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Evaluation of Effectiveness of Three Types of Highway Alignment Best Management Practices for Sediment and Nutrient Control

December 2004

Prepared by: Nevada Department of Transportation and
Division of Hydrologic Sciences, Desert Research Institute
University and Community College System of Nevada
Prepared for: U.S. Forest Service- Lake Tahoe Basin Management Unit,
Nevada Division of State Lands, and The Nevada Department of Transportation

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16. Abstract

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This research evaluates the efficiency of three types of highway alignment BMPs installed during the first phase of the NDOT Master Plan. A sediment trap, sediment basin and Stormceptor® were evaluated for nutrient and suspended sediment removal efficiency. Problems with flow sensors prevented efficiency calculations for the sediment basin. Concentration values did indicate some level of treatment however. The sediment trap removed 51 percent, 42 percent, and 32 percent of TSS, TP and TN respectively, although statistical analysis showed no difference between inflow and outflow. The Stormceptor® provided 31 percent, 25 percent, and 21 percent nutrient removal rates respectively for TSS, TP and TN with statistically significant differences between inflow and outflow.

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CHAPTER 1. INTRODUCTION

The beauty of Lake Tahoe, with its exceptional transparency and deep blue color, is widely acclaimed. In *Roughing It,* Mark Twain wrote, "So singularly clear was the water, that...even eighty feet deep...every pebble was distinct, every speckled trout, every hand's-breadth of sand...The water was not merely transparent but dazzlingly, brilliantly so."

Regrettably, the clarity of Lake Tahoe is declining at a rate of approximately 1 foot per year (Goldman 1988; Rueter and Miller, 2000). Many factors, identified in studies from 1962 to 1999, have contributed to eutrophication of Lake Tahoe including land disturbance, habitat destruction, soil erosion and air pollution (Rueter and Miller, 2000). Population growth, increased urbanization and roadways are believed to be the major factors contributing to increased sediment input to Tahoe basin streams and the lake (Rueter and Miller, 2000). Decreasing water clarity can be attributed to increases in primary productivity and suspended sediments (Jassaby *et al.*, 1999). Primary productivity has increased at a rate greater than 5 percent per year, closely tracking population growth within the Tahoe basin (Goldman, 1988). Increased nutrient loading has been identified as the cause of progressive eutrophication (Goldman, 1988). Most of the total nitrogen and dissolved inorganic nitrogen load to Lake Tahoe comes from atmospheric deposition (Jassaby *et al.*, 1994), while the majority of phosphorus comes from watershed contributions (Hatch *et al.*, 2001).

Prior to 1980, algal growth in Lake Tahoe was co-limited by nitrogen (N) and phosphorus (P) but began to shift to consistently P limitation around 1980, indicated by bioassay responses to P enrichment (Goldman *et al.*, 1993). This suggests algal growth is increasingly stimulated and limited by phosphorus. Early on, watershed management focused on exporting all sewage from the basin, restricting development, and controlling erosion. Although these measures were originally put into place for controlling nitrogen loading, they are now important controls for P contributions derived from the watershed (Jassaby *et al.*, 1994).

Over the decades, efforts for reducing nutrients and sediment loading to the lake have included acquisition of environmentally sensitive lands, treating surface runoff and implementing best management practices (BMPs) for controlling erosion. Two recent reports (Hydro Science, 2000; Murphy and Knopp, 2000) identified the lack of information pertaining to the effectiveness of various BMPs being constructed in the Tahoe basin and the need for research and monitoring to assess the efficacy of the various treatments and their potential for reducing nutrient and sediment loading to Lake Tahoe.

The Nevada Department of Transportation (NDOT) is responsible for 39 miles of roadway within the Tahoe basin. This includes 14 miles of State Route 28 (SR 28) and 12 miles of U.S. Highway 50 (US 50); both run adjacent to Lake Tahoe's east shore for much of its length. Typically, roadway runoff from stormwater and snowmelt is channelized in roadside ditches or curb and gutter, ultimately discharged through culvert crossings. In many instances, these culverts discharge at locations within close proximity to Lake Tahoe, e.g., in some cases with direct hydrologic connection to the lake. Effectively treating stormwater runoff prior to discharge to the lake is a difficult challenge. Limited right-of-way, steep topography, highly erosive soils, large rock outcrops, shallow bedrock and lack of precipitation during spring and summer growing seasons are among the challenges that limit the types of BMPs available for use by NDOT.

In March 1997, NDOT implemented the first phase of the NDOT Lake Tahoe Master Plan for Erosion Control and Stormwater Management (MPECSWM) along 5.5 miles of SR 28 and 2 miles of US 50 from Spooner Summit to Glenbrook. This master plan identified needed improvements to meet the Tahoe Regional Planning Agency's (TRPA) 208 Water Quality Plan thresholds (Harding Lawson Associates, 1998). Collaborators, in implementing the MPECSWM, included over 15 different agencies including TRPA, Nevada State Lands, Nevada State Parks, Nevada Division of Environmental Protection, Federal Highway Administration (FHWA), U.S. Fish and Wildlife Service, Washoe County and Carson City. This effort would evolve into NDOT's Environmental Improvement Program (EIP), a component of the TRPA Environmental Improvement Program.

TRPA's EIP is a strategy for restoring, maintaining and/or attaining the nine environmental thresholds (including water quality) developed by TRPA for the Tahoe basin (TRPA, 2001). This is accomplished through the partnership of local, state and government agencies as well as private interests. The EIP serves as the framework for implementing regional projects and programs.

Since Lake Tahoe has become phosphorus limited, with the major sources of P coming from within the watershed, erosion control strategies for sediment reduction are considered appropriate courses of action (Goldman *et al.*, 1993). The Nevada Department of Transportation uses both source and treatment control strategies for sediment control and reduction. Primary source control strategies include roadside shoulder paving, riprap placement and revegetation of cut and fill slopes. Treatment controls include sediment/infiltration basins, sediment traps and ultra-urban BMPs such as sand/oil separators for treatment of roadway runoff. The Nevada Department of Transportation will spend over $100 million by 2010 on erosion control and water quality improvements within the basin.

To date, 11 miles of NDOT roadways have been retrofitted with typical highway or ultra-urban BMPs. These include sediment traps, sand/oil separators, drop inlets modified to allow infiltration and sediment storage, infiltration basins and sediment basins. Although numerous studies have evaluated the effectiveness of various types of urban BMPs, appropriate mitigation measures for treating urban runoff within the Tahoe basin are unknown. Additionally, the effectiveness of various ultra-urban BMPs, now on the market, in reducing fine-grained sediment is debatable.

Responding to research needs, NDOT along with the Desert Research Institute (DRI), sought funding for monitoring typical treatment control structures installed along NDOT's roadways. This project is specific to three types of BMPs used in highway applications for the reduction of sediment and nutrients contained in highway stormwater runoff. The primary objective of this study is to determine the effectiveness of sediment traps, sediment basins and Stormceptor® units in removing nutrients and suspended sediments from stormwater runoff along NDOT roadways within the Tahoe basin. A second objective is to evaluate the cost benefit of these three types of structures.

Data and information gathered in this study will assist NDOT in adapting erosion control and water quality treatment strategies for future projects. Additionally, these data will be added to the Tahoe Interagency Information Management System (TIIMS) providing scientists, managers, implementers and others with data and information to assist in decision making.

The three BMP study sites are in rural settings surrounded by U.S. Forest Service property. However, although the majority of NDOT's roadways in the Tahoe basin are essentially rural settings, the terrain, exorbitant private property values, limited right-of-way, numerous underground utilities and the unique environment of the Tahoe basin dictate that ultra-urban BMPs be used.

The FHWA defines ultra-urban settings using the following factors to distinguish between studies addressing ultra-urban BMPs (USDA, 2000):

- Limited space available for BMP implementation (less than 1 acre).
- Drainage area imperviousness greater than 50 percent.
- Property value of land over $30 per square foot.
- Location of BMP in right-of-way (only available space).
- Existence of build-out conditions at the site (lot-line to lot-line development).

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CHAPTER 2. LITERATURE REVIEW

Highway Water Quality Control

The Clean Water Act (PL 95-217) requires cooperation between federal, state and local agencies for the development of comprehensive solutions to prevent, reduce and eliminate pollution of U.S. waters. The FHWA is responsible for protecting the environment from highway source pollution under the Clean Water Act and other federal laws. A comprehensive program to identify and quantify the effects of highway runoff and develop management practices for the protection of water resources was initiated by the FHWA and summarized in a series of reports from 1981 through 1986 (Dorman *et al.*, 1996). This four-phase research program included the identification and quantification of highway runoff constituents, identification of pollutant sources, the effects to receiving waters, and the development of tools to minimize the effects of highway runoff pollutants. Research began with a comprehensive, systematic literature search to collect information on mitigation practices in treating highway runoff. Practices include vegetation controls, wet detention basins, dry extended detention basins, infiltration systems and wetlands and are considered the state-of-the art in pollutant removal from highway runoff.

Smith and Lord (1990) summarized the first three phases, over 15 years of FHWA sponsored research, which identified and quantified effects from highway runoff, and developed measures for protecting the environment from potential adverse effects. Five management measures were found to be cost effective for pollutant removal from highway runoff. These are vegetation controls, wet detention basins, dry extended detention basins, infiltration systems and wetlands. Effective nonstructural measures include elimination of curbs, reduction in direct discharge and runoff velocities, management of deicing chemicals, and establishment and maintenance of vegetation (Smith and Lord, 1990). Common practices such as street cleaning, installation of catch basins, porous pavements and filtration devices for sediment control and pollutant load reduction were found to be ineffective.

Phase 1 of the program identified and quantified highway runoff constituents. Table 2.1, adapted from USDA (2000), summarizes average concentration values reported in the literature from several studies, in locations throughout the United States, of various constituents of highway stormwater runoff. Data gathered from this NDOT/DRI investigation found results above the ranges listed here for TSS and TP.

Identification of the primary sources of highway pollutants was the program objective of Phase 2. Particulate sources were primarily from pavement wear, vehicles, atmospheric deposition, and maintenance activities. Major nitrogen and phosphorus sources were identified as the atmosphere and application of roadside fertilizer. Wu *et al.* (1998) found that 20 percent of TSS loadings and 70 to 90 percent of nitrogen loadings from stormwater runoff of highways possibly originated from atmospheric deposition.

Table 2.1. Constituents of highway runoff.

Parameter	National Concentration (mg/L)	NDOT[1] Concentration (mg/L)
Total Suspended Solids (TSS)	45 to 798	74 to 2,799 (827)
Volatile Suspended Solids (VSS)	4.3 to 79	Not Sampled
Total Organic Carbon (TOC)	24 to 77	Not Sampled
Chemical Oxygen Demand (COD)	14.7 to 272	Not Sampled
Biochemical Oxygen Demand (BOD)	12.7 to 37	Not Sampled
Nitrate + Nitrite (NO_3+NO_2)	0.15 to 1.636	0.016 to 0.980 (0.15)
Total Kjeldahl Nitrogen (TKN)	0.335 to 55.0	0.52 to 13.45 (3.69)
Total Phosphorus as P	0.113 to 0.998	0.210 to 4.297 (1.15)
Copper (Cu)	0.022 to 7.033	Not Sampled
Lead (Pb)	0.073 to 1.78	Not Sampled
Zinc (Zn)	0.056 to 0.929	Not Sampled

[1]NDOT concentrations are maximum and minimum values. Values in parentheses are the average concentrations for the study period.

Phase 3 program objectives were to determine the magnitude and extent of highway stormwater runoff impacts. Results indicated minimal impacts to receiving waters for highways with less than 30,000 vehicles per day or ADT (Average Daily Traffic). It should be noted that in the Tahoe basin, traffic volume is not the main source for nutrients and suspended sediments, but rather nitrogen comes from atmospheric sources and phosphorus from roadway cut slopes. Evaluation of the use of retention, detention, and overland flow systems as potential highway runoff mitigation measures was the final study in Phase 4. The resulting FHWA report (Dorman *et al.*, 1996) developed and updated design guidelines for these state-of-the-art practices representing the best available technology for removal of pollutants from highway runoff. From the five management measures identified as cost effective, vegetative controls were considered the primary pollution management measure for highway stormwater runoff. Vegetative controls including vegetated swales and filter strips are effective, relatively low in cost and have widespread applicability.

Vegetative Swales

Grass-lined channels and overland flow areas are the most common mitigation measures used for pollutant removal of highway runoff (Dorman *et al.*, 1996). Design flexibility, site adaptability and relatively low costs in comparison to other mitigation measures are key reasons for their widespread use. When properly designed, vegetative measures can be extremely effective in reducing runoff pollution. Flow depth and detention time are key design elements for the effectiveness of vegetative swales. Increasing flow width and flow length and decreasing slope will extend detention times and increase pollutant removal efficiencies. Successful design of swales should include mild slopes, dense vegetation, low flows, low velocities, maximized surface area and check dams to create ponding areas.

The primary function of vegetative channels and flow areas is the removal of pollutants through sedimentation. Effectiveness is dependent on flow depth and detention time. Stability is the overriding design factor with stability of vegetative control systems dependent on the erodibility of the underlying soils and the maximum shear stress of the soil. Mitigation is achieved by using grass, riprap, etc., but only grass lining provides effective pollutant removal. Grass is the most common vegetation used and nutrients are more effectively removed by grass than by shrubs, trees, or other vegetation.

Vegetative swales have been shown to reduce 23 percent to 80 percent of TSS loadings from roadway runoff (Kaighn and Yu, 1996; Wu *et al.*, 1998). Kaighn and Yu (1996) reported that one study comparing pollutant concentrations in grass lined and paved channels found water quality parameters were 63 percent lower in grass-lined channels than the paved channels. However, Kaighn and Yu (1996) reported that another study found swales were actual sources of pollution.

Yousef *et al.* (1985) found mass removal of heavy metals, nitrogen, and phosphorus was directly related to infiltration losses and on-site storage. Removal efficiencies were dependent upon contact time and infiltration rates. Losses of nitrogen and phosphorus were found to be lower than those for dissolved heavy metals. Retention of pollutants in swale areas is most likely through chemical mechanisms such as sorption, precipitation, co-precipitation and biological uptake processes.

Dorman *et al.* (1996) state minimum design criteria of vegetative controls are as follows:

- Non-erosive slopes, generally less than 8 percent
- Channel lengths of at least 200 feet in length
- Overland minimum length of 40 feet the direction of flow with minimum width of 40 feet

Vegetative controls are not well suited for environmental conditions within the Tahoe basin due to the lack of moisture within the growing season. Precipitation occurs mainly in the winter months in the form of snow when plants are typically dormant.

Wet Detention Basins

Where vegetative control systems are not feasible, wet detention basins can be an acceptable and effective alternative when properly designed (Dorman *et al.*, 1996). Wet detention ponds are designed to have a permanent pool of water. This permanent pool enhances particulate settling by increasing water residence time and also provides conditions for growth of aquatic vegetation, allowing enhanced filtration, and metals and nutrient uptake (USDA, 2000). Basin depth, the ratio of basin storage volume to watershed area, and routine maintenance are important features for ensuring pollutant removal effectiveness.

Highway pollutants (suspended sediments and trace metals) are removed primarily through sedimentation. Ortho-phosphorus, nitrate and nitrite can be effectively removed through plant and algal uptake and denitrification. A number of studies have shown that wet detention basins are moderately to highly effective in reducing suspended solids, nitrogen and phosphorus (e.g., Ferrara and Witkowski; 1983 and Martin, 1988). However, detention basins can be sources of nutrients (Ferrara and Witkowski, 1983).

Detention facilities are commonly used for peak flow reduction of a design storm. Water quality benefits have been claimed for these structures although such basins are not specifically designed for water quality improvements. Ferrara and Witkowski (1983) cite two studies that demonstrated detention basin design should be different for flood control and pollution control. Considerations for water quality treatment of solids require characterization of solid gradation, mass loading, surface area and specific gravity (Sansalone *et al.*, 1998). Characteristics of rainfall, runoff, settling velocities for suspended solids and particulate and pollutant distributions in each size fraction are needed to design wet detention basins to achieve pollutant removal objectives (Dorman *et al.*, 1996). Wet detention basins can be highly effective provided the systems are properly designed to settle out suspended solids.

Dry Detention Basins

Dorman *et al.* (1996) recommends the use of dry detention basins in place of wet detention basins where removal of sediments, rather than nutrients, is the major emphasis. The advantage of a dry detention basin is the reduced volume of storage required when compared to a wet detention basin. Pollutant reduction is dependent on the removal of suspended sediments. Typically, it is assumed that infiltration through the underlying soils will remove soluble nutrients from surface runoff. Infiltration rates and depth to groundwater should be considered when opting for retention of stormwater runoff. Stanley (1996) found that in dry detention basins, TSS removal ranged from 3 percent and 87 percent, TP and TN removals from 13 to 40 percent and 10 to 35 percent, respectively. Table 2.2 shows the removal efficiencies of TSS, TP, TKN and NO_3 from a number of studies. This table indicates greater success in removal of pollutant loading from stormwater runoff than Stanley (1996).

Table 2.2 Pollutant removal effectiveness of detention ponds (%), modified from USDA (2000).

Type	TSS	TP	TKN	NO_3
On-line wet pond[1]	46	37	14	36
Wet retention pond[1]	94	81	44	64
Extended detention wet pond[2]	76	70	65	75
In-line wet detention pond as pretreatment to wetland system. Efficiencies are for pond only[2]	78	20	-	-
Based on water column sampling from various sites in wet detention pond[1]	85	54	26	92
Dry detention pond[2]	67 to 93	75 to 94	-	-
Dry detention pond, study evaluated modifications to outlet[2]	96	81	44	64

[1] Removal efficiencies based on concentration.
[2] Removal efficiencies based on mass loading.

In general, detention basins should detain runoff for a minimum of 6 hours and have one inlet and outlet to facilitate monitoring. If a permanent pool is present, it should be between 2 and 10 feet in depth. Basin configurations should not allow short-circuiting of storm flows through the basin (Dorman *et al.*, 1996). Detention basin use in the Tahoe basin is limited due to the steep and rugged terrain and the lack of suitable right-of-way.

Infiltration Systems

Suitable infiltration facilities for highway runoff treatment applications include infiltration/retention basins, infiltration/retention trenches, and infiltration/retention wells (Dorman *et al.*, 1996). Susceptibility to clogging and the resulting additional maintenance requirements make infiltration trenches and wells impractical for use at some highway sites. Infiltration basin locations are dependent upon site conditions. Adequate infiltration rates are required with a minimum infiltration rate of 0.3 in/hr, recommended by Dorman *et al.* (1996), needed to allow for available storage for subsequent runoff events. Depth to the seasonal high groundwater table, beneath a basin, should be a minimum of 2 to 4 feet. Urbonas and Stahre (1993) recommend more stringent guidelines including minimum depth to groundwater, depth to bedrock, specific surface and underlying soil types, and a minimum infiltration rate of 0.3 in/hr as reported by SCS soil surveys.

Infiltration basins are typically designed to capture flow from first flush stormwater runoff. The Nevada Department of Transportation, where possible, sizes sediment/infiltration basins to retain the 20-year, 1-hour storm, the storm locally defined as one inch of rainfall. This storm is considered to be the first flush storm. Due to local topography and terrain constraints, detention basins constructed to treat runoff from NDOT roadways are frequently undersized. Large runoff events are not contained within these basins and pass on through; only small runoff events are infiltrated. However, the prevailing thought is that infiltration is the preferable stormwater runoff treatment and should be implemented where possible. Discussions regarding first flush issues are provided in a later section.

Wetlands

Wetlands have been identified as a potentially significant treatment for stormwater runoff (Reuter *et al.*, 1992; Mitsch, 1993; Dorman *et al.*, 1996). Nutrient and pollutant removal in wetlands is effected by a complex, interrelated combination of physical, chemical and biological mechanisms (Reuter *et al.*, 1992; Dorman *et al.*, 1996). Figures 2.1 and 2.2 show nitrogen and phosphorus transformations within a wetland system.

Subsurface soils and vegetation stands provide a large surface area, allowing for high levels of physical, chemical and biological removal of the various forms of nitrogen and phosphorus. Physical processes include entrapment, sedimentation, adsorption and filtration. Chemical processes include volatilization, precipitation, and decomposition. Vegetation and algal uptake and bacterial denitrification are the primary biological removal mechanisms of nitrogen and phosphorus. As with other reported BMPs, flow regime, detention time and ratio of surface area to volume treated are important parameters for treatment effectiveness. Despite reported effectiveness, wetlands do export nutrients at various times. Table 2.3 provides examples of nutrient export.

The Nevada Department of Transportation treats roadway runoff at a few locations using wetlands (none within the Tahoe basin). However these opportunities are rare. In most instances, wetlands are not a feasible option for treating NDOT's stormwater runoff. Highway runoff is intermittent, random, and varies with rainfall intensity. Excessive rainfall could cause erosion. Vegetation would not survive too little rainfall, a common occurrence in Nevada.

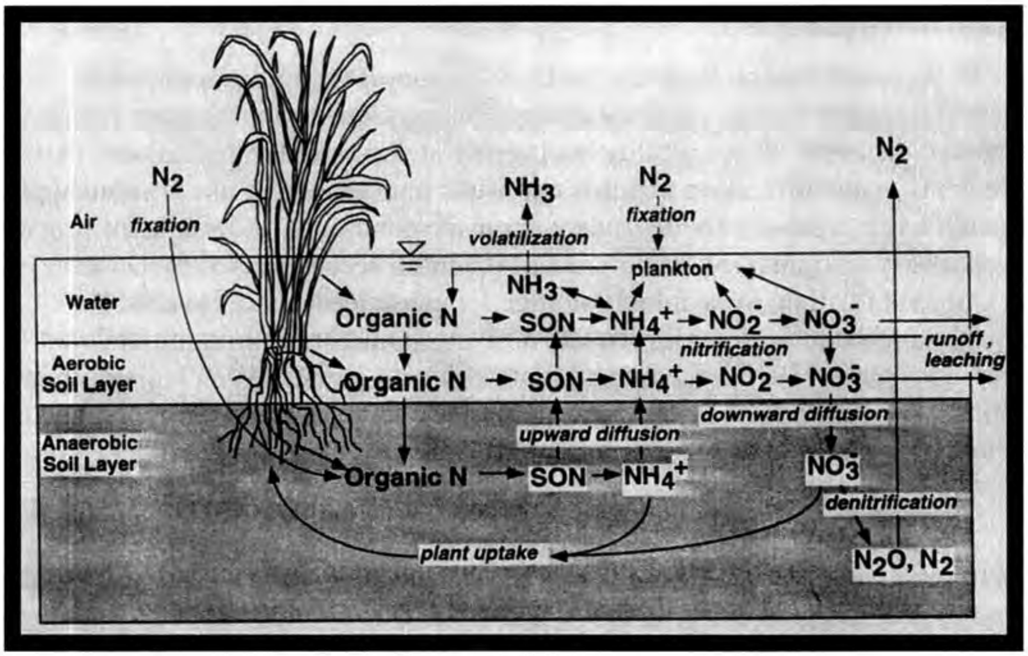

Figure 2.1. Nitrogen transformations (Mitsch, 1993).

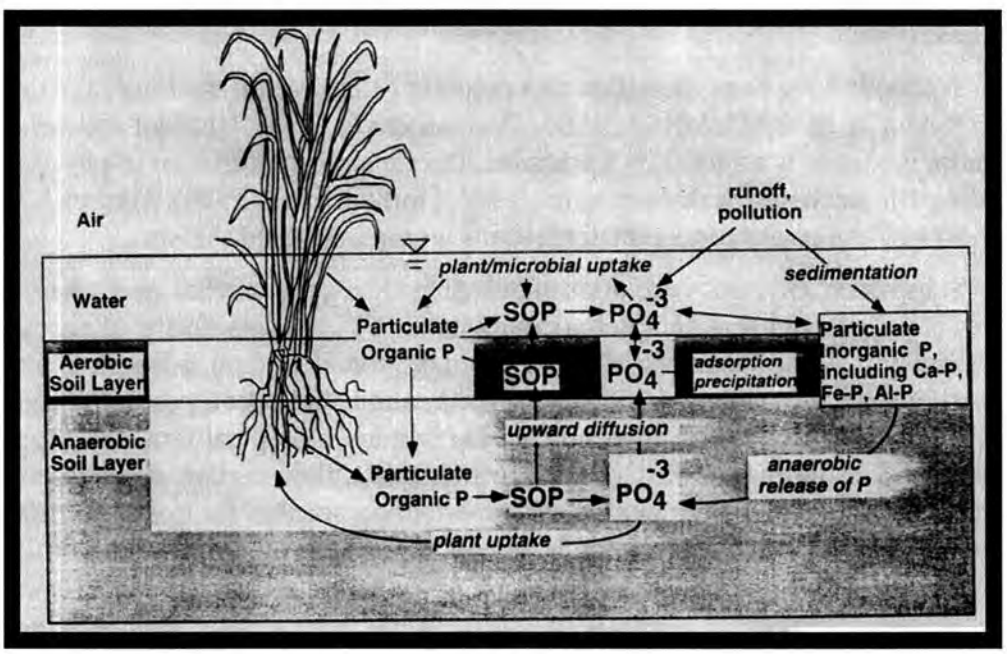

Figure 2.2. Phosphorus transformations (Mitsch, 1993).

Table 2.3. Nutrient and sediment removal comparison for treatment of wastewater and urban runoff expressed as mean annual percent removal. Adapted from Rueter *et al.* (1992).

Wet Land System	TKN	NH_4	NO_3	TP	SRP	SS
Wastewater Range	12 to 81	24 to 96	20 to 99	13 to 99	6 to 98	29 to 92
Urban Runoff Minnesota	31	-	97	61	62	80
Urban Runoff Florida	16 to 25	(-73) to (-19)	-	9 to 19	(-18) to 1	44 to 54
Newly Constructed Tahoe Wetland	(-3) to (-14)	(-58) to (-53)	85 to 87	44 to 47	(-28) to (-41)	80 to 88

First Flush

The first flush is a term commonly used throughout the literature and used as a minimum design parameter for the goal of treating urban runoff. A first flush phenomenon has been defined as the initial period of stormwater runoff where pollutant concentrations are substantially higher than concentrations in the later stages of storm runoff (Lee *et al.*, 2002). First flush runoff in the Tahoe basin is commonly referred as the 20-year, 1-hour storm, approximately equivalent to 1 inch of rainfall over a typical watershed for the Tahoe basin.

Higher nutrient and suspended sediment concentrations of a first flush are assumed to result from the accumulation of pollutants deposited on paved and unpaved surfaces (from various sources such as atmospheric deposition) that will wash off upon the arrival of new storms. The length of time between storms likely increases the amount of loading to receiving waters from stormwater runoff. If the first flush phenomenon is valid for highway runoff in the Lake Tahoe basin, then stormwater treatment systems could be designed to treat only a portion of the storm and not the storm in its entirety. Various studies have reported conflicting results on whether or not a first flush exists and what its characteristics are (Urbonas and Stahre, 1993; Barrett *et al.*, 1998; Deletic, 1998; Lee *et al.*, 2002).

Deletic (1998) provides a number of definitions for first flush calculations reported in the literature. Typically, a comparison is made between the cumulative total pollutant mass versus the total cumulative volume of runoff. Resulting curves with slopes greater than 45 percent are identified as storm runoff affected by a first flush load. A stringent first flush definition is provided, occurring when at least 80 percent of the pollutant load has been conveyed during the first 30 percent of runoff volume. Other common definitions use an approach where a fraction of the total pollutant load is compared with a fraction of the runoff load, typically at the 25 percent to 30 percent storm runoff point (Deletic, 1998). These various definitions contribute to the difficulty and variability in assessing first flush phenomena.

The first flush appears to be highly variable and complex. Lee *et al.* (2002) reported that concentration peaks may vary for different pollutants during the same storm event or for the same watershed during different storm events. Additionally, they found that when analyzing the same storm data using three different first flush analysis methods, the strength of the first flush varied with each calculation method. Deletic (1998) suggests that a first flush effect at the end of a drainage system may be caused by pollutant transformations and transport processes rather than direct pollution input into the drainage system.

The magnitude of the first flush observed in a number of studies varied between types of pollutants, types and sizes of watersheds, percentage of impervious surface, method of first flush calculation and volume of runoff (Cristina and Sansalone, 2003; Deletic, 1998; Lee and Bang, 2000; Lee *et al.*, 2002). Lee and Woong (2000) found that peak pollutant concentration preceded that of the peak flow rate in an area smaller than 100 ha (247 acres) in which impervious area encompassed more than 80 percent of the watershed. Their study found stronger evidence of the first flush for both particulate and dissolved pollutants as the watershed area decreases and the rainfall intensity (r) increases (Figure 2.3). Values located above the 45 percent line are indicative of the first flush.

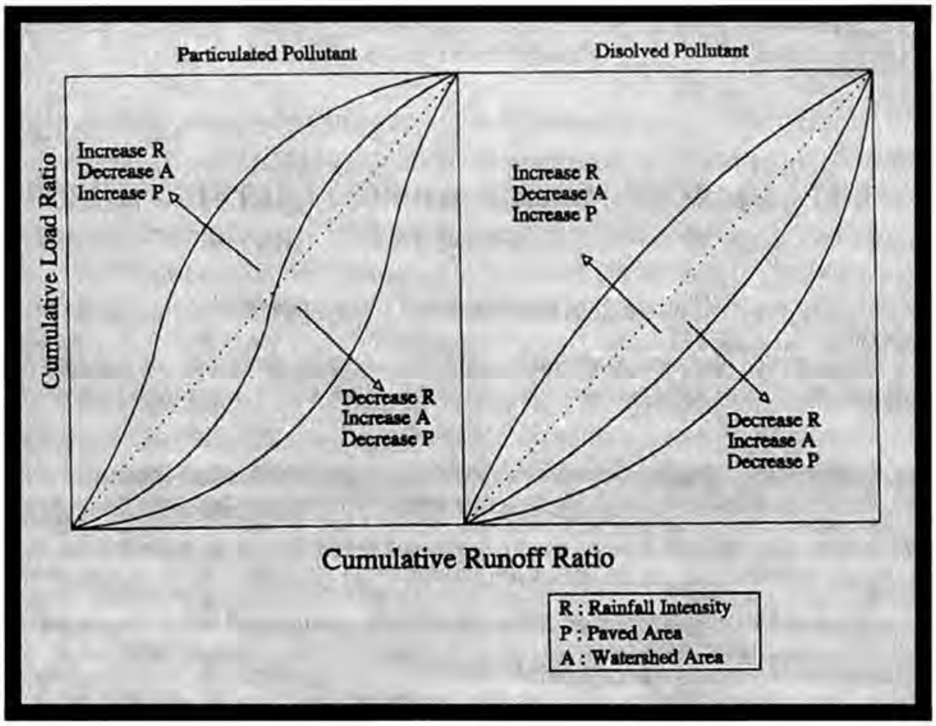

Figure 2.3. Apparent affects of rainfall intensity, paved area, and watershed area on first flush phenomena (Lee and Woong, 2000).

Studies have been contradictory in regard to pollutant build-up between storms. Some research has found no correlation between the first flush phenomenon and the length of antecedent dry weather period (Whipple *et al.*, 1977; Stanley, 1996; Lee *et al.*, 2002), but Brezonik and Stadelmann (2002) found that length of time between storms increased pollutant concentrations in stormwater runoff.

First flush analysis could not be performed for the NDOT sites, as the study was not designed to examine this phenomenon. Detailed analysis is required to determine whether the study areas exhibit first flush characteristics. Data collection must be frequent enough, especially in the first hour of each runoff event, to correctly study the first flush and to capture the short, high-intensity thunderstorms (Delectic, 1998). Analysis of data collected during this study showed little evidence that a first flush existed. Concentrations and loading values showed no pattern of progressive deceases as storm flows progressed. It is equally important to obtain numerous samples throughout the duration of the event. However, NDOT sites could express first flush phenomena, as these are typically small in size (1 to 2 acres), with impervious surface areas greater than 80 percent.

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CHAPTER 3. STUDY SITE

Environmental Setting

Lake Tahoe is an ultra-oligotrophic lake noted for its unusual clarity (Jassaby et.al., 1994, 1999). Characteristics causing this high transparency include the small watershed area (314 mi^2) relative to the lake's size (192 mi^2), a watershed to lake ratio of only 1.6 (Jassaby *et al.*, 1999) Forty percent of the precipitation in the Tahoe basin falls directly on the lake. The dominant basin soils are relatively sterile decomposed granite soils that allow water to filter through relatively free of nutrients and sediment.

Due to the high altitudes of the surrounding mountain ranges and the prevailing storm systems, precipitation is unevenly distributed throughout the basin. The western side of the Tahoe basin receives more than 80 inches of precipitation per year, on average, compared to the 30 inches per year received on the eastern side (USGS, 1997). Much of the precipitation in the basin falls in January through March in the form of snow. Low annual precipitation, falling mainly in the winter months in the form of snow, along with erosive granite soils pose difficult challenges for implementation of erosion control solutions along Tahoe's east shore. Cagwin-Rock outcrop complex (CaF) is the soil type in the study area on SR 28. The U.S. Highway 50 site contains Umpa (UmE) soils. These soil types have high and moderate erosion hazards, respectively (USDA, 1974).

Study Sites

Locations of the three monitoring sites are along Tahoe's east shore (Figure 3.1). Two sites, NDOT 2 and NDOT 4, are located on SR 28 in the Secret Harbor Creek watershed. The third site, NDOT 3, is located along US 50 in the Glenbrook Creek watershed. Table 3.1 summarizes site conditions.

A stipulation of one funding source required BMP monitoring take place along SR 28 within Carson City limits. Locations were chosen based on similar contributing areas and on type of runoff each BMP would collect. Each BMP site receives mostly roadway runoff with minimal stormwater runoff contribution from offsite (nonhighway runoff) flows. Sediment contributions to NDOT 2 are a combination of both onsite from road sand applications and offsite contributions from the adjacent 14,585 square foot cut slope. NDOT 3 and NDOT 4 receive sediment mostly from winter sanding operations.

The terrain along much of the 26-mile stretch along SR 28 and US 50 is steep with many of the roadway cut and fill slopes at 1:2 or steeper. Roadway cut slopes generally range from 5 to 100 feet in height. Fill slopes range from 5 to 50 feet in height. Dominant vegetative cover is primarily Jeffery Pine (Pinus jefferyi) forest with an understory consisting of shrubs such as manzanita (Arctostaphylos spp.), bitterbrush (Purshia tridentata) and sagebrush (Artemisia spp.). Vegetation cover is typically less than 60 percent (Harding 1997). The average daily traffic is 6,000 and 12,600 vehicles per day for SR 28 and US 50, respectively.

The east shore of Lake Tahoe receives thousands of visitors each year, primarily to enjoy the beaches. Negative impacts of such use include roadside parking and impromptu startup trails created by beach users, which cause increased erosion. Moreover, roadside parking impacts erosion control and water quality improvements implemented by NDOT.

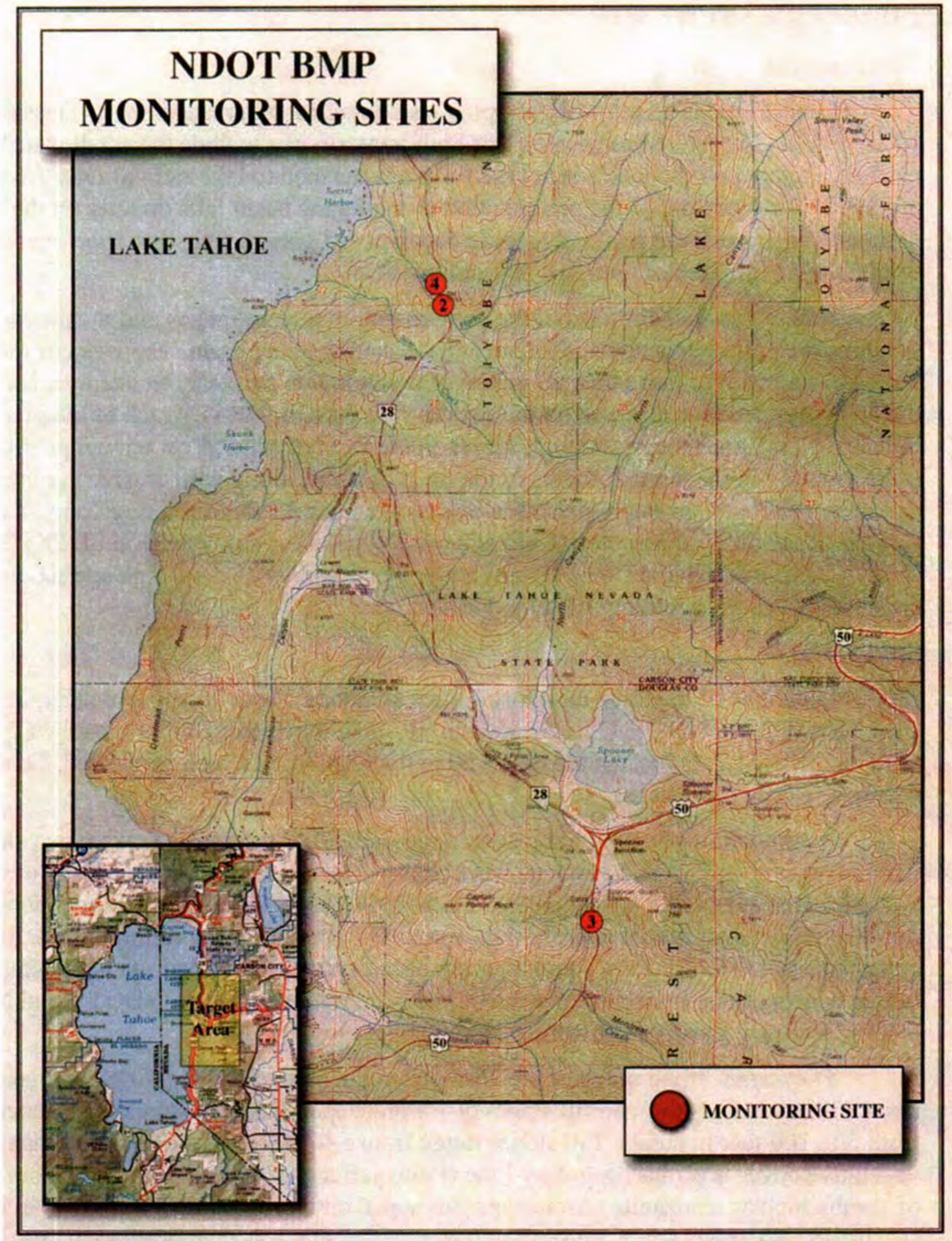

Figure 3.1 NDOT BMP monitoring sites.

Table 3.1 Site characteristics.

Site	Area (Ac)	% Imp Area[1]	Onsite Design Peak Flows (cfs)	Offsite Design Peak Flows (cfs)	Average Daily Traffic (Vehicles/ day)	Land Use	Soil Type	Annual Offsite Sed. Vol (ft^3)	Annual Onsite Sed. Vol (ft^3)	Tc[2]
NDOT2	0.37	100	1.24	N/A	6,000	Rural Hwy	CaF	56	78	2.5
NDOT3	0.72	100	2.05	N/A	12,600	Rural Hwy	UmE	-	12	10.5
NDOT4	0.24	100	0.64	N/A	6,000	Rural Hwy	CaF	-	23	3.9

1. Impervious surface area. 2. Time of Concentration (time for water to flow from the most remote point of drainage area to BMP) in minutes.

Much of the adjacent land along the roadway corridors is relatively undisturbed U.S. Forest Service land, Nevada State Parks or prime residential real estate. The difficulty in acquiring right-of-way on environmentally sensitive land or expense of prime private property limits NDOT's stormwater treatment options.

To date, 11 miles of roadway have been retrofitted with typical highway BMPs. These include sediment traps, sand/oil separators, modified drop inlets with sediment storage that allow infiltration, sediment and infiltration basins. The Nevada Department of Transportation will spend over $100 million by 2010 on erosion control and water quality improvements to its roadways in the Lake Tahoe basin.

General Design Criteria

Development of the NDOT MPECSWM was a partnering effort with input from numerous Lake Tahoe basin stakeholders including the Tahoe Region Planning Agency, Federal Highway Administration, Nevada Division of Environmental Protection, Nevada State Lands, Nevada State Parks, Caltrans and the U.S. Forest Service (Haring, 1998). Erosion control and stormwater quality management are addressed using two strategies, source control and treatment control methods. Source control strategies are efforts to prevent sediment from entering stormwater by protecting roadway cut and fill slopes from the erosive forces of wind and rain. Typical source control methods include stabilizing the toe of slopes, applying rock riprap on slopes 1:1.5 (H:V) and steeper, and revegetating areas where success is most likely. Treatment control methods are designed to remove nutrient and sediment from stormwater runoff. Strategies for treating roadside drainage and sediment interception design criteria were also developed through the partnering process. Agreed-upon design criteria are as follows. Sand/oil separators are installed where paved turnouts, in close proximity to the lake, provide room to park 15 or more cars. Sediment catchment facilities are installed where sediment deposition from upstream cut slopes is substantial.

Sediment and infiltration basins are constructed where favorable topography and adequate area exist along the roadside and where traffic safety standards are not jeopardized. The 20-year, 1-hour storm event, typically assumed as 1inch of rainfall, is the target criteria used by the TRPA for sizing infiltration and sediment basins (TRPA, 2002). Most basins along NDOT's roadways are not large enough to hold that volume, as the steep topography and lack of right-of-way make this criterion difficult to meet. In areas where favorable site conditions exist, but runoff exceeds the 20-year, 1-hour volume, sediment basins may still be constructed, allowing for some infiltration of highway runoff. State Route 28 drainage facilities are designed to pass the 10-year storm for onsite and the 25-year storm for offsite (NDOT, 1998). US 50 has a minimum design storm return period of 25 years for onsite drainage systems and 50-year storm for offsite flow conveyance.

The control of erosion is a major goal of the MPECSWM and TRPA. Treatment control facility design along NDOT roadways is influenced by four sources of sediment production (Harding, 1998). Sources include erosion from rainfall and snowfall runoff events, erosion of cut and fill slopes adjacent to the highway, channel degradation from concentrated stormwater, and deicing sand placed during winter months. Sediment that would be generated from cut and fill slopes was estimated using the Revised Universal Soil Loss Equation. Additionally, estimates of average deicing sand applications for SR 28 and US 50 were used for sizing of sediment capture structures. Harding (1998) estimated annual sediment generation along SR 28 at 2,622 ft^3/yr from cut and fill slopes and 3,007 ft^3/year from winter maintenance activities. Source control improvement, such as riprap placement and slope revegetation, are expected to yield an approximate 40 percent reduction, estimated at 1573 ft^3/year (Harding, 1998). Treatment control structures provide 1,573 ft^3 of sediment storage. The Nevada Department of Transportation maintenance crews applied 8721 ft^3 of road sand along SR 28 during the winter of 2002/2003. Records show 15,535 ft^3 of sediment were recovered from sweeping operations along SR 28 during the same time period (Jeffery Dodge, 2004, personal communication, NDOT Maintenance Manager Coordinator).

Estimated annual sediment production along US 50 is 8,147 ft^3/yr and 3,357 ft^3/year from adjacent cut and fill slopes and winter sanding operations, respectively (Harding, 1998). Slope-generated sediment is expected to be reduced to 7,518 ft^3/yr by source control improvements such as riprap. Treatment control facilities are designed to capture sediment not contained by source control improvements. The volume provided by proposed treatment control structures along US 50 is 3,460 ft^3. Winter maintenance operations applied a total of 6,426 ft^3 of road sand to US 50 in the winter of 2002/2003. A total volume of 7,263 ft^3 was recovered from sweeping operations from June 2002 through July 2003 (Dodge, 2004)

Sampling Methodologies

Runoff samples at all three sites were collected using automated samplers. Flow measurements were taken using Palmer Bowlus flumes at the sediment trap and Stormceptor® sites. Secret Harbor Creek flows were measured with a Parshal flume. Pressure transducers were used to measure and determine continuous flow in Secret Harbor Creek and flow into and out of each site during storm events. Probes recording turbidity, electrical conductivity (EC) and water temperature were installed at each sampling location. Sandbag berms were used to direct flow through sampling devices during storm events. Solar panels provided power for instrumentation.

Sample collection was triggered on the basis of outflow. Samples were taken every half hour, 10 minutes and 1 hour at NDOT 2, NDOT 3 and NDOT 4, respectively. Dataloggers stored data and transmitted real time information back to the DRI via cell phone, allowing for real-time assessment of ongoing storms. Figure 3.2 shows the setup configuration in the sediment trap at NDOT 2. Shown are the three probes and sampling tube for the automated sampler.

Figure 3.2. Sample collection tube, temperature, EC and turbidity sensors within sediment trap at NDOT 2.

Sample bottles were collected within 24 hours after each storm event and taken to the DRI for analyses. Nutrient analyses included total Kjeldahl nitrogen (TKN), dissolved TKN (TKNsol), nitrate, nitrite, ammonium, total phosphorus (TP), TPsol (dissolved TP), orthophosphate (OPO_4), TSS and turbidity. Ammonium and nitrite concentrations were analyzed on two occasions and found to be at very low concentrations and therefore not measured again. The amount of sediment captured in the sediment trap was measured after each storm event.

Outflow samples were taken at the end of the culvert pipes at NDOT 2 and NDOT 4, not accounting for possible bypass flows. Therefore, efficiency calculations were for the entire BMP system that included bypass flows. Field personnel did not observe storm events large enough to cause bypass flows for either NDOT 2 or NDOT 4.

Due to a construction error, stormwater discharge through the sediment basin flowed over a side berm rather than through the overflow section. Hence, outflow data records do not accurately reflect actual discharge from the basin. Repairs were made in July 2003. This error may have affected the results of storm events from November 2002 through August 2003.

BMP efficiencies for each runoff event were calculated by subtracting the nutrient outflow load from the nutrient inflow load and dividing the difference by the inflow load. Total loads (TL), in grams, for each runoff event were calculated using Equation (1)

$$TL = \sum[C_i(Q_i\Delta t_i)] \quad (1)$$

where C_i = pollutant concentration (mg/L) during sample interval, Q_i = flow (L/min) during sample interval, and Δt_i = time interval.

Equation (2) is a summation of all inflow and outflow loads used in calculating BMP efficiencies (E) for the entire monitoring period. Due to the small watershed size relative to the BMP flow capacity and lack of precipitation, bypass flows did not occur during any runoff event for the monitoring period.

$$E = \frac{\sum Load_{in} - \sum Load_{out}}{\sum Load_{in}} \quad (2)$$

Event mean concentration (EMC) values were calculated for every storm event using Equation (3). The EMC is defined as the average pollutant concentration (mg/L) present in the total volume of runoff from a storm event and was calculated by the following equation:

$$EMC = \frac{\sum[C_i(Q_i\Delta t_i)]}{\sum(Q_i t_i)} \quad (3)$$

where C_i = pollutant concentration (mg/L) of sample interval, Q_i = (L/min) flow during sample interval, and Δt_i = time interval.

CHAPTER 4. NDOT 2 SEDIMENT TRAP

Site Description

The sediment trap site is located along the lakeside of SR 28 in Carson City at approximately milepost 3.4 and discharges directly into Secret Harbor Creek, approximately 0.7 miles upstream of the confluence with Lake Tahoe (Figure 3.1). This site collects stormwater runoff from two lanes of roadway with an average daily traffic (ADT) volume of 6,000 vehicles per day. Offsite flow contributions are negligible. The total onsite area is 0.37 acres with the 10-year design storm peak flow of 1.24 cfs (Harding, 1998). The roadway longitudinal and transverse slopes are 5.56 percent and 0.5 percent, respectively.

