.051		0.028
NITRITE	mg/L	*0.005*	*0.005*		*0.005*	*0.005*	*0.005*	*0.005*	0.005	*0.005*	*0.005*	0.011	0.006	*0.005*	*0.005*		*0.005*
NITRATE	mg/L	0.096	0.212		0.152	0.063	0.042	0.045	0.051	0.047	0.035	0.051	0.043	0.012	0.039		0.026
TOTAL-N	mg/L	0.18	0.20		0.19	0.17	0.12	0.20	0.15	0.27	0.17	0.05	0.19	0.10	0.12		0.11
ORTHO-P	mg/L	0.01	*0.01*		*0.01*	0.06	0.06	0.09	0.06	0.05	0.04	0.03	0.04	0.05	*0.01*		0.03
TOTAL-P	mg/L	0.02	0.02		0.02	0.08	0.06	0.10	0.07	0.08	0.04	0.03	0.06	0.07	*0.01*		0.04
CADMIUM	ug/L	*0.15*	*0.15*		*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*		*0.15*
COPPER	ug/L	7.4	4.7		6.1	5.6	3.0	5.4	4.4	2.1	2.6	4.8	2.8	11.8	9.5		10.7
IRON	ug/L	350	180		268	120	70	60	89	90	40	30	57	330	110		220
LEAD	ug/L	3.0	*1.0*		2.0	*1.0*	*1.0*	*1.0*	1.0	*1.0*	*1.0*	*1.0*	1.0	*1.0*	*1.0*		*1.0*
MANGANESE	ug/L	8.4	5.0		6.8	3.1	2.0	1.5	2.4	1.6	1.6	1.2	1.5	6.9	2.7		4.8
ZINC	ug/L	50.0	*15.0*		33.2	*15.0*	*15.0*	*15.0*	*15.0*	*15.0*	*15.0*	*15.0*	*15.1*	*15.0*	*15.0*		*15.0*
CHLORIDE	mg/L	2.82	1.97		2.41	2.49	2.54	3.43	2.65	2.37	2.08	3.18	2.40	2.66	2.82		2.74
POTASSIUM	mg/L	0.14	0.11		0.13	1.50	1.39	5.17	2.00	1.82	1.90	3.03	2.09	0.32	0.29		0.31
SODIUM	mg/L	1.83	1.42		1.63	1.61	1.49	3.96	1.91	1.14	1.33	1.40	1.28	1.32	1.40		1.36
SULFATE	mg/L	2.18	1.80		2.00	3.64	1.78	3.99	2.86	2.29	2.30	3.58	2.54	1.89	3.66		2.78
CALCIUM	mg/L	6.99	6.71		6.86	6.35	7.56	18.00	8.64	7.54	10.60	26.50	12.43	7.17	6.18		6.68
MAGNESIUM	mg/L	0.21	0.21		0.21	0.18	0.18	1.02	0.31	0.15	0.18	0.24	0.18	0.17	0.17		0.17
HARDNESS	mg/L	18.32	17.62		17.98	16.59	19.62	49.15	22.84	19.44	27.21	67.16	31.78	18.60	16.13		17.37
TSS	mg/L	5.94	1.86		3.98	5.08	3.76	3.66	4.27	1.08	0.58	0.57	0.77	15.08	5.53		10.31
MASS					TOTAL				TOTAL				TOTAL				TOTAL
VOLUME (cu ft)		600.0	550.0	0.0	1150	350.0	400.0	130.0	880.0	260.0	300.0	120.0	680.0	390.0	390.0	0.0	780.0
AMMONIA	grams	0.168	0.262	0.000	0.430	0.049	0.123	0.018	0.190	0.240	0.042	0.044	0.326	0.055	0.557	0.000	0.612
NITRITE	grams	0.084	0.077	0.000	0.161	0.049	0.056	0.018	0.123	0.036	0.042	0.037	0.115	0.055	0.055	0.000	0.109
NITRATE	grams	1.613	3.265	0.000	4.878	0.617	0.470	0.164	1.252	0.342	0.294	0.171	0.808	0.131	0.426	0.000	0.557
TOTAL-N	grams	3.024	3.080	0.000	6.104	1.666	1.344	0.728	3.738	1.966	1.428	0.171	3.565	1.092	1.310	0.000	2.402
ORTHO-P	grams	0.168	0.077	0.000	0.245	0.549	0.706	0.317	1.571	0.371	0.361	0.104	0.837	0.513	0.055	0.000	0.568
TOTAL-P	grams	0.403	0.231	0.000	0.634	0.735	0.706	0.375	1.816	0.612	0.361	0.104	1.077	0.710	0.055	0.000	0.764
CADMIUM	grams	0.0025	0.0023	0.0000	0.0048	0.0015	0.0017	0.0005	0.0037	0.0011	0.0013	0.0005	0.0029	0.0016	0.0016	0.0000	0.0033
COPPER	grams	0.1243	0.0724	0.0000	0.1967	0.0549	0.0336	0.0197	0.1081	0.0153	0.0218	0.0161	0.0533	0.1289	0.1037	0.0000	0.2326
IRON	grams	5.88	2.77	0.00	8.65	1.18	0.78	0.22	2.18	0.66	0.34	0.10	1.09	3.60	1.20	0.00	4.80
LEAD	grams	0.050	0.015	0.000	0.066	0.010	0.011	0.004	0.025	0.007	0.008	0.003	0.019	0.011	0.011	0.000	0.022
MANGANESE	grams	0.14	0.08	0.00	0.22	0.03	0.02	0.01	0.06	0.01	0.01	0.00	0.03	0.08	0.03	0.00	0.10
ZINC	grams	0.84	0.23	0.00	1.07	0.15	0.17	0.05	0.37	0.11	0.13	0.05	0.29	0.16	0.16	0.00	0.33
CHLORIDE	grams	47.38	30.34	0.00	77.71	24.40	28.45	12.49	65.34	17.25	17.47	10.68	45.41	29.05	30.79	0.00	59.84
POTASSIUM	grams	2.35	1.69	0.00	4.05	14.70	15.57	18.82	49.09	13.25	15.96	10.18	39.39	3.49	3.17	0.00	6.66
SODIUM	grams	30.74	21.87	0.00	52.61	15.78	16.69	14.41	46.88	8.30	11.17	4.70	24.18	14.41	15.29	0.00	29.70
SULFATE	grams	36.62	27.72	0.00	64.34	35.67	19.94	14.52	70.13	16.67	19.32	12.03	48.02	20.64	39.97	0.00	60.61
CALCIUM	grams	117.43	103.33	0.00	220.77	62.23	84.67	65.52	212.42	54.89	89.04	89.04	232.97	78.30	67.49	0.00	145.78
MAGNESIUM	grams	3.53	3.23	0.00	6.76	1.76	2.02	3.71	7.49	1.09	1.51	0.81	3.41	1.86	1.86	0.00	3.71
HARDNESS	grams	307.78	271.35	0.00	579.12	162.58	219.74	178.91	561.23	141.52	228.56	225.66	595.74	203.11	176.14	0.00	379.25
TSS	grams	99.79	28.64	0.00	128.44	49.78	42.11	13.32	105.22	7.86	4.87	1.92	14.65	164.67	60.39	0.00	225.06

Appendix I-3. Discrete samples taken at intervals across the hydrograph for the January 23, 1999 storm at the Florida Aquarium parking lot. Rain amount was 2.54 inches in about five hours and antecedent dry conditions were 336 hours with no significant rainfall. Rain (0.46 inches) fell on January 9th. Numbers in italics were below the laboratory detection limit and one half the detection limit was used in calculations.

JANUARY 23, 1999 RAIN 2.61 (5 HOURS)		Asphalt w/ swale (F2)				Cement w/ swale (F4)				Permeable paving with swale (F6)				Asphalt paving with swale (F8)			
CONSTITUENT VOLUME (cu ft)	UNITS	rising 39%	top 40%	falling 21%	weighted average	rising 40%	top 39%	falling 23%	weighted average	rising 39%	top 39%	falling 22%	weighted average	rising 44%	top 43%	falling 17%	weighted average
AMMONIA	mg/L	0.026	0.017	0.019	0.021	0.028	0.046	0.025	0.035	0.011	0.015	0.022	0.015	0.052	0.018	0.019	0.034
NITRITE	mg/L	0.058	*0.005*	*0.005*	0.026	0.013	0.01	0.012	0.012	0.011	0.012	0.016	0.012	*0.005*	*0.005*	*0.005*	0.005
NITRATE	mg/L	*0.005*	0.033	0.047	0.025	0.080	0.132	0.079	0.102	0.094	0.086	0.089	0.090	0.105	0.045	0.032	0.071
TOTAL-N	mg/L	0.089	0.055	0.071	0.072	0.121	0.188	0.116	0.148	0.116	0.113	0.127	0.117	0.162	0.068	0.056	0.110
ORTHO-P	mg/L	0.032	0.023	0.021	0.026	0.097	0.149	0.103	0.121	0.115	0.091	0.063	0.094	0.148	0.099	0.105	0.126
TOTAL-P	mg/L	0.150	0.032	0.028	0.077	0.110	0.173	0.113	0.137	0.135	0.117	0.11	0.122	0.177	0.124	0.113	0.150
CADMIUM	ug/L	*0.15*	*0.15*	*0.15*	0.150	*0.15*	*0.15*	*0.15*	0.153	*0.15*	*0.15*	*0.15*	0.150	*0.15*	*0.15*	*0.15*	0.156
COPPER	ug/L	27.10	2.60	2.60	12.16	1.10	3.90	*0.05*	1.97	4.30	1.60	5.20	3.45	9.00	4.40	3.00	6.36
IRON	ug/L	1210	40	90	507	50	120	40	76	50	*15*	40	34	230	100	50	153
LEAD	ug/L	23.1	*1.0*	*1.0*	9.6	*1.0*	2.2	*1.0*	1.5	*1.0*	*1.0*	*1.0*	1.0	4.7	2.4	*1.0*	3.3
MANGANESE	ug/L	24.7	1.5	4.8	11.2	2.0	3.6	2.0	2.7	1.6	0.9	0.7	1.1	6.5	4.6	2.5	5.3
ZINC	ug/L	120.0	*15.0*	*15.0*	56.0	*15.0*	*15.0*	*0.2*	11.9	*15.0*	*15.0*	*15.0*	15.0	60.0	30.0	30.0	44.4
CHLORIDE	mg/L	0.80	0.53	0.47	0.62	1.10	1.76	1.07	1.37	1.32	1.27	1.30	1.30	1.47	1.03	0.93	1.25
POTASSIUM	mg/L	0.11	0.08	0.09	0.09	2.08	2.65	1.92	2.31	3.86	4.20	4.67	4.17	0.73	0.41	0.39	0.56
SODIUM	mg/L	0.34	0.27	0.21	0.28	0.99	1.01	0.70	0.95	0.66	0.78	1.00	0.78	0.77	0.59	0.53	0.68
SULFATE	mg/L	1.38	0.86	1.64	1.23	2.94	3.36	2.28	3.01	3.00	3.21	4.23	3.35	3.11	2.11	2.51	2.70
CALCIUM	mg/L	8.58	5.58	6.81	7.01	14.10	5.01	7.65	9.35	6.69	16.40	28.10	15.19	6.45	7.02	9.02	7.39
MAGNESIUM	mg/L	0.11	0.08	0.09	0.09	0.31	0.25	0.23	0.27	0.19	0.28	0.26	0.24	0.34	0.33	0.42	0.36
HARDNESS	mg/L	21.88	14.26	17.38	17.89	36.48	13.54	20.05	24.48	17.49	42.10	71.24	38.91	17.51	18.89	24.25	19.95
TSS	mg/L	86.8	8.2	n/a	47.5	1.5	0.9	1.5	1.3	0.3	0.5	1.0	0.5	3.9	5.4	3.4	4.6
MASS					TOTAL				TOTAL				TOTAL				TOTAL
VOLUME (cu ft)		506.6	519.6	272.8	1299	403.2	393.1	231.8	1008.0	307.3	307.3	173.4	788.0	461.6	451.1	178.3	1049.0
AMMONIA	grams	0.369	0.247	0.145	0.761	0.316	0.506	0.162	0.985	0.095	0.129	0.107	0.331	0.672	0.227	0.095	0.994
NITRITE	grams	0.823	0.073	0.038	0.934	0.147	0.110	0.078	0.335	0.095	0.103	0.078	0.276	0.065	0.063	0.025	0.153
NITRATE	grams	0.071	0.480	0.359	0.910	0.903	1.453	0.513	2.869	0.809	0.740	0.432	1.981	1.357	0.568	0.160	2.085
TOTAL-N	grams	1.262	0.800	0.542	2.605	1.366	2.069	0.753	4.188	0.998	0.972	0.617	2.587	2.094	0.859	0.280	3.232
ORTHO-P	grams	0.454	0.335	0.160	0.949	1.095	1.640	0.669	3.404	0.990	0.783	0.306	2.078	1.913	1.250	0.524	3.688
TOTAL-P	grams	2.128	0.466	0.214	2.807	1.242	1.904	0.733	3.879	1.162	1.007	0.534	2.702	2.288	1.566	0.564	4.418
CADMIUM	grams	0.002	2.182	1.146	3.330	0.002	1.651	0.974	2.626	1.291	1.291	0.728	3.310	0.002	0.002	0.001	0.005
COPPER	grams	0.384	0.038	0.020	0.442	0.012	0.043	0.000	0.056	0.037	0.014	0.025	0.076	0.116	0.056	0.015	0.187
IRON	grams	17.16	0.58	0.69	18.43	0.564	1.321	0.260	2.145	0.430	0.129	0.194	0.753	2.973	1.263	0.250	4.485
LEAD	grams	0.33	0.01	0.01	0.35	0.01	0.02	0.01	0.04	0.01	0.01	0.00	0.02	0.06	0.03	0.00	0.10
MANGANESE	grams	0.35	0.02	0.04	0.41	0.02	0.04	0.01	0.08	0.01	0.01	0.00	0.02	0.08	0.06	0.01	0.15
ZINC	grams	1.70	0.22	0.11	2.03	0.17	0.17	0.00	0.34	0.13	0.13	0.07	0.33	0.78	0.38	0.15	1.30
CHLORIDE	grams	11.35	7.71	3.59	22.65	12.42	19.37	6.94	38.74	11.36	10.93	6.31	28.60	19.00	13.01	4.64	36.65
POTASSIUM	grams	1.56	1.16	0.69	3.41	23.48	29.17	12.46	65.11	33.21	36.14	22.67	92.03	9.44	5.18	1.95	16.56
SODIUM	grams	4.82	3.93	1.60	10.36	11.18	11.12	4.54	26.84	5.68	6.71	4.86	17.25	9.95	7.45	2.65	20.05
SULFATE	grams	19.58	12.51	12.53	44.61	33.19	36.98	14.80	84.97	25.81	27.62	20.54	73.97	40.20	26.65	12.53	79.38
CALCIUM	grams	121.71	81.18	52.02	254.91	159.18	55.14	49.65	263.98	57.56	141.11	136.43	335.11	83.36	88.67	45.03	217.06
MAGNESIUM	grams	1.56	1.16	0.69	3.41	3.50	2.75	1.49	7.74	1.63	2.41	1.26	5.31	4.39	4.17	2.10	10.66
HARDNESS	grams	310.36	207.47	132.76	650.58	411.84	149.03	130.13	691.01	150.49	362.25	345.88	858.62	226.31	238.60	121.07	585.97
TSS	grams	1231.2	119.3	0.0	1350.5	17.2	9.7	9.8	36.6	2.3	4.0	4.8	11.1	50.1	68.1	17.1	135.3

Appendix I-4. Discrete samples taken at intervals across the hydrograph for the June 18, 1999 storm at the Florida Aquarium parking lot. Rain amount was 1.40 inches in about one hour. The time since the last significant rain was about eleven hours.
Numbers in italics were below the laboratory detection limit and one half the detection limit was used in calculations.

JUNE 18, 1999 rain=1.4 in. in 1 hour		Asphalt without swale (F2)				Cement with swale (F4)				Permeable paving w/ swale (F6)				Asphalt paving with swale (F8)			
CONSTITUENT	UNITS	rising top	falling	tail	weighted average	rising top	falling	tail	weighted average	rising top	falling	tail	weighted average	rising top	falling	tail	weighted average
percentage		67%	33%			40%	40%	20%		38%	38%	25%		38%	42%	20%	
AMMONIA	mg/L	0.106	0.071		0.094	0.034	0.020	0.018	0.025	0.032	0.019	0.062	0.035	0.058	0.005	0.011	0.027
NITRITE	mg/L	0.134	0.197		0.155	0.130	0.054	0.013	0.076	0.144	0.100	0.062	0.107	0.115	0.056	0.021	0.053
NITRATE	mg/L	*0.005*	*0.005*		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.0031*
TOTAL-N	mg/L	0.27	0.35		0.30	0.32	0.37	0.42	0.36	0.42	0.54	0.54	0.50	0.35	0.25	0.42	0.23
ORTHO-P	mg/L	0.025	0.017		0.022	0.078	0.160	0.249	0.145	0.135	0.109	0.119	0.121	0.130	0.144	0.184	0.091
TOTAL-P	mg/L	0.051	0.035		0.046	0.113	0.215	0.312	0.194	0.178	0.154	0.174	0.168	0.169	0.192	0.232	0.117
COPPER	ug/L	2.60	5.30		3.49	0.70	5.30	*1.00*	2.60	1.90	3.60	2.90	2.79	2.20	4.60	4.40	1.80
IRON	ug/L	170	*40*		127	*15*	*15*	*15*	*15*	50	*15*	*15*	28.125	80	*15*	*15*	36.6
LEAD	ug/L	*1*	*1*		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
MANGANESE	ug/L	5.3	4.9		5.2	3.1	3.6	0.9	2.9	1.0	0.8	1.5	1.1	4.3	1.7	0.1	1.8
ZINC	ug/L	*15*	*15*		*15*	*15*	40	*15*	25	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*9*
CHLORIDE	mg/L	0.36	0.72		0.48	0.51	0.82	1.09	0.75	0.57	0.55	0.62	0.58	0.65	0.64	0.79	0.43
POTASSIUM	mg/L	0.13	0.17		0.14	1.09	1.45	1.95	1.41	1.47	1.45	1.74	1.53	0.46	0.39	0.38	0.27
SODIUM	mg/L	0.16	0.43		0.25	0.45	0.67	0.87	0.62	0.40	0.36	0.37	0.38	0.41	0.38	0.45	0.26
SULFATE	mg/L	1.26	2.89		1.80	1.97	2.98	4.21	2.82	2.14	1.60	2.08	1.92	1.79	1.77	2.09	1.17
CALCIUM	mg/L	5.86	14.80		8.81	4.42	9.08	13.10	8.02	5.55	8.62	14.00	8.81	5.68	9.65	12.70	4.93
MAGNESIUM	mg/L	0.08	0.25		0.14	0.25	0.53	0.76	0.46	0.28	0.36	0.52	0.37	0.31	0.62	0.82	0.29
HARDNESS	mg/L	14.60	37.98		22.32	12.07	24.86	35.84	21.94	15.01	23.01	37.10	23.53	15.46	26.65	35.09	13.51
TSS	mg/L	5.53	2.42		4.50	1.14	1.38	1.38	1.28	1.97	1.60	1.33	1.67	5.91	1.32	0.98	2.68
MASS					TOTAL				TOTAL				TOTAL				TOTAL
VOLUME (cu ft)		724.3	356.7	0.0	1081	414.4	414.4	207.2	1036.0	311.3	311.3	207.5	830.0	410.8	454.0	216.2	1081.0
AMMONIA	grams	2.150	0.709	0.000	2.859	0.395	0.232	0.104	0.731	0.279	0.166	0.360	0.805	0.667	0.064	0.067	0.797
NITRITE	grams	2.718	1.968	0.000	4.685	1.508	0.627	0.075	2.210	1.255	0.872	0.360	2.487	1.323	0.712	0.127	2.162
NITRATE	grams	0.101	0.050	0.000	0.151	0.058	0.058	0.029	0.145	0.044	0.044	0.029	0.116	0.058	0.064	0.030	0.151
TOTAL-N	grams	5.476	3.496	0.000	8.971	3.713	4.293	2.437	10.443	3.661	4.707	3.137	11.505	4.026	3.178	2.543	9.746
ORTHO-P	grams	0.507	0.170	0.000	0.677	0.905	1.857	1.445	4.206	1.177	0.950	0.691	2.818	1.495	1.831	1.114	4.440
TOTAL-P	grams	1.034	0.350	0.000	1.384	1.311	2.495	1.810	5.616	1.552	1.342	1.011	3.905	1.944	2.441	1.404	5.789
COPPER	grams	0.053	0.053	0.000	0.106	0.008	0.061	0.006	0.075	0.017	0.031	0.017	0.065	0.025	0.058	0.027	0.110
IRON	grams	3.448	0.400	0.000	3.847	0.174	0.174	0.087	0.435	0.436	0.131	0.087	0.654	0.920	0.191	0.091	1.202
LEAD	grams	0.020	0.010	0.000	0.030	0.012	0.012	0.006	0.029	0.009	0.009	0.006	0.023	0.012	0.013	0.006	0.030
MANGANESE	grams	0.107	0.049	0.000	0.156	0.036	0.042	0.005	0.083	0.009	0.007	0.009	0.024	0.049	0.022	0.000	0.072
ZINC	grams	0.304	0.150	0.000	0.454	0.174	0.464	0.087	0.725	0.131	0.131	0.087	0.349	0.173	0.191	0.091	0.454
CHLORIDE	grams	7.301	7.191	0.000	14.49	5.92	9.51	6.32	21.76	4.97	4.79	3.60	13.36	7.48	8.14	4.78	20.39
POTASSIUM	grams	2.636	1.698	0.000	4.33	12.65	16.82	11.31	40.79	12.81	12.64	10.11	35.56	5.29	4.96	2.30	12.55
SODIUM	grams	3.245	4.295	0.000	7.54	5.22	7.77	5.05	18.04	3.49	3.14	2.15	8.77	4.72	4.83	2.72	12.27
SULFATE	grams	25.553	28.864	0.000	54.42	22.86	34.58	24.42	81.86	18.65	13.95	12.08	44.68	20.59	22.50	12.65	55.74
CALCIUM	grams	118.843	147.816	0.000	266.66	51.29	105.36	76.00	232.64	48.38	75.14	81.34	204.85	65.33	122.67	76.88	264.89
MAGNESIUM	grams	1.622	2.497	0.000	4.12	2.90	6.15	4.41	13.46	2.44	3.14	3.02	8.60	3.57	7.88	4.96	16.41
HARDNESS	grams	296.094	379.329	0.000	675.42	140.00	288.46	207.93	636.39	130.84	200.53	215.55	546.92	177.82	338.77	212.41	729.00
TSS	grams	112.151	24.170	0.000	136.32	13.23	16.01	8.01	37.25	17.16	13.95	7.70	38.80	67.98	16.78	5.93	90.69

Appendix I-5. Discrete samples taken at intervals across the hydrograph for the July 4, 2000 storm at the Florida Aquarium parking lot. Rain amount was 1.95 inches in about three hours and antecedent dry conditions were 79 hours with no significant rainfall. Rain (0.81 inches) fell on July 1st. Numbers in italics were below the laboratory detection limit and one half the detection limit was used in calculations.

JULY 4, 2000		Asphalt without swale (F2)				Cement with swale (F4)				Permeable paving w/ swale (F6)					Asphalt paving with swale (F8)			
CONSTITUENT	UNITS	btl 1	btl 2		weighted average	btl 1	btl 2	btl 3	weighted average	btl 1	btl 2	btl 3	btl 4	weighted average	btl 1	blt 2	btl 3	weighted average
		65.33%	34.67%			35.14%	36.04%	28.83%		28.79%	30.30%	30.30%	10.61%		39.39%	40.40%	20.20%	
AMMONIA	mg/L	0.131	0.033		0.097	0.097	0.101	0.113	0.103	0.081	0.087	0.105	0.128	0.095	0.052	0.159	0.136	0.112
NITRITE	mg/L	0.010	0.027		0.016	0.008	0.015	0.020	0.014	0.008	0.009	0.010	0.014	0.010	0.008	0.016	0.025	0.015
NITRATE	mg/L	0.318	0.420		0.353	0.263	0.322	0.441	0.336	0.213	0.187	0.231	0.294	0.219	0.305	0.371	0.367	0.344
TOTAL-N	mg/L	0.580	0.420		0.525	0.770	0.900	0.240	0.664	0.33	0.32	0.40	2.7	0.600	0.32	0.77	0.58	0.554
ORTHO-P	mg/L	0.022	0.013		0.019	0.117	0.344	0.508	0.312	0.28	0.25	0.31	0.4	0.290	0.12	0.28	0.32	0.225
TOTAL-P	mg/L	0.034	0.039		0.036	0.117	0.453	0.637	0.388	0.25	0.28	0.40	0.46	0.328	0.13	0.29	0.32	0.233
CADMIUM	ug/L	*0.150*	*0.150*		0.150	*0.150*	*0.150*	*0.150*	0.150	*0.15*	*0.15*	*0.15*	0.6	0.198	*0.15*	*0.15*	*0.15*	0.150
COPPER	ug/L	2.300	4.300		2.993	*1.000*	8.800	8.300	5.916	4.8	3.1	3.4	2.3	3.595	2.5	3.0	4.6	3.126
IRON	ug/L	270.0	70.0		200.7	70.0	90.0	60.0	74.3	130.0	60.0	50.0	90.0	80.3	330.0	100.0	70.0	184.5
LEAD	ug/L	1.500	*0.750*		1.240	*0.750*	*0.750*	*0.750*	0.750	1.5	0.8	0.8	*0.75*	0.966	2.1	*0.8*	*0.8*	1.282
MANGANESE	ug/L	5.300	4.000		4.849	1.600	2.200	2.100	1.961	2.6	1.7	1.6	2.1	1.971	6.4	2.8	2.2	4.097
ZINC	ug/L	*7.500*	20.000		11.834	20.000	20.000	20.000	20.002	*7.5*	*7.5*	*7.5*	*7.5*	7.500	20.0	20.0	20.0	19.998
CHLORIDE	mg/L	1.860	1.880		1.867	1.990	2.290	2.710	2.306	1.89	1.83	1.92	1.98	1.890	1.97	2.01	2.18	2.028
POTASSIUM	mg/L	0.280	0.340		0.301	1.630	3.430	4.460	3.095	2.45	2.72	3.63	4.55	3.112	0.74	1.22	1.34	1.055
SODIUM	mg/L	0.220	0.770		0.411	0.630	1.100	1.440	1.033	0.48	0.43	0.59	0.88	0.541	0.47	0.69	1.02	0.670
SULFATE	mg/L	2.950	4.690		3.553	3.230	4.790	6.220	4.655	2.59	2.96	3.52	4.33	3.169	3.18	3.77	4.15	3.614
CALCIUM	mg/L	8.340	16.100		11.030	5.120	12.500	15.100	10.657	6.10	8.85	12.70	16	9.983	7.84	12.00	14.60	10.885
MAGNESIUM	mg/L	0.000	0.130		0.045	0.150	0.570	0.690	0.457	0.19	0.32	0.50	0.63	0.370	0.13	0.57	0.70	0.423
HARDNESS	mg/L	20.825	40.737		27.728	13.402	33.560	40.546	28.494	16.01	23.42	33.77	42.55	26.452	20.11	23.31	39.34	25.285
TSS	mg/L	11.094	na		na	1.933	3.256	na	2.603	4.66	3.27	2.76	na	3.54	9.24	4.79	na	6.99
MASS					TOTAL				TOTAL					TOTAL				TOTAL
VOLUME (cu ft)		848.6	450.4	0.0	1299	384.1	393.9	315.1	1093.0	196.0	206.2	206.2	72.2	680.6	430.5	441.6	220.8	1093.0
AMMONIA	grams	3.113	0.416	0.000	3.529	1.043	1.114	0.997	3.154	0.445	0.502	0.606	0.259	1.812	0.627	1.966	0.841	3.434
NITRITE	grams	0.238	0.341	0.000	0.578	0.086	0.165	0.176	0.428	0.044	0.052	0.058	0.028	0.182	0.096	0.198	0.155	0.449
NITRATE	grams	7.556	5.297	0.000	12.853	2.829	3.551	3.891	10.271	1.169	1.080	1.334	0.594	4.177	3.676	4.587	2.269	10.533
TOTAL-N	grams	13.781	5.297	0.000	19.078	8.281	9.926	2.117	20.325	1.811	1.848	2.309	5.458	11.426	3.857	9.521	3.586	16.964
ORTHO-P	grams	0.523	0.164	0.000	0.687	1.258	3.794	4.482	9.534	1.515	1.432	1.772	0.809	5.528	1.446	3.462	1.978	6.887
TOTAL-P	grams	0.808	0.492	0.000	1.300	1.258	4.996	5.620	11.875	1.388	1.622	2.304	0.930	6.244	1.567	3.586	1.978	7.131
CADMIUM	grams	0.0036	0.0019	0.0000	0.0055	0.0016	0.0017	0.0013	0.0046	0.0008	0.0009	0.0009	0.0012	0.0038	0.0018	0.0019	0.0009	0.0046
COPPER	grams	0.0546	0.0542	0.0000	0.1089	0.0108	0.0971	0.0732	0.1810	0.0263	0.0179	0.0196	0.0046	0.0685	0.0301	0.0371	0.0284	0.0957
IRON	grams	6.415	0.883	0.000	7.298	0.753	0.993	0.529	2.275	0.713	0.346	0.289	0.182	1.530	3.978	1.236	0.433	5.647
LEAD	grams	0.0356	0.0095	0.0000	0.0451	0.0081	0.0083	0.0066	0.0230	0.0082	0.0043	0.0043	0.0015	0.0184	0.0253	0.0093	0.0046	0.0392
MANGANESE	grams	0.126	0.050	0.000	0.176	0.017	0.024	0.019	0.060	0.014	0.010	0.009	0.004	0.038	0.077	0.035	0.014	0.125
ZINC	grams	0.178	0.252	0.000	0.430	0.215	0.221	0.176	0.612	0.041	0.043	0.043	0.015	0.143	0.241	0.247	0.124	0.612
CHLORIDE	grams	44.20	23.71	0.00	67.90	0.02	0.03	0.02	0.07	10.37	10.57	11.09	4.00	36.03	23.75	24.85	13.48	62.08
POTASSIUM	grams	6.65	4.29	0.00	10.94	17.53	37.83	39.35	94.71	13.45	15.70	20.96	9.20	59.31	8.92	15.09	8.28	32.29
SODIUM	grams	5.23	9.71	0.00	14.94	6.78	12.13	12.70	31.61	2.63	2.48	3.41	1.78	10.30	5.67	8.53	6.31	20.50
SULFATE	grams	70.09	59.15	0.00	129.24	34.74	52.83	54.88	142.45	14.21	17.09	20.32	8.75	60.38	38.33	46.62	25.66	110.60
CALCIUM	grams	198.17	203.04	0.00	401.21	55.06	137.87	133.22	326.15	33.48	51.10	73.32	32.35	190.24	94.50	148.38	90.26	333.14
MAGNESIUM	grams	0.00	1.64	0.00	1.64	1.61	6.29	6.09	13.99	1.04	1.85	2.89	1.27	7.05	1.57	7.05	4.33	12.94
HARDNESS	grams	494.82	513.74	0.00	1008.56	144.14	370.14	357.73	872.01	87.88	135.19	194.97	86.02	504.07	242.41	288.22	243.22	773.85
TSS	grams	263.61	0.00	0.00	263.61	20.79	35.91	0.00	56.70	25.55	18.87	15.91	0.00	60.33	111.38	59.20	0.00	170.58

FLOW DATA IN FL17JL00.WB3

Appendix I-6. Discrete samples taken at intervals across the hydrograph for the July 15, 2000 storm at the Florida Aquarium parking lot. Numbers in italics were below the laboratory detection limit and one half the detection limit was used in calculations.

JULY 15, 2000		Cement with swale (F4)				Permeable paving w/ swale (F6)				Asphalt paving with swale (F8)			
CONSTITUENT	UNITS	btl 1 43.96%	btl 2 42.86%	btl 3 13.19%	weighted average	btl 1 34.48%	btl 2 34.48%	btl 3 31.03%	weighted average	btl 1 41.67%	btl 2 40.63%	btl 3 17.71%	weighted average
AMMONIA	mg/L	0.065	0.139	0.047	0.094	0.051	0.054	0.079	0.061	0.060	0.046	0.037	0.050
NITRITE	mg/L	0.022	0.012	0.010	0.016	0.011	0.010	0.012	0.011	0.009	0.009	0.016	0.010
NITRATE	mg/L	0.217	0.150	0.239	0.191	0.276	0.188	0.217	0.227	0.210	0.205	0.230	0.212
TOTAL-N	mg/L	1.000	1.000	0.770	0.970	0.710	0.630	0.890	0.738	0.790	0.510	1.000	0.714
ORTHO-P	mg/L	0.213	0.148	0.079	0.167	0.125	0.155	0.187	0.155	0.081	0.149	0.187	0.127
TOTAL-P	mg/L	0.253	0.179	0.093	0.200	0.148	0.163	0.211	0.173	0.090	0.162	0.221	0.142
CADMIUM	ug/L	*0.150*	*0.150*	*0.150*	0.150	*0.150*	*0.150*	*0.150*	0.150	*0.150*	*0.150*	*0.150*	0.150
COPPER	ug/L	5.600	2.700	2.800	3.988	3.700	2.400	3.500	3.189	10.400	8.300	7.800	9.087
IRON	ug/L	60.0	70.0	330.0	99.9	160.0	100.0	80.0	114.5	560.0	160.0	140.0	323.2
LEAD	ug/L	*0.750*	*0.750*	*0.750*	0.750	1.500	*0.750*	*0.750*	1.009	3.700	*0.750*	*0.750*	1.979
MANGANESE	ug/L	3.400	2.400	2.500	2.853	3.400	1.900	1.600	2.324	13.000	4.600	3.200	7.853
ZINC	ug/L	20.000	20.000	20.000	20.002	30.000	*7.500*	*7.500*	15.257	40.000	30.000	20.000	32.399
CHLORIDE	mg/L	2.420	2.210	2.200	2.301	2.050	1.910	1.900	1.955	2.030	2.060	2.270	2.085
POTASSIUM	mg/L	2.760	2.210	1.420	2.348	1.640	1.730	2.070	1.804	0.560	0.730	0.760	0.665
SODIUM	mg/L	1.480	1.200	1.100	1.310	0.830	0.820	0.830	0.826	0.760	0.910	1.060	0.874
SULFATE	mg/L	5.000	3.730	3.490	4.257	3.410	2.860	2.970	3.083	3.130	3.260	3.920	3.323
CALCIUM	mg/L	17.200	13.400	6.600	14.175	10.100	10.100	13.800	11.247	8.470	12.700	17.600	11.806
MAGNESIUM	mg/L	0.980	0.780	0.410	0.819	0.380	0.530	0.680	0.525	0.370	0.750	1.060	0.647
HARDNESS	mg/L	46.984	36.672	18.169	38.768	26.785	27.402	37.259	30.245	22.673	34.800	48.312	32.143
TSS	mg/L	2.740	5.463	na	4.08	19.811	3.299	3.866	9.168	20.898	4.691	na	12.90
MASS					TOTAL				TOTAL				TOTAL
VOLUME (cu ft)		193.4	188.6	58.0	440	62.8	62.8	56.5	182.0	245.9	239.7	104.5	590.0
AMMONIA	grams	0.352	0.734	0.076	1.162	0.090	0.095	0.125	0.310	0.413	0.309	0.108	0.830
NITRITE	grams	0.119	0.063	0.016	0.199	0.019	0.018	0.019	0.056	0.062	0.060	0.047	0.169
NITRATE	grams	1.175	0.792	0.388	2.355	0.485	0.331	0.343	1.159	1.446	1.376	0.673	3.495
TOTAL-N	grams	5.415	5.281	1.250	11.946	1.248	1.108	1.408	3.764	5.439	3.423	2.926	11.788
ORTHO-P	grams	1.153	0.782	0.128	2.063	0.220	0.273	0.296	0.788	0.558	1.000	0.547	2.105
TOTAL-P	grams	1.370	0.945	0.151	2.466	0.260	0.287	0.334	0.881	0.620	1.087	0.647	2.354
CADMIUM	grams	0.0008	0.0008	0.0002	0.0018	0.0003	0.0003	0.0002	0.0008	0.0010	0.0010	0.0004	0.0025
COPPER	grams	0.0303	0.0143	0.0045	0.0491	0.0065	0.0042	0.0055	0.0163	0.0716	0.0557	0.0228	0.1501
IRON	grams	0.3249	0.3697	0.5359	1.2305	0.281	0.176	0.127	0.584	3.856	1.074	0.410	5.339
LEAD	grams	0.0041	0.0040	0.0012	0.0092	0.0026	0.0013	0.0012	0.0051	0.0255	0.0050	0.0022	0.0327
MANGANESE	grams	0.018	0.013	0.004	0.035	0.0060	0.0033	0.0025	0.0119	0.090	0.031	0.009	0.130
ZINC	grams	0.108	0.106	0.032	0.246	0.053	0.013	0.012	0.078	0.275	0.201	0.059	0.535
CHLORIDE	grams	13.10	11.67	3.57	28.35	3.60	3.36	3.01	9.97	13.98	13.83	6.64	34.44
POTASSIUM	grams	14.95	11.67	2.31	28.92	2.88	3.04	3.27	9.20	3.86	4.90	2.22	10.98
SODIUM	grams	8.01	6.34	1.79	16.14	1.46	1.44	1.31	4.21	5.23	6.11	3.10	14.44
SULFATE	grams	27.08	19.70	5.67	52.44	6.00	5.03	4.70	15.72	21.55	21.88	11.47	54.90
CALCIUM	grams	93.14	70.76	10.72	174.62	17.76	17.76	21.83	57.35	58.32	85.24	51.50	195.05
MAGNESIUM	grams	5.31	4.12	0.67	10.09	0.67	0.93	1.08	2.68	2.55	5.03	3.10	10.68
HARDNESS	grams	254.43	193.66	29.51	477.59	47.10	48.18	58.94	154.23	156.11	233.57	141.36	531.04
TSS	grams	14.84	28.85	0.00	43.69	34.84	5.80	6.12	46.75	143.89	31.48	0.00	175.37

FLOW DATA IN FL17JL00.WB3

Appendix I-7. Discrete samples taken at intervals across the hydrograph for the July 31, 2000 storm at the Florida Aquarium parking lot. Rain amount was 1.99 inches in about one hour and antecedent dryconditions were 115 hours with no significant rainfall. Rain (1.24 inches) fell on July 26. Numbers in italics were below the laboratory detection limit and one half the detection limit was used in calculations.