Harding (1998) reports that an estimated 134 ft^3/yr of sediment would be generated within this catchment basin from slope erosion for post-project conditions and road sand applications. Estimated sediment production from a single 130-ft cut slope is 100 ft^3/yr for pre-project conditions and 56 ft^3/yr for post-project conditions (after riprap application). The slope varies from 0 feet to 29 feet in height with a slope angle of 0.5:1 (H:V) and an exposed cut slope area of approximately 14,585 ft^2 (Harding 1998). Vegetation cover varies from 0 to 25 percent. Rock outcroppings are moderately to deeply weathered. The soil type is Cagwin-Rock Outcrop Complex (CaF) with a particle size distribution of greater than 80 percent sand, hydrologic soil group C and a high erosion hazard (USDA Soil Conservation Service, 1974). Road sand applications yield an estimated 78 ft^3/yr for this catchment basin. Sediment capacity provided by the sediment trap at this location is 170 ft^3.

Best Management Practice – Structures Installed

A Stormceptor® was originally intended for this location because of the perennial creek crossing. However, a large boulder was encountered during excavation, preventing the Stormceptor® installation. A triple-barrel sediment trap was substituted, as it could fit in the narrow space between the buried boulder and Secret Harbor Creek.

A typical sediment trap is a very simple design typically consisting of two 36 inch by 8 foot corrugated metal pipes (CMP) placed vertically in the ground with 36-inch-diameter grates placed on top (Figure 4.1a and 4.1b).

Each pipe is connected near the top by an 18 inch by 7.5 foot CMP. Low-flow stormwater runoff typically passes into the upstream grate. Stormwater runoff rises within the first pipe, flowing into subsequent pipes, and discharging into a riprap outlet. These traps are designed and sized simply to capture roadway runoff and sediments from adjacent cut slopes and deicing activities. The sediment trap at NDOT 2 consists of three barrels due to the large, highly erosive cut slope immediately upstream of this location (Figure 4.2).

From August 2001 through April 2002, Caltrans monitored similar double-barrel sediment traps at two locations within the Tahoe basin (Caltrans, 2002). One objective of the study was to assess the effectiveness of this type of BMP to reduce nutrient and suspended sediment concentrations in highway runoff.

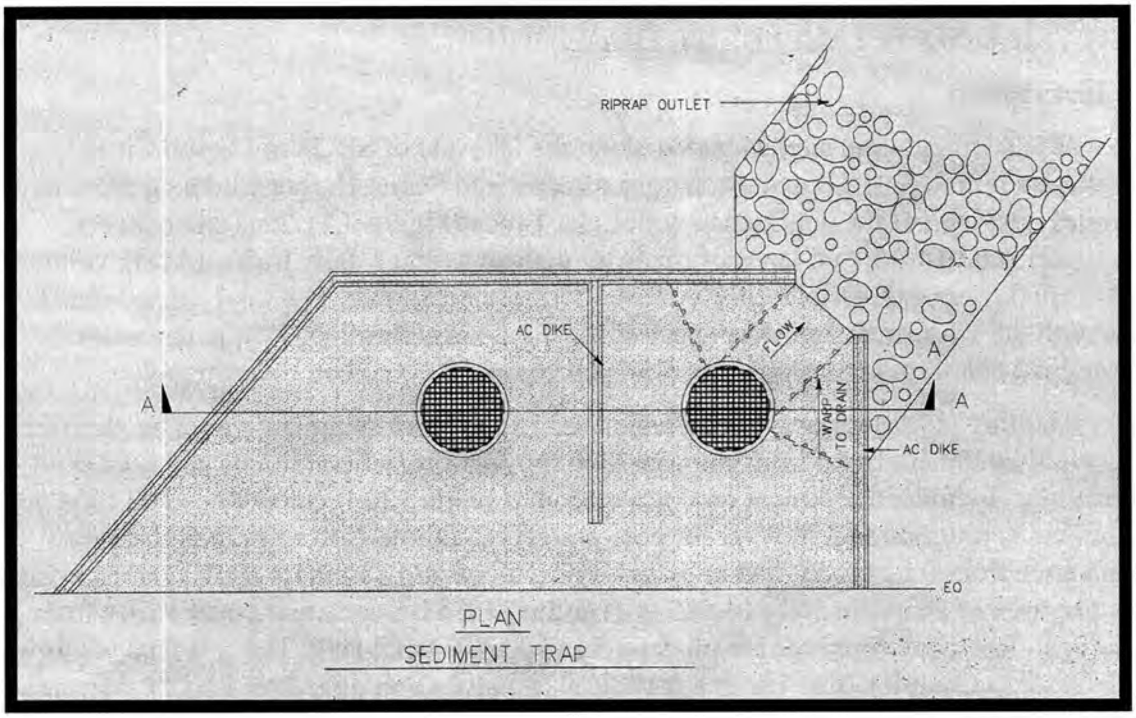

Figure 4.1a. Plan view of typical NDOT double barrel sediment trap BMP (Section A-A shown in Figure 4.1b).

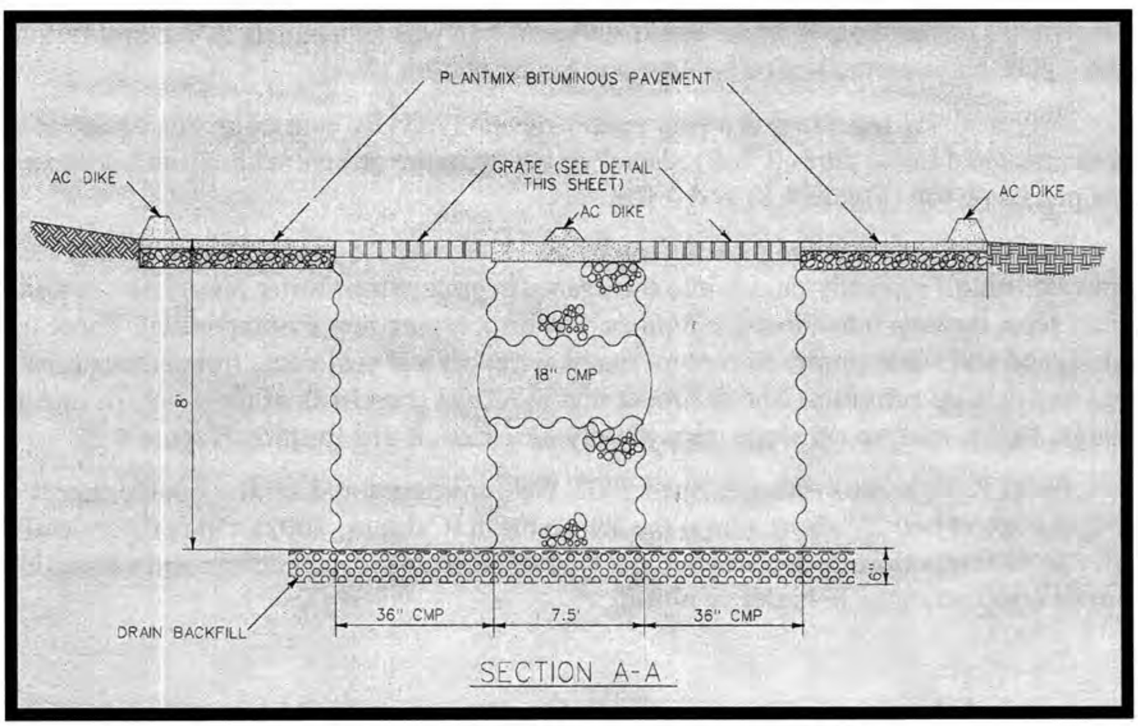

Figure 4.1b. Cross-sectional view of a typical NDOT sediment trap BMP.

Figure 4.2. Triple-barrel sediment trap at Secret Harbor Creek.

For comparison purposes, sediment trap monitoring studies performed by Caltrans at two locations in the Tahoe basin are provided in this report. Table 4.1 lists selected nutrient and suspended sediment EMC values from the Caltrans 2001 to 2002 monitoring season. Listed EMCs are combined influent and effluent data for each site. Caltrans used the paired t-test to determine if runoff through the sediment trap produced statistically different results from inflow values. Statistically significant results are indicated by the word "Yes" in the far-right column of Table 4.1. Insignificant results were indicated by the word "No." P-values of 0.1 or less were considered significant in the Caltrans report.

Table 4.1. Selected sediment and nutrient ranges of combined influent and effluent data from Caltrans sand trap effectiveness studies of 2001 to 2002 (Caltrans, 2002).

Constituent	No. of Samples	Mean (mg/L)		Mean Standard Deviation		Inf/Eff Difference (%)	Statistically Different ($p<0.1$)
		Influent	Effluent	Influent	Effluent		
TSS	25	657	422	505	299	36	Yes
Nitrate	25	0.3	0.3	0.3	0.2	-1	No
TKN	25	2.0	1.7	1.8	1.5	12	No
TP	25	0.4	0.4	0.2	0.3	8	No
Dissolved P	25	0.08	0.07	0.03	0.03	15	Yes
Orthophosphate	25	0.08	0.06	0.04	0.04	24	Yes

Results for NDOT 2 are listed in Table 4.2. P-values of 0.05 or less were considered significant for NDOT data. Although percent efficiency ranges from -20 percent to 35 percent depending on the constituent monitored, all p-values indicate that there is no statistical difference between inflow EMC values and outflow EMC values at the NDOT 2 site. EMC values for NDOT 2 are displayed here for comparisons with the two Caltrans sites. The large, highly erosive cut slope directly adjacent to this site may have affected NDOT 2 efficiency. The sediment trap was reported almost full by mid-April 2003. Increased maintenance at this location would most likely improve overall performance of the sediment trap.

Table 4.2. Selected suspended sediment and nutrient EMC ranges (total runoff volume of 181,693 liters through the sediment trap) from NDOT sediment trap effectiveness studies of 2002 to 2004.

Constituent	No. of Samples	Mean EMC (mg/L) Influent	Mean EMC (mg/L) Effluent	Standard Deviation Influent	Standard Deviation Effluent	Inf/Eff Difference (%)	P-value ($p<0.05$)
TSS	18	784	483	762	414	35	No
Nitrate	18	0.13	0.15	0.21	0.23	-20	No
TKN	18	2.43	2.14	1.92	1.39	11	No
TP	18	1.08	0.80	1.07	0.53	26	No
Dissolved P	18	0.05	0.05	0.03	0.02	-1	No
Orthophosphate	18	0.030	0.021	0.02	0.01	14	No

Monitoring Results

Total loads entering and leaving each site were used to calculate BMP efficiency. As noted previously, no bypass flow occurred during the monitoring period; therefore efficiency percentages represent the entire system. Table 4.3 shows total influent and effluent loading and percent differences and p-values for 18 runoff events. As with the p-values for EMCs, p-values for total loading show no statistical difference between influent and effluent concentrations using the criteria that $p < 0.05$ is significant.

Table 4.3. Sediment and nutrient total loads for 18 storms from NDOT sediment trap effectiveness studies of 2002 to 2004.

Constituent	Total Load (g) In	Total Load (g) Out	Mean (g) In	Mean (g) Out	Standard Deviation (g) In	Standard Deviation (g) Out	Inf/Eff Difference (%)	P-value ($p<0.05$)
TSS	1,043,590	507,059	1,043,590	28,170	122,225	51,926.52	29	No
Nitrate	188	216	10.5	12.0	19.08	20.09	0	No
TKN	3,395	2264	189	126	393.49	207.73	3	No
TKNsol	722	647	40.1	36.0	72.12	59.38	-14	No
TN	3,590	2432	199	135	411.38	226.49	3	No
TP	1,526	880	85	49	184.39	87.39	21	No
Dissolved P	25	22	1.7	1.4	2.68	1.89	-2	No
OPO_4-P	46	30	2.6	1.7	5.29	2.09	6	No

Figure 4.3 depicts the total influent and effluent loads to NDOT 2 for 13 runoff events (grams are used rather than pounds due to the small values). Percent reductions for TSS, TP, and TN are 35 percent, 26 percent and 9 percent, respectively. Reduction in nutrient loading is indicated in all cases with the exception of TKNsol and NO_3, showing an export of 9 percent and 20 percent, respectively. However, p-values indicate no significant difference between nutrient loads entering and exiting the sediment trap. The increase in TKNsol represents a decrease in TKN possibly signifying transformation of TKN to TKNsol within the sediment trap.

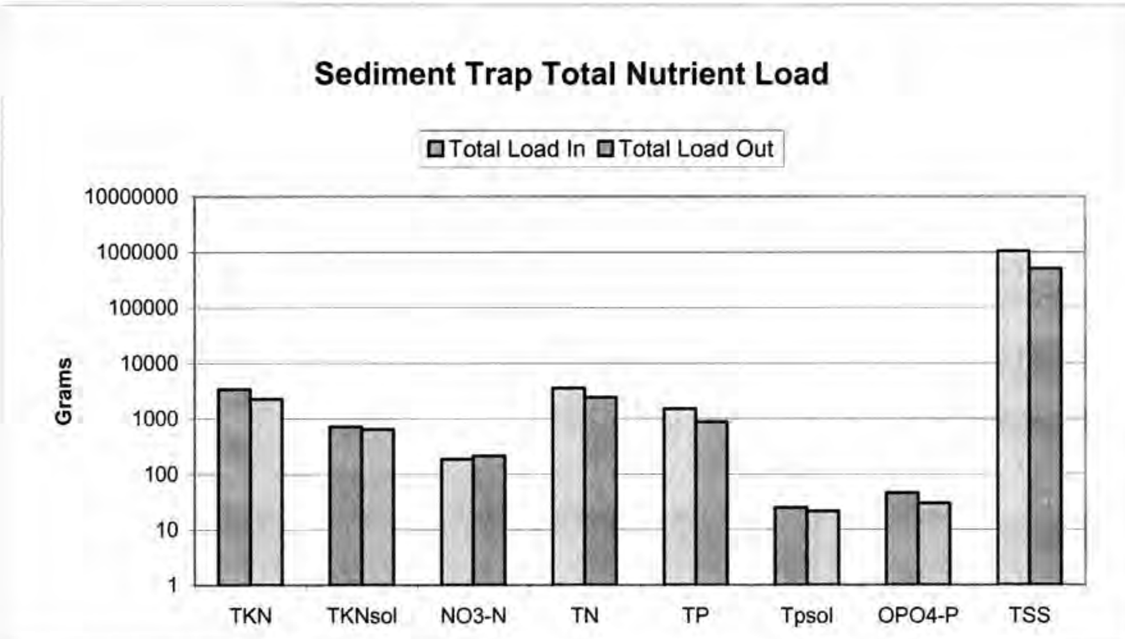

Figure 4.3. Total influent and effluent loads for 18 runoff events from November 2002 through April 2004.

Figures 4.4 and 4.5 show average EMC values and total loads for the study period. Summer EMC values are higher than winter EMC values. Higher EMC values in the summer months may be due to higher rainfall intensity. These values are based on two summer storms and 11 winter storms. In contrast, nutrient loads are greatest in the winter due to greater volume of runoff for winter storms and the application of road which would result in increased TSS and associated TP, TPsol and OPO_4-P.

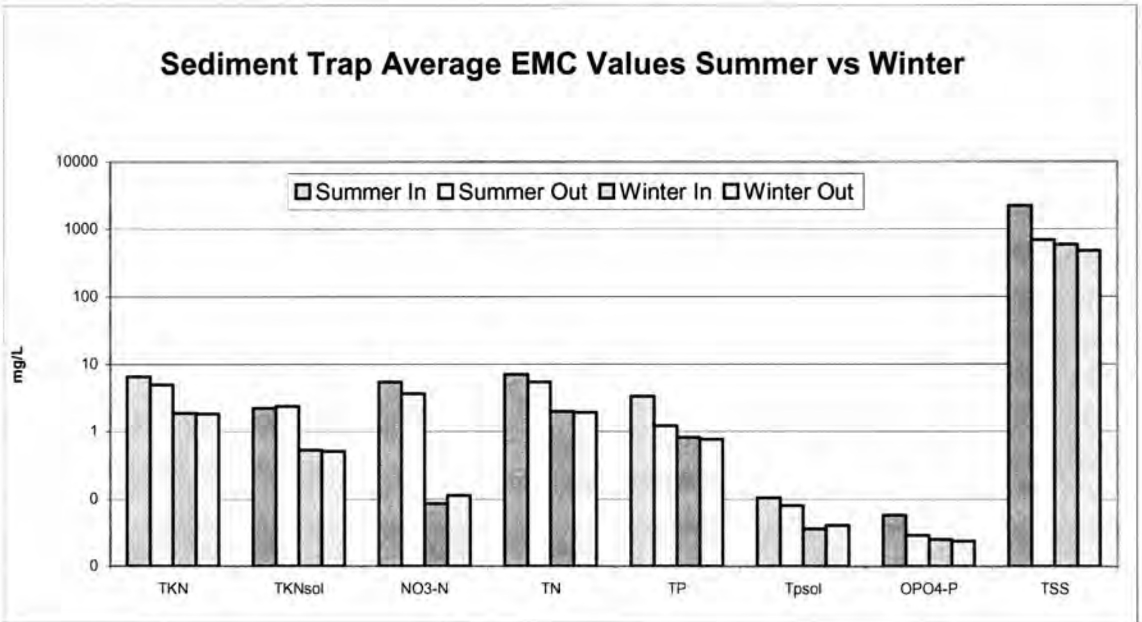

Figure 4.4. Average EMC values summer/winter from November 2002 through April 2004.

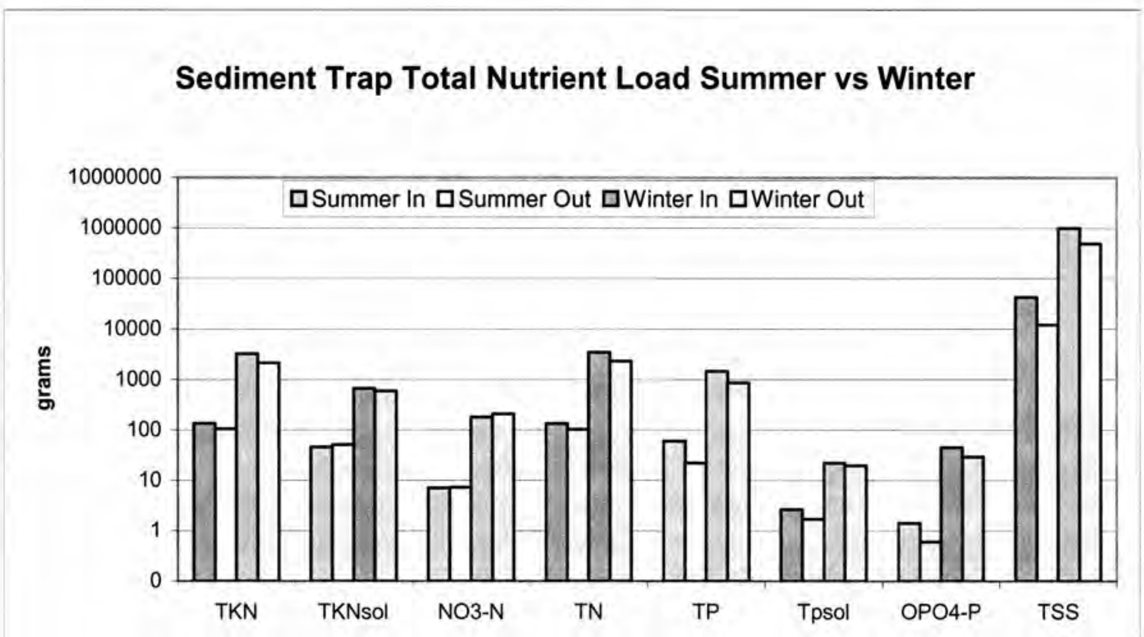

Figure 4.5. Total summer/winter nutrient values from November 2002 through April 2004.

Figures 4.6 through 4.8 show pollutant removal efficiencies as a function of runoff volume. As expected, efficiencies decrease as flows increase, due to re-suspension of sediment within the sediment trap, with negative efficiencies occurring for all pollutants.

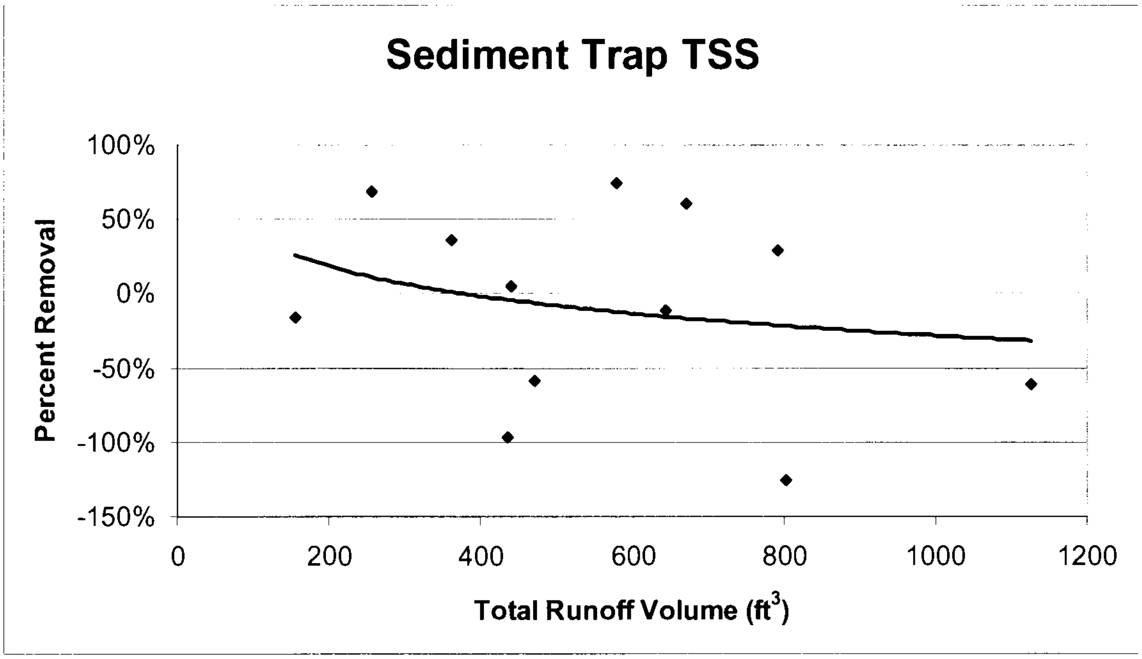

Figure 4.6. Percent removal of TSS as a function of runoff volume for NDOT 2.

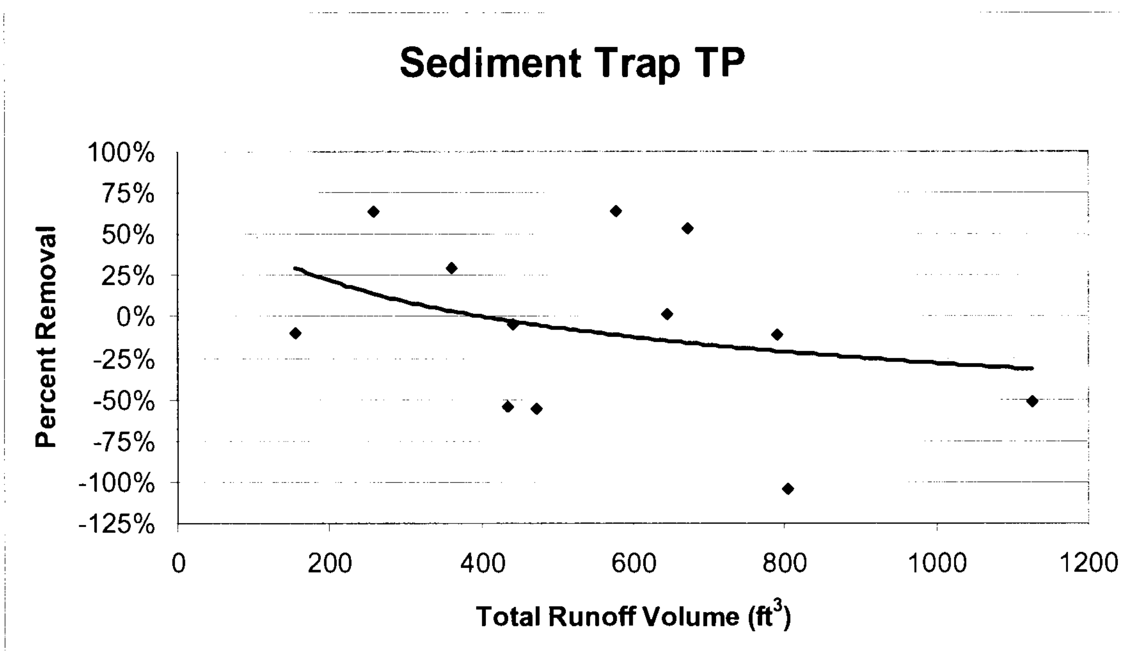

Figure 4.7. Percent removal of TP as a function of runoff volume for NDOT 2.

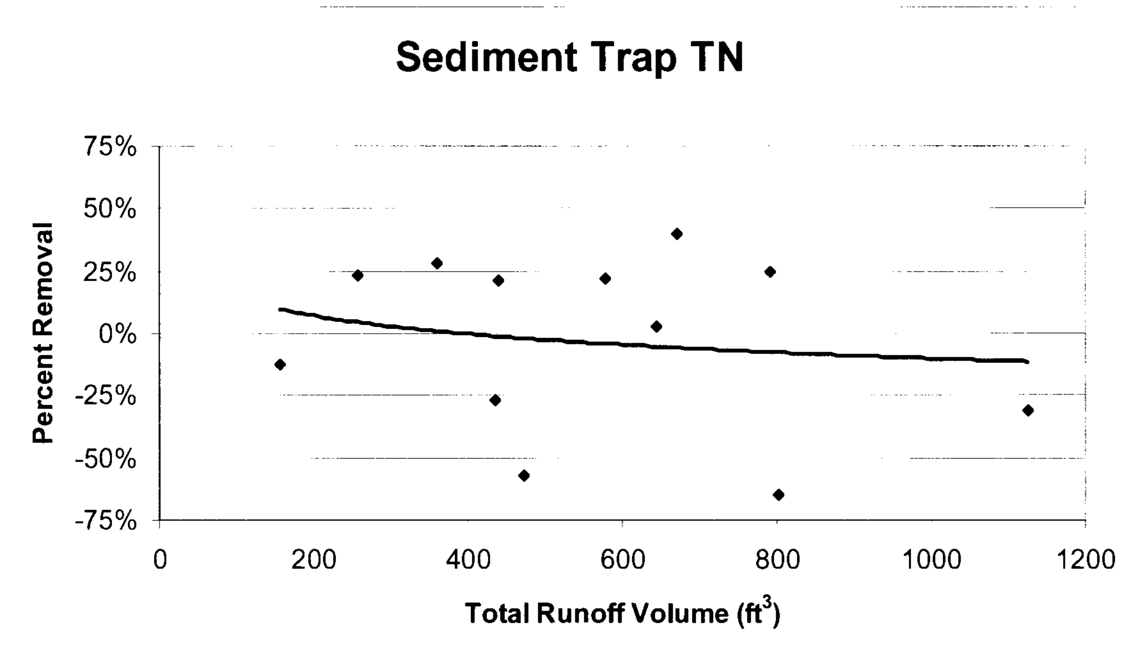

Figure 4.8. Percent removal of TN as a function of runoff volume at NDOT 2.

CHAPTER 5. NDOT 1 SECRET HARBOR CREEK

Site Description

Secret Harbor Creek crosses SR 28 at Carson City mile post 3.4 (Figure 3.1). Water quality monitoring was performed upstream and downstream of SR 28 adjacent to the sediment trap (Figure 5.1). Secret Harbor Creek is an ungaged creek of which 1.87 square miles drain to the creek crossing at this location. Soil type is dominated by Cagwin-Rock Outcrop Complex with 30 to 50 percent slopes and the watershed is mostly undeveloped. Vegetation is mainly evergreen forest and with a small percentage of shrub land.

Figure 5.1. Secret Harbor Creek just downstream of sediment trap.

Monitoring Results

Comparisons of pollutant concentrations upstream and downstream of SR 28 indicate Secret Harbor Creek is, in some instances, impacted by roadway runoff. Figure 5.2 shows TSS upstream and downstream concentrations for three storms on November 8, 2002, April 15, 2003, and June 23, 2003. Only TSS had p-values < 0.1 for all three storms. P–values are 0.006, 0.08, and 0.027 for the November 2002, April 2003, and June 2003 storms, respectively. Figures 5.3 and 5.4 illustrate effects of roadway runoff in Secret Harbor Creek for TP and TN. TP concentrations have p-values of 0.482, 0.12 and 0.05 for the November 2002, April 2003, and June 2003 storms, respectively. Only during the June 2003 storm event did Secret Harbor Creek receive a significant TN contribution from SR 28, a p-value of 0.081. Significant contributions from other nutrients varied from storm to storm.

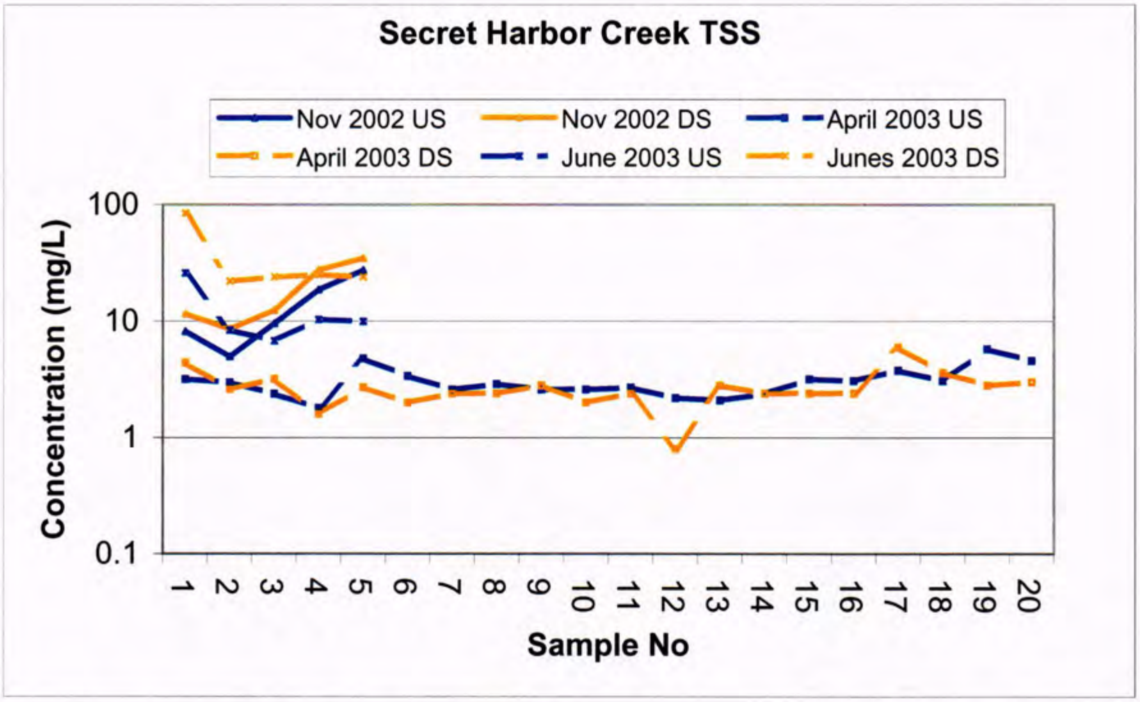

Figure 5.2. Upstream (US) and downstream (DS) TSS concentrations at Secret Harbor Creek.

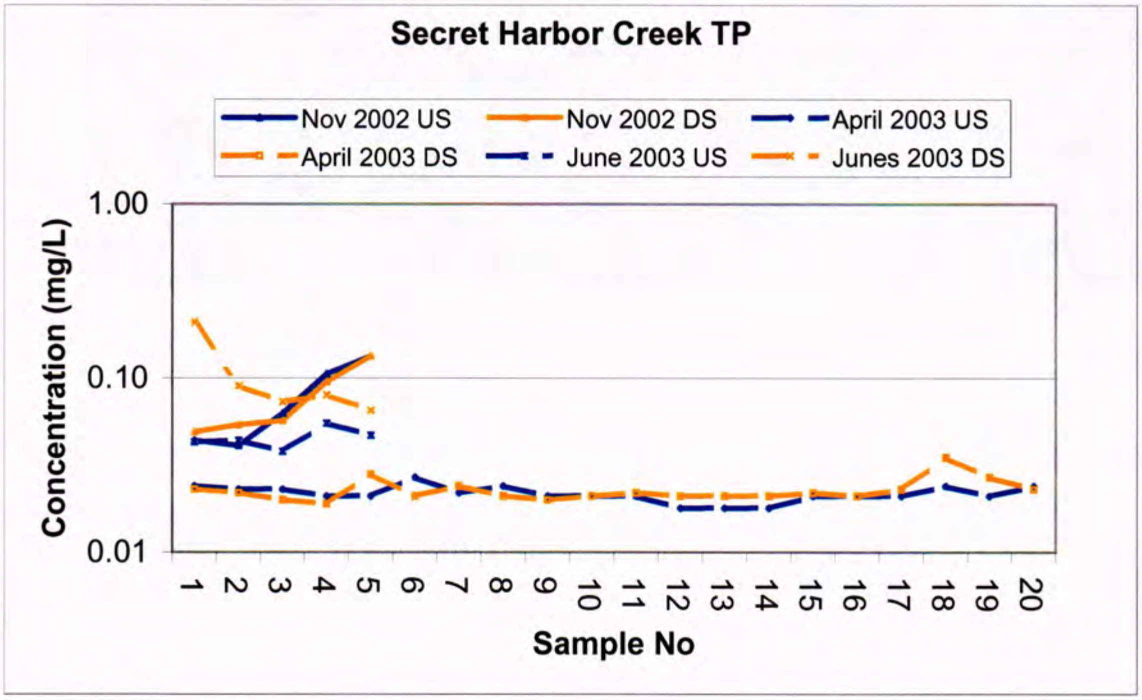

Figure 5.3. Upstream (US) and downstream (DS) TP concentrations at Secret Harbor Creek.

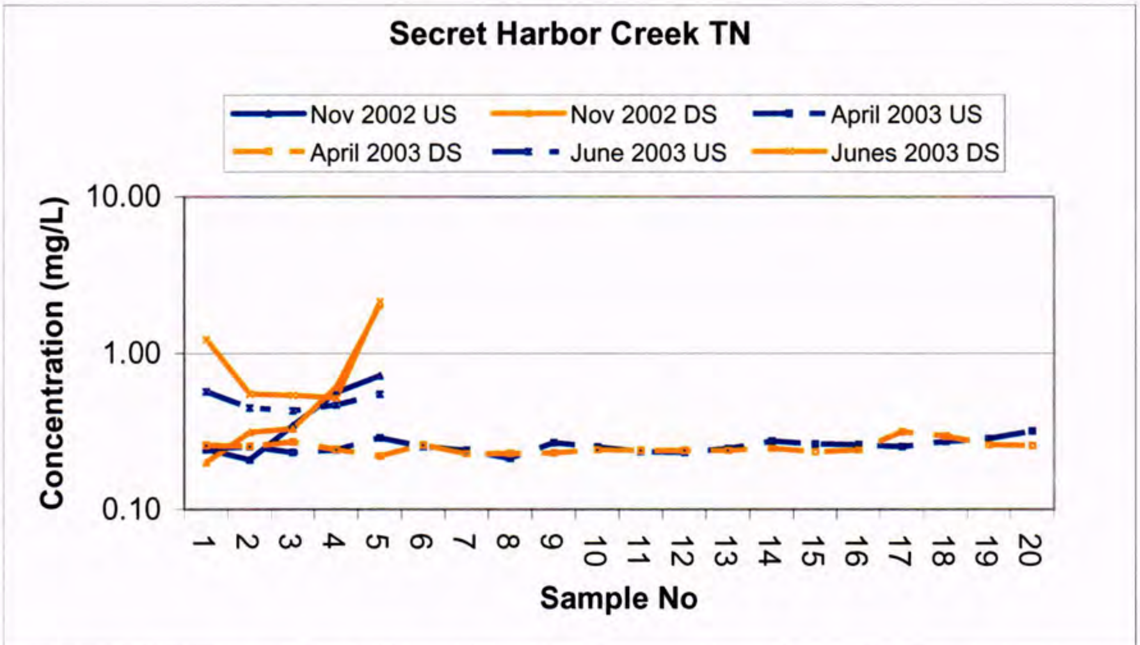

Figure 5.4. Upstream (US) and downstream (DS) TN concentrations at Secret Harbor Creek.

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CHAPTER 6. NDOT 3 SEDIMENT BASIN

Site Description

NDOT 3 (sediment basin site) is located along the lakeside of US 50 in Douglas County at approximately milepost 11.5 (Figures 3.1 and 6.1). Stormwater runoff is collected from four lanes of roadway with an ADT volume of 12,600 vehicles per day. Offsite flows (nonhighway runoff) contributions are negligible. The total onsite area is 0.72 acres with the 10-year design peak flow of 2.05 cfs (Harding, 1998). Roadway longitudinal and transverse slopes are 5.5 percent and 3.5 percent, respectively. Basin design storage volume is 413 ft^3 with the total estimated volume of runoff for the 20-year, 1-hour storm at 2,336 ft^3. Harding (1998) estimates road sand applications during winter months yield an estimated 92 ft^3/yr for this catch basin.

Figure 6.1. NDOT 3, U.S. Highway 50 sediment basin.

This site is located on Umpa (UmE) soils, classified as a very stony sandy loam found on 15 to 30 percent slopes (USDA Soil Conservation Service, 1974). Umpa soils are in hydrologic soil group C and pose a moderate erosion hazard. Much of the stormwater runoff entering this basin is infiltrated. Overflows discharge into a 60-ft-long riprap channel. The Soil Survey estimates infiltration rates based on UmE soils to be 2.0 to 6.3 in/hr. A percolation test was not performed at this location, therefore the infiltration rate is unknown.

The Tahoe Regional Planning Agency requires treatment of the 20-year, 1-hour storm, which is considered the first flush. Limited right-of-way, steep topography, and culturally and environmentally sensitive areas limit feasible locations for sediment/infiltration basins. The primary variables for determining viability of different treatment strategies such as sediment basins and infiltration systems are particulate characterization and loading rates (Sansalone *et al.*, 1998). Forebays, settling basins or sinuous flowpaths typically used to settle out and keep suspended solids within the BMP cannot be incorporated into this type of basin, as there simply is no room to do so. Therefore, on the occasions where flow overwhelms the storage capacity of the basin, an export of nutrients and sediment can occur. However, it is thought that some infiltration, notwithstanding the limited volume and poor soils, is better than no infiltration. Dorman *et al.* (1996) reiterate this basic assumption.

Best Management Practice - Structure Installed

Sediment/infiltration basins are typically located in areas where there is a natural depression or where the terrain lends itself to basin construction. Locations that have favorable width, depth, site stability, mild slope and are located outside an archeologically sensitive area or in a stream environment zone are few. Design considerations such as characterization of roadway runoff reaching the structure, soil hydrologic group, soil organic content, soil cation exchange capacity, and settling velocities have not been considered in designs of existing sediment basins. Infiltration rates are determined by percolation tests. The Nevada Department of Transportation sediment basins must be located in areas where maintenance crews can easily access the site for sediment removal. All NDOT sediment basins are lined with interlocking articulated concrete block consisting of 13 inch x 11 ½ inch x 4 ¾ inch open celled blocks tied together with cables. The 20 percent open area allows vegetation establishment and infiltration. The articulated blocks provide a stable hard surface for maintenance crews to remove accumulated sediment without disturbing the underlying soils and with minimal disturbance to established vegetation.

Monitoring Results

Technical difficulties plagued the NDOT 3 sediment basin site. During the original basin construction, the side berm was constructed at an elevation lower than the outlet riprap channel. This error caused stormwater runoff to overflow the side berm rather than flow through the outlet channel. Construction crews corrected the error in August 2003. As a result, accurate outflow loadings could not be calculated for the November 2002 and March 2003 storm events (the only two storms with both inflow, outflow and chemistry data). Problems continued through summer 2003. Automated samplers were originally triggered to take samples upon sensing outflow, however, several storms in April and May did not produce outflow through the basin and therefore chemistry data are not available to calculate inflow loads for several spring storms. One grab sample was taken for the June storm event. Outflow chemistry data are not available for the July storm. Inflow depth sensors failed during the two storms in August 2003.

For small volume storms, the basin has been effective in capturing and infiltrating runoff produced by small storms, as evidenced by the stored storm runoff. As previously stated, an assumed benefit is gained by stormwater infiltration. Although loading data are currently unavailable, concentration values indicate that the basin is effective in retaining and treating nutrients via infiltration. Figures 6.2 through 6.4 show concentration values for TSS, TP and TN from July 2002 through August 2003. Note that November 2002 is a composite sample. July 2002 and April and June 2003 concentration values are grab samples. Values for all other months are averaged from samples collected during storm events. Inflow concentration values are greater than outflow values, indicating a reduction in pollutant loading through this system.

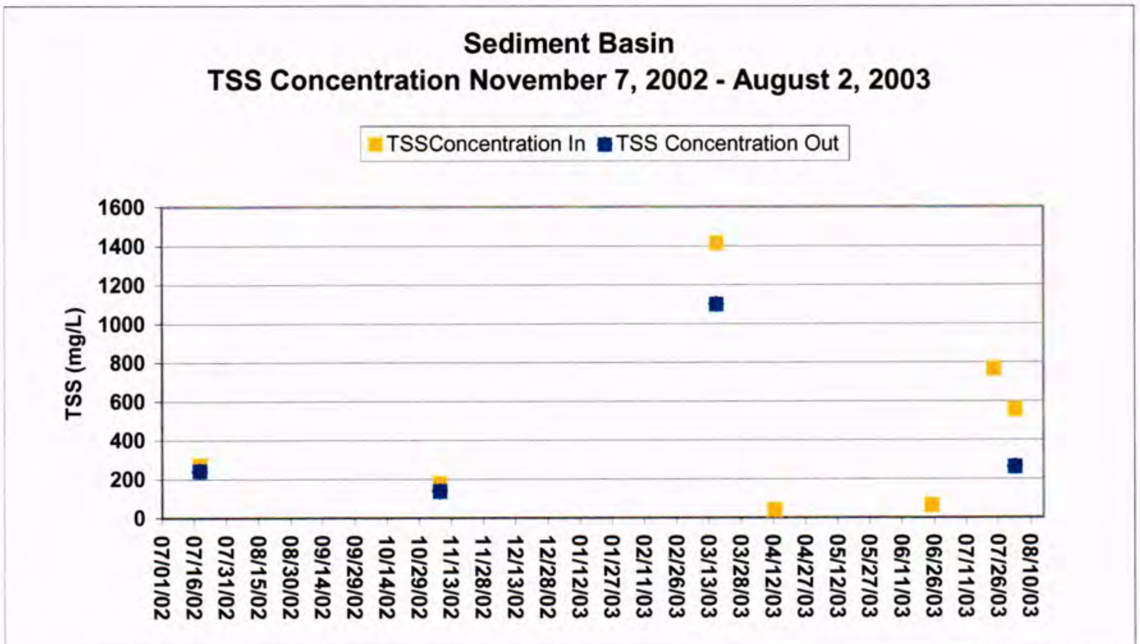

Figure 6.2. NDOT 3 TSS concentrations.

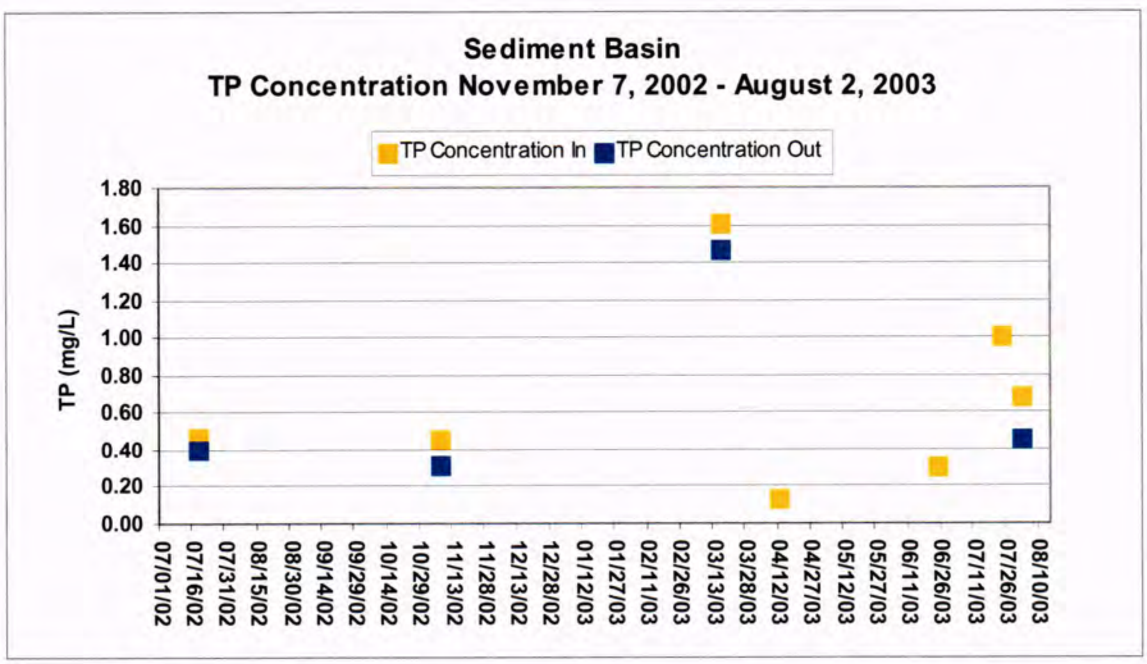

Figure 6.3. NDOT 3 TP concentrations.

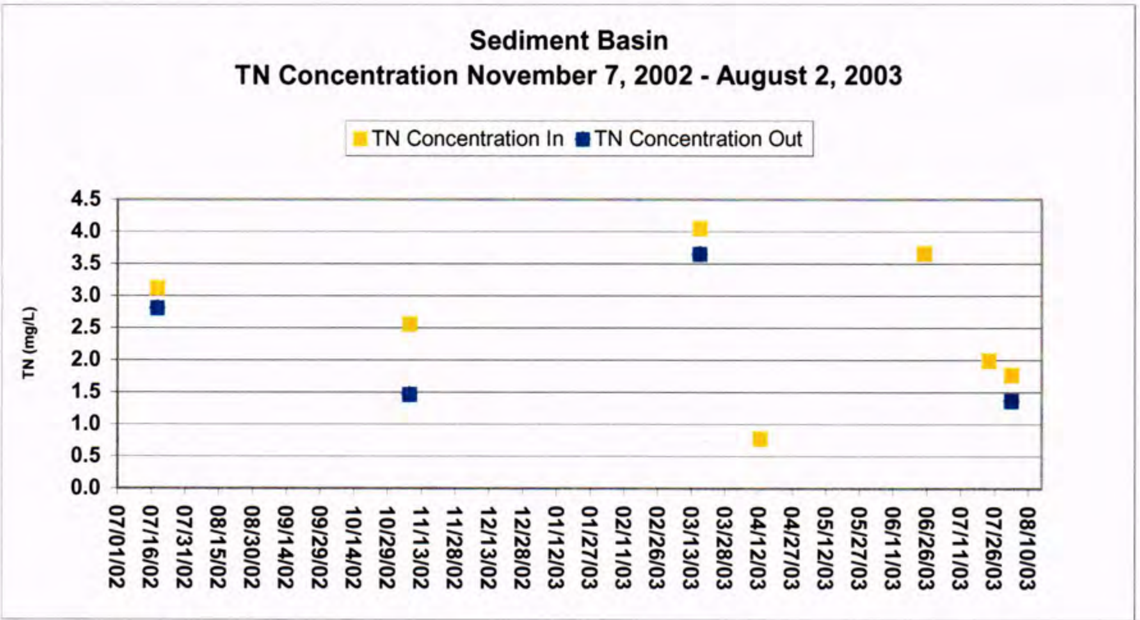

Figure 6.4. NDOT 3 TN concentrations.

CHAPTER 7. NDOT 4 STUDY SITE

Site Description

The NDOT 4 study site is located along the lake side of SR 28 in Carson City at CC mile post 3.7 and approximately ¼ mile from the NDOT 2 study site (Figure 3.1). The distance to Lake Tahoe from the discharge point is approximately 0.7 miles. This site collects stormwater runoff from two lanes of roadway with an ADT volume of 6,000 vehicles per day and discharges directly into a stream environment zone (SEZ) (Figure 7.1).

Figure 7.1. NDOT 4 study site.

Offsite flow, nonhighway runoff, contributions are negligible. The total roadway onsite drainage area is 0.25 acre with the 10-year design storm flow of 0.64 cfs (Harding, 1998). The roadway longitudinal and transverse slopes are 4.76 percent and 0.5 percent, respectively.

Harding (1998) reports that 22 ft^3/yr of sediment are generated within this catchment basin from road sand applications for post-project conditions. The soil type is Cagwin-Rock Outcrop Complex (CaF) with a particle size distribution of over 80 percent sand, hydrologic soil group C, and a high erosion hazard (USDA Soil Conservation Service, 1974).

The NDOT 4 roadway runoff is treated by a Stormceptor® inlet (Figure 7.2). Stormceptor® is a patented stormwater treatment structure that removes oil and sediment from stormwater runoff. It has been on the market for over 10 years. The Stormceptor® unit can be divided into two components, the lower treatment chamber and the upper by-pass chamber separated by a fiberglass insert. Storm flows entering the unit, are diverted by a u-shaped weir downward into the separation/holding chamber. Pipes aligned perpendicular to the inflow pipe direct stormwater around the circular walls of the chamber and horizontally toward the pipe outlet. Sediment accumulates at the chamber bottom and oil is trapped underneath the fiberglass insert for removal at a later date (Figure 7.3.a.). During high-flow events beyond the Stormceptor® treatment capacity, flows are diverted over the weir and through the bypass chamber directly to the outlet pipe (Figure 7.3.b). Previously-captured sediment and oil are left relatively undisturbed at the bottom of the chamber.

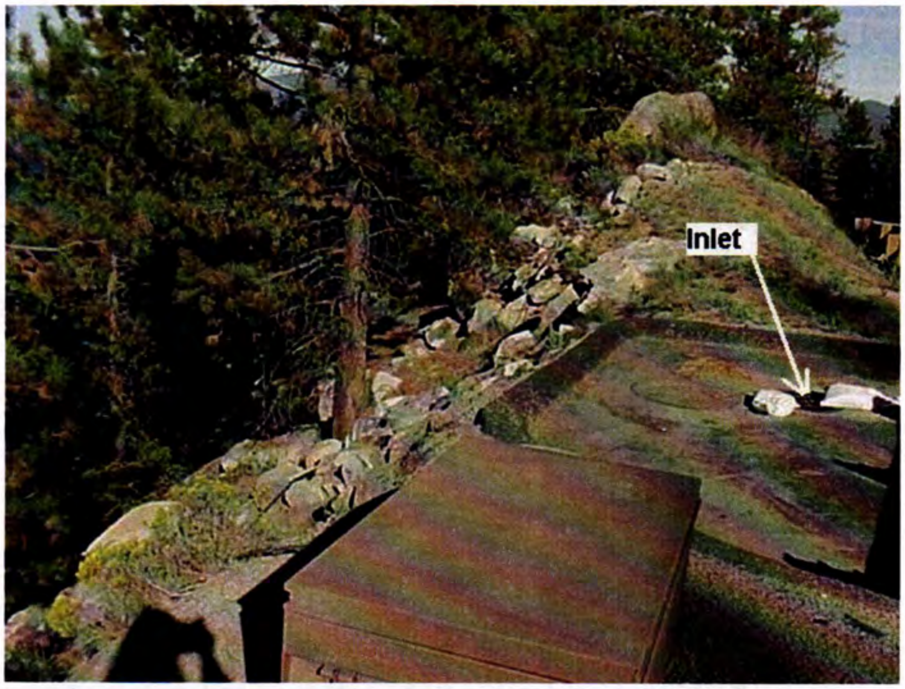

Figure 7.2. NDOT 4 Study Site, Stormceptor® unit.

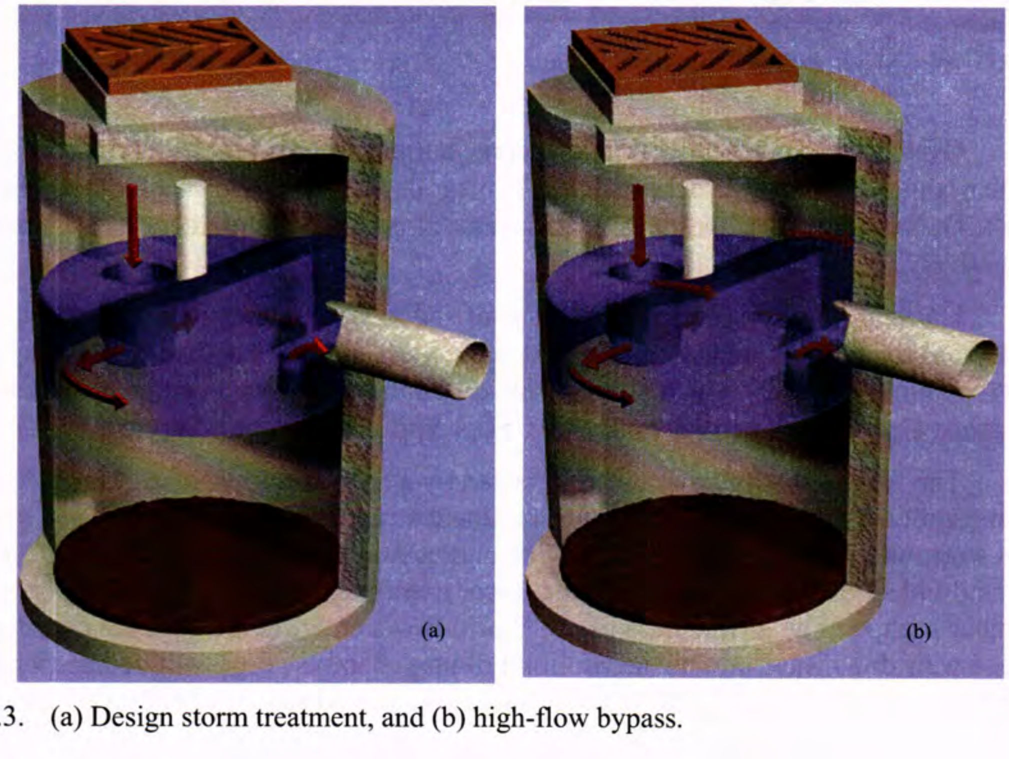

Figure 7.3. (a) Design storm treatment, and (b) high-flow bypass.

Best Management Practice Description

Product literature indicates that up to 80 percent of fine and coarse sediment loads can be captured from storm flows treated by the Stormceptor® (Stormceptor, 2001). Nutrient removal rates for nitrogen and phosphorus are not specifically claimed by the manufacturer. However, several studies (e.g., Yu *et al.*, 200; Waschbush, 1999) have investigated EPA-recommended urban runoff constituents including TSS, TN, TP and oil and grease removal capabilities of the Stormceptor. The Virginia Department of Transportation sponsored a study evaluating the use of several ultra-urban BMPs including the Stormceptor® (Yu *et al.*, 2001). Removal efficiencies were based on EMCs. The study found that removal rates for TSS, TP, and TN were 57 percent, 66 percent and -27 percent, respectively. Cost comparisons between BMPs found that the Stormceptor®-associated cost per percent TSS removed was $76.92. In comparison, a bioretention area, comprising of a grass buffer strip, ponding area, and planted area, monitored during the same study period, cost $12.19 per percent TSS removed.

The U.S. Geological Survey performed an extensive study of a Stormceptor® unit treating a 4.3-acre public works maintenance yard (Waschbush, 1999). Removal efficiencies of the treatment chamber were found to be 25 percent, 19 percent and 21 percent for TSS, TP, and dissolved P, respectively. Total efficiencies for the entire unit, which included flows bypassing the treatment chamber, were 21 percent and 17 percent for TSS and TP, respectively. It was noted that the unit was improperly installed, causing bypass flows to occur at a flow rate of 500 gal/min rather than the 800 gal/min published in the product literature. Overall efficiency of the unit was affected by the improper installation but the efficiency of the treatment chamber was not.

A Stormceptor® model STC 900 unit was installed at NDOT Site 4. This model has a total holding capacity of 950 gallons and a sediment holding capacity of 75 ft^3. At the time of project design, Stormceptor® sizing was based on a flow rate and total acreage treated. The Stormceptor® model STC 900 is recommended to treat a maximum flow rate of 0.635 cfs (287 gal/min) and a maximum impervious area of 0.45 acres for areas designated as sensitive. The NDOT 4 site has 0.25 acres of impervious surface that results in a design storm discharge of 0.64 cfs. The STC 900 is well within the design criteria of this site. Field observations indicate that, throughout the study period, storm flows were never large enough to bypass the treatment chamber. The maximum flow rate recorded at this site was 0.07 cfs (36 gal/min) recorded on January 23, 2003.

It should be noted that Stormceptor® units may now be sized according to sizing software that simulates five different physical models to estimate TSS removal. These include a pollutant buildup model, a pollutant wash-off model, and the EPA SWMM Version 4.3 model.

Monitoring Results

Total loads entering and leaving the treatment chamber were used to calculate BMP efficiency. As noted previously, no bypass flow occurred during the monitoring period; therefore, efficiency percentages represent the entire system. Table 7.1 shows total influent and effluent loads and percent differences and p-values. In contrast to the NDOT 2 site, P-values for total loads show a statistical difference between all influent and effluent loads with the criteria that $p < 0.05$ is significant.

Table 7.1. Total sediment and nutrient loads for 16 storms from NDOT Stormceptor® effectiveness studies of 2002 to 2004.

Constituent	Total Load (g)		Mean (g)		Standard Deviation (g)		Inf/Eff Difference (%)	P-value ($p<0.05$)
	In	Out	In	Out	In	Out		
TSS	173,639	119,723	19,293	7,043	1,8045	13,109	31	Yes
Nitrate	29	10	3.44	0.63	3.51	1.19	65	Yes
TKN	618	490	68.68	28.82	46.19	39.23	21	Yes
TKNsol	199	145	22.10	8.56	16.42	9.99	27	No
TN	613	483	68.16	28.41	49.14	40.34	21	Yes
TP	227	170	25.27	9.98	22.19	16.88	25	Yes
Dissolved P	12	7	1.36	0.43	0.94	0.52	40	Yes
OPO_4-P	7	3	0.79	0.21	0.60	0.30	51	Yes

Figure 7.4 shows the total influent and effluent loads for the NDOT 4 site (grams are used rather than pounds due to the small values). Percent reductions for TSS, TP, and TN are 31 percent, 25 percent and 21 percent, respectively. Reduction in nutrient loads is indicated in all cases including dissolved species. Significant differences exist between flows entering and exiting the Stormceptor® for all nutrients and TSS.

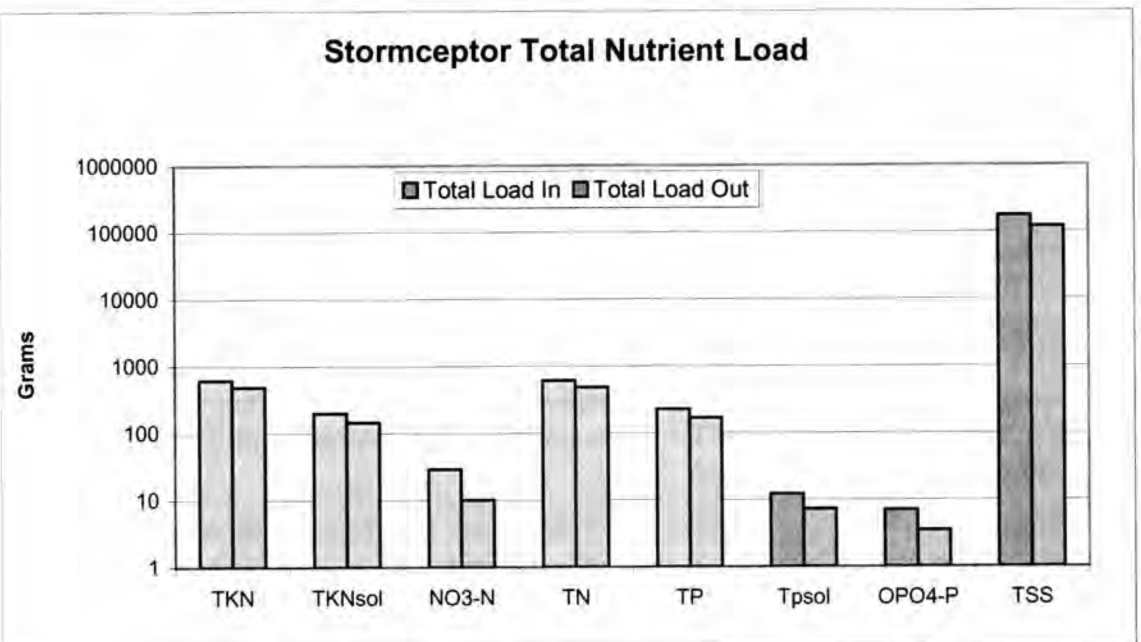

Figure 7.4. Total Nutrient and TSS Loads from November 2002 through November 2003.

Figures 7.5 and 7.6 show average EMC values and total loads for the study period. Most summer EMC values are higher than winter EMC values including TSS. However, these values are based on four summer storms and 13 winter storms. Phosphorus and TSS loads are greatest in the winter, whereas nitrogen loads are generally similar or less in the winter.

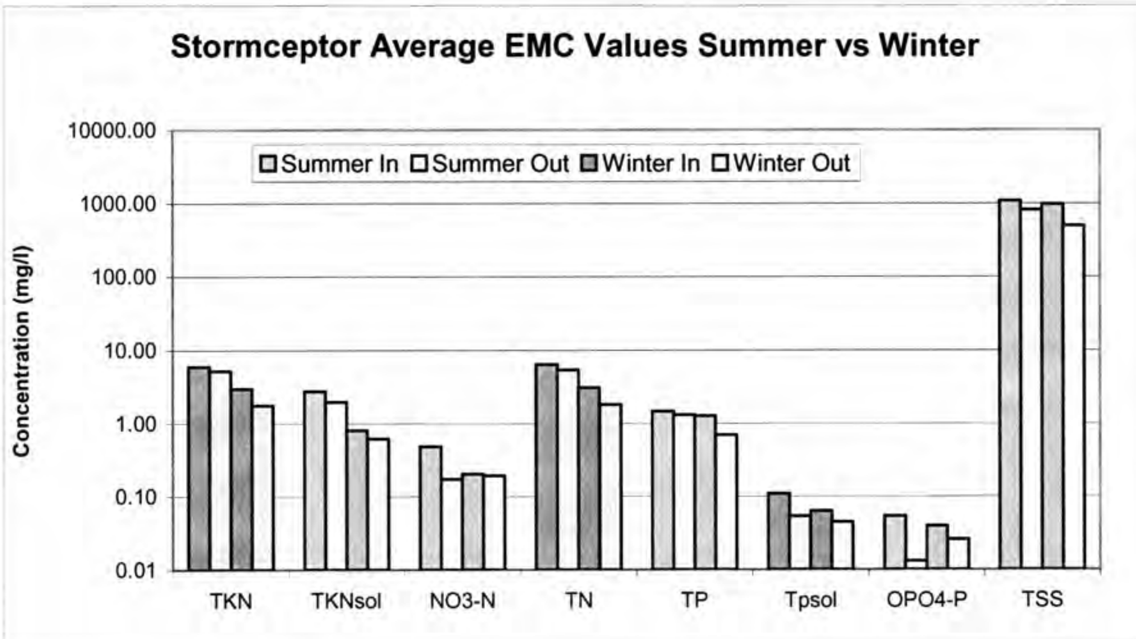

Figure 7.5. Average EMC values summer/winter from November 2002 through November 2003.

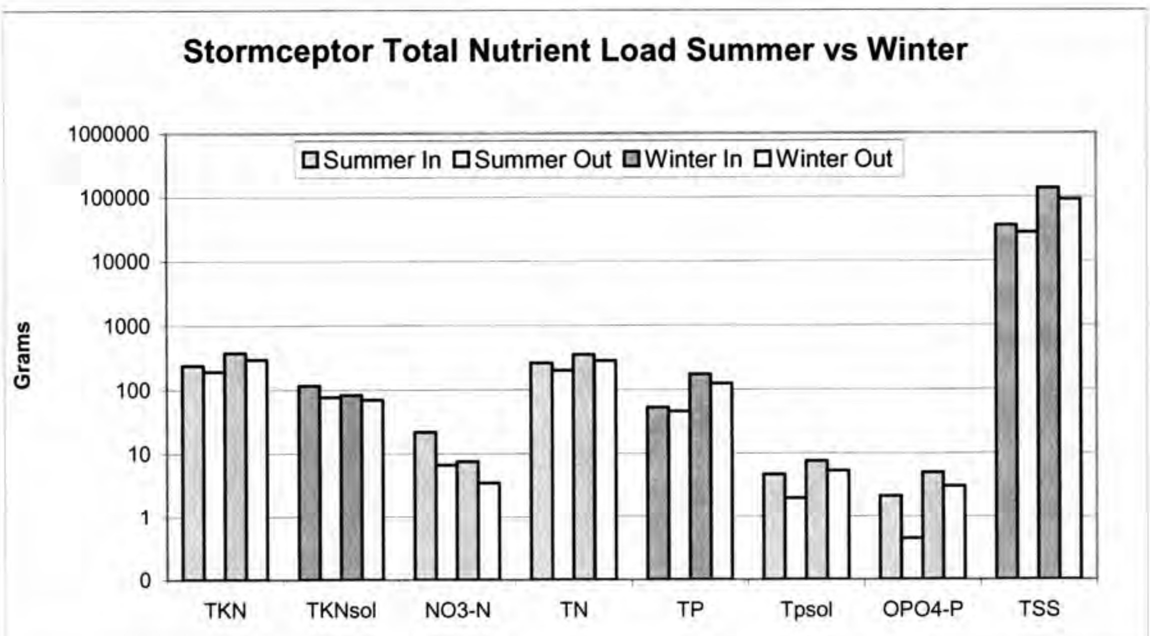

Figure 7.6. Total summer/winter nutrient values from November 2002 through November 2003.

Figures 7.7 through 7.9 show removal efficiencies as a function of runoff volume. As expected, efficiencies decrease as flows increase. However, in contrast to the sediment trap, flow increases do not cause best-fit line for removal efficiencies to fall below zero.

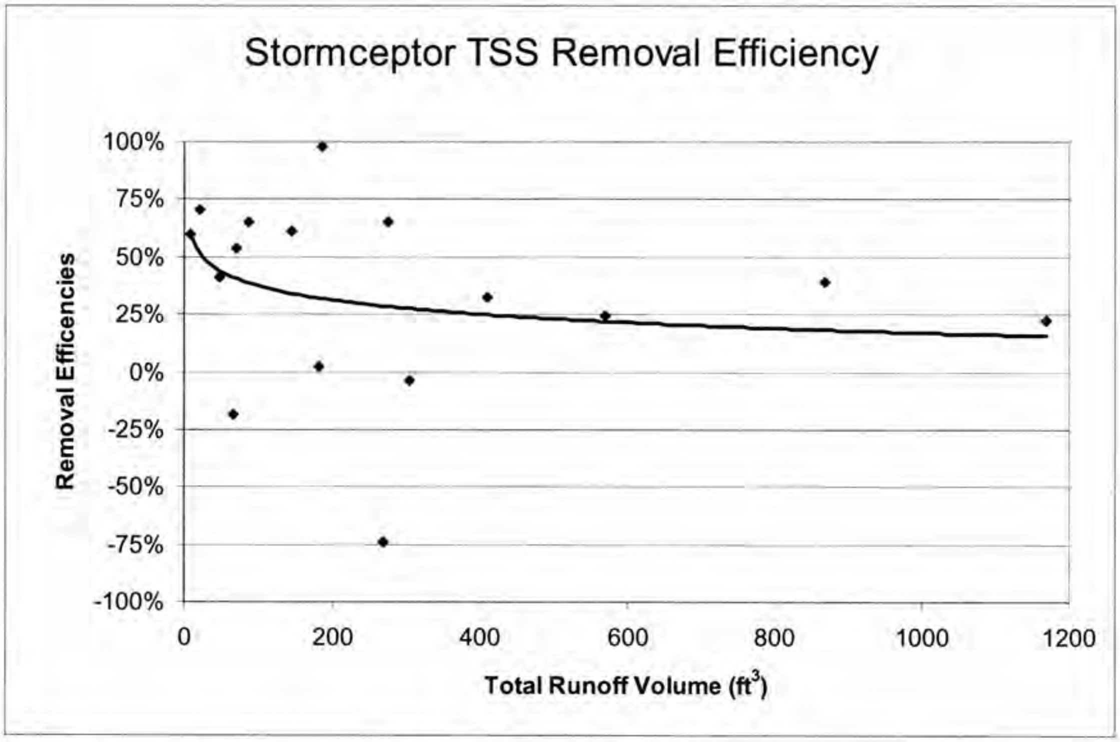

Figure 7.7. TSS as a function of runoff volume for NDOT 4.

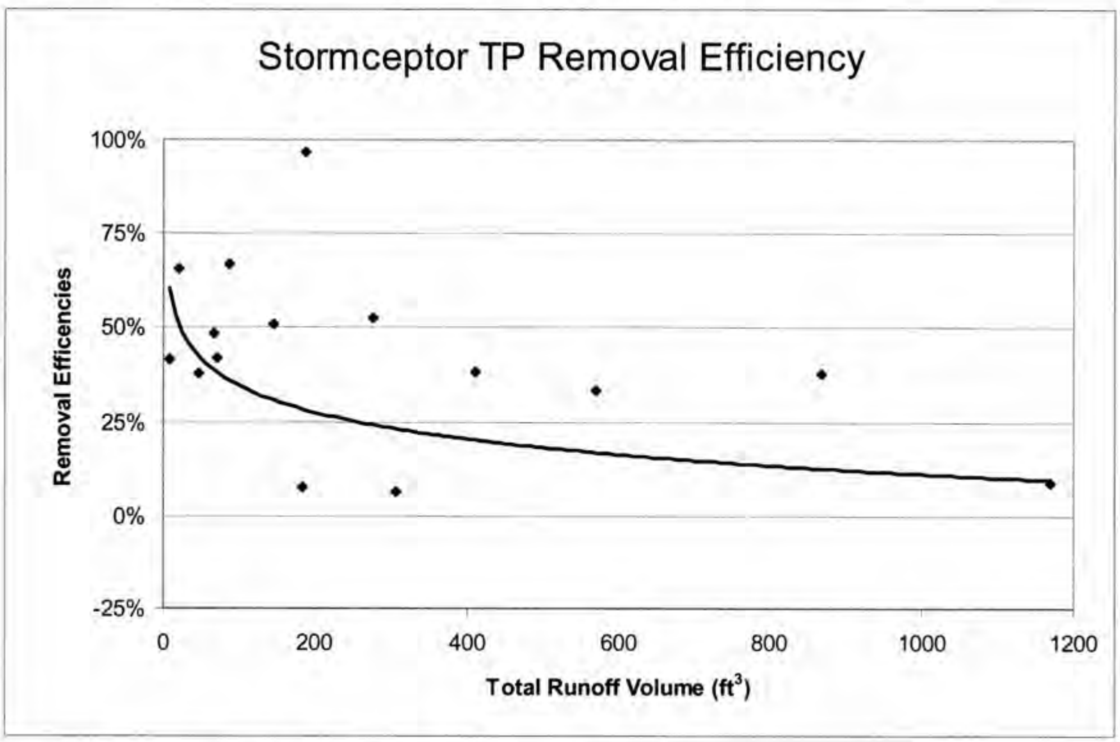

Figure 7.8. TP as a function of runoff volume for NDOT 4.

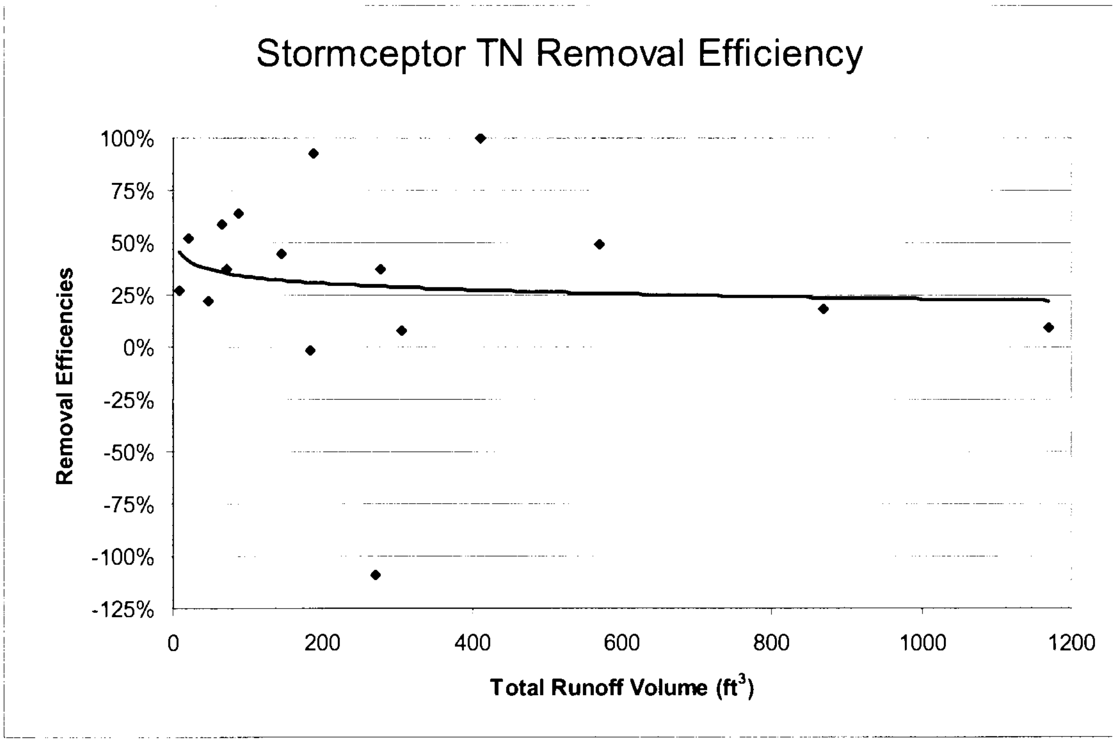

Figure 7.9. TN as a function of runoff volume at NDOT 4.

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CHAPTER 8. COMPARISONS

During the period July 2002 through April 2004, nutrient data from roadway runoff were collected for a total of 25 storms at NDOT 2, nine storms at NDOT 3, and 21 storms at NDOT 4.

Due to sampling problems, efficiency comparisons were calculated for only 18 out of the 25 storms at NDOT 2. Nutrient loading for the current study period, could not be calculated for NDOT 3 due to faulty construction and difficulties with inflow depth sensors on various occasions. As previously noted, the sediment basin outlet elevation was slightly higher than the west berm, causing a portion of the flows during the November 2002 and March 2003 storms to bypass the outlet, thus prohibiting meaningful load calculations. Seventeen of the 21 storms were used for comparisons at NDOT 4.

During the sampling period, three types of storms were experienced along SR 28 and US 50: frontal storms, winter snowstorms, and summer convective storms. For the purpose of this study, winter storms were classified as those storms where roads required snow plowing and sand/salt treatments. Maintenance records show that sand and salt were applied during and after every frontal and winter storm at all monitoring locations. Winter storms, where road sanding and plowing activities took place, occurred between November and May of each year. Sixteen winter storms were sampled at NDOT 2 and 13 at NDOT 4. Summer thunderstorms accounted for two storms at NDOT 2 and four storms at NDOT 4. Overall, average nutrient loads were higher for summer storms than winter storms (Figures 8.1 and 8.2).

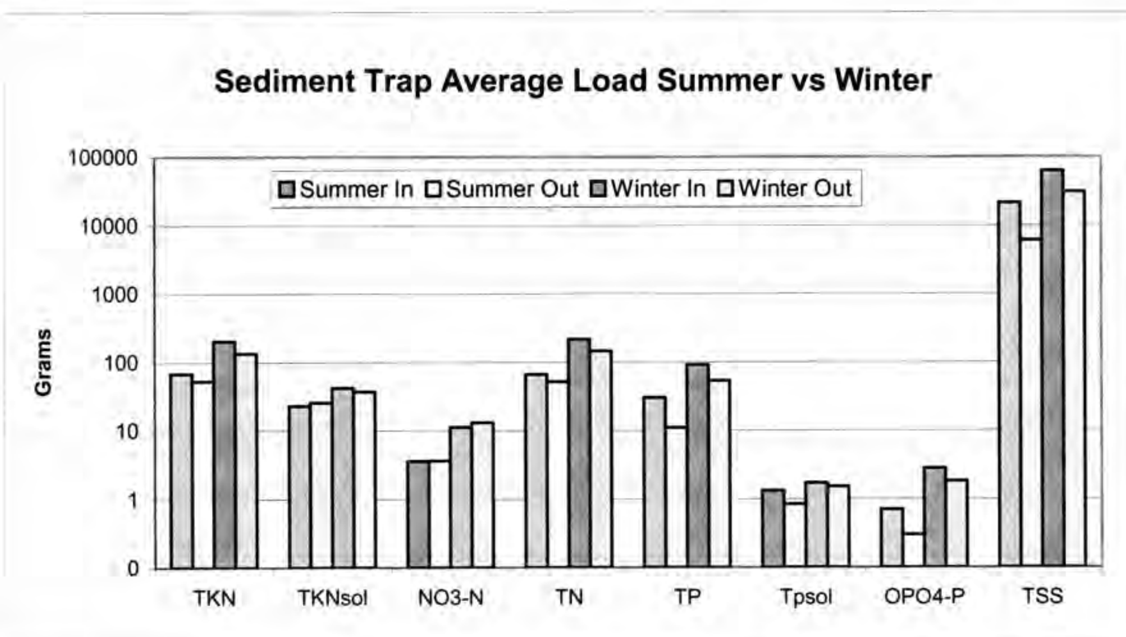

Figure 8.1. Average Nutrient Load per Storm to Sediment Trap (NDOT 2).

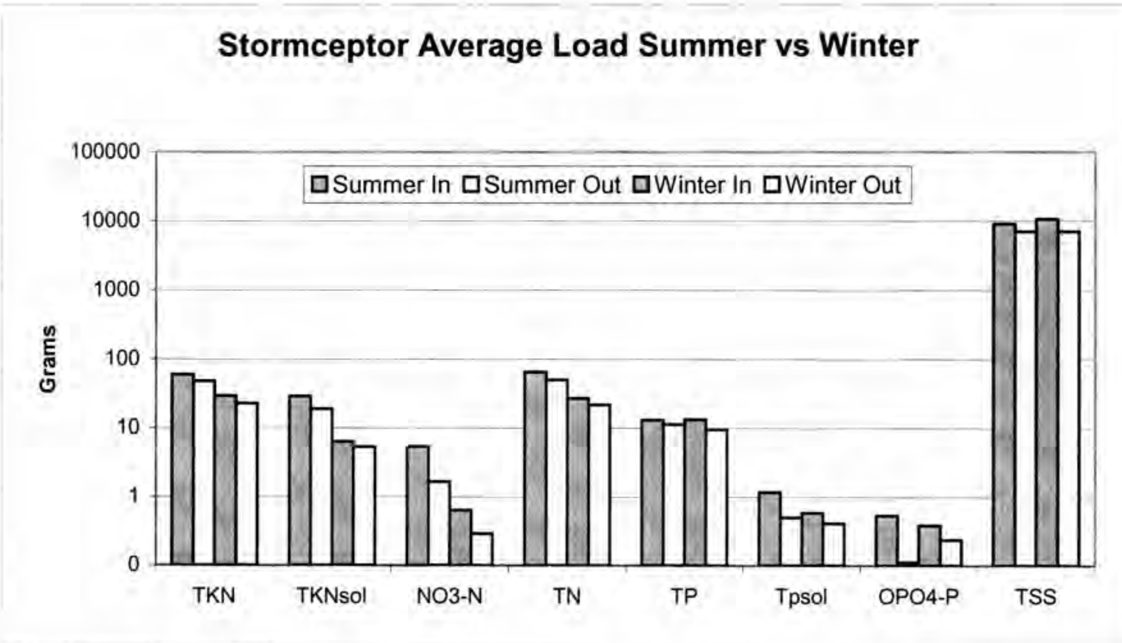

Figure 8.2. Average nutrient load per storm to Stormceptor® (NDOT 4).

Total suspended solids and TP loads to the Stormceptor® were higher for winter storms. This may be due to the fact there are no roadway cut slopes adjacent to this site; therefore, sediment reaching the Stormceptor® would be mostly from winter maintenance activities. The sediment trap site is adjacent to a large cut slope and receives sediment from storm runoff for both summer and winter storm events.

Summer convective thunderstorms occurred during the months of June through August 2003. At each site, winter snowstorms typically produced the most runoff flowing through each BMP and therefore the greatest loading. However, nutrient loading did not appear to depend on the type of storm, e.g., winter or summer storms, during 2003. For example, at NDOT 2, the maximum nutrient loading occurred during the March 2003 storm for TSS, TP, and TN, with summer thunderstorms in June and July 2003 contributing approximately the same loading (see Figures 8.3 through 8.7). Total loading for orthophosphate (OPO_4) and nitrate (NO_3) were higher during the summer convective storms of June and July. Loading rates were much greater during the winter of 2004 due to higher flows. Markers shown in red indicate a net export of nutrient during given storm event.

Field personnel reported the sediment trap was nearly full on April 10, 2003. Maintenance crews were unable to clean this site until August 26, 2003. It is reasonable to assume lack of maintenance affected overall BMP performance.

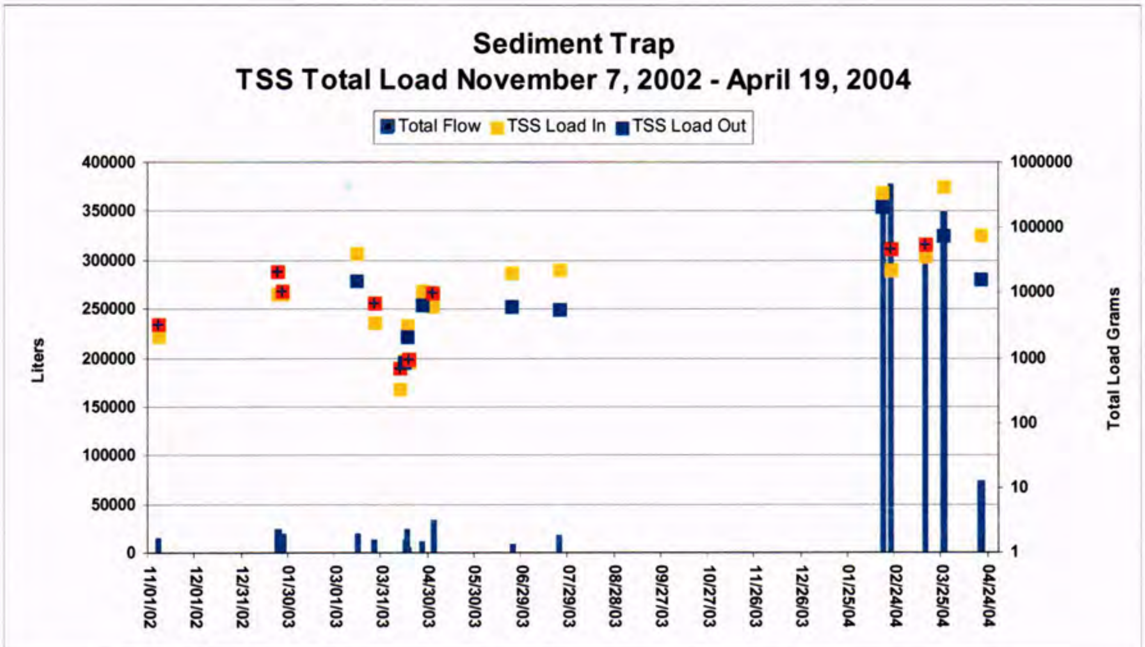

Figure 8.3. TSS loading to sediment trap (NDOT 2).

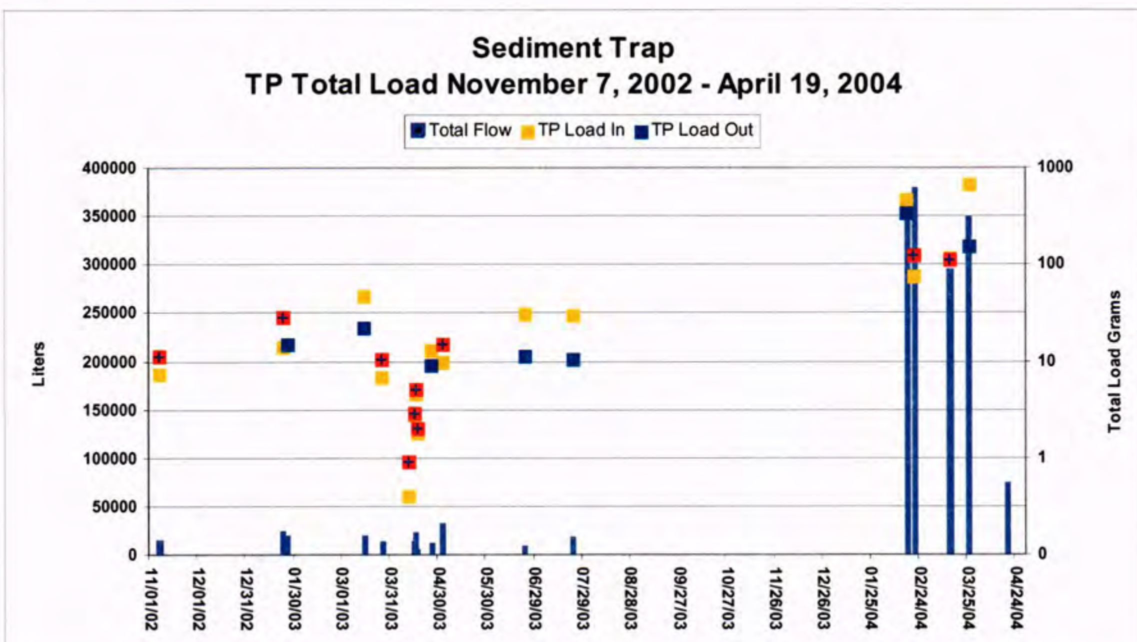

Figure 8.4. TP loading to sediment trap (NDOT 2).

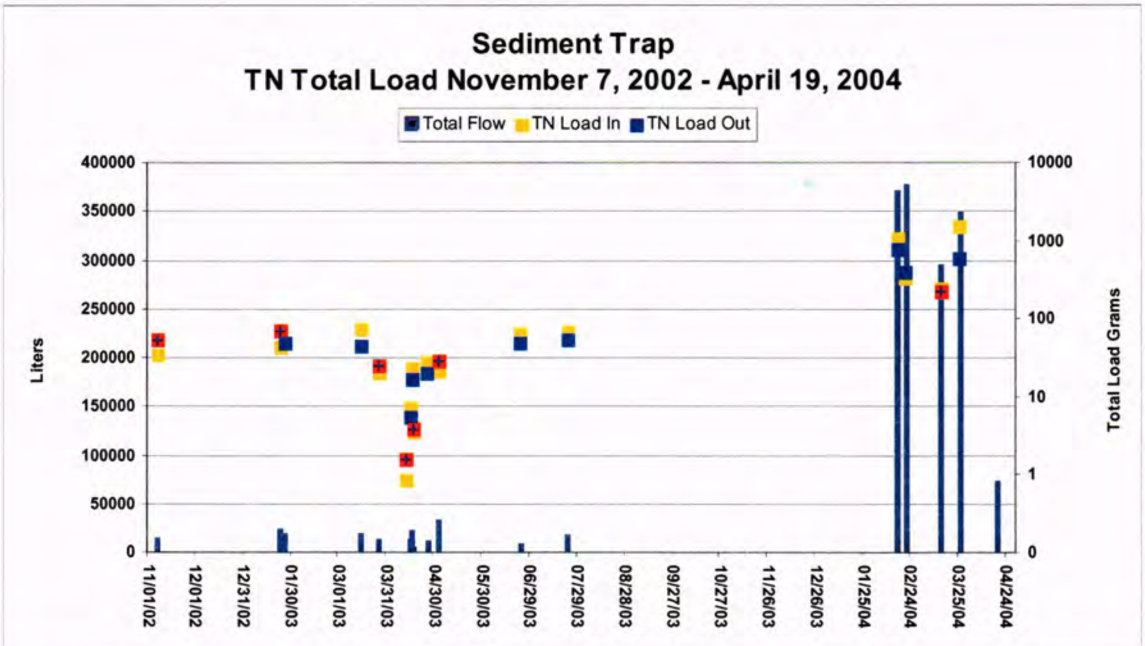

Figure 8.5. TN loading to sediment trap (NDOT 2).

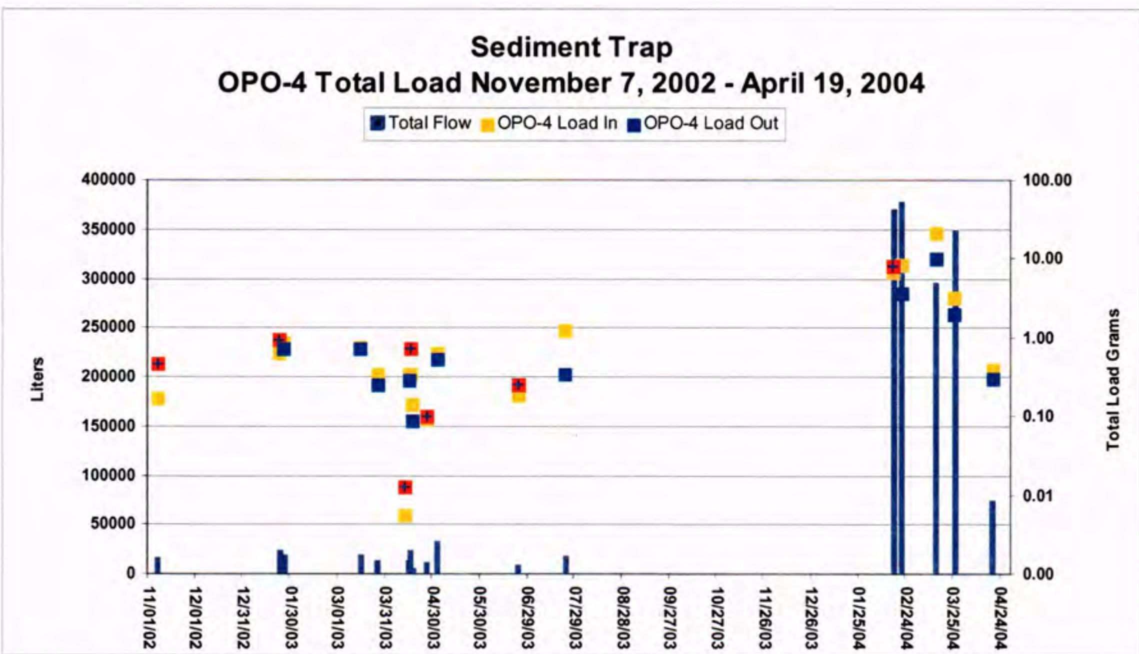

Figure 8.6. OPO_4 loading to sediment trap (NDOT 2).

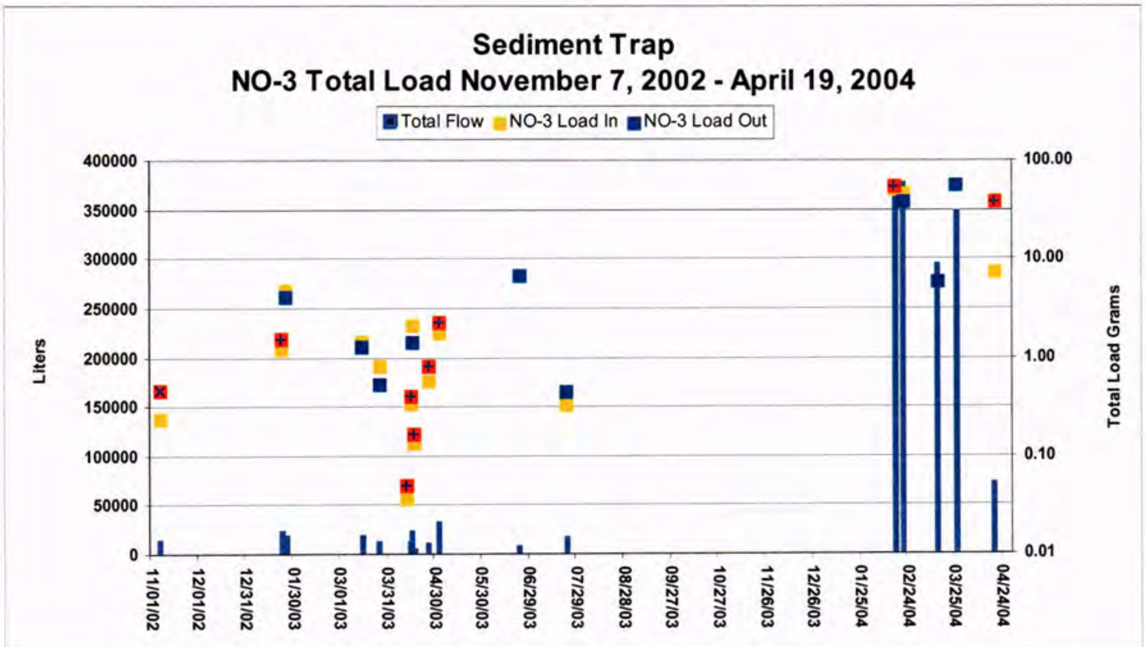

Figure 8.7. NO_3 loading to sediment trap (NDOT 2).

The NDOT 4 site followed a similar pattern with the exception of the greatest total load to the site for TSS, TP and TN was during the January 2003 storm. Orthophosphate and NO_3 loading was highest during summer thunderstorms (Figures 8.8 through 8.12).