JULY 31, 2000		Asphalt without swale (F2)				Cement with swale (F4)				Permeable paving w/ swale (F6)					Asphalt paving with swale (F8)			
CONSTITUENT	UNITS	btl 1	btl 2		weighted average	btl 1	btl 2	btl 3	weighted average	btl 1	btl 2	btl 3	btl 4	weighted average	btl 1	btl 2	btl 3	weighted average
		55.56%	44.44%			36.79%	37.74%	25.47%		25.32%	24.05%	25.32%	25.32%		32.77%	34.45%	32.77%	
AMMONIA	mg/L	0.105	0.105		0.105	0.047	0.082	0.046	0.060	0.002	0.074	0.058	0.054	0.047	0.122	0.107	0.099	0.109
NITRITE	mg/L	0.015	0.014		0.015	0.015	0.022	0.015	0.018	0.012	0.013	0.014	0.016	0.014	0.014	0.021	0.025	0.020
NITRATE	mg/L	0.210	0.223		0.216	0.206	0.328	0.172	0.242	0.168	0.196	0.204	0.196	0.191	0.229	0.285	0.174	0.230
TOTAL-N	mg/L	0.570	0.170		0.392	0.530	0.850	0.460	0.631	0.540	0.700	0.750	0.720	0.677	0.880	0.950	0.740	0.858
ORTHO-P	mg/L	0.031	0.021		0.027	0.094	0.284	0.080	0.161	0.073	0.173	0.209	0.199	0.163	0.145	0.252	0.105	0.169
TOTAL-P	mg/L	0.054	0.031		0.044	0.120	0.342	0.095	0.196	0.007	0.206	0.255	0.230	0.174	0.281	0.294	0.134	0.237
CADMIUM	ug/L	0.150	0.150		0.150	0.150	0.150	0.150	0.150	0.300	0.150	0.150	0.150	0.188	0.150	0.150	0.150	0.150
COPPER	ug/L	5.800	3.900		4.956	3.000	9.500	3.100	5.453	6.200	1.000	2.000	1.000	2.570	8.300	4.500	10.400	7.678
IRON	ug/L	270.0	100.0		194.5	80.0	100.0	70.0	84.7	320.0	120.0	60.0	50.0	137.7	450.0	60.0	320.0	273.0
LEAD	ug/L	1.700	0.750		1.278	0.750	0.750	0.750	0.748	2.500	0.750	0.750	0.750	1.193	2.700	0.750	2.600	1.995
MANGANESE	ug/L	7.30	4.30		5.97	2.80	2.30	2.40	2.50	6.50	1.60	1.80	2.60	3.14	9.60	1.90	10.60	7.27
ZINC	ug/L	30.00	40.00		34.44	30.00	40.00	30.00	33.67	7.50	7.50	7.50	7.50	7.50	7.50	20.00	7.50	11.81
CHLORIDE	mg/L	2.12	2.41		2.25	2.25	2.70	2.55	2.49	2.03	2.35	2.27	2.35	2.25	2.35	2.58	2.57	2.50
POTASSIUM	mg/L	0.33	0.26		0.30	1.27	2.44	1.41	1.74	1.00	1.65	1.74	1.70	1.52	0.87	1.39	0.59	0.96
SODIUM	mg/L	0.20	0.53		0.35	0.47	0.80	0.80	0.68	0.23	0.49	0.42	0.55	0.42	0.44	0.66	0.63	0.58
SULFATE	mg/L	4.22	4.18		4.20	3.86	5.39	4.58	4.61	3.28	3.98	3.90	4.26	3.85	4.24	4.97	4.46	4.56
CALCIUM	mg/L	9.47	9.34		9.41	6.39	13.00	8.94	9.50	6.68	9.27	12.00	12.60	10.15	9.14	11.70	10.90	10.60
MAGNESIUM	mg/L	0.02	0.02		0.02	0.20	0.50	0.33	0.34	0.06	0.25	0.36	0.44	0.28	0.22	0.48	0.35	0.35
HARDNESS	mg/L	23.73	23.40		23.58	16.78	34.52	23.68	25.14	17.00	24.18	31.45	33.27	26.50	23.73	31.19	28.66	27.91
TSS	mg/L	9.04	3.92		6.76	2.48	3.95	2.92	3.13	17.38	3.71	4.91	17.81	11.04	11.12	2.45	14.27	9.16
MASS					TOTAL				TOTAL					TOTAL				TOTAL
VOLUME (cu ft)		715.1	572.0	0.0	1287	413.5	424.2	286.3	1123.9	216.8	206.0	216.8	216.8	856.4	430.2	452.2	430.2	1312.7
AMMONIA	grams	2.102	1.682	0.000	3.784	0.544	0.974	0.369	1.887	0.012	0.427	0.352	0.328	1.119	1.470	1.355	1.193	4.017
NITRITE	grams	0.300	0.224	0.000	0.525	0.174	0.261	0.120	0.555	0.073	0.075	0.085	0.097	0.330	0.169	0.266	0.301	0.736
NITRATE	grams	4.205	3.572	0.000	7.776	2.385	3.896	1.379	7.660	1.020	1.131	1.238	1.190	4.579	2.758	3.609	2.096	8.463
TOTAL-N	grams	11.413	2.723	0.000	14.136	6.136	10.096	3.688	19.920	3.278	4.038	4.553	4.371	16.239	10.600	12.029	8.914	31.542
ORTHO-P	grams	0.621	0.336	0.000	0.957	1.088	3.373	0.641	5.103	0.443	0.998	1.269	1.208	3.918	1.747	3.191	1.265	6.202
TOTAL-P	grams	1.081	0.496	0.000	1.578	1.389	4.062	0.762	6.213	0.042	1.188	1.548	1.396	4.175	3.385	3.723	1.614	8.721
CADMIUM	grams	0.0030	0.0024	0.0000	0.0054	0.0017	0.0018	0.0012	0.0047	0.0018	0.0009	0.0009	0.0009	0.0045	0.0018	0.0019	0.0018	0.0055
COPPER	grams	0.1161	0.0625	0.0000	0.1786	0.0347	0.1128	0.0249	0.1724	0.0376	0.0058	0.0121	0.0061	0.0616	0.1000	0.0570	0.1253	0.2822
IRON	grams	5.406	1.602	0.000	7.008	0.926	1.188	0.561	2.675	1.943	0.692	0.364	0.304	3.302	5.421	0.760	3.855	10.035
LEAD	grams	0.0340	0.0120	0.0000	0.0461	0.0087	0.0089	0.0060	0.0236	0.0152	0.0043	0.0046	0.0046	0.0286	0.0325	0.0095	0.0313	0.0733
MANGANESE	grams	0.146	0.069	0.000	0.215	0.032	0.027	0.019	0.079	0.039	0.009	0.011	0.016	0.075	0.1156	0.0241	0.1277	0.2674
ZINC	grams	0.601	0.641	0.000	1.241	0.347	0.475	0.240	1.063	0.046	0.043	0.046	0.046	0.180	0.090	0.253	0.090	0.434
CHLORIDE	grams	42.45	38.60	0.00	81.05	26.05	32.07	20.44	78.56	12.32	13.55	13.78	14.27	53.92	28.31	32.67	30.96	91.93
POTASSIUM	grams	6.61	4.16	0.00	10.77	14.70	28.98	11.30	54.99	6.07	9.52	10.56	10.32	36.47	10.48	17.60	7.11	35.19
SODIUM	grams	4.00	8.49	0.00	12.49	5.44	9.50	6.41	21.36	1.40	2.83	2.55	3.34	10.11	5.30	8.36	7.59	21.25
SULFATE	grams	84.50	66.95	0.00	151.44	44.69	64.02	36.72	145.43	19.91	22.96	23.67	25.86	92.40	51.07	62.93	53.72	167.72
CALCIUM	grams	189.62	149.59	0.00	339.21	73.98	154.41	71.67	300.06	40.55	53.47	72.84	76.49	243.35	110.10	148.14	131.30	389.53
MAGNESIUM	grams	0.40	0.32	0.00	0.72	2.32	5.94	2.65	10.90	0.36	1.44	2.19	2.67	6.66	2.65	6.08	4.22	12.94
HARDNESS	grams	475.10	374.84	0.00	849.94	194.27	410.01	189.83	794.11	103.20	139.45	190.89	201.96	635.50	285.82	394.93	345.20	1025.95
TSS	grams	181.01	62.70	0.00	243.71	28.67	46.92	23.38	98.96	105.48	21.40	29.81	108.10	264.79	133.95	31.07	171.83	336.85

FLOW DATA IN FL01AGG00.WB3

Appendix I-8. Discrete samples taken at intervals across the hydrograph for the storm at the Florida Aquarium parking lot. Rain amount was 2.91 inches in about 3.75 hours and antecedent dry conditions were 169 hours with no significant rainfall. Rain (0.0.45 inches) fell on August 21st. Numbers in italics were below the laboratory detection limit and one half the detection limit was used in calculations.

AUGUST 22, 1999		Asphalt without swale (F2)				Cement with swale (F4)					Permeable paving w/ swale (F6)					Asphalt paving with swale (F8)				
RAIN=																				
CONSTITUENT	UNITS	rising & top 30%	falling 33%	tail 36%	weighted average	rising & top 24%	falling 25%	tail 1 25%	tail 2 25%	weighted average	rising & top 25%	falling 25%	tail 1 25%	tail 2 25%	weighted average	rising & top 25%	falling 26%	tail 1 26%	tail 2 23%	weighted average
AMMONIA	mg/L	0.017	0.037	0.125	0.062	*0.010*	*0.017*	0.024	*0.020*	0.018	0.013	0.018	0.040	0.089	0.040	0.035	*0.016*	0.026	0.013	0.023
NITRATE	mg/L	*0.005*	*0.005*	*0.005*	0.005	*0.005*	*0.005*	*0.005*	*0.005*	0.005	*0.005*	0.079	0.018	*0.005*	0.027	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
NITRITE	mg/L	*0.0025*	*0.0025*	*0.0025*	*0.0025*	*0.0025*	0.0025	0.0250	0.0025	0.008	*0.0025*	*0.0025*	*0.0025*	*0.0025*	*0.002*	*0.025*	0.003	*0.025*	0.003	0.014
TOTAL-N	mg/L	0.110	0.140	0.300	0.187	0.090	0.100	0.120	0.120	0.107	0.040	0.100	0.100	0.089	0.082	0.270	0.260	0.330	0.320	0.295
ORTHO-P	mg/L	0.016	0.014	0.021	0.017	0.038	0.079	0.151	0.132	0.100	0.044	0.054	0.068	0.057	0.055	0.046	0.059	*0.091*	0.084	0.070
TOTAL-P	mg/L	0.026	0.023	0.030	0.026	0.050	0.094	0.177	0.115	0.109	0.055	0.070	0.101	0.107	0.083	0.077	0.070	*0.114*	0.103	0.091
CADMIUM	ug/L	*0.15*	*0.15*	0.20	0.17	*0.15*	*0.15*	*0.15*	*0.15*	0.15	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*	*0.15*
COPPER	ug/L	7.40	2.90	5.03	4.99	*1.00*	2.00	3.70	5.30	2.99	*1.00*	*1.00*	3.40	5.60	2.74	12.80	3.70	2.70	2.00	5.32
IRON	ug/L	330	60	49	136	*13*	*13*	40	70	34	60	60	*13*	30	40	670	100	80	40	224
LEAD	ug/L	2.70	*0.75*	*0.75*	1.33	*0.75*	*0.75*	*0.75*	*0.75*	0.74	*0.75*	*0.75*	*0.75*	*0.75*	*0.74*	4.80	*0.75*	*0.75*	*0.75*	1.76
MANGANESE	ug/L	8.40	10.30	3.27	7.10	2.40	1.60	0.50	1.10	1.38	0.50	0.50	0.50	0.50	0.50	14.20	3.60	2.60	1.40	5.48
ZINC	ug/L	20.00	*7.50*	*7.50*	11.18	*7.50*	*7.50*	*7.50*	20.00	10.55	*7.50*	*7.50*	*7.50*	20.00	10.55	40.00	*7.50*	20.00	*7.50*	18.88
CHLORIDE	mg/L	0.74	0.43	1.12	0.77	0.47	0.44	1.03	2.40	1.08	*0.20*	*0.20*	0.56	0.92	0.47	0.60	0.40	0.87	1.11	0.74
POTASSIUM	mg/L	*0.02*	*0.02*	*0.02*	*0.02*	0.21	0.36	1.13	1.40	0.77	0.28	0.30	0.89	2.59	1.01	0.26	0.30	0.39	0.37	0.33
SODIUM	mg/L	0.24	0.25	0.30	0.26	0.33	0.38	0.79	0.94	0.61	0.31	0.24	0.38	0.67	0.40	0.26	0.23	0.37	0.54	0.35
SULFATE	mg/L	3.70	2.48	4.79	3.65	3.35	2.36	4.42	NA	3.34	3.72	1.95	3.21	4.92	3.41	3.61	1.57	3.49	5.03	3.38
CALCIUM	mg/L	9.58	13.00	18.07	13.67	5.94	9.94	18.20	19.30	13.29	6.68	10.00	17.60	36.20	17.55	9.74	10.40	18.00	24.80	15.52
MAGNESIUM	mg/L	0.15	0.27	0.39	0.27	0.28	0.48	0.71	0.76	0.55	0.30	0.37	0.53	0.88	0.52	0.34	0.57	0.86	1.19	0.73
HARDNESS	mg/L	24.53	33.57	46.72	35.25	15.98	26.79	48.36	51.32	35.45	18.36	26.49	46.12	94.01	46.06	25.72	28.31	18.48	66.82	33.96
TSS	mg/L	6.79	2.48	1.50	3.40	3.31	3.63	2.32	2.65	2.94	3.36	1.22	1.82	2.97	2.31	50.37	3.17	3.37	3.91	15.19
MASS					TOTAL					TOTAL					TOTAL					TOTAL
VOLUME (cu ft)		654.9	720.4	785.9	2183	473.4	501.5	501.5	501.5	2005.8	503.8	503.8	503.8	503.8	2015.3	513.4	534.0	534.0	472.4	2053.7
AMMONIA	grams	0.312	0.746	2.753	3.811	0.133	0.239	0.337	0.281	0.989	0.184	0.254	0.564	1.255	2.258	0.503	0.239	0.389	0.172	1.303
NITRITE	grams	0.092	0.101	0.110	0.303	0.066	0.070	0.070	0.070	0.277	0.071	1.114	0.254	0.071	1.510	0.072	0.075	0.075	0.066	0.288
NITRATE	grams	0.046	0.050	0.055	0.151	0.033	0.035	0.351	0.035	0.454	0.035	0.035	0.035	0.035	0.141	0.359	0.037	0.374	0.033	0.804
TOTAL-N	grams	2.017	2.824	6.602	11.443	1.193	1.404	1.685	1.685	5.967	0.566	1.411	1.411	1.255	4.643	3.881	3.888	4.934	4.233	16.936
ORTHO-P	grams	0.293	0.282	0.454	1.030	0.504	1.109	2.120	1.854	5.587	0.623	0.762	0.959	0.804	3.148	0.661	0.882	1.361	1.111	4.015
TOTAL-P	grams	0.477	0.464	0.662	1.603	0.663	1.320	2.485	1.615	6.083	0.779	0.987	1.425	1.509	4.701	1.107	1.047	1.705	1.362	5.220
CADMIUM	grams	0.0028	0.0030	0.0044	0.0102	0.0020	0.0021	0.0021	0.0021	0.0083	0.0021	0.0021	0.0021	0.0021	0.0085	0.0022	0.0022	0.0022	0.0020	0.0086
COPPER	grams	0.1357	0.0585	0.1106	0.3048	0.0133	0.0281	0.0520	0.0744	0.1677	0.0142	0.0141	0.0480	0.0790	0.1552	0.1840	0.0553	0.0404	0.0265	0.3061
IRON	grams	6.051	1.210	1.080	8.342	0.166	0.176	0.562	0.983	1.886	0.850	0.846	0.176	0.423	2.296	9.63	1.50	1.20	0.53	12.85
LEAD	grams	0.050	0.015	0.017	0.081	0.010	0.011	0.011	0.011	0.042	0.011	0.011	0.011	0.011	0.042	0.07	0.01	0.01	0.01	0.10
MANGANESE	grams	0.154	0.208	0.072	0.434	0.032	0.022	0.007	0.015	0.077	0.007	0.007	0.007	0.007	0.028	0.20	0.05	0.04	0.02	0.32
ZINC	grams	0.367	0.151	0.165	0.683	0.099	0.105	0.105	0.281	0.591	0.106	0.106	0.106	0.282	0.600	0.58	0.11	0.30	0.10	1.09
CHLORIDE	grams	13.57	8.67	24.61	46.85	6.23	6.18	14.46	33.70	60.57	2.83	2.82	7.90	12.98	26.53	0.01	0.01	0.01	0.01	0.04
POTASSIUM	grams	0.37	0.40	0.44	1.21	2.78	5.06	15.87	19.66	43.36	3.97	4.23	12.55	36.54	57.29	3.74	4.49	5.83	4.89	18.95
SODIUM	grams	4.40	5.04	6.68	16.12	4.37	5.34	11.09	13.20	34.00	4.39	3.39	5.36	9.45	22.59	3.74	3.44	5.53	7.14	19.85
SULFATE	grams	67.85	50.02	105.43	223.30	44.40	33.14	62.07	0.00	139.61	52.68	27.51	45.28	69.40	194.88	51.89	23.47	52.18	66.53	194.08
CALCIUM	grams	175.67	262.23	397.66	835.55	78.74	139.58	511.13	271.01	1000.45	94.60	141.06	248.27	510.65	994.59	140.01	155.50	269.14	328.03	892.69
MAGNESIUM	grams	2.75	5.45	8.52	16.72	3.71	6.74	9.97	10.67	31.09	4.25	5.22	7.48	12.41	29.36	4.89	8.52	12.86	15.74	42.01
HARDNESS	grams	449.81	677.15	1028.00	2154.96	211.82	376.19	679.07	720.64	1987.71	260.02	373.68	650.59	1326.14	2610.43	369.73	423.29	276.31	883.84	1953.18
TSS	grams	124.51	50.02	33.03	207.56	43.87	50.97	32.58	37.21	164.64	47.59	17.21	25.67	41.90	132.37	724.08	47.40	50.39	51.72	873.58

Appendix I-9. Discrete samples taken at intervals across the hydrograph for the September 17, 2000 storm at the Florida Aquarium parking lot. Rain amount was 2.04 inches in about eighteen hours and antecedent dry conditions were 219 hours with no significant rainfall. Rain (1.96 inches) fell on September 7th.

SEPT. 17, 2000		Asphalt without swale (F2)				Cement with swale (F4)				Permeable paving w/ swale (F6)				Asphalt paving with swale (F8)			
CONSTITUENT	UNITS	btl 1 39.52%	btl 2 41.13%	btl 3 19.35%	weighted average	btl 1 49.37%	btl 2 50.63%		weighted average	btl 1 41.30%	btl 2 43.48%	btl 3 15.22%	weighted average	btl 1 63.49%	btl 2 30.16%		weighted average
AMMONIA	mg/L	0.112	0.059	0.055	0.079	0.101	0.063		0.082	0.032	0.135	0.084	0.085	0.073	0.067		0.067
NITRITE	mg/L	*0.0025*	*0.0025*	*0.0025*	0.003	0.005	0.006		0.006	*0.0025*	*0.0025*	0.009	0.003	0.006	0.005		0.005
NITRATE	mg/L	0.055	0.021	0.189	0.067	0.155	0.104		0.129	0.103	0.113	0.113	0.109	0.148	0.084		0.119
TOTAL-N	mg/L	0.300	0.320	0.230	0.295	0.430	0.480		0.455	0.37	0.51	0.57	0.461	0.710	0.440		0.583
ORTHO-P	mg/L	0.022	0.017	0.021	0.020	0.081	0.122		0.102	0.078	0.117	0.13	0.103	0.100	0.104		0.095
TOTAL-P	mg/L	0.045	0.024	0.029	0.033	0.120	0.148		0.134	0.10	0.15	0.16	0.133	0.158	0.134		0.141
CADMIUM	ug/L	*0.150*	*0.150*	*0.150*	0.150	*0.150*	*0.150*		0.150	*0.15*	0.30	*0.15*	0.215	*0.150*	*0.150*		0.140
COPPER	ug/L	3.700	*1.000*	2.100	2.280	3.20	5.20		4.213	2.0	6.2	10.0	5.044	68.90	10.30		46.851
IRON	ug/L	180.0	110.0	100.000	135.729	120.0	130.0		125.063	180	80	200	139.564	990.00	460.00		767.287
LEAD	ug/L	*0.750*	*0.750*	*0.750*	0.750	*0.750*	*0.750*		0.750	*0.75*	*0.75*	2.1	0.955	6.20	3.30		4.932
MANGANESE	ug/L	*0.50*	*0.50*	*0.500*	0.500	1.90	1.40		1.647	2.6	1.4	4.6	2.383	23.80	11.40		18.549
ZINC	ug/L	20.00	*7.50*	20.000	14.859	20.00	20.00		20.000	20.0	20.0	40.0	23.044	80.00	40.00		62.856
CHLORIDE	mg/L	1.990	2.280	2.870	2.280	2.440	2.760		2.602	2.20	2.44	2.76	2.390	2.390	2.670		2.323
POTASSIUM	mg/L	0.290	0.270	0.290	0.282	1.410	1.740		1.577	1.27	1.78	2.14	1.624	0.590	0.600		0.556
SODIUM	mg/L	0.330	0.580	1.040	0.570	0.850	1.040		0.946	0.56	0.74	0.86	0.684	0.650	0.900		0.684
SULFATE	mg/L	1.630	1.270	1.950	1.544	2.600	2.820		2.711	1.78	2.48	3.37	2.326	2.410	2.110		2.166
CALCIUM	mg/L	11.400	7.620	11.200	9.807	11.200	15.500		13.377	9.55	14.60	20.90	13.473	12.000	12.500		11.389
MAGNESIUM	mg/L	0.000	0.000	0.000	0.000	0.310	0.490		0.401	0.13	0.33	0.49	0.272	0.210	0.290		0.221
HARDNESS	mg/L	28.466	19.027	27.966	24.487	29.243	40.721		35.054	24.382	37.82	54.21	34.762	30.829	32.407		29.347
TSS	mg/L	9.021	1.856	4.875	5.272	4.716	1.702		3.190	16.28	8.69	na	12.39	107.162	29.833		77.035
MASS					TOTAL				TOTAL				TOTAL				TOTAL
VOLUME (cu ft)		517.3	538.4	253.3	1309	413.7	424.3	0.0	838.0	201.1	211.7	74.1	487.0	445.7	211.7	0.0	702.0
AMMONIA	grams	1.622	0.889	0.390	2.902	1.170	0.748	0.000	1.918	0.180	0.800	0.174	1.155	0.911	0.397	0.000	1.308
NITRITE	grams	0.036	0.038	0.018	0.092	0.058	0.071	0.000	0.129	0.014	0.015	0.019	0.048	0.075	0.030	0.000	0.105
NITRATE	grams	0.797	0.317	1.340	2.454	1.795	1.236	0.000	3.031	0.580	0.670	0.234	1.484	1.847	0.498	0.000	2.345
TOTAL-N	grams	4.345	4.824	1.631	10.801	4.981	5.703	0.000	10.684	2.083	3.023	1.183	6.289	8.861	2.608	0.000	11.469
ORTHO-P	grams	0.319	0.256	0.149	0.724	0.938	1.449	0.000	2.388	0.439	0.694	0.266	1.398	1.248	0.616	0.000	1.864
TOTAL-P	grams	0.652	0.362	0.206	1.219	1.390	1.758	0.000	3.148	0.569	0.913	0.332	1.814	1.972	0.794	0.000	2.766
CADMIUM	grams	0.0022	0.0023	0.0011	0.0055	0.0017	0.0018	0.0000	0.0035	0.0008	0.0018	0.0003	0.0029	0.0019	0.0009	0.0000	0.0028
COPPER	grams	0.0536	0.0151	0.0149	0.0836	0.0371	0.0618	0.0000	0.0988	0.0113	0.0368	0.0207	0.0688	0.8598	0.0611	0.0000	0.9209
IRON	grams	2.607	1.658	0.709	4.975	1.390	1.544	0.000	2.934	1.014	0.474	0.415	1.903	12.355	2.727	0.000	15.082
LEAD	grams	0.0109	0.0113	0.0053	0.0275	0.0087	0.0089	0.0000	0.0176	0.0042	0.0044	0.0044	0.0130	0.0774	0.0196	0.0000	0.0969
MANGANESE	grams	0.007	0.008	0.004	0.018	0.0220	0.0166	0.0000	0.0386	0.015	0.008	0.010	0.032	0.297	0.068	0.000	0.365
ZINC	grams	0.290	0.113	0.142	0.545	0.232	0.238	0.000	0.469	0.113	0.119	0.083	0.314	0.998	0.237	0.000	1.235
CHLORIDE	grams	28.82	34.37	20.36	83.55	28.26	32.79	0.00	61.05	12.39	14.46	5.73	32.58	29.83	15.83	0.00	45.65
POTASSIUM	grams	4.20	4.07	2.06	10.33	16.33	20.67	0.00	37.00	7.15	10.55	4.44	22.14	7.36	3.56	0.00	10.92
SODIUM	grams	4.78	8.74	7.38	20.90	9.85	12.36	0.00	22.20	3.15	4.39	1.78	9.32	8.11	5.33	0.00	13.45
SULFATE	grams	23.61	19.15	13.83	56.59	30.12	33.50	0.00	63.62	10.02	14.70	6.99	31.72	30.08	12.51	0.00	42.58
CALCIUM	grams	165.12	114.87	79.43	359.43	129.74	184.15	0.00	313.88	53.77	86.54	43.36	183.68	149.76	74.10	0.00	223.85
MAGNESIUM	grams	0.00	0.00	0.00	0.00	3.59	5.82	0.00	9.41	0.73	1.96	1.02	3.70	2.62	1.72	0.00	4.34
HARDNESS	grams	412.31	286.84	198.35	897.49	338.74	483.79	0.00	822.52	137.29	224.15	112.46	473.91	384.73	192.09	0.00	576.82
TSS	grams	130.66	27.97	34.58	193.21	54.63	20.22	0.00	74.85	91.67	51.53	0.00	143.20	1337.34	176.84	0.00	1514.18

FLOW DATA IN FL27SP00.WB3

APPENDIX J

CONSTITUENT LOADS

SUMMARY OF SUMMARIES
AND
INDIVIDUAL EVENTS WITH SUMMARIES

Appendix J summaries. Yearly loads for the even numbered basin are calculated for each pavement type to compare years. (See the footnote for rain data and appendicies J and B for all of the data). The even numbered basins are all alike except for paving type .

Constituents	units	Asphalt no swale F2		Asphalt with swale F8		Concrete with swale F4		Porous with swale F6	
		YEAR 1	YEAR 2	YEAR 1	YEAR 2	YEAR 1	YEAR 2	YEAR 1	YEAR 2
Ammonia	kg/ha-yr	0.43	0.38	0.23	0.22	0.12	0.19	0.08	0.06
Nitrate	kg/ha-yr	0.61	0.74	0.34	0.58	0.36	0.58	0.21	0.29
Total Nitrogen	kg/ha-yr	1.58	1.77	0.73	1.56	1.33	1.64	0.92	0.80
Ortho Phosphorus	kg/ha-yr	0.19	0.11	0.54	0.36	0.54	0.48	0.34	0.28
Total Phosphorus	kg/ha-yr	0.34	0.20	0.66	0.51	0.55	0.63	0.33	0.35
Suspended Solids	kg/ha-yr	58.61	29.12	32.79	7.31	12.76	15.43	5.11	20.83
Copper	kg/ha-yr	0.033	0.031	0.025	0.027	0.009	0.013	0.006	0.006
Iron	kg/ha-yr	1.396	0.994	0.667	1.150	0.228	0.165	0.107	0.132
Lead	kg/ha-yr	0.017	0.009	0.007	0.007	0.004	0.002	0.003	0.002
Manganese	kg/ha-yr	0.041	0.029	0.024	0.025	0.013	0.007	0.003	0.003
Zinc	kg/ha-yr	0.147	0.098	0.079	0.083	0.056	0.049	0.036	0.057

For YEAR ONE the total rainfall measured greater than 0.40 cm (0.16 in) was 105.83 cm (40.88 in) and water quality samples were collected for 85.82 cm (33.79 in) of these storms. For YEAR TWO the total rainfall was 86.30 cm (31.61 in). (Most of the missed storms were less than 0.94 cm (0.37 in) and produced little runoff. Average annual rainfall for the region is 129.54 cm (51 in). For missing data, which occurred in the basins with swales, a median value for the measured rain events was used. Since these were small ev ents with little runoff, the substitutions give a reasonable estimate and is more accurate than leaving these storms out of the calculations completely.