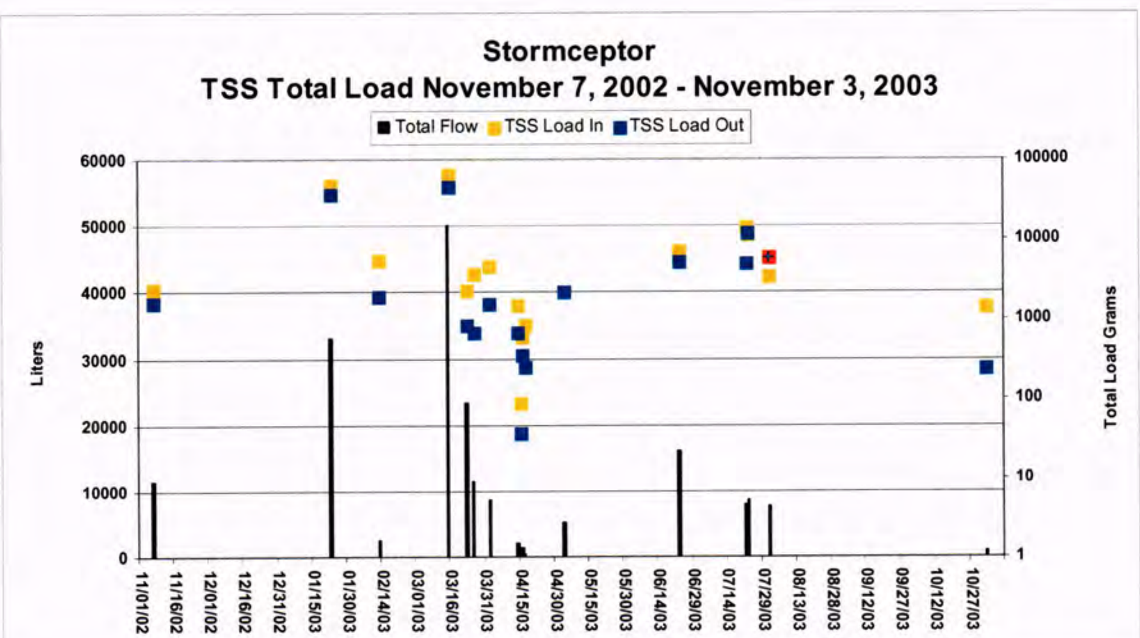

Figure 8.8. TSS loading to Stormceptor® (NDOT 4).

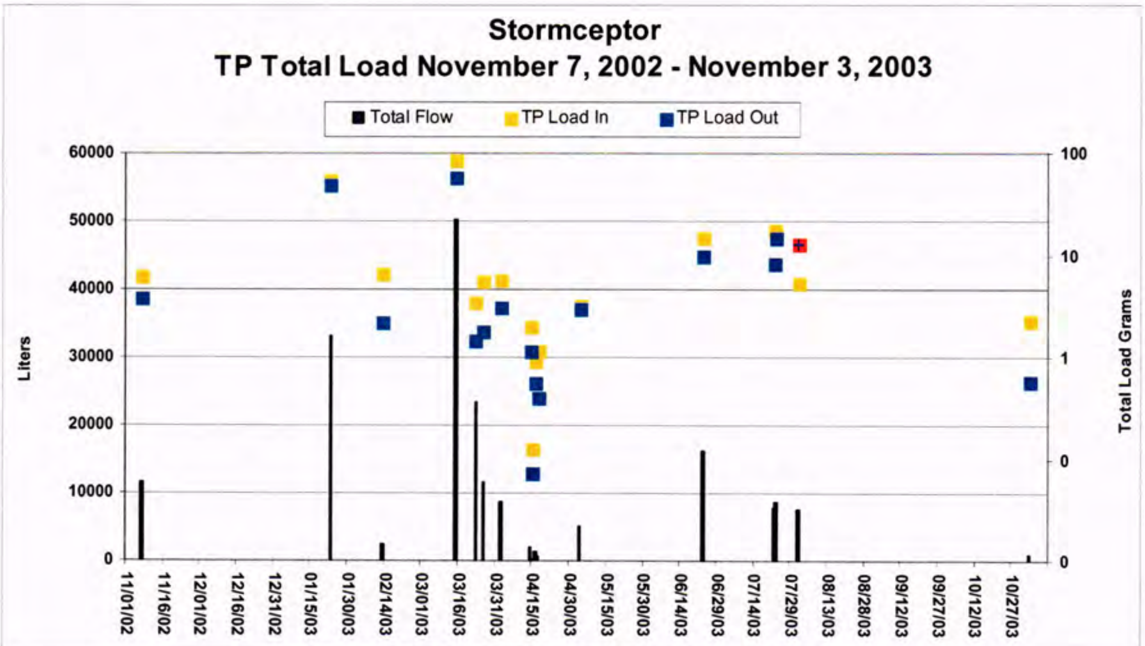

Figure 8.9. TP loading to Stormceptor® (NDOT 4).

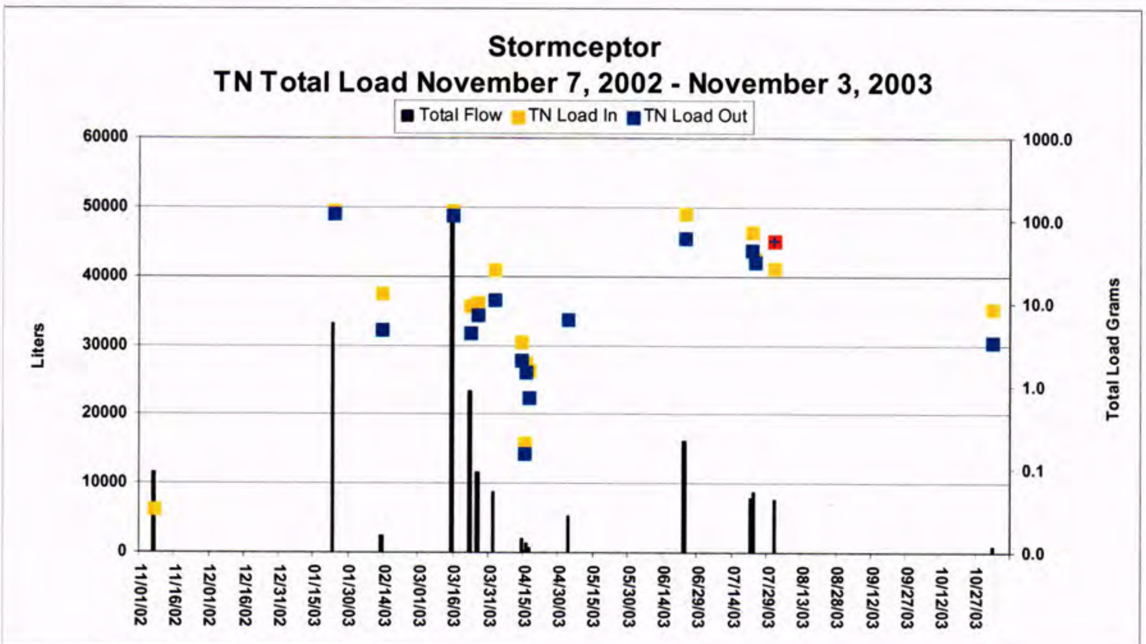

Figure 8.10. TN loading to Stormceptor® (NDOT 4).

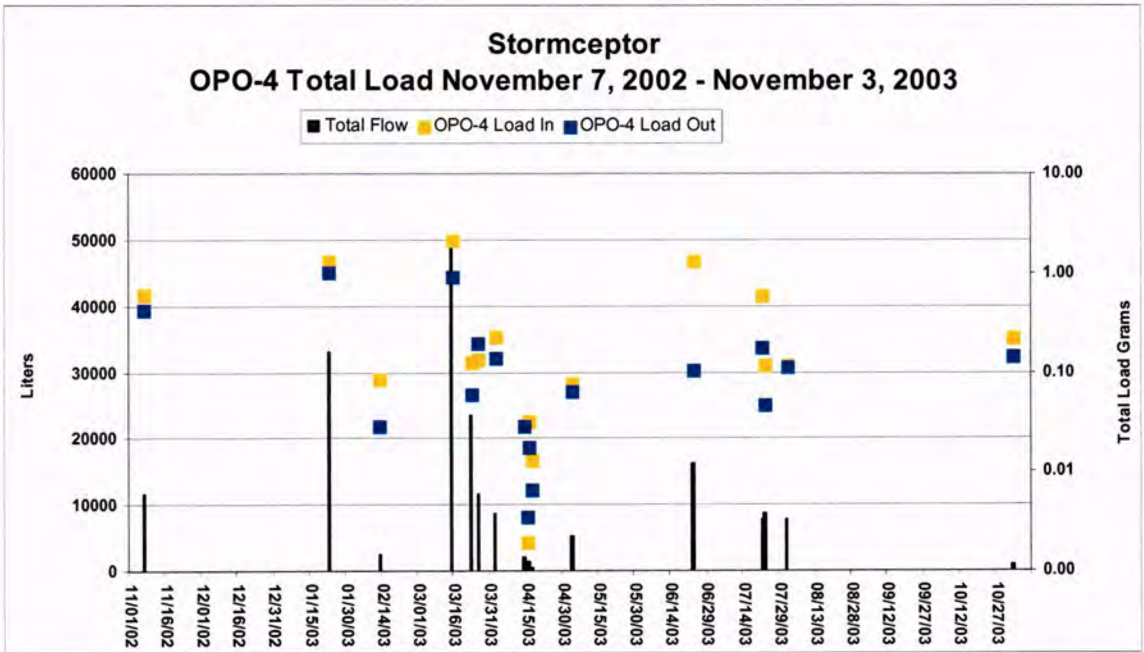

Figure 8.11. OPO_4 loading to Stormceptor® (NDOT 4).

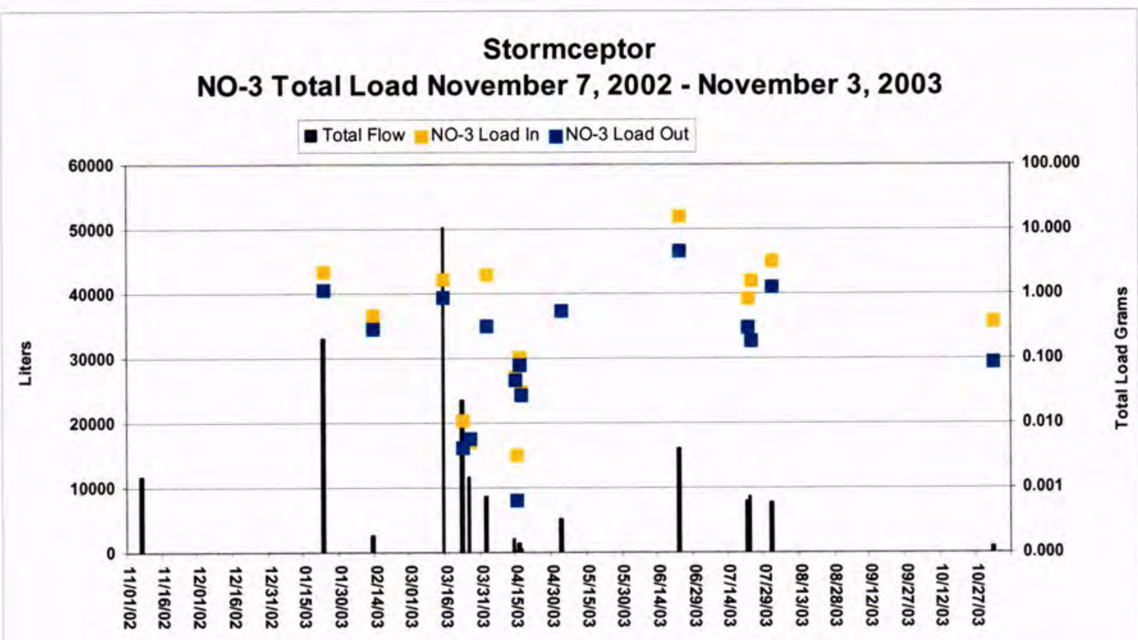

Figure 8.12. NO_3 loading to Stormceptor® (NDOT 4).

Comparisons between NDOT 2 and NDOT 4 yielded both expected and unexpected results. Table 8.1 lists overall efficiencies calculated as the percent of total pollutant removal using the total nutrient load, in grams, entering each BMP. Total nutrient loads for the monitoring period are listed in Table 8.2. Most surprising was the lack of statistical significance between inflows and outflows to the sediment trap. Another unexpected result was the apparent removal of dissolved nutrients by the Stormceptor®. A possible mechanism for this reduction may be through bacterial activities with captured road oils serving as the carbon source. However, further investigation is needed to determine if this apparent reduction is real.

Table 8.1. Removal efficiencies for the three BMP structure types from November 2002 through April 2004.

NDOT BMP	Overall BMP Performance							
	TKN	TKN_{sol}	NO_3-N	TN	TP	TP_{sol}	OPO_4-P	TSS
Sediment Trap % Removal	33	10	-15	32	42	14	35	51
Sediment Trap P-values	0.123	0.118	0.200	0.116	0.123	0.222	0.097	0.082
Sediment Basin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Stormceptor % Removal	21	27	65	21	25	40	51	31
Stormceptor P-values	0.039	0.091	0.048	0.050	0.031	0.026	0.020	0.016

Table 8.2. Total loading entering and exiting for the three BMPs from November 2002 through April 2004.

BMP TYPE (NDOT Site)	Total Nutrient Load In and Out (grams)							
	TKN In Out	TKN_{sol} In Out	NO_3-N In Out	TN In Out	TP In Out	TP_{sol} In Out	OPO_4-P In Out	TSS (kg) In Out
Sediment Trap	3,395	722	188	3,590	1,526	25	46	1,043.6
(NDOT2)	2,264	647	216	2,432	880	22	30	507.1
Sediment Basin (NDOT3)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Stormceptor	618	199	29	613	227	12	7	173.6
(NDOT4)	490	146	10	483	170	7	3	119.7

NDOT 2 – Sediment Trap

Monitoring data for NDOT 2 were collected for 18 storms from November 07, 2002 through May 19, 2004. A total of 1,655,985 liters (437,465 gallons) was treated through this site. Two summer thunderstorms produced 23,657 liters (6,250 gallons) of runoff. Twelve winter storms contributed a total of 1,632,328 liters (431,215 gallons) or 98 percent of the total roadway runoff for the monitoring period.

NDOT 2 was the only structure to show a net export of nutrients and was the least effective of the three types of structures. Although, the differences in percent effectiveness for TSS and TP were similar to those of NDOT 4, p-values indicate no significant difference between influent pollutants and effluent pollutants. A possible explanation is the need for maintenance at this site. Although NDOT 2 did show a moderate removal of TP and TSS with total removal of 51 percent and 42 percent, respectively, these values can essentially be attributed to three storms, on March 15, 2003, June 23, 2003, and July 23, 2003 (Figures 8.13

through 8.17, Table 8.3). The NDOT 2 site removed 35 percent of the orthophosphate and had a negative treatment effect on removing nitrate entering this system.

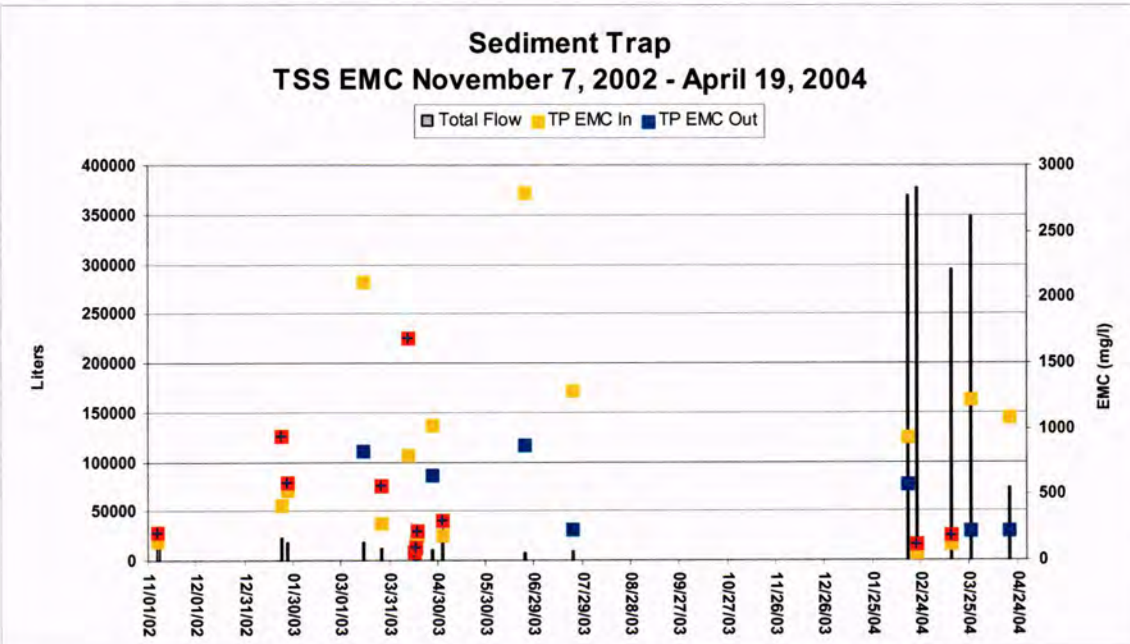

Figure 8.13. TSS EMC value for sediment trap.

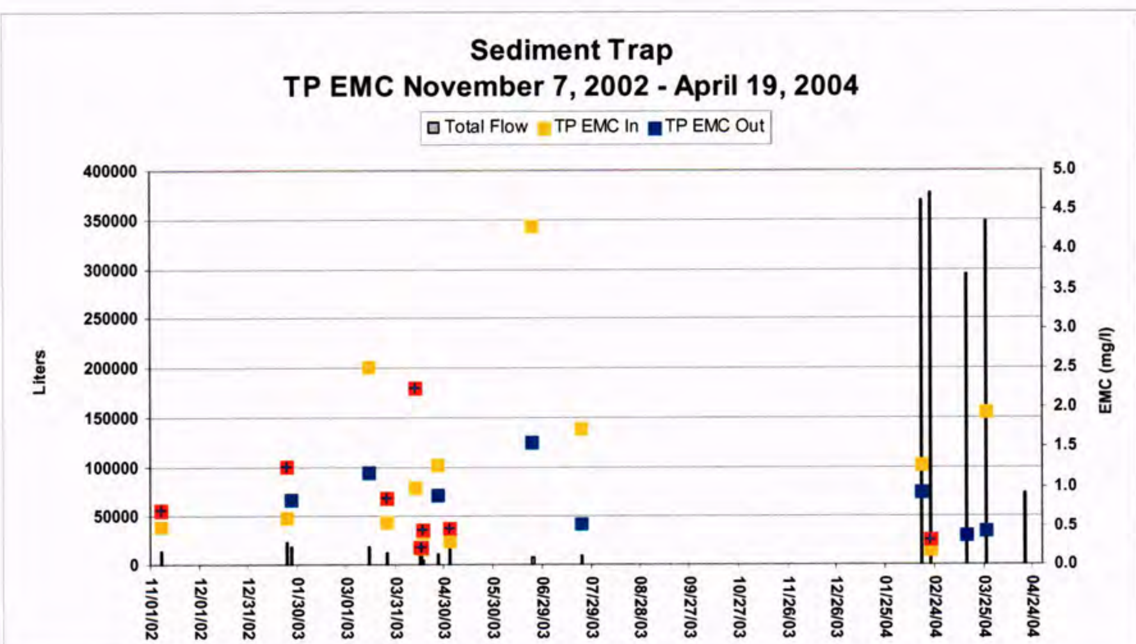

Figure 8.14. TP EMC value for sediment trap.

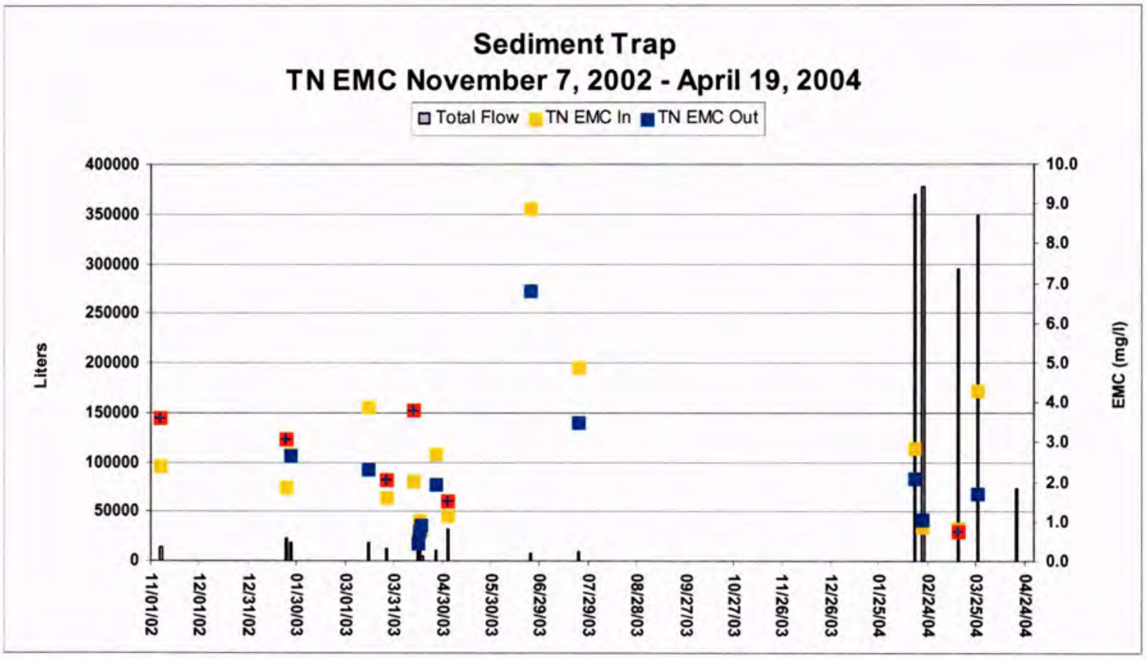

Figure 8.15. TN EMC value for sediment trap.

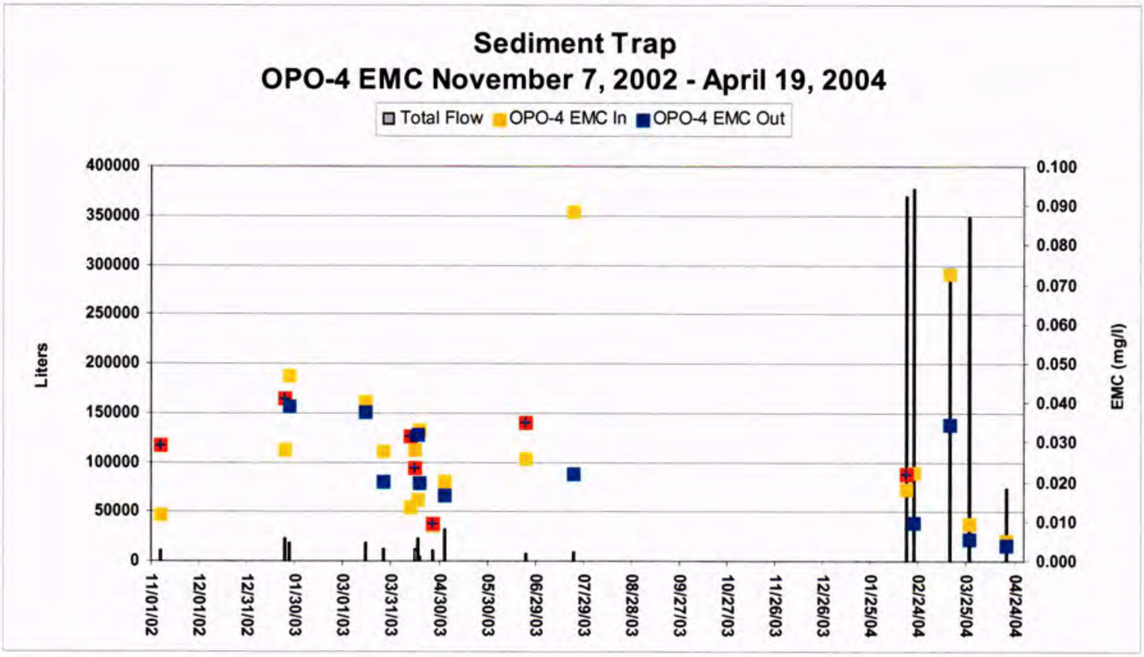

Figure 8.16. OPO_4 EMC value for sediment trap.

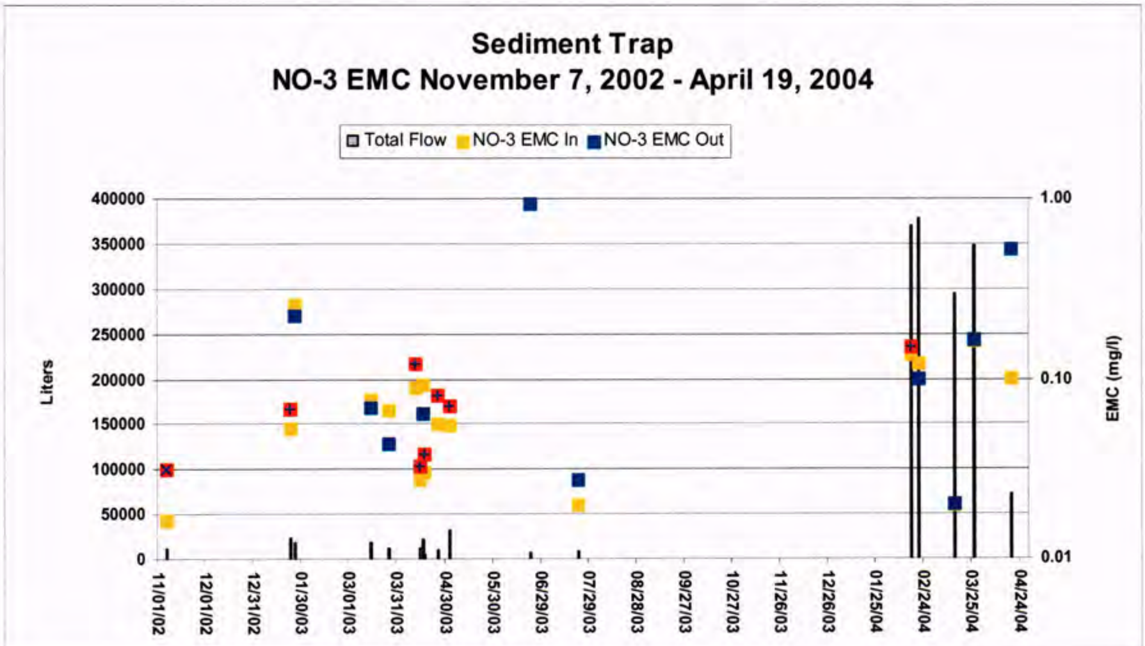

Figure 8.17. NO_3 EMC value for sediment trap.

Net export of all nutrients (markers shown in red) occurred during storms sampled starting on November 7, and ending November 10, 2002 and April 12, 2003. A possible explanation may be that the sediment trap was at capacity and treatment opportunities were not available. Seven out of the 13 storms sampled had a net export of TSS. Total nitrogen was greater in the outflow than in the inflow during six storm events. Total phosphorous was exported during eight storm events. Data show that net export of at least one nutrient occurred during every storm event.

Field observations indicated the sediment trap was at capacity and in need of maintenance by early April. It is important to note that this structure was cleaned, for the first time, on August 26, 2003 and again on November 14, 2003. This is a plausible explanation for the better performance during the 2004 storms and demonstrates the importance of regular BMP structure maintenance to ensure proper functioning of the structure. As described in Chapter 4, the sediment trap consists of three 36 inch corrugated metal pipes placed vertically in the ground with a grate on top. Each vertical can is connected by an 18 inch cross pipe to allow deposition of sediment as flow is conveyed through the three pipes. With no bypass feature, it would be expected that re-suspension of sediment would occur. Data analyses shows that the sediment trap is ineffective in capturing fine-grained sediments. Demonstration of effectiveness in capturing coarse-grained sediments has been shown as all three chambers filled and required maintenance within six months of installation.

Table 8.3. Removal efficiency of storm runoff at sediment trap site.

Inflow			Total Load grams							
Event No.	Date	Total Volume Runoff (l)	TKN	TKNsol	NO_3-N	TN	TP	Tpsol	OPO_4-P	TSS
1	11/07/02	14,524	35	12	0.2	35	7	1	0.2	2,116
2	01/23/03	22,741	41	9	1.2	43	14	1	0.6	9,531
3	01/26/03	18,240	45	11	4.8	50	15	1	0.9	9,719
4	03/15/03	19,019	73	7	1.5	74	48	1	0.8	40,299
5	03/26/03	12,328	19	5	0.8	20	7	1	0.3	3,557
6	04/12/03	409	1	0	0.0	1	0	0	0.0	326
7	04/15/03	12,470	7	2	0.3	7	3	0	0.4	927
8	04/16/03	22,398	21	11	2.1	23	5	1	0.3	3,136
9	04/17/03	4,394	3	1	0.1	4	2	0	0.1	856
10	04/26/03	10,207	27	6	0.6	28	13	0	0.1	10,550
11	05/03/03	31,897	20	7	1.8	22	10	1	0.6	6,168
12	06/23/03	7,266	58	19	6.8	65	31	1	0.2	20,340
13	07/23/03	16,391	78	27	0.3	69	30	2	1.2	22,304
14	02/16/04	370,196	1,016	151	51	1,067	473	6	7	347,381
15	02/21/04	377,450	266	154	46	337	76	10	9	23,044
16	03/14/04	294,857	239	41	6	245	114	--	21	37,009
17	03/26/04	348,462	1,446	260	57	1503	678	--	3	427,533
18	04/19/04	72,736	0	0	7	0	0	0	0	78,793
Total Load		1,655,985	3,395	722	188	3,590	1,526	25	46	1,043,590
Outflow										
Event No.	Date	Total Volume Runoff (l)	TKN	TKNsol	NO_3-N	TN	TP	Tpsol	OPO_4-P	TSS
1	11/07/02	14,524	54	21	0.5	55	11	1	0.5	3,351
2	01/23/03	22,741	69	9	1.6	70	29	1	0.9	21,502
3	01/26/03	18,240	44	11	4.2	49	15	1	0.7	10,830
4	03/15/03	19,019	43	8	1.3	45	22	1	0.7	15,947
5	03/26/03	12,328	25	5	0.5	25	11	1	0.2	7,013
6	04/12/03	409	2	0	0.1	2	1	0	0.0	694
7	04/15/03	12,470	5	2	0.4	6	3	0	0.3	881
8	04/16/03	22,398	16	10	1.5	17	5	1	0.7	2,225
9	04/17/03	4,394	4	1	0.2	4	2	0	0.1	988
10	04/26/03	10,207	19	6	0.8	20	9	0	0.1	6,680
11	05/03/03	31,897	27	8	2.3	28	15	1	0.5	9,916
12	06/23/03	7,266	43	20	6.8	50	11	1	0.3	6,443
13	07/23/03	16,391	63	32	0.5	54	11	1	0.4	5,654
14	02/16/04	370,196	720	134	56	775	345	6	8	217,416
15	02/21/04	377,450	369	143	38	407	123	6	4	46,742
16	03/14/04	294,857	216	35	6	222	112	--	10	55,722
17	03/26/04	348,462	546	203	58	604	154	--	2	78,568
18	04/19/04	72,736	0	0	38	0	0	0	0	16,487
Total Load		1,655,985	2,264	647	216	2,432	880	22	30	507,059

NDOT 3 - Sediment Basin

Monitoring data for the NODT 3 site were collected for eight storms from November 11, 2002 through August 21, 2003. A total of 79,125 gallons was treated through this site. Two summer thunderstorms produced 47,675 gallons of runoff. Four winter storms contributed a total of 37,450 gallons or 44 percent of the total roadway runoff for the monitoring period.

Presumably, the NDOT 3 BMP structure was the most effective in removing nutrients from surface stormwater runoff. This is largely due to the volume of water that is stored within the basin. The basin design volume is 413 cubic feet. While suspended sediment typically remains trapped within the basin, much of the dissolved nutrients are infiltrated through the bottom of the structure. Monitoring effects of stormwater infiltration for nutrient removal and potential resulting effects on groundwater below this site was not part of this study.

Chemistry data were collected at this site for a total of eight storms. During storms where outflow was present, there were exports of nutrients on two occasions (Figures 8.18 and 8.19). Nutrient export occurred during the July 18, 2002 storm for total soluble phosphorus and orthophosphate and on August 2, 2003 for TKNsol, nitrate, total soluble phosphorus and orthophosphate. Concentration data indicate a reduction of TSS exiting the basin from that entering the basin (Figure 8.20). Accurate loading calculations could not be made for this data set. The total amount of stormwater runoff entering the basin far exceeded flows exiting the basin. However, repairs were made in August 2003.

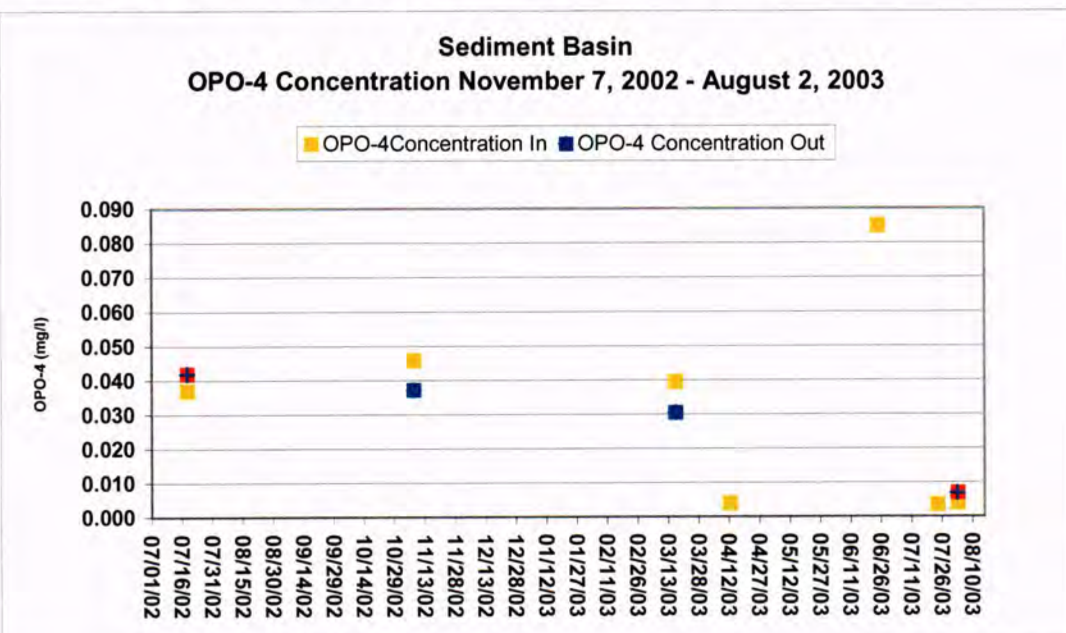

Figure 8.18. OPO_4 concentrations at NDOT 3.

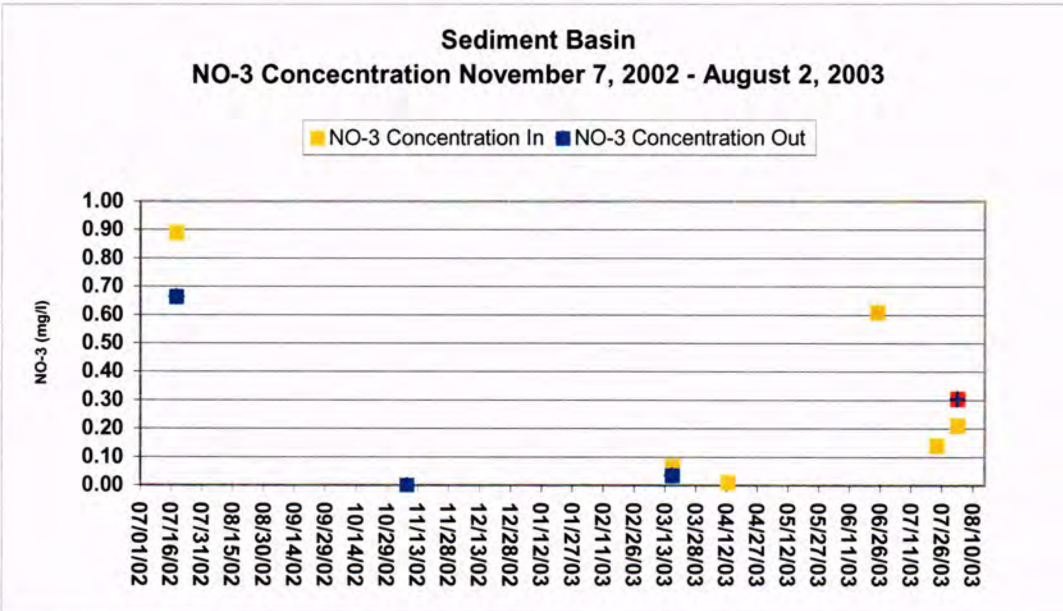

Figure 8.19. NO_3 concentrations at NDOT 3.

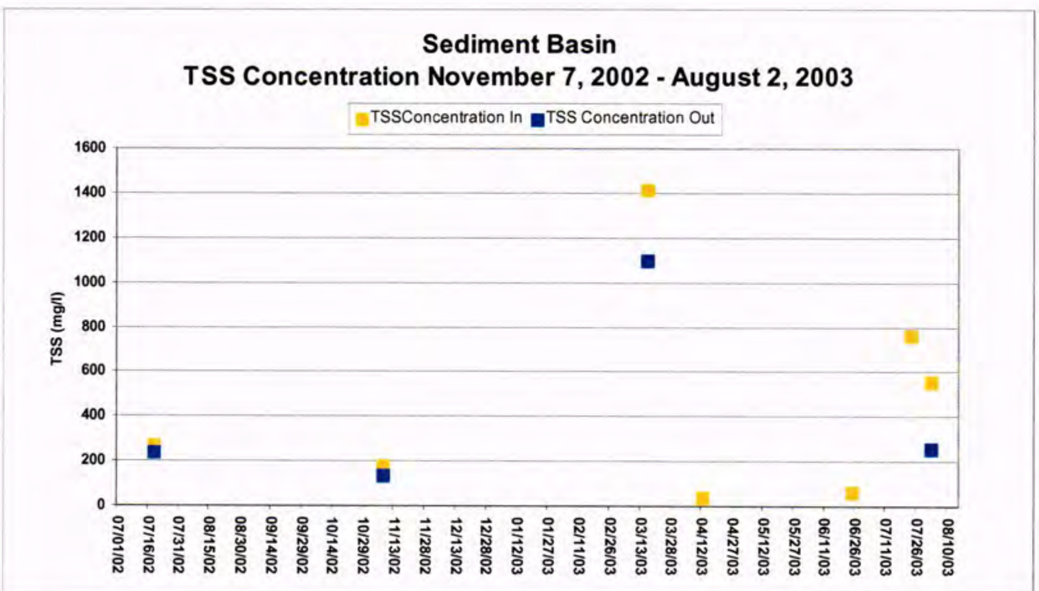

Figure 8.20. TSS concentrations at NDOT 3.

Flow and chemistry data were available for total loading calculations for storms on November 7, 2002 and March 15, 2003. However, accurate estimation of outflow cannot be determined at this time, because of discharge of flows over the side berm. A number of problems prevented complete data analyses for other storm events. Originally, the automated samplers were triggered by outflow. Thus, since it was rare that storm events at the sediment basin produced runoff volumes greater than the basin capacity, inflow rates and samples were not collected for numerous storms. The samplers were reset to collect inflow samples in summer 2003. Flow data were not recorded for the July 18, 2002, August 2, 2003, and August 23, 2003 runoff events due to faulty depth sensors. Flow data and inflow chemistry data were collected for the July 22, 2003 convective storm, however, comparisons could not be made, as the outflow samplers failed to collect chemistry data. There were insufficient samples for analyses of TKN, TP and TSS for the December 2003 storm.

NDOT 4 - Stormceptor®

Monitoring data for NDOT 4 were collected for 18 storms from November 11, 2002 through August 1, 2003. A total of 191,412 liters (50,566 gallons) was treated through this site. Summer thunderstorms produced 40,239 liters (10,630) gallons of runoff. Thirteen winter storms contributed a total of 151,173 liters (39,935 gallons) or 79 percent of the total roadway runoff for the monitoring period.

Total nutrient removal at the NDOT 4 site was not as effective as the NDOT 3 site but the site performed better overall than NDOT 2. As with NDOT 2, NDOT 4 also showed net exports of nutrients but to a lesser extent. Nine out of 18 storm events had a net export of at least one nutrient. However, seven storm events showed a reduction in outflow loading for all nutrients. This is in stark contrast to NDOT 2, which yielded a net export of at least one nutrient at every storm event. At NDOT 4, efficiency in removing TSS, TP and TN for all the storms sampled was 31 percent, 25 percent and 21 percent, respectively. Noteworthy is that NDOT 2 had a net export of TSS for 9 out of the 18 storms, whereas NDOT 4 had a net export in only three out of 17 storms. Although the apparent overall percent effectiveness is similar between NDOT 2 and NDOT 4, the treatment effectiveness of the sediment trap is statistically insignificant as indicated in Table 8.3.

Stormceptor® product literature claims up to 80 percent removal of TSS. Several studies (USGS, 1999; Yu *et al.*, 2001) have reported TSS removals of 25 percent to 57 percent. Total suspended solids removal of 31 percent in this study is within range of other published studies but far lower than product literature. Residence time in the Stormceptor® vault, at most only minutes, is dependent on the flow rate of stormwater entering the vault and on storage volume at the time of the storm.

What is surprising and unreported to date, is the apparent removal of dissolved nutrients such as NO_3-N, soluble TP and OPO_4 at 65 percent, 40 percent and 51 percent, respectively. Possible mechanisms for nutrient removal may be additional settling with suspended sediment and/or bacterial transformations of N and P in which oil captured from roadway runoff would serve as the carbon source. Overall, NDOT 4 has superior performance in removing all nutrients sampled.

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CHAPTER 9. CONCLUSIONS

Of the three types of BMPs tested for this study, the sediment basin (NDOT 3 site) is assumed to be the most effective in removing overall total nutrients from surface water flows. Again, total loading could not be accurately calculated for this monitoring period. However, over the course of the monitoring period, more stormwater entered, was stored, and infiltrated than what exited through this basin. Numerous small storms, not recorded, as well as melt from snow removal piles were treated at this site through infiltration. At NDOT 4, the Stormceptor® was the better flow-through treatment structure when compared to the sediment trap (Table 8.1). Table 9.1 lists overall cost for pollutant removal for each structure.

Table 9.1. Cost per percent pollutant removed per acre per year (includes annual maintenance).

BMP TYPE (NDOT Site)	Pollutant							
	TKN	TKN_{sol}	NO_3-N	TN	TP	TP_{sol}	OPO_4-P	TSS
Sediment Trap	$80	$259	$(178)	$83	$63	$197	$75	$52
Sediment Basin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Stormceptor®	$369	$285	$117	$360	$301	$190	$151	$247

Plainly evident is the high cost for removal of pollutants from stormwater runoff. Stormceptor®, at first glance, appears to be the least cost effective. However, as previously shown, treatment through the sediment trap is not statically significant. Design modifications to the sediment trap along with regular maintenance should improve overall efficiency and may substantiate the lower costs indicated in Table 9.1.

Unexpectedly, the Stormceptor® was effective in removing all nutrients. Especially surprising was the removal of the dissolved nutrients from stormwater passing through the Stormceptor®. Reductions may be attributed to settling of suspended sediments or in various bacterial reactions. However, on several occasions a net export of nutrients did occur. Similar performance ranges are expected of other sand/oil separator products currently on the market. Keeping with the intent of the NDOT Master Plan, sand/oil separator installation, including but not limited to the Stormceptor® brand, where stormwater runoff would discharge into stream environment zones and in areas with high volumes of traffic such as beach parking areas, is recommended.

Least effective of the three types of highway BMPs was the sediment trap (NDOT 2 site). Stormwater runoff through the sediment trap actually contributed additional NO_3-N to stormwater discharges during this study. Although TSS and TP removal was relatively similar to that of Stormceptor®, this efficiency can be contributed to only 50% of the storms. Net export of nutrients occurred during the majority of storms. Timely maintenance may have increased the performance level of this sediment trap. As previously stated, maintenance was needed in April 2003 but did not occur until August 2003.

Sediment traps are typically placed at the terminus of steep cut slopes where installation of riprap and revegetation treatment is not practical. Sediment traps have shown to be effective in capturing coarse grain sediment along with suspended sediment and associated TP, and use should continue at suitable locations.

The Nevada Department of Transportation is considering revising its strategy for treatment control. Presently, the Master Plan incorporates an approach of collecting and treating roadway runoff based upon early direction in the 1990s from TRPA (Amir Soltani, personal communication, 2003). Unintended consequences have arisen from collecting and concentrating storm flows. At issue is the erosion caused by stormwater concentrated and discharged at a single point. Typically, discharge occurs atop tall, steep hillsides along the majority of NDOT's roads in the Tahoe basin. This concentrated flow discharges into riprap channels that occasionally fail due to the steep slopes and erosive soils (Figure 9.1).

Figure 9.1. Riprap channel terminus on steep hillside below SR 28.

Additionally, the discharge of water collected and treated either through a series of drop inlets with additional sediment capacity, routed through sediment traps, sediment basins, or water quality vaults, and then discharged back onto bare ground, should be evaluated. Because of these issues, NDOT is considering alternatives to collect-and-treat methods, including various source control and flow dispersion methods where feasible. New techniques using bioengineering are also being investigated.

Mitigation measures, as recommended by Dorman *et al.* (1996) are not typically suitable for use in the Tahoe basin. Vegetative controls such as grass-lined channels and overland flow areas are the most common BMPs for treating highway stormwater runoff (Dorman *et al.*, 1996). Their flexibility, effectiveness, adaptability, and low cost lend to their extensive use. However, vegetative control systems are not a viable option for NDOT roadways within the Tahoe basin, where the majority of roadway runoff is from winter precipitation in the form of snow. Slopes are typically very steep, with the average slope 2:1 (H:V) or steeper, and the average vegetative cover along the east shore of Lake Tahoe less than 60 percent (Harding Lawson Associates, 1998).

Numerous ultra-urban stormwater runoff treatment systems on the market are currently being evaluated for effectiveness. Some limitations of these systems are as follows. The large footprint associated with volume-based water quality vaults increases the likelihood of utility conflicts, increasing installation costs significantly. Consideration of annual maintenance costs and maintenance safety issues such as enclosed space hazards may lessen acceptability. Additionally, adequate treatment of highway runoff flows must be considered when considering flow-based systems. Suitability of outfall locations is also an important consideration, as previously noted.

Finally erosion caused by concentrated flow, the result of the collect-and-treat strategy, must be addressed. Managing stormwater runoff is an adaptive process, and lessons learned from this monitoring study will be applied as NDOT moves forward with completing the erosion control improvements to its roadways throughout Nevada. Methods for treating highway runoff are site specific and require input from federal, state and local agencies as well as local general improvement districts, homeowners associations, and private landowners. Stakeholder involvement will continue to be an integral part of NDOT's Lake Tahoe EIP program.

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APPENDIX A. NDOT 2 DATA

SR 28 at Secret Harbor Creek November 7-9, 2002 Loading

Sediment Trap Inflow

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Time	TKN	TKNsol	NO3-N	TP	Tpsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	11/7/02 8:30	0	0	0	0	0	0	0	0	0
54868	NDOT 2A-1	11/7/02 8:40	4.16	1.65	0.17	1.03	0.101	0.072	493.00	11/7/02 9:00	208	864	343	36	900	214	21	15	102380
54869	NDOT 2A-2	11/7/02 9:01	4.35	1.69	0.19	1.18	0.114	0.080	362.00	11/7/02 9:30	415	1806	702	80	1886	490	47	33	150294
		Average	4.26	1.67	0.18	1.11	0.108	0.076	427.50	11/7/02 10:00	377	1605	630	69	1674	417	41	29	161267
		Average	4.26	1.67	0.18	1.11	0.108	0.076	427.50	11/7/02 10:30	7	31	12	1	32	8	1	1	3072
		Average	4.26	1.67	0.18	1.11	0.108	0.076	427.50	11/7/02 11:00	0	0	0	0	0	0	0	0	0
		Average	4.26	1.67	0.18	1.11	0.108	0.076	427.50	11/7/02 18:30	0	0	0	0	0	0	0	0	0
54939	NDOT 2A-1	11/7/02 18:51	3.50	1.40	NA	0.68	0.071	0.019	128.00	11/7/02 19:00	133	465	186	N/A	465	90	9	3	16990
54940	NDOT 2A-3	11/7/02 19:01	2.90	1.16	0.00	0.56	0.062	0.017	120.00	11/7/02 19:30	1922	5575	2230	2	5577	1080	119	33	230692
		Average	2.32	0.79	0.00	0.47	0.036	0.008	122.34	11/7/02 20:00	1560	3626	1232	5	3631	735	56	12	190866
54941	NDOT 2A-4	11/7/02 20:01	1.53	0.51	0.00	0.31	0.020	0.002	86.70	11/7/02 20:30	727	1112	371	1	1113	222	15	1	63026
		Average	2.32	0.79	0.00	0.47	0.036	0.008	122.34	11/7/02 21:00	2180	5067	1723	8	5075	1027	78	17	266755
54942	NDOT 2A-4	11/7/02 21:01	1.92	0.49	0.01	0.42	0.015	0.001	161.00	11/7/02 21:30	2192	4208	1074	22	4230	912	33	2	352898
		Average	2.32	0.79	0.00	0.47	0.036	0.008	122.34	11/7/02 22:00	2139	4971	1690	7	4978	1007	77	17	261673
54943	NDOT 2A-5	11/7/02 22:01	1.77	0.39	0.00	0.40	0.012	0.001	116.00	11/7/02 22:30	1495	2647	583	3	2650	591	18	1	173446
		Average	2.32	0.79	0.00	0.47	0.036	0.008	122.34	11/7/02 23:00	214	496	169	1	497	101	8	2	26135
		Average	2.32	0.79	0.00	0.47	0.036	0.008	122.34	11/7/02 23:30	213	494	168	1	495	100	8	2	26004
		Average	2.32	0.79	0.00	0.47	0.036	0.008	122.34	11/8/02 0:00	742	1724	586	3	1727	349	27	6	90761
										Total	14524	34691	11698	238	34929	7341	557	174	2116258
											EMC In	2.39	0.81	0.02	2.40	0.51	0.038	0.012	145.71

Sediment Trap Outflow

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Time	TKN	TKNsol	NO3-N	TP	Tpsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	11/7/02 8:30	0	0	0	0	0	0	0	0	0
54870	NDOT 2B-1	11/7/02 8:40	8.88	3.96	0.46	1.49	0.308	0.272	508.00	11/7/02 9:00	208	1844	822	95	1939	309	64	56	105495
54871	NDOT 2B-2	11/7/02 9:01	5.70	2.61	0.45	1.35	0.218	0.136	464.00	11/7/02 9:30	415	2367	1084	188	2554	560	91	56	192642
		Average	7.29	3.29	0.46	1.42	0.263	0.204	486.00	11/7/02 10:00	377	2750	1239	172	2922	536	99	77	183335
		Average	7.29	3.29	0.46	1.42	0.263	0.204	486.00	11/7/02 10:30	7	52	24	3	56	10	2	1	3492
		Average	7.29	3.29	0.46	1.42	0.263	0.204	486.00	11/7/02 11:00	0	0	0	0	0	0	0	0	0
		Average	7.29	3.29	0.46	1.42	0.263	0.204	486.00	11/7/02 18:30	0	0	0	0	0	0	0	0	0
54944	NDOT 2B-1	11/7/02 18:51	6.04	2.71	0.01	1.18	0.142	0.053	308.00	11/7/02 19:00	133	802	360	1	803	157	19	7	40881
54945	NDOT 2B-2	11/7/02 19:01	5.80	2.63	NA	1.15	0.156	0.057	272.00	11/7/02 19:30	1922	11150	5056	NA	11150	2211	300	110	522903
		Average	3.63	1.43	0.04	0.77	0.072	0.023	220.40	11/7/02 20:00	1560	5669	2225	61	5731	1206	112	36	343852
54946	NDOT 2B-3	11/7/02 20:01	2.29	0.74	<.001	0.62	0.029	0.003	208.00	11/7/02 20:30	727	1665	538	0	1665	450	21	2	151204
		Average	3.63	1.43	0.04	0.77	0.072	0.023	220.40	11/7/02 21:00	2180	7924	3109	86	8009	1685	157	50	480568
54947	NDOT 2B-4	11/7/02 21:01	2.31	0.63	0.10	0.52	0.017	0.001	184.00	11/7/02 21:30	2192	5063	1381	228	5291	1129	37	2	403312
		Average	3.63	1.43	0.04	0.77	0.072	0.023	220.40	11/7/02 22:00	2139	7773	3050	84	7857	1653	154	49	471413
54948	NDOT 2B-5	11/7/02 22:01	1.73	0.42	0.00	0.40	0.015	0.001	130.00	11/7/02 22:30	1495	2587	628	6	2593	600	22	1	194379
		Average	3.63	1.43	0.04	0.77	0.072	0.023	220.40	11/7/02 23:00	214	776	305	8	785	165	15	5	47084
		Average	3.63	1.43	0.04	0.77	0.072	0.023	220.40	11/7/02 23:30	213	772	303	8	781	164	15	5	46848
		Average	3.63	1.43	0.04	0.77	0.072	0.023	220.40	11/8/02 0:00	742	2696	1058	29	2725	573	53	17	163509
										Total	14524	53890	21181	467	54860	11409	1161	476	3350916
											EMC Out	3.71	1.46	0.03	3.78	0.79	0.080	0.033	230.72

SR 28 at Secret Harbor Creek January 23, 2003 Loading

Sediment Trap Inflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4P mg/l	TSS mg/l
55464	NDOT 2A-1	1/23/03 14:01	1.65	0.45	0.05	0.39	0.020	0.010	insuff smpl
55465	NDOT 2A-2	1/23/03 15:01	1.50	0.37	0.03	0.40	0.025	0.014	248.00
55466	NDOT 2A-3	1/23/03 16:01	1.94	0.41	0.04	0.63	0.047	0.034	392.00
55467	NDOT 2A-4	1/23/03 17:01	2.08	0.42	0.11	0.60	0.050	0.033	insuff smpl
55468	NDOT 2A-5	1/23/03 18:01	2.11	0.35	0.05	0.96	0.056	0.041	676.00
55469	NDOT 2A-6	1/23/03 19:01	1.78	0.35	0.05	0.71	0.049	0.034	insuff smpl
		Averege	1.84	0.39	0.06	0.61	0.041	0.028	438.67
		Average	1.84	0.39	0.06	0.61	0.041	0.028	438.67
		Average	1.84	0.39	0.06	0.61	0.041	0.028	438.67
		Average	1.84	0.39	0.06	0.61	0.041	0.028	438.67
		Average	1.84	0.39	0.06	0.61	0.041	0.028	438.67
		Average	1.84	0.39	0.06	0.61	0.041	0.028	438.67
		Average	1.84	0.39	0.06	0.61	0.041	0.028	438.67
		Average	1.84	0.39	0.06	0.61	0.041	0.028	438.67

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4P	TSS
1/23/03 14:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
1/23/03 14:01	466	768.55	209.61	24.687	793.24	180.727	9.316	4.658	204327
1/23/03 15:01	3682	5522.78	1362.28	110.46	5633.23	1480.10	92.05	51.55	913099
1/23/03 16:01	2607	5058.24	1069.01	112.12	5170.36	1637.41	122.54	88.65	1022077
1/23/03 17:01	1970	4097.75	827.43	216.71	4314.45	1180.07	98.50	65.01	864204
1/23/03 18:01	1597	3369.50	558.92	86.23	3455.73	1529.85	89.43	65.47	1079518
1/23/03 19:01	3746	6668.56	1311.23	172.33	6840.89	2663.68	183.57	127.38	1643412
1/23/03 19:30	2309	4256.95	904.51	129.33	4386.28	1418.73	95.07	63.89	1013047
1/23/03 20:00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
1/23/03 20:30	1994	3676.10	781.09	111.68	3787.78	1225.14	82.10	55.17	874818
1/23/03 21:00	1554	2863.87	608.51	87.00	2950.88	954.45	63.96	42.98	681529
1/23/03 21:30	732	1349.67	286.77	41.00	1390.67	449.81	30.14	20.26	321187
1/23/03 22:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
1/23/03 22:30	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total	20658	37632	7919	1092	38724	12720	867	585	8617217
EMC In		1.82	0.38	0.05	1.87	0.62	0.042	0.028	417.14

Sediment Trap Outflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4P mg/l	TSS mg/l
55453	NDOT 2B-1	1/23/03 14:01	1.35	0.33	0.05	0.44	0.038	0.031	224.00
55454	NDOT 2B-2	1/23/03 15:01	3.37	0.43	0.09	1.24	0.051	0.038	948.00
55455	NDOT 2B-3	1/23/03 16:01	2.56	0.46	0.09	0.92	0.062	0.047	552.00
55456	NDOT 2B-4	1/23/03 17:01	3.52	0.44	0.06	1.43	0.063	0.049	1024.00
55457	NDOT 2B-5	1/23/03 18:01	5.56	0.32	0.05	2.73	0.060	0.044	2076.00
55458	NDOT 2B-6	1/23/03 19:01	1.84	0.27	0.06	0.87	0.050	0.037	576.00
		Average	3.03	0.38	0.07	1.27	0.054	0.041	1035.20
		Average	3.03	0.38	0.07	1.27	0.054	0.041	1035.20
		Average	3.03	0.38	0.07	1.27	0.054	0.041	1035.20
		Average	3.03	0.38	0.07	1.27	0.054	0.041	1035.20
		Average	3.03	0.38	0.07	1.27	0.054	0.041	1035.20
		Average	3.03	0.38	0.07	1.27	0.054	0.041	1035.20
		Average	3.03	0.38	0.07	1.27	0.054	0.041	1035.20

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4P	TSS
1/23/03 14:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0
1/23/03 14:01	466	628.82	153.71	23.76	652.57	204.48	17.70	14.439	104337
1/23/03 15:01	3682	12407.83	1583.20	324.00	12731.84	4565.49	187.77	139.910	3490394
1/23/03 16:01	2607	6674.79	1199.38	229.45	6904.24	2385.72	161.66	122.545	1439252
1/23/03 17:01	1970	6934.65	866.83	110.32	7044.97	2817.20	124.11	96.533	2017352
1/23/03 18:01	1597	8878.88	511.01	86.23	8965.11	4359.59	95.82	70.264	3315206
1/23/03 19:01	3746	6893.34	1011.52	217.29	7110.63	3274.34	187.32	138.616	2157915
1/23/03 19:30	2309	7005.11	866.02	152.03	7157.15	2935.99	124.71	94.684	2390668
1/23/03 20:00	2083	6317.83	781.05	137.12	6454.95	2647.94	112.47	85.395	2156116
1/23/03 20:30	1994	6049.27	747.85	131.29	6180.56	2535.38	107.69	81.765	2064464
1/23/03 21:00	1554	4712.70	582.61	102.28	4814.98	1975.19	83.90	63.699	1608326
1/23/03 21:30	732	2220.97	274.57	48.20	2269.17	930.86	39.54	30.020	757961
1/23/03 22:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0
1/23/03 22:30	0	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0
Total	22741	68724	8578	1562	70286	28632	1243	938	21501990
EMC Out		3.02	0.38	0.07	3.09	1.26	0.055	0.041	945.53

SR 28 at Secret Harbor Creek January 27, 2003 Loading

Sediment Trap Inflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4P mg/l	TSS mg/l
55470	NDOT 2A-9	1/27/03 16:31	5.58	0.71	0.350	2.190	0.052	0.035	1828
55471	NDOT 2A-10	1/27/03 17:01	3.87	0.71	0.360	1.300	0.057	0.087	1032
55472	NDOT 2A-11	1/27/03 18:01	2.04	0.74	0.300	0.596	0.051	0.036	264
55473	NDOT 2A-12	1/27/03 19:01	1.36	0.57	0.240	0.390	0.053	0.041	172
55474	NDOT 2A-13	1/27/03 20:01	0.96	0.46	0.200	0.283	0.047	0.036	60
		Average	2.96	0.45	0.13	1.18	0.053	0.043	671
		Average	2.95796	0.45	0.13	1.18	0.053	0.043	671
		Average	2.95796	0.45	0.13	1.18	0.053	0.043	671
		Average	2.95796	0.45	0.13	1.18	0.053	0.043	671
		Average	2.95796	0.45	0.13	1.18	0.053	0.043	671

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
1/27/03 16:00	0	0	0	0	0	0	0	0	0
1/27/03 16:30	0	0	0	0	0	0	0	0	0
1/27/2003 16:31	1335	7449.3	947.85	467.25	7917	2923.65	69.42	46.725	2440380
1/27/2003 17:01	3263	12627.81	2316.73	1174.68	13802	4241.9	185.991	283.881	3367416
1/27/2003 18:01	4264	8698.56	3155.36	1279.2	9978	2541.344	217.464	153.504	1125696
1/27/2003 19:01	2344	3187.84	1336.08	562.56	3750	914.16	124.232	96.104	403168
1/27/2003 20:01	3826	3672.96	1759.96	785.2	4438	1082.758	179.822	137.736	229560
1/27/03 20:30	1749	5172.485	783.4989	224.0072	5396	2067.925	93.45641	74.60969	1173703.7
1/27/03 21:00	1162	3435.775	520.4319	148.7947	3585	1373.6	62.07755	49.55879	779621.76
1/27/03 21:30	298	880.6104	133.3899	38.137	919	352.0622	15.91086	12.70222	199821.87
1/27/03 22:00	0	0	0	0	0	0	0	0	0
1/27/03 22:30	0	0	0	0	0	0	0	0	0
Total	18240	45125	10953	4660	49785	15497	948	855	9719367
EMC In		2.47	0.60	0.26	2.73	0.85	0.05	0.047	533

Sediment Trap Outflow

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TP	TPsol	OPO4-P	TSS
55459	NDOT 2B-9	1/27/03 16:31	1.28	0.33	0.064	0.512	0.043	0.033	300
55460	NDOT 2B-10	1/27/03 17:01	3.09	0.54	0.230	1.130	0.049	0.036	868
55461	NDOT 2B-11	1/27/03 18:01	3.12	0.71	0.270	1.100	0.053	0.038	861
55462	NDOT 2B-12	1/27/03 19:01	2.35	0.79	0.280	0.767	0.056	0.041	484
55463	DOT 2B-13	1/27/03 20:01	1.67	0.59	0.220	0.458	0.056	0.045	264
		Average	2.30	0.59	0.21	0.79	0.05	0.04	555
		Average	2.302	0.592	0.213	0.793	0.051	0.0386	555.4
		Average	2.302	0.592	0.213	0.793	0.051	0.0386	555.4
		Average	2.302	0.592	0.213	0.793	0.051	0.0386	555.4
		Average	2.302	0.592	0.213	0.793	0.051	0.0386	555.4

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4P	TSS
1/27/03 16:00	0	0	0	0	0	0	0	0	0
1/27/03 16:30	0	0	0	0	0	0	0	0	0
1/27/2003 16:31	1335	1708.8	440.55	85.44	1794	683.52	57.405	44.055	400500
1/27/2003 17:01	3263	10082.67	1762.02	750.49	10833	3687.19	159.887	117.468	2832284
1/27/2003 18:01	4264	13303.68	3027.44	1151.28	14455	4690.4	225.992	162.032	3671304
1/27/2003 19:01	2344	5508.4	1851.76	656.32	6165	1797.848	131.264	96.104	1134496
1/27/2003 20:01	3826	6389.42	2257.34	841.72	7231	1752.308	214.256	172.17	1010064
1/27/03 20:30	1749	4025.426	1035.209	372.1158	4398	1387.39	89.88136	67.49845	971208.3
1/27/03 21:00	1162	2673.852	687.6283	247.1745	2921	921.5612	59.70286	44.83522	645116.1
1/27/03 21:30	298	685.3247	176.2434	63.35234	749	236.2018	15.30221	11.49154	165347.24
1/27/03 22:00	0	0	0	0	0	0	0	0	0
1/27/03 22:30	0	0	0	0	0	0	0	0	0
Total	18240	44378	11238	4168	48545	15156	954	716	10830320
EMC Out		2.43	0.62	0.23	2.66	0.83	0.05	0.04	594

SR 28 at Secret Harbor Creek March 15, 2003 Loading

Sediment Trap Inflow

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 4:00	0	0	0	0	0	0	0	0	0
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 4:30	0	0	0	0	0	0	0	0	0
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 5:00	1853	7244	648	144	7387	4822	111	75	4090657
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 5:30	150	587	53	12	599	391	9	6	331635
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 6:00	262	1023	92	20	1043	681	16	11	577550
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 6:30	369	1445	129	29	1473	962	22	15	815734
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 7:00	1047	4094	366	81	4175	2725	63	43	2311878
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 7:30	1617	6324	566	125	6449	4210	97	66	3571138
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 8:00	866	3384	303	67	3451	2253	52	35	1911036
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 8:30	671	2625	235	52	2677	1748	40	27	1482572
55910	NDOT 2A-5	3/15/03 8:46	1.86	0.39	0.09	0.86	0.074	0.053	592.00	3/15/03 8:46	898	1670	350	81	1751	774	66	48	531436
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 9:30	220	859	77	17	876	572	13	9	484853
55911	NDOT 2A-6	3/15/03 9:51	2.85	0.29	0.06	2.27	0.064	0.044	1810.00	3/15/03 9:51	1009	2875	293	61	2936	2290	65	44	1826003
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 10:30	1430	5591	501	111	5702	3722	85	58	3157460
55912	NDOT 2A-7	3/15/03 11:01	6.27	0.30	0.09	4.56	0.058	0.038	4120.00	3/15/03 11:01	1	3	0	0	3	2	0	0	2211
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 11:30	1586	6199	555	123	6322	4127	95	65	3500855
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 12:00	270	1058	95	21	1078	704	16	11	597189
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 12:30	354	1383	124	27	1411	921	21	14	781039
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 13:00	564	2205	197	44	2249	1468	34	23	1245438
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 13:30	1240	4850	434	96	4946	3228	74	51	2738545
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 14:00	3078	12037	1077	239	12275	8013	184	125	6797196
55913	NDOT 2A-10	3/15/03 14:16	4.66	0.42	0.07	2.72	0.043	0.028	2310.00	3/15/03 14:16	1535	7151	645	107	7259	4174	66	43	3545048
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 15:00	0	0	0	0	0	0	0	0	0
		Average	3.91	0.35	0.08	2.60	0.060	0.041	2208.00	3/15/03 15:30	0	0	0	0	0	0	0	0	0
										Total	19019	72607	6739	1456	74063	47788	1128	770	40299470
											EMC In	3.82	0.35	0.08	3.89	2.51	0.059	0.040	2118.90

Sediment Trap Outflow

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	Tpsol mg/l	OPO4-P mg/l	TSS mg/l	Time EMC in mg/l	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 4:00	0	0	0	0	0	0	0	0	0
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 4:30	0	0	0	0	0	0	0	0	0
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 5:00	1853	4377	824	130	4507	2286	111	70	1644229
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 5:30	150	355	67	11	365	185	9	6	133300
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 6:00	262	618	116	18	636	323	16	10	232145
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 6:30	369	873	164	26	899	456	22	14	327882
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 7:00	1047	2474	466	73	2547	1292	63	40	929253
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 7:30	1617	3821	720	113	3934	1995	97	61	1435410
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 8:00	866	2045	385	61	2105	1068	52	33	768136
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 8:30	671	1586	299	47	1633	828	40	25	595916
55915	NDOT 2B-5	3/15/03 8:46	2.60	0.55	0.08	1.05	0.050	0.029	716.00	3/15/03 8:46	898	2334	494	72	2406	943	45	26	642750
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 9:30	220	519	98	15	534	271	13	8	194885
55916	NDOT 2B-6	3/15/03 9:51	1.74	0.45	0.08	1.04	0.068	0.044	760.00	3/15/03 9:51	1009	1755	454	81	1836	1049	69	44	766719
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 10:30	1430	3378	636	100	3478	1764	86	54	1269133
55917	NDOT 2B-7	3/15/03 11:01	3.54	0.50	0.07	2.10	0.065	0.041	1610.00	3/15/03 11:01	1	2	0	0	2	1	0	0	864
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 11:30	1586	3746	706	111	3857	1956	95	60	1407160
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 12:00	270	639	120	19	658	334	16	10	240039
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 12:30	354	836	157	25	860	436	21	13	313936
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 13:00	564	1333	251	39	1372	696	34	21	500600
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 13:30	1240	2930	552	87	3017	1530	74	47	1100751
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 14:00	3078	7273	1370	215	7488	3798	185	116	2732116
55918	NDOT 2B-10	3/15/03 14:16	1.57	0.28	0.05	0.75	0.057	0.037	464.00	3/15/03 14:16	1535	2409	430	77	2486	1143	87	57	712079
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 15:00	0	0	0	0	0	0	0	0	0
		Average	2.36	0.45	0.07	1.23	0.060	0.038	887.50	3/15/03 15:30	0	0	0	0	0	0	0	0	0
										Total	19019	43302	8310	1320	44622	22355	1136	715	15947304
											EMC Out	2.28	0.44	0.07	2.35	1.18	0.060	0.038	838.49

SR 28 at Secret Harbor Creek March 26, 2003 Loading

Sediment Trap Inflow

Lab #	Sample Name	Sample Time	TKN	TKNsol	NO3	TP	TPsol	OPO4	TSS	Total Load (In) miligrams Average Concentration Value Used for flow volumes without concentrations									
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	1.54	0.40	0.07	0.54	0.053	0.028	280.33	3/26/03 8:00	0	0	0	0	0	0	0	0	0
		Average	1.54	0.40	0.07	0.54	0.053	0.028	280.33	3/26/03 8:30	1751	2703	695	119	2822	952	93	49	490948
		Average	1.54	0.40	0.07	0.54	0.053	0.028	280.33	3/26/03 9:00	1740	2685	690	118	2804	946	93	49	487747
56032	NDOT 2A-4	3/26/03 9:16	1.21	0.35	0.01	0.46	0.036	0.019	281.00	3/26/03 9:16	1879	2273	658	24	2298	857	68	36	527944
		Average	1.54	0.40	0.07	0.54	0.053	0.028	280.33	3/26/03 10:00	2030	3133	805	138	3271	1104	108	57	569144
56033	NDOT 2A-5	3/26/03 10:21	1.91	0.37	0.10	0.72	0.060	0.035	384.00	3/26/03 10:21	2048	3912	758	205	4117	1464	123	72	786437
		Average	1.54	0.40	0.07	0.54	0.053	0.028	280.33	3/26/03 11:00	1600	2470	635	109	2579	870	85	45	448627
56034	NDOT 2A-6	3/26/03 11:26	1.51	0.47	0.09	0.46	0.064	0.030	176.00	3/26/03 11:26	1079	1629	507	98	1728	496	69	32	189922
		Average	1.54	0.40	0.07	0.54	0.053	0.028	280.33	3/26/03 12:00	200	309	79	14	322	109	11	6	56043
		Average	1.54	0.40	0.07	0.54	0.053	0.028	280.33	3/26/03 12:30	0	0	0	0	0	0	0	0	0
										Total	12328	19114	4827	825	19940	6798	650	345	3556813
										EMC In		1.55	0.39	0.07	1.62	0.55	0.053	0.028	288.52

Sediment Trap Outflow

Lab #	Sample Name	Sample Time	TKN	TKNsol	NO3	TP	TPsol	OPO4	TSS	Total Load (Out) miligrams Average Concentration Value Used for flow volumes without concentrations									
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	1.99	0.40	0.05	0.84	0.043	0.021	558.67	3/26/03 8:00	0	0	0	0	0	0	0	0	0
		Average	1.99	0.40	0.05	0.84	0.043	0.021	558.67	3/26/03 8:30	1751	3491	701	79	3570	1470	75	36	978394
		Average	1.99	0.40	0.05	0.84	0.043	0.021	558.67	3/26/03 9:00	1740	3468	696	79	3547	1460	74	36	972014
56035	NDOT 2B-4	3/26/03 9:16	2.73	0.39	0.03	1.24	0.030	0.012	884.00	3/26/03 9:16	1879	5129	733	56	5186	2330	56	23	1660864
		Average	1.99	0.40	0.05	0.84	0.043	0.021	558.67	3/26/03 10:00	2030	4047	812	92	4139	1704	87	42	1134228
56036	NDOT 2B-5	3/26/03 10:21	1.61	0.37	0.04	0.68	0.045	0.022	420.00	3/26/03 10:21	2048	3297	758	76	3373	1391	92	45	860165
		Average	1.99	0.40	0.05	0.84	0.043	0.021	558.67	3/26/03 11:00	1600	3190	640	73	3263	1343	68	33	894053
56037	NDOT 2B-6	3/26/03 11:26	1.64	0.44	0.07	0.60	0.053	0.028	372.00	3/26/03 11:26	1079	1770	475	74	1844	646	57	30	401427
		Average	1.99	0.40	0.05	0.84	0.043	0.021	558.67	3/26/03 12:00	200	398	80	9	408	168	9	4	111686
		Average	1.99	0.40	0.05	0.84	0.043	0.021	558.67	3/26/03 12:30	0	0	0	0	0	0	0	0	0
										Total	12328	24791	4894	539	25329	10512	518	249	7012831
										EMC Out		2.01	0.40	0.04	2.05	0.85	0.042	0.020	568.87

SR 28 at Secret Harbor Creek April 12, 2003 Loading

Sediment Trap Inflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	Tpsol mg/l	OPO4-P mg/l	TSS mg/l
56148	NDOT 2A-4	4/12/03 16:41	2.14	0.68	0.09	2.23	1.24	0.029	0.013	1010.00
		Average	1.86	0.75	0.09	1.95	0.88	0.031	0.014	699.00
56149	NDOT 2A-5	4/12/03 17:46	1.58	0.81	0.10	1.68	0.51	0.032	0.015	388.00
		Average	1.58	0.81	0.10	1.68	0.51	0.032	0.015	388.00
		Average	1.58	0.81	0.10	1.68	0.51	0.032	0.015	388.00
		Average	1.58	0.81	0.10	1.68	0.51	0.032	0.015	388.00
		Average	1.58	0.81	0.10	1.68	0.51	0.032	0.015	388.00
		Average	1.58	0.81	0.10	1.68	0.51	0.032	0.015	388.00

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
4/12/03 16:30	0	0	0	0	0	0	0	0	0
4/12/03 17:00	247	529	168	21	550	306	7	3	249449
4/12/03 17:30	45	83	33	4	87	39	1	1	31182
4/12/03 18:00	31	48	25	3	51	16	1	0	11891
4/12/03 18:30	24	38	19	2	40	12	1	0	9248
4/12/03 19:00	19	30	15	2	32	10	1	0	7337
4/12/03 19:30	42	67	34	4	71	22	1	1	16388
4/12/03 20:00	2	3	2	0	4	1	0	0	859
4/12/03 20:30	0	0	0	0	0	0	0	0	0
Total	409	798	297	37	835	406	12	6	326355
EMC In		1.95	0.72	0.09	2.04	0.99	0.030	0.014	797

Sediment Trap Outflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	Tpsol mg/l	OPO4-P mg/l	TSS mg/l
56150	NDOT 2B-4	4/12/03 16:41	4.55	1.36	0.14	4.69	2.85	0.057	0.037	2180.00
		Average	3.29	1.08	0.12	3.41	1.97	0.050	0.029	1470.00
56151	NDOT 2B-5	4/12/03 17:46	2.03	0.80	0.09	2.12	1.08	0.043	0.021	760.00
		Average	2.03	0.80	0.09	2.12	1.08	0.043	0.021	760.00
		Average	2.03	0.80	0.09	2.12	1.08	0.043	0.021	760.00
		Average	2.03	0.80	0.09	2.12	1.08	0.043	0.021	760.00
		Average	2.03	0.80	0.09	2.12	1.08	0.043	0.021	760.00
		Average	2.03	0.80	0.09	2.12	1.08	0.043	0.021	760.00

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
4/12/03 16:30	0	0	0	0	0	0	0	0	0
4/12/03 17:00	247	1124	336	35	1158	704	14	9	538414
4/12/03 17:30	45	147	48	5	152	88	2	1	65576
4/12/03 18:00	31	62	25	3	65	33	1	1	23292
4/12/03 18:30	24	48	19	2	51	26	1	1	18116
4/12/03 19:00	19	38	15	2	40	20	1	0	14371
4/12/03 19:30	42	86	34	4	90	46	2	1	32100
4/12/03 20:00	2	4	2	0	5	2	0	0	1684
4/12/03 20:30	0	0	0	0	0	0	0	0	0
Total	409	1510	478	50	1560	919	21	13	693552
EMC Out		3.69	1.17	0.12	3.81	2.24	0.052	0.032	1694

SR 28 at Secret Harbor Creek April 15-17, 2003 Loading

Sediment Trap Inflow

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 12:00	0	0	0	0	0	0	0	0	0
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 12:30	1156	662	225	31	692	266	43	31	94202
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 13:00	146	84	28	4	87	34	5	4	11900
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 13:30	157	90	31	4	94	36	6	4	12823
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 14:00	189	108	37	5	113	43	7	5	15364
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 14:30	193	111	38	5	116	44	7	5	15752
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 15:00	175	100	34	5	105	40	6	5	14257
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 15:30	148	85	29	4	88	34	5	4	12031
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 16:00	151	86	29	4	90	35	6	4	12311
56212	NDOT 2A-2	4/15/03 16:21	0.66	0.22	0.02	0.30	0.022	0.012	140.00	4/15/03 16:21	121	80	27	2	82	36	3	1	16968
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 17:00	1368	783	267	36	820	314	51	37	111523
56213	NDOT 2A-3	4/15/03 17:26	0.75	0.17	0.02	0.23	0.035	0.026	98.00	4/15/03 17:26	213	160	36	4	164	49	7	6	20884
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 18:00	2424	1388	473	64	1452	557	90	65	197574
56214	NDOT 2A-4	4/15/03 18:31	0.44	0.22	0.03	0.19	0.045	0.033	46.00	4/15/03 18:31	2173	956	478	72	1028	419	98	72	99964
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 19:00	2640	1512	515	70	1582	607	98	71	215186
		Average	0.57	0.20	0.03	0.23	0.037	0.027	81.50	4/15/03 19:30	637	364	124	17	381	146	24	17	51878
56215	NDOT 2A-5	4/15/03 19:36	0.44	0.17	0.04	0.19	0.046	0.036	42.00	4/15/03 19:36	579	255	98	20	275	112	27	21	24312
										4/15/03 20:30	0	0	0	0	0	0	0	0	0
										4/15/03 21:00	0	0	0	0	0	0	0	0	0
									Total		12470	6823	2469	347	7170	2773	482	351	926928
										EMC In		0.55	0.20	0.03	0.57	0.22	0.039	0.028	74.33

Sediment Trap Inflow

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
56216	NDOT 2A-6	4/16/03 17:16	0.49	0.20	0.03	0.20	0.046	0.037	58.00		No Flow								
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/16/03 17:30	0	0	0	0	0	0	0	0	0
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/16/03 18:00	99	97	50	10	108	23	2	1	14714
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/16/03 18:30	909	889	454	96	985	208	22	14	134724
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/16/03 19:00	1103	1079	552	117	1196	253	27	17	163562
56217	NDOT 2A-8	4/16/03 19:26	1.11	0.60	0.18	0.20	0.018	0.009	74.00	4/16/03 19:26	1184	1314	710	213	1527	237	21	11	87613
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/16/03 20:00	1182	1157	591	125	1282	271	29	18	175277
56218	NDOT 2A-9	4/16/03 20:31	1.19	0.63	0.18	0.24	0.019	0.009	184.00	4/16/03 20:31	328	390	207	59	449	78	6	3	60344
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/16/03 21:00	89	87	44	9	96	20	2	1	13177
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/16/03 21:30	182	178	91	19	197	42	4	3	26955
56219	NDOT 2A-10	4/16/03 21:36	1.21	0.56	0.12	0.32	0.025	0.015	180.00	4/16/03 21:36	174	211	97	21	231	56	4	3	31331
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/16/03 22:30	1538	1505	769	163	1667	352	37	23	227991
56220	NDOT 2A-11	4/16/03 22:41	1.00	0.49	0.09	0.28	0.027	0.018	188.00	4/16/03 22:41	1008	1008	494	91	1099	277	27	18	189572
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/16/03 23:30	207	202	103	22	224	47	5	3	30670
56221	NDOT 2A-12	4/16/03 23:46	0.81	0.40	0.07	0.22	0.027	0.017	140.00	4/16/03 23:46	1688	1367	675	110	1477	371	46	29	236354
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/17/03 0:30	2025	1982	1013	214	2196	464	49	30	300317
56222	NDOT 2A-13	4/17/03 0:51	0.76	0.43	0.06	0.23	0.029	0.020	160.00	4/17/03 0:51	1515	1151	651	85	1236	341	44	30	242378
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/17/03 1:30	2218	2170	1109	234	2405	508	54	33	328848
56223	NDOT 2A-14	4/17/03 1:56	0.77	0.39	0.05	0.12	0.024	0.017	112.00	4/17/03 1:56	3949	3041	1540	193	3234	490	95	67	442263
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/17/03 2:30	2627	2571	1313	278	2648	602	63	39	389537
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/17/03 3:00	374	366	187	40	406	86	9	6	55524
		Average	0.98	0.50	0.11	0.23	0.024	0.015	148.29	4/17/03 3:30	0.00	0	0	0	0	0	0	0	0
									Total		22398	20669	10602	2099	22865	4702	544	347	3136438
										EMC In		0.92	0.47	0.09	1.02	0.21	0.024	0.016	140.03

Sediment Trap Inflow

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

			TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
56224	NDOT 2A-15	4/17/03 11:46	0.51	0.36	0.05	0.07	0.022	0.014	132.00		No flow								
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 12:00	0	0	0	0	0	0	0	0	0
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 12:30	8	7	1	0	7	4	0	0	1732
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 13:00	222	190	43	8	198	106	10	8	50273
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 13:30	164	140	32	6	146	78	7	6	37067
56225	NDOT 2A-17	4/17/03 13:56	1.71	0.21	0.05	1.06	0.036	0.028	648.00	4/17/03 13:56	164	280	34	8	287	173	6	5	105968
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 14:30	157	135	31	5	141	75	7	6	35697
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 15:00	161	138	31	6	144	77	7	6	36559
56226	NDOT 2A-18	4/17/03 15:01	1.25	0.21	0.04	0.66	0.027	0.018	352.00	4/17/03 15:01	162	202	34	6	209	106	4	3	56971
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 16:00	164	141	32	6	146	78	7	6	37113
56227	NDOT 2A-19	4/17/03 16:06	0.67	0.17	0.04	0.36	0.031	0.024	164.00	4/17/03 16:06	148	99	25	5	105	53	5	4	24351
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 17:30	1396	1198	272	48	1246	666	61	49	316420
56228	NDOT 2A-20	4/17/03 17:11	0.55	0.22	0.02	0.28	0.045	0.035	96.00	4/17/03 17:11	1393	766	306	32	798	386	63	49	133738
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 18:00	35	30	7	1	31	17	2	1	7917
56229	NDOT 2A-21	4/17/03 18:16	0.49	0.18	0.03	0.25	0.060	0.050	52.00	4/17/03 18:16	33	16	6	1	17	8	2	2	1732
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 19:00	27	23	5	1	24	13	1	1	6206
56230	NDOT 2A-22	4/17/03 19:21	0.48	0.18	0.03	0.26	0.063	0.056	48.00	4/17/03 19:21	22	11	4	1	11	6	1	1	1063
		Average	0.86	0.20	0.03	0.48	0.044	0.035	226.67	4/17/03 20:00	12	10	2	0	11	6	1	0	2703
										4/17/03 20:30	126	0	0	0	0	0	0	0	0
										4/17/03 21:00	0	0	0	0	0	0	0	0	0
									Total		4394	3388	867	134	3522	1852	183	145	855509
										EMC In		0.77	0.20	0.03	0.80	0.42	0.042	0.033	194.68

Sediment Trap Outflow

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

		Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 12:00	0	0	0	0	0	0	0	0	0
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 12:30	1156	517	153	38	555	274	35	27	85533
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 13:00	146	65	19	5	70	35	4	3	10805
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 13:30	157	70	21	5	76	37	5	4	11643
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 14:00	189	84	25	6	90	45	6	4	13950
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 14:30	193	86	26	6	93	46	6	4	14303
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 15:00	175	78	23	6	84	41	5	4	12945
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 15:30	148	66	20	5	71	35	4	3	10924
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 16:00	151	68	20	5	73	36	5	3	11178
56232	NDOT 2B-2	4/15/03 16:21	0.63	0.14	0.03	0.28	0.021	0.015	100.00	4/15/03 16:21	121	76	17	3	80	34	3	2	12120
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 17:00	1368	612	181	44	657	324	41	31	101260
56233	NDOT 2B-3	4/15/03 17:26	0.46	0.14	0.03	0.24	0.031	0.024	76.00	4/15/03 17:26	213	98	30	7	105	52	7	5	16196
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 18:00	2424	1085	321	79	1164	574	73	56	179393
56234	NDOT 2B-4	4/15/03 18:31	0.29	0.13	0.03	0.22	0.034	0.026	56.00	4/15/03 18:31	2173	630	283	74	704	472	74	57	121695
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 19:00	2640	1182	350	86	1267	625	80	61	195384
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 19:30	637	285	84	21	306	151	19	15	47104
56235	NDOT 2B-5	4/15/03 19:36	0.41	0.12	0.03	0.21	0.035	0.027	64.00	4/15/03 19:36	579	237	69	20	257	121	20	16	37046
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 20:30	0	0	0	0	0	0	0	0	0
		Average	0.45	0.13	0.03	0.24	0.030	0.023	74.00	4/15/03 21:00	0	0	0	0	0	0	0	0	0
									Total		12470	5241	1642	409	5651	2900	387	295	881487
										EMC Out		0.42	0.13	0.03	0.45	0.23	0.031	0.024	70.69

Sediment Trap Outflow

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

		Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		4/16/03 17:16	xxx	0.16	0.04	xxx	0.025	0.016	xxx		No flow								
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/16/03 17:30	0	0	0	0	0	0	0	0	0
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/16/03 18:00	99	66	42	6	72	23	5	4	9923
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/16/03 18:30	909	601	387	56	657	208	50	33	90854
56236	NDOT 2B-6	Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/16/03 19:00	1103	730	470	68	798	252	60	40	110302
56237	NDOT 2B-8	4/16/03 19:26	0.34	0.20	0.04	0.24	0.057	0.046	92.00	4/16/03 19:26	1184	403	237	44	446	263	67	54	108924
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/16/03 20:00	1182	782	503	73	855	270	65	43	118202
56238	NDOT 2B-9	4/16/03 20:31	0.32	0.21	0.04	0.22	0.064	0.050	64.00	4/16/03 20:31	328	105	69	12	117	73	21	16	20989
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/16/03 21:00	89	59	38	5	64	20	5	3	8886
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/16/03 21:30	182	120	77	11	131	42	10	7	18178
56239	NDOT 2B-10	4/16/03 21:36	0.59	0.31	0.06	0.21	0.061	0.047	96.00	4/16/03 21:36	174	103	54	11	113	37	11	8	16710
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/16/03 22:30	1536	1017	655	95	1112	351	84	56	153751
56240	NDOT 2B-11	4/16/03 22:41	0.92	0.89	0.08	0.21	0.054	0.041	120.00	4/16/03 22:41	1008	928	897	76	1003	208	54	41	121004
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/16/03 23:30	207	137	88	13	150	47	11	7	20683
56241	NDOT 2B-12	4/16/03 23:46	0.75	0.47	0.07	0.22	0.056	0.041	120.00	4/16/03 23:46	1688	1266	793	120	1386	370	95	69	202589
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/17/03 0:30	2025	1340	862	125	1465	463	111	73	202526
56242	NDOT 2B-13	4/17/03 0:51	0.85	0.46	0.07	0.25	0.047	0.013	128.00	4/17/03 0:51	1515	1288	697	106	1394	379	71	20	193902
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/17/03 1:30	2218	1467	944	137	1604	507	121	80	221767
56243	NDOT 2B-14	4/17/03 1:56	0.86	0.44	0.08	0.25	0.043	0.015	80.00	4/17/03 1:56	3949	3396	1737	320	3716	999	170	59	315902
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/17/03 2:30	2627	1738	1118	162	1900	600	143	95	262694
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/17/03 3:00	374	248	159	23	271	86	20	14	37444
		Average	0.66	0.43	0.06	0.23	0.055	0.036	100.00	4/17/03 3:30	0	0	0	0	0	0	0	0	0
									Total		22398	15724	9786	1463	17253	5192	1169	722	2225308
										EMC Out		0.70	0.44	0.07	0.77	0.23	0.052	0.032	99.35

Sediment Trap Outflow

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

		Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
56244	NDOT 2B-15	4/17/03 11:46	xxx	0.37	0.08	xxx	0.018	0.007	xxx		No flow								
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 12:00	0	0	0	0	0	0	0	0	0
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 12:30	8	7	2	0	7	4	0	0	1946
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 13:00	222	203	50	9	211	107	7	5	56483
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 13:30	164	149	37	6	156	79	5	3	41646
56245	NDOT 2B-17	4/17/03 13:56	1.20	0.33	0.03	0.54	0.027	0.017	308.00	4/17/03 13:56	164	196	54	5	201	89	4	3	50368
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 14:30	157	144	35	6	150	76	5	3	40106
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 15:00	161	147	36	6	154	78	5	3	41075
56246	NDOT 2B-18	4/17/03 15:01	1.72	0.42	0.06	0.93	0.027	0.017	624.00	4/17/03 15:01	162	278	68	10	288	150	4	3	100994
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 16:00	164	150	37	6	156	79	5	3	41698
56247	NDOT 2B-19	4/17/03 16:06	1.10	0.18	0.05	0.61	0.019	0.011	356.00	4/17/03 16:06	148	163	27	8	171	91	3	2	52859
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 17:30	1396	1275	312	55	1330	676	43	29	355507
56248	NDOT 2B-20	4/17/03 17:11	0.63	0.16	0.03	0.35	0.028	0.019	108.00	4/17/03 17:11	1393	878	223	47	925	492	39	26	150455
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 18:00	35	32	8	1	33	17	1	1	8894
56249	NDOT 2B-21	4/17/03 18:16	0.42	0.13	0.03	0.25	0.040	0.029	76.00	4/17/03 18:16	33	14	4	1	15	8	1	1	2531
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 19:00	27	25	6	1	26	13	1	1	6972
56250	NDOT 2B-22	4/17/03 19:21	0.41	0.12	0.03	0.22	0.044	0.033	56.00	4/17/03 19:21	22	9	3	1	10	5	1	1	1240
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 20:00	12	11	3	0	11	6	0	0	3037
56251	NDOT 2B-23	Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 20:30	126	115	28	5	120	61	4	3	32154
		Average	0.91	0.22	0.04	0.48	0.031	0.021	254.67	4/17/03 21:00	0	0	0	0	0	0	0	0	0
									Total		4394	3796	931	169	3966	2032	129	87	987966
										EMC Out		0.86	0.21	0.04	0.90	0.46	0.029	0.020	224.83

SR 28 at Secret Harbor Creek April 26, 2003 Loading

Sediment Trap Inflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Total Load (In) miligrams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	2.55	0.54	0.06	1.21	0.023	0.009	976.00	4/26/03 9:30	0	0	0	0	0	0	0	0	0
		Average	2.55	0.54	0.06	1.21	0.023	0.009	976.00	4/26/03 10:00	24	62	13	1	63	29	1	0	23722
		Average	2.55	0.54	0.06	1.21	0.023	0.009	976.00	4/26/03 10:30	1581	4023	858	87	4110	1907	36	14	1542848
56381	NDOT 2A-2	4/26/03 10:56	4.22	0.67	0.06	1.90	0.026	0.011	1580.00	4/26/03 10:56	852	3594	571	50	3644	1618	22	9	1345528
		Average	2.55	0.54	0.06	1.21	0.023	0.009	976.00	4/26/03 11:30	840	2137	456	46	2184	1013	19	8	819652
		Average	2.55	0.54	0.06	1.21	0.023	0.009	976.00	4/26/03 12:00	1671	4252	906	92	4344	2016	38	15	1630459
56382	NDOT 2A-3	4/26/03 12:01	3.66	0.62	0.07	1.96	0.026	0.011	1580.00	4/26/03 12:01	1651	6044	1024	111	6155	3237	43	18	2609316
		Average	2.55	0.54	0.06	1.21	0.023	0.009	976.00	4/26/03 13:00	1043	2655	566	58	2713	1259	24	9	1018261
56383	NDOT 2A-4	4/26/03 13:06	1.62	0.46	0.06	0.75	0.020	0.007	588.00	4/26/03 13:06	1061	1719	488	58	1777	793	21	7	623954
		Average	2.55	0.54	0.06	1.21	0.023	0.009	976.00	4/26/03 14:00	794	2021	431	44	2065	958	18	7	775195
56384	NDOT 2A-5	4/26/03 14:11	0.68	0.42	0.04	0.22	0.020	0.007	156.00	4/26/03 14:11	625	425	262	25	450	137	12	4	97499
		Average	2.55	0.54	0.06	1.21	0.023	0.009	976.00	4/26/03 15:00	65	165	35	4	169	78	1	1	63291
										4/26/03 15:30	0	0	0	0	0	0	0	0	0
										Total	10207	27098	5610	577	27674	13045	237	93	10549725
											EMC In	2.65	0.55	0.06	2.71	1.28	0.023	0.009	1033.57

Sediment Trap Outflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Total Load (Out) miligrams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	1.81	0.54	0.08	0.86	0.025	0.010	624.00	4/26/03 9:30	0	0	0	0	0	0	0	0	0
		Average	1.81	0.54	0.08	0.86	0.025	0.010	624.00	4/26/03 10:00	24	44	13	2	46	21	1	0	15166
		Average	1.81	0.54	0.08	0.86	0.025	0.010	624.00	4/26/03 10:30	1581	2853	854	127	2981	1355	39	15	986411
56388	NDOT 2B-2	4/26/03 10:56	1.58	0.43	0.10	0.65	0.024	0.008	468.00	4/26/03 10:56	852	1346	366	85	1431	554	20	7	398549
		Average	1.81	0.54	0.08	0.86	0.025	0.010	624.00	4/26/03 11:30	840	1516	453	68	1583	720	21	8	524040
		Average	1.81	0.54	0.08	0.86	0.025	0.010	624.00	4/26/03 12:00	1671	3015	902	134	3150	1432	41	16	1042424
56389	NDOT 2B-3	4/26/03 12:01	2.37	0.58	0.09	1.22	0.028	0.011	900.00	4/26/03 12:01	1651	3914	958	144	4058	2015	46	18	1486319
		Average	1.81	0.54	0.08	0.86	0.025	0.010	624.00	4/26/03 13:00	1043	1883	563	84	1967	894	26	10	651019
56390	NDOT 2B-4	4/26/03 13:06	1.95	0.63	0.07	1.04	0.024	0.012	768.00	4/26/03 13:06	1061	2069	669	77	2147	1104	25	13	814960
		Average	1.81	0.54	0.08	0.86	0.025	0.010	624.00	4/26/03 14:00	794	1434	429	64	1498	681	19	8	495616
56391	NDOT 2B-5	4/26/03 14:11	1.32	0.52	0.06	0.52	0.022	0.007	360.00	4/26/03 14:11	625	825	325	39	864	324	14	4	224997
		Average	1.81	0.54	0.08	0.86	0.025	0.010	624.00	4/26/03 15:00	65	117	35	5	122	56	2	1	40465
			1.81	0.54	0.08	0.86	0.025	0.010	624.00	4/26/03 15:30	0	0	0	0	0	0	0	0	0
										Total	10207	19016	5567	829	19845	9155	253	99	6679968
											EMC Out	1.86	0.55	0.08	1.94	0.90	0.025	0.010	654.45