Appendix J summaries. Yearly loads for the odd numbered basin are calculated for each pavement type to compare years. Asphalt with no swale is the same size as the even numbered basins and also has the same size garden area as the even numbered basin. The rest of the odd numbered basins have larger garden areas. For cement and porous the additional size is about the size of one parking space and for asphalt, it is about the size of two parking spaces

Constituents	units	Asphalt no swale F1		Asphalt with swale F7		Concrete with swale F3		Porous with swale F5	
		YEAR 1	YEAR 2	YEAR 1	YEAR 2	YEAR 1	YEAR 2	YEAR 1	YEAR 2
Ammonia	kg/ha-yr	0.57	0.47	0.11	0.10	0.08	0.08	0.11	0.09
Nitrate	kg/ha-yr	0.72	0.81	0.19	0.27	0.26	0.37	0.15	0.16
Total Nitrogen	kg/ha-yr	1.86	2.04	1.07	0.69	1.15	0.93	0.53	0.39
Ortho Phosphorus	kg/ha-yr	0.15	0.14	0.15	0.15	0.31	0.35	0.06	0.06
Total Phosphorus	kg/ha-yr	0.28	0.25	0.21	0.21	0.37	0.42	0.07	0.08
Suspended Solids	kg/ha-yr	52.28	37.06	8.68	16.33	4.47	3.41	4.26	3.99
Copper	kg/ha-yr	0.042	0.039	0.008	0.010	0.008	0.008	0.003	0.003
Iron	kg/ha-yr	1.805	1.361	0.227	0.287	0.156	0.086	0.114	0.076
Lead	kg/ha-yr	0.018	0.010	0.002	0.003	0.003	0.002	0.001	0.001
Manganese	kg/ha-yr	0.042	0.031	0.007	0.008	0.004	0.003	0.003	0.002
Zinc	kg/ha-yr	0.174	0.115	0.037	0.032	0.042	0.032	0.020	0.016

See footnote for Figure 6a for rainfall information

APPENDIX Ja-1 . Constituent loads measured for each storm event and summary data for the year

AMMONIA - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/05/98	0.57	2.05	1.59	0.61	2.61	0.21	0.12	0.25	0.24
08/06/98	0.68	0.18	0.16	0.68	0.09	0.07	0.12	0.44	0.06
08/07/98	1.30	16.08	14.62	2.51	8.43	0.17	2.22	1.89	0.37
08/09/98	2.47	56.40	23.40	14.96	0.00	15.05	10.98	26.47	10.29
08/20/98	0.68	3.64	2.44	0.68	0.21	0.85	0.60	0.89	0.13
09/03/97	1.97	5.82	1.33	1.53	2.99	0.44	0.79	1.51	1.30
09/17/98	0.49	1.20	0.13	0.26	1.19	0.06	0.36	0.03	0.09
09/18/98	0.66	0.36	0.13	0.07	0.80	0.05	0.07	0.00	0.07
09/19/98	0.75	0.54	0.82	0.13	5.53	0.24	0.45	0.51	0.22
09/20/98	1.85	3.61	2.55	0.22	1.39	0.12	0.20	0.70	0.31
09/26/98	1.64	0.46	0.46	0.13	0.28	0.21	0.38	0.79	0.22
11/05/98	1.20	1.41	0.90	0.00	0.44	0.00	0.16	0.00	0.00
12/13/98	0.37	0.07	1.47	0.01	0.43	0.00	0.01	0.00	0.00
01/03/99	1.23	2.39	2.33	1.73	2.61	0.26	2.38	0.75	0.15
01/23/99	2.60	2.69	2.96	1.53	3.54	1.08	3.73	2.17	1.29
03/14/99	0.82	6.18	5.67	0.39	6.43	0.07	3.36	0.04	0.06
04/17/99	0.54	4.19	4.96	0.07	0.37	0.00	0.00	0.00	0.00
05/21/99	1.36	39.19	36.91	7.58	22.30	4.07	8.27	0.19	3.24
05/30/99	0.39	12.91	11.87	0.16	3.70	0.03	0.11	0.00	0.01
06/09/99	0.81	0.24	0.70	0.57	0.49	0.21	0.09	0.06	0.08
06/13/99	1.32	10.23	15.81	3.69	6.46	1.05	3.28	3.22	1.13
06/16/99	1.68	9.59	7.15	2.66	5.15	2.49	2.93	1.66	1.30
06/17/99	0.77	1.99	2.04	0.76	3.67	0.41	1.77	0.44	0.35
06/18/99	1.60	10.58	11.12	2.12	2.81	1.63	2.85	2.51	3.13
07/01/99	1.53	13.07	6.99	1.42	4.01	1.38	0.20	0.26	0.91
07/07/99	0.81	7.30	6.30	0.40	3.34	0.19	0.30	0.04	0.16
07/09/99	1.17	5.22	2.21	1.15	1.61	0.93	1.33	0.78	0.51
07/14/99	1.58	7.17	4.57	0.14	1.47	0.10	0.11	0.04	0.05
07/20/99	0.88	7.76	2.86	0.38	2.10	0.16	0.27	0.04	0.47
TOTALS	**33.72**	**232.50**	**174.44**	**46.53**	**94.46**	**31.53**	**47.43**	**45.69**	**26.14**

AMMONIA - SUMMARY STATISTICS -YEAR ONE

	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (g/ac)	232.50	**174.44**	46.53	**94.46**	31.53	**47.43**	45.69	**26.14**
Average (two basins)(g/ac)		**203.47**		**70.50**		**39.48**		**35.92**
g/ac-yr	232.50	**174.44**	46.53	**94.46**	31.53	**47.43**	45.69	**26.14**
kg/ac-yr	0.23	**0.17**	0.05	**0.09**	0.03	**0.05**	0.05	**0.03**
kg/ha-yr	0.57	**0.43**	0.11	**0.23**	0.08	**0.12**	0.11	**0.06**
23% more (g/ac-yr)	301.95	**226.55**	60.43	**122.68**	40.95	**61.59**	59.34	**33.95**
kg/ac-yr	0.30	**0.23**	0.06	**0.12**	0.04	**0.06**	0.06	**0.03**
kg/ha-yr	0.75	**0.56**	0.15	**0.30**	0.10	**0.15**	0.15	**0.08**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				46%		73%		85%
Odd numbered basins w/ larger garde			80%		86%		80%	

Appendix Jb-1. Constituent loads measured for each storm event and summary data for the year

AMMONIUM - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	ASPHALT WO/SWALE F2	ASPHALT W/SWALE F7	ASPHALT W/SWALE F8	CONCRETE W/SWALE F3	CONCRETE W/SWALE F4	POROUS W/SWALE F5	POROUS W/SWALE F6
Basin (ac		0.260	0.260	0.23	0.26	0.23	0.26	0.24	0.26
	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/06/99	1.29	5.89	0.29	0.10	0.21	0.35	0.17	0.03	0.10
08/12/99	0.70	6.06	2.57	0.78	1.75	0.05	0.63	0.10	0.14
08/15/99	1.23	12.29	6.80	4.04	4.90	0.95	3.24	1.65	1.05
08/19/99	0.90	3.16	1.79	1.23	0.93	0.61	2.12	0.15	0.60
08/22/99	2.95	18.55	12.71	0.55	5.14	0.99	3.86	2.50	8.75
09/11/99	0.84	12.13	7.33	0.57	5.12	0.07	0.96	0.39	0.71
09/18/99	0.85	2.16	0.10	0.01	0.04	0.00	0.07	0.00	0.00
09/25/99	1.37	2.98	2.33	2.30	3.77	0.21	1.43	0.30	1.32
10/03/99	1.22	6.56	7.86	1.77	2.93	0.38	1.35	0.22	0.75
10/04/99	0.98	0.60	0.28	0.13	1.34	0.06	0.88	0.00	0.00
11/01/99	1.63	1.41	6.52	2.92	4.31	0.85	9.21	0.27	1.01
12/17/99	0.75	0.67	0.83	0.00	0.14	0.00	0.03	0.00	0.00
01/06/00	0.79	3.53	8.36	0.71	4.07	0.11	2.94	0.06	0.19
01/24/00	0.68	1.88	1.65	0.00	0.56	0.00	1.34	0.00	0.00
01/31/00	0.70	2.35	1.57	0.13	1.49	0.00	2.16	0.00	0.00
06/13/00	1.29	20.49	22.31	2.89	8.53	3.90	9.74	0.34	6.01
06/22/00	0.39	2.54	2.57	0.02	0.45	0.00	0.04	0.02	0.00
06/***/00	1.39	3.27	4.50	0.11	1.16	0.01	1.41	0.20	0.01
06/29/00	0.71	3.56	2.47	0.47	1.25	0.13	2.50	0.16	0.11
07/01/00	0.81	8.60	4.59	1.03	1.78	0.06	1.33	0.11	0.13
07/04/00	1.95	26.28	12.91	8.41	13.26	9.98	12.26	6.87	7.04
07/08/00	1.07	16.80	13.37	1.67	7.63	1.32	3.39	0.94	1.23
07/15/00	1.98	13.21	11.18	3.30	5.40	2.69	8.91	2.16	3.89
07/26/00	1.24	6.32	2.68	0.87	2.02	0.08	0.75	0.07	0.27
07/31/00	2.69	9.40	14.71	8.39	15.30	9.04	7.35	2.55	4.38
TOTALS	**30.40**	**190.70**	**152.27**	**42.40**	**93.49**	**31.84**	**78.08**	**19.07**	**37.69**

AMMONIUM - SUMMARY STATISTICS - YEAR TWO								
Total loads (g/ac)	**190.70**	**152.27**	**42.40**	**93.49**	**31.84**	**78.08**	**19.07**	**37.69**
Average (two basins)(g/ac)		**171.48**		**67.95**		**54.96**		**28.38**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
g/ac-yr	**190.70**	**152.27**	**42.40**	**93.49**	**31.84**	**78.08**	**19.07**	**37.69**
kg/ac-yr	0.191	**0.152**	0.042	**0.093**	0.032	**0.078**	0.019	**0.038**
kg/ha-yr	0.47	**0.38**	0.10	**0.23**	0.08	**0.19**	0.05	**0.09**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (g/ac-yr)	288.93	**230.71**	64.24	**141.66**	48.24	**118.30**	28.89	**57.11**
kg/ac-yr	0.29	**0.23**	0.06	**0.14**	0.05	**0.12**	0.03	**0.06**
kg/ha-yr	0.71	**0.57**	0.16	**0.35**	0.12	**0.29**	0.07	**0.14**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**39%**		**49%**		**75%**
Odd numbered basins w/ larger gardens			**78%**		**83%**		**90%**	

APPENDIX Ja-2 . Constituent loads measured for each storm event and summary data for the year

NITRATE - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/05/98	0.57	11.17	11.98	0.96	3.60	0.79	8.09	0.37	0.82
08/06/98	0.68	12.37	10.74	1.00	5.88	3.78	9.23	0.65	3.65
08/07/98	1.30	14.92	14.22	3.64	8.26	7.43	13.88	4.28	7.50
08/09/98	2.47	50.01	27.64	21.40	17.95	31.03	31.55	26.98	29.91
08/20/98	0.68	8.34	7.53	2.86	5.29	4.14	7.40	0.96	2.99
09/03/97	1.97	13.10	15.50	1.95	2.77	12.63	5.00	5.34	3.30
09/17/98	0.49	2.79	5.73	0.41	1.64	0.21	0.50	0.04	0.31
09/18/98	0.66	1.07	1.08	0.11	1.10	0.19	0.07	0.00	0.22
09/19/98	0.75	1.73	1.74	0.29	7.62	0.24	0.98	0.75	0.22
09/20/98	1.85	3.61	3.40	0.59	1.87	0.82	1.76	0.39	1.27
09/26/98	1.64	7.90	2.84	0.13	0.28	0.41	0.38	1.16	0.22
11/05/98	1.20	3.97	2.92	0.00	0.60	0.00	0.22	0.00	0.00
12/13/98	0.37	2.41	1.50	0.13	0.59	0.01	0.01	0.00	0.00
01/03/99	1.23	5.35	3.60	7.88	8.75	6.91	9.60	2.34	4.02
01/23/99	2.60	7.40	6.49	7.63	7.32	8.08	10.87	6.63	7.73
03/14/99	0.82	6.65	4.28	0.61	4.22	0.25	3.73	0.07	0.20
04/17/99	0.54	4.19	4.96	0.11	0.50	0.00	0.00	0.00	0.00
05/21/99	1.36	39.19	36.91	7.58	22.30	4.07	8.27	0.28	3.24
05/30/99	0.39	12.91	11.87	0.25	3.70	0.10	0.15	0.00	0.03
06/09/99	0.81	0.24	0.70	0.89	0.49	0.79	0.09	0.09	0.08
06/13/99	1.32	10.23	15.81	3.69	6.46	1.05	3.28	3.22	1.13
06/16/99	1.68	13.56	10.56	3.87	5.07	9.31	7.86	5.02	4.63
06/17/99	0.77	3.01	2.41	1.18	0.94	1.00	10.33	0.00	0.64
06/18/99	1.60	16.33	18.22	6.67	7.63	7.01	8.61	2.51	9.67
07/01/99	1.53	13.07	6.99	1.42	4.01	1.38	0.20	0.26	0.91
07/07/99	0.81	7.30	6.30	0.62	3.34	0.71	0.30	0.07	0.53
07/09/99	1.17	5.22	2.21	1.15	1.61	0.93	1.33	0.78	0.51
07/14/99	1.58	7.17	4.57	0.23	1.47	0.37	0.11	0.05	0.17
07/20/99	0.88	7.76	2.86	0.60	2.89	0.59	0.27	0.07	0.47
TOTALS	**33.72**	**292.97**	**245.56**	**77.83**	**138.15**	**104.24**	**144.07**	**62.30**	**84.35**

NITRATE - SUMMARY STATISTICS -YEAR ONE

	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (g/ac)	292.97	**245.56**	77.83	**138.15**	104.24	**144.07**	62.30	**84.35**
Average (two basins)(g/ac)		**269.26**		**107.99**		**124.16**		**73.32**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
g/ac-yr	292.97	**245.56**	77.83	**138.15**	104.24	**144.07**	62.30	**84.35**
kg/ac-yr	0.29	**0.25**	0.08	**0.14**	0.10	**0.14**	0.06	**0.08**
kg/ha-yr	0.72	**0.61**	0.19	**0.34**	0.26	**0.36**	0.15	**0.21**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (g/ac-yr)	380.47	**318.90**	101.07	**179.41**	135.37	**187.11**	80.90	**109.54**
kg/ac-yr	0.38	**0.32**	0.10	**0.18**	0.14	**0.19**	0.08	**0.11**
kg/ha-yr	0.94	**0.79**	0.25	**0.44**	0.33	**0.46**	0.20	**0.27**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				44%		41%		66%
Odd numbered basins w/ larger garden			73%		64%		79%	

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Appendix Jb-2. Constituent loads measured for each storm event and summary data for the year

NITRATE - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	inches	**0.260 g/ac**	**0.260 g/ac**	**0.23 g/ac**	**0.26 g/ac**	**0.23 g/ac**	**0.26 g/ac**	**0.24 g/ac**	**0.26 g/ac**
08/06/99	1.29	3.60	3.46	1.67	4.17	2.92	5.39	1.16	1.73
08/12/99	0.70	13.32	10.13	1.87	7.36	1.36	3.73	0.33	1.14
08/15/99	1.23	34.74	22.56	16.75	24.44	18.73	22.86	9.19	15.93
08/19/99	0.90	21.60	22.10	6.52	16.37	10.05	13.18	2.84	8.05
08/22/99	2.95	1.19	1.01	0.55	1.12	0.99	1.08	5.00	5.86
09/11/99	0.84	2.50	1.95	1.37	0.10	0.59	1.49	1.36	3.22
09/18/99	0.85	1.22	0.91	0.13	0.67	0.00	0.13	0.00	0.00
09/25/99	1.37	9.32	10.89	7.72	19.02	6.23	9.02	2.39	6.01
10/03/99	1.22	4.75	4.74	2.56	3.31	1.13	4.06	0.65	0.75
10/04/99	0.98	2.23	1.67	0.30	0.49	0.50	0.45	0.00	0.00
11/01/99	1.63	8.74	na	6.99	14.88	3.81	11.05	1.07	4.48
12/17/99	0.75	0.90	0.68	0.00	0.36	0.00	0.12	0.00	0.00
01/06/00	0.79	3.88	8.53	1.70	6.41	0.97	7.40	0.19	0.89
01/24/00	0.68	2.76	1.80	0.00	0.63	0.00	2.16	0.00	0.00
01/31/00	0.70	2.79	1.67	0.30	2.29	0.00	1.90	0.00	0.00
06/13/00	1.29	41.59	38.45	5.29	20.76	5.59	29.30	1.20	11.48
06/22/00	0.39	9.55	6.47	0.05	1.25	0.00	0.14	0.06	0.00
06/*/00**	1.39	7.80	11.27	0.27	2.91	0.06	5.08	0.22	0.05
06/29/00	0.71	9.14	7.16	1.12	3.66	1.16	4.84	0.44	1.34
07/01/00	0.81	9.03	7.20	0.77	2.27	0.53	4.02	0.39	0.58
07/04/00	1.95	27.60	46.98	16.97	40.73	27.87	40.00	15.27	16.22
07/08/00	1.07	30.78	26.86	4.69	20.03	5.69	17.47	4.63	8.37
07/15/00	1.98	27.60	25.42	14.58	22.91	18.25	18.10	12.42	14.46
07/26/00	1.24	0.68	6.10	2.08	0.30	0.72	0.40	0.25	0.82
07/31/00	2.69	52.19	30.26	19.99	32.29	42.70	29.65	6.99	17.81
TOTALS	**30.40**	**329.52**	**298.27**	**114.26**	**248.73**	**149.84**	**233.01**	**66.08**	**119.19**

NITRATE - SUMMARY STATISTICS - YEAR TWO								
Total loads (g/ac)	**329.52**	**298.27**	**114.26**	**248.73**	**149.84**	**233.01**	**66.08**	**119.19**
Average (two basins)(g/ac)		**313.89**		**181.49**		**191.43**		**92.64**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
g/ac-yr	**329.52**	**298.27**	**114.26**	**248.73**	**149.84**	**233.01**	**66.08**	**119.19**
kg/ac-yr	0.330	**0.298**	0.114	**0.249**	0.150	**0.233**	0.066	**0.119**
kg/ha-yr	0.81	**0.74**	0.28	**0.61**	0.37	**0.58**	0.16	**0.29**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (g/ac-yr)	499.27	**451.92**	173.12	**376.86**	227.03	**353.05**	100.12	**180.59**
kg/ac-yr	0.50	**0.45**	0.17	**0.38**	0.23	**0.35**	0.10	**0.18**
kg/ha-yr	1.23	**1.12**	0.43	**0.93**	0.56	**0.87**	0.25	**0.45**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**17%**		**22%**		**60%**
Odd numbered basins w/ larger gardens			**65%**		**55%**		**80%**	

APPENDIX Ja-4 . Constituent loads measured for each storm event and summary data for the year

TOTAL NITROGEN - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/05/98	0.57	23.03	29.50	4.22	10.30	2.94	17.53	1.51	3.58
08/06/98	0.68	14.43	12.54	4.42	8.70	5.72	13.89	2.64	5.27
08/07/98	1.30	41.05	47.19	14.70	31.13	18.32	36.05	11.34	23.65
08/09/98	2.47	95.77	57.00	66.47	51.38	53.76	50.04	80.57	46.32
08/20/98	0.68	14.68	12.18	8.54	12.70	11.50	16.55	3.94	10.13
09/03/97	1.97	37.05	19.37	10.99	11.73	20.03	14.72	9.17	14.58
09/17/98	0.49	4.50	5.87	1.79	4.68	0.77	3.25	0.16	1.36
09/18/98	0.66	2.48	1.08	0.50	3.16	0.72	5.25	0.00	0.97
09/19/98	0.75	3.25	2.56	2.07	21.81	3.43	4.91	3.08	3.51
09/20/98	1.85	7.31	8.93	1.40	5.74	2.89	3.13	1.21	3.36
09/26/98	1.64	9.76	7.33	6.18	8.41	2.89	6.82	0.00	7.62
11/05/98	1.20	13.68	10.30	0.00	1.72	0.00	1.41	0.00	0.00
12/13/98	0.37	8.73	3.68	1.96	1.68	0.04	0.08	0.00	0.00
01/03/99	1.23	14.34	12.02	26.64	25.78	21.50	29.95	11.81	15.60
01/23/99	2.60	11.78	14.40	29.66	17.72	23.64	43.04	22.85	39.84
03/14/99	0.82	30.65	19.84	2.68	23.83	0.93	14.91	0.27	0.86
04/17/99	0.54	27.17	35.60	0.50	1.44	0.00	0.00	0.00	0.00
05/21/99	1.36	92.93	84.62	28.29	79.82	28.24	59.33	1.13	31.84
05/30/99	0.39	26.54	23.89	1.09	9.49	0.38	0.99	0.00	0.12
06/09/99	0.81	11.00	10.95	3.93	11.90	2.91	9.98	0.38	4.12
06/13/99	1.32	50.64	49.79	33.53	114.81	31.44	51.65	18.11	41.09
06/16/99	1.68	13.69	12.52	15.95	37.36	27.66	36.73	17.02	43.24
06/17/99	0.77	5.61	6.52	5.22	12.30	5.71	12.69	2.64	5.70
06/18/99	1.60	26.45	31.79	24.31	37.40	21.95	36.14	18.39	37.96
07/01/99	1.53	37.45	23.50	10.35	21.17	14.12	22.69	5.04	15.31
07/07/99	0.81	29.65	24.50	2.73	15.87	2.61	10.26	0.27	2.30
07/09/99	1.17	29.30	11.27	5.55	11.29	10.36	14.47	3.19	9.85
07/14/99	1.58	33.20	26.76	0.99	13.93	1.35	5.51	0.22	0.74
07/20/99	0.88	36.88	33.64	2.63	8.27	2.19	15.10	0.27	4.85
TOTALS	**33.72**	**752.99**	**639.15**	**317.32**	**615.53**	**317.97**	**537.05**	**215.23**	**373.76**

TOTAL NITROGEN - SUMMARY STATISTICS -YEAR ONE								
Total loads (g/ac)	752.99	**639.15**	317.32	**615.53**	317.97	**537.05**	215.23	**373.76**
Average (two basins)(g/ac)		**696.07**		**466.42**		**427.51**		**294.50**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
g/ac-yr	752.99	**639.15**	317.32	**615.53**	317.97	**537.05**	215.23	**373.76**
kg/ac-yr	0.75	**0.64**	0.32	**0.62**	0.32	**0.54**	0.22	**0.37**
kg/ha-yr	1.86	**1.58**	0.78	**1.52**	0.79	**1.33**	0.53	**0.92**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (g/ac-yr)	977.91	**830.06**	412.11	**799.38**	412.95	**697.47**	279.52	**485.41**
kg/ac-yr	0.98	**0.83**	0.41	**0.80**	0.41	**0.70**	0.28	**0.49**
kg/ha-yr	2.42	**2.05**	1.02	**1.98**	1.02	**1.72**	0.69	**1.20**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				4%		16%		42%
Odd numbered basins w/ larger garde			58%		58%		71%	

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Appendix Jb-4. Constituent loads measured for each storm event and summary data for the year

TOTAL NITROGEN - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac		0.260	0.260	0.23	0.26	0.23	0.26	0.24	0.26
	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/06/99	1.29	38.62	28.81	11.16	19.61	10.41	24.73	3.67	10.68
08/12/99	0.70	21.35	16.93	4.85	0.00	5.22	11.27	0.87	3.44
08/15/99	1.23	48.30	34.57	16.94	29.52	29.73	26.58	11.63	21.50
08/19/99	0.90	24.55	24.43	7.66	21.68	10.86	19.02	3.35	9.42
08/22/99	2.95	49.93	38.17	28.69	65.97	37.65	23.29	7.51	18.00
09/11/99	0.84	24.18	21.04	3.57	13.80	1.47	9.92	3.56	9.47
09/18/99	0.85	2.88	4.76	0.78	3.27	0.00	1.25	0.00	0.00
09/25/99	1.37	42.61	33.70	26.18	44.35	26.35	40.27	7.45	21.89
10/03/99	1.22	14.66	13.20	7.09	8.60	4.95	12.37	1.41	8.53
10/04/99	0.98	4.30	3.00	0.78	2.88	1.24	4.33	0.00	0.00
11/01/99	1.63	na	na	na	na	na	na	na	na
12/17/99	0.75	5.65	6.08	0.00	1.01	0.00	0.38	0.00	0.00
01/06/00	0.79	7.76	22.38	4.42	10.23	2.40	9.06	0.51	2.61
01/24/00	0.68	3.01	0.59	0.00	7.67	0.00	3.14	0.00	0.00
01/31/00	0.70	7.06	6.34	0.78	8.24	0.00	2.81	0.00	0.00
06/13/00	1.29	102.47	95.94	16.83	49.93	16.91	71.19	3.12	33.11
06/22/00	0.39	13.13	11.62	0.14	1.35	0.00	0.45	0.15	0.00
06/***/00	1.39	8.69	13.67	0.71	8.17	0.15	12.22	0.74	0.14
06/29/00	0.71	19.29	14.99	2.92	10.99	2.87	15.14	1.07	4.80
07/01/00	0.81	9.13	7.51	2.07	5.75	1.32	8.89	1.02	1.72
07/04/00	1.95	66.07	69.88	25.09	65.59	39.50	79.05	39.79	44.44
07/08/00	1.07	115.89	115.67	14.02	99.71	26.88	88.01	18.11	19.82
07/15/00	1.98	66.07	64.55	38.38	77.15	63.91	91.92	34.53	47.02
07/26/00	1.24	43.23	15.48	5.42	28.10	1.78	30.85	0.65	2.40
07/31/00	2.69	87.99	54.91	73.53	120.46	93.50	77.32	19.46	63.12
TOTALS	**30.40**	**826.82**	**718.22**	**292.04**	**704.03**	**377.09**	**663.44**	**158.61**	**322.10**

TOTAL NITROGEN - SUMMARY STATISTICS - YEAR TWO								
Total loads (g/ac)	**826.82**	**718.22**	**292.04**	**704.03**	**377.09**	**663.44**	**158.61**	**322.10**
Average (two basins)(g/ac)		**772.52**		**498.03**		**520.27**		**240.35**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
g/ac-yr	**826.82**	**718.22**	**292.04**	**704.03**	**377.09**	**663.44**	**158.61**	**322.10**
kg/ac-yr	0.827	**0.718**	0.292	**0.704**	0.377	**0.663**	0.159	**0.322**
kg/ha-yr	2.04	**1.77**	0.72	**1.74**	0.93	**1.64**	0.39	**0.80**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (g/ac-yr)	1252.75	**1088.22**	442.48	**1066.71**	571.35	**1005.22**	240.31	**488.03**
kg/ac-yr	1.25	**1.09**	0.44	**1.07**	0.57	**1.01**	0.24	**0.49**
kg/ha-yr	3.10	**2.69**	1.09	**2.64**	1.41	**2.48**	0.59	**1.21**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**2%**		**8%**		**55%**
Odd numbered basins w/ larger gardens			**65%**		**54%**		**81%**	

APPENDIX Ja-6 . Constituent loads measured for each storm event and summary data for the year

ORTHO PHOSPHORUS - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/05/98	0.57	1.54	1.23	0.88	3.29	1.02	2.79	0.40	0.87
08/06/98	0.68	0.90	0.71	0.92	0.89	1.80	2.43	0.70	0.66
08/07/98	1.30	2.05	2.13	1.22	2.12	3.70	4.33	0.69	2.03
08/09/98	2.47	3.62	1.15	3.53	6.07	5.68	5.56	1.92	3.34
08/20/98	0.68	1.47	0.89	2.01	2.37	3.48	2.99	0.31	1.19
09/03/97	1.97	2.12	0.51	2.44	3.20	6.27	14.72	3.24	0.92
09/17/98	0.49	1.11	0.35	0.37	1.49	0.27	0.99	0.04	0.33
09/18/98	0.66	0.50	0.13	0.10	1.01	0.18	1.17	0.00	0.24
09/19/98	0.75	1.08	0.51	1.50	6.96	5.29	4.64	0.81	1.67
09/20/98	1.85	0.24	0.21	0.64	0.69	1.32	1.53	0.14	0.75
09/26/98	1.64	0.46	6.60	1.07	2.07	1.53	2.73	1.26	2.15
11/05/98	1.20	1.50	0.99	0.00	0.55	0.00	0.43	0.00	0.00
12/13/98	0.37	0.18	0.37	0.28	0.54	0.01	0.02	0.00	0.00
01/03/99	1.23	1.53	1.55	6.98	7.36	8.96	7.08	1.16	3.87
01/23/99	2.60	5.21	3.67	12.46	17.72	17.24	43.04	1.84	39.84
03/14/99	0.82	4.62	13.95	0.56	34.83	0.33	20.42	0.07	0.21
04/17/99	0.54	2.62	7.77	0.10	0.46	0.00	0.00	0.00	0.00
05/21/99	1.36	5.42	11.07	3.84	27.99	8.33	21.11	0.30	11.86
05/30/99	0.39	1.80	3.78	0.23	4.56	0.13	0.30	0.00	0.03
06/09/99	0.81	1.48	2.37	0.81	9.01	1.02	5.55	0.10	2.13
06/13/99	1.32	3.48	3.67	5.27	22.82	15.41	18.98	2.52	17.61
06/16/99	1.68	4.93	3.83	5.70	22.28	16.50	20.59	3.83	21.72
06/17/99	0.77	1.12	1.30	1.08	6.54	4.02	4.90	0.70	3.62
06/18/99	1.60	2.18	2.63	4.43	15.67	10.76	16.37	2.56	10.96
07/01/99	1.53	3.08	1.78	2.22	6.57	5.74	6.26	0.61	4.38
07/07/99	0.81	1.64	1.43	0.57	2.25	0.92	1.97	0.07	0.56
07/09/99	1.17	2.50	0.98	2.11	4.17	4.96	4.78	0.86	4.11
07/14/99	1.58	1.62	1.46	0.21	1.49	0.48	0.60	0.06	0.18
07/20/99	0.88	1.51	0.80	0.55	2.64	0.77	1.49	0.07	0.36
TOTALS	**33.72**	**61.52**	**77.81**	**62.06**	**217.58**	**126.13**	**217.78**	**24.26**	**135.60**

ORTHO PHOSPHORUS - SUMMARY STATISTICS -YEAR ONE

	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (g/ac)	61.52	**77.81**	62.06	**217.58**	126.13	**217.78**	24.26	**135.60**
Average (two basins)(g/ac)		**69.66**		**139.82**		**171.96**		**79.93**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
g/ac-yr	61.52	**77.81**	62.06	**217.58**	126.13	**217.78**	24.26	**135.60**
kg/ac-yr	0.06	**0.08**	0.06	**0.22**	0.13	**0.22**	0.02	**0.14**
kg/ha-yr	0.15	**0.19**	0.15	**0.54**	0.31	**0.54**	0.06	**0.34**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (g/ac-yr)	79.90	**101.05**	80.60	**282.57**	163.80	**282.84**	31.50	**176.10**
kg/ac-yr	0.08	**0.10**	0.08	**0.28**	0.16	**0.28**	0.03	**0.18**
kg/ha-yr	0.20	**0.25**	0.20	**0.70**	0.40	**0.70**	0.08	**0.44**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				-180%		-180%		-74%
Odd numbered basins w/ larger garde			-1%		-105%		61%	

Appendix Jb-5. Constituent loads measured for each storm event and summary data for the year

ORTHO-PHOSPHORUS - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac		0.260	0.260	0.23	0.26	0.23	0.26	0.24	0.26
	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/06/99	1.29	1.18	1.44	2.75	4.30	4.47	3.83	0.38	2.92
08/12/99	0.70	0.68	0.49	0.90	1.70	2.37	1.93	0.12	0.00
08/15/99	1.23	1.86	0.76	3.20	4.19	7.91	5.05	1.13	4.43
08/19/99	0.90	1.61	1.07	2.12	4.59	4.52	4.51	0.55	3.42
08/22/99	2.95	5.23	3.44	6.18	15.65	24.77	21.77	5.25	12.07
09/11/99	0.84	1.05	0.60	0.66	1.71	0.40	2.27	0.48	2.54
09/18/99	0.85	0.50	0.43	0.17	0.54	0.00	0.25	0.00	0.00
09/25/99	1.37	1.60	1.17	5.82	3.83	6.48	5.51	1.05	5.87
10/03/99	1.22	1.82	1.38	2.79	2.62	3.80	4.37	0.23	3.77
10/04/99	0.98	0.46	0.34	0.15	0.70	0.33	1.52	0.00	0.00
11/01/99	1.63	3.31	1.79	3.39	13.32	9.34	15.73	0.63	6.27
12/17/99	0.75	0.54	0.29	0.00	0.18	0.00	0.07	0.00	0.00
01/06/00	0.79	12.18	2.69	0.82	2.22	0.65	3.69	0.07	0.70
01/24/00	0.68	0.85	0.75	0.00	2.28	0.00	2.16	0.00	0.00
01/31/00	0.70	0.47	0.69	0.15	2.35	0.00	2.37	0.00	0.00
06/13/00	1.29	4.61	9.75	1.84	11.59	4.08	27.69	0.42	16.07
06/22/00	0.39	0.57	1.28	0.03	0.24	0.00	0.09	0.02	0.00
06/***/00	1.39	0.91	1.83	0.13	1.48	0.04	3.20	0.14	0.04
06/29/00	0.71	1.26	1.69	0.54	3.70	0.77	4.72	0.13	1.98
07/01/00	0.81	1.34	1.23	0.42	2.28	0.36	4.26	0.14	0.46
07/04/00	1.95	3.82	2.53	8.19	26.64	29.40	37.14	7.25	21.48
07/08/00	1.07	1.81	1.48	1.13	5.42	2.19	5.41	1.05	4.86
07/15/00	1.98	3.82	3.06	5.60	13.72	13.99	15.82	3.50	9.88
07/26/00	1.24	1.55	0.73	1.01	2.10	0.48	2.04	0.09	0.95
07/31/00	2.69	4.40	3.78	11.70	23.73	26.65	19.73	3.44	15.20
TOTALS	30.40	57.45	44.68	59.71	151.09	143.00	195.12	26.05	112.88

ORTHO-PHOSPHORUS - SUMMARY STATISTICS - YEAR TWO								
Total loads (g/ac)	57.45	44.68	59.71	151.09	143.00	195.12	26.05	112.88
Average (two basins)(g/ac)		51.06		105.40		169.06		69.47
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
g/ac-yr	57.45	44.68	59.71	151.09	143.00	195.12	26.05	112.88
kg/ac-yr	0.057	0.045	0.060	0.151	0.143	0.195	0.026	0.113
kg/ha-yr	0.14	0.11	0.15	0.37	0.35	0.48	0.06	0.28
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (g/ac-yr)	87.04	67.70	90.47	228.92	216.66	295.64	39.48	171.04
kg/ac-yr	0.09	0.07	0.09	0.23	0.22	0.30	0.04	0.17
kg/ha-yr	0.22	0.17	0.22	0.57	0.54	0.73	0.10	0.42
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				-238%		-337%		-153%
Odd numbered basins w/ larger gardens			-4%		-149%		55%	

APPENDIX Ja-7 . Constituent loads measured for each storm event and summary data for the year

TOTAL PHOSPHORUS - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/05/98	0.57	2.60	2.68	0.87	2.79	0.98	3.79	0.11	0.61
08/06/98	0.68	0.97	1.00	0.91	0.87	2.26	2.88	0.18	0.86
08/07/98	1.30	2.60	2.66	1.54	3.46	4.25	6.25	1.00	2.85
08/09/98	2.47	7.02	2.06	5.30	13.94	7.68	8.06	3.58	4.87
08/20/98	0.68	1.94	1.44	2.43	3.68	3.90	3.95	0.23	1.71
09/03/97	1.97	3.97	2.04	6.72	4.27	6.97	6.87	1.24	4.61
09/17/98	0.49	2.92	1.09	0.37	1.27	0.26	0.97	0.01	0.23
09/18/98	0.66	0.91	0.86	0.10	0.86	0.24	1.58	0.00	0.17
09/19/98	0.75	1.08	0.82	2.15	5.92	6.27	5.98	0.21	2.37
09/20/98	1.85	1.41	1.19	1.09	1.75	2.09	2.43	0.33	1.45
09/26/98	1.64	1.67	9.53	1.24	4.26	4.04	5.00	0.33	2.78
11/05/98	1.20	2.31	2.45	0.00	0.47	0.00	0.42	0.00	0.00
12/13/98	0.37	1.75	0.80	0.45	0.46	0.01	0.02	0.00	0.00
01/03/99	1.23	2.77	5.65	8.46	10.43	9.52	8.13	1.93	5.01
01/23/99	2.60	8.07	11.01	15.76	16.12	19.51	14.71	3.29	10.48
03/14/99	0.82	8.83	17.85	0.55	42.71	0.31	25.12	0.02	0.15
04/17/99	0.54	4.11	10.24	0.10	0.39	0.00	0.00	0.00	0.00
05/21/99	1.36	11.31	20.31	6.19	34.47	10.33	26.56	0.08	14.09
05/30/99	0.39	3.51	6.16	0.22	5.29	0.13	0.30	0.00	0.02
06/09/99	0.81	3.78	3.33	0.81	11.10	0.98	6.63	0.03	2.72
06/13/99	1.32	7.65	7.16	7.08	27.20	17.64	22.68	3.45	20.69
06/16/99	1.68	6.85	5.89	7.44	26.92	17.98	23.41	4.77	25.94
06/17/99	0.77	2.65	3.71	0.38	8.10	5.18	6.20	0.18	4.59
06/18/99	1.60	4.83	5.38	6.55	20.44	13.53	21.86	4.24	15.18
07/01/99	1.53	4.99	3.05	3.09	8.38	6.81	7.98	0.83	5.76
07/07/99	0.81	2.61	3.53	0.56	3.37	0.88	2.94	0.02	0.39
07/09/99	1.17	4.43	1.96	3.03	5.60	6.11	6.39	1.19	5.43
07/14/99	1.58	2.67	2.68	0.07	1.79	0.45	0.88	0.02	0.13
07/20/99	0.88	2.56	1.92	0.54	2.24	0.74	2.25	0.02	0.57
TOTALS	**33.72**	**112.79**	**138.46**	**83.98**	**268.54**	**149.05**	**224.21**	**27.28**	**133.66**

TOTAL PHOSPHORUS - SUMMARY STATISTICS -YEAR ONE

	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (g/ac)	112.79	**138.46**	83.98	**268.54**	149.05	**224.21**	27.28	**133.66**
Average (two basins)(g/ac)		**125.63**		**176.26**		**186.63**		**80.47**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
g/ac-yr	112.79	**138.46**	83.98	**268.54**	149.05	**224.21**	27.28	**133.66**
kg/ac-yr	0.11	**0.14**	0.08	**0.27**	0.15	**0.22**	0.03	**0.13**
kg/ha-yr	0.28	**0.34**	0.21	**0.66**	0.37	**0.55**	0.07	**0.33**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (g/ac-yr)	146.48	**179.82**	109.06	**348.75**	193.57	**291.19**	35.42	**173.58**
kg/ac-yr	0.15	**0.18**	0.11	**0.35**	0.19	**0.29**	0.04	**0.17**
kg/ha-yr	0.36	**0.44**	0.27	**0.86**	0.48	**0.72**	0.09	**0.43**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				-94%		-62%		3%
Odd numbered basins w/ larger garde			26%		-32%		76%	

Appendix Jb-6. Constituent loads measured for each storm event and summary data for the year

TOTAL PHOSPHORUS - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	ASPHALT WO/SWALE F2	ASPHALT W/SWALE F7	ASPHALT W/SWALE F8	CONCRETE W/SWALE F3	CONCRETE W/SWALE F4	POROUS W/SWALE F5	POROUS W/SWALE F6
Basin (ac		**0.260**	**0.260**	**0.23**	**0.26**	**0.23**	**0.26**	**0.24**	**0.26**
	inches	**g/ac**	**g/ac**	**g/ac**	**g/ac**	**g/ac**	**g/ac**	**g/ac**	**g/ac**
08/06/99	1.29	1.83	1.56	3.97	5.55	4.80	4.64	0.61	3.61
08/12/99	0.70	1.96	0.49	1.34	2.46	2.64	2.34	0.16	1.05
08/15/99	1.23	3.81	2.81	4.77	6.61	9.65	8.03	1.52	6.07
08/19/99	0.90	2.95	2.56	2.93	6.56	5.57	6.54	0.73	4.57
08/22/99	2.95	7.13	5.35	7.94	20.35	27.94	23.71	7.76	18.22
09/11/99	0.84	2.10	1.65	0.98	3.16	0.47	2.98	0.64	3.22
09/18/99	0.85	0.93	0.54	0.24	0.87	0.00	0.30	0.00	0.00
09/25/99	1.37	5.06	5.64	7.76	9.98	9.91	16.57	1.73	9.59
10/03/99	1.22	1.68	1.68	3.95	4.22	4.22	4.95	0.31	5.08
10/04/99	0.98	1.03	0.58	0.22	1.10	0.40	2.09	0.00	0.00
11/01/99	1.63	7.13	3.42	5.02	21.26	11.34	19.31	1.50	6.54
12/17/99	0.75	0.96	0.55	0.00	0.31	0.00	0.10	0.00	0.00
01/06/00	0.79	1.75	4.82	1.22	6.66	0.77	4.97	0.09	0.89
01/24/00	0.68	2.58	1.18	0.00	2.84	0.00	2.52	0.00	0.00
01/31/00	0.70	1.41	1.62	0.22	4.54	0.00	2.59	0.00	0.00
06/13/00	1.29	16.65	19.67	2.43	15.35	4.41	38.97	0.56	22.13
06/22/00	0.39	1.71	1.87	0.04	1.34	0.00	0.12	0.03	0.00
06/*/00**	1.39	1.67	3.07	0.20	2.53	0.05	3.72	0.18	0.05
06/29/00	0.71	3.27	2.89	0.81	5.49	0.92	6.16	0.19	2.65
07/01/00	0.81	1.92	1.98	0.52	3.03	0.42	6.18	0.18	0.58
07/04/00	1.95	7.63	4.79	11.59	27.59	37.52	46.19	6.61	24.29
07/08/00	1.07	3.91	1.67	1.36	5.85	2.14	5.15	1.50	4.98
07/15/00	1.98	7.63	5.86	9.29	15.34	15.84	18.95	4.46	11.02
07/26/00	1.24	2.57	1.40	1.50	4.35	0.57	2.81	0.12	1.22
07/31/00	2.69	11.20	6.16	16.88	33.27	30.70	24.02	5.29	16.22
TOTALS	**30.40**	**100.50**	**83.80**	**85.17**	**210.62**	**170.30**	**253.91**	**34.15**	**141.97**