SR 28 at Secret Harbor Creek May 3, 2003 Loading

Sediment Trap Inflow

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Sample Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
											5/3/03 10:00	0	0	0	0	0	0	0	0	0
56445	NDOT 2A-2	5/3/03 10:06	1.46	0.53	0.06	1.52	0.44	0.026	0.014	324.00	5/3/03 10:30	89	129	47	5	134	39	2	1	28723
		Average	1.50	0.60	0.06	1.56	0.40	0.032	0.017	278.00	5/3/03 11:00	1098	1642	659	68	1709	435	35	18	305252
56446	NDOT 2A-3	5/3/03 11:11	1.53	0.67	0.07	1.60	0.36	0.037	0.019	232.00	5/3/03 11:30	1452	2221	973	99	2320	515	54	28	336853
		Average	1.40	0.66	0.06	1.46	0.30	0.035	0.019	186.00	5/3/03 12:00	1160	1618	765	75	1692	352	40	21	215670
56447	NDOT 2A-4	5/3/03 12:16	1.26	0.65	0.06	1.32	0.25	0.032	0.018	140.00	5/3/03 12:30	839	1057	546	51	1109	212	27	15	117496
			1.26	0.65	0.06	1.32	0.25	0.032	0.018	140.00	5/3/03 13:00	518	653	337	32	684	131	17	9	72526
			1.26	0.65	0.06	1.32	0.25	0.032	0.018	140.00	5/3/03 13:30	174	219	113	11	229	44	6	3	24308
											5/3/03 14:00	0	0	0	0	0	0	0	0	0
56448	NDOT 2A-6	5/3/03 22:56	1.74	0.43	0.04	1.78	0.82	0.026	0.014	616.00	5/3/03 23:30	17	30	7	1	31	14	0	0	10633
56449	NDOT 2A-7	5/4/03 0:01	1.32	0.35	0.05	1.37	0.58	0.041	0.029	368.00	5/4/03 0:00	1334	1761	467	68	1829	778	55	39	490907
		Average	1.31	0.32	0.06	1.36	0.64	0.035	0.024	418.00	5/4/03 0:30	944	1232	302	55	1287	603	33	23	394669
56450	NDOT 2A-8	5/4/03 1:06	1.29	0.29	0.07	1.36	0.70	0.029	0.019	468.00	5/4/03 1:00	477	615	138	31	646	331	14	9	223088
		Average	1.15	0.28	0.06	1.21	0.60	0.029	0.019	396.00	5/4/03 1:30	1014	1166	279	62	1228	603	29	19	401470
		Average	1.15	0.28	0.06	1.21	0.60	0.029	0.019	396.00	5/4/03 2:00	1406	1617	387	86	1703	837	41	27	556745
56451	NDOT 2A-9	5/4/03 2:11	1.01	0.26	0.06	1.07	0.50	0.029	0.019	324.00	5/4/03 2:30	1633	1649	425	95	1744	808	47	31	529049
		Average	0.89	0.25	0.06	0.95	0.42	0.027	0.018	274.00	5/4/03 3:00	1545	1375	386	90	1465	651	42	28	423460
56452	NDOT 2A-10	5/4/03 3:16	0.77	0.24	0.06	0.83	0.35	0.025	0.017	224.00	5/4/03 3:30	1651	1271	396	96	1367	573	41	28	369847
		Average	0.70	0.24	0.06	0.76	0.29	0.024	0.016	180.00	5/4/03 4:00	1721	1196	404	105	1301	499	41	28	309777
56453	NDOT 2A-11	5/4/03 4:21	0.62	0.23	0.06	0.68	0.23	0.023	0.015	136.00	5/4/03 4:30	1642	1018	378	105	1123	383	38	25	223305
		Average	0.59	0.27	0.06	0.65	0.21	0.025	0.017	114.00	5/4/03 5:00	1557	911	413	95	1006	321	39	26	177457
56454	NDOT 2A-12	5/4/03 5:26	0.55	0.30	0.06	0.61	0.18	0.027	0.018	92.00	5/4/03 5:30	1179	648	354	68	717	211	32	21	108430
		Average	0.55	0.30	0.06	0.61	0.17	0.030	0.021	84.00	5/4/03 6:00	1616	889	485	95	984	277	48	34	135757
56455	NDOT 2A-13	5/4/03 6:31	0.55	0.30	0.06	0.61	0.16	0.032	0.024	76.00	5/4/03 6:30	1595	877	478	96	973	262	51	38	121203
		Average	0.64	0.32	0.05	0.69	0.16	0.033	0.024	82.00	5/4/03 7:00	1556	988	490	82	1070	241	51	37	127627
56456	NDOT 2A-14	5/4/03 7:36	0.72	0.33	0.05	0.77	0.15	0.033	0.024	88.00	5/4/03 7:30	1460	1051	482	66	1117	213	48	35	128439
		Average	0.64	0.34	0.04	0.68	0.15	0.033	0.024	82.00	5/4/03 8:00	1284	822	430	46	867	189	42	30	105276
		Average	0.64	0.34	0.04	0.68	0.15	0.033	0.024	82.00	5/4/03 8:30	1059	678	355	38	715	156	35	25	86829
56457	NDOT 2A-15	5/4/03 8:41	0.56	0.34	0.03	0.59	0.15	0.033	0.023	76.00	5/4/03 9:00	820	459	279	21	480	121	27	19	62317
		Average	0.56	0.34	0.03	0.59	0.15	0.033	0.023	76.00	5/4/03 9:30	573	321	195	15	336	85	19	13	43544
		Average	0.56	0.34	0.03	0.59	0.15	0.033	0.023	76.00	5/4/03 10:00	377	211	128	10	221	56	12	9	28672
		Average	0.56	0.34	0.03	0.59	0.15	0.033	0.023	76.00	5/4/03 10:30	108	61	37	3	64	16	4	2	8243
											5/4/03 11:00	0	0	0	0	0	0	0	0	0
											Total	31897	28385	11133	1767	30152	9956	969	641	6167573
											EMC In		0.89	0.35	0.06	0.95	0.31	0.030	0.020	193.36

Sediment Trap Outflow

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Times	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Sample Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
											5/3/03 10:00	0	0	0	0	0	0	0	0	0
56458	NDOT 2B-2	5/3/03 10:06	1.62	0.57	0.09	1.71	0.45	0.02	0.01	300.00	5/3/03 10:30	89	144	51	8	152	40	2	1	26595
		Average	1.66	0.62	0.09	1.75	0.46	0.03	0.01	304.00	5/3/03 11:00	1098	1823	675	93	1916	505	28	14	333800
56459	NDOT 2B-3	5/3/03 11:11	1.70	0.66	0.08	1.78	0.47	0.03	0.02	308.00	5/3/03 11:30	1452	2468	958	116	2584	678	46	25	447202
		Average	1.28	0.66	0.06	1.34	0.44	0.03	0.01	276.00	5/3/03 12:00	1160	1478	765	72	1551	514	33	15	320027
56460	NDOT 2B-4	5/3/03 12:16	0.85	0.66	0.05	0.90	0.42	0.03	0.01	244.00	5/3/03 12:30	839	713	554	38	751	352	21	8	204779
		Average	0.85	0.66	0.05	0.90	0.42	0.03	0.01	244.00	5/3/03 13:00	518	440	342	23	464	217	13	5	126403
		Average	0.85	0.66	0.05	0.90	0.42	0.03	0.01	244.00	5/3/03 13:30	174	148	115	8	155	73	4	2	42365
											5/3/03 14:00	0	0	0	0	0	0	0	0	0
56461	NDOT 2B-6	5/3/03 22:56	2.19	0.55	0.09	2.28	1.02	0.02	0.01	756.00	5/3/03 23:30	17	38	9	2	39	18	0	0	13049
56462	NDOT 2B-7	5/4/03 0:01	1.74	0.56	0.10	1.84	0.69	0.03	0.02	588.00	5/4/03 0:00	1334	2321	747	133	2455	914	40	21	784385
		Average	2.00	0.45	0.09	2.08	0.96	0.03	0.02	770.00	5/4/03 0:30	944	1884	425	82	1966	909	28	15	727022
56463	NDOT 2B-8	5/4/03 1:06	2.25	0.34	0.07	2.32	1.24	0.03	0.02	952.00	5/4/03 1:00	477	1073	162	35	1108	591	14	7	453803
		Average	1.96	0.32	0.07	2.03	1.05	0.03	0.02	734.00	5/4/03 1:30	1014	1982	324	75	2057	1067	27	16	744139
		Average	1.96	0.32	0.07	2.03	1.05	0.03	0.02	734.00	5/4/03 2:00	1406	2749	450	103	2852	1479	38	22	1031947
56464	NDOT 2B-9	5/4/03 2:11	1.66	0.30	0.07	1.73	0.86	0.03	0.02	516.00	5/4/03 2:30	1633	2711	490	119	2830	1411	41	26	842560
		Average	1.37	0.29	0.07	1.44	0.70	0.03	0.02	428.00	5/4/03 3:00	1545	2110	448	111	2220	1076	41	27	661464
56465	NDOT 2B-10	5/4/03 3:16	1.07	0.28	0.07	1.14	0.53	0.03	0.02	340.00	5/4/03 3:30	1651	1767	462	116	1882	872	46	31	561375
		Average	0.97	0.28	0.07	1.04	0.45	0.03	0.02	288.00	5/4/03 4:00	1721	1661	482	121	1782	771	44	29	495644
56466	NDOT 2B-11	5/4/03 4:21	0.86	0.28	0.07	0.93	0.37	0.02	0.02	236.00	5/4/03 4:30	1642	1412	460	117	1529	604	38	25	387501
		Average	NA	NA	0.07	NA	NA	0.02	0.02	206.00	5/4/03 5:00	1557	NA	NA	110	NA	NA	38	25	320668
56467	NDOT 2B-12	5/4/03 5:26	NA	NA	0.07	NA	NA	0.03	0.02	176.00	5/4/03 5:30	1179	NA	NA	83	NA	NA	31	20	207431
		Average	NA	NA	0.07	NA	NA	0.03	0.02	156.00	5/4/03 6:00	1616	NA	NA	116	NA	NA	42	28	252120
56468	NDOT 2B-13	5/4/03 6:31	NA	NA	0.07	NA	NA	0.03	0.02	136.00	5/4/03 6:30	1595	NA	NA	116	NA	NA	41	29	216890
		Average	NA	NA	0.07	NA	NA	0.03	0.02	118.00	5/4/03 7:00	1556	NA	NA	107	NA	NA	43	30	183658
56469	NDOT 2B-14	5/4/03 7:36	NA	NA	0.06	NA	NA	0.03	0.02	100.00	5/4/03 7:30	1460	NA	NA	93	NA	NA	42	31	145953
		Average	NA	NA	0.07	NA	NA	0.03	0.02	94.00	5/4/03 8:00	1284	NA	NA	87	NA	NA	37	27	120682
		Average	NA	NA	0.07	NA	NA	0.03	0.02	94.00	5/4/03 8:30	1059	NA	NA	71	NA	NA	30	22	99536
56470	NDOT 2B-15	5/4/03 8:41	NA	NA	0.07	NA	NA	0.03	0.02	88.00	5/4/03 9:00	820	NA	NA	58	NA	NA	23	17	72157
		Average	NA	NA	0.07	NA	NA	0.03	0.02	88.00	5/4/03 9:30	573	NA	NA	41	NA	NA	16	12	50420
		Average	NA	NA	0.07	NA	NA	0.03	0.02	88.00	5/4/03 10:00	377	NA	NA	27	NA	NA	11	8	33199
		Average	NA	NA	0.07	NA	NA	0.03	0.02	88.00	5/4/03 10:30	108	NA	NA	8	NA	NA	3	2	9544
											5/4/03 11:00	0	0	0	0	0	0	0	0	0
											Total	31897	26920	7920	2288	28292	12089	861	539	9916316
											EMC Out		1.44	0.42	0.07	1.51	0.38	0.027	0.017	310.89
											Sub Total	18713								

SR 28 at Secret Harbor Creek June 23, 2003 Loading

Sediment Trap Inflow

Total Load (IN) miligrams

Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3 mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4 mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 12:30	0	0	0	0	0	0	0	0	0
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 13:00	16	138	45	16	154	77	1	0	50348
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 13:30	379	3203	1053	372	3575	1779	24	9	1167644
56843	NDOT 2A-2	6/23/03 13:51	6.25	2.35	0.65	6.90	2.78	0.103	0.050	1850.00	6/23/03 14:00	842	5260	1978	547	5808	2340	87	42	1557106
56844	NDOT 2A-3	6/23/03 14:26	8.46	2.73	1.05	9.51	6.81	0.058	0.013	3690.00										
56845	NDOT 2A-4	6/23/03 14:56	10.10	3.59	1.24	11.34	6.33	0.042	0.009	3670.00	6/23/03 15:00	931	8639	2942	1066	9705	6116	47	10	3425717
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 15:30	277	2345	771	272	2617	1302	18	6	854687
56846	NDOT 2A-5	6/23/03 16:01	11.10	3.19	1.12	12.22	5.18	0.038	0.009	4430.00	6/23/03 16:00	132	1471	423	148	1619	686	5	1	586909
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 16:30	597	5046	1659	585	5631	2802	38	14	1839192
56847	NDOT 2A-6	6/23/03 17:06	6.34	2.03	0.84	7.18	2.36	0.080	0.033	1760.00	6/23/03 17:00	1319	8359	2677	1108	9467	3112	105	44	2320597
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 17:30	1199	10132	3331	1175	11307	5626	77	27	3693015
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 18:00	848	7170	2357	832	8001	3981	54	19	2613291
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 18:30	532	4493	1477	521	5015	2495	34	12	1637865
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 19:00	193	1629	536	189	1818	905	12	4	593777
		Average	8.45	2.78	0.98	9.43	4.69	0.064	0.023	3080.00	6/23/03 19:30	0	0	0	0	0	0	0	0	0
											Sample Total	7266	57885	19248	6830	64716	31220	503	189	20340147
												EMC In	7.97	2.65	0.94	8.91	4.30	0.069	0.026	2799.46

Sediment Trap Outflow

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Times	TKN mg/l	TKNsol mg/l	NO3 mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4 mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 12:30	0	0	0	0	0	0	0	0	0
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 13:00	16	98	45	15	114	27	2	1	15072
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 13:30	379	2275	1046	358	2633	615	36	12	349535
56848	NDOT 2B-2	6/23/03 13:51	7.86	3.20	1.11	8.97	2.20	0.067	0.015	1400.00	6/23/03 14:00	842	6616	2693	934	7550	1852	56	13	1178350
56849	NDOT 2B-3	6/23/03 14:26	6.40	3.07	1.10	7.50	1.52	0.071	0.011	820.00										
56850	NDOT 2B-4	6/23/03 14:56	6.78	3.01	1.00	7.78	2.20	0.078	0.016	1240.00	6/23/03 15:00	931	6135	2830	977	7112	1731	69	13	958829
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 15:30	277	1666	766	262	1927	450	26	9	255851
56851	NDOT 2B-5	6/23/03 16:01	4.98	2.36	0.74	5.72	1.39	0.117	0.052	790.00	6/23/03 16:00	132	660	313	98	758	184	16	7	104663
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 16:30	597	3584	1648	564	4148	968	56	19	550563
56852	NDOT 2B-6	6/23/03 17:06	3.99	2.16	0.77	4.76	0.80	0.137	0.069	360.00	6/23/03 17:00	1319	5261	2848	1015	6276	1052	181	91	474668
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 17:30	1199	7197	3309	1132	8328	1944	113	39	1105506
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 18:00	848	5093	2342	801	5893	1376	80	28	782290
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 18:30	532	3192	1468	502	3694	862	50	17	490296
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 19:00	193	1157	532	182	1339	313	18	6	177747
		Average	6.00	2.76	0.94	6.95	1.62	0.094	0.033	922.00	6/23/03 19:30	0	0	0	0	0	0	0	0	0
											Sample Total	7266	42932	19840	6841	49773	11374	702	255	6443371
												EMC Out	5.91	2.73	0.94	6.85	1.57	0.097	0.035	886.82

SR 28 at Secret Harbor Creek July 23, 2003 Loading

Sediment Trap Inflow

Lab #	Sample Name	Sample Times	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Total Load (IN) Grams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											7/23/03 15:00	0	0	0	0	0	0	0	0	0
57145	NDOT 2A-2	7/23/03 15:21	4.45	1.35	0.024	4.47	1.80	0.049	0.010	1480	7/23/03 15:30	312	1388	421	7	1396	561	15	3	461645
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 16:00	2765	13013	4662	56	10595	4811	371	215	3587051
57146	NDOT 2A-3	7/23/03 16:26	4.76	1.10	0.018	4.78	2.71	0.065	0.021	2160	7/23/03 16:30	1955	9306	2151	35	9341	5298	127	41	4222989
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 17:00	1868	8789	3149	38	7156	3250	251	145	2422692
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 17:30	1671	7861	2817	34	6401	2907	224	130	2167004
57147	NDOT 2A-4	7/23/03 17:31	5.69	1.74	0.027	5.72	1.69	0.104	0.050	1510	7/23/03 18:00	1485	8451	2584	40	8491	2510	154	74	2242723
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 18:30	1215	5720	2049	25	4657	2115	163	95	1576733
57148	NDOT 2A-5	7/23/03 18:36	4.47	2.19	0.015	4.49	1.30	0.197	0.129	896	7/23/03 19:00	1001	4473	2191	15	4488	1301	197	129	896595
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 19:30	908	4273	1531	19	3479	1580	122	71	1177734
57149	NDOT 2A-6	7/23/03 19:41	4.16	2.05	0.018	4.18	1.20	0.256	0.179	440	7/23/03 20:00	720	2996	1477	13	3009	864	184	129	316934
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 20:30	602	2834	1015	12	2308	1048	81	47	781236
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 21:00	560	2633	943	11	2144	974	75	44	725801
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 21:30	435	2046	733	9	1666	757	58	34	564075
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 22:00	312	1467	525	6	1194	542	42	24	404285
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 22:30	219	1031	369	4	839	381	29	17	284115
		Average	4.71	1.686	0.020	3.83	1.74	0.134	0.078	1297	7/23/03 23:00	182	857	307	4	698	317	24	14	236331
		Average	4.71	1.69	0.020	4.73	1.74	0.134	0.078	1297	7/23/03 23:30	182	855	306	4	859	316	24	14	235763
											7/24/03 0:00	0	0	0	0	0	0	0	0	0
											Total	16391	77995	27232	333	68722	29532	2144	1226	22303706
												EMC In	4.76	1.66	0.02	4.19	1.80	0.131	0.075	1360.71

Sediment Trap Outflow

Lab #	Sample Name	Sample Times	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Total Load (Out) miligrams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											7/23/03 15:00 0		0	0	0	0	0	0	0	0
57150	NDOT 2B-2	7/23/03 15:21	5.74	2.24	0.027	5.77	1.44	0.05	0.019	1000	7/23/03 15:30 312		1790	699	8	1799	449	17	6	311922
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 16:00 2765		10678	5346	76	8097	1871	166	59	1001012
57151	NDOT 2B-3	7/23/03 16:26	4.82	2.01	0.028	4.85	0.75	0.06	0.022	456	7/23/03 16:30 1955		9424	3930	55	9478	1468	119	43	891520
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 17:00 1868		7212	3611	51	5468	1264	112	40	676083
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 17:30 1671		6451	3230	46	4891	1130	101	35	604730
57152	NDOT 2B-4	7/23/03 17:31	3.34	2.16	0.026	3.37	0.52	0.07	0.022	212	7/23/03 18:00 1485		4961	3208	39	4999	771	100	33	314872
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 18:30 1215		4694	2350	33	3559	822	73	26	440007
57153	NDOT 2B-5	7/23/03 18:36	2.95	1.77	0.029	2.98	0.47	0.07	0.024	172	7/23/03 19:00 1001		2952	1771	29	2981	466	69	24	172114
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 19:30 908		3506	1755	25	2658	614	55	19	328662
57154	NDOT 2B-6	7/23/03 19:41	3.02	1.62	0.028	3.05	0.45	0.07	0.023	172	7/23/03 20:00 720		2175	1167	20	2195	325	48	17	123893
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 20:30 602		2326	1164	17	1763	408	36	13	218014
57155	NDOT 2B-7	7/23/03 20:46	3.30	1.80	0.027	3.33	0.43	0.04	0.017	160	7/23/03 21:00 560		1846	1007	15	1862	242	25	10	89522
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 21:30 435		1679	841	12	1273	294	26	9	157412
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 22:00 312		1204	603	9	913	211	19	7	112821
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 22:30 219		846	423	6	641	148	13	5	79286
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 23:00 182		704	352	5	533	123	11	4	65951
		Average	3.86	1.93	0.028	2.93	0.68	0.06	0.021	362	7/23/03 23:30 182		702	351	5	532	123	11	4	65793
		Average	3.86	1.93	0.028	3.89	0.68	0.06	0.021	362	7/24/03 0:00 0		0	0	0	0	0	0	0	0
											Total	16391	63149	31808	451	53644	10731	1000	351	5653613
												EMC Out	3.85	1.94	0.03	3.27	0.65	0.061	0.021	344.92

SR 28 at Secret Harbor Creek February 16-17, 2004 Loading

Sediment Trap Inflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Total Load (IN) miligrams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
58786	NDOT 2A-1	2/16/04 8:01	0.83	0.30	0.07	0.29	0.016	0.017	77.30	2/16/04 8:01	10388	8622	3116	769	9391	3012	166	177	802972
58787	NDOT 2A-2	2/16/04 9:06	3.79	0.69	0.18	1.71	0.021	0.020	1160.00	2/16/04 9:06	22366	84768	15433	3936	88704	38246	470	447	25944683
58788	NDOT 2A-3	2/16/04 10:11	4.67	0.61	0.21	2.17	0.018	0.020	1570.00	2/16/04 10:11	21190	98955	12926	4429	103384	45981	381	424	33267671
58789	NDOT 2A-4	2/16/04 11:16	6.00	0.45	0.18	2.71	0.013	0.016	2160.00	2/16/04 11:16	19709	118252	8869	3469	121721	53411	256	315	42570893
58790	NDOT 2A-5	2/16/04 12:21	2.79	0.54	0.22	1.09	0.014	0.016	777.00	2/16/04 12:21	21142	58986	11417	4630	63617	23045	296	338	16427406
58791	NDOT 2A-6	2/16/04 13:26	4.17	0.46	0.16	1.93	0.013	0.017	1450.00	2/16/04 13:26	26498	110497	12189	4213	114710	51141	344	450	38422204
58792	NDOT 2A-7	2/16/04 14:31	3.78	0.49	0.12	1.93	0.016	0.022	1480.00	2/16/04 14:31	32034	121087	15696	3780	124867	61825	513	705	47409830
58793	NDOT 2A-8	2/16/04 15:36	2.88	0.33	0.08	1.42	0.020	0.026	988.00	2/16/04 15:36	27514	79241	9080	2256	81497	39070	550	715	27184094
58794	NDOT 2A-9	2/16/04 16:41	4.44	0.30	0.09	2.76	0.024	0.028	2170.00	2/16/04 16:41	23801	105678	7140	2237	107915	65692	571	666	51648918
58795	NDOT 2A-10	2/16/04 17:46	2.73	0.30	0.08	1.41	0.019	0.021	1500.00	2/16/04 17:46	18936	51696	5681	1496	53192	26700	360	398	28404500
58796	NDOT 2A-11	2/16/04 18:51	2.13	0.32	0.10	0.94	0.015	0.021	806.00	2/16/04 18:51	16919	36038	5414	1743	37780	15972	254	355	13636784
58797	NDOT 2A-12	2/16/04 19:56	1.44	0.34	0.14	0.57	0.013	0.018	428.00	2/16/04 19:56	16593	23894	5642	2240	26134	9442	216	299	7101874
58798	NDOT 2A-13	2/16/04 21:01	1.34	0.36	0.15	0.47	0.011	0.015	237.00	2/16/04 21:01	14960	20046	5386	2199	22245	7061	165	224	3545508
58799	NDOT 2A-14	2/16/04 22:06	1.19	0.34	0.22	0.40	0.012	0.016	196.00	2/16/04 22:06	14319	17039	4868	3093	20132	5770	172	229	2806465
58800	NDOT 2A-15	2/16/04 23:11	1.22	0.35	0.14	0.37	0.009	0.014	171.00	2/16/04 23:11	13877	16930	4857	1901	18832	5176	125	194	2373022
58801	NDOT 2A-16	2/17/04 0:16	1.11	0.39	0.13	0.35	0.008	0.013	108.00	2/17/04 0:16	13403	14877	5227	1769	16646	4637	107	174	1447484
58802	NDOT 2A-17	2/17/04 1:21	1.02	0.37	0.14	0.32	0.012	0.013	107.00	2/17/04 1:21	10826	11043	4006	1462	12504	3497	130	141	1158412
58803	NDOT 2A-18	2/17/04 2:26	0.88	0.32	0.13	0.29	0.008	0.012	67.50	2/17/04 2:26	12515	11013	4005	1564	12577	3604	100	150	844734
58804	NDOT 2A-19	2/17/04 3:31	0.82	0.31	0.12	0.29	0.010	0.013	74.10	2/17/04 3:31	11303	9269	3504	1311	10580	3221	113	147	837570
58805	NDOT 2A-20	2/17/04 4:36	0.82	0.30	0.11	0.28	0.013	0.013	62.00	2/17/04 4:36	9416	7721	2825	1055	8776	2608	122	122	583782
58806	NDOT 2A-21	2/17/04 5:41	0.84	0.30	0.10	0.28	0.007	0.012	82.60	2/17/04 5:41	7255	6094	2177	718	6813	2017	51	87	599289
58807	NDOT 2A-22	2/17/04 6:46	0.81	0.30	0.09	0.27	0.011	0.011	69.40	2/17/04 6:46	5232	4238	1570	476	4714	1428	58	58	363088
										Total	370196	1015985	151026	50746	1066732	472558	5520	6817	347381181
											EMC In	2.74	0.41	0.14	2.88	1.28	0.015	0.018	938

Sediment Trap Outflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Total Load (Out) miligrams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
58810	NDOT 2B-1	2/16/04 8:01	0.95	0.42	0.29	0.32	0.017	0.026	75.30	2/16/04 8:01	10388	9868	4363	3012	12881	3366	177	270	782197
58811	NDOT 2B-2	2/16/04 9:06	1.06	0.28	0.06	0.49	0.009	0.010	269.00	2/16/04 9:06	22366	23708	6263	1431	25140	10959	201	224	6016482
58812	NDOT 2B-3	2/16/04 10:11	2.45	0.44	0.16	1.06	0.013	0.014	677.00	2/16/04 10:11	21190	51915	9323	3454	55368	22461	275	297	14345359
58813	NDOT 2B-4	2/16/04 11:16	3.26	0.44	0.19	1.56	0.015	0.017	1130.00	2/16/04 11:16	19709	64251	8672	3764	68015	30746	296	335	22270884
58814	NDOT 2B-5	2/16/04 12:21	3.04	0.50	0.20	1.41	0.017	0.018	844.00	2/16/04 12:21	21142	64272	10571	4186	68458	29810	359	381	17843926
58815	NDOT 2B-6	2/16/04 13:26	4.18	0.49	0.18	2.12	0.013	0.017	1550.00	2/16/04 13:26	26498	110762	12984	4664	115426	56176	344	450	41072011
58816	NDOT 2B-7	2/16/04 14:31	3.33	0.41	0.14	1.78	0.010	0.020	1350.00	2/16/04 14:31	32034	106672	13134	4453	111125	57020	320	641	43245453
58817	NDOT 2B-8	2/16/04 15:36	2.68	0.27	0.08	1.56	0.018	0.025	1150.00	2/16/04 15:36	27514	73738	7429	2229	75967	42922	495	688	31641406
58818	NDOT 2B-9	2/16/04 16:41	1.78	0.23	0.10	0.99	0.018	0.023	640.00	2/16/04 16:41	23801	42366	5474	2309	44675	23659	428	547	15232860
58819	NDOT 2B-10	2/16/04 17:46	1.44	0.27	0.12	0.71	0.016	0.024	433.00	2/16/04 17:46	18936	27268	5113	2310	29579	13350	303	454	8199432
58820	NDOT 2B-11	2/16/04 18:51	1.18	0.28	0.13	0.52	0.015	0.025	234.00	2/16/04 18:51	16919	19965	4737	2250	22215	8713	254	423	3959066
58821	NDOT 2B-12	2/16/04 19:56	1.03	0.30	0.15	0.42	0.019	0.027	153.00	2/16/04 19:56	16593	17091	4978	2456	19547	7036	315	448	2538754
58822	NDOT 2B-13	2/16/04 21:01	0.98	0.35	0.16	0.38	0.018	0.026	113.00	2/16/04 21:01	14960	14661	5236	2364	17024	5640	269	389	1690474
58823	NDOT 2B-14	2/16/04 22:06	0.98	0.34	0.16	0.36	0.013	0.026	101.00	2/16/04 22:06	14319	14032	4868	2277	16309	5183	186	372	1446189
58824	NDOT 2B-15	2/16/04 23:11	1.01	0.38	0.21	0.35	0.024	0.026	101.00	2/16/04 23:11	13877	14016	5273	2928	16944	4871	333	361	1401609
58825	NDOT 2B-16	2/17/04 0:16	0.96	0.44	0.19	0.34	0.016	0.027	95.10	2/17/04 0:16	13403	12867	5897	2533	15400	4584	214	362	1274590
58826	NDOT 2B-17	2/17/04 1:21	0.96	0.37	0.16	0.33	0.016	0.028	87.20	2/17/04 1:21	10826	10393	4006	1743	12136	3562	173	303	944051
58827	NDOT 2B-18	2/17/04 2:26	0.96	0.35	0.16	0.33	0.016	0.026	87.10	2/17/04 2:26	12515	12014	4380	2027	14041	4142	200	325	1090019
58828	NDOT 2B-19	2/17/04 3:31	0.93	0.35	0.16	0.32	0.024	0.028	79.10	2/17/04 3:31	11303	10512	3956	1763	12275	3651	271	316	894086
58829	NDOT 2B-20	2/17/04 4:36	0.90	0.36	0.16	0.33	0.020	0.026	72.60	2/17/04 4:36	9416	8474	3390	1525	10000	3070	188	245	683589
58830	NDOT 2B-21	2/17/04 5:41	0.86	0.35	0.16	0.32	0.021	0.026	68.50	2/17/04 5:41	7255	6240	2539	1183	7422	2322	152	189	496989
58831	NDOT 2B-22	2/17/04 6:46	0.88	0.35	0.16	0.32	0.021	0.026	66.20	2/17/04 6:46	5232	4604	1831	848	5452	1658	110	136	346346
										Total	370196	719689	134418	55709	775398	344900	5867	8156	217415774
											EMC Out	1.94	0.36	0.15	2.09	0.93	0.016	0.022	587

SR 28 at Secret Harbor Creek February 21-22, 2004 Loading

Sediment Trap Inflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Total Load (In) miligrams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
59145	NDOT 2A-1	2/21/04 13:31	NA	0.55	0.17	1.07	0.09	0.045	0.040	33.30	2/21/04 13:31	26910	NA	14801	4548	28767	2395	1211	1076	896107
59146	NDOT 2A-2	2/21/04 14:36	0.90	0.27	0.05	0.95	0.35	0.023	0.018	85.80	2/21/04 14:36	16092	14483	4345	756	15239	5696	370	290	1380675
59147	NDOT 2A-3	2/21/04 15:41	0.94	0.29	0.06	1.00	0.36	0.028	0.022	117.00	2/21/04 15:41	15683	14742	4548	863	15604	5630	439	345	1834862
59148	NDOT 2A-4	2/21/04 16:46	0.86	0.27	0.05	0.91	0.34	0.027	0.021	97.40	2/21/04 16:46	15963	13728	4310	814	14543	5348	431	335	1554823
59149	NDOT 2A-5	2/21/04 17:51	0.90	0.24	0.05	0.95	0.37	0.027	0.023	87.30	2/21/04 17:51	17542	15788	4210	824	16612	6403	474	403	1531398
59150	NDOT 2A-6	2/21/04 18:56	0.87	0.25	0.05	0.92	0.35	0.029	0.025	70.70	2/21/04 18:56	14598	12701	3650	701	13401	5109	423	365	1032110
59151	NDOT 2A-7	2/21/04 20:01	1.00	0.29	0.07	1.07	0.38	0.021	0.014	93.20	2/21/04 20:01	13544	13544	3928	975	14519	5160	284	190	1262320
59152	NDOT 2A-8	2/21/04 21:06	1.04	0.30	0.08	1.12	0.37	0.015	0.009	103.00	2/21/04 21:06	14352	14926	4306	1148	16074	5368	215	129	1478257
59153	NDOT 2A-9	2/21/04 22:11	1.00	0.31	0.09	1.09	0.33	0.014	0.008	213.00	2/21/04 22:11	14960	14960	4638	1346	16306	4997	209	120	3186469
59154	NDOT 2A-10	2/21/04 23:16	0.86	0.30	0.09	0.95	0.29	0.013	0.008	79.00	2/21/04 23:16	14485	12457	4346	1246	13703	4157	188	116	1144335
		Average	0.79	0.30	0.10	0.89	0.26	0.013	0.008	62.60	Average	13486	10654	4046	1349	12002	3473	169	101	844218
59155	NDOT 2A-12	2/22/04 1:26	0.72	0.30	0.11	0.83	0.23	0.012	0.007	46.20	2/22/04 1:26	12363	8901	3709	1409	10311	2819	148	87	571178
59156	NDOT 2A-13	2/22/04 2:31	0.65	0.32	0.12	0.77	0.19	0.012	0.007	38.40	2/22/04 2:31	11468	7454	3670	1388	8841	2213	138	80	440353
59157	NDOT 2A-14	2/22/04 3:36	0.60	0.30	0.13	0.73	0.04	0.010	0.006	34.30	2/22/04 3:36	14852	8911	4456	1960	10871	520	149	89	509413
59158	NDOT 2A-15	2/22/04 4:41	0.61	0.31	0.13	0.74	0.16	0.010	0.005	32.60	2/22/04 4:41	16066	9800	4980	2153	11953	2571	161	80	523741
59159	NDOT 2A-16	2/22/04 5:46	0.56	0.37	0.14	0.70	0.15	0.013	0.008	32.10	2/22/04 5:46	15073	8441	5577	2065	10506	2216	196	121	483848
59160	NDOT 2A-17	2/22/04 6:51	0.62	0.41	0.15	0.77	0.11	0.018	0.014	30.80	2/22/04 6:51	14402	8929	5905	2103	11032	1570	259	202	443581
59161	NDOT 2A-18	2/22/04 7:56	0.68	0.51	0.16	0.84	0.10	0.027	0.024	33.70	2/22/04 7:56	14185	9646	7235	2199	11845	1376	383	340	478050
59162	NDOT 2A-19	2/22/04 9:01	0.71	0.59	0.23	0.94	0.09	0.038	0.034	30.70	2/22/04 9:01	16421	11659	9689	3695	15354	1544	624	558	504140
59163	NDOT 2A-20	2/22/04 10:06	0.54	0.50	0.16	0.70	0.08	0.040	0.037	24.00	2/22/04 10:06	16092	8690	8046	2623	11313	1255	644	595	386203
59164	NDOT 2A-21	2/22/04 11:11	0.68	0.49	0.19	0.87	0.09	0.042	0.040	39.70	2/22/04 11:11	16092	10942	7885	3057	14000	1384	676	644	638844
59165	NDOT 2A-22	2/22/04 12:16	0.84	0.71	0.17	1.01	0.09	0.044	0.042	37.10	2/22/04 12:16	16092	13517	11425	2703	16221	1368	708	676	597005
59166	NDOT 2A-23	2/22/04 13:21	0.56	0.66	0.17	0.73	0.08	0.043	0.043	37.80	2/22/04 13:21	16750	9380	11055	2848	12228	1407	720	720	633153
59167	NDOT 2A-24	2/22/04 14:26	0.61	0.66	0.17	0.78	0.08	0.042	0.042	34.50	2/22/04 14:26	19980	12188	13187	3397	15584	1618	839	839	689296
											Total	377450	266441	153943	46169	336829	75596	10059	8502	23044376
												EMC In	0.71	0.41	0.12	0.89	0.20	0.027	0.023	61

Sediment Trap Outflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Total Load (Out) miligrams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
59168	NDOT 2B-1	2/21/04 13:31	0.87	0.60	0.213	1.083	0.109	0.025	0.021	40.8	2/21/04 13:31	26910	23412	16146	5732	29144	2933	673	565	1097933
59169	NDOT 2B-2	2/21/04 14:36	0.92	0.31	0.036	0.956	0.390	0.012	0.008	181	2/21/04 14:36	16092	14804	4988	579	15384	6276	193	129	2912613
59170	NDOT 2B-3	2/21/04 15:41	0.95	0.28	0.069	1.019	0.417	0.022	0.018	193	2/21/04 15:41	15683	14898	4391	1082	15981	6540	345	282	3026738
59171	NDOT 2B-4	2/21/04 16:46	0.90	0.25	0.060	0.96	0.366	0.023	0.018	127	2/21/04 16:46	15963	14367	3991	958	15325	5843	367	287	2027335
59172	NDOT 2B-5	2/21/04 17:51	0.87	0.27	0.061	0.931	0.382	0.024	0.019	137	2/21/04 17:51	17542	15261	4736	1070	16331	6701	421	333	2403225
59173	NDOT 2B-6	2/21/04 18:56	0.84	0.24	0.058	0.898	0.389	0.024	0.020	120	2/21/04 18:56	14598	12263	3504	847	13109	5679	350	292	1751813
59174	NDOT 2B-7	2/21/04 20:01	0.91	0.28	0.073	0.983	0.386	0.020	0.015	147	2/21/04 20:01	13544	12325	3792	989	13314	5228	271	203	1990998
		Average	0.98	0.30	0.079	1.054	0.398	0.0145	0.010	143	Average	14352	13993	4234	1127	15120	5712	208	144	2045161
59175	NDOT 2B-9	2/21/04 22:11	1.04	0.31	0.084	1.124	0.410	0.009	0.005	138	2/21/04 22:11	14960	15558	4638	1257	16815	6134	135	75	2064473
59176	NDOT 2B-10	2/21/04 23:16	0.99	0.29	0.027	1.017	0.403	0.008	0.002	173	2/21/04 23:16	14485	14340	4201	391	14732	5838	116	29	2505949
59177	NDOT 2B-11	2/22/04 0:21	0.99	0.29	0.101	1.091	0.400	0.009	0.002	144	2/22/04 0:21	13486	13351	3911	1362	14713	5394	121	27	1941971
59178	NDOT 2B-12	2/22/04 1:26	1.02	0.28	0.109	1.129	0.387	0.008	0.004	154	2/22/04 1:26	12363	12610	3462	1348	13958	4785	99	49	1903926
59179	NDOT 2B-13	2/22/04 2:31	0.97	0.26	0.148	1.118	0.371	0.008	0.004	114	2/22/04 2:31	11468	11124	2982	1697	12821	4254	92	46	1307298
59180	NDOT 2B-14	2/22/04 3:36	1.01	0.28	0.158	1.168	0.376	0.008	0.003	131	2/22/04 3:36	14852	15000	4158	2347	17347	5584	119	45	1945571
59181	NDOT 2B-15	2/22/04 4:41	1.01	0.32	0.036	1.046	0.371	0.008	0.002	129	2/22/04 4:41	16066	16226	5141	578	16805	5960	129	32	2072471
59182	NDOT 2B-16	2/22/04 5:46	1.00	0.29	0.035	1.035	0.366	0.008	0.002	129	2/22/04 5:46	15073	15073	4371	528	15601	5517	121	30	1944434
59183	NDOT 2B-17	2/22/04 6:51	1.08	0.33	0.050	1.13	0.367	0.009	0.002	125	2/22/04 6:51	14402	15554	4753	720	16274	5286	130	29	1800247
59184	NDOT 2B-18	2/22/04 7:56	1.98	0.43	0.166	2.146	0.781	0.013	0.008	479	2/22/04 7:56	14185	28087	6100	2355	30442	11079	184	113	6794832
59185	NDOT 2B-19	2/22/04 9:01	1.02	0.42	0.193	1.213	0.307	0.016	0.011	104	2/22/04 9:01	16421	16750	6897	3169	19919	5041	263	181	1707835
59186	NDOT 2B-20	2/22/04 10:06	0.92	0.46	0.204	1.124	0.239	0.010	0.012	76.7	2/22/04 10:06	16092	14804	7402	3283	18087	3846	161	193	1234240
59187	NDOT 2B-21	2/22/04 11:11	0.90	0.50	0.094	0.994	0.197	0.018	0.007	49.3	2/22/04 11:11	16092	14483	8046	1513	15995	3170	290	113	793325
59188	NDOT 2B-22	2/22/04 12:16	0.86	0.54	0.107	0.967	0.163	0.023	0.010	43.4	2/22/04 12:16	16092	13839	8690	1722	15561	2623	370	161	698383
59189	NDOT 2B-23	2/22/04 13:21	0.83	0.60	0.119	0.949	0.113	0.025	0.013	20.5	2/22/04 13:21	16750	13903	10050	1993	15896	1893	419	218	343376
59190	NDOT 2B-24	2/22/04 14:26	0.83	0.61	0.070	0.9	0.090	0.027	0.008	21.4	2/22/04 14:26	19980	16583	12188	1399	17982	1798	539	160	427563
											Total	377450	368610	142770	38043	406654	123113	6114	3735	46741712
												EMC Out	0.98	0.38	0.10	1.08	0.33	0.016	0.010	124

SR 28 at Secret Harbor Creek March 13-14, 2004 Loading

Sediment Trap Inflow

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Date	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
59370	NDOT 2A-1	3/12/04 14:36	0.91	0.08	0.02	0.93	0.46 x		0.058	204.0	3/12/04 14:36	11561	10520	925	185	10705	5306	NA	671	2358372
59371	NDOT 2A-2	3/12/04 15:41	0.87	0.11	0.02	0.89	0.41 x		0.063	160.0	3/12/04 15:41	11810	10275	1299	224	10500	4807	NA	744	1889678
59372	NDOT 2A-3	3/12/04 16:46	0.81	0.08	0.02	0.83	0.39 x		0.060	151.0	3/12/04 16:46	11810	9566	945	260	9826	4630	NA	709	1783383
59373	NDOT 2A-4	3/12/04 17:51	0.90	0.10	0.02	0.92	0.36 x		0.062	110.0	3/12/04 17:51	10849	9764	1085	239	10003	3873	NA	673	1193389
59374	NDOT 2A-5	3/12/04 18:56	0.74	0.09	0.03	0.77	0.36 x		0.065	92.2	3/12/04 18:56	11106	8219	1000	300	8519	3943	NA	722	1024010
59375	NDOT 2A-6	3/12/04 20:01	0.72	0.10	0.02	0.74	0.36 x		0.071	84.8	3/12/04 20:01	11303	8138	1130	203	8342	4058	NA	803	958515
		Average	0.74	0.13	0.02	0.75	0.36 x		0.079	81.1	3/12/04 21:06	9840	7232	1230	192	7424	3572	NA	772	797516
59376	NDOT 2A-8	3/12/04 22:11	0.75	0.15	0.02	0.77	0.37 x		0.086	77.3	3/12/04 22:11	7501	5626	1125	158	5784	2753	NA	645	579855
59377	NDOT 2A-9	3/12/04 23:16	0.76	0.15	0.02	0.78	0.37 x		0.091	68.0	3/12/04 23:16	5232	3976	785	110	4086	1936	NA	476	355764
59378	NDOT 2A-10	3/13/04 10:26	0.77	0.18	0.02	0.79	0.38 x		0.096	71.1	3/13/04 10:26	8403	6470	1513	193	6664	3168	NA	807	597457
59379	NDOT 2A-11	3/13/04 11:31	0.84	0.15	0.02	0.86	0.38 x		0.084	115.0	3/13/04 11:31	19709	16555	2956	434	16989	7470	NA	1656	2266506
59380	NDOT 2A-12	3/13/04 12:36	0.97	0.16	0.03	1.00	0.43 x		0.070	145.0	3/13/04 12:36	17544	17017	2807	456	17474	7544	NA	1228	2543834
59381	NDOT 2A-13	3/13/04 13:41	0.90	0.14	0.02	0.92	0.43 x		0.061	199.0	3/13/04 13:41	15508	13958	2171	310	14268	6591	NA	946	3086182
59382	NDOT 2A-14	3/13/04 14:46	0.90	0.15	0.03	0.93	0.43 x		0.057	172.0	3/13/04 14:46	14960	13464	2244	389	13853	6418	NA	853	2573111
59383	NDOT 2A-15	3/13/04 15:51	0.84	0.13	0.02	0.86	0.40 x		0.058	172.0	3/13/04 15:51	14569	12238	1894	219	12456	5755	NA	845	2505788
59384	NDOT 2A-16	3/13/04 16:56	0.75	0.13	0.02	0.77	0.37 x		0.060	116.0	3/13/04 16:56	14019	10514	1822	252	10767	5215	NA	841	1626192
59385	NDOT 2A-17	3/13/04 18:01	0.69	0.13	0.02	0.71	0.35 x		0.064	130.0	3/13/04 18:01	14735	10167	1916	295	10462	5201	NA	943	1915562
59386	NDOT 2A-18	3/13/04 19:06	0.70	0.14	0.02	0.72	0.34 x		0.068	102.0	3/13/04 19:06	13569	9498	1900	231	9729	4573	NA	923	1384057
59387	NDOT 2A-19	3/13/04 20:11	0.75	0.17	0.02	0.77	0.36 x		0.084	90.1	3/13/04 20:11	11273	8455	1916	180	8635	4013	NA	947	1015693
59388	NDOT 2A-20	3/13/04 21:16	0.72	0.16	0.02	0.74	0.36 x		0.086	84.7	3/13/04 21:16	8929	6429	1429	170	6599	3179	NA	768	756289
59389	NDOT 2A-21	3/13/04 22:21	0.71	0.15	0.02	0.73	0.36 x		0.090	78.9	3/13/04 22:21	6952	4936	1043	160	5096	2510	NA	626	548491
59390	NDOT 2A-22	3/14/04 10:26	0.71	0.20	0.01	0.72	0.37 x		0.102	67.5	3/14/04 10:26	9153	6498	1831	64	6562	3386	NA	934	617798
59391	NDOT 2A-23	3/14/04 11:31	0.77	0.17	0.02	0.79	0.39 x		0.093	120.0	3/14/04 11:31	19709	15176	3350	434	15609	7647	NA	1833	2365050
59392	NDOT 2A-24	3/14/04 12:36	0.94	0.16	0.02	0.96	0.46 x		0.076	153.0	3/14/04 12:36	14813	13924	2370	281	14206	6873	NA	1126	2266371
											Total	294857	238617	40685	5938	244555	114420	NA	21488	37008861
												EMC In	0.81	0.14	0.02	0.83	0.39	NA	0.073	125.51