TOTAL PHOSPHORUS - SUMMARY STATISTICS - YEAR TWO								
Total loads (g/ac)	**100.50**	**83.80**	**85.17**	**210.62**	**170.30**	**253.91**	**34.15**	**141.97**
Average (two basins)(g/ac)		**92.15**		**147.90**		**212.10**		**88.06**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
g/ac-yr	**100.50**	**83.80**	**85.17**	**210.62**	**170.30**	**253.91**	**34.15**	**141.97**
kg/ac-yr	0.100	**0.084**	0.085	**0.211**	0.170	**0.254**	0.034	**0.142**
kg/ha-yr	0.25	**0.21**	0.21	**0.52**	0.42	**0.63**	0.08	**0.35**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (g/ac-yr)	152.27	**126.97**	129.05	**319.12**	258.03	**384.70**	51.75	**215.10**
kg/ac-yr	0.15	**0.13**	0.13	**0.32**	0.26	**0.38**	0.05	**0.22**
kg/ha-yr	0.38	**0.31**	0.32	**0.79**	0.64	**0.95**	0.13	**0.53**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**-151%**		**-203%**		**-69%**
Odd numbered basins w/ larger gardens			**15%**		**-69%**		**66%**	

APPENDIX Ja-7 . Constituent loads measured for each storm event and summary data for the year

TOTAL COPPER - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac
08/05/98	0.57	494.65	349.48	59.40	258.54	33.72	160.91	7.26	29.58
08/06/98	0.68	86.58	96.46	62.19	128.65	102.39	71.92	12.71	56.37
08/07/98	1.30	10.26	126.28	95.01	341.52	82.98	108.16	46.38	77.61
08/09/98	2.47	1000.25	200.71	51.93	1289.74	599.01	69.50	63.94	69.55
08/20/98	0.68	364.06	299.08	273.23	520.88	208.75	193.10	18.93	122.09
09/03/97	1.97	926.36	621.89	451.88	1141.20	391.96	431.75	194.28	214.92
09/17/98	0.49	299.97	186.65	25.16	117.52	8.80	32.50	0.78	11.25
09/18/98	0.66	159.77	188.70	6.99	79.32	8.31	25.57	0.00	8.04
09/19/98	0.75	324.67	317.87	173.62	547.43	156.74	13.38	14.78	6.57
09/20/98	1.85	253.34	229.74	14.26	208.33	132.26	215.12	21.03	103.52
09/26/98	1.64	548.29	476.61	107.47	437.36	140.16	265.21	22.82	188.15
11/05/98	1.20	359.02	493.77	0.00	43.09	0.00	14.15	0.00	0.00
12/13/98	0.37	213.15	104.10	40.19	42.11	0.49	0.76	0.00	0.00
01/03/99	1.23	477.89	1173.26	280.81	729.98	184.31	280.51	93.14	203.98
01/23/99	2.60	1463.48	1750.39	406.79	661.69	177.33	204.54	66.89	297.81
03/14/99	0.82	898.82	675.12	37.73	285.97	10.75	136.48	1.30	7.07
04/17/99	0.54	597.81	749.90	6.99	36.23	0.00	0.00	0.00	0.00
05/21/99	1.36	1138.40	963.34	205.90	450.77	125.05	226.84	5.45	129.35
05/30/99	0.39	326.20	457.16	15.37	50.90	4.40	9.94	0.00	0.96
06/09/99	0.81	583.62	385.60	55.20	173.39	33.72	50.82	1.82	28.13
06/13/99	1.32	2085.35	829.76	199.00	731.92	104.79	237.31	85.53	176.10
06/16/99	1.68	383.45	325.00	231.94	523.07	82.98	132.61	34.04	218.48
06/17/99	0.77	367.02	415.95	73.37	84.40	77.62	38.36	12.71	15.09
06/18/99	1.60	517.44	411.00	56.11	389.79	169.95	293.61	83.61	251.94
07/01/99	1.53	1057.29	393.84	85.35	242.62	98.23	148.63	25.60	74.15
07/07/99	0.81	421.36	223.97	38.43	24.41	30.30	39.46	1.30	18.97
07/09/99	1.17	664.60	181.35	128.08	238.85	140.65	132.63	196.70	118.16
07/14/99	1.58	408.90	360.39	13.98	188.21	15.64	45.88	1.04	6.11
07/20/99	0.88	520.18	307.46	37.04	207.61	25.41	84.54	1.30	39.21
TOTALS	**33.72**	**16952.17**	**13294.85**	**3233.42**	**10175.49**	**3146.68**	**3664.20**	**1013.32**	**2473.16**

TOTAL COPPER - SUMMARY STATISTICS -YEAR ONE	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (mg/ac)	16952	**13295**	3233	**10175**	3147	**3664**	1013	**2473**
Average (two basins)(mg/ac)		**15124**		**6704**		**3405**		**1743**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
mg/ac-yr	16952	**13295**	3233	**10175**	3147	**3664**	1013	**2473**
g/ac-yr	16.95	**13.29**	3.23	**10.18**	3.15	**3.66**	1.01	**2.47**
g/ha-yr	41.89	**32.85**	7.99	**25.14**	7.78	**9.05**	2.50	**6.11**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (mg/ac-yr)	22015.80	**17266.04**	4199.25	**13214.92**	4086.60	**4758.70**	1316.00	**3211.90**
g/ac-yr	22.02	**17.27**	4.20	**13.21**	4.09	**4.76**	1.32	**3.21**
g/ha-yr	54.40	**42.66**	10.38	**32.65**	10.10	**11.76**	3.25	**7.94**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				23%		72%		81%
Odd numbered basins w/ larger garden			81%		81%		94%	

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Appendix Jb-7. Constituent loads measured for each storm event and summary data for the year

TOTAL COPPER - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	inches	0.260 mg/ac	0.260 mg/ac	0.23 mg/ac	0.26 mg/ac	0.23 mg/ac	0.26 mg/ac	0.24 mg/ac	0.26 mg/ac
08/06/99	1.29	393	127	91	221	44	85	26	73
08/12/99	0.70	384	433	71	233	57	74	5	25
08/15/99	1.23	729	516	173	336	202	266	57	152
08/19/99	0.90	603	393	96	222	122	186	34	86
08/22/99	2.95	904	1017	243	1191	515	653	125	601
09/11/99	0.84	274	244	52	3	11	80	21	54
09/18/99	0.85	149	269	14	127	0	6	0	0
09/25/99	1.37	357	305	334	1253	209	199	47	160
10/03/99	1.22	314	156	144	353	91	162	14	73
10/04/99	0.98	92	86	11	74	9	79	0	0
11/01/99	1.63	813	606	265	1075	222	343	38	84
12/17/99	0.75	161	98	0	20	0	3	0	0
01/06/00	0.79	212	570	64	606	18	131	3	15
01/24/00	0.68	391	200	0	236	0	50	0	0
01/31/00	0.70	329	1084	11	587	0	49	0	0
06/13/00	1.29	3638	2406	146	530	100	442	18	148
06/22/00	0.39	304	201	2	75	0	3	1	0
06/***/00	1.39	210	430	10	158	1	96	4	1
06/29/00	0.71	319	382	43	632	21	110	9	17
07/01/00	0.81	187	455	88	209	10	154	9	10
07/04/00	1.95	1233	398	339	370	110	704	205	266
07/08/00	1.07	666	334	129	338	14	44	10	40
07/15/00	1.98	1233	1038	1036	982	232	378	129	203
07/26/00	1.24	282	249	79	305	13	131	4	27
07/31/00	2.69	1780	694	704	1078	1325	668	252	240
TOTALS	**30.40**	**15957**	**12690**	**4147**	**11215**	**3325**	**5097**	**1013**	**2273**

TOTAL COPPER - SUMMARY STATISTICS - YEAR TWO								
Total loads (mg/ac)	**15957**	**12690**	**4147**	**11215**	**3325**	**5097**	**1013**	**2273**
Average (two basins)(mg/ac)		**14324**		**7681**		**4211**		**1643**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
mg/ac-yr	**15957**	**12690**	**4147**	**11215**	**3325**	**5097**	**1013**	**2273**
g/ac-yr	15.957	**12.690**	4.147	**11.215**	3.325	**5.097**	1.013	**2.273**
g/ha-yr	39.43	**31.36**	10.25	**27.71**	8.22	**12.59**	2.50	**5.62**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (mg/ac-yr	24177	**19228**	6283	**16993**	5038	**7722**	1535	**3445**
g/ac-yr	24.18	**19.23**	6.28	**16.99**	5.04	**7.72**	1.54	**3.44**
g/ha-yr	59.74	**47.51**	15.53	**41.99**	12.45	**19.08**	3.79	**8.51**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**12%**		**60%**		**82%**
Odd numbered basins w/ larger gardens			**74%**		**79%**		**94%**	

APPENDIX Ja-8 . Constituent loads measured for each storm event and summary data for the year

TOTAL IRON - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac
08/05/98	0.57	17057	13616	1128	6211	459	5044	354	451
08/06/98	0.68	5772	5466	1181	4541	1596	1984	619	1348
08/07/98	1.30	10264	8640	2941	12537	2420	4807	1374	554
08/09/98	2.47	53205	15598	10906	30985	19967	12232	9591	6120
08/20/98	0.68	9982	7754	4696	8470	3328	3678	922	2078
09/03/97	1.97	46318	27322	14350	23464	7404	8733	5936	4375
09/17/98	0.49	10799	6666	478	2823	120	583	38	172
09/18/98	0.66	4407	2965	133	1906	113	968	0	123
09/19/98	0.75	8658	7178	3887	13151	735	2944	720	657
09/20/98	1.85	17052	10636	1240	7850	1443	5085	404	2329
09/26/98	1.64	18586	16498	2687	11775	618	3789	1112	1344
11/05/98	1.20	5129	9017	0	1035	0	254	0	0
12/13/98	0.37	3256	3406	1145	1012	7	14	0	0
01/03/99	1.23	21027	60076	6840	26071	2560	6181	2726	6299
01/23/99	2.60	67286	73121	11865	15659	11822	8015	6689	2920
03/14/99	0.82	36888	27492	717	8799	146	3211	63	108
04/17/99	0.54	17469	21140	133	870	0	0	0	0
05/21/99	1.36	85186	72901	6444	18313	2017	9422	265	2786
05/30/99	0.39	21839	25170	292	4280	60	178	0	15
06/09/99	0.81	33486	19280	1049	7505	459	1317	88	412
06/13/99	1.32	96323	37557	2948	25115	1310	3490	2767	2446
06/16/99	1.68	27389	17314	4349	12831	2766	4388	2979	2697
06/17/99	0.77	15802	20798	1394	2411	913	1180	619	838
06/18/99	1.60	17248	14964	4987	4242	1062	1694	2230	2542
07/01/99	1.53	30838	8893	2179	5735	460	587	233	957
07/07/99	0.81	9364	6649	730	1953	412	631	63	289
07/09/99	1.17	12149	2451	2135	3908	555	1206	6233	844
07/14/99	1.58	14980	16414	266	5082	213	408	51	93
07/20/99	0.88	12810	5788	704	4988	346	196	63	490
TOTALS	**33.72**	**730568**	**564771**	**91803**	**273520**	**63310**	**92219**	**46140**	**43286**

TOTAL IRON - SUMMARY STATISTICS -YEAR ONE

	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (mg/ac)	730568	**564771**	91803	**273520**	63310	**92219**	46140	**43286**
Average (two basins)(mg/ac)		**647670**		**182662**		**77765**		**44713**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
mg/ac-yr	730568	**564771**	91803	**273520**	63310	**92219**	46140	**43286**
g/ac-yr	731	**565**	92	**274**	63	**92**	46	**43**
g/ha-yr	1805	**1396**	227	**676**	156	**228**	114	**107**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (mg/ac-yr)	948790	**733469**	119225	**355221**	82220	**119765**	59923	**56216**
g/ac-yr	949	**733**	119	**355**	82	**120**	60	**56**
g/ha-yr	2344	**1812**	295	**878**	203	**296**	148	**139**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				52%		84%		92%
Odd numbered basins w/ larger garde			87%		91%		94%	

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Appendix Jb-8. Constituent loads measured for each storm event and summary data for the year

TOTAL IRON - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac		0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
	inches	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac
08/06/99	1.29	11128	4033	620	9595	277	423	87	252
08/12/99	0.70	11101	9119	1966	4061	123	271	17	105
08/15/99	1.23	23727	15822	1155	6494	701	664	224	527
08/19/99	0.90	18939	8341	1095	79507	424	553	113	357
08/22/99	2.95	16644	27827	7723	49866	2477	7347	5004	8779
09/11/99	0.84	8463	5637	1445	8156	117	902	466	1721
09/18/99	0.85	3115	7450	14	127	0	6	0	0
09/25/99	1.37	8522	7777	9480	35482	3346	4078	1064	2432
10/03/99	1.22	7680	3601	3041	9035	990	2707	302	1456
10/04/99	0.98	1719	1502	318	1002	98	746	0	0
11/01/99	1.63	9038	15579	7371	33761	331	622	420	858
12/17/99	0.75	3973	1754	0	658	0	40	0	0
01/06/00	0.79	12175	20279	1792	22199	191	2181	67	474
01/24/00	0.68	11524	4313	0	7807	0	1372	0	0
01/31/00	0.70	16763	9136	318	21926	0	1163	0	0
06/13/00	1.29	163955	111127	6871	37447	1285	6370	409	6100
06/22/00	0.39	10131	6762	58	2440	0	49	19	0
06/*/00**	1.39	6862	14332	289	5305	12	1333	47	25
06/29/00	0.71	16354	19858	1185	12531	228	1549	322	882
07/01/00	0.81	11048	11861	2069	4880	105	1296	78	312
07/04/00	1.95	41111	26700	18450	21847	5486	8849	7059	5948
07/08/00	1.07	20281	8997	5959	12572	707	3080	906	2577
07/15/00	1.98	41111	26700	29166	34916	3705	9467	5276	7294
07/26/00	1.24	17488	6402	2197	14238	141	1350	86	534
07/31/00	2.69	57993	27237	18642	38328	14026	10383	8819	12842
TOTALS	**30.40**	**550845**	**402144**	**121222**	**474178**	**34769**	**66801**	**30783**	**53473**

TOTAL IRON - SUMMARY STATISTICS - YEAR TWO								
Total loads (mg/ac)	**550845**	**402144**	**121222**	**474178**	**34769**	**66801**	**30783**	**53473**
Average (two basins)(mg/ac)		**476495**		**297700**		**50785**		**42128**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
mg/ac-yr	**550845**	**402144**	**121222**	**474178**	**34769**	**66801**	**30783**	**53473**
g/ac-yr	550.845	**402.144**	121.222	**474.178**	34.769	**66.801**	30.783	**53.473**
g/ha-yr	1361.14	**993.70**	299.54	**1171.69**	85.91	**165.07**	76.06	**132.13**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (mg/ac-yr	834614	**609310**	183670	**718452**	52680	**101213**	46641	**81020**
g/ac-yr	834.61	**609.31**	183.67	**718.45**	52.68	**101.21**	46.64	**81.02**
g/ha-yr	2062.33	**1505.60**	453.85	**1775.29**	130.17	**250.10**	115.25	**200.20**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**-18%**		**83%**		**87%**
Odd numbered basins w/ larger gardens			**78%**		**94%**		**94%**	

APPENDIX Ja-9 . Constituent loads measured for each storm event and summary data for the year

TOTAL LEAD - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	ASPHALT WO/SWALE F2	ASPHALT W/SWALE F7	ASPHALT W/SWALE F8	CONCRETE W/SWALE F3	CONCRETE W/SWALE F4	POROUS W/SWALE F5	POROUS W/SWALE F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac
08/05/98	0.57	158	132	9	26	8	24	3	9
08/06/98	0.68	36	32	9	19	13	25	5	12
08/07/98	1.30	68	66	23	134	35	60	17	37
08/09/98	2.47	468	172	104	129	154	139	128	139
08/20/98	0.68	147	55	53	127	30	46	8	26
09/03/97	1.97	291	204	61	107	87	98	54	77
09/17/98	0.49	117	91	4	12	2	8	0	3
09/18/98	0.66	28	27	1	8	2	14	0	2
09/19/98	0.75	108	103	26	55	49	89	6	44
09/20/98	1.85	132	43	16	30	24	39	8	26
09/26/98	1.64	93	92	27	129	41	76	10	45
11/05/98	1.20	43	43	0	4	0	4	0	0
12/13/98	0.37	43	14	14	4	0	0	0	0
01/03/99	1.23	268	735	101	333	51	114	45	93
01/23/99	2.60	1346	1383	186	331	286	158	56	86
03/14/99	0.82	400	355	6	106	2	36	1	2
04/17/99	0.54	167	238	1	4	0	0	0	0
05/21/99	1.36	736	723	80	211	20	35	2	20
05/30/99	0.39	160	213	2	40	1	3	0	0
06/09/99	0.81	445	280	8	148	8	60	1	16
06/13/99	1.32	1152	576	37	179	109	70	25	49
06/16/99	1.68	137	677	48	387	92	194	43	126
06/17/99	0.77	112	184	11	24	23	30	5	17
06/18/99	1.60	115	118	62	107	71	113	56	90
07/01/99	1.53	73	64	29	106	46	39	12	24
07/07/99	0.81	105	66	6	24	7	16	1	6
07/09/99	1.17	143	49	21	33	74	40	14	113
07/14/99	1.58	117	143	2	49	4	8	0	2
07/20/99	0.88	148	98	6	21	6	11	1	11
TOTALS	**33.72**	**7355**	**6974**	**954**	**2888**	**1244**	**1548**	**501**	**1076**

TOTAL LEAD - SUMMARY STATISTICS -YEAR ONE

	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (mg/ac)	7355	**6974**	954	**2888**	1244	**1548**	501	**1076**
Average (two basins)(mg/ac)		**7165**		**1921**		**1396**		**788**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
mg/ac-yr	7355	**6974**	954	**2888**	1244	**1548**	501	**1076**
g/ac-yr	7	**7**	1	**3**	1	**2**	1	**1**
g/ha-yr	18	**17**	2	**7**	3	**4**	1	**3**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (mg/ac-yr)	9552	**9057**	1239	**3751**	1616	**2011**	651	**1397**
g/ac-yr	10	**9**	1	**4**	2	**2**	1	**1**
g/ha-yr	24	**22**	3	**9**	4	**5**	2	**3**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				59%		78%		85%
Odd numbered basins w/ larger garden			87%		83%		93%	

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Appendix Jb-9. Constituent loads measured for each storm event and summary data for the year

TOTAL LEAD - SUMMARY STATISTICS - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac		0.260	0.260	0.23	0.26	0.23	0.26	0.24	0.26
	inches	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac
08/06/99	1.29	111	43	15	31	17	25	5	15
08/12/99	0.70	85	65	15	38	7	16	1	6
08/15/99	1.23	178	158	29	44	42	40	13	32
08/19/99	0.90	154	113	16	39	25	33	7	21
08/22/99	2.95	178	271	83	394	149	162	94	163
09/11/99	0.84	97	94	11	88	2	11	4	11
09/18/99	0.85	50	77	1	18	0	1	0	0
09/25/99	1.37	112	104	95	116	31	38	11	26
10/03/99	1.22	52	45	19	95	15	29	4	16
10/04/99	0.98	21	16	3	9	1	11	0	0
11/01/99	1.63	75	155	58	125	20	37	4	16
12/17/99	0.75	40	24	0	4	0	0	0	0
01/06/00	0.79	97	189	14	110	3	34	1	3
01/24/00	0.68	43	49	0	32	0	5	0	0
01/31/00	0.70	112	96	3	177	0	7	0	0
06/13/00	1.29	1213	983	43	270	12	116	4	44
06/22/00	0.39	83	66	0	23	0	0	0	0
06/***/00	1.39	73	137	2	30	0	20	1	0
06/29/00	0.71	92	142	9	139	3	13	2	9
07/01/00	0.81	96	146	31	66	2	37	1	2
07/04/00	1.95	308	165	133	152	82	89	48	72
07/08/00	1.07	130	48	46	104	11	33	8	15
07/15/00	1.98	308	266	330	214	69	71	36	64
07/26/00	1.24	131	64	17	120	2	14	1	3
07/31/00	2.69	360	179	155	280	117	92	7	111
TOTALS	30.40	4201	3696	1129	2718	611	937	251	629

TOTAL LEAD - SUMMARY STATISTICS - YEAR TWO								
Total loads (mg/ac)	**4201**	**3696**	**1129**	**2718**	**611**	**937**	**251**	**629**
Average (two basins)(mg/ac)		**3949**		**1924**		**774**		**440**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
mg/ac-yr	**4201**	**3696**	**1129**	**2718**	**611**	**937**	**251**	**629**
g/ac-yr	4.201	**3.696**	1.129	**2.718**	0.611	**0.937**	0.251	**0.629**
g/ha-yr	10.38	**9.13**	2.79	**6.72**	1.51	**2.32**	0.62	**1.55**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (mg/ac-yr	6366	**5599**	1711	**4119**	926	**1420**	380	**953**
g/ac-yr	6.37	**5.60**	1.71	**4.12**	0.93	**1.42**	0.38	**0.95**
g/ha-yr	15.73	**13.84**	4.23	**10.18**	2.29	**3.51**	0.94	**2.35**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**26%**		**75%**		**83%**
Odd numbered basins w/ larger gardens			**73%**		**85%**		**94%**	

APPENDIX Ja-10 . Constituent loads measured for each storm event and summary data for the year

TOTAL MANGANESE - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac
08/05/98	0.57	448	458	35	166	10	127	7	16
08/06/98	0.68	206	193	37	121	37	77	12	29
08/07/98	1.30	328	326	90	294	62	132	43	48
08/09/98	2.47	1149	459	322	826	384	222	281	167
08/20/98	0.68	341	305	179	229	73	3	19	52
09/03/97	1.97	966	693	385	512	200	236	135	115
09/17/98	0.49	297	208	15	75	3	26	1	6
09/18/98	0.66	149	167	4	51	2	28	0	4
09/19/98	0.75	346	354	137	351	44	129	15	48
09/20/98	1.85	409	272	36	187	31	102	9	52
09/26/98	1.64	418	412	75	280	12	76	22	36
11/05/98	1.20	368	451	0	28	0	11	0	0
12/13/98	0.37	209	108	38	27	0	1	0	0
01/03/99	1.23	535	1230	223	579	87	176	89	114
01/23/99	2.60	1295	1609	398	562	424	284	151	96
03/14/99	0.82	888	1023	22	882	3	702	1	4
04/17/99	0.54	503	843	4	23	0	0	0	0
05/21/99	1.36	1890	2011	206	1362	87	1124	5	99
05/30/99	0.39	724	963	9	325	1	8	0	1
06/09/99	0.81	564	438	33	367	10	188	2	12
06/13/99	1.32	1341	821	111	725	52	363	58	98
06/16/99	1.68	685	614	130	542	111	498	72	119
06/17/99	0.77	301	465	0	145	25	106	0	23
06/18/99	1.60	425	608	125	253	21	323	56	95
07/01/99	1.53	595	305	62	256	40	141	9	43
07/07/99	0.81	308	283	23	156	9	66	1	10
07/09/99	1.17	465	98	81	221	2	125	191	48
07/14/99	1.58	389	453	8	160	5	22	1	3
07/20/99	0.88	446	322	22	133	7	48	1	35
TOTALS	**33.72**	**16987**	**16493**	**2811**	**9838**	**1743**	**5344**	**1182**	**1374**

TOTAL MANGANESE - SUMMARY STATISTICS -YEAR ONE

	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (mg/ac)	16987	**16493**	2811	**9838**	1743	**5344**	1182	**1374**
Average (two basins)(mg/ac)		**16740**		**6324**		**3544**		**1278**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
mg/ac-yr	16987	**16493**	2811	**9838**	1743	**5344**	1182	**1374**
g/ac-yr	17	**16**	3	**10**	2	**5**	1	**1**
g/ha-yr	42	**41**	7	**24**	4	**13**	3	**3**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (mg/ac-yr)	22062	**21420**	3650	**12777**	2264	**6940**	1534	**1784**
g/ac-yr	22	**21**	4	**13**	2	**7**	2	**2**
g/ha-yr	55	**53**	9	**32**	6	**17**	4	**4**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				40%		68%		92%
Odd numbered basins w/ larger garde			83%		90%		93%	

Appendix Jb-10. Constituent loads measured for each storm event and summary data for the year

TOTAL MANGANESE - SUMMARY STATISTICS - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac		0.260	0.260	0.23	0.26	0.23	0.26	0.24	0.26
	inches	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac
08/06/99	1.29	340	213	41	242	11	95	8	10
08/12/99	0.70	278	316	52	195	14	61	3	13
08/15/99	1.23	593	434	96	319	28	133	29	42
08/19/99	0.90	400	286	59	408	17	97	5	29
08/22/99	2.95	642	1447	165	1226	99	301	63	109
09/11/99	0.84	298	259	38	307	5	47	13	35
09/18/99	0.85	96	221	9	121	0	6	0	0
09/25/99	1.37	277	272	293	1198	88	138	29	56
10/03/99	1.22	272	210	114	404	48	128	6	29
10/04/99	0.98	80	77	8	43	4	21	0	0
11/01/99	1.63	412	536	194	825	100	149	14	36
12/17/99	0.75	79	84	0	17	0	1	0	0
01/06/00	0.79	251	531	47	574	8	84	2	10
01/24/00	0.68	281	167	0	200	0	34	0	0
01/31/00	0.70	229	249	8	534	0	31	0	0
06/13/00	1.29	3040	2534	39	119	68	453	11	66
06/22/00	0.39	204	147	2	54	0	2	1	0
06/***/00	1.39	213	373	8	134	1	84	2	1
06/29/00	0.71	340	390	31	310	10	46	6	25
07/01/00	0.81	240	229	45	119	4	31	1	6
07/04/00	1.95	998	645	443	485	230	233	128	146
07/08/00	1.07	493	334	134	312	27	110	23	52
07/15/00	1.98	998	918	837	849	157	270	129	148
07/26/00	1.24	393	220	58	337	6	46	2	22
07/31/00	2.69	1260	836	559	1021	405	307	219	293
TOTALS	**30.40**	**12707**	**11930**	**3283**	**10352**	**1330**	**2909**	**692**	**1127**

TOTAL MANGANESE - SUMMARY STATISTICS - YEAR TWO								
Total loads (mg/ac)	**12707**	**11930**	**3283**	**10352**	**1330**	**2909**	**692**	**1127**
Average (two basins)(mg/ac)		**12319**		**6818**		**2119**		**910**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
mg/ac-yr	**12707**	**11930**	**3283**	**10352**	**1330**	**2909**	**692**	**1127**
g/ac-yr	12.707	**11.930**	3.283	**10.352**	1.330	**2.909**	0.692	**1.127**
g/ha-yr	31.40	**29.48**	8.11	**25.58**	3.29	**7.19**	1.71	**2.78**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (mg/ac-yr	19254	**18076**	4974	**15686**	2015	**4407**	1049	**1707**
g/ac-yr	19.25	**18.08**	4.97	**15.69**	2.01	**4.41**	1.05	**1.71**
g/ha-yr	47.58	**44.67**	12.29	**38.76**	4.98	**10.89**	2.59	**4.22**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**13%**		**76%**		**91%**
Odd numbered basins w/ larger gardens			**74%**		**90%**		**95%**	

APPENDIX Ja-11 . Constituent loads measured for each storm event and summary data for the year

TOTAL ZINC - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac	mg/ac
08/05/98	0.57	2132	1815	203	518	115	721	47	135
08/06/98	0.68	541	482	213	284	199	372	81	184
08/07/98	1.30	1026	1994	339	1297	519	901	258	554
08/09/98	2.47	6385	2409	1558	2582	4608	2085	1918	2087
08/20/98	0.68	1762	1662	854	635	908	690	121	390
09/03/97	1.97	1985	3385	916	1600	1307	1472	810	1151
09/17/98	0.49	1200	800	86	235	30	125	5	51
09/18/98	0.66	413	404	24	159	28	207	0	37
09/19/98	0.75	1623	1538	389	1096	735	1338	95	657
09/20/98	1.85	731	638	233	453	361	587	121	388
09/26/98	1.64	1394	1375	403	841	618	1137	146	672
11/05/98	1.20	1710	2147	0	86	0	54	0	0
12/13/98	0.37	1036	409	164	84	2	3	0	0
01/03/99	1.23	1434	4241	1440	2897	768	1426	341	1200
01/23/99	2.60	5046	8046	2542	4686	1478	1647	836	1288
03/14/99	0.82	4676	3480	129	1466	37	803	8	32
04/17/99	0.54	2523	2893	24	73	0	0	0	0
05/21/99	1.36	6970	5207	943	2348	303	1047	35	298
05/30/99	0.39	1935	2312	53	463	15	38	0	4
06/09/99	0.81	2870	1753	126	388	115	282	12	103
06/13/99	1.32	9930	3494	1106	2870	655	1047	755	1467
06/16/99	1.68	2054	1565	725	1475	1383	1450	638	1179
06/17/99	0.77	765	612	0	362	342	443	0	251
06/18/99	1.60	1725	1766	935	1603	1062	2823	836	1356
07/01/99	1.53	2937	953	545	1323	460	587	116	359
07/07/99	0.81	1561	1050	131	488	103	316	8	87
07/09/99	1.17	1429	735	640	869	555	804	693	563
07/14/99	1.58	1619	1427	48	565	53	204	7	28
07/20/99	0.88	1165	723	127	416	86	226	8	98
TOTALS	**33.72**	**70577**	**59313**	**14894**	**32161**	**16844**	**22834**	**7895**	**14621**

TOTAL ZINC - SUMMARY STATISTICS -YEAR ONE

	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (mg/ac)	70577	**59313**	14894	**32161**	16844	**22834**	7895	**14621**
Average (two basins)(mg/ac)		**64945**		**23527**		**19839**		**11258**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
mg/ac-yr	70577	**59313**	14894	**32161**	16844	**22834**	7895	**14621**
g/ac-yr	71	**59**	15	**32**	17	**23**	8	**15**
g/ha-yr	174	**147**	37	**79**	42	**56**	20	**36**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (mg/ac-yr)	91658	**77030**	19343	**41767**	21875	**29655**	10253	**18988**
g/ac-yr	92	**77**	19	**42**	22	**30**	10	**19**
g/ha-yr	226	**190**	48	**103**	54	**73**	25	**47**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				46%		62%		75%
Odd numbered basins w/ larger garde			79%		76%		89%	

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Appendix Jb-11. Constituent loads measured for each storm event and summary data for the year

TOTAL ZINC - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	inches	0.260 mg/ac	0.260 mg/ac	0.23 mg/ac	0.26 mg/ac	0.23 mg/ac	0.26 mg/ac	0.24 mg/ac	0.26 mg/ac
08/06/99	1.29	1309	1152	413	834	166	677	52	151
08/12/99	0.70	1281	1303	209	508	197	434	27	168
08/15/99	1.23	1695	1172	770	1181	421	399	134	316
08/19/99	0.90	2104	2383	438	1033	255	884	181	214
08/22/99	2.95	1783	2279	2207	4249	1486	2305	2502	2195
09/11/99	0.84	806	1503	154	1255	32	301	110	301
09/18/99	0.85	180	621	30	335	0	13	0	0
09/25/99	1.37	399	486	1354	4435	836	1019	304	695
10/03/99	1.22	524	450	507	1291	149	290	38	156
10/04/99	0.98	215	161	34	251	27	298	0	0
11/01/99	1.63	0	0	0	0	0	0	0	0
12/17/99	0.75	837	376	0	57	0	7	0	0
01/06/00	0.79	1235	2098	191	2245	52	503	16	83
01/24/00	0.68	1503	784	0	697	0	196	0	0
01/31/00	0.70	1176	1269	34	1727	0	194	0	0
06/13/00	1.29	11101	8794	701	2913	338	1873	96	871
06/22/00	0.39	713	634	6	196	0	13	4	0
06/*/00**	1.39	172	250	31	456	3	83	5	4
06/29/00	0.71	839	1124	126	771	63	516	54	98
07/01/00	0.81	961	791	71	523	29	370	12	54
07/04/00	1.95	4405	1575	1476	2368	823	2381	481	555
07/08/00	1.07	1449	1285	467	867	106	880	75	149
07/15/00	1.98	4405	3993	3070	3501	1852	1895	959	972
07/26/00	1.24	1457	957	234	1124	39	145	20	114
07/31/00	2.69	5999	4202	777	1658	6234	4125	1520	16180
TOTALS	**30.40**	**46548**	**39642**	**13299**	**34472**	**13108**	**19804**	**6591**	**23277**

TOTAL ZINC - SUMMARY STATISTICS - YEAR TWO								
Total loads (mg/ac)	**46548**	**39642**	**13299**	**34472**	**13108**	**19804**	**6591**	**23277**
Average (two basins)(mg/ac)		**43095**		**23886**		**16456**		**14934**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
mg/ac-yr	**46548**	**39642**	**13299**	**34472**	**13108**	**19804**	**6591**	**23277**
g/ac-yr	46.548	**39.642**	13.299	**34.472**	13.108	**19.804**	6.591	**23.277**
g/ha-yr	115.02	**97.95**	32.86	**85.18**	32.39	**48.94**	16.29	**57.52**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (mg/ac-yr	70527	**60063**	20150	**52231**	19860	**30007**	9986	**35268**
g/ac-yr	70.53	**60.06**	20.15	**52.23**	19.86	**30.01**	9.99	**35.27**
g/ha-yr	174.27	**148.42**	49.79	**129.06**	49.07	**74.15**	24.68	**87.15**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**13%**		**50%**		**41%**
Odd numbered basins w/ larger gardens			**71%**		**72%**		**86%**	

APPENDIX Ja-12 . Constituent loads measured for each storm event and summary data for the year

TOTAL SUSPENDED SOLIDS - YEAR ONE

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	F2	ASPHALT W/SWALE F7	F8	CONCRETE W/SWALE F3	F4	POROUS W/SWALE F5	F6
Basin (ac	==>	0.26	0.26	0.23	0.26	0.23	0.26	0.24	0.26
Units	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/05/98	0.57	414	514	48	267	14	709	11	23
08/06/98	0.68	202	296	50	246	24	89	20	121
08/07/98	1.30	330	824	139	562	69	691	117	85
08/09/98	2.47	1319	1373	546	1330	703	398	624	150
08/20/98	0.68	355	325	150	596	83	164	29	78
09/03/97	1.97	865	190	417	1100	53	419	79	59
09/17/98	0.49	243	158	20	121	4	30	1	12
09/18/98	0.66	123	77	6	82	3	50	0	9
09/19/98	0.75	208	388	181	564	93	323	23	57
09/20/98	1.85	333	278	0	240	27	243	29	42
09/26/98	1.64	438	684	0	1533	22	367	35	84
11/05/98	1.20	561	375	0	44	0	13	0	0
12/13/98	0.37	114	116	12	43	0	1	0	0
01/03/99	1.23	1504	2318	129	1293	130	239	150	123
01/23/99	2.60	2520	5477	253	496	16	139	221	44
03/14/99	0.82	400	296	30	189	4	41	2	8
04/17/99	0.54	149	189	6	37	0	0	0	0
05/21/99	1.36	2810	3946	111	567	104	214	8	288
05/30/99	0.39	775	218	12	119	2	9	0	1
06/09/99	0.81	1102	557	44	208	14	76	3	25
06/13/99	1.32	2427	992	159	739	79	249	61	145
06/16/99	1.68	787	1029	188	896	92	182	89	135
06/17/99	0.77	414	748	59	187	25	45	20	65
06/18/99	1.60	614	530	705	320	123	145	119	151
07/01/99	1.53	692	221	96	251	75	106	28	132
07/07/99	0.81	298	291	31	281	12	57	2	21
07/09/99	1.17	370	228	77	179	22	94	50	167
07/14/99	1.58	314	786	11	161	6	20	2	7
07/20/99	0.88	475	296	30	214	10	54	2	35
TOTALS	**33.72**	**21157**	**23719**	**3512**	**12867**	**1811**	**5166**	**1724**	**2069**

TOTAL SUSPENDED SOLIDS - SUMMARY STATISTICS -YEAR ONE								
Total loads (g/ac)	21157	**23719**	3512	**12867**	1811	**5166**	1724	**2069**
Average (two basins)(g/ac)		**22438**		**8190**		**3488**		**1896**
TOTAL RAIN MEASURED FOR YEAR (1998-99) 39.24 INCHES; TOTAL WQ SAMPLED 33.72 INCHES								
g/ac-yr	21157	**23719**	3512	**12867**	1811	**5166**	1724	**2069**
kg/ac-yr	21	**24**	4	**13**	2	**5**	2	**2**
kg/ha-yr	52	**59**	9	**32**	4	**13**	4	**5**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
23% more (g/ac-yr)	27477	**30804**	4561	**16711**	2351	**6708**	2239	**2686**
kg/ac-yr	27	**31**	5	**17**	2	**7**	2	**3**
kg/ha-yr	68	**76**	11	**41**	6	**17**	6	**7**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				46%		78%		91%
Odd numbered basins w/ larger garden			83%		91%		92%	

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Appendix Jb-12. Constituent loads measured for each storm event and summary data for the year

TOTAL SUSPENDED SOLIDS - - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	ASPHALT WO/SWALE F2	ASPHALT W/SWALE F7	ASPHALT W/SWALE F8	CONCRETE W/SWALE F3	CONCRETE W/SWALE F4	POROUS W/SWALE F5	POROUS W/SWALE F6
Basin (ac		**0.260**	**0.260**	**0.23**	**0.26**	**0.23**	**0.26**	**0.24**	**0.26**
	inches	**g/ac**	**g/ac**	**g/ac**	**g/ac**	**g/ac**	**g/ac**	**g/ac**	**g/ac**
08/06/99	1.29	371.16	200.51	257.49	422.17	39.85	63.34	38.54	39.29
08/12/99	0.70	286.07	399.27	104.22	245.41	17.71	27.53	7.46	60.98
08/15/99	1.23	876.21	407.85	249.09	159.98	81.33	122.78	35.78	380.63
08/19/99	0.90	292.50	224.02	75.97	370.69	37.68	98.61	50.35	69.92
08/22/99	2.95	596.81	692.37	332.10	3376.55	214.01	643.33	172.64	504.79
09/11/99	0.84	379.63	220.58	76.64	736.96	4.21	34.14	30.46	109.29
09/18/99	0.85	126.04	55.05	18.39	146.94	0.00	3.35	0.00	0.00
09/25/99	1.37	214.65	145.17	440.12	399.17	60.22	83.60	38.01	78.52
10/03/99	1.22	304.41	65.42	249.07	310.63	35.65	75.79	27.97	213.24
10/04/99	0.98	218.40	125.95	16.86	154.13	3.54	33.89	0.00	0.00
11/01/99	1.63	477.02	455.86	390.84	732.11	59.50	134.60	19.02	79.82
12/17/99	0.75	159.44	73.53	0.00	20.10	0.00	1.24	0.00	0.00
01/06/00	0.79	365.61	572.70	95.03	797.67	6.86	38.09	4.35	30.09
01/24/00	0.68	190.99	115.08	0.00	85.78	0.00	14.84	0.00	0.00
01/31/00	0.70	224.21	148.97	16.86	163.51	0.00	22.01	0.00	0.00
06/13/00	1.29	3626.43	3363.44	848.86	515.36	12.18	328.06	26.73	183.78
06/22/00	0.39	294.98	262.72	3.07	26.81	0.00	1.48	1.24	0.00
06/*/00**	1.39	242.36	743.96	15.33	162.17	0.44	25.23	3.73	1.58
06/29/00	0.71	451.86	629.08	62.84	630.61	8.19	39.08	14.92	35.64
07/01/00	0.81	213.70	490.80	44.45	504.33	3.76	42.05	8.70	19.80
07/04/00	1.95	1119.39	1476.61	895.56	827.59	228.39	173.93	356.80	262.19
07/08/00	1.07	475.15	236.76	341.29	358.19	20.98	80.75	30.19	105.87
07/15/00	1.98	1119.39	781.30	1438.09	1393.83	109.99	386.62	245.14	584.17
07/26/00	1.24	343.84	187.33	116.49	824.31	5.09	43.78	5.59	27.72
07/31/00	2.69	2025.77	947.16	822.19	1286.61	428.56	384.02	496.35	1029.69
TOTALS	**30.40**	**14996.00**	**13021.49**	**6910.84**	**14651.60**	**1378.14**	**2902.16**	**1613.98**	**3817.02**

TOTAL SUSPENDED SOLIDS - SUMMARY STATISTICS - YEAR TWO

	F1	F2	F7	F8	F3	F4	F5	F6
Total loads (g/ac)	**14996**	**13021**	**6911**	**14652**	**1378**	**2902**	**1614**	**3817**
Average (two basins)(g/ac)		**14009**		**10781**		**2140**		**2715**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
g/ac-yr	**14996**	**13021**	**6911**	**14652**	**1378**	**2902**	**1614**	**3817**
kg/ac-yr	14.996	**13.021**	6.911	**14.652**	1.378	**2.902**	1.614	**3.817**
kg/ha-yr	37.06	**32.18**	17.08	**36.20**	3.41	**7.17**	3.99	**9.43**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (g/ac-yr)	22721.21	**19729.53**	10470.97	**22199.40**	2088.10	**4397.21**	2445.42	**5783.36**
kg/ac-yr	22.72	**19.73**	10.47	**22.20**	2.09	**4.40**	2.45	**5.78**
kg/ha-yr	56.14	**48.75**	25.87	**54.85**	5.16	**10.87**	6.04	**14.29**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**-13%**		**78%**		**71%**
Odd numbered basins w/ larger gardens			**54%**		**91%**		**89%**	

Appendix J-3. Constituent loads measured for each storm event and summary data for the year

NITRITE - YEAR TWO

DATE	RAIN AMOUNT	ASPHALT WO/SWALE F1	ASPHALT WO/SWALE F2	ASPHALT W/SWALE F7	ASPHALT W/SWALE F8	CONCRETE W/SWALE F3	CONCRETE W/SWALE F4	POROUS W/SWALE F5	POROUS W/SWALE F6
Basin (ac		0.260	0.260	0.23	0.26	0.23	0.26	0.24	0.26
	inches	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac	g/ac
08/06/99	1.29	0.16	0.14	0.05	0.10	0.06	0.08	0.06	0.05
08/12/99	0.70	0.11	0.08	0.07	0.06	0.02	0.05	0.01	0.02
08/15/99	1.23	0.85	0.47	0.27	0.53	0.50	0.53	0.16	0.42
08/19/99	0.90	0.56	0.54	0.18	0.41	0.41	0.53	0.12	0.34
08/22/99	2.95	0.59	0.50	0.28	3.13	0.50	1.77	0.31	0.54
09/11/99	0.84	0.48	0.60	0.05	0.33	0.02	0.33	0.05	0.15
09/18/99	0.85	0.06	0.05	0.00	0.02	0.00	0.00	0.00	0.00
09/25/99	1.37	0.13	0.16	0.11	0.14	0.10	0.13	0.04	0.09
10/03/99	1.22	0.17	0.15	0.06	0.11	0.05	0.10	0.04	0.05
10/04/99	0.98	0.07	0.05	0.01	0.03	0.02	0.04	0.00	0.00
11/01/99	1.63	0.25	na	0.25	0.31	0.13	0.40	0.03	0.17
12/17/99	0.75	0.05	0.03	0.00	0.01	0.00	0.01	0.00	0.00
01/06/00	0.79	0.32	0.56	0.06	0.37	0.03	0.40	0.01	0.04
01/24/00	0.68	0.25	0.20	0.00	0.02	0.00	0.04	0.00	0.00
01/31/00	0.70	0.29	0.23	0.01	0.13	0.00	1.36	0.00	0.00
06/13/00	1.29	1.02	1.20	0.10	0.40	0.13	0.56	0.05	0.26
06/22/00	0.39	0.11	0.03	0.00	0.02	0.00	0.01	0.00	0.00
06/***/00	1.39	0.27	0.47	0.01	0.12	0.00	0.26	0.02	0.00
06/29/00	0.71	0.38	0.30	0.04	0.13	0.04	0.24	0.03	0.08
07/01/00	0.81	0.34	0.43	0.03	0.21	0.02	0.22	0.02	0.03
07/04/00	1.95	1.17	2.13	0.66	1.78	1.10	1.67	0.51	0.74
07/08/00	1.07	0.51	0.58	na	na	0.14	0.53	0.14	0.18
07/15/00	1.98	na	na	0.61	1.08	0.93	1.52	0.43	0.70
07/26/00	1.24	0.39	18.86	0.07	10.12	0.03	6.88	0.01	0.04
07/31/00	2.69	2.60	2.10	1.24	2.81	2.18	2.21	0.43	1.31
TOTALS	**30.40**	**11.16**	**29.87**	**4.18**	**22.39**	**6.41**	**19.86**	**2.47**	**5.21**

NITRITE - SUMMARY STATISTICS - YEAR TWO								
Total loads (g/ac)	**11.16**	**29.87**	**4.18**	**22.39**	**6.41**	**19.86**	**2.47**	**5.21**
Average (two basins)(g/ac)		**20.51**		**13.28**		**13.13**		**3.84**
TOTAL RAIN MEASURED FOR YEAR (1999-2000) 33.98 INCHES; TOTAL WITH WQ SAMPLES 30.40NCHES								
g/ac-yr	**11.16**	**29.87**	**4.18**	**22.39**	**6.41**	**19.86**	**2.47**	**5.21**
kg/ac-yr	0.011	**0.030**	0.004	**0.022**	0.006	**0.020**	0.002	**0.005**
kg/ha-yr	0.03	**0.07**	0.01	**0.06**	0.02	**0.05**	0.01	**0.01**
ADJUSTED FOR NORMAL RAINFALL YEAR OF 51 INCHES OF RAIN								
33% more (g/ac-yr)	16.91	**45.25**	6.33	**33.92**	9.71	**30.09**	3.75	**7.90**
kg/ac-yr	0.02	**0.05**	0.01	**0.03**	0.01	**0.03**	0.00	**0.01**
kg/ha-yr	0.04	**0.11**	0.02	**0.08**	0.02	**0.07**	0.01	**0.02**
LOAD EFFICIENCY (% REDUCTION) COMPARED TO NOT HAVING A SWALE								
Even numbered basins (0.26 acres)				**25%**		**34%**		**83%**
Odd numbered basins w/ larger gardens			**63%**		**43%**		**78%**	

APPENDIX K

SEDIMENT DATA FOR FLORIDA AQUARIUM PARKING LOT STUDY
DATA ARE IN TABLE FORMAT

Appendix K-1. Sediment samples for basins in the parking lot paved with asphalt without swale (F1, F2) and asphalt with swale (F7, F8). Abbreviations include -1=first inch of sediments (or available sediment for F1 and F2), -4=4 to 5inch depth, B=sediments in drop box, D=duplicate sample

November 1998

CONSTITUENT		F1-1	F1-B	F2-1	F2-B	F7-1	F7-4	F7-B	F8-1	F8-1d	F8-4	F8-B
SEMI-VOLATILE ORGANIC POLLUTANTS - SEDIMENT												
Acenaphthene	ug/kg	— U	— U	— U	— U	— U	68 I	— U	— U	— U	610 I	— U
Anthracene	ug/kg	— U	— U	— U	— U	— U	— U	— U	— U	— U	1400 I	— U
Benzo(a)anthracene	ug/kg	670 I	— U	— U	— U	290	210 I	— U	540 I	770 I	1100 I	— U
Benzo(a)pyrene	ug/kg	900 I	— U	440 I	— U	380	280	— U	640 I	730 I	1700	— U
Benzo(b)fluoranthene	ug/kg	2100	— U	960 I	— U	940	470	— U	1400 I	1000 I	700 I	— U
Benzo(k)fluoranthene	ug/kg	730 I	— U	— U	— U	290	140 I	— U	450 I	440 I	— U	— U
Benzo(g,h,i)perylene	ug/kg	— U	— U	— U	— U	110 I	160 I	— U	— U	450 I	— U	— U
Bis(2-ethylhexyl)phtha	ug/kg	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U
Butyl benzyl phthalate	ug/kg	— U	— U	— U	7100	77 I	— U	— U	— U	— U	— U	3100
Chrysene	ug/kg	1300 I	— U	580 I	— U	470	230 I	— U	790 I	760 I	1400 I	— U
Di-n-octyl phthalate	ug/kg	— U	— U	— U	— U	100 I	— U	— U	— U	— U	— U	— U
Fluoranthene	ug/kg	1900	— U	960 I	— U	640	330	— U	1500	1700	3000	980 I
Fluorene	ug/kg	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U
Indeno(1,2,3-cd)pyren	ug/kg	— U	— U	— U	— U	110 I	160 I	— U	— U	410 I	— U	— U
Phenanthrene	ug/kg	770 I	— U	380 I	— U	310	150 I	— U	660 I	1100 I	2300	— U
Pyrene	ug/kg	1900	— U	750 I	— U	670	310	— U	1100 I	1200 I	2200	770 I
METALS, TOTAL RECOVERABLE - SEDIMENT												
Aluminum_308	mg/kg	3590	1110	4300	2940	4650	1050 A	1650	3410	1610	1680	1870
Cadmium	mg/kg	1	0.24 I	0.6 I	0.56 I	2.2	0.24 I	0.46 I	0.59 I	0.48 I	0.47 I	0.48 I
Chromium	mg/kg	12.8	3.45	13.4	10	30	5.79 A	9.44	11.1	8.19	8.56	13.2
Copper	mg/kg	92.3	14.2	38.1	24.5	81.4	2.45 A	22	86.1	7.36	7.64	43.4
Iron_271	mg/kg	8940	2170	7970	6670	10500	658 A	2180	6730	1170 *	1070 *	4330
Lead	mg/kg	21.8 J	5.6	17 J	14	28.8 J*	5.3 A	12	21.9 J*	14 J	12	16
Manganese	mg/kg	179	46.3	186	175	290	14.1 A	46.4	145	18.8	25.6	64.4
Nickel	mg/kg	12	2 U	9.3	5.5 I	8.3	2 U	2.9 I	7.6 I	2 U	2.4 I	7.2 I
Zinc	mg/kg	248	57.6 J*	200 *	129 J*	258	30.4 J*	71.3 J*	171	52.9 *	47.6 J*	131 J*
ORGANONITROGEN AND PHOSPHORUS PESTICIDES - SEDIMENT												
Chlorpyrifos Ethyl	ug/kg	— U*	— U	— U*	6.7 I	— U*	— U	— U	— U	— U	— U	— U
Diazanon	ug/kg	— U*	— U	41.0 I*	41.0	— U*	— U	— U	— U	— U	— U	16.0
Parathion Methyl	ug/kg	— U*	— U	— U*	— U	— U*	— U	— U	— U	— U	— U	— U
ORGANOCHLORINE PESTICIDES-SOIL												
Aldrin	ug/kg	— *	— U	— *	— U	— U*	— U	— U	*	26.0 N*	*	
Chlordane	ug/kg	16.0 I	— U	14.0 I	15.0	17.0 I	— U	12.0 I	15.0 I	22.0 I	26.0 I	17.0 I
DDD-p,p'	ug/kg	— U	— U	— U	U	— U	— U	— U	— U	— U	— U	— U
DDE-p,p'	ug/kg	1.0 I	— U	— U	U	— U	— U	— U	0.7 I	1.7 I	— U	— U
DDT-p,p'	ug/kg	— U	— U	— U	1.8 I	— U	— U	— U	— U	— U	— U	— U
Dieldrin	ug/kg	— U	5.9	— U	3.0 J*	— U	3.9	7.8	— U	— U	41.0	3.3 J*
Endosulfan Sulfate	ug/kg	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U
PCB-1248	ug/kg	— U	— U	— U	— U	— U	— U	— U	8.6 I	— U	— U	— U
PCB-1260	ug/kg	— U	— U	— U	U	— U	— U	— U	— U	15.0 I	14.0 I	— U
TOTAL KJELDAHL NITROGEN - SOIL												
TKN	mg/kg	380.0	140.0	610.0	550.0	1600	190.0	860.0	440.0	940.0	780.0	580.0
TOTAL PHOSPHOROUS - SOIL												
Total - P	mg/kg	420.0	240.0 *	410.0 *	490.0	550.0 J*	450.0 A	560.0	360.0 J*	980.0	580.0 *	340.0

Key: A=Value reported is the mean of two or more determinations. I= Value reported is less than the minimum quantitation limit, and greater or equal to the minimum detection limit. J=Estimated value. N=Presumptive evidence of presence of material. U=Material analyzed but not detected. *=Had a laboratory comment.

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Appendix K-2. Sediment samples for basins in the parking lot pav ed with cement (F3 - F4) or permeable pav ing (F5 - F6). Other abbreviations include: -1=first inch of sediments, -4=4 to 5 inch depth, B =sediments in drop box, d=duplicate sample.
November 1998

CONSTITUENT		F3-1	F3-4	F3-B	F4-1	F4-4	F4-B	F5-1	F5-4	5-4d	F5-B	F6-1	F6-4	6-4d	F6-B
SEMI-VOLATILE ORGANIC POLLUTANTS - SEDIMENT															
Acenaphthene	ug/kg	— U	— U	390 I	— U	— U	480 I	— U	— U	— U	— U	— U	— U	— U	— U
Anthracene	ug/kg	— U	— U	600 I	— U	— U	830 I	— U	— U	— U	— U	— U	— U	— U	— U
Benzo(a)anthracene	ug/kg	— U	730 I	1200 I	710 I	400 I	1800	— U	350 I	430 I	89 I	— U	— U	— U	— U
Benzo(a)pyrene	ug/kg	380 I	670 I	1000 I	700 I	430 I	1600	— U	400 I	470 I	99 I	— U	— U	— U	— U
Benzo(b)fluoranthene	ug/kg	730 I	1000 I	1700	1200 I	1000 I	2800	520 I	590 I	700 I	170 I	400 I	460 I	500 I	— U
Benzo(k)fluoranthene	ug/kg	— U	360 I	510 I	420 I	— U	840 I	— U	390 I	400 I	— U	— U	360 I	380 I	— U
Benzo(g,h,i)perylene	ug/kg	— U	— U	— U	— U	420 I	440 I	— U	— U	— U	— U	— U	— U	— U	— U
Bis(2-ethylhexyl)phthala	ug/kg	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U
Butyl benzyl phthalate	ug/kg	— U	— U	460 I	— U	— U	5200	— U	— U	— U	— U	— U	— U	— U	— U
Chrysene	ug/kg	— U	740 I	1200 I	750 I	480 I	1800	— U	380 I	450 I	100 I	— U	— U	350 I	— U
Di-n-octyl phthalate	ug/kg	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U
Fluoranthene	ug/kg	— U	1600	3000	1700	820 I	4400	580 I	670 I	780 I	170 I	— U	610 I	680 I	770 I
Fluorene	ug/kg	— U	— U	— U	— U	— U	390 I	— U	— U	— U	— U	— U	— U	— U	— U
Indeno(1,2,3-cd)pyrene	ug/kg	— U	— U	470 I	— U	340 I	510 I	— U	— U	— U	— U	— U	— U	— U	— U
Phenanthrene	ug/kg	340 I	1300 I	2500	1000 I	340 I	3500	— U	— U	340 I	— U	470 I	360 I	420 I	— U
Pyrene	ug/kg	620 I	1200 I	2000	1300	760 I	3300	490 I	550 I	660 I	150 I	370 I	500 I	550 I	— U
METALS, TOTAL RECOVERABLE - SEDIMENT															
Aluminum_308	mg/kg	1250	1330	1410	1670	3310	2330	1450	2050	2900	1300	1670	2530	2430	2440
Cadmium	mg/kg	0.4 I	0.34 I	0.44 I	0.34 I	0.43 I	0.59 I	0.43 I	0.37 I	0.4 I	0.39 I	0.37 I	0.53 I	0.4	0.8
Chromium	mg/kg	7.42	6.31	12.7	8.08	12.7	10.6	10.4	8.66	11.7	6.62	7.85	13.7	10.1	8.99
Copper	mg/kg	22.2	5.53	19.7	17.4	6.22	27.1	22.6	6.29	5.39	7.29	11.7	14.4	5.75	22.2
Iron_271	mg/kg	1440	1140	4960	1320	2660	3620	1400	1350	1550	1340	1430	7400	1790	4010
Lead	mg/kg	15	14 J*	18 J*	12	16 J*	17 J*	16	21	20.8	11	16	23	23.9	15
Manganese	mg/kg	27.8	21.1	53.8	21.5	23.1	99.1	28.2	25.7	25.1	38.7	31.2	49.3	20.4	79.6
Nickel	mg/kg	2.1 I	2 U	6.4 I	2.1 I	2.3 I	4.5 I	4 I	2 I	2.2 I	2 U	2.2 I	4.6 I	2.6 I	5.3 I
Zinc	mg/kg	76.4 J*	35.5	43.3	59.4 J*	39.9	121	115 J*	64.9 J*	47.6 J*	42.6 J*	80.4 J*	44.6 J*	43.3 J*	130 J*
ORGANONITROGEN AND PHOSPHORUS PESTICIDES - SEDIMENT															
Chlorpyrifos Ethyl	ug/kg	— U	— U	— U	— U	— U	8.3 N*	— U	— U	— U	— U	— U	— U	— U	— U
Diazanon	ug/kg	— U	— U	— U	— U	— U	12.0 N*	— U	— U	— U	— U	— U	— U	— U	25.0
Parathion Methyl	ug/kg	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U
ORGANOCHLORINE PESTICIDES-SOIL															
Aldrin	ug/kg	— *	— *	— *	— *	— *	*	— U	— U	— U	— U	— U	— U	— U	— U
Chlordane	ug/kg	— U	— U	— U	6.5 I	— U	13.0 I	9.7 I	— U	— U	— U	13.0 I	— U	— U	25.0 I
DDD-p,p'	ug/kg	— U	— U	— U	— U	— U	— U	1.2 I	7.1	4.7	— U	— U	1.3 I	— U	1.0 I
DDE-p,p'	ug/kg	7.4	4.2	4.0	— U	— U	0.8 I	5.9	36.0	30.0	2.3 I	1.8 I	3.0 I	2.2 I	1.4 I
DDT-p,p'	ug/kg	6.0	4.7	— U	— U	— U	— U	2.6 I	17.0	12.0	— U	1.9 I	3.1 I	2.0 I	— U
Dieldrin	ug/kg	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	2.9 J*
Endosulfan Sulfate	ug/kg	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	8.6 U*
PCB-1248	ug/kg	— U	— U	81.0	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U	— U
PCB-1260	ug/kg	16.0 I	16.0 I	16.0 I	— U	12.0 I	13.0 I	— U	25.0 I	23.0 I	— U	— U	— U	— U	13.0 I
TOTAL KJELDAHL NITROGEN - SOIL															
TKN	g/kg	2000	690	170	1300	750	550	2000	470	510	350	2200	680	700	520
TOTAL PHOSPHOROUS - SOIL															
Total - P	g/kg	730	910	870	540	650	900 J*	700	570 *	800 J*	670 J	1700 J*	900 *	1200 J*	470

Key: A=Value reported is the mean of two or more determinations. I= Value reported is less than the minimum quantitation limit, and greater or equal to the minimum detection limit. J=Estimated value. N=Presumptive evidence of presence of material. U=Material

Appendix K-3. Sediment samples for the strand and pond used for additional treatment for parking lot runoff.
See Appendix k-1 for abbreviations

November 1998

CONSTITUENT		S9-1		S9-4		S10-1		S10-4		S10-4d		P11-1		P11-4		P12-1		P12-1d		P12-4	
SEMI-VOLATILE ORGANIC POLLUTANTS - SEDIMENT																					
Acenaphthene	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
Anthracene	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
Benzo(a)anthracene	ug/kg	—	U	—	U	72	I	1300	I	770	I	1100	I	420	I	180	I	280	I	—	U
Benzo(a)pyrene	ug/kg	—	U	—	U	84	I	1300	I	760	I	1200	I	420	I	220	I	380	I	—	U
Benzo(b)fluoranthene	ug/kg	190	I	—	U	160	I	2300		1200	I	3300		770	I	380	I	650	I	520	I
Benzo(k)fluoranthene	ug/kg	—	U	—	U	—	U	630	I	410	I	990	I	—	U	—	U	220	I	—	U
Benzo(g,h,i)perylene	ug/kg	—	U	—	U	—	U	300	I	—	U	—	U	—	U	—	U	170	I	—	U
Bis(2-ethylhexyl)phthalat	ug/kg	—	U	—	U	9200	*	—	U	—	U	—	U	—	U	—	U	—	U	—	U
Butyl benzyl phthalate	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
Chrysene	ug/kg	—	U	—	U	92		1400		770	I	1300	I	470	I	210	I	320	I	—	U
Di-n-octyl phthalate	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
Fluoranthene	ug/kg	—	U	450	I	120	I	2600		1400		2800		1100	I	400	I	580	I	460	I
Fluorene	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
Indeno(1,2,3-cd)pyrene	ug/kg	—	U	—	U	—	U	590	I	—	U	440	I	—	U	—	U	—	U	—	U
Phenanthrene	ug/kg	—	U	—	U	—	U	770	I	910	I	1700	I	820	I	200	I	340	I	—	U
Pyrene	ug/kg	—	U	—	U	110	I	2400		1200	I	2100		800	I	360	I	520	I	400	I
METALS, TOTAL RECOVERABLE - SEDIMENT																					
Aluminum_308	mg/kg	9530		18900		8190	A	3270		3730	A	2990		2240		1780		2620		2260	
Cadmium	mg/kg	0.45	I	0.41	I	0.39	I	0.72	I	0.77	I	0.52	I	0.56	I	0.38	I	0.6	I	0.56	I
Chromium	mg/kg	41.7		45.1		40.8	A	16.2		17.6	A	12.7		9.67		7.96		12.9		9.67	
Copper	mg/kg	6.84		3.84		25.3	A	17.4		15.9	A	103		12.5		60.9		9.45		11.1	
Iron_271	mg/kg	6560		5090		5750	A	4920		3870	A	3190		3130		1720		2420		2980	
Lead	mg/kg	12		11	J	8.9	A	27.6	J*	27.9	J*	22.8		17	J*	15		19	J*	20.6	J*
Manganese	mg/kg	16.8		16.4		17.9	A	43.8		38.9	A	36.7		32.1		18.7		27.4		28.1	
Nickel	mg/kg	2.5	I	2.6	I	2.2	I	3.6	I	3.7	I	3	I	2.4	I	2	U	2.7	I	2.1	I
Zinc	mg/kg	20.9	I	33.1		41.4	J*	54.3		52.3	A	67.3	J*	52.4		38.6	I*	38.5		49.2	
ORGANONITROGEN AND PHOSPHORUS PESTICIDES - SEDIMENT																					
Chlorpyrifos Ethyl	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
Diazanon	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
Parathion Methyl	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	15.0	N*	—	U	—	U	—	U
ORGANOCHLORINE PESTICIDES-SOIL																					
Aldrin	ug/kg	—	U	—	U	—	U*	—	U*	—	U	—	U*	—	U*	—	U	—	U*	—	U*
Chlordane	ug/kg	7.4	I	6.5	I	—	U	41.0		51.0		—	U	—	U	7.6	I	7.6	I	8.2	I
DDD-p,p'	ug/kg	—	U	—	U	—	U	2.5	I	4.6		—	U	—	U	—	U	—	U	—	U
DDE-p,p'	ug/kg	8.8		1.8	I	—	U	17.0		15.0		7.7	J*	12.0		4.6		4.3	I	5.3	
DDT-p,p'	ug/kg	5.7		3.1	I	—	U	17.0		20.0		—	U	—	U	—	U	—	U	—	U
Dieldrin	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
Endosulfan Sulfate	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
PCB-1248	ug/kg	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U	—	U
PCB-1260	ug/kg	—	U	—	U	—	U	23.0	I	—	U	17.0	I	13.0	I	22.0	I	17.0	I	13.0	I
TOTAL KJELDAHL NITROGEN - SOIL																					
TKN	mg/kg	350.0		250.0		590.0	A	860.0		810.0	A	500.0		240.0		480.0		260.0	J*	220.0	
TOTAL PHOSPHOROUS - SOIL																					
Total - P	mg/kg	4000		920		4300		6600	J*	4400	J*	1600		1300		3700	J*	7000	J*	3100	J*

Key: A=Value reported is the mean of two or more determinations. I= Value reported is less than the minimum quantitation limit, and greater or equal to the minimum detection limit. J=Estimated value. N=Presumptive evidence of presence of material. U=Material analyzed but not detected. *=See comment page at the end of this section.

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Appendix K-4. Water quality samples taken at the same time as the sediment samples (Nov. 1998)

CONSTITUENT	UNITS	F1-B	F5-B	F5-Bd	F7-B	P11	P12	P12d
CADMIUM	ug/L (ppb)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
COPPER	ug/L (ppb)	7.3	4.1	3.0	10.9	14.8	9.9	9.3
IRON	ug/L (ppb)	180	330	410	640	390	270	240
LEAD	ug/L (ppb)	2.9	<2	2.0	5.1	<2	<2	<2
MANGANESE	ug/L (ppb)	16.7	171.0	171.0	19.6	178.0	91.2	14.4
ZINC	mg/L (ppm	50	30	40	60	<30	<30	<30
TSS	mg/L	4.49	10.07	14.08	12.26	7.98	4.50	3.67
TOTAL PHOSPHORU	mg/L as P	0.12	0.17	0.02	0.13	0.11	0.13	0.12
ORTHO PHOSPHOR.	mg/L (ppm	0.08	0.15	0.14	0.07	0.01	0.04	0.06
NITROGEN, TOTAL	mg/L as N	0.8	1.6	1.4	0.7	1.9	2.0	1.6
AMMONIA	mg/L as N	<.01	0.08	0.01	<.01	<.01	<.01	<.01
NITRATE	mg/L as N	0.03	0.02	0.02	0.03	0.01	<.01	<.01
NITRITE	mg/L as N	0.01	<.01	<.01	0.01	<.01	<.01	<.01
ORG. NITROGEN								
CHLORIDE	mg/L (ppm	5.0	10.2	10.3	4.6	46.2	41.5	41.1
POTASSIUM	mg/L (ppm	3.3	10.7	10.7	2.9	28.8	27.7	27.2
SODIUM	mg/L (ppm	7.6	24.9	24.9	7.2	36.2	35.7	35.2
SULFATE	mg/L (ppm	22.3	67.7	67.5	18.6	274.0	269.0	266.0
CALCIUM	mg/L (ppm	35.60	90.50	89.50	33.20	107.00	110.00	108.00
MAGNESIUM	mg/L (ppm	2.19	11.40	11.60	1.99	15.00	14.80	14.40
HARDNESS	mg/L as C	97.90	272.97	271.25	91.10	328.95	335.62	328.98

Appendix K-5. Sediment samples for basins in the parking lot paved with asphalt without swale (F1, F2) and asphalt with swale (F7, F8). Abbreviations include -1=first inch of sediments (or available sediment for F1 and F2), -4=4 to 5inch depth, B=sediments in drop box, D =duplicate sample

OCTOBER 2000

CONSTITUENT		F1-1	F2-1	F7-1	F7-4	F8-1	F8-4
SEMI-VOLATILE ORGANIC							
Acenaphthene	ug/kg	–	–	–	–	–	110
Acenaphthylene	ug/kg	–	–	–	–	–	82 I
Anthracene	ug/kg	–	–	–	–	–	310
Benzo(a)anthracene	ug/kg	–	1100 I	–	–	–	840
Benzo(a)pyrene	ug/kg	–	1800 I	–	–	–	750
Benzo(b)fluoranthene	ug/kg	–	3900	810 I	–	1200 I	1300
Benzo(k)fluoranthene	ug/kg	–	1300 I	–	–	–	480.0
Benzo(g,h,i)perylene	ug/kg	–	890 I	–	–	–	300.0
Bis(2-ethylhexyl)phthalate	ug/kg	–	–	–	–	–	–
Butyl benzyl phthalate	ug/kg	–	–	–	–	–	–
Chrysene	ug/kg	–	2300 I	–	–	740 I	880
Di-n-octyl phthalate	ug/kg	–	–	–	–	–	–
Dibenzo(a,h)anthracene		–	–	–	–	–	97.0 I
Diethyl phthalate	ug/kg	–	–	–	–	–	–
Fluoranthene	ug/kg	–	3800	–	–	1300 I	180
Fluorene	ug/kg	–	–	–	–	–	150.0 I
Indeno(1,2,3-cd)pyrene	ug/kg	–	880 I	–	–	–	290.0
Phenanthrene	ug/kg	–	1500 I	–	–	–	1300
Pyrene	ug/kg	–	4000 I	790 J	–	1100 J	1700 J
METALS							
Aluminum_308	mg/kg	3600	6030	2210	953	3490	1750 A
Cadmium	mg/kg	0.82	1.4	1.2	0.36 I	0.91	0.59 I
Chromium	mg/kg	7.8	20.1	22.9	6.8	8.8	8.8 A
Copper	mg/kg	41.5	94.1	54.7	9.7	47.7	8.9 A
Iron_271	mg/kg	7130	10900	3840	919	7010	1450 A
Lead	mg/kg	12.6	40.8	22.2	7.1	23	16.7 A
Manganese	mg/kg	174.0	319.0	104.0	22.9	195.0	26.2 A
Nickel	mg/kg	9.3	18.0	5.4 I	1.9 U	6.8 I	2.5 I
Zinc	mg/kg	150.0	400.0	181.0	28.0 I	170.0	46.1 A
PESTICIDES							
Chlorpyrifos Ethyl	ug/kg	–	–	–	–	–	–
Diazanon	ug/kg	–	–	–	–	–	–
Parathion Methyl	ug/kg	–	–	–	–	–	9.6 I
Aldrin	ug/kg	–	0.58 I	0.67 I	–	1.30 I	15.00
Chlordane	ug/kg	11.0 I	34.0	35.0 I	9.6	26.0 I	25.0 I
DDD-p,p'	ug/kg	–	–	–	–	–	–
DDE-p,p'	ug/kg	0.8 I	2.2 I	1.6 I	–	1.4 I	2.9 I
DDT-p,p'	ug/kg	1.5 I	–	4.1	–	2.5 I	2.0 I
Dieldrin	ug/kg	–	–	–	–	–	91.00 N
Endosulfan Sulfate	ug/kg	6.50 J	8.70 J	–	–	10.00 J	–
Endrin Aldehyde	ug/kg						
Methoxychlor	ug/kg						
PCB-1248	ug/kg	–	–	–	–	–	–
PCB-1260	ug/kg	–	–	–	–	–	–
TOTAL KJELDAHL N							
TKN	mg/kg	200 J	1200 J	2300 J	750 J	2000 J	690 J
TOTAL PHOSPHOROUS							
Total - P	mg/kg	390 J	1200 J	620 J	760 J	420 J	690 J

Key: A=Value reported is the mean of two or more determinations. I= Value reported is less than the minimum quantitation limit, and greater or equal to the minimum detection limit. J=Estimated value. N=Presumptive evidence of presence of material. U=Material analyzed but not detected. *=See comment page at the end of this section.