Sediment Trap Outflow

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Sample Date	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
59393	NDOT 2B-1	3/12/04 14:36	0.90	0.12	0.02	0.92	0.48 x		0.033	279.0	3/12/04 14:36	11561	10405	1387	231	10636	5584	NA	382	3225421
59394	NDOT 2B-2	3/12/04 15:41	0.79	0.12	0.01	0.80	0.40 x		0.026	190.0	3/12/04 15:41	11810	9330	1417	59	9389	4771	NA	307	2243992
59395	NDOT 2B-3	3/12/04 16:46	0.78	0.11	0.02	0.80	0.42 x		0.033	215.0	3/12/04 16:46	11810	9212	1299	213	9425	4949	NA	390	2539254
59396	NDOT 2B-4	3/12/04 17:51	0.75	0.13	0.02	0.77	0.40 x		0.035	190.0	3/12/04 17:51	10849	8137	1410	184	8321	4307	NA	380	2061308
59397	NDOT 2B-5	3/12/04 18:56	0.72	0.13	0.02	0.74	0.38 x		0.037	180.0	3/12/04 18:56	11106	7997	1444	267	8263	4176	NA	411	1999152
59398	NDOT 2B-6	3/12/04 20:01	0.67	0.12	0.02	0.69	0.34 x		0.036	151.0	3/12/04 20:01	11303	7573	1356	203	7777	3877	NA	407	1706789
59399	NDOT 2B-7	3/12/04 21:06	0.65	0.12	0.03	0.68	0.33 x		0.035	145.0	3/12/04 21:06	9840	6396	1181	256	6652	3267	NA	344	1426771
59400	NDOT 2B-8	3/12/04 22:11	0.59	0.11	0.02	0.61	0.33 x		0.034	139.0	3/12/04 22:11	7501	4426	825	180	4606	2445	NA	255	1042689
59401	NDOT 2B-9	3/12/04 23:16	0.56	0.10	0.03	0.59	0.32 x		0.035	126.0	3/12/04 23:16	5232	2930	523	146	3076	1669	NA	183	659209
59402	NDOT 2B-10	3/13/04 10:26	0.53	0.10	0.02	0.55	0.30 x		0.034	106.0	3/13/04 10:26	8403	4454	840	176	4630	2521	NA	286	890723
59403	NDOT 2B-11	3/13/04 11:31	0.60	0.10	0.02	0.62	0.31 x		0.037	136.0	3/13/04 11:31	19709	11825	1971	473	12298	6070	NA	729	2680390
59404	NDOT 2B-12	3/13/04 12:36	0.91	0.12	0.03	0.94	0.43 x		0.034	254.0	3/13/04 12:36	17544	15965	2105	474	16438	7614	NA	596	4456095
59405	NDOT 2B-13	3/13/04 13:41	0.95	0.11	0.02	0.97	0.48 x		0.031	282.0	3/13/04 13:41	15508	14733	1706	341	15074	7475	NA	481	4373384
59406	NDOT 2B-14	3/13/04 14:46	0.88	0.09	0.03	0.91	0.47 x		0.031	270.0	3/13/04 14:46	14960	13165	1346	374	13539	7091	NA	464	4039186
59407	NDOT 2B-15	3/13/04 15:51	0.80	0.11	0.02	0.82	0.43 x		0.034	226.0	3/13/04 15:51	14569	11655	1603	277	11932	6235	NA	495	3292489
59408	NDOT 2B-16	3/13/04 16:56	0.74	0.11	0.03	0.77	0.40 x		0.036	199.0	3/13/04 16:56	14019	10374	1542	350	10724	5608	NA	505	2789760
59409	NDOT 2B-17	3/13/04 18:01	0.75	0.11	0.03	0.78	0.38 x		0.037	195.0	3/13/04 18:01	14735	11051	1621	398	11449	5585	NA	545	2873343
59410	NDOT 2B-18	3/13/04 19:06	0.68	0.14	0.03	0.71	0.35 x		0.037	159.0	3/13/04 19:06	13569	9227	1900	380	9607	4776	NA	502	2157501
59411	NDOT 2B-19	3/13/04 20:11	0.65	0.12	0.03	0.68	0.33 x		0.038	136.0	3/13/04 20:11	11273	7327	1353	293	7621	3686	NA	428	1533122
59412	NDOT 2B-20	3/13/04 21:16	0.57	0.12	0.01	0.58	0.32 x		0.038	132.0	3/13/04 21:16	8929	5090	1071	116	5206	2857	NA	339	1178632
59413	NDOT 2B-21	3/13/04 22:21	0.60	0.14	0.02	0.62	0.30 x		0.038	118.0	3/13/04 22:21	6952	4171	973	104	4275	2086	NA	264	820303
59414	NDOT 2B-22	3/14/04 10:26	0.58	0.14	0.01	0.59	0.30 x		0.037	121.0	3/14/04 10:26	9153	5308	1281	73	5382	2700	NA	339	1107460
59415	NDOT 2B-23	3/14/04 11:31	0.62	0.12	0.01	0.63	0.32 x		0.035	155.0	3/14/04 11:31	19709	12219	2365	197	12417	6346	NA	690	3054856
59416	NDOT 2B-24	3/14/04 12:36	0.87	0.17	0.01	0.88	0.44 x		0.035	241.0	3/14/04 12:36	14813	12887	2518	207	13095	6547	NA	518	3569905
											Total	294857	215857	35039	5974	221831	112243	NA	10240	55721732
												EMC Out	0.73	0.12	0.02	0.75	0.38	NA	0.035	188.98

SR 28 at Secret Harbor Creek March 25-26 Loading

Sediment Trap Inflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Total Load (In) miligrams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
59607	NDOT 2A-2	3/25/04 19:16	1.77	0.19	0.02	1.79	0.80	x	0.052	524.00	3/25/04 19:16	9081	16073	1725	218	16291	7283	NA	472	4758253
59608	NDOT 2A-3	3/25/04 20:21	33.50	1.52	0.15	33.65	19.30	x	0.005	18400.00	3/25/04 20:21	15148	507442	23024	2287	509729	292347	NA	76	278714268
59609	NDOT 2A-4	3/25/04 21:26	11.30	1.29	0.24	11.54	6.76	x	0.004	insuff smpl	3/25/04 21:26	13877	156814	17902	3386	160200	93811	NA	56	
		Average	8.52	1.17	0.21	8.72	4.52	x	0.004	insuff smpl	Average	14435	122916	16817	3017	125933	65175	NA	58	
59610	NDOT 2A-6	3/25/04 23:36	5.73	1.04	0.17	5.90	2.27	x	0.004	1670.00	3/25/04 23:36	16815	96349	17487	2926	99275	38170	NA	67	28080715
59611	NDOT 2A-7	3/26/04 0:41	3.79	0.84	0.14	3.93	1.15	x	0.004	802.00	3/26/04 0:41	17746	67259	14907	2414	69672	20408	NA	71	14232604
59612	NDOT 2A-8	3/26/04 1:46	2.77	0.65	0.24	3.01	0.70	x	0.005	440.00	3/26/04 1:46	16092	44574	10460	3894	48468	11329	NA	80	7080386
59613	NDOT 2A-9	3/26/04 2:51	2.51	0.64	0.21	2.72	0.58	x	0.005	451.00	3/26/04 2:51	15508	38926	9925	3272	42199	9041	NA	78	6994313
59614	NDOT 2A-10	3/26/04 3:56	2.21	0.66	0.20	2.41	0.55	x	0.004	372.00	3/26/04 3:56	14319	31644	9450	2821	34465	7904	NA	57	5326556
59615	NDOT 2A-11	3/26/04 5:01	1.86	0.65	0.20	2.06	0.39	x	0.004	246.00	3/26/04 5:01	14102	26230	9166	2750	28980	5486	NA	56	3469135
59616	NDOT 2A-12	3/26/04 6:06	1.62	0.63	0.19	1.81	1.96	x	0.004	235.00	3/26/04 6:06	14960	24235	9425	2857	27092	29321	NA	60	3515588
59617	NDOT 2A-13	3/26/04 7:11	1.47	0.64	0.20	1.67	0.33	x	0.005	204.00	3/26/04 7:11	14402	21171	9217	2837	24008	4796	NA	72	2938003
59618	NDOT 2A-14	3/26/04 8:16	1.52	0.63	0.19	1.71	0.28	x	0.005	193.00	3/26/04 8:16	13544	20587	8533	2519	23106	3738	NA	68	2614031
59619	NDOT 2A-15	3/26/04 9:21	1.09	0.57	0.18	1.27	0.22	x	0.004	152.00	3/26/04 9:21	17789	19390	10140	3202	22592	3878	NA	71	2703953
59620	NDOT 2A-16	3/26/04 10:26	2.20	0.96	0.24	2.44	0.59	x	0.020	541.00	3/26/04 10:26	18605	40932	17861	4540	45471	11033	NA	372	10065467
59621	NDOT 2A-17	3/26/04 11:31	3.47	1.18	0.24	3.71	1.07	x	0.032	952.00	3/26/04 11:31	18876	65500	22274	4436	69936	20197	NA	604	17970090
59622	NDOT 2A-18	3/26/04 12:36	2.10	1.11	0.20	2.30	0.69	x	0.021	499.00	3/26/04 12:36	19107	40124	21209	3860	43984	13241	NA	401	9534326
59623	NDOT 2A-19	3/26/04 13:41	1.54	0.54	0.15	1.69	0.54	x	0.009	411.00	3/26/04 13:41	18395	28329	9933	2704	31033	9989	NA	166	7560431
59624	NDOT 2A-20	3/26/04 14:46	1.36	0.30	0.09	1.45	0.63	x	0.005	484.00	3/26/04 14:46	16385	22284	4916	1442	23726	10306	NA	82	7930507
59625	NDOT 2A-21	3/26/04 15:51	1.31	0.28	0.07	1.38	0.51	x	0.008	380.00	3/26/04 15:51	14928	19555	4180	1015	20570	7628	NA	119	5672553
59626	NDOT 2A-22	3/26/04 16:56	1.08	0.34	0.03	1.11	0.42	x	0.005	271.00	3/26/04 16:56	13403	14475	4557	402	14877	5669	NA	67	3632112
59627	NDOT 2A-23	3/26/04 18:01	1.04	0.31	0.02	1.06	0.38	x	0.006	232.00	3/26/04 18:01	11780	12251	3652	283	12534	4441	NA	71	2733007
59628	NDOT 2A-24	3/26/04 19:06	0.97	0.33	0.02	0.99	0.35	x	0.005	219.00	3/26/04 19:06	9164	8889	3024	165	9054	3207	NA	46	2006856
											Total	348462	1445950	259784	57247	1503197	678399	NA	3270	427533153
											EMC In		4.15	0.75	0.16	4.31	1.95	NA	0.009	1226.92

Sediment Trap Outflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Total Load (Out) miligrams Average Concentration Value Used for flow volumes without concentrations Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
59630	NDOT 2B-2	3/25/04 19:16	0.63	0.08	0.00	0.63	0.28	x	0.020	159.00	3/25/04 19:16	9081	5721	726	18	5739	2524	NA	182	1443821
59631	NDOT 2B-3	3/25/04 20:21	1.22	0.34	0.05	1.27	0.44	x	0.006	284.00	3/25/04 20:21	15148	18480	5150	803	19283	6604	NA	91	4301894
59632	NDOT 2B-4	3/25/04 21:26	1.38	0.42	0.07	1.45	0.48	x	0.005	299.00	3/25/04 21:26	13877	19151	5828	1027	20178	6606	NA	69	
59633	NDOT 2B-5	3/25/04 22:31	1.37	0.44	0.07	1.44	0.44	x	0.004	235.00	Average	14435	19776	6352	982	20758	6352	NA	58	
59634	NDOT 2B-6	3/25/04 23:36	1.32	0.46	0.09	1.41	0.39	x	0.003	227.00	3/25/04 23:36	16815	22196	7735	1463	23658	6591	NA	50	3816959
59635	NDOT 2B-7	3/26/04 0:41	1.28	0.45	0.10	1.38	0.37	x	0.004	178.00	3/26/04 0:41	17746	22715	7986	1739	24455	6548	NA	71	3158857
59636	NDOT 2B-8	3/26/04 1:46	1.46	0.49	0.12	1.58	0.47	x	0.002	287.00	3/26/04 1:46	16092	23494	7885	1931	25425	7483	NA	32	4618342
		Average	1.59	0.54	0.15	1.73	0.49	x	0.002	297.50	3/26/04 2:51	15508	24581	8297	2256	26837	7615	NA	31	4613765
59637	NDOT 2B-10	3/26/04 3:56	1.71	0.58	0.17	1.88	0.52	x	0.002	308.00	3/26/04 3:56	14319	24485	8305	2448	26933	7403	NA	29	4410159
59638	NDOT 2B-11	3/26/04 5:01	1.71	0.55	0.16	1.87	0.52	x	0.002	333.00	3/26/04 5:01	14102	24115	7756	2200	26315	7390	NA	28	4696024
59639	NDOT 2B-12	3/26/04 6:06	1.73	0.62	0.17	1.90	0.52	x	0.003	266.00	3/26/04 6:06	14960	25881	9275	2528	28409	7734	NA	45	3979346
59640	NDOT 2B-13	3/26/04 7:11	1.82	0.53	0.19	2.01	0.52	x	0.003	284.00	3/26/04 7:11	14402	26212	7633	2708	28919	7417	NA	43	4090162
59641	NDOT 2B-14	3/26/04 8:16	1.76	0.53	0.19	1.95	0.49	x	0.003	300.00	3/26/04 8:16	13544	23838	7178	2587	26425	6691	NA	41	4063261
59642	NDOT 2B-15	3/26/04 9:21	1.64	0.58	0.20	1.84	0.47	x	0.003	285.00	3/26/04 9:21	17789	29174	10318	3540	32714	8290	NA	53	5069912
59643	NDOT 2B-16	3/26/04 10:26	1.73	0.56	0.21	1.94	0.49	x	0.003	237.00	3/26/04 10:26	18605	32187	10419	3814	36001	9098	NA	56	4409456
59644	NDOT 2B-17	3/26/04 11:31	1.90	0.68	0.29	2.19	0.49	x	0.006	297.00	3/26/04 11:31	18876	35865	12836	5455	41320	9230	NA	113	5606215
59645	NDOT 2B-18	3/26/04 12:36	2.08	0.95	0.28	2.36	0.48	x	0.011	266.00	3/26/04 12:36	19107	39742	18152	5426	45169	9190	NA	210	5082426
59646	NDOT 2B-19	3/26/04 13:41	1.96	0.99	0.27	2.23	0.46	x	0.012	225.00	3/26/04 13:41	18395	36055	18211	5022	41077	8443	NA	221	4138922
59647	NDOT 2B-20	3/26/04 14:46	1.80	0.92	0.24	2.04	0.40	x	0.011	211.00	3/26/04 14:46	16385	29494	15075	3867	33361	6571	NA	180	3457308
59648	NDOT 2B-21	3/26/04 15:51	1.53	0.75	0.19	1.72	0.36	x	0.009	180.00	3/26/04 15:51	14928	22839	11196	2896	25735	5359	NA	134	2686999
59649	NDOT 2B-22	3/26/04 16:56	1.29	0.57	0.16	1.45	0.34	x	0.007	170.00	3/26/04 16:56	13403	17289	7639	2131	19420	4517	NA	94	2278447
59650	NDOT 2B-23	3/26/04 18:01	1.15	0.45	0.15	1.30	0.31	x	0.006	125.00	3/26/04 18:01	11780	13547	5301	1708	15255	3652	NA	71	1472525
59651	NDOT 2B-24	3/26/04 19:06	1.05	0.41	0.12	1.17	0.30	x	0.007	128.00	3/26/04 19:06	9164	9622	3757	1054	10676	2740	NA	64	1172957
											Total	348462	546458	203010	57604	604062	154048	NA	1966	78567757
											EMC Out		1.57	0.58	0.17	1.73	0.44	NA	0.006	225.47

SR 28 at Secret Harbor Creek April 19-20, 2004 Loading

Sediment Trap Inflow

Lab #	Sample Name	Sample Date	OPO4-P mg/l	NO3-N mg/l	NO2-N mg/l	TSS mg/l	Time	Interval Liters	OPO4-P	NO3-N	NO2-N	TSS
							Total Load (In) miligrams Average Concentration Value Used for flow volumes without concentrations					
59928	NDOT 2A-1	4/18/04 22:21	0.009	0.204	0.063	203	4/18/04 22:21	82	1	17	5	16714
59929	NDOT 2A-2	4/18/04 23:26	0.008	0.034	0.265	10100	4/18/04 23:26	388	3	13	103	3916936
59930	NDOT 2A-3	4/19/04 0:31	0.004	0.025	0.665	3190	4/19/04 0:31	2401	10	60	1597	7660070
59931	NDOT 2A-4	4/19/04 1:36	0.008	0.030	1.04	2400	4/19/04 1:36	5663	45	170	5889	13591143
59932	NDOT 2A-5	4/19/04 2:41	0.007	0.016	0.848	1510	4/19/04 2:41	8682	61	139	7362	13109296
59933	NDOT 2A-6	4/19/04 3:46	0.005	0.007	1.06	1190	4/19/04 3:46	10576	53	74	11211	12585964
59934	NDOT 2A-7	4/19/04 4:51	0.006	0.018	0.944	955	4/19/04 4:51	10826	65	195	10220	10339095
59935	NDOT 2A-8	4/19/04 5:56	0.003	0.020	0.842	883	4/19/04 5:56	6617	20	132	5572	5843057
59936	NDOT 2A-9	4/19/04 7:01	0.006	0.019	0.764	724	4/19/04 7:01	696	4	13	532	503866
59937	NDOT 2A-10	4/19/04 8:06	0.005	0.020	1.01	689	4/19/04 8:06	2015	10	40	2035	1388057
59938	NDOT 2A-11	4/19/04 9:11	0.005	1.05	0.350	744	4/19/04 9:11	927	5	974	325	689864
59939	NDOT 2A-12	4/19/04 10:16	0.004	0.530	0.091	1470	4/19/04 10:16	279	1	148	25	410664
59940	NDOT 2A-13	4/19/04 11:21	0.003	0.358	0.071	1090	4/19/04 11:21	804	2	288	57	875971
59941	NDOT 2A-14	4/19/04 12:26	0.008	0.316	0.063	706	4/19/04 12:26	1474	12	466	93	1040405
59942	NDOT 2A-15	4/19/04 13:31	0.002	0.296	0.066	845	4/19/04 13:31	1673	3	495	110	1413654
59943	NDOT 2A-16	4/19/04 14:36	0.006	0.271	0.074	378	4/19/04 14:36	1893	11	513	140	715514
59944	NDOT 2A-17	4/19/04 15:41	0.003	0.269	0.070	320	4/19/04 15:41	1406	4	378	98	449949
59945	NDOT 2A-18	4/19/04 16:46	0.003	0.209	0.074	294	4/19/04 16:46	666	2	139	49	195817
59946	NDOT 2A-19	4/19/04 19:36	0.006	0.186	0.078	287	4/19/04 19:36	1372	8	255	107	393825
59947	NDOT 2A-20	4/19/04 20:41	0.008	0.179	0.073	267	4/19/04 20:41	3316	27	594	242	885428
59948	NDOT 2A-21	4/19/04 21:46	0.004	0.207	0.068	267	4/19/04 21:46	3765	15	779	256	1005146
59949	NDOT 2A-22	4/19/04 22:51	0.003	0.210	0.067	242	4/19/04 22:51	3473	10	729	233	840448
59950	NDOT 2A-23	4/19/04 23:56	0.004	0.208	0.066	255	4/19/04 23:56	2568	10	534	170	654894
59951	NDOT 2A-24	4/20/04 1:01	0.007	0.210	0.065	228	4/20/04 1:01	1174	8	246	76	267596
							Total	72736	391	7392	46507	78793372
							EMC In		0.005	0.102	0.639	' 1083

Sediment Trap Outflow

Lab #	Sample Name	Sample Date	OPO4-P mg/l	NO3-N mg/l	NO2-N mg/l	TSS mg/l	Time	Interval Liters	OPO4-P	NO3-N	NO2-N	TSS
							Total Load (Out) miligrams Average Concentration Value Used for flow volumes without concentrations					
59952	NDOT 2B-1	4/18/04 22:21	0.003	0.46	0.052	145	4/18/04 22:21	82	0.247	38	4	11938
59953	NDOT 2B-2	4/18/04 23:26	0.003	0.49	0.032	206	4/18/04 23:26	388	1.163	190	12	79890
59954	NDOT 2B-3	4/19/04 0:31	0.005	0.569	0.04	238	4/19/04 0:31	2401	12.006	1366	96	571504
59955	NDOT 2B-4	4/19/04 1:36	0.003	0.566	0.039	200	4/19/04 1:36	5663	16.989	3205	221	1132595
59956	NDOT 2B-5	4/19/04 2:41	0.004	0.555	0.039	215	4/19/04 2:41	8682	34.727	4818	339	1866555
59957	NDOT 2B-6	4/19/04 3:46	0.005	0.556	0.039	196	4/19/04 3:46	10576	52.882	5881	412	2072982
59958	NDOT 2B-7	4/19/04 4:51	0.006	0.552	0.039	190	4/19/04 4:51	10826	64.958	5976	422	2056993
59959	NDOT 2B-8	4/19/04 5:56	0.003	0.550	0.039	165	4/19/04 5:56	6617	19.852	3640	258	1091851
59960	NDOT 2B-9	4/19/04 7:01	0.004	0.554	0.038	172	4/19/04 7:01	696	2.784	386	26	119703
59961	NDOT 2B-10	4/19/04 8:06	0.003	0.534	0.038	157	4/19/04 8:06	2015	6.044	1076	77	316292
59962	NDOT 2B-11	4/19/04 9:11	0.002	0.535	0.039	148	4/19/04 9:11	927	1.854	496	36	137231
59963	NDOT 2B-12	4/19/04 10:16	0.004	0.530	0.045	428	4/19/04 10:16	279	1.117	148	13	119568
59964	NDOT 2B-13	4/19/04 11:21	0.008	0.524	0.048	433	4/19/04 11:21	804	6.429	421	39	347977
59965	NDOT 2B-14	4/19/04 12:26	0.009	0.513	0.049	354	4/19/04 12:26	1474	13.263	756	72	521676
59966	NDOT 2B-15	4/19/04 13:31	0.005	0.505	0.051	422	4/19/04 13:31	1673	8.365	845	85	705990
59967	NDOT 2B-16	4/19/04 14:36	0.002	0.494	0.052	400	4/19/04 14:36	1893	3.786	935	98	757158
59968	NDOT 2B-17	4/19/04 15:41	0.003	0.494	0.053	338	4/19/04 15:41	1406	4.218	695	75	475259
59969	NDOT 2B-18	4/19/04 16:46	0.003	0.486	0.053	283	4/19/04 16:46	666	1.998	324	35	188490
59970	NDOT 2B-19	4/19/04 19:36	0.001	0.473	0.055	258	4/19/04 19:36	1372	1.372	649	75	354031
59971	NDOT 2B-20	4/19/04 20:41	0.007	0.457	0.058	365	4/19/04 20:41	3316	23.213	1516	192	1210417
59972	NDOT 2B-21	4/19/04 21:46	0.003	0.456	0.057	210	4/19/04 21:46	3765	11.294	1717	215	790564
59973	NDOT 2B-22	4/19/04 22:51	0.002	0.464	0.055	236	4/19/04 22:51	3473	6.946	1611	191	819611
59974	NDOT 2B-23	4/19/04 23:56	0.003	0.469	0.053	201	4/19/04 23:56	2568	7.705	1204	136	516211
59975	NDOT 2B-24	4/20/04 1:01	0.002	0.504	0.056	190	4/20/04 1:01	1174	2.347	592	66	222997
							Total	72736	306	38483	3196	16487482
							EMC OUT		0.004	0.529	0.044	227

APPENDIX B. NDOT 3 DATA

Basin Parameters

Volume: 413 cubic feet

Infiltration Rate:

Notes for Each Storm

07/18/02

1. No Flow data

11/08/02

1. Supposed storage far exceeds basin volume
2. Loading calculations based on 1 inflow and 1 outflow composite sample

03/16/03

1. Supposed storage far exceeds basin volume

04/12/03

1. Grab sample only. No estimation of volume.
2. No associcated flow volume.
3. No recent storms. Where did water come from?

05/12/03

1. Grab Sample

06/23/03

1. Supposed storage exceeds basin volume but may be accounted for by infiltration rate: Flow data shows only inflow
2. Grab Sample

07/23/03

1. Supposed storage far exceeds basin volume
2. No outflow chemistry data

08/02/03

1. Inflow data sensor failed
2. Concentration values show an overall reduction

08/21/03

1. Inflow data sensor failed
2. Concentration values fluctuate throughout inflow and outflow
3. Supposed storage far exceeds basin volume

12/06/03

1. Uncertain best method to calculate

US 50 Sediment Basin

Lab #	Sample Name	Sample Date	TKN	TKNsol	TP	TPsol	OPO4	NO3NO2	TSS	TU
			mg/l as N	mg/l as N	mg/l as P	mg/l as P	mg/l as P	mg/l as N	mg/l	ntu
54040	NDOT-3 INFLOW	18-Jul-02	2.23	1.14	0.469	0.061	0.037	0.889	272	165
54041	NDOT-3 OUTFLOW	18-Jul-02	2.15	1.06	0.405	0.062	0.042	0.665	244	222

INFLOW and OUTFLOW samples are grab samples from the second storm on July 18th

US 50 Sediment Basin — US 50 Sediment Basin
Supposed storage far exceeds basin volume
Loading calculations based on 1 inflow and 1 outflow composite sample

Lab #	Sample Name	Sample Date	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Tu ntu	NH4-N mg/l
	US 50 Sediment Basin Inflow												
54954	NDOT 3A-1,6,7,11 Composite	8-Nov-02	11/7/2002 19:25	0.73	0.28	0.080	0.810	0.265	0.062	0.052	116	70.1	0.006
	US 50 Sediment Basin Outflow												
54955	NDOT 3B-1,6,7,11 Composite	8-Nov-02	11/7/2002 19:25	1.27	0.56	0.152	1.422	0.328	0.040	0.029	171	135	0.008

Total Load (IN) Grams
Average Concentration Value Used for flow volumes without concentrations

Time	Liters/hour	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
EMC in mg/l									
11/7/02 19:00	806	588	226	64	653	214	50	42	93488
11/7/02 20:00	12620	9213	3534	1010	10223	3344	782	656	1463973
11/7/02 21:00	6727	4911	1884	538	5449	1783	417	350	780352
11/7/02 22:00	4151	3030	1162	332	3362	1100	257	216	481518
11/7/02 23:00	2186	1595	612	175	1770	579	136	114	253530
11/8/02 0:00	1328	970	372	106	1076	352	82	69	154080
11/8/02 1:00	1291	942	361	103	1046	342	80	67	149749
11/8/02 2:00	1328	970	372	106	1076	352	82	69	154080
11/8/02 3:00	1481	1081	415	118	1200	392	92	77	171790
11/8/02 4:00	1679	1226	470	134	1360	445	104	87	194772
11/8/02 5:00	1843	1346	516	147	1493	488	114	96	213807
11/8/02 6:00	4205	3070	1177	336	3406	1114	261	219	487787
11/8/02 7:00	5331	3892	1493	427	4318	1413	331	277	618432
11/8/02 8:00	4151	3030	1162	332	3362	1100	257	216	481518
11/8/02 9:00	2876	2099	805	230	2329	762	178	150	333565
11/8/02 10:00	2686	1961	752	215	2175	712	167	140	311544
11/8/02 11:00	2733	1995	765	219	2214	724	169	142	317004
11/8/02 12:00	3990	2913	1117	319	3232	1057	247	207	462867
Sample Total	61413	44831	17196	4913	49744	16274	3808	3193	7123854
	EMC In	0.73	0.28	0.08	0.81	0.265	0.062	0.052	116

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Time	Liters/hour	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
EMC Out mg/l									
11/7/02 19:00	0	0	0	0	0	0	0	0	0
11/7/02 20:00	1005	1276	563	153	1429	330	40	29	171836
11/7/02 21:00	681	865	382	104	969	223	27	20	116505
11/7/02 22:00	303	385	170	46	431	99	12	9	51802
11/7/02 23:00	1969	2501	1103	299	2800	646	79	57	336766
11/8/02 0:00	11	14	6	2	16	4	0	0	1901
11/8/02 1:00	0	0	0	0	0	0	0	0	0
11/8/02 2:00	0	0	0	0	0	0	0	0	0
11/8/02 3:00	0	0	0	0	0	0	0	0	0
11/8/02 4:00	0	0	0	0	0	0	0	0	0
11/8/02 5:00	0	0	0	0	0	0	0	0	0
11/8/02 6:00	214	272	120	33	304	70	9	6	36612
11/8/02 7:00	3218	4086	1802	489	4575	1055	129	93	550200
11/8/02 8:00	0	0	0	0	0	0	0	0	0
11/8/02 9:00	4	5	2	1	6	1	0	0	687
11/8/02 10:00	11	14	6	2	16	4	0	0	1901
11/8/02 11:00	401	509	225	61	570	132	16	12	68575
11/8/02 12:00	0	0	0	0	0	0	0	0	0
Sample Total	7817	9928	4378	1188	11116	2564	313	227	1336785
	EMC Out	1.270	0.560	0.152	1.422	0.328	0.040	0.029	171

	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
Total Load In	44831	17196	4913	49744	16274	3808	3193	7123854
Total Load Out	9928	4378	1188	11116	2564	313	227	1336785
Percent Difference	78%	75%	76%	78%	84%	92%	93%	81%

US 50 Sediment Basin
Supposed storage far exceeds basin volume

Lab #	Sample Name		TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
55868	NDOT 3A-1	3/15/2003 7:25	1.41	0.47	0.02	1.43	1.00	0.063	0.056	704
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
55869	NDOT 3A-3	3/15/2003 11:55	1.24	0.34	0.03	1.27	1.14	0.028	0.020	732
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718
		Average	1.325	0.405	0.025	1.35	1.07	0.0455	0.038	718

Total Load (IN) Grams
Average Concentration Value Used for flow volumes without concentrations

Time EMC in mg/l	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
3/15/03 1:00	0	0	0	0	0	0	0	0	0
3/15/03 1:30	175	232	71	4	237	188	8	7	125968
3/15/03 2:00	387	513	157	10	523	414	18	15	277922
3/15/03 2:30	188	249	76	5	254	201	9	7	134872
3/15/03 3:00	555	735	225	14	749	594	25	21	398301
3/15/03 3:30	964	1277	390	24	1301	1031	44	37	691800
3/15/03 4:00	609	806	247	15	822	651	28	23	437013
3/15/03 4:30	1559	2066	632	39	2105	1668	71	59	1119573
3/15/03 5:00	901	1194	365	23	1216	964	41	34	646804
3/15/03 5:30	254	336	103	6	343	271	12	10	182179
3/15/03 6:00	371	492	150	9	501	397	17	14	266662
3/15/03 6:30	4485	5943	1817	112	6055	4799	204	170	3220427
3/15/03 7:00	4011	5315	1624	100	5415	4292	183	152	2879900
3/15/03 7:30	2843	4008	1336	57	4065	2843	179	159	2001266
3/15/03 8:00	1390	1842	563	35	1877	1487	63	53	998066
3/15/03 8:30	2607	3455	1056	65	3520	2790	119	99	1872147
3/15/03 9:00	3084	4087	1249	77	4164	3300	140	117	2214561
3/15/03 9:30	485	643	197	12	655	519	22	18	348505
3/15/03 10:00	326	431	132	8	440	348	15	12	233789
3/15/03 10:30	282	373	114	7	380	302	13	11	202330
3/15/03 11:00	254	336	103	6	343	271	12	10	182179
3/15/03 11:30	2963	3926	1200	74	4000	3170	135	113	2127248
3/15/03 12:00	5119	6348	1741	154	6502	5836	143	102	3747335
3/15/03 12:30	1510	2001	612	38	2039	1616	69	57	1084404
3/15/03 13:00	326	431	132	8	440	348	15	12	233789
3/15/03 13:30	151	201	61	4	204	162	7	6	108755
3/15/03 14:00	43	56	17	1	57	46	2	2	30544
3/15/03 14:30	0	0	0	0	0	0	0	0	0
Sample Total	35842	47297	14368	907	48204	38510	1591	1321	25766339
EMC In		1.32	0.40	0.03	1.34	1.07	0.04	0.037	719

Lab #	Sample Name		TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
55870	NDOT 3B-1	3/15/2003 7:25	1.55	0.33	0.02	1.57	1.10	0.048	0.036	2610
		Average	1.28	0.337	0.033	1.31	0.970	0.046	0.034	1190
55871	NDOT 3B-2	3/15/2003 8:30	1.17	0.34	0.04	1.21	1.07	0.049	0.035	472
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
55872	NDOT 3B-3	3/15/2003 11:55	1.12	0.34	0.04	1.16	0.74	0.04	0.028	488
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190
		Average	1.28	0.34	0.03	1.31	0.97	0.05	0.034	1190

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Time EMC Out mg/l	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
3/15/03 1:00	0	0	0	0	0	0	0	0	0
3/15/03 1:30	0	0	0	0	0	0	0	0	0
3/15/03 2:00	0	0	0	0	0	0	0	0	0
3/15/03 2:30	0	0	0	0	0	0	0	0	0
3/15/03 3:00	0	0	0	0	0	0	0	0	0
3/15/03 3:30	0	0	0	0	0	0	0	0	0
3/15/03 4:00	0	0	0	0	0	0	0	0	0
3/15/03 4:30	0	0	0	0	0	0	0	0	0
3/15/03 5:00	0	0	0	0	0	0	0	0	0
3/15/03 5:30	0	0	0	0	0	0	0	0	0
3/15/03 6:00	0	0	0	0	0	0	0	0	0
3/15/03 6:30	0	0	0	0	0	0	0	0	0
3/15/03 7:00	59	76	20	2	78	57	3	2	70247
3/15/03 7:30	254	393	84	5	398	279	12	10	662238
3/15/03 8:00	240	307	81	8	315	233	11	8	285665
3/15/03 8:30	240	281	82	10	290	257	12	8	113306
3/15/03 9:00	240	307	81	8	315	233	11	8	285665
3/15/03 9:30	227	290	76	8	298	220	10	8	269681
3/15/03 10:00	175	225	59	6	230	170	8	6	208777
3/15/03 10:30	97	124	33	3	127	94	4	3	115123
3/15/03 11:00	97	124	33	3	127	94	4	3	115123
3/15/03 11:30	87	111	29	3	114	84	4	3	103255
3/15/03 12:00	367	434	132	15	449	286	15	11	188894
3/15/03 12:30	403	516	136	13	529	391	18	14	479529
3/15/03 13:00	227	290	76	8	298	220	10	8	269681
3/15/03 13:30	213	273	72	7	280	207	10	7	253993
3/15/03 14:00	213	273	72	7	280	207	10	7	253993
3/15/03 14:30	0	0	0	0	0	0	0	0	0
Sample Total	3159	4023	1064	106	4130	3032	143	106	3675170
EMC Out		1.27	0.34	0.03	1.31	0.96	0.05	0.033	1163

	Total Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
Total Load In	35842	47297	14368	907	48204	38510	1591	1321	25766339
Total Load Out	3159	4023	1064	106	4130	3032	143	106	3675170
Percent Difference	91%	91%	93%	88%	91%	92%	91%	92%	86%

US 50 Sediment Basin
Grab sample only. No estimation of volume.
No associcated flow volume.
No recent storms. Where did water come from?

Lab #	Sample Name	Sample Date	TKN	NO3-N	NH4-N	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
56536	NDOT 3 Basin	12-May-03	0.77	0.01	0.022	0.135	0.014	0.004	42.0

US 50 Sediment Basin
Supposed storage far exceeds basin volume
No outflow chemistry data

Lab #	Sample Name	Sample Date	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Tu ntu
57156	NDOT 3A-2	29-Jul-03	7/23/2003 15:00	3.17	0.65	0.019	3.19	1.92	0.022	0.008	1700	613
		Average of 15:00 & 15:15		2.51	0.605	0.0425	2.55	1.56	0.02	0.005	1286	493.5
57157	NDOT 3A-3	29-Jul-03	7/23/2003 15:15	1.85	0.56	0.066	1.92	1.20	0.018	0.002	872	374
57158	NDOT 3A-4	29-Jul-03	7/23/2003 15:30	1.40	0.55	0.13	1.53	0.732	0.018	0.003	512	231
		Average of 15:30 & 15:45		1.46	0.57	0.225	1.69	0.642	0.0165	0.003	418	202.5
57159	NDOT 3A-5	29-Jul-03	7/23/2003 15:45	1.52	0.59	0.32	1.84	0.552	0.015	0.003	324	174
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	
		Average of 15:30 & 15:45		1.46	0.57	0.23	1.69	0.64	0.02	0.003	418	

Total Load (IN) Grams
Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P
EMC in mg/l								
7/23/2003 14:50	0	0	0	0	0	0	0	0
7/23/2003 15:00	1661	5264	1079	32	5296	3188	37	13
7/23/2003 15:10	4587	11515	2775	195	11710	7156	92	23
7/23/2003 15:20	3870	7160	2167	255	7415	4644	70	8
7/23/2003 15:30	3229	4520	1776	420	4940	2363	58	10
7/23/2003 15:40	2417	3529	1378	544	4073	1552	40	7
7/23/2003 15:50	1802	2738	1063	577	3315	994	27	5
7/23/2003 16:00	1537	2244	876	346	2590	987	25	5
7/23/2003 16:10	718	1048	409	162	1210	461	12	2
7/23/2003 16:20	248	362	141	56	417	159	4	1
7/23/2003 16:30	131	191	75	29	220	84	2	0
7/23/2003 16:40	122	179	70	28	206	79	2	0
7/23/2003 16:50	118	173	67	27	199	76	2	0
7/23/2003 17:00	116	170	66	26	196	75	2	0
7/23/2003 17:10	114	167	65	26	192	73	2	0
7/23/2003 17:20	112	164	64	25	189	72	2	0
7/23/2003 17:30	112	164	64	25	189	72	2	0
7/23/2003 17:40	110	161	63	25	185	71	2	0
7/23/2003 17:50	108	158	62	24	182	69	2	0
7/23/2003 18:00	108	158	62	24	182	69	2	0
7/23/2003 18:10	106	155	60	24	179	68	2	0
7/23/2003 18:20	106	155	60	24	179	68	2	0
7/23/2003 18:30	104	152	59	23	175	67	2	0
7/23/2003 18:40	104	152	59	23	175	67	2	0
7/23/2003 18:50	104	152	59	23	175	67	2	0
7/23/2003 19:00	104	152	59	23	175	67	2	0
7/23/2003 19:10	104	152	59	23	175	67	2	0
7/23/2003 19:20	102	149	58	23	172	66	2	0
7/23/2003 19:30	102	149	58	23	172	66	2	0
7/23/2003 19:40	102	149	58	23	172	66	2	0
7/23/2003 19:50	102	149	58	23	172	66	2	0
7/23/2003 20:00	102	149	58	23	172	66	2	0
7/23/2003 20:10	102	149	58	23	172	66	2	0
7/23/2003 20:20	100	146	57	23	169	64	2	0
7/23/2003 20:30	100	146	57	23	169	64	2	0
7/23/2003 20:40	100	146	57	23	169	64	2	0
7/23/2003 20:50	100	146	57	23	169	64	2	0
Sample Total	22966	42611	13317	3237	45848	23366	412	83
	EMC In	1.86	0.58	0.14	2.00	1.02	0.02	0.004

TSS
0
2,822,960.87
5,899,520.71
3,374,810.52
1,653,026.96
1,010,304.48
583,711.33
642591
300169
103539
54697
51165
49428
48567
47710
46858
46858
46011
45169
45169
44333
44333
43501
43501
43501
43501
43501
42674
42674
42674
42674
42674
42674
41852
41852
41852
41852
17,601,886.11
766

US 50 Sediment Basin
Inflow data sensor failed
Concentration values show an overall reduction

Lab #	Sample Name		TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	
57171	NDOT 3A-1	8/2/2003 9:45	1.94	0.42	0.16	2.1	0.780	0.010	0.002	652	No Inflow Data
57172	NDOT 3A-2	8/2/2003 10:00	1.19	0.49	0.26	1.45	0.591	0.018	0.006	464	
		Average	1.57	0.46	0.21	1.78	0.69	0.01	0.004	558	
57169	NDOT 3B-1	8/2/2003 9:45	0.70	0.36	0.24	0.94	0.512	0.025	0.011	348	
57170	NDOT 3B-2	8/2/2003 10:00	1.44	0.68	0.37	1.81	0.406	0.023	0.003	180	
		Average	1.07	0.52	0.31	1.38	0.46	0.02	0.007	264	

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
EMC Out mg/l									
8/2/2003 9:00	0								
8/2/2003 9:10	301								
8/2/2003 9:20	832								
8/2/2003 9:30	832								
8/2/2003 9:40	1508								
8/2/2003 9:50	335021								
8/2/2003 10:00	187019								
8/2/2003 10:10	91061								
8/2/2003 10:20	29999								
8/2/2003 10:30	4172								
8/2/2003 10:40	0								

US 50 Sediment Basin

1. Inflow data sensor failed
2. Concentration values fluctuate throughout inflow and outflow
3. Supposed storage far exceeds basin volume

Lab #	Sample Name	Sample Date	TKN	TKNsol	NO3-N	**TN**	TP	TPsol	OPO4-P	TSS	Tu
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ntu
57408	NDOT 3A-2	23-Aug-03	2.09	1.08	0.47	2.56	0.348	0.013	0.002	166	60.5
57409	NDOT 3A-3	23-Aug-03	1.84	1.27	0.65	2.49	0.340	0.017	0.003	152	58.5
57410	NDOT 3A-4	23-Aug-03	1.41	0.91	0.29	1.7	0.318	0.016	0.003	154	59.7
57411	NDOT 3A-5	23-Aug-03	1.27	0.68	0.38	1.65	0.319	0.012	0.002	176	56.8
57412	NDOT 3A-6	23-Aug-03	0.89	0.43	0.26	1.15	0.254	0.009	0.002	144	59.1
57413	NDOT 3A-7	23-Aug-03	0.70	0.39	0.13	0.83	0.217	0.008	0.001	114	53.1
57414	NDOT 3A-8	23-Aug-03	0.66	0.42	0.40	1.06	0.162	0.007	0.001	66	37.6
57415	NDOT 3A-9	23-Aug-03	0.64	0.43	0.48	1.12	0.142	0.008	0.001	48	31.9
57416	NDOT 3A-10	23-Aug-03	0.76	0.46	0.57	1.33	0.139	0.008	0.001	44	28.8
57417	NDOT 3B-1	23-Aug-03	1.07	0.50	0.60	1.67	0.452	0.010	0.001	290	96.3
57418	NDOT 3B-2	23-Aug-03	0.70	0.29	0.30	1.00	0.280	0.014	0.004	166	61.4
57419	NDOT 3B-3	23-Aug-03	0.36	0.22	0.12	0.48	0.191	0.011	0.003	111	49.2
57420	MDOT 3B-4	23-Aug-03	0.36	0.25	0.11	0.47	0.395	0.006	0.001	284	59.8
57421	NDOT 3B-5	23-Aug-03	0.42	0.29	0.39	0.81	0.159	0.006	0.001	97	29.2
57422	NDOT 3B-6	23-Aug-03	0.53	0.35	0.49	1.02	0.148	0.007	0.001	71	26.2
57423	NDOT 3B-7	23-Aug-03	0.70	0.55	0.82	1.52	0.152	0.011	0.001	67	25.7
57424	NDOT 3B-8	23-Aug-03	0.77	0.53	0.84	1.61	0.138	0.013	0.003	64	24.9

APPENDIX C. NDOT 4 DATA

SR 28 at Secret Harbor Creek November 7-9, 2002 Loading

Stormceptor Inflow

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TP	TPsol	OPO4-P	TSS
54874	NDOT 4-1	11/7/03 7:40	8.06	4.30	0.304	0.921	0.104	0.070	238
54875	NDOT 4-2	11/7/02 8:05	9.51	3.86	0.861	1.080	0.196	0.123	258
54876	NDOT 4-3	11/7/02 9:00	3.76	1.72	0.290	0.969	0.117	0.056	420
55104	NDOT 4A-9	11/7/02 21:00	1.40	0.46	NA	NA	0.01	0.00	NA
55105	NDOT 4A-10	11/7/02 22:00	1.53	0.28	NA	NA	0.03	0.02	NA
54991	NDOT 4A-1	11/8/02 15:55	1.41	0.38	NA	0.331	0.035	0.022	159
54992	NDOT 4A-2	11/8/02 16:00	1.44	0.4	NA	0.256	0.044	0.03	190
54993	NDOT 4A-3	11/8/02 17:00	1.42	0.35	NA	0.347	0.048	0.033	195
54994	NDOT 4A-4	11/8/02 18:00	1.12	0.29	NA	0.298	0.052	0.039	127
54995	NDOT 4A-5	11/8/02 19:00	1.13	0.31	NA	0.265	0.056	0.042	97
54996	NDOT 4A-6	11/8/02 20:00	0.93	0.26	NA	0.247	0.046	0.031	101
54997	NDOT 4A-7	11/8/02 21:00	0.82	0.24	NA	0.209	0.047	0.035	79
54998	NDOT 4A-8	11/8/02 22:00	0.74	0.27	NA	0.191	0.057	0.043	56
54999	NDOT 4A-9	11/9/02 15:15	0.73	0.27	NA	0.144	0.051	0.04	39
55000	NDOT 4A-10	11/9/02 23:05	0.88	0.32	NA	0.191	0.045	0.032	50
		Average	1.22	0.31	NA	0.27	0.03	0.02	110.67
55001	NDOT 4A-11	11/10/02 11:45	1.19	0.44	NA	0.231	0.025	0.01	82
55002	NDOT 4A-12	11/10/02 12:00	1.36	0.25	NA	0.269	0.018	0.007	97
55003	NDOT 4A-13	11/10/02 13:00	1.1	0.25	NA	0.299	0.055	0.04	153

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	nterval Liter	TKN	TKNsol	NO3-N	TP	TPsol	OPO4-P	TSS
11/7/02 8:00	72	580	309	22	66	7	5	17130
11/7/02 9:00	1569	14919	6055	1351	1694	307	193	404731
11/7/02 9:00		5898	2698	455	1520	184	88	658864
No Corresponding Flow								
No Corresponding Flow								
11/8/02 15:00	0							
11/8/02 16:00	1200	1692	456	NA	397	42	26	190785
11/8/02 17:00	1672	2408	669	NA	428	74	50	317697
11/8/02 18:00	686	974	240	NA	238	33	23	133687
11/8/02 19:00	654	732	190	NA	195	34	25	83002
11/8/02 20:00	2432	2748	754	NA	644	136	102	235894
11/8/02 21:00	880	819	229	NA	217	40	27	88900
11/8/02 22:00	566	464	136	NA	118	27	20	44725
11/8/02 23:00	41	30	11	NA	8	2	2	2284
11/9/02 15:00	0							
11/9/02 16:00	153	112	41	NA	22	8	6	5961
11/9/02 23:00	0							
11/10/02 0:00	42	37	14	NA	8	2	1	2115
11/10/02 10:00	0							
11/10/02 11:00	3	3	1	NA	1	0	0	307
11/10/02 12:00	15	18	7	NA	4	0	0	1243
11/10/02 13:00	904	1230	226	NA	243	16	6	87711
11/10/02 14:00	706	777	177	NA	211	39	28	108087
11/10/02 15:00	53	64	17	NA	14	2	1	5862
Totals	11648	33505	12228	NA	6029	954	605	2388983
	EMC in	2.88	1.05	NA	0.52	0.08	0.05	205

Stormceptor Outflow

		Time	TKN	TKNsol	NO3-N	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
54877	NDOT 4B-3	11/7/02 9:00	4.18	2.52	0.022	0.574	0.100	0.045	165
55106	NDOT 4B-9	11/7/02 21:00	0.98	0.27	NA	NA	0.01	0.00	NA
55107	NDOT 4B-10	11/7/02 22:00	0.93	0.28	NA	NA	0.05	0.03	NA
55004	NDOT 4B-1	11/8/02 15:55	1.26	0.24	NA	0.322	0.041	0.03	170
55005	NDOT 4B-2	11/8/02 16:00	0.86	0.22	NA	0.227	0.05	0.04	93
55006	NDOT 4B-3	11/8/02 17:00	1.09	0.34	NA	0.267	0.067	0.049	72
55007	NDOT 4B-4	11/8/02 18:00	0.95	0.32	NA	0.228	0.071	0.052	leaked
55008	NDOT 4B-5	11/8/02 19:00	0.67	0.2	NA	0.175	0.052	0.041	49
55009	NDOT 4B-6	11/8/02 20:00	0.72	0.25	NA	0.139	0.056	0.043	40
55010	NDOT 4B-7	11/8/02 21:00	0.75	0.3	NA	0.169	0.075	0.056	25
55011	NDOT 4B-8	11/8/02 22:00	2.37	0.64	NA	0.417	0.017	0.002	234
								Average	98