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Appendix K-6. Sediment samples for basins in the parking lot paved with cement (F3 - F4) or permeable paving (F5 - F6). Other abbreviations include: -1=first inch of sediments, -4=4 to 5 inch depth, B=sediments in drop box, d=duplicate sample.

OCTOBER 2000

CONSTITUENT		F3-1		F3-4		F4-1		F4-4		F5-1		F5-4		F6-1		F6-1D		F6-4		F6-4d	
Acenaphthene	ug/kg	–		–		–		–		–		–		–		–		–		–	
Acenaphthylene	ug/kg	–		–		–		–		–		–		–		–		–		–	
Anthracene	ug/kg	–		–		340.0	I	–		–		–		–		–		–		–	
Benzo(a)anthracene	ug/kg	340	I	410	I	780.0	I	–		750.0	I	520	I	–		–		–		350.0	I
Benzo(a)pyrene	ug/kg	590	I	380	I	660.0	I	–		850.0	I	400	I	–		–		–		–	
Benzo(b)fluoranthene	ug/kg	–		570	I	1000	I	440.0	I	1600	I	640	I	610	I	510	I	400	I	480	I
Benzo(k)fluoranthene	ug/kg	–		–		320.0	I	–		–		–		–		–		–		–	
Benzo(g,h,i)perylene	ug/kg	–		–		350.0	I	–		730.0	I	–		–		–		–		–	
Bis(2-ethylhexyl)phthalat	ug/kg	–		–		–		4900	I	–		–		–		–		–		–	
Butyl benzyl phthalate	ug/kg	–		–		–		–		–		–		–		–		–		–	
Chrysene	ug/kg	440	I	450	I	720.0	I	–		1300	I	540	I	470.0	I	390.0	I	330	I	370	I
Di-n-octyl phthalate	ug/kg	–		–		–		–		–		–		–		–		–		–	
Dibenzo(a,h)anthracene		–		–		–		–		–		–		–		–		–		–	
Diethyl phthalate	ug/kg	–		320	I	–		–		–		–		–		–		–		–	
Fluoranthene	ug/kg	630	I	670	I	1500		450.0	I	1700	I	760	I	620.0	I	510.0	I	420	I	610	I
Fluorene	ug/kg	–		–		–		–		–		–		–		–		–		–	
Indeno(1,2,3-cd)pyrene	ug/kg	–		–		340.0	I	–		–		–		–		–		–		–	
Phenanthrene	ug/kg	–		–		1300		–		720.0	I	360	I	–		–		–		–	
Pyrene	ug/kg	740	I	720	I	1400		430.0	I	1800	I	950	I	650	I	550	I	520	I	630	I
METALS																					
Aluminum_308	mg/kg	1130	J	1320	J	1620	AJ	2400	J	4060	J	1710	J	1560	J	2200	J	2600	J	1530	J
Cadmium	mg/kg	0.52	I	0.44	I	0.31	I	0.62	I	1		0.45	I	0.64	I	0.61	I	0.52	I	0.56	I
Chromium	mg/kg	7.3		6.6		8.9	A	9.1		45.9		10.7		15.6		13.5		10.3		7.2	
Copper	mg/kg	28.4		6.4		15.0	A	8.3		111.0		6.5		38.2		41.5		6.9		5.2	
Iron_271	mg/kg	2220		1610		1320	A	22500		4960		1430		1830		2040		1450		1430	
Lead	mg/kg	17	J	22.1	J	14	AJ	30.2	J	42.7	J	26.9	J	22.7	J	22.5	J	13.3	J	19.7	J
Manganese	mg/kg	35.1		33.4		22.4	A	36.3		94.0		28.0		50.3		52.4		20.4		21.0	
Nickel	mg/kg	2.5	I	1.9	U	2.2	I	1.8	U	13.9		2.4	I	3.8	I	4.4	I	1.9	U	1.9	U
Zinc	mg/kg	146.0	J	50.2	J	68.6	AJ	35.7	J	374.0	J	64.4	J	157.0	J	180.0	J	32.0	I	31.0	I
PESTICIDES																					
Chlorpyrifos Ethyl	ug/kg	–		–		–		–		–		–		–		–		–		–	
Diazanon	ug/kg	–		–		–		–		–		–		–		–		–		–	
Parathion Methyl	ug/kg	–		–		–		–		–		–		–		–		–		–	
Aldrin	ug/kg	–		–		–		–		–		–		–		–		–		–	
Chlordane	ug/kg	10.0	I	–		–		–		29.0	I	–		16.0	I	19.0	I	–		–	
DDD-p,p'	ug/kg	1.8	I	3.2	I	–		–		–		4.8		–		–		–		–	
DDE-p,p'	ug/kg	5.9		9.9		–		1.7	I	4.5		27.0		1.9	I	2.3	I	0.9	I	1.6	I
DDT-p,p'	ug/kg	6.5		13		–		1.5	I	5.0	J	14.0		1.9	I	2.9	I	–		1.7	I
Dieldrin	ug/kg	–		–		–		–		–		–		–		–		–		–	
Endosulfan Sulfate	ug/kg	–		–		–		–		26.00	J	–		–		11.00	J	–		–	
Endrin Aldehyde	ug/kg																				
Methoxychlor	ug/kg																				
PCB-1248	ug/kg	–		–		–		–		–		–		–		–		–		–	
PCB-1260	ug/kg	11	I	16	I	–		–		19.0	I	22.0	I	–		–		–		–	
Total Kjeldahl - N																					
TKN	mg/kg	3900	J	350	AJ	2000	J	700	J	5100	J	360	J	5400	J	5900	J	830	J	590	J
Total - Phosphorus																					
Total - P	mg/kg	1000		1100	A	510		1200		1100		770		1100		1300		580		910	

Key: A=Value reported is the mean of two or more determinations. I= Value reported is less than the minimum quantitation limit, and greater or equal to the minimum detection limit. J=Estimated value. N=Presumptive evidence of presence of material. U=Material analyzed but not detected.

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Appendix K-7. Sediment samples for the strand and pond used for additional treatment for parking lot runoff. In the repair of the the berm, the sediments in the strand and pond were altered

see Table K-5 for abbreviations

OCTOBER 2000

CONSTITUENT		S10-1	S10-4	P11-1	P11-4	P12-1	P12-4	P13-1	P13-4
SEMI-VOLATILE ORGANIC									
Acenaphthene	ug/kg	–	–	–	–	–	–	–	–
Acenaphthylene	ug/kg	–		–	–	–	–	–	–
Anthracene	ug/kg	–	–	–	–	–	–	–	–
Benzo(a)anthracene	ug/kg	–	–	–	280 I	–	430 I	–	180 I
Benzo(a)pyrene	ug/kg	–	–	–	250 I	–	370 I	–	150 I
Benzo(b)fluoranthene	ug/kg	–	–	–	–	–	590 I	–	250 I
Benzo(k)fluoranthene	ug/kg	–	–	–	–	–	180.0 I	–	–
Benzo(g,h,i)perylene	ug/kg	–	–	–	– I	–	260.0 I	–	–
Bis(2-ethylhexyl)phthala	ug/kg	–	–	–	–	–	–	–	–
Butyl benzyl phthalate	ug/kg	–	390 I	–	–	–	–	–	–
Chrysene	ug/kg	–	–	–	310 I	–	440 I	–	190 I
Di-n-octyl phthalate	ug/kg	–	–	–	–	–	–	–	–
Dibenzo(a,h)anthracene		–	–	–	–	–	–	–	–
Diethyl phthalate	ug/kg	–	–	–	–	–	–	–	–
Fluoranthene	ug/kg	–	–	–	610 I	–	550 I	–	220 I
Fluorene	ug/kg	–	–	–	–	–	–	–	–
Indeno(1,2,3-cd)pyrene	ug/kg	–	–	–	190.0 I	–	250.0 I	–	–
Phenanthrene	ug/kg	–	–	–	320 I	–	350 I	–	–
Pyrene	ug/kg	–	–	–	830	–	780	–	340 I
METALS									
Aluminum_308	mg/kg	3030 AJ	1070.0 J	4750.0	1800 J	5490	2940	1620 J	1290 J
Cadmium	mg/kg	– U	– U	0.84	0.67	1.2	0.64	0.6 I	0.39 I
Chromium	mg/kg	1.5 A	2.10	17.10	8.3	23.6	8.9	8.6	5.9
Copper	mg/kg	3.6 A	1.30 I	323.00	32.4	241.0	19.0	18.1	11.1
Iron_271	mg/kg	148 A	279.00	3840.0	3410	4870	2680	2340	1100
Lead	mg/kg	107 I	2.20 I	37.10	18.1	51.3	29.2	20.5	15.8
Manganese	mg/kg	3.8 A	2.50	52.30	33.8	46.0 J	37.7 J	69.2	15.6
Nickel	mg/kg	– U	– U	4.50 I	2.2 I	6.4 I	2.0 I	U	U
Zinc	mg/kg	– U	– U	90.40	37.5	178.0	66.9	55.9	31.1
PESTICIDES									
Chlorpyrifos Ethyl	ug/kg	–	–	–	–	–	–	–	–
Diazanon	ug/kg	–	–	–	–	–	–	–	–
Parathion Methyl	ug/kg	–	–	–	–	–	–	–	–
Aldrin	ug/kg	–	–	–	–	–	–	–	–
Chlordane	ug/kg	–	–	31.0 I	–	–	–	–	–
DDD-p,p'	ug/kg	–	–	–	–	–	–	–	–
DDE-p,p'	ug/kg	–	–	7.3	7.5	–	8.8	–	–
DDT-p,p'	ug/kg	–	–	–	–	–	–	–	–
Dieldrin	ug/kg	–	–	–	–	–	–	–	–
Endosulfan Sulfate	ug/kg	–	0.8 N	7.6 N	–	–	–	–	–
Endrin Aldehyde	ug/kg	–	–	–	–	2.90 N	–	–	–
Methoxychlor	ug/kg	–	–	18.0 N	–	23.00 N	13.00 N	–	–
PCB-1248	ug/kg	–	–	–	–	–	–	–	–
PCB-1260	ug/kg	–	–	–	–	–	–	–	–
TOTAL KJELDAHL N									
TKN	mg/kg	1600	570.0 A	3100.0	380	6000	370	1400	770
TOTAL PHOSPHOROUS									
Total - P	mg/kg	120	110.0 A	2000.0	1200	2700	1600	1700	740

Key: A=Value reported is the mean of two or more determinations. I= Value reported is less than the minimum quantitation limit, and greater or equal to the minimum detection limit. J=Estimated value. N=Presumptive evidence of presence of material. U=Material analyzed but not detected.

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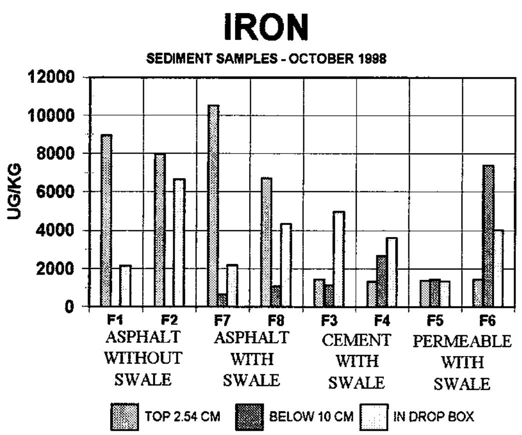
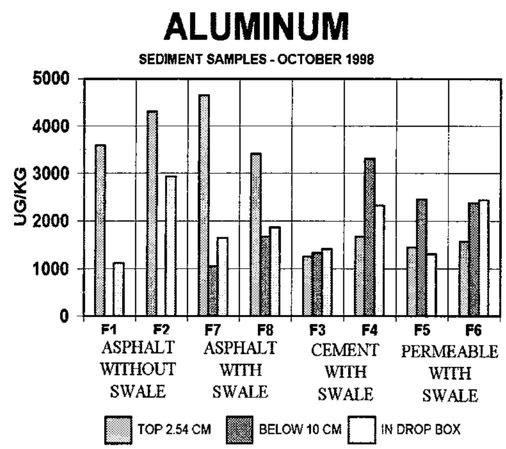
Appendix K-8. Water quality samples taken at the same time as the sediment samples (October 2000).

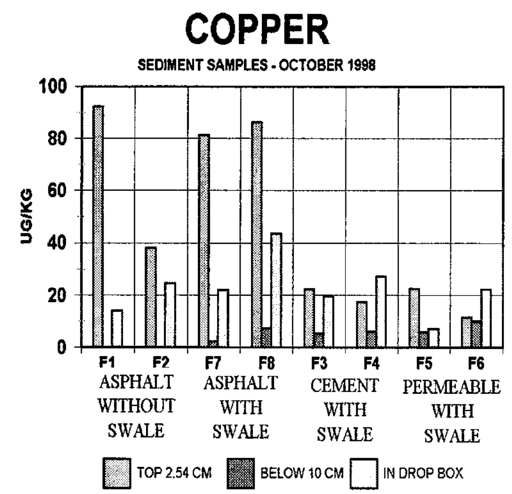
CONSTITUENT	UNITS	F1	F3	F5	F6	F6D	F7	P11	
CADMIUM	ug/L (ppb)	*0.15*	*0.15*	*0.15*	0.50	0.40	*0.15*	0.3	
COPPER	ug/L (ppb)	*1.0*	23.9	*1.0*	53.7	26.3	2.5	49.10	
IRON	ug/L (ppb)	140	1120	90	4980	2020	130	1930.0	
LEAD	ug/L (ppb)	*0.750*	10.100	*0.750*	29.600	13.800	*0.750*	7.4	
MANGANESE	ug/L (ppb)	36.3	150.0	45.9	98.4	85.1	34.9	162.0	
ZINC	mg/L (ppm)	20.0	80.0	*7.5*	280.0	170.0	20.0	60	
TSS	mg/L (ppm)	4.32	21.04	0.16	102.00	45.31	1.96	274.67	
PHOSPHOROUS, TOTA	mg/L as P	0.131	0.234	0.128	1.060	1.010	0.139	1.40	
PHOSPHOROUS, ORTH	mg/L as P	0.117	0.113	0.131	0.344	0.410	0.113	0.11	
NITROGEN, TOTAL	mg/L as N	0.47	0.92	0.40	2.20	2.10	0.44	6.7	
AMMONIA	mg/L as N	0.156	0.051	0.059	2.130	3.430	0.158	0.57	
NITRATE	mg/L as N	0.028	*0.003*	0.113	0.009	0.022	0.031	0.002	
NITRITE	mg/L as N	*0.0025*	*0.0025*	0.0060	0.0280	0.0330	*0.0025*	0.016	
ORGANIC NITROGEN	mg/L as N	0.28	0.86	0.22	0.03	-1.39	0.25	6.11	
CHLORIDE	mg/L (ppm)	13.50	4.58	6.21	3.55	3.73	16.80	221.0	
POTASSIUM	mg/L (ppm)	2.60	4.35	5.09	4.22	4.04	2.60	29.7	
SODIUM	mg/L (ppm)	17.70	4.33	7.29	2.04	2.21	22.60	123.0	
SULFATE	mg/L (ppm)	54.70	12.30	18.40	3.76	3.92	69.20	18.3	
CALCIUM	mg/L (ppm)	62.30	92.60	73.90	65.30	62.20	69.20	147.00	
MAGNESIUM	mg/L (ppm)	3.20	4.52	4.57	1.74	1.47	3.82	14.70	
HARDNESS	mg/L as CaCO3							427.59	

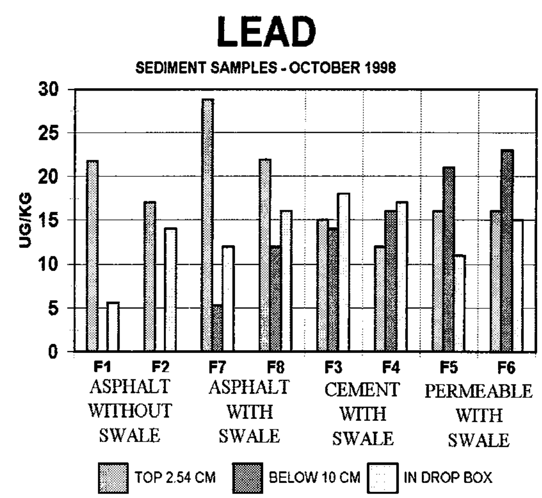
APPENDIX L

GRAPHS OF SEDIMENT DATA FOR 1998

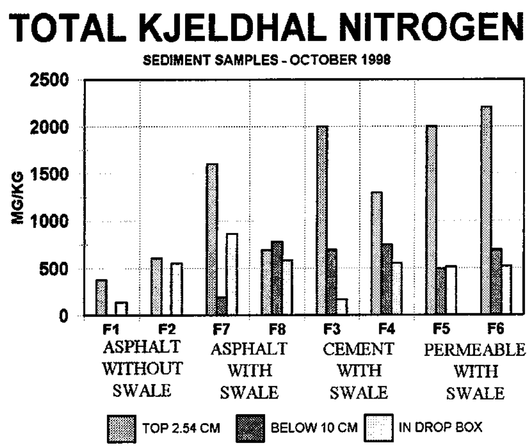


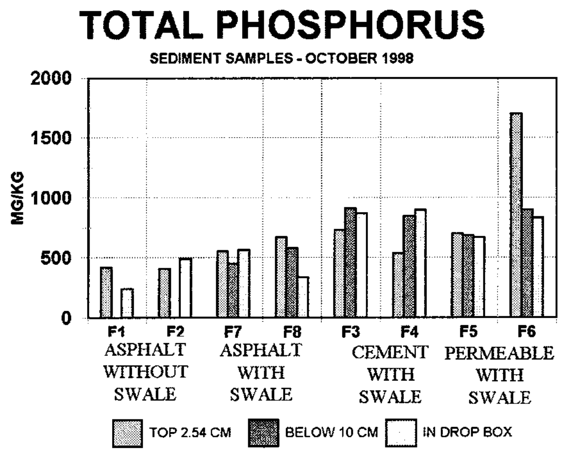






Appendix L. Comparison of metals measured in the surface sediments for the top 2.5 cm, in the deeper sediments below 10 cm and the sediment residue in the drop box. There are no samples for the deeper sediments in the basins with no swales (F1, F2) snd surface sediments in these basins represent the residue collected in the asphalt depression.





Appendix L-2. Comparison of nutrients measured in the sediments for the top 2.5 cm, below 10 cm and the residue in the drop box. Asphalt with no swale has no sample for the deeper sediments.

Appendix L-3. The Polycyclic Aromatic Hydrocarbons (PAH'S) ug/kg **and pesticides measured in the sediments. F1 through F8 represent basins in the parking lot and the other samples were collected in the strand and the pond. Abbreviations include: U=sediment was analyzed for but not detected, det=constituent was detected but was less than the minimum quantification limit. Data represent PAH's and pesticides found in the top 2.5 cm (1 inch) of sediments.**

PESTICIDES	UNITS	Asphalt no swale		Asphalt with swale		Concret with swale		Porous with swale		Strand		Pond	
		F1	F2	F7	F8	F3	F4	F5	F6	S9	S10	P11	P12
Chlorpyrifos Ethyl	ug/kg	U	U	U	U	U	U	U	U	U	U	U	U
Diazanon	ug/kg	U	det	U	U	U	U	U	U	U	U	U	U
Parathion Methyl	ug/kg	U	U	U	U	U	U	U	U	U	U	U	U
Aldrin	ug/kg	U	U	U	U	U	U	U	U	U	U	U	U
Chlordane	ug/kg	det	det	det	det	U	det	det	det	det	U	U	det
DDD-p,p'	ug/kg	U	U	U	U	U	U	det	U	U	U	U	U
DDE-p,p'	ug/kg	det	U	U	det	7.4	U	5.9	det	8.8	U	7.7	4.6
DDT-p,p'	ug/kg	U	U	U	U	6.0	U	det	det	5.7	U	U	U
Dieldrin	ug/kg	U	U	U	U	U	U	U	U	U	U	U	U
Endosulfan Sulfate	ug/kg	U	U	U	U	U	U	U	U	U	U	U	U
PCB-1248	ug/kg	U	U	U	det	U	U	U	U	U	U	U	U
PCB-1260	ug/kg	U	U	U	U	det	U	U	U	U	U	det	det

APPENDIX M

STATISTICAL RESULTS

Appendix M-1. Florida Aquarium Parking Lot data for data used in SAS programs. A dot indicates missing data usually because not enough flow in that basin to collect data. (See Appendix M-2 for abbreviations).

Obs	MO	DAY	YEAR	SET	RA1	ANTE	DURA	MAXI	AVGI	RA2	FF1	FF2	FF3
1	8	5	1998	yr1	0.56	123.8	1.25	0.510	0.448	0.57	391	417	61
2	8	6	1998	yr1	0.67	22.50	1.25	0.660	0.536	0.68	331	310	110
3	8	7	1998	yr1	1.30	20.00	5.50	0.300	0.236	1.30	638	610	281
4	8	9	1998	yr1	2.43	21.75	1.50	1.470	1.620	2.47	1955	1535	1324
5	8	20	1998	yr1	0.67	20.50	1.50	0.590	0.447	0.68	539	509	254
6	9	3	1998	yr1	1.97	33.25	7.25	1.090	0.272	1.97	1539	1239	744
7	9	17	1998	yr1	0.49	229.8	1.00	0.490	0.490	0.49	276	246	17
8	9	18	1998	yr1	0.58	28.75	5.75	0.220	0.101	0.66	266	248	16
9	9	19	1998	yr1	0.53	13.75	3.00	0.260	0.177	0.75	281	274	51
10	9	20	1998	yr1	1.85	.	.	.	.	1.85	1161	1064	474
11	9	25	1998	yr1	1.36	3.75	8.50	0.240	0.160	1.64	959	949	337
12	11	4	1998	yr1	1.20	921.3	20.5	0.200	0.059	1.20	395	400	0
13	12	13	1998	yr1	0.37	588.3	2.75	0.290	0.135	0.37	137	125	1
14	1	2	1999	yr1	1.22	104.5	2.25	1.060	0.542	1.23	877	649	181
15	1	23	1999	yr1	2.54	336.0	5.25	1.290	0.484	2.60	1552	1299	833
16	3	14	1999	yr1	0.80	333.8	3.25	0.440	0.246	0.82	476	320	20
17	4	17	1999	yr1	0.50	785.0	2.25	0.280	0.222	0.54	179	204	0
18	5	21	1999	yr1	1.34	69.00	2.25	1.230	0.596	1.36	718	598	164
19	5	30	1999	yr1	0.39	215.0	1.50	0.380	0.260	0.39	254	236	8
20	6	9	1999	yr1	0.81	96.25	1.75	0.690	0.463	0.81	439	401	63
21	6	13	1999	yr1	1.20	96.75	1.25	1.200	0.960	1.32	911	802	405
22	6	16	1999	yr1	1.64	18.00	4.75	1.090	0.345	1.68	1256	957	748
23	6	17	1999	yr1	0.75	12.50	5.50	0.430	0.136	0.77	468	374	185
24	6	18	1999	yr1	1.40	11.00	1.25	1.170	1.120	1.40	1286	1134	777
25	7	1	1999	yr1	1.52	145.3	6.25	0.600	0.243	1.53	684	581	250
26	7	7	1999	yr1	0.81	101.5	1.50	0.360	0.540	0.81	358	321	56
27	7	9	1999	yr1	1.17	40.00	1.50	0.110	0.780	1.17	657	450	344
28	7	14	1999	yr1	1.57	68.25	13.5	0.420	0.100	1.58	635	540	48
29	7	20	1999	yr1	0.88	118.0	1.00	0.880	0.880	0.88	357	331	47
30	8	6	1999	yr2	1.13	167.0	2.50	0.880	0.452	1.29	601	529	180
31	8	12	1999	yr2	0.70	8.75	5.25	0.410	0.133	0.70	392	299	80
32	8	14	1999	yr2	1.23	24.50	1.25	0.510	0.984	1.23	778	538	456
33	8	19	1999	yr2	0.90	49.25	1.25	0.840	0.720	0.90	644	547	276
34	8	22	1999	yr2	2.91	38.00	3.75	0.630	0.776	2.95	2183	1872	1611
35	9	11	1999	yr2	0.84	105.3	2.25	0.690	0.373	0.84	370	345	49
36	9	18	1999	yr2	0.43	166.5	1.25	0.390	0.344	0.85	220	190	0
37	9	25	1999	yr2	1.37	116.3	1.50	1.300	0.913	1.37	489	595	340
38	10	3	1999	yr2	1.21	190.3	2.25	0.440	0.538	1.22	641	551	161
39	10	4	1999	yr2	0.82	24.25	12.8	0.210	0.064	0.98	263	197	16
40	11	1	1999	yr2	1.63	293.0	9.75	0.740	0.167	1.63	922	713	215
41	12	17	1999	yr2	0.43	88.25	12.0	0.100	0.036	0.75	192	115	0
42	1	6	2000	yr2	0.79	461.5	5.00	0.640	0.160	0.79	162	321	31
43	1	24	2000	yr2	0.68	318.0	11.3	0.240	0.140	0.68	230	180	0
44	1	31	2000	yr2	0.62	166.0	6.50	0.260	0.120	0.70	270	233	0
45	6	13	2000	yr2	1.29	147.5	2.00	1.270	0.645	1.29	784	734	55
46	6	22	2000	yr2	0.39	38.25	0.75	0.390	0.520	0.39	131	97	0
47	6	23	2000	yr2	1.04	28.75	7.25	0.370	0.840	1.39	210	306	2
48	6	29	2000	yr2	0.71	63.75	3.75	0.620	0.189	0.71	385	344	37
49	7	1	2000	yr2	0.81	40.75	6.50	0.330	0.125	0.81	441	363	17
50	7	4	2000	yr2	1.95	79.25	2.75	1.910	0.709	1.95	1348	1222	892
51	7	8	2000	yr2	1.07	.	.	.	.	1.07	665	590	115
52	7	15	2000	yr2	1.98	45.25	8.00	1.550	0.248	1.98	1348	1222	753
53	7	26	2000	yr2	1.24	51.75	2.50	0.140	0.496	1.24	446	293	23
54	7	31	2000	yr2	2.69	114.8	1.00	1.990	1.990	2.69	1836	1286	1269
55	8	29	2000	yr3	1.18	61.25	2.00	0.750	0.590	1.20	865	669	390
56	9	7	2000	yr3	1.96	157.8	4.00	1.320	0.490	1.96	1398	1199	637
57	9	17	2000	yr3	2.04	218.8	18.5	0.730	0.110	2.05	1461	1309	428
58	9	24	2000	yr3	1.16	113.8	2.75	1.120	0.422	1.16	656	623	258
59	11	25	2000	yr3	1.42	372.8	3.50	0.930	0.930	1.42	900	759	126

FLORIDA AQUARIUM PARKING LOT STUDY

Obs	FF4	FF5	FF6	FF7	FF8	NHR	NH1	NH2	NH3	NH4	NH5
1	221	25	83	75	238	0.005	0.048	0.035	.	0.005	0.054
2	228	44	112	80	189	0.005	0.005	0.005	0.005	0.005	.
3	554	141	338	191	396	0.218	0.235	0.220	0.005	0.037	0.110
4	1545	1059	1366	934	1351	0.296	0.265	0.204	0.098	0.079	0.207
5	481	66	260	189	458	0.079	0.062	0.044	0.028	0.013	.
6	1064	442	742	538	890	0.051	0.044	0.013	0.005	0.008	0.028
7	77	3	32	33	107	0.024	0.040	0.005	.	.	.
8	127	0	23	9	74	0.017	0.013	0.005	.	0.005	.
9	171	0	51	30	112	0.005	0.005	0.008	0.005	0.005	.
10	1012	119	595	320	673	0.064	0.074	0.060	0.005	0.005	0.087
11	711	79	419	250	540	.	0.005	0.005	0.005	0.005	.
12	34	0	0	10	40	0.005	0.033	0.021	.	.	.
13	3	0	0	20	39	0.077	0.005	.	.	.	.
14	436	185	276	306	532	0.050	0.025	0.033	0.005	0.050	0.033
15	1047	454	788	754	1049	0.032	0.016	0.021	0.011	0.034	0.039
16	106	4	20	48	168	0.128	0.119	0.163	.	0.293	.
17	1	0	0	8	33	0.127	0.216	0.223	.	.	.
18	321	19	183	164	440	0.496	0.506	0.567	0.202	0.237	.
19	23	0	3	18	106	0.357	0.467	0.462	.	.	.
20	172	6	64	72	238	0.040	0.005	0.016	.	0.005	.
21	640	207	449	314	659	0.183	0.103	0.181	0.024	0.047	0.128
22	887	359	694	457	903	0.096	0.070	0.069	0.027	0.030	0.039
23	268	44	154	95	278	0.102	0.039	0.050	0.018	0.060	.
24	887	460	696	529	1030	0.113	0.092	0.094	0.023	0.025	0.045
25	377	63	218	160	405	0.223	0.178	0.110	0.045	0.005	0.033
26	145	5	53	49	195	0.149	0.187	0.180	.	0.019	.
27	369	113	258	180	398	0.067	0.073	0.045	0.025	0.033	0.056
28	192	4	28	45	297	0.080	0.177	0.128	.	0.011	.
29	138	4	44	47	190	0.184	0.200	0.079	.	0.018	.
30	311	62	185	168	383	0.005	0.005	0.005	0.016	0.005	0.005
31	199	12	77	68	233	0.164	0.142	0.079	0.005	0.029	.
32	488	160	387	313	542	0.310	0.145	0.116	0.017	0.061	0.092
33	406	81	262	178	474	.	0.045	0.030	0.018	0.048	0.017
34	2006	1119	2015	897	2053	0.110	0.078	0.062	0.005	0.018	0.020
35	138	19	23	50	198	0.212	0.301	0.195	.	0.064	.
36	16	0	0	12	77	0.121	0.005	0.005	0.005	0.039	.
37	468	136	319	367	509	0.047	0.056	0.036	0.005	0.028	0.020
38	355	45	191	206	395	0.184	0.094	0.131	0.019	0.035	0.043
39	137	0	0	11	115	0.013	0.021	0.013	.	0.059	.
40	457	47	197	255	574	0.052	0.014	.	0.032	0.185	0.051
41	5	0	0	0	15	0.036	0.032	0.066	.	.	.
42	154	7	38	62	229	0.178	0.200	0.239	.	0.175	.
43	60	0	0	0	64	0.099	0.075	0.084	.	0.205	.
44	89	0	0	11	122	0.087	0.080	0.062	.	0.223	.
45	344	43	160	57	191	0.293	0.240	0.279	0.577	0.260	.
46	6	2	0	2	20	0.174	0.178	0.243	.	.	.
47	102	6	2	10	121	0.095	0.143	0.135	.	0.127	0.291
48	158	24	45	41	177	0.046	0.085	0.066	.	0.145	0.058
49	170	14	25	29	160	0.111	0.179	0.116	.	0.072	.
50	1093	574	680	600	1087	0.151	0.179	0.097	0.091	0.103	0.107
51	404	90	182	11	15	0.320	0.232	0.208	0.093	0.077	0.093
52	870	429	585	624	992	0.103	.	.	0.029	0.094	0.045
53	177	9	35	76	172	.	0.130	.	.	0.039	.
54	1125	272	856	1251	1289	0.222	0.047	0.105	0.058	0.060	0.084
55	491	163	256	276	487	0.267	0.226	0.126	0.026	0.017	0.108
56	782	373	500	486	815	0.155	0.112	0.074	0.083	0.106	0.105
57	838	225	487	425	702	0.157	.	0.079	.	0.082	.
58	374	193	249	425	702	0.761	.	0.358	0.188	0.212	0.242
59	218	68	88	178	353	0.121	0.045	0.053	0.238	0.005	0.178

FLORIDA AQUARIUM PARKING LOT STUDY

Obs	NH6	NH7	NH8	NOR	NO1	NO2	NO3	NO4	NO5	NO6	NO7	NO8
1	.	.	.	0.162	0.262	0.264	.	0.337	0.177	.	.	.
2	0.005	.	0.005	0.374	0.343	0.334	0.284	0.372	.	0.298	.	0.311
3	0.010	0.111	0.195	0.235	0.218	0.214	0.215	0.231	0.249	0.203	0.161	0.191
4	0.074	0.144	.	0.256	0.235	0.241	0.202	0.227	0.211	0.215	0.206	.
5	0.005	0.032	0.005	0.190	0.142	0.136	0.137	0.161	.	0.115	0.134	0.125
6	0.017	0.025	0.028	0.039	0.099	0.152	0.145	0.051	0.099	0.043	0.032	0.026
7	.	.	.	0.057	0.093	0.215	.	.	.	.	.	.
8	.	.	.	0.017	0.039	0.040	.	0.005	.	.	.	.
9	0.005	0.005	.	0.030	0.016	0.017	0.005	0.011	.	0.005	0.011	.
10	0.012	0.014	0.046	0.081	0.074	0.080	0.034	0.045	0.048	0.049	0.038	0.062
11	0.005	0.005	0.005	.	0.085	0.031	0.010	0.005	.	0.005	0.005	0.005
12	.	.	.	0.005	0.093	0.068	.	.	.	.	.	.
13	.	0.005	.	0.105	0.163	.	.	.	.	.	0.056	.
14	0.005	0.048	0.045	0.045	0.056	0.051	0.135	0.202	0.103	0.134	0.219	0.151
15	0.015	0.018	0.031	0.034	0.044	0.046	0.082	0.099	0.119	0.090	0.090	0.064
16	.	.	0.351	0.069	0.128	0.123	.	0.325	.	.	.	0.230
17	.	.	.	0.316	0.403	0.376	.	.	.	.	.	.
18	0.163	0.482	0.475	0.502	0.532	0.529	0.641	0.237	.	0.585	0.710	0.718
19	.	.	0.320	0.331	0.449	0.467	.	.	.	.	.	0.354
20	0.011	.	0.019	0.270	0.226	0.214	.	0.278	.	0.212	.	0.227
21	0.023	0.100	0.090	0.118	0.122	0.097	0.107	0.123	0.065	0.159	0.111	0.214
22	0.017	0.055	0.052	0.111	0.099	0.101	0.101	0.081	0.118	0.059	0.080	0.052
23	0.021	.	0.152	0.068	0.059	0.059	0.044	0.350	.	0.038	.	0.039
24	0.035	0.034	0.026	0.111	0.142	0.155	0.099	0.076	0.045	0.107	0.107	0.071
25	0.038	0.078	0.091	0.292	0.272	0.205	0.154	0.176	0.005	0.139	0.183	0.202
26	.	.	0.137	0.365	0.372	0.400	.	0.342	.	.	.	0.363
27	0.018	0.054	0.037	.	0.125	0.101	0.109	0.126	0.150	0.101	0.113	0.106
28	.	.	0.078	0.620	0.572	0.571	.	0.381	.	.	.	0.259
29	0.096	.	.	0.763	0.742	0.740	.	0.683	.	0.672	.	.
30	0.005	0.005	0.005	0.063	0.055	0.060	0.132	0.159	0.168	0.086	0.081	0.100
31	0.017	.	0.069	0.304	0.312	0.311	0.138	0.172	.	0.136	.	0.290
32	0.025	0.105	0.083	0.552	0.410	0.385	0.334	0.430	0.514	0.378	0.435	0.414
33	0.021	0.056	0.018	.	0.308	0.371	0.296	0.298	0.314	0.282	0.298	0.317
34	0.040	0.005	0.023	0.005	0.005	0.005	0.005	0.005	0.040	0.027	0.005	0.005
35	.	.	0.245	0.069	0.062	0.052	.	0.099	.	.	.	0.005
36	0.021	0.005	0.005	0.084	0.051	0.044	0.084	0.077	.	0.156	0.085	0.080
37	0.038	0.051	0.068	0.132	0.175	0.168	0.149	0.177	0.157	0.173	0.171	0.343
38	0.036	0.070	0.068	0.086	0.068	0.079	0.057	0.105	0.129	0.036	0.101	0.077
39	.	.	0.107	0.080	0.078	0.078	.	0.030	.	.	.	0.039
40	0.047	.	0.069	0.073	0.087	.	0.144	0.222	0.204	0.209	.	0.238
41	.	.	.	0.087	0.043	0.054	.	.	.	.	.	.
42	.	.	0.163	0.259	0.220	0.244	.	0.441	.	.	.	0.257
43	.	.	0.080	0.182	0.110	0.092	.	0.331	.	.	.	0.091
44	.	.	0.112	0.074	0.095	0.066	.	0.196	.	.	.	0.172
45	0.345	0.412	0.410	0.386	0.487	0.481	0.826	0.782	.	0.659	0.754	0.998
46	.	.	0.207	0.535	0.669	0.612	.	.	.	.	.	0.575
47	.	.	.	0.351	0.341	0.338	.	0.457	0.327	.	.	.
48	0.022	.	0.065	0.186	0.218	0.191	.	0.281	0.164	0.274	.	0.190
49	.	0.288	0.102	0.161	0.188	0.182	.	.	.	.	0.215	0.130
50	0.095	0.114	0.112	0.328	.	0.353	0.254	0.336	0.238	0.219	0.230	0.344
51	0.062	0.143	0.176	0.535	0.425	0.418	0.402	0.397	0.460	0.422	0.401	0.462
52	0.061	0.043	0.050	0.310	.	.	0.197	0.191	0.259	0.227	0.190	0.212
53	0.072	.	0.108	.	0.014	.	.	0.021	.	.	.	0.016
54	0.047	0.081	0.109	0.199	0.261	0.216	0.274	0.242	0.230	0.191	0.193	0.230
55	0.005	0.164	0.026	0.232	0.362	0.346	0.346	0.381	0.381	0.281	0.317	0.454
56	0.066	0.117	0.125	0.418	0.251	0.248	0.291	0.212	0.327	0.198	0.268	0.270
57	0.085	.	0.067	0.061	.	0.067	.	0.129	.	0.109	.	0.119
58	0.236	0.384	0.410	1.530	.	1.650	1.310	1.270	1.520	1.094	1.080	2.200
59	.	0.167	.	0.084	0.142	0.156	0.560	0.531	0.508	.	0.502	.

FLORIDA AQUARIUM PARKING LOT STUDY

Obs	TNR	TN1	TN2	TN3	TN4	TN5	TN6	TN7	TN8	OPR	OP1	OP2
1	0.17	0.54	0.65	.	0.73	0.62	.	.	.	0.005	0.036	0.027
2	0.38	0.40	0.39	0.43	0.56	.	0.43	.	0.46	0.011	0.025	0.022
3	0.57	0.60	0.71	0.53	0.60	0.66	0.64	0.65	0.72	0.017	0.030	0.032
4	0.82	0.45	0.50	0.35	0.36	0.63	0.33	0.64	.	0.005	0.017	0.010
5	0.32	0.25	0.22	0.38	0.36	.	0.39	0.40	0.30	0.005	0.025	0.016
6	0.12	0.28	0.19	0.23	0.15	0.17	0.19	0.18	0.11	0.005	0.016	0.005
7	0.10	0.15	0.22	.	.	.	.	.	.	0.005	0.037	0.013
8	0.04	0.09	0.04	.	0.38	.	.	.	.	0.005	0.018	0.005
9	0.40	0.03	0.03	0.07	0.06	.	0.08	0.08	.	0.005	0.010	0.005
10	0.25	0.15	0.21	0.12	0.08	0.15	0.13	0.09	0.19	0.005	0.005	0.005
11	.	0.11	0.08	0.07	0.09	.	0.17	0.23	0.15	.	0.005	0.072
12	0.10	0.32	0.24	.	.	.	.	.	.	0.005	0.035	0.023
13	0.32	0.59	.	.	.	.	.	0.84	.	0.005	0.012	.
14	0.15	0.15	0.17	0.42	0.63	0.52	0.52	0.74	0.45	0.005	0.016	0.022
15	0.11	0.07	0.10	0.24	0.39	0.41	0.46	0.35	0.16	0.011	0.031	0.026
16	0.29	0.59	0.57	.	1.30	.	.	.	1.30	0.013	0.089	0.401
17	0.50	1.40	1.60	.	.	.	.	.	.	0.017	0.135	0.349
18	0.98	1.20	1.30	1.40	1.70	.	1.60	1.80	1.70	0.022	0.070	0.170
19	0.72	0.96	0.93	.	.	.	.	.	0.82	0.005	0.065	0.147
20	0.40	0.23	0.25	.	0.53	.	0.60	.	0.46	0.005	0.031	0.054
21	0.38	0.51	0.57	0.72	0.74	0.72	0.84	0.91	1.60	0.005	0.035	0.042
22	0.40	0.10	0.16	0.30	0.43	0.40	0.58	0.33	0.36	0.005	0.036	0.037
23	0.22	0.11	0.16	0.25	0.43	.	0.34	.	0.51	0.005	0.022	0.032
24	0.23	0.23	0.30	0.31	0.36	0.33	0.50	0.39	0.32	0.005	0.019	0.022
25	0.60	0.51	0.37	0.46	0.58	0.65	0.64	0.57	0.48	0.038	0.042	0.028
26	0.97	0.76	0.70	.	0.65	.	.	.	0.65	0.260	0.042	0.041
27	.	0.41	0.23	0.28	0.36	0.23	0.35	0.26	0.26	0.005	0.035	0.020
28	0.80	0.82	0.75	.	0.54	.	.	.	0.74	0.016	0.040	0.041
29	0.96	0.95	0.93	.	1.00	.	0.99	.	.	0.019	0.039	0.022
30	0.08	0.59	0.50	0.47	0.73	0.53	0.53	0.54	0.47	0.013	0.018	0.025
31	0.52	0.50	0.52	0.53	0.52	.	0.41	.	.	0.005	0.016	0.015
32	0.87	0.57	0.59	0.53	0.50	0.65	0.51	0.44	0.50	0.012	0.022	0.013
33	.	0.35	0.41	0.32	0.43	0.37	0.33	0.35	0.42	.	0.023	0.018
34	0.16	0.21	0.19	0.19	0.11	0.06	0.08	0.26	0.30	0.160	0.022	0.017
35	0.74	0.60	0.56	.	0.66	.	.	.	0.66	0.023	0.026	0.016
36	0.35	0.12	0.23	0.89	0.72	.	0.95	0.53	0.39	0.042	0.021	0.021
37	0.82	0.80	0.52	0.63	0.79	0.49	0.63	0.58	0.80	0.029	0.030	0.018
38	0.37	0.21	0.22	0.25	0.32	0.28	0.41	0.28	0.20	0.043	0.026	0.023
39	0.08	0.15	0.14	.	0.29	.	.	.	0.23	0.005	0.016	0.016
40	.	.	.	.	.	.	.	.	.	0.041	0.033	.
41	0.15	0.27	.	.	.	.	.	.	.	0.005	0.026	0.035
42	0.38	0.44	0.64	.	0.54	.	.	.	0.41	0.005	0.690	0.077
43	0.00	0.12	0.03	.	0.48	.	.	.	1.10	0.005	0.034	0.038
44	0.27	0.24	0.25	.	0.29	.	.	.	0.62	0.005	0.016	0.027
45	0.82	1.20	1.20	2.50	1.90	.	1.90	2.40	2.40	0.021	0.054	0.122
46	0.53	0.92	1.10	.	.	.	.	.	.	0.005	0.040	0.121
47	0.27	0.38	0.41	.	1.10	1.10	.	.	.	0.005	0.040	0.055
48	0.29	0.46	0.40	.	0.88	0.40	0.98	.	0.57	0.005	0.030	0.045
49	0.07	0.19	0.19	.	0.48	.	.	.	0.33	0.005	0.028	0.031
50	0.30	.	0.53	0.36	0.66	0.62	0.60	0.34	0.55	0.028	.	0.019
51	1.90	1.60	1.80	1.90	2.00	1.80	1.00	1.20	2.30	0.005	0.025	0.023
52	0.69	.	.	0.69	0.97	0.72	0.74	0.50	0.71	0.005	.	.
53	.	0.89	.	.	1.60	.	.	.	1.50	.	0.032	.
54	0.52	0.44	0.39	0.60	0.63	0.64	0.68	0.71	0.86	0.026	0.022	0.027
55	0.47	0.80	0.77	0.94	0.88	1.30	0.65	1.00	1.30	0.005	0.023	0.008
56	0.56	0.60	0.59	0.64	0.74	0.86	0.61	0.61	1.00	0.005	0.023	0.022
57	0.17	.	0.30	.	0.46	.	0.46	.	0.58	0.005	.	0.020
58	2.20	.	2.10	2.00	1.90	1.80	2.40	1.80	2.50	0.027	.	0.024
59	0.34	0.43	0.47	1.40	1.30	1.20	.	1.40	.	0.016	0.030	0.041

AQUARIUM PARKING LOT STUDY

Obs	OP3	OP4	OP5	OP6	OP7	OP8	TPR	TP1	TP2	TP3	TP4	TP5
1	.	0.116	0.066	.	.	.	0.025	0.061	0.059	.	0.158	0.091
2	0.135	0.098	.	0.054	.	0.040	0.019	0.027	0.031	0.170	0.116	.
3	0.107	0.072	0.040	0.055	0.054	0.049	0.018	0.038	0.040	0.123	0.104	0.058
4	0.037	0.040	0.015	0.024	0.034	.	0.005	0.033	0.018	0.050	0.058	0.028
5	0.115	0.065	.	0.046	0.094	0.056	0.005	0.033	0.026	0.129	0.086	.
6	0.072	0.150	0.060	0.012	0.040	0.030	0.005	0.030	0.020	0.080	0.070	0.023
7	.	.	.	.	.	.	0.005	0.972	0.041	.	.	.
8	.	0.085	.	.	.	.	0.005	0.033	0.032	.	0.114	.
9	0.108	0.052	.	0.038	0.058	.	0.005	0.010	0.008	0.128	0.067	.
10	0.055	0.039	0.017	0.029	0.041	0.023	0.005	0.029	0.028	0.087	0.062	0.041
11	0.037	0.036	.	0.048	0.040	0.037	.	0.018	0.104	0.098	0.066	.
12	.	.	.	.	.	.	0.018	0.054	0.057	.	.	.
13	.	.	.	.	0.119	.	0.018	0.118	.	.	.	.
14	0.175	0.149	0.051	0.129	0.194	0.127	0.005	0.029	0.080	0.186	0.171	0.085
15	0.175	0.392	0.033	0.464	0.147	0.155	0.005	0.048	0.078	0.198	0.134	0.059
16	.	1.780	.	.	.	1.900	0.005	0.170	0.513	.	2.190	.
17	.	.	.	.	.	.	0.015	0.212	0.460	.	.	.
18	0.413	0.605	.	0.596	0.244	0.596	0.072	0.146	0.312	0.512	0.761	.
19	.	.	.	.	.	0.394	0.020	0.127	0.240	.	.	.
20	.	0.295	.	0.311	.	0.348	0.005	0.079	0.076	.	0.352	.
21	0.353	0.272	0.100	0.360	0.143	0.318	0.005	0.077	0.082	0.404	0.325	0.137
22	0.179	0.213	0.090	0.276	0.118	0.227	0.005	0.050	0.056	0.195	0.242	0.112
23	0.176	0.166	.	0.216	.	0.271	0.011	0.052	0.091	0.227	0.210	.
24	0.152	0.145	0.046	0.121	0.071	0.147	0.005	0.042	0.046	0.191	0.194	0.076
25	0.187	0.160	0.079	0.183	0.122	0.149	0.046	0.068	0.048	0.222	0.204	0.107
26	.	0.125	.	.	.	0.092	0.037	0.067	0.101	.	0.186	.
27	0.134	0.119	0.062	0.146	0.099	0.096	0.012	0.062	0.040	0.165	0.159	0.086
28	.	0.059	.	.	.	0.079	0.022	0.066	0.075	.	0.086	.
29	.	0.099	.	0.073	.	.	0.037	0.066	0.053	.	0.149	.
30	0.202	0.113	0.055	0.145	0.133	0.103	0.013	0.028	0.027	0.217	0.137	0.088
31	0.241	0.089	.	0.094	.	0.067	0.015	0.046	0.015	0.268	0.108	.
32	0.141	0.095	0.063	0.105	0.083	0.071	0.019	0.045	0.048	0.172	0.151	0.085
33	0.133	0.102	0.061	0.120	0.097	0.089	.	0.042	0.043	0.164	0.148	0.081
34	0.125	0.100	0.042	0.055	0.056	0.070	0.123	0.030	0.026	0.141	0.109	0.062
35	.	0.151	.	.	.	0.082	0.045	0.052	0.044	.	0.198	.
36	0.300	0.144	.	0.198	0.114	0.064	0.073	0.039	0.026	0.364	0.171	.
37	0.155	0.108	0.069	0.169	0.129	0.069	0.072	0.095	0.087	0.237	0.325	0.114
38	0.192	0.113	0.045	0.181	0.110	0.061	0.058	0.024	0.028	0.213	0.128	0.061
39	.	0.102	.	.	.	0.056	0.014	0.036	0.027	.	0.140	.
40	0.353	0.316	0.119	0.292	.	0.213	0.049	0.071	.	0.429	0.388	0.286
41	.	.	.	.	.	.	0.005	0.046	.	.	.	.
42	.	0.220	.	.	.	0.089	0.019	0.099	0.138	.	0.296	.
43	.	0.330	.	.	.	0.327	0.022	0.103	0.060	.	0.385	.
44	.	0.244	.	.	.	0.177	0.024	0.048	0.064	.	0.267	.
45	0.603	0.739	.	0.922	0.263	0.557	0.016	0.195	0.246	0.652	1.040	.
46	.	.	.	.	.	.	0.025	0.120	0.177	.	.	.
47	.	0.288	0.207	.	.	.	0.037	0.073	0.092	.	0.335	0.269
48	.	0.274	0.047	0.403	.	0.192	0.023	0.078	0.077	.	0.358	0.069
49	.	0.230	.	.	0.119	0.131	0.015	0.040	0.050	.	0.334	.
50	0.268	0.312	0.113	0.290	0.111	0.225	0.042	.	0.036	0.342	0.388	0.103
51	0.155	0.123	0.104	0.245	0.097	0.125	0.014	0.054	0.026	0.151	0.117	0.149
52	0.151	0.167	0.073	0.155	0.073	0.127	0.028	.	.	0.171	0.200	0.093
53	.	0.106	.	0.249	.	0.112	.	0.053	.	.	0.146	.
54	0.171	0.161	0.113	0.163	0.113	0.169	0.018	0.056	0.044	0.197	0.196	0.174
55	0.170	0.147	0.099	0.127	0.106	0.188	0.005	0.040	0.018	0.203	0.189	0.136
56	0.140	0.111	0.110	0.166	0.103	0.126	0.010	0.046	0.037	0.193	0.158	0.160
57	.	0.102	.	0.103	.	0.095	0.018	.	0.033	.	0.134	.
58	0.096	0.086	0.086	0.242	0.061	0.106	0.049	.	0.062	0.136	0.131	0.128
59	0.220	0.135	0.127	.	0.173	.	0.032	0.069	0.073	0.331	0.235	0.235

FLORIDA AQUARIUM PARKING LOT STUDY

Obs	TP6	TP7	TP8	CUR	CU1	CU2	CU3	CU4	CU5	CU6	CU7	CU8
1	.	.	.	1.40	11.6	7.7	.	6.7	3.3	.	.	.
2	0.070	.	0.046	4.80	2.4	3.0	7.7	2.9	.	4.6	.	6.8
3	0.077	0.068	0.080	2.30	0.2	1.9	2.4	1.8	2.7	2.1	4.2	7.9
4	0.035	0.051	.	0.50	4.7	1.8	3.9	0.2	0.2	0.2	0.2	.
5	0.066	0.114	0.087	4.00	6.2	5.4	6.9	4.2	.	4.7	12.8	12.3
6	0.060	0.110	0.040	15.40	7.0	6.1	4.5	4.4	3.6	2.8	7.4	10.7
7	.	.	.	11.40	10.0	7.0	.	.	.	.	.	.
8	.	.	.	8.40	5.8	7.0	.	.	.	.	.	.
9	0.054	0.083	.	2.20	3.0	3.1	3.2	0.2	.	0.2	6.7	.
10	0.056	0.070	0.058	4.40	5.2	5.4	5.5	5.5	2.6	4.0	0.9	6.9
11	0.062	0.046	0.076	.	5.9	5.2	3.4	3.5	.	4.2	4.0	7.8
12	.	.	.	5.40	8.4	11.5	.	.	.	.	.	.
13	.	0.191	.	3.60	14.4	.	.	.	.	.	17.2	.
14	0.167	0.235	0.180	1.00	5.0	16.6	3.6	5.9	4.1	6.8	7.8	12.6
15	0.122	0.186	0.141	0.59	8.7	12.4	1.8	1.9	1.2	3.5	4.8	5.8
16	.	.	2.330	0.50	17.3	19.4	.	11.9	.	.	.	15.6
17	.	.	.	5.90	30.8	33.7	.	.	.	.	.	.
18	0.708	0.394	0.734	2.20	14.7	14.8	6.2	6.5	.	6.5	13.1	9.6
19	.	.	0.457	3.40	11.8	17.8	.	.	.	.	.	4.4
20	0.397	.	0.429	1.40	12.2	8.8	.	2.7	.	4.1	.	6.7
21	0.423	0.192	0.379	2.10	21.0	9.5	2.4	3.4	3.4	3.6	5.4	10.2
22	0.330	0.154	0.274	0.15	2.8	3.1	0.9	1.4	0.8	2.8	4.8	5.3
23	0.274	.	0.336	2.30	7.2	10.2	3.4	1.3	.	0.9	.	3.5
24	0.168	0.105	0.191	0.15	4.5	3.5	2.4	2.6	1.5	2.8	0.9	3.6
25	0.241	0.170	0.190	12.90	14.4	6.2	3.2	3.8	3.3	3.1	4.7	5.5
26	.	.	0.138	6.20	10.8	6.4	.	2.5	.	.	.	1.0
27	0.193	0.142	0.129	3.00	9.3	3.7	3.8	3.3	14.2	4.2	6.0	5.5
28	.	.	0.095	6.70	10.1	10.1	.	4.5	.	.	.	10.0
29	0.117	.	.	5.10	13.4	8.5	.	5.6	.	8.0	.	.
30	0.179	0.192	0.133	1.00	6.0	2.2	2.0	2.5	3.8	3.6	4.4	5.3
31	0.125	.	0.097	3.10	9.0	13.3	5.8	3.4	.	3.0	.	9.2
32	0.144	0.124	0.112	4.10	8.6	8.8	3.6	5.0	3.2	3.6	4.5	5.7
33	0.160	0.134	0.127	.	8.6	6.6	3.6	4.2	3.8	3.0	4.4	4.3
34	0.083	0.072	0.091	6.20	3.8	5.0	2.6	3.0	1.0	2.7	2.2	5.3
35	.	.	0.151	8.00	6.8	6.5	.	5.3	.	.	.	0.2
36	0.246	0.165	0.104	12.70	6.2	13.0	4.6	3.5	.	3.8	9.5	15.2
37	0.276	0.172	0.180	32.70	6.7	4.7	5.0	3.9	3.1	4.6	7.4	22.6
38	0.244	0.156	0.098	19.20	4.5	2.6	4.6	4.2	2.7	3.5	5.7	8.2
39	.	.	0.088	13.30	3.2	4.0	.	5.3	.	.	.	5.9
40	0.305	.	0.340	13.10	8.1	.	8.4	6.9	7.3	3.9	.	17.2
41	.	.	.	1.00	7.7	7.8	.	.	.	.	.	.
42	.	.	0.267	7.80	12.0	16.3	.	7.8	.	.	.	24.3
43	.	.	0.407	1.00	15.6	10.2	.	7.7	.	.	.	33.8
44	.	.	0.342	1.00	11.2	42.7	.	5.1	.	.	.	44.2
45	1.270	0.347	0.738	5.30	42.6	30.1	14.8	11.8	.	8.5	20.8	25.5
46	.	.	0.616	12.70	21.3	19.0	.	.	.	.	.	34.2
47	.	.	.	2.60	9.2	12.9	.	8.6	5.9	.	.	.
48	0.540	.	0.285	1.00	7.6	10.2	.	6.4	3.3	3.5	.	32.8
49	.	0.145	0.174	2.40	3.9	11.5	.	8.3	5.8	.	24.6	12.0
50	0.328	0.157	0.233	5.20	.	3.0	1.0	5.9	3.2	3.6	4.6	3.1
51	0.251	0.116	0.135	1.00	9.2	5.2	1.0	1.0	1.0	2.0	11.0	7.8
52	0.173	0.121	0.142	1.0	.	.	2.5	4.0	2.7	3.2	13.5	9.1
53	0.321	.	0.232	.	5.8	.	.	6.8	.	7.1	.	16.3
54	0.174	0.163	0.237	1.0	8.9	5.0	8.5	5.5	8.3	2.6	6.8	7.7
55	0.189	0.195	0.262	1.0	8.4	3.9	4.6	5.9	6.1	5.0	14.3	13.1
56	0.179	0.153	0.203	1.0	5.7	6.8	6.8	4.4	7.5	3.9	6.6	11.9
57	0.133	.	0.141	1.0	.	2.3	.	4.2	.	5.0	.	46.9
58	0.311	0.190	0.231	6.6	.	23.2	8.1	6.3	9.1	14.2	26.7	23.5
59	.	0.272	.	3.7	16.6	19.6	15.1	16.1	18.7	.	12.8	.

FLORIDA AQUARIUM PARKING LOT STUDY

Obs	FER	FE1	FE2	FE3	FE4	FE5	FE6	FE7	FE8	PBR	PB1	PB2
1	40.0	400	300	.	210	80	.	.	.	1.00	3.7	2.9
2	380.0	160	170	120	80	.	110	.	240	1.00	1.0	1.0
3	40.0	150	130	70	80	80	15	130	290	1.00	1.0	1.0
4	110.0	250	136	130	88	75	44	105	.	1.00	2.2	1.5
5	90.0	170	140	110	80	.	80	220	200	1.00	2.5	1.0
6	110.0	350	268	85	89	110	57	235	220	1.00	2.2	2.0
7	90.0	360	250	.	.	.	.	.	.	1.00	3.9	3.4
8	15.0	160	110	.	70	.	.	.	.	1.00	1.0	1.0
9	15.0	80	70	15	33	.	15	150	.	1.00	1.0	1.0
10	70.0	350	250	60	130	50	90	80	260	1.00	2.7	1.0
11	.	200	180	15	50	.	30	100	210	1.00	1.0	1.0
12	40.0	120	210	.	.	.	.	.	.	1.00	1.0	1.0
13	15.0	220	.	.	.	.	.	490	.	1.00	2.9	.
14	15.0	220	850	50	130	120	210	190	450	1.00	2.8	10.4
15	15.0	400	518	120	73	120	34	140	137	1.00	8.0	9.8
16	50.0	710	790	.	280	.	.	.	480	1.00	7.7	10.2
17	100.0	900	950	.	.	.	.	.	.	2.20	8.6	10.7
18	120.0	1100	1120	100	270	.	140	410	390	2.20	9.5	11.1
19	110.0	790	980	.	.	.	.	.	370	1.00	5.8	8.3
20	70.0	700	440	.	70	.	60	.	290	2.00	9.3	6.4
21	100.0	970	430	30	50	110	50	80	350	5.20	11.6	6.6
22	90.0	200	166	30	45	70	34	90	131	1.00	1.0	6.5
23	330.0	310	510	40	40	.	50	.	100	1.00	2.2	4.5
24	40.0	150	127	15	15	40	28	80	40	1.00	1.0	1.0
25	230.0	420	140	15	15	30	40	120	130	1.00	1.0	1.0
26	90.0	240	190	.	40	.	.	.	80	1.00	2.7	1.9
27	80.0	170	50	15	30	450	30	100	90	1.00	2.0	1.0
28	100.0	370	460	.	40	.	.	.	270	1.80	2.9	4.0
29	130.0	330	160	.	15	.	100	.	.	2.70	3.8	2.7
30	110.0	170	70	13	13	13	13	30	230	0.75	1.7	0.8
31	30.0	260	280	13	13	13	13	.	160	0.75	2.0	2.0
32	12.5	280	270	13	13	13	13	30	110	0.75	2.1	2.7
33	.	270	140	13	13	13	13	50	1540	.	2.2	1.9
34	30.0	70	136	13	34	40	40	70	223	0.75	0.8	1.3
35	50.0	210	150	.	60	.	.	.	390	2.40	2.4	2.5
36	50.0	130	360	60	4	.	4	10	15	0.75	0.8	3.7
37	110.0	160	120	80	80	70	70	210	640	1.50	2.1	1.6
38	100.0	110	60	50	70	60	70	120	210	0.75	0.8	0.8
39	50.0	60	70	.	50	.	.	.	80	0.75	0.8	0.8
40	100.0	90	.	13	13	80	40	.	540	0.75	0.8	.
41	12.5	190	140	.	.	.	.	.	.	0.75	1.9	1.9
42	110.0	690	580	.	130	.	.	.	890	0.75	5.5	5.4
43	12.5	460	220	.	210	.	.	.	1120	0.75	1.7	2.5
44	12.5	570	360	.	120	.	.	.	1650	0.75	3.8	3.8
45	160.0	1920	1390	190	170	.	350	980	1800	1.60	14.2	12.3
46	140.0	710	640	.	.	.	.	.	1120	2.70	5.8	6.2
47	70.0	300	430	.	120	70	.	.	.	0.75	3.2	4.1
48	80.0	390	530	.	90	120	180	.	650	0.75	2.2	3.8
49	40.0	230	300	.	70	50	.	580	280	0.75	2.0	3.7
50	330.0	.	201	50	74	110	80	250	185	1.80	.	1.2
51	60.0	280	140	50	70	90	130	510	290	1.60	1.8	0.8
52	50	.	.	40	100	110	114	380	323	0.75	.	.
53	.	360	.	.	70	.	140	.	760	.	2.7	.
54	120	290	194	90	85	290	138	180	273	0.75	1.8	1.3
55	210	380	105	140	224	250	205	670	420	0.75	2.3	0.8
56	50	290	154	40	50	150	153	220	415	0.75	2.2	1.3
57	50	.	136	.	125	.	140	.	767	0.75	.	0.8
58	180	.	400	90	100	180	300	690	480	4.50	.	3.1
59	40	450	420	370	250	550	.	300	.	0.75	4.0	4.1

FLORIDA AQUARIUM PARKING LOT STUDY

Obs	PB3	PB4	PB5	PB6	PB7	PB8	ZNR	ZN1	ZN2	ZN3	ZN4	ZN5
1	.	1.0	1.1	.	.	.	15.0	50.0	40.0	.	30.0	15.0
2	1.0	1.0	.	1.0	.	1.0	15.0	15.0	15.0	15.0	15.0	.
3	1.0	1.0	1.0	1.0	1.0	3.1	15.0	15.0	30.0	15.0	15.0	15.0
4	1.0	1.0	1.0	1.0	1.0	.	30.0	30.0	21.0	30.0	15.0	15.0
5	1.0	1.0	.	1.0	2.5	3.0	15.0	30.0	30.0	30.0	15.0	.
6	1.0	1.0	1.0	1.0	1.0	1.0	40.0	15.0	33.2	15.0	15.0	15.0
7	.	.	.	.	.	.	70.0	40.0	30.0	.	.	.
8	.	1.0	.	.	.	.	15.0	15.0	15.0	.	15.0	.
9	1.0	1.0	.	1.0	1.0	.	15.0	15.0	15.0	15.0	15.0	.
10	1.0	1.0	1.0	1.0	1.0	1.0	15.0	15.0	15.0	15.0	15.0	15.0
11	1.0	1.0	.	1.0	1.0	2.3	15.0	15.0	15.0	15.0	15.0	.
12	.	.	.	.	.	.	15.0	40.0	50.0	.	.	.
13	.	.	.	.	5.9	.	110.0	70.0	.	.	.	.
14	1.0	2.4	2.0	3.1	2.8	5.8	15.0	15.0	60.0	15.0	30.0	15.0
15	2.9	1.4	1.0	1.0	2.2	2.9	15.0	30.0	57.0	15.0	15.0	15.0
16	.	3.1	.	.	.	5.8	80.0	90.0	100.0	.	70.0	.
17	.	.	.	.	.	.	30.0	130.0	130.0	.	.	.
18	1.0	1.0	.	1.0	5.1	4.5	70.0	90.0	80.0	15.0	30.0	.
19	.	.	.	.	.	3.5	15.0	70.0	90.0	.	.	.
20	.	3.2	.	2.4	.	5.7	15.0	60.0	40.0	.	15.0	.
21	2.5	1.0	1.0	1.0	1.0	2.5	110.0	100.0	40.0	15.0	15.0	30.0
22	1.0	1.0	1.0	1.6	1.0	3.9	15.0	15.0	15.0	15.0	15.0	15.0
23	1.0	1.0	.	1.0	.	1.0	15.0	15.0	15.0	15.0	15.0	.
24	1.0	1.0	1.0	1.0	1.0	1.0	15.0	15.0	15.0	15.0	25.0	15.0
25	1.5	1.0	1.5	1.0	1.6	2.4	15.0	40.0	15.0	15.0	15.0	15.0
26	.	1.0	.	.	.	1.0	40.0	40.0	30.0	.	20.0	.
27	2.0	1.0	1.0	4.0	1.0	0.8	60.0	20.0	15.0	15.0	20.0	50.0
28	.	0.8	.	.	.	2.6	40.0	40.0	40.0	.	20.0	.
29	.	0.8	.	2.3	.	.	30.0	30.0	20.0	.	15.0	.
30	0.8	0.8	0.8	0.8	0.8	0.8	7.5	20.0	20.0	7.5	20.0	7.5
31	0.8	0.8	.	0.8	.	1.5	40.0	30.0	40.0	20.0	20.0	.
32	0.8	0.8	0.8	0.8	0.8	0.8	180.0	20.0	20.0	7.5	7.5	7.5
33	0.8	0.8	0.8	0.8	0.8	0.8	.	30.0	40.0	7.5	20.0	20.0
34	0.8	0.7	0.8	0.7	0.8	1.8	7.5	7.5	11.2	7.5	10.6	20.0
35	.	0.8	.	.	.	4.2	40.0	20.0	40.0	.	20.0	.
36	0.8	0.8	.	0.8	0.8	2.1	20.0	7.5	30.0	7.5	7.5	.
37	0.8	0.8	0.8	0.8	2.1	2.1	7.5	7.5	7.5	20.0	20.0	20.0
38	0.8	0.8	0.8	0.8	0.8	2.2	20.0	7.5	7.5	7.5	7.5	7.5
39	.	0.8	.	.	.	0.8	7.5	7.5	7.5	.	20.0	.
40	0.8	0.8	0.8	0.8	.	2.0	.	.	.	.	.	.
41	.	.	.	.	.	.	7.5	40.0	30.0	.	.	.
42	.	2.0	.	.	.	4.4	20.0	70.0	60.0	.	30.0	.
43	.	0.8	.	.	.	4.6	7.5	60.0	40.0	.	30.0	.
44	.	0.8	.	.	.	13.3	7.5	40.0	50.0	.	20.0	.
45	1.8	3.1	.	2.5	6.1	13.0	30.0	130.0	110.0	50.0	50.0	.
46	.	.	.	.	.	10.6	40.0	50.0	60.0	.	.	.
47	.	1.8	0.8	.	.	.	7.5	7.5	7.5	.	7.5	7.5
48	.	0.8	0.8	1.8	.	7.2	20.0	20.0	30.0	.	30.0	20.0
49	.	2.0	0.8	.	8.6	3.8	7.5	20.0	20.0	.	20.0	7.5
50	0.8	0.8	0.8	1.0	1.8	1.3	20.0	.	11.8	7.5	20.0	7.5
51	0.8	0.8	0.8	0.8	3.9	2.4	20.0	20.0	20.0	7.5	20.0	7.5
52	0.8	0.8	0.8	1.0	4.3	2.0	7.5	.	.	20.0	20.0	20.0
53	.	0.8	.	0.8	.	6.4	.	30.0	.	.	7.5	.
54	0.8	0.7	0.2	1.2	1.5	2.0	20.0	30.0	30.0	40.0	33.7	50.0
55	0.8	1.9	1.9	2.1	4.6	3.5	30.0	40.0	22.3	20.0	28.1	30.0
56	0.8	0.8	0.8	1.3	1.9	3.7	7.5	30.0	24.1	20.0	16.2	20.0
57	.	0.8	.	1.0	.	4.9	7.5	.	14.9	.	20.0	.
58	0.8	0.8	1.8	3.1	7.3	4.1	30.0	.	40.0	30.0	20.0	20.0
59	3.4	2.4	4.6	.	3.2	.	30.0	50.0	60.0	60.0	50.0	60.0

FLORIDA AQUARIUM PARKING LOT STUDY

Obs	ZN6	ZN7	ZN8	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8
1	.	.	.	9.7	11.3	.	29.5	4.4	.	.	.
2	15.0	.	15.0	5.6	9.2	.	.	.	9.9	.	13.0
3	15.0	15.0	30.0	4.8	12.4	2.0	11.5	6.8	2.3	6.2	13.0
4	15.0	15.0	.	6.2	12.0	4.6	2.9	4.9	1.1	5.3	.
5	15.0	40.0	15.0	6.0	5.9	2.8	3.6	.	3.0	7.1	14.1
6	15.0	15.0	15.0	6.5	1.9	0.6	4.3	1.5	0.8	6.8	10.3
7	.	.	.	8.1	5.9	.	.	.	.	.	.
8	.	.	.	4.5	2.9	.	.	.	.	.	.
9	15.0	15.0	.	1.9	3.8	1.9	3.6	.	1.3	7.0	.
10	15.0	15.0	15.0	6.8	6.5	1.1	6.2	.	1.6	0.0	7.9
11	15.0	15.0	15.0	4.7	7.5	0.5	4.8	.	1.9	.	27.3
12	.	.	.	13.1	8.7	.	.	.	.	.	.
13	.	70.0	.	.	.	.	.	.	.	.	.
14	40.0	40.0	50.0	15.7	32.8	2.5	5.0	6.6	4.1	3.6	22.3
15	15.0	30.0	41.0	15.0	38.8	0.2	1.3	4.0	0.5	3.0	4.3
16	.	.	80.0	.	.	.	.	.	.	.	.
17	.	.	.	.	.	.	.	.	.	.	.
18	15.0	60.0	50.0	36.3	60.6	5.2	6.1	.	14.5	7.1	12.1
19	.	.	40.0	28.1	.	.	.	.	.	.	.
20	15.0	15.0	15.0	23.0	12.7	.	4.0	.	.	.	8.0
21	30.0	30.0	40.0	24.4	11.4	1.8	3.6	2.4	3.0	4.3	.
22	15.0	15.0	15.0	5.7	9.9	1.0	1.9	2.1	1.7	3.9	9.1
23	15.0	.	15.0	8.1	18.3	1.1	1.5	.	3.9	.	7.8
24	15.0	15.0	15.0	5.3	4.5	1.7	1.3	2.1	1.7	11.3	3.0
25	15.0	30.0	30.0	9.4	3.5	2.4	2.7	.	5.5	.	5.7
26	.	.	20.0	7.6	8.3	.	.	.	.	.	11.5
27	20.0	30.0	20.0	5.2	4.7	0.6	2.3	.	5.9	3.6	4.1
28	.	.	30.0	7.8	22.0	.	2.0	.	.	.	8.6
29	20.0	.	.	12.2	8.2	.	.	.	7.2	.	.
30	7.5	20.0	20.0	5.7	3.5	.	1.9	.	2.0	.	10.1
31	20.0	.	20.0	6.7	12.3	.	1.3	.	.	.	9.7
32	7.5	20.0	20.0	10.3	7.0	1.5	2.3	2.0	9.0	6.5	2.7
33	7.5	20.0	20.0	4.2	3.8	1.1	2.2	.	2.5	3.5	7.2
34	10.0	20.0	19.0	2.5	3.4	1.1	2.9	1.4	2.3	3.0	15.1
35	.	.	60.0	9.4	5.9	.	.	.	.	.	35.2
36	7.5	20.0	40.0	5.3	2.7	.	1.9	.	.	.	17.5
37	20.0	30.0	80.0	4.0	2.2	1.4	1.6	2.5	2.3	9.8	7.2
38	7.5	20.0	30.0	4.4	1.1	1.8	2.0	.	10.3	9.8	7.2
39	.	.	20.0	.	.	.	.	.	.	.	.
40	.	.	.	4.8	.	2.3	2.7	3.6	3.7	.	11.7
41	.	.	.	.	.	.	.	.	.	.	.
42	.	.	90.0	20.7	16.4	.	.	.	.	.	32.0
43	.	.	100.0	.	.	.	.	.	.	.	.
44	.	.	130.0	.	.	.	.	.	.	.	.
45	50.0	100.0	140.0	42.5	42.1	.	8.8	.	10.5	121.1	24.8
46	.	.	90.0	20.7	24.9	.	.	.	.	.	.
47	.	.	.	10.6	22.3	.	.	.	.	.	.
48	20.0	.	40.0	10.8	16.8	.	.	.	.	.	32.7
49	.	20.0	30.0	4.4	12.4	.	.	.	.	.	28.9
50	7.5	20.0	20.0	.	11.1	2.1	1.5	5.6	3.5	12.1	7.0
51	7.5	40.0	20.0	6.6	3.7	1.5	1.8	3.0	5.3	29.2	8.3
52	15.3	40.0	32.4	.	.	1.2	4.1	5.1	9.2	18.7	12.9
53	30.0	.	60.0	7.1	.	.	2.3	.	.	.	44.0
54	173.5	7.5	11.8	10.1	6.8	2.8	3.1	16.3	11.0	7.9	9.2
55	28.3	60.0	46.3	8.4	2.8	6.1	7.4	14.2	15.3	16.9	10.7
56	23.0	30.0	34.6	8.2	4.2	2.3	2.0	7.9	6.6	12.5	11.3
57	23.0	.	62.9	.	5.3	.	3.2	.	12.4	.	77.0
58	40.0	70.0	40.0	.	5.7	5.6	4.5	13.5	12.2	71.5	36.2
59	.	50.0	.	19.1	11.2	21.9	22.7	41.6	.	51.7	.

Appendix M-2 Tests for significant differences between years using the parametric Duncan's Multiple Range Test and the non-parametric Kruskal-Wallis Test. Means and medians with the same letter are not significantly different.

Abbreviation & Identity	Duncan	Mean	N	SET	Kruskal -Wallis	Median	Pr>Chi-Square
RA1 Rainfall (in)							
	A	1.1214	29	yr1	C	1.17	
	A	1.1544	25	yr2	C	1.15	
FF1 Flow from Basin 1 (Cubic feet)							
	A	688.8	29	yr1	C	539	
	A	638.0	25	yr2	C	621	
FF2 Flow from Basin 2 (Cubic feet)							
	A	590.4	29	yr1	C	450	
	A	547.3	25	yr2	C	543	
FF3 Flow from Basin 3 (Cubic feet)							
	A	268.9	29	yr1	C	164	
	A	263.1	25	yr2	C	121	
FF4 Flow from Basin 4 (Cubic feet)							
	A	421.9	29	yr1	C	268	
	A	389.5	25	yr2	C	328	
FF5 Flow from Basin 5 (Cubic feet)							
	A	134.66	29	yr1	C	44	
	A	126.04	25	yr2	C	46	
FF6 Flow from Basin 6 (Cubic feet)							
	A	274.1	29	yr1	C	154	
	A	250.6	25	yr2	C	171	
FF7 Flow from Basin 7 (Cubic feet)							
	A	204.30	29	yr1	C	95	
	A	211.96	25	yr2	C	122	
FF8 Flow from Basin 8 (Cubic feet)							
	A	414.7	29	yr1	C	297	
	A	408.3	25	yr2	C	293	
ANTE Inter-Event dry period (hrs)							
	A	163.50	28	yr1	C	82.63	
	A	117.78	24	yr2	C	105.25	
DURA Duration of storm (hrs)							
	A	4.098	28	yr1	C	2.25	
	A	4.708	24	yr2	C	3.50	
MAXI Maximum Intensity (in/hr)							
	A	0.6411	28	yr1	C	0.50	
	A	0.7021	24	yr2	C	0.64	
NHR Ammonia in rainfall (mg/L)							
	A	0.11689	28	yr1	C	0.08	
	A	0.13622	23	yr2	C	0.14	
NOR Nitrate in rainfall (mg/L)							
	A	0.20615	27	yr1	C	0.12	
	A	0.21917	23	yr2	C	0.18	
TNR Total nitrogen in rainfall (mg/L)							
	A	0.4185	27	yr1	C	0.38	
	A	0.4627	22	yr2	C	0.37	
OPR Ortho-phosphate in rainfall (mg/L)							
	A	0.01836	28	yr1	C	0.005	
	A	0.02165	23	yr2	C	0.005	
TPR Total phosphorus in rainfall (mg/L)							
	A	0.017140	28	yr1	C	0.012	0.001
	B	0.033435	23	yr2	D	0.022	
CUR Total copper in rainfall (ug/L)							
	A	4.193	28	yr1	C	3.20	
	A	6.800	23	yr2	C	3.40	

Abbreviation	Duncan	Mean	N	SET	Kruskal -Wallis	Median	Pr>Chi-Square
FER Total iron in rainfall (ug/L)							
	A	95.89	28	yr1	C	90	
	A	80.00	23	yr2	C	55	
PBR Total lead in rainfall (ug/L)							
	A	1.3483	29	yr1	C	BD	
	A	1.0587	23	yr2	C	BD	
ZNR Total zinc in rainfall (ug/L)							
	A	33.276	29	yr1	C	15.0	
	A	24.773	22	yr2	C	20.0	
NH1 Ammonia in runoff from Basin 1 (mg/L)							
	A	0.11403	29	yr1	C	0.070	
	A	0.11275	24	yr2	C	0.130	
NO1 Nitrate in runoff from Basin 1 (mg/L)							
	A	0.21397	29	yr1	C	0.142	
	A	0.20357	23	yr2	C	0.182	
TN1 Total nitrogen in runoff from Basin 1 (mg/L)							
	A	0.4467	29	yr1	C	0.40	
	A	0.5114	22	yr2	C	0.44	
OP1 Ortho-Phosphorus in runoff from Basin 1 (mg/L)							
	A	0.03510	29	yr1	C	0.031	
	A	0.05609	23	yr2	C	0.026	
TP1 Total phosphorus in runoff from Basin 1 (mg/L)							
	A	0.09714	29	yr1	C	0.054	
	A	0.06404	23	yr2	C	0.050	
CU1 Total Copper in runoff from Basin 1 (ug/L)							
	A	9.612	29	yr1	C	8.70	
	A	9.848	23	yr2	C	8.25	
FE1 Total iron in runoff from Basin 1 (ug/L)							
	A	377.59	29	yr1	C	310	
	A	356.52	23	yr2	C	280	
PB1 Total lead in runoff from Basin 1 (ug/L)							
	A	3.6552	29	yr1	C	2.70	
	A	2.7326	23	yr2	C	2.10	
ZN1 Total zinc in runoff from Basin 1 (ug/L)							
	A	40.172	29	yr1	C	30.00	
	A	30.682	22	yr2	C	30.00	
NH2 Ammonia in runoff from Basin 2 (mg/L)							
	A	0.10879	28	yr1	C	0.055	
	A	0.10783	22	yr2	C	0.028	
NO2 Nitrate in runoff from Basin 2 (mg/L)							
	A	0.21525	28	yr1	C	0.153	
	A	0.21818	22	yr2	C	0.191	
TN2 Total nitrogen in runoff from Basin 2 (mg/L)							
	A	0.4484	28	yr1	C	0.27	
	A	0.5150	21	yr2	C	0.49	
OP2 Ortho-phosphorus in runoff from Basin 2 (mg/L)							
	A	0.06032	28	yr1	C	0.027	
	A	0.03645	22	yr2	C	0.023	
TP2 Total phosphorus in runoff from Basin 2 (mg/L)							
	A	0.10054	28	yr1	C	0.057	
	A	0.06577	21	yr2	C	0.044	
CU2 Total copper in runoff from Basin 2 (ug/L)							
	A	8.920	28	yr1	C	7.00	
	A	10.933	22	yr2	C	7.80	
FE2 Total iron in runoff from Basin 2 (ug/L)							
	A	360.54	28	yr1	C	310	
	A	308.25	22	yr2	C	280	
PB2 Total lead in runoff from Basin 2 (ug/L)							
	A	4.0674	28	yr1	C	2.70	
	A	2.9521	22	yr2	C	2.00	

Abbreviation	Duncan	Mean	N	SET	Kruskal -Wallis	Median	Pr>Chi-Square
ZN2 Total zinc in runoff from Basin 2 (ug/L)							
	A	38.257	28	yr1	C	30.00	
	A	31.500	22	yr2	C	30.00	
NH3 Ammonia in runoff from Basin 3 (mg/L)							
	A	0.03153	17	yr1	C	0.018	
	A	0.06929	14	yr2	C	0.028	
NO3 Nitrate in runoff from Basin 3 (mg/L)							
	A	0.14729	17	yr1	C	0.109	
	A	0.23514	14	yr2	C	0.264	
TN3 Total nitrogen in runoff from Basin 3 (mg/L)							
	A	0.3859	17	Yr1	C	0.31	0.02
	A	0.7585	14	Yr2	D	0.63	
OP3 Ortho-phosphorus in runoff from Basin 3 (mg/L)							
	A	0.15353	17	yr1	C	0.135	0.05
	A	0.22786	14	yr2	D	0.171	
TP3 Total Phosphorus in runoff from Basin 3 (mg/L)							
	A	0.18618	17	yr1	C	0.170	0.05
	A	0.26557	14	yr2	D	0.208	
CU3 Total copper in runoff from Basin 3 (ug/L)							
	A	3.835	17	yr1	C	3.40	
	A	4.857	14	yr2	C	4.60	
FE3 Total iron in runoff from Basin 3 (ug/L)							
	A	60.00	17	yr1	C	50	
	A	48.93	14	yr2	C	50	
PB3 Total lead in runoff from Basin 3							
	A	1.2882	17	yr1	C	bd	
	B	0.8250	14	yr2	C	bd	
ZN3 Total zinc in runoff from Basin 3 (ug/L)							
	A	16.765	17	yr1	C	15.0	
	A	16.154	13	yr2	C	20.0	
NH4 Ammonia in runoff from Basin 4 (mg/L)							
	A	0.04311	24	yr1	C	0.019	0.001
	B	0.09351	23	yr2	D	0.068	
NO4 Nitrate in runoff from Basin 4 (mg/L)							
	A	0.20519	24	yr1	C	0.189	
	A	0.24768	22	yr2	C	0.222	
TN4 Total nitrogen in runoff from Basin 4 (mg/L)							
	A	0.5419	24	yr1	C	0.48	
	A	0.7546	22	yr2	C	0.65	
OP4 Ortho-phosphorus in runoff from Basin 4 (mg/L)							
	A	0.22217	24	yr1	C	0.122	
	A	0.20116	23	yr2	C	0.140	
TP4 Total phosphorus in runoff from Basin 4 (mg/L)							
	A	0.25399	24	yr1	C	0.149	0.05
	A	0.24367	23	yr2	D	0.189	
CU4 Total copper in runoff from Basin 4 (ug/L)							
	A	3.7624	23	yr1	C	3.40	0.01
	B	5.4803	23	yr2	D	5.30	
FE4 Total iron in runoff from Basin 4 (ug/L)							
	A	84.31	24	yr1	C	70	
	A	72.55	23	yr2	C	80	
PB4 Total lead in runoff from Basin 4 (ug/L)							
	A	1.2350	24	yr1	C	bd	
	A	1.0061	23	yr2	C	bd	
ZN4 Total zinc in runoff from Basin 4 (ug/L)							
	A	20.208	24	yr1	C	15.0	
	A	20.078	22	yr2	C	20.0	
NH5 Ammonia in runoff from Basin 5 (mg/L)							
	A	0.07158	12	yr1	C	0.042	
	A	0.07123	13	yr2	C	0.084	

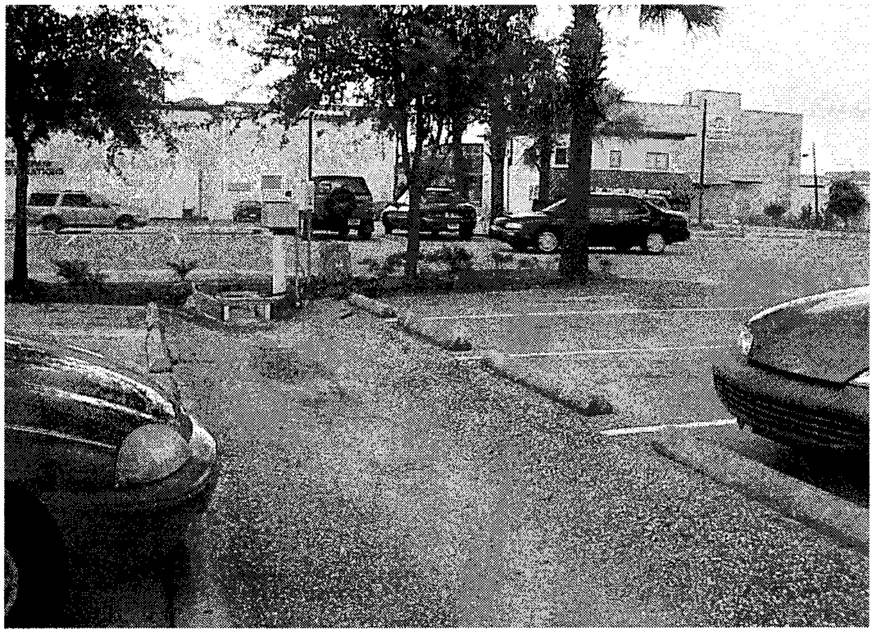
Abbreviation	Duncan	Mean	N	SET	Kruskal -Wallis	Median	Pr>Chi-Square
NO5 Nitrate in runoff from Basin 5 (mg/L)							
	A	0.11575	12	yr1	C	0.101	0.006
	B	0.24646	13	yr2	D	0.259	
TN5 Total nitrogen in runoff from Basin 5 (mg/L)							
	A	0.4575	12	yr1	C	0.41	
	A	0.6383	12	yr2	C	0.62	
OP5 Ortho-phosphorus in runoff from Basin 5 (mg/L)							
	A	0.05492	12	yr1	C	0.051	0.06
	A	0.08546	13	yr2	C	0.086	
TP5 Total phosphorus in runoff from Basin 5 (mg/L)							
	A	0.07525	12	yr1	C	0.068	0.06
	B	0.13469	13	yr2	D	0.116	
CU5 Total copper in runoff from Basin 5 (ug/L)							
	A	3.404	12	yr1	C	2.70	
	A	3.936	14	yr2	C	3.80	
PB5 Total lead in runoff from Basin 5 (ug/L)							
	A	1.13000	12	yr1	C	bd	
	B	bd	14	yr2	C	bd	
FE5 Total iron in runoff from Basin 5 (ug/L)							
	A	111.25	12	yr1	C	80	
	A	76.00	15	yr2	C	97	
ZN5 Total zinc in runoff from Basin 5 (ug/L)							
	A	19.167	12	yr1	C	15.0	
	A	15.577	13	yr2	C	20.0	
NH6 Ammonia in runoff from Basin 6 (mg/L)							
	A	0.03022	19	yr1	C	0.017	
	A	0.05962	16	yr2	C	0.043	
O6 Nitrate in runoff from Basin 6 (mg/L)							
	A	0.16994	19	yr1	C	0.115	
	A	0.23165	15	yr2	C	0.209	
TN6 Total nitrogen in runoff from Basin 6 (mg/L)							
	A	0.5151	19	yr1	C	0.46	
	A	0.6962	14	yr2	C	0.62	
OP6 Ortho-phosphorus in runoff from Basin 6 (mg/L)							
	A	0.16745	19	yr1	C	0.121	
	A	0.23663	16	yr2	C	0.168	
TP6 Total phosphorus in runoff from Basin 6 (mg/L)							
	A	0.18452	19	yr1	C	0.120	0.04
	A	0.27819	16	yr2	D	0.214	
CU6 Total copper in runoff from Basin 6 (ug/L)							
	A	3.6281	19	yr1	C	3.60	
	A	3.8871	16	yr2	C	3.60	
FE6 Total iron in runoff from Basin 6 (ug/L)							
	A	64.08	19	yr1	C	50	
	A	87.89	16	yr2	C	97	
PB6 Total lead in runoff from Basin 6 (ug/L)							
	A	1.4422	19	yr1	C	bd	
	A	0.9819	16	yr2	C	bd	
ZN6 Total zinc in runoff from Basin 6 (ug/L)							
	A	17.632	19	yr1	C	15.0	
	A	26.086	15	yr2	C	20.0	
NH7 Ammonia in runoff from Basin 7 (mg/L)							
	A	0.07563	16	yr1	C	0.041	0.056
	A	0.10600	13	yr2	C	0.105	
NO7 Nitrate in runoff from Basin 7 (mg/L)							
	A	0.14100	16	yr1	C	0.109	
	A	0.24300	13	yr2	C	0.230	
TN7 Total nitrogen in runoff from Basin 7 (mg/L)							
	A	0.5288	16	yr1	C	0.40	
	A	0.6775	12	yr2	C	0.56	

Abbreviation	Duncan	Mean	N	SET	Kruskal -Wallis	Median	Pr>Chi-Square
OP7 Ortho-phosphorus in runoff from Basin 7 (mg/L)							
	A	0.10113	16	yr1	C	0.097	
	A	0.11523	13	yr2	C	0.110	
TP7 Total phosphorus in runoff from Basin 7 (mg/L)							
	A	0.14444	16	yr1	C	0.128	
	A	0.15877	13	yr2	C	0.157	
CU7 Total copper in runoff from Basin 7 (ug/L)							
	A	6.304	16	yr1	C	5.10	
	A	9.185	13	yr2	C	7.40	
FE7 Total iron in runoff from Basin 7 (ug/L)							
	A	170.00	16	yr1	C	125	
	A	261.50	13	yr2	C	220	
PB7 Total lead in runoff from Basin 7 (ug/L)							
	A	1.8813	16	yr1	C	bd	
	A	2.5231	13	yr2	C	1.90	
ZN7 Total zinc in runoff from Basin 7 (ug/L)							
	A	27.353	17	yr1	C	15.0	
	A	29.038	13	yr2	C	20.0	
NH8 Ammonia in runoff from Basin 8 (mg/L)							
	A	0.10944	20	yr1	C	0.049	
	A	0.10670	23	yr2	C	0.083	
NO8 Nitrate in runoff from Basin 8 (mg/L)							
	A	0.18850	20	yr1	C	0.171	
	A	0.24283	23	yr2	C	0.23	
TN8 Total runoff from Basin 8 (mg/L)							
	A	0.5868	20	yr1	C	0.46	
	A	0.7661	20	yr2	C	0.60	
OP8 Ortho-phosphorus in runoff from Basin 8 (mg/L)							
	A	0.25666	20	yr1	C	0.137	
	A	0.14436	22	yr2	C	0.109	
TP8 Total phosphorus in runoff from Basin 8 (mg/L)							
	A	0.3195	20	yr1	C	0.161	
	A	0.2317	23	yr2	C	0.180	
CU8 Total iron in runoff from Basin 8 (ug/L)							
	A	0.10944	20	Yr1	C	6.85	0.07
	A	0.10670	23	Yr2	C	12.00	
FE8 Total iron in runoff from Basin 8 (ug/L)							
	A	236.4	20	yr1	C	230	0.03
	B	586.0	23	yr2	D	415	
PB8 Total lead in runoff from Basin 8 (ug/L)							
	A	2.7370	20	yr1	C	2.55	
	A	3.9052	23	yr2	C	2.40	
ZN8 Total zinc in runoff from Basin 8 (ug/L)							
	A	28.300	20	yr1	C	20.0	0.03
	B	49.691	22	yr2	D	37.3	
SS1 Total suspended solids in runoff from Basin 1 (mg/L)							
	A	10.847	26	yr1	C	7.69	
	A	10.035	19	yr2	C	7.62	
SS2 Total suspended solids in runoff from Basin 2 (mg/L)							
	A	12.944	25	yr1	C	8.73	
	A	11.005	18	yr2	C	5.87	
SS3 Total suspended solids in runoff from Basin 3 (mg/L)							
	A	1.8770	16	yr1	C	1.77	
	A	1.6632	10	yr2	C	1.94	
SS4 Total suspended solids in runoff from Basin 4 (mg/L)							
	A	5.164	19	yr1	C	3.56	0.05
	A	2.692	15	yr2	D	2.29	
SS5 Total suspended solids in runoff from Basin 5 (mg/L)							
	A	3.863	9	yr1	C	3.18	
	A	4.937	8	yr2	C	5.34	

Abbreviation	Duncan	Mean	N	SET	Kruskal -Wallis	Median	Pr>Chi-Square
SS6 Total suspended solids in runoff from Basin 6 (mg/L)							
	A	3.883	18	yr1	C	2.63	
	A	5.966	12	yr2	C	7.83	
SS7 Total suspended solids in runoff from Basin 7 (mg/L)							
	A	5.311	13	yr1	C	5.26	0.03
	A	22.162	10	yr2	D	12.30	
SS8 Total suspended solids in runoff from Basin 8 (mg/L)							
	A	10.719	17	yr1	C	9.12	
	A	17.020	19	yr2	C	11.71	

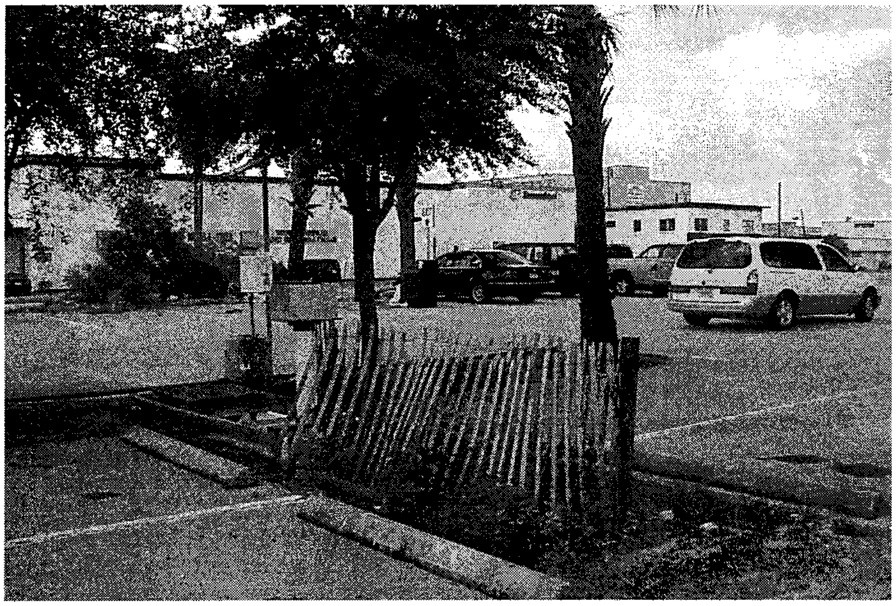
APPENDIX N

PICTURES



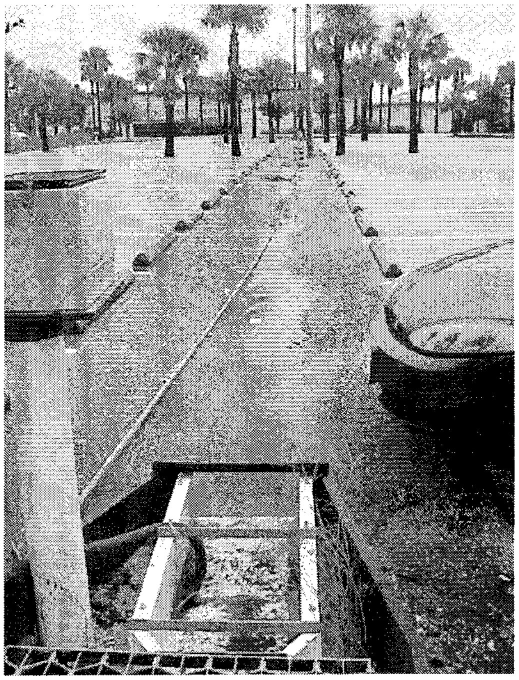
ASPHALT PAVEMENT WITH NO PLANTED SWALE

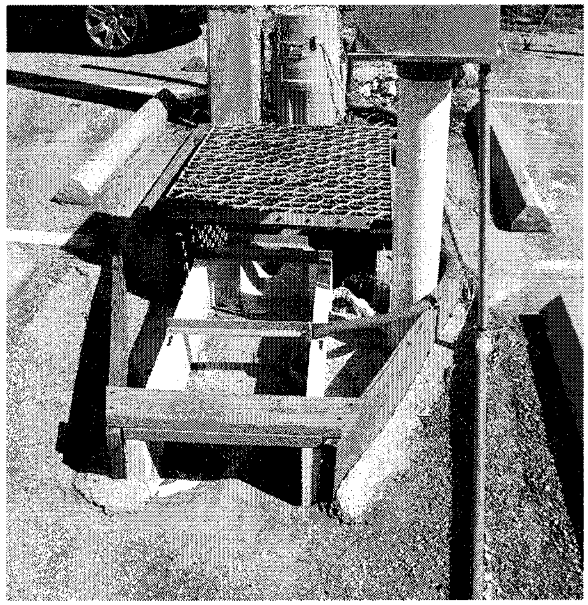
CONCRETE WITH PLANTED SWALE



POROUS PAVEMENT WITH PLANTED SWALE IN POOR CONDITIONS BECAUSE PEOPLE HAVE REMOVED THE FENCE AND TAKEN SHORT CUTS ACROSS THE SWALE

STRAND THAT RECEIVES RUNOFF FROM SWALES

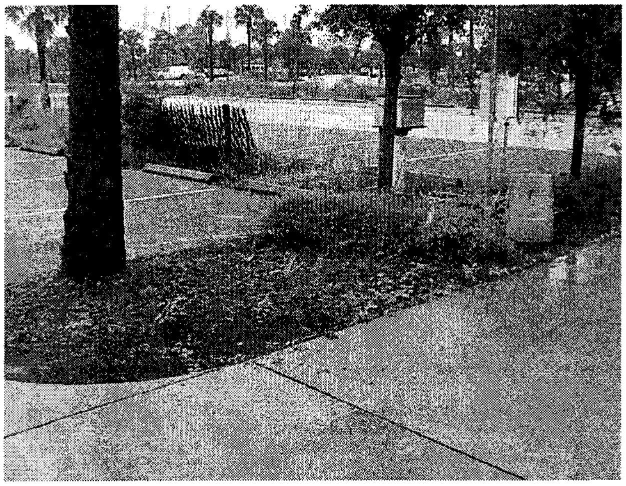




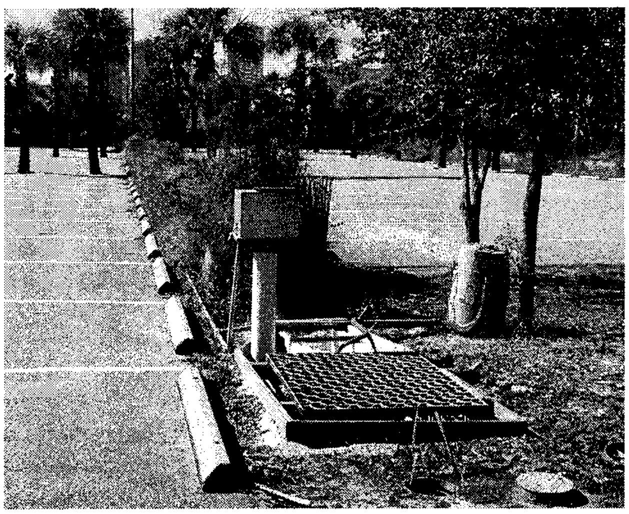
CLOSE UP BASIN WITHOUT SWALE

ASPHALT BASIN WITHOUT PLANTED SWALE

ASPHALT BASIN WITHOUT PLANTED SWALE
SHOWS SAMPLING EQUIPMENT



Small Garden Area and sampling equipment

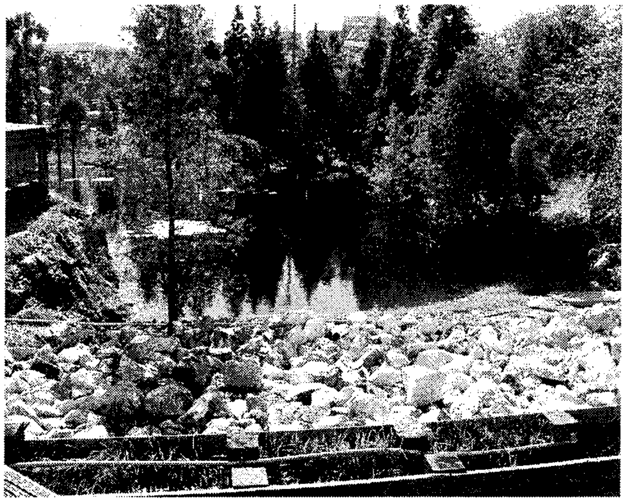


Large Garden Area with planted swale in background

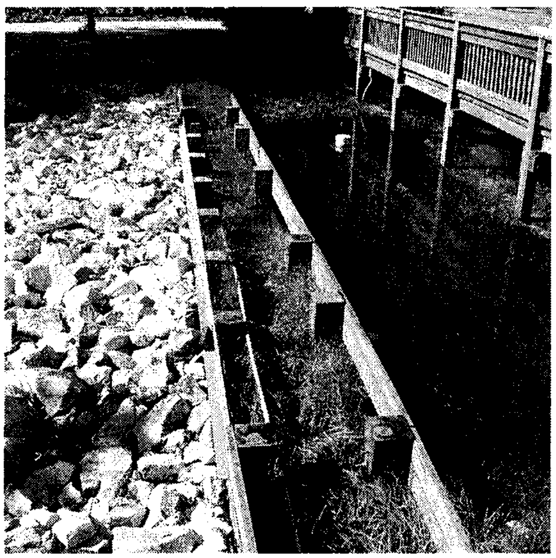
Sampling Equipment showing shaft encoder, data logger and automatic water quality sampler

THE STRAND AFTER THE BERM REPAIRS SHOWING NEW SIDE BANK FILTER

THE POND SHOWING WEIR STRUCTURES



INFLOW



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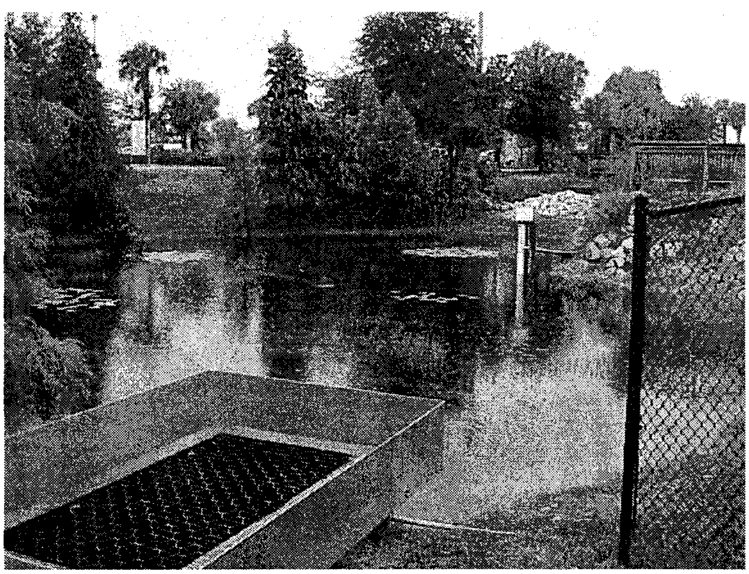
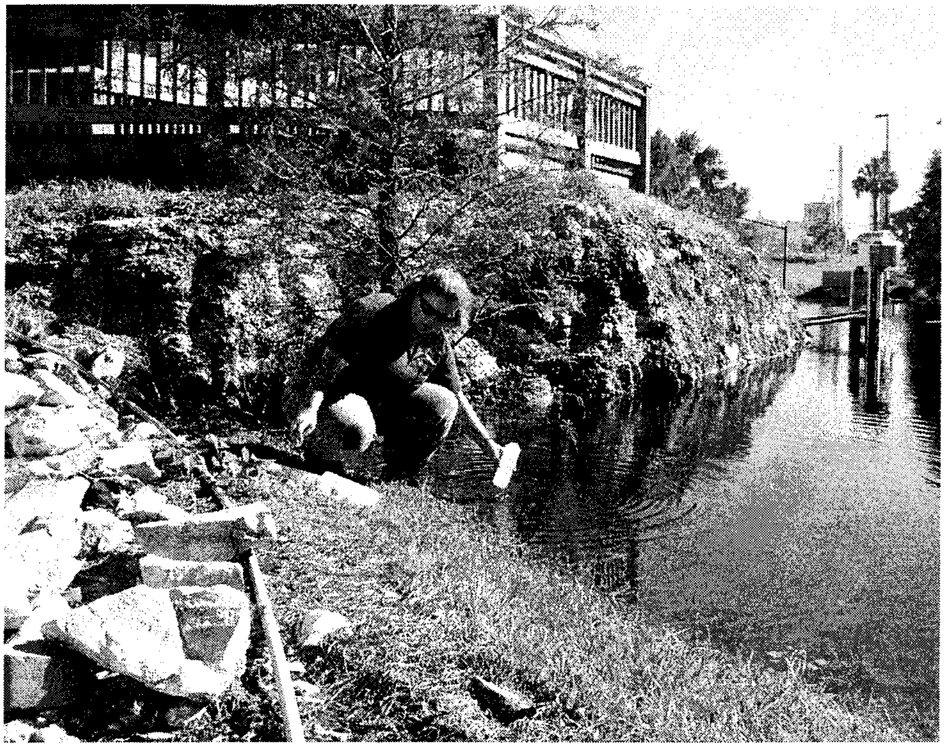
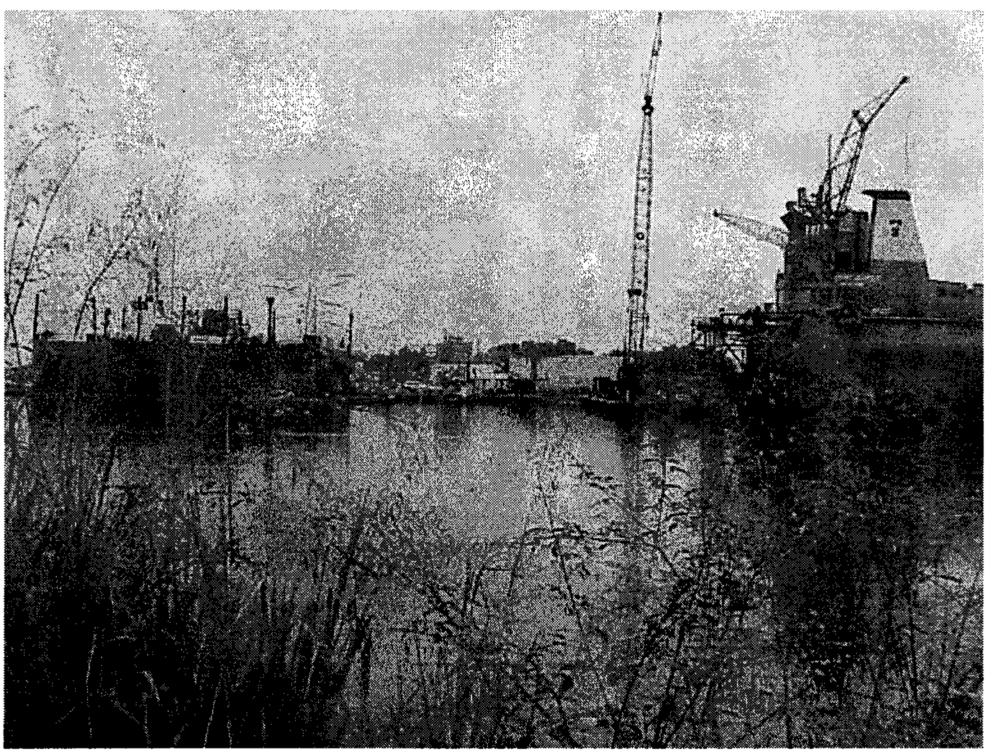


OUTFLOW



HUNK OF
CONCRETE LEFT
FROM PREVIOUS
INDUSTRIAL
ACTIVITY



YBOR CHANNEL