Total Load (IN) mg

Average Concentration Value Used for flow volumes without concentrations

Time	Liters/60 m	TKN	TKNsol	NO3-N	TP	TPsol	OPO4-P	TSS
11/7/02 8:00	72							
11/7/02 9:00	1569	6557	3953	35	900	157	71	258839
11/8/02 15:00	0							
11/8/02 16:00	1200	1512	288	#VALUE!	386	49	36	203984
11/8/02 17:00	1672	1438	368	#VALUE!	380	84	67	155504
11/8/02 18:00	686	747	233	#VALUE!	183	46	34	49361
11/8/02 19:00	654	621	209	#VALUE!	149	46	34	63769
11/8/02 20:00	2432	1629	486	#VALUE!	426	126	100	119163
11/8/02 21:00	880	634	220	#VALUE!	122	49	38	35208
11/8/02 22:00	566	425	170	#VALUE!	96	42	32	14153
11/8/02 23:00	41	97	26	#VALUE!	17	1	0	9545
11/9/02 15:00	0							

55012	NDOT 4B-9	11/9/02 15:15	2.4	0.98	NA	0.358	0.015	0.004	204	11/9/02 16:00	153	367	150	#VALUE!	55	2	1	31178
										11/9/02 23:00	0							
55013	NDOT 4B-10	11/9/02 23:05	2.22	0.73	NA	0.541	0.017	0.008	340	11/10/02 0:00	42	94	31	#VALUE!	23	1	0	14385
										11/10/02 10:00	0							
			1.83	0.47	NA	0.59	0.023	0.01	375	11/10/02 11:00	3	5	1	#VALUE!	2	0	0	1040
55014	NDOT 4B-11	11/10/02 11:45	2.01	0.61	NA	0.64	0.022	0.012	leaked	11/10/02 12:00	15	30	9	#VALUE!	10	0	0	5675
55015	NDOT 4B-12	11/10/02 12:00	1.97	0.33	NA	0.802	0.028	0.019	558	11/10/02 13:00	904	1781	298	#VALUE!	725	25	17	504564
55016	NDOT 4B-13	11/10/02 13:00	1.51	0.46	NA	0.334	0.018	0.007	191	11/10/02 14:00	706	1067	325	#VALUE!	236	13	5	134932
										11/10/02 15:00	53	97	25	#VALUE!	31	1	1	19836
										Totals	11648	17101	6793	#VALUE!	3741	644	434	1621138

SR 28 at Secret Harbor Creek January 23, 2003 Loading

Stormceptor Inflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
55475	NODT 4A-1	1/23/03 13:05	4.16	0.46	0.04	1.39	0.026	0.014	1150.00
55476	NDOT 4A-2	1/23/03 13:10	4.22	0.50	0.05	1.74	0.068	0.052	1430.00
55477	NDOT 4A-3	1/23/03 14:00	3.01	0.56	0.12	0.94	0.070	0.047	1100.00
55478	NDOT 4A-5	1/23/03 16:00	4.70	0.36	0.05	2.52	0.060	0.045	2060.00
		Average	4.02	0.47	0.07	1.65	0.056	0.040	1435.00
		Average	3.99	0.47	0.07	1.71	0.064	0.046	1506.25
		Average	3.93	0.47	0.08	1.71	0.062	0.044	1525.31
		Average	4.16	0.44	0.07	1.90	0.060	0.044	1631.64
		Average	4.03	0.46	0.07	1.74	0.061	0.043	1524.55
		Average	4.03	0.46	0.07	1.76	0.062	0.044	1546.94
		Average	4.04	0.46	0.07	1.78	0.061	0.044	1557.11
		Average	4.06	0.46	0.07	1.79	0.061	0.044	1565.06
		Average	4.04	0.46	0.07	1.77	0.061	0.044	1548.41
		Average	4.04	0.46	0.07	1.78	0.061	0.044	1554.38
		Average	4.04	0.46	0.07	1.78	0.061	0.044	1556.24
		Average	4.05	0.46	0.07	1.78	0.061	0.044	1556.02

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
1/23/03 10:00	0	0	0	0	0	0	0	0	0
1/23/03 11:00	352	1417	166	23	1441	581	20	14	505604
1/23/03 12:00	284	1144	134	19	1163	469	16	11	408055
1/23/03 13:00	1703	6889	789	78	6967	2573	77	54	2120848
1/23/03 14:00	1644	4949	921	197	5146	1547	115	77	1808475
1/23/03 15:00	4217	16964	1982	280	17244	6949	236	167	6051723
1/23/03 16:00	352	1656	127	18	1674	888	21	16	725814
1/23/03 17:00	6076	24439	2856	404	24843	10011	340	240	8718536
1/23/03 18:00	6896	27739	3241	459	28197	11363	386	272	9895622
1/23/03 19:00	8137	32732	3825	541	33273	13408	456	321	11676995
1/23/03 20:00	2392	9624	1124	159	9783	3942	134	95	3433161
1/23/03 21:00	542	2180	255	36	2216	893	30	21	777841
1/23/03 22:00	192	772	90	13	785	316	11	8	275423
1/23/03 23:00	112	452	53	7	460	185	6	4	161378
1/24/03 0:00	112	452	53	7	460	185	6	4	161378
1/24/03 1:00	89	359	42	6	365	147	5	4	128082
1/24/03 2:00	32	127	15	2	129	52	2	1	45304
1/24/03 3:00	0	0	0	0	0	0	0	0	0
Total	33134	131895	15671	2251	134146	53509	1862	1310	46894238
	EMC in	3.98	0.47	0.07	4.05	1.61	0.056	0.040	1415.28

Stormceptor Outflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	Tpsol mg/l	OPO4-P mg/l	TSS mg/l
		Average	3.65	0.41	0.03	1.49	0.046	0.030	1116
55479	NDOT 4B-1	1/23/03 13:05	2.75	0.44	0.02	0.88	0.016	0.002	664.00
55480	NDOT 4B-2	1/23/03 13:10	3.86	0.48	0.05	1.50	0.047	0.032	1080.00
55481	NDOT 4B-3	1/23/03 14:00	3.44	0.43	0.05	1.38	0.069	0.049	980.00
55482	NDOT 4B-5	1/23/03 16:00	4.54	0.30	0.03	2.20	0.051	0.038	1740.00
		Average	3.65	0.41	0.03	1.49	0.046	0.030	1116.00
		Average	3.87	0.41	0.04	1.64	0.053	0.037	1229.00
		Average	3.87	0.39	0.04	1.68	0.055	0.039	1266.25
		Average	3.98	0.38	0.04	1.75	0.051	0.036	1337.81
		Average	3.84	0.40	0.04	1.64	0.051	0.036	1237.27
		Average	3.89	0.39	0.04	1.68	0.053	0.037	1267.58
		Average	3.90	0.39	0.04	1.69	0.052	0.037	1277.23
		Average	3.91	0.39	0.04	1.69	0.052	0.036	1279.97
		Average	3.89	0.39	0.04	1.67	0.052	0.036	1265.51
		Average	3.90	0.39	0.04	1.68	0.052	0.037	1272.57
		Average	3.90	0.39	0.04	1.68	0.052	0.037	1273.82
		Average	3.90	0.39	0.04	1.68	0.052	0.036	1272.97

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
1/23/03 10:00	0	0	0	0	0	0	0	0	0
1/23/03 11:00	352	1285	145	12	1297	525	16	11	393208
1/23/03 12:00	284	1037	117	10	1047	423	13	9	317345
1/23/03 13:00	1703	5434	756	50	5484	1954	52	28	1433627
1/23/03 14:00	1644	5656	707	74	5730	2269	113	81	1611187
1/23/03 15:00	4217	15382	1740	147	15529	6281	193	128	4706427
1/23/03 16:00	352	1600	106	12	1611	775	18	13	613066
1/23/03 17:00	6076	22161	2506	211	22372	9048	278	184	6780408
1/23/03 18:00	6896	25153	2845	240	25392	10270	315	209	7695829
1/23/03 19:00	8137	29681	3357	283	29963	12118	372	246	9081203
1/23/03 20:00	2392	8726	987	83	8810	3563	109	72	2669970
1/23/03 21:00	542	1977	224	19	1996	807	25	16	604927
1/23/03 22:00	192	700	79	7	707	286	9	6	214197
1/23/03 23:00	112	410	46	4	414	167	5	3	125503
1/24/03 0:00	112	410	46	4	414	167	5	3	125503
1/24/03 1:00	89	326	37	3	329	133	4	3	99610
1/24/03 2:00	32	115	13	1	116	47	1	1	35233
1/24/03 3:00	0	0	0	0	0	0	0	0	0
Total	33134	120053	13711	1159	121211	48834	1530	1012	36507244
	EMC out	3.62	0.41	0.03	3.66	1.47	0.046	0.031	1101.80

SR 28 at Secret Harbor Creek February 13, 2003 Loading

Stormceptor Inflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
55556	NDOT 4A-2	2/13/03 4:00	7.85	0.86	0.18	4.37	0.039	0.032	4060.00
55557	NDOT 4A-3	2/13/03 5:00	4.92	0.69	0.20	2.97	0.039	0.031	2240.00
55558	NDOT 4A-4	2/13/03 6:00	3.48	0.55	0.14	2.19	0.048	0.038	1480.00
55559	NDOT 4A-5	2/13/03 7:00	2.83	0.73	0.13	1.51	0.051	0.035	926.00
55560	NDOT 4A-6	2/13/03 8:00	4.30	0.76	0.11	2.18	0.048	0.029	1550.00
55561	NDOT 4A-8	2/13/03 9:00	4.36	1.02	0.26	1.51	0.051	0.034	1600.00
		Average	4.33	0.89	0.19	1.85	0.050	0.032	1575.00

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
2/13/03 3:00	0								
2/13/03 4:00	508	3987	437	91	4078	2219	20	16	2062003
2/13/03 5:00	491	2415	339	98	2513	1458	19	15	1099362
2/13/03 6:00	194	674	106	27	701	424	9	7	286469
2/13/03 7:00	276	781	202	36	817	417	14	10	255662
2/13/03 8:00	323	1389	245	36	1424	704	16	9	500570
2/13/03 9:00	316	1376	322	82	1458	477	16	11	504974
2/13/03 10:00	342	2199	452	94	2293	937	25	16	799915
2/13/03 11:00	0								
Total	2449	12820	2103	464	13284	6636	119	85	5508956
	EMC in	5.24	0.86	0.19	5.42	2.71	0.049	0.035	2249.70

Stormceptor Outflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
55562	NDOT 4B-2	2/13/03 4:00	0.87	0.49	<.01	0.14	0.025	0.013	67.00
55563	NDOT 4B-3	2/13/03 5:00	2.30	0.65	0.08	1.00	0.020	0.009	688.00
55564	NDOT 4B-4	2/13/03 6:00	2.70	0.68	0.10	1.15	0.018	0.009	883.00
55565	NDOT 4B-5	2/13/03 7:00	2.52	0.48	0.10	1.26	0.027	0.014	867.00
55566	NDOT 4B-6	2/13/03 8:00	2.23	0.71	0.15	1.06	0.026	0.014	1350.00
55567	NDOT 4B-8	2/13/03 9:00	1.33	0.79	0.14	0.38	0.026	0.013	241.00
		Average	1.78	0.75	0.15	0.72	0.026	0.014	795.50

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
2/13/03 3:00	0								
2/13/03 4:00	508	442	330	41	482	507	10	5	349423
2/13/03 5:00	491	1129	334	49	1178	564	9	4	433365
2/13/03 6:00	194	523	93	19	542	244	5	3	167817
2/13/03 7:00	276	696	196	41	737	293	7	4	372725
2/13/03 8:00	323	720	255	45	765	122	8	4	77831
2/13/03 9:00	316	420	237	46	466	227	8	4	251067
2/13/03 10:00	342	609	256	50	658	246	9	5	271959
2/13/03 11:00	0.0								
Total	2449	4538	1701	291	4829	2203	57	29	1924186
	EMC out	1.85	0.69	0.12	1.97	0.90	0.023	0.012	785.78

SR 28 at Secret Harbor Creek March 15, 2003 Loading

Stormceptor Inflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
55937	NDOT 4A-3	3/15/03 0:25	7.25	0.88	0.09	4.56	0.025	0.006	4260.00
55938	NDOT 4A-4	3/15/03 1:30	4.03	0.88	0.08	2.06	0.022	0.008	1590.00
55939	NDOT 4A-5	3/15/03 2:30	3.41	0.77	0.06	1.83	0.030	0.011	1420.00
55940	NDOT 4A-6	3/15/03 3:35	2.57	0.72	0.05	1.36	0.069	0.039	1030.00
55941	NDOT 4A-7	3/15/03 4:40	2.44	0.53	0.03	1.57	0.073	0.048	1304.00
55942	NDOT 4A-8	3/15/03 5:45	2.96	0.36	0.02	2.16	0.070	0.047	1508.00
55943	NDOT 4A-9	3/15/03 7:00	2.14	0.36	0.02	1.40	0.037	0.047	1120.00
		Average	2.53	0.49	0.03	1.62	0.062	0.045	1240.50
		Average	2.53	0.49	0.03	1.62	0.062	0.045	1240.50
		Average	2.53	0.49	0.03	1.62	0.062	0.045	1240.50
		Average	2.53	0.49	0.03	1.62	0.062	0.045	1240.50
		Average	2.53	0.49	0.03	1.62	0.062	0.045	1240.50
		Average	2.53	0.49	0.03	1.62	0.062	0.045	1240.50

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
3/15/03 0:00	0								
3/15/03 1:00	957	6937	842	86	7023	4363	24	6	4076024
3/15/03 2:00	1513	6099	1332	121	6220	3117	33	12	2406223
3/15/03 3:00	2096	7147	1614	126	7273	3836	63	23	2976267
3/15/03 4:00	4232	10875	3047	212	11087	5755	292	165	4358590
3/15/03 5:00	5974	14576	3166	179	14755	9379	436	287	7789650
3/15/03 6:00	3486	10317	1255	70	10387	7529	244	164	5256223
3/15/03 7:00	6353	13595	2287	127	13722	8894	235	299	7115289
3/15/03 8:00	8675	21926	4272	260	22186	14075	540	393	10761344
3/15/03 9:00	5942	15018	2926	178	15196	9641	370	269	7370906
3/15/03 10:00	1216	3074	599	36	3111	1973	76	55	1508833
3/15/03 11:00	3389	8565	1669	102	8667	5498	211	153	4203850
3/15/03 12:00	3823	9663	1883	115	9777	6203	238	173	4742454
3/15/03 13:00	2471	6245	1217	74	6319	4009	154	112	3065165
3/15/03 14:00	0	0	0	0	0	0	0	0	0
Total	50126	134038	26109	1686	135724	84272	2916	2110	65630820
	EMC in	2.67	0.52	0.03	2.71	1.68	0.058	0.042	1309.32

Stormceptor Outflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
55945	NDOT 4B-3	3/15/03 0:25	1.94	0.91	<.01	0.60	0.034	0.015	408.00
55946	NDOT 4B-4	3/15/03 1:30	1.80	0.99	0.03	0.43	0.029	0.011	228.00
55947	NDOT 4B-5	3/15/03 2:30	2.25	0.91	0.03	0.73	0.023	0.008	456.00
55948	NDOT 4B-6	3/15/03 3:35	2.13	0.73	0.03	0.73	0.023	0.007	500.00
55949	NDOT 4B-7	3/15/03 4:40	2.36	0.68	0.02	1.11	0.030	0.011	1070.00
55950	NDOT 4B-8	3/15/03 5:45	2.83	0.46	0.01	1.63	0.043	0.025	1250.00
55951	NDOT 4B-9	3/15/03 7:00	2.29	0.42	0.01	1.33	0.050	0.032	972.00
		Average	2.40	0.57	0.02	1.20	0.037	0.019	948.00
		Average	2.40	0.57	0.02	1.20	0.037	0.019	948.00
		Average	2.40	0.57	0.02	1.20	0.037	0.019	948.00
		Average	2.40	0.57	0.02	1.20	0.037	0.019	948.00
		Average	2.40	0.57	0.02	1.20	0.037	0.019	948.00
		Average	2.40	0.57	0.02	1.20	0.037	0.019	948.00
		Average	2.40	0.57	0.02	1.20	0.037	0.019	948.00

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
3/15/03 0:00	0								
3/15/03 1:00	957	1856	871	5	1861	570	33	14	390380
3/15/03 2:00	1513	2724	1498	45	2769	652	44	17	345043
3/15/03 3:00	2096	4716	1907	63	4779	1526	48	17	955759
3/15/03 4:00	4232	9013	3089	127	9140	3106	97	30	2115821
3/15/03 5:00	5974	14098	4062	119	14217	6631	179	66	6391814
3/15/03 6:00	3486	9864	1603	35	9899	5681	150	87	4356949
3/15/03 7:00	6353	14548	2668	64	14612	8449	318	203	6175055
3/15/03 8:00	8675	20842	4966	152	20994	10419	317	163	8223905
3/15/03 9:00	5942	14275	3402	104	14379	7136	217	111	5632905
3/15/03 10:00	1216	2922	696	21	2943	1461	44	23	1153062
3/15/03 11:00	3389	8142	1940	59	8201	4070	124	64	3212616
3/15/03 12:00	3823	9185	2189	67	9252	4591	140	72	3624221
3/15/03 13:00	2471	5936	1415	43	5980	2968	90	46	2342424
3/15/03 14:00	0	0	0	0	0	0	0	0	0
Total	50126	118122	30307	904	119026	57261	1800	912	44919954
	EMC out	2.36	0.60	0.02	2.37	1.14	0.036	0.018	896.14

SR 28 at Secret Harbor Creek March 23, 2003 Loading
Stormceptor Inflow

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3	TN	TP	TPsol	OPO4	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 10:00	0	0	0	0	0	0	0	0	0
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 11:00	1833	4015	1164	5	4020	1443	110	55	1001090
56040	NDOT 4A-4	3/23/03 11:25	2.38	0.66	0.00	2.38	0.93	0.080	0.045	668.00	3/23/03 12:00	1985	4725	1310	4	4729	1850	159	89	1326090
56041	NDOT 4A-6	3/23/03 20:30	2.00	0.61	0.00	2.00	0.64	0.040	0.015	424.00	3/23/03 13:00	2371	4741	1446	7	4748	1522	95	36	1005135
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 14:00	4621	10121	2935	12	10132	3637	277	139	2523278
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 15:00	2302	5040	1462	6	5046	1811	138	69	1256660
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 16:00	1031	2258	655	3	2261	812	62	31	563050
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 17:00	915	2004	581	2	2006	720	55	27	499653
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 18:00	723	1584	459	2	1586	569	43	22	394862
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 19:00	1245	2727	791	3	2730	980	75	37	679759
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 20:00	1441	3157	915	4	3160	1134	86	43	787045
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 21:00	2118	4639	1345	5	4645	1667	127	64	1156693
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 22:00	1679	3676	1066	4	3681	1321	101	50	916562
		Average	2.19	0.64	0.00	2.19	0.79	0.060	0.030	546.00	3/23/03 23:00	1152	2522	731	3	2525	906	69	35	628866
											Total	23417	9466	2756	11	9477	3372	254	125	2331225
											EMC in		0.40	0.12	0.00	0.40	0.14	0.011	0.005	100

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3	TN	TP	TPsol	OPO4	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 10:00	0	0	0	0	0	0	0	0	0
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 11:00	1833	2200	1357	2	2202	695	67	34	381368
56044	NDOT 4B-4	3/23/03 11:25	0.87	0.89	0.00	0.87	0.28	0.018	0.008	176.00	3/23/03 12:00	1985	1727	1767	2	1729	552	36	16	349389
56045	NDOT 4B-6	Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 13:00	2371	2845	1754	2	2847	898	87	44	493085
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 14:00	4621	5546	3420	5	5550	1752	169	85	961249
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 15:00	2302	2762	1703	2	2764	872	84	43	478728
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 16:00	1031	1237	763	1	1239	391	38	19	214495
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 17:00	915	1098	677	1	1099	347	33	17	190344
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 18:00	723	868	535	1	869	274	26	13	150424
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 19:00	1245	1494	921	1	1495	472	45	23	258956
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 20:00	1441	1730	1067	1	1731	546	53	27	299827
		3/23/03 20:30	1.53	0.59	0.00	1.53	0.48	0.055	0.029	240.00	3/23/03 21:00	2118	3241	1250	2	3243	1017	117	61	508437
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 22:00	1679	2014	1242	2	2016	636	61	31	349166
		Average	1.20	0.74	0.00	1.20	0.38	0.037	0.019	208.00	3/23/03 23:00	1152	1382	852	1	1383	437	42	21	239568
											Total	23417	4572	3521	4	4576	1450	122	60	842474
											EMC out		0.20	0.15	0.00	0.20	0.06	0.005	0.003	35.98

Total Load (IN) miligrams
Average Concentration Value Used for flow volumes without concentrations

			TKN	TKNsol	NO3	TN	TP	TPsol	OPO4	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
		Average	1.88	0.51	0.00	1.88	0.84	0.047	0.022	578.00	3/26/03 5:00	0	0	0	0	0	0	0	0	0
		Average	1.88	0.51	0.00	1.88	0.84	0.047	0.022	578.00	3/26/03 6:00	111	208	56	0	208	94	5	2	64178
56042	NDOT 4A-7	3/26/03 6:55	1.74	0.57	0.00	1.74	0.60	0.039	0.016	424.00	3/26/03 7:00	577	1004	329	1	1005	345	23	9	244724
56043	NDOT 4A-8	3/26/03 8:00	2.01	0.44	0.00	2.01	1.09	0.055	0.027	732.00	3/26/03 8:00	4713	9472	2074	5	9477	5137	259	127	3449685
		Average	1.88	0.51	0.00	1.88	0.84	0.047	0.022	578.00	3/26/03 9:00	3660	6863	1848	4	6866	3087	172	79	2115510
		Average	1.88	0.51	0.00	1.88	0.84	0.047	0.022	578.00	3/26/03 10:00	2518	4721	1271	3	4723	2124	118	54	1455230
		Average	1.88	0.51	0.00	1.88	0.84	0.047	0.022	578.00	3/26/03 11:00	0	0	0	0	0	0	0	0	0
											Total	11579	10477	2403	5	10482	5481	282	136	3694409
											EMC in		0.90	0.21	0.00	0.91	0.47	0.024	0.012	319

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

			TKN	TKNsol	NO3	TN	TP	TPsol	OPO4	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
		Average	1.46	0.64	0.00	1.46	0.39	0.060	0.031	151.00	3/26/03 5:00	0	0	0	0	0	0	0	0	0
		Average	1.46	0.64	0.00	1.46	0.39	0.060	0.031	151.00	3/26/03 6:00	111	162	71	0	162	43	7	3	16766
56046	NDOT 4B-7	3/26/03 6:55	1.53	0.64	0.00	1.53	0.46	0.047	0.022	180.00	3/26/03 7:00	577	883	369	1	884	263	27	13	103892
56047	NDOT 4B-8	3/26/03 8:00	1.38	0.63	0.00	1.38	0.32	0.072	0.040	122.00	3/26/03 8:00	4713	6504	2969	5	6508	1494	339	189	574948
		Average	1.46	0.64	0.00	1.46	0.39	0.060	0.031	151.00	3/26/03 9:00	3660	5325	2324	5	5331	1415	218	113	552668
		Average	1.46	0.64	0.00	1.46	0.39	0.060	0.031	151.00	3/26/03 10:00	2518	3663	1599	4	3667	973	150	78	380173
		Average	1.46	0.64	0.00	1.46	0.39	0.060	0.031	151.00	3/26/03 11:00	0	0	0	0	0	0	0	0	0
											Total	11579	7387	3338	6	7392	1757	366	201	678840
											EMC out		0.64	0.29	0.00	0.64	0.15	0.032	0.017	58.63

SR 28 at Secret Harbor Creek April 2, 2003 Loading

Stormceptor Inflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3 mg/l	TP mg/l	TPsol mg/l	OPO4 mg/l	TSS mg/l
		Average	2.80	1.71	0.24	0.66	0.063	0.025	532.50
		Average	2.80	1.71	0.24	0.66	0.063	0.025	532.50
		Average	2.80	1.71	0.24	0.66	0.063	0.025	532.50
		Average	2.80	1.71	0.24	0.66	0.063	0.025	532.50
		Average	2.80	1.71	0.24	0.66	0.063	0.025	532.50
		Average	2.80	1.71	0.24	0.66	0.063	0.025	532.50
56088	NDOT 4A-2	4/2/03 15:20	2.80	1.63	0.23	0.65	0.048	0.016	532.50
		Average	2.80	1.71	0.24	0.66	0.063	0.025	532.50
		Average	2.80	1.71	0.24	0.66	0.063	0.025	532.50
		Average	2.80	1.79	0.24	0.68	0.079	0.033	532.50
56089	NDOT 4A-4	4/2/03 20:05	2.79	1.95	0.25	0.70	0.109	0.050	508.00
		Average	2.64	1.91	0.24	0.67	0.112	0.050	532.50
56090	NDOT 4A-5	4/2/03 21:10	2.49	1.86	0.23	0.64	0.114	0.049	557.00
		Average	2.64	1.91	0.24	0.67	0.112	0.050	532.50

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
4/2/03 10:00	0	0	0	0	0	0	0	0	0
4/2/03 11:00	368	1028	629	86	1114	244	23	9	195770
4/2/03 12:00	1349	3770	2306	317	4087	894	85	33	718198
4/2/03 13:00	599	1675	1025	141	1816	397	38	15	319174
4/2/03 14:00	499	1396	854	117	1513	331	32	12	265898
4/2/03 15:00	1170	3271	2001	275	3546	776	74	29	623188
4/2/03 16:00	1411	3951	2300	325	4275	919	68	23	751329
4/2/03 17:00	429	1198	733	101	1299	284	27	11	228272
4/2/03 18:00	1136	3175	1942	267	3442	753	72	28	604834
4/2/03 19:00	646	1804	1156	155	1959	436	51	21	343771
4/2/03 20:00	476	1329	929	119	1448	333	52	24	241904
4/2/03 21:00	272	719	519	65	785	183	30	13	145058
4/2/03 22:00	177	442	330	41	482	114	20	9	98789
4/2/03 23:00	88	232	167	21	253	59	10	4	46707
Total	8620	23988	14890	2030	26018	5722	582	230	4582892
	EMC in	2.78	1.73	0.24	3.02	0.66	0.067	0.027	532

Stormceptor Outflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
		Average	1.26	0.57	0.04	0.36	0.039	0.016	180.00
		Average	1.26	0.57	0.04	0.36	0.039	0.016	180.00
		Average	1.26	0.57	0.04	0.36	0.039	0.016	180.00
		Average	1.26	0.57	0.04	0.36	0.039	0.016	180.00
		Average	1.26	0.57	0.04	0.36	0.039	0.016	180.00
		Average	1.26	0.57	0.04	0.36	0.039	0.016	180.00
56091	NDOT 4B-2	4/2/03 15:20	1.15	0.52	0.01	0.32	0.055	0.027	128.00
		Average	1.26	0.57	0.04	0.36	0.039	0.016	180.00
		Average	1.26	0.57	0.04	0.36	0.039	0.016	180.00
		Average	1.26	0.57	0.04	0.36	0.039	0.016	180.00
56092	NDOT 4B-4	4/2/03 20:05	1.37	0.62	0.06	0.40	0.023	0.004	232.00
		Average	1.41	0.65	0.08	0.39	0.032	0.008	222.00
56093	NDOT 4B-5	4/2/03 21:10	1.45	0.68	0.10	0.39	0.040	0.012	212.00
		Average	1.41	0.65	0.08	0.39	0.032	0.008	222.00

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
4/2/03 10:00	0	0	0	0	0	0	0	0	0
4/2/03 11:00	368	463	210	13	477	132	14	6	66176
4/2/03 12:00	1349	1699	769	49	1749	484	53	21	242771
4/2/03 13:00	599	755	342	22	777	215	23	9	107890
4/2/03 14:00	499	629	285	18	647	179	19	8	89881
4/2/03 15:00	1170	1475	667	43	1517	420	46	18	210655
4/2/03 16:00	1411	1623	734	13	1635	452	78	38	180601
4/2/03 17:00	429	540	244	16	556	154	17	7	77162
4/2/03 18:00	1136	1431	647	41	1473	407	44	18	204451
4/2/03 19:00	646	813	368	24	837	231	25	10	116204
4/2/03 20:00	476	652	295	30	683	189	11	2	110476
4/2/03 21:00	272	384	177	22	406	107	9	2	60475
4/2/03 22:00	177	257	121	18	275	69	7	2	37600
4/2/03 23:00	88	124	57	7	131	35	3	1	19472
Total	8620	10846	4915	317	11163	3073	349	141	1523815
	EMC out	1.26	0.57	0.04	1.29	0.36	0.040	0.016	177

SR 28 at Secret Harbor Creek April 14-17, 2003 Loading

Stormceptor Inflow

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											4/14/03 12:00	0								
		Average	1.70	0.24	0.03	1.73	0.98	0.021	0.014	721.33	4/14/03 13:00	133	226	31	4	230	130	3	2	95995
		Average	1.70	0.24	0.03	1.73	0.98	0.021	0.014	721.33	4/14/03 14:00	41	70	10	1	71	40	1	1	29809
56190	NDOT4A-2	4/14/03 14:10	1.73	0.27	0.03	1.76	0.87	0.013	0.007	696.00	4/14/03 15:00	294	508	79	8	517	255	4	2	204549
56191	NDOT4A-3	4/14/03 15:15	1.83	0.23	0.03	1.86	1.16	0.022	0.014	844.00	4/14/03 16:00	644	1178	148	20	1198	747	14	9	543386
56192	NDOT4A-4	4/14/03 16:20	1.54	0.21	0.02	1.56	0.90	0.027	0.020	624.00	4/14/03 17:00	571	879	120	12	891	514	15	11	356109
		Average	1.70	0.24	0.03	1.73	0.98	0.021	0.014	721.33	4/14/03 18:00	308	524	73	8	532	300	6	4	222191
		Average	1.70	0.24	0.03	1.73	0.98	0.021	0.014	721.33	4/14/03 19:00	0	0	0	0	0	0	0	0	0
											Total	1991	3386	461	53	3439	1985	43	29	1452040
												EMC in	1.70	0.23	0.03	1.73	1.00	0.022	0.015	729.36

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											4/15/03 13:00	0	0	0	0	0	0	0	0	0
56193	NDOT4A-5	4/15/03 13:10	0.96	0.16	0.02	0.98	0.56	0.014	0.009	408.00	4/15/03 14:00	89	85	14	1	86	50	1	1	36151
			0.96	0.16	0.02	0.98	0.56	0.014	0.009	408.00	4/15/03 15:00	131	126	21	2	128	74	2	1	53544
											4/15/03 16:00	0	0	0	0	0	0	0	0	0
											Total	220	211	35	3	214	124	3	2	89694
												EMC in	0.96	0.16	0.02	0.98	0.56	0.014	0.009	408.00

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											4/16/03 17:00	0								
		Average	1.39	0.52	0.087	1.472	0.6535	0.03625	0.02325	435	4/16/03 18:00	11	16	6	1	17	7	0	0	4893
			1.40	0.59	0.11	1.51	0.57	0.025	0.014	340.00	4/16/03 19:00	48	67	28	5	72	27	1	1	16299
56194	NDOT4A-6	4/16/03 19:15	1.40	0.59	0.11	1.51	0.57	0.025	0.014	340.00	4/16/03 20:00	107	150	63	12	162	61	3	1	36424
56195	NDOT4A-7	4/16/03 20:20	1.56	0.57	0.11	1.67	0.64	0.040	0.026	488.00	4/16/03 21:00	165	258	94	18	276	106	7	4	80688
56196	NDOT4A-8	4/16/03 21:20	1.26	0.53	0.08	1.34	0.63	0.036	0.024	348.00	4/16/03 22:00	235	296	125	18	314	149	8	6	81758
56197	NDOT4A-9	4/16/03 22:30	1.32	0.39	0.05	1.37	0.77	0.044	0.029	564.00	4/16/03 23:00	356	470	139	18	488	273	16	10	200943
		Average	1.39	0.52	0.09	1.47	0.65	0.036	0.023	435.00	4/17/03 0:00	414	573	215	36	609	270	15	10	179987
											4/17/03 1:00	0								
											Total	1337	1830	670	108	1938	895	50	32	600992
												EMC in	1.37	0.50	0.08	1.45	0.67	0.037	0.024	449.63

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											4/17/03 6:00	0	0	0	0	0	0	0	0	0
56198	NDOT4A-10	4/17/03 6:40	1.55	0.42	0.06	1.61	0.96	0.047	0.034	696.00	4/17/03 7:00	15	23	6	1	24	14	1	1	10488
			1.55	0.42	0.06	1.61	0.96	0.047	0.034	696.00	4/17/03 8:00	42	65	18	3	68	40	2	1	29213
											4/17/03 9:00	0	0	0	0	0	0	0	0	0
											4/17/03 12:00	0	0	0	0	0	0	0	0	0
56199	NDOT4A-11	4/17/03 12:55	3.76	0.40	0.07	3.83	2.90	0.032	0.019	2160.00	4/17/03 13:00	119	447	48	8	455	345	4	2	256713
56200	NDOT4A-12	4/17/03 14:00	2.24	0.33	0.04	2.28	1.58	0.037	0.024	1100.00	4/17/03 14:00	168	376	55	7	384	266	6	4	184866
		Average	3.00	0.37	0.06	3.06	2.24	0.035	0.022	1630.00	4/17/03 15:00	220	659	80	12	672	492	8	5	358298
											4/17/03 16:00	0	0	0	0	0	0	0	0	0
											Total	564	1571	207	32	1603	1157	20	13	839578
												EMC in	2.79	0.37	0.06	2.84	2.05	0.04	0.02	1489.23

Stormceptor Outflow

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											4/14/03 12:00	0								
		Average	1.02	0.21	0.02	1.05	0.55	0.022	0.014	313.33	4/14/03 13:00	133	136	28	3	139	73	3	2	41698
		Average	1.02	0.21	0.02	1.05	0.55	0.022	0.014	313.33	4/14/03 14:00	41	42	9	1	43	23	1	1	12949
56201	NDOT4B-2	4/14/03 14:10	0.81	0.26	0.02	0.83	0.36	0.017	0.009	152.00	4/14/03 15:00	294	238	76	7	245	105	5	3	44672
56202	NDOT4B-3	4/14/03 15:15	1.12	0.19	0.03	1.15	0.64	0.023	0.015	376.00	4/14/03 16:00	644	721	122	20	741	411	15	10	242077
56203	NDOT4B-4	4/14/03 16:20	1.14	0.17	0.02	1.16	0.65	0.026	0.018	412.00	4/14/03 17:00	571	651	97	10	660	372	15	10	235124
		Average	1.02	0.21	0.02	1.05	0.55	0.022	0.014	313.33	4/14/03 18:00	308	315	64	7	323	169	7	4	96515
											4/14/03 19:00	0	0	0	0	0	0	0	0	0
											Total	1991	2103	395	48	2152	1153	45	29	673035
												EMC out	1.06	0.20	0.02	1.08	0.58	0.023	0.015	338.07

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											4/15/03 13:00	0	0	0	0	0	0	0	0	0
56204	NDOT4B-5	4/15/03 13:10	0.71	0.19	0.00	0.71	0.33	0.023	0.016	164.00	4/15/03 14:00	89	63	17	0	63	29	2	1	14531
			0.71	0.19	0.00	0.71	0.33	0.023	0.016	164.00	4/15/03 15:00	131	93	25	0	94	43	3	2	21522
											4/15/03 16:00	0	0	0	0	0	0	0	0	0
											Total	220	156	42	1	157	73	5	4	36054
												EMC out	0.71	0.19	0.00	0.71	0.33	0.023	0.016	164.00

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											4/16/03 17:00	0	0	0	0	0	0	0	0	0
		Average	1.03	0.3575	0.059	1.084	0.393	0.0405	0.0125	252	4/16/03 18:00	11	12	4	1	12	4	0	0	2835
		Average	1.03	0.3575	0.059	1.084	0.393	0.0405	0.0125	252	4/16/03 19:00	48	49	17	3	52	19	2	1	12080
56205	NDOT4B-6	4/16/03 19:15	0.63	0.23	0.03	0.66	0.22	0.016	0.009	132.00	4/16/03 20:00	107	67	25	3	70	24	2	1	14141
56206	NDOT4B-7	4/16/03 20:20	1.06	0.38	0.06	1.12	0.38	0.091	0.011	280.00	4/16/03 21:00	165	175	63	11	186	63	15	2	46296
56207	NDOT4B-8	4/16/03 21:20	1.30	0.45	0.08	1.38	0.49	0.026	0.012	316.00	4/16/03 22:00	235	305	106	18	324	116	6	3	74240
56208	NDOT4B-9	4/16/03 22:30	1.11	0.37	0.07	1.18	0.47	0.029	0.018	280.00	4/16/03 23:00	356	395	132	24	419	168	10	6	99759
		Average	1.03	0.36	0.06	1.08	0.39	0.041	0.013	252.00	4/17/03 0:00	414	424	148	24	448	163	17	5	104268
											4/17/03 1:00	0								
											Total	1337	1428	494	83	1511	557	52	18	353620
												EMC out	1.07	0.37	0.06	1.13	0.42	0.039	0.013	264.56

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l										
											4/17/03 6:00	0	0	0	0	0	0	0	0	0
56209	NDOT4B-10	4/17/03 6:40	0.84	0.33	0.06	0.90	0.32	0.027	0.017	184.00	4/17/03 7:00	15	13	5	1	13	5	0	0	2773
			0.84	0.33	0.06	0.90	0.32	0.027	0.017	184.00	4/17/03 8:00	42	35	14	2	38	14	1	1	7723
											4/17/03 9:00	0	0	0	0	0	0	0	0	0
											4/17/03 12:00	0	0	0	0	0	0	0	0	0
56210	NDOT4B-11	4/17/03 12:55	1.27	0.34	0.05	1.32	0.72	0.023	0.011	416.00	4/17/03 13:00	119	151	40	6	157	85	3	1	49441
56211	NDOT4B-12	4/17/03 14:00	1.42	0.33	0.05	1.47	0.77	0.021	0.011	516.00	4/17/03 14:00	168	239	55	8	246	130	4	2	86719
		Average	1.35	0.34	0.05	1.39	0.74	0.022	0.011	466.00	4/17/03 15:00	220	296	74	10	306	164	5	2	102434
											4/17/03 16:00	0	0	0	0	0	0	0	0	0
											Total	564	733	188	27	760	397	13	7	249089
												EMC out	1.30	0.33	0.05	1.35	0.70	0.022	0.012	441.83

SR 28 at Secret Harbor Creek May 3-4, 2003 Loading

Stormceptor Inflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
			1.78	0.34	0.066	1.85	1.18	0.019	0.008	952
56433	NDOT 4A-5	5/3/03 23:35	1.78	0.34	0.066	1.85	1.18	0.019	0.008	952
56434	NDOT 4A-6	5/4/03 0:45	1.17	0.31	0.16	1.33	0.65	0.023	0.013	412
56435	NDOT 4A-7	5/4/03 1:50	1.02	0.30	0.11	1.13	0.47	0.030	0.019	268
56436	NDOT 4A-8	5/4/03 2:55	0.83	0.27	0.081	0.91	0.35	0.030	0.020	228
56437	NDOT 4A-9	5/4/03 3:55	0.83	0.30	0.085	0.92	0.31	0.024	0.015	208
			0.83	0.30	0.085	0.92	0.31	0.024	0.015	208
			0.83	0.30	0.085	0.92	0.31	0.024	0.015	208

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
5/3/03 22:00	0	0	0	0	0	0	0	0	0
5/3/03 23:00	764	1359	260	50	1410	901	15	6	727063
5/4/03 0:00	291	517	99	19	536	343	6	2	276593
5/4/03 1:00	1366	1598	423	219	1817	893	31	18	562760
5/4/03 2:00	1284	1310	385	141	1451	597	39	24	344196
5/4/03 3:00	598	496	161	48	545	208	18	12	136319
5/4/03 4:00	568	472	170	48	520	175	14	9	118212
5/4/03 5:00	299	248	90	25	273	92	7	4	62157
5/4/03 6:00	8	6	2	1	7	2	0	0	1562
5/4/03 7:00	0	0	0	0	0	0	0	0	0
Total	5177	6007	1591	552	6559	3212	129	76	2228862
	EMC In	1.16	0.31	0.11	1.27	0.62	0.025	0.015	430.53

Stormceptor Outflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
			1.55	0.37	0.007	1.56	0.80	0.016	0.005	600
56440	NDOT 4B-5	5/3/03 23:35	1.55	0.37	0.007	1.56	0.80	0.016	0.005	600
56441	NDOT 4B-6	5/4/03 0:45	1.50	0.36	0.20	1.70	0.76	0.019	0.010	588
56442	NDOT 4B-7	5/4/03 1:50	0.98	0.30	0.11	1.09	0.48	0.023	0.015	332
56443	NDOT 4B-8	5/4/03 2:55	0.89	0.30	0.074	0.96	0.36	0.030	0.020	224
56444	NDOT 4B-9	5/4/03 3:55	0.73	0.23	0.09	0.82	0.31	0.025	0.017	200
			0.73	0.23	0.09	0.82	0.31	0.025	0.017	200

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
5/3/03 22:00	0	0	0	0	0	0	0	0	0
5/3/03 23:00	764	1184	283	5	1189	608	12	4	458233
5/4/03 0:00	291	450	107	2	452	231	5	1	174323
5/4/03 1:00	1366	2049	492	273	2322	1035	26	14	803163
5/4/03 2:00	1284	1259	385	141	1400	613	30	19	426392
5/4/03 3:00	598	532	179	44	576	213	18	12	133928
5/4/03 4:00	568	415	131	51	466	176	14	10	113665
5/4/03 5:00	299	218	69	27	245	93	7	5	59766
5/4/03 6:00	8	5	2	1	6	2	0	0	1502
5/4/03 7:00	0	0	0	0	0	0	0	0	0
Total	5177	6112	1648	545	6657	2972	112	65	2170972
	EMC Out	1.18	0.32	0.11	1.29	0.57	0.022	0.013	419.34

SR 28 at Secret Harbor Creek June 23, 2003 Loading

Stormceptor Inflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3 mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4 mg/l	TSS mg/l
56859	NDOT 4A-1	6/23/03 12:25	12.30	7.33	1.05	13.35	1.14	0.184	0.073	656.00
56860	NDOT 4A-2	6/23/03 13:30	6.48	3.63	0.98	7.46	0.96	0.116	0.032	552.00
56861	NDOT 4A-3	6/23/03 14:35	5.50	3.60	1.11	6.61	0.89	0.223	0.119	304.00
56862	NDOT 4A-4	6/23/03 15:40	4.12	2.33	0.80	4.92	0.69	0.187	0.102	256.00
		Average	5.37	3.19	0.96	6.33	0.84	0.175	0.084	370.67

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
6/23/03 12:00	0	0	0	0	0	0	0	0	0
6/23/03 13:00	3321	40849	24343	3487	44336	3786	611	242	2178599
6/23/03 14:00	3350	21710	12162	3283	24994	3206	389	107	1849398
6/23/03 15:00	2993	16459	10773	3322	19781	2654	667	356	909729
6/23/03 16:00	3167	13049	7380	2534	15582	2176	592	323	810796
6/23/03 17:00	3293	17674	10494	3172	20846	2778	577	278	1220682
6/23/03 18:00	0	0	0	0	0	0	0	0	0
Total	16124	109740	65152	15798	125539	14601	2837	1307	6969203
	EMC in	6.81	4.04	0.98	7.79	0.91	0.176	0.081	432.22

Stormceptor Outflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3 mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4 mg/l	TSS mg/l
56863	NDOT 4B-1	6/23/03 12:25	4.42	2.43	0.02	4.44	0.38	0.045	0.009	156.00
56864	NDOT 4B-2	6/23/03 13:30	3.78	1.82	0.16	3.94	0.60	0.033	0.008	364.00
56865	NDOT 4B-3	6/23/03 14:35	2.98	1.13	0.32	3.30	0.69	0.028	0.005	408.00
56866	NDOT 4B-4	6/23/03 15:40	3.65	1.76	0.64	4.29	0.69	0.046	0.005	340.00
		Average	3.47	1.57	0.37	3.84	0.66	0.036	0.006	370.67

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
6/23/03 12:00	0	0	0	0	0	0	0	0	0
6/23/03 13:00	3321	14679	8070	66	14745	1249	149	30	518082
6/23/03 14:00	3350	12664	6098	536	13200	2014	111	27	1219530
6/23/03 15:00	2993	8918	3382	958	9875	2077	84	15	1220951
6/23/03 16:00	3167	11560	5574	2027	13587	2192	146	16	1076838
6/23/03 17:00	3293	11427	5170	1229	12657	2181	117	20	1220682
6/23/03 18:00	0	0	0	0	0	0	0	0	0
Total	16124	59249	28294	4817	64065	9712	607	107	5256083
	EMC out	3.67	1.75	0.30	3.97	0.60	0.038	0.007	325.97

SR 28 at Secret Harbor Creek June 22, 2003 Loading

Stormceptor Inflow

Lab #	Sample Name	Sample Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
57088	NDOT 4A-2	7/22/03 16:30	9.88	3.62	0.10	9.98	2.38	0.059	0.008	2000.00
57089	NDOT 4A-3	7/22/03 17:35	7.03	3.53	0.16	7.19	1.53	0.469	0.346	1070.00

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
7/22/03 16:00	0	0	0	0	0	0	0	0	0
7/22/03 17:00	6262	61870	22669	626	62497	14904	369	50	12524361
7/22/03 18:00	1551	10903	5475	248	11151	2373	727	537	1659516
Total	7813	72774	28144	874	73648	17277	1097	587	14183877
	EMC in	9.31	3.60	0.11	9.43	2.21	0.140	0.075	1815

Stormceptor Outflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
57090	NDOT 4B-2	7/22/03 16:30	6.17	3.10	0.04	6.21	1.08	0.112	0.025	680.00
57091	NDOT 4B-3	7/22/03 17:35	4.49	2.10	0.04	4.53	0.91	0.048	0.013	464.00

Total Load (Out) miligrams

Average Concentı Liters/hour

Time		TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
7/22/03 16:00	0	0	0	0	0	0	0	0	0
7/22/03 17:00	6262	38638	19413	257	38894	6763	701	157	4258283
7/22/03 18:00	1551	6964	3257	54	7018	1405	74	20	719640
Total	7813	45601	22670	311	45912	8168	776	177	4977923
	EMC out	5.84	2.90	0.04	5.88	1.05	0.099	0.023	637

SR 28 at Secret Harbor Creek July 23, 2003 Loading

Stormceptor Inflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
57119	NDOT 4A-2	7/23/03 15:20	4.33	1.40	0.20	4.53	1.95	0.031	0.004	1470.00
57120	NDOT 4A-3	7/23/03 16:25	2.15	0.52	0.16	2.31	1.31	0.092	0.046	788.00

Total Load (In) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
7/23/03 15:00	0	0	0	0	0	0	0	0	0
7/23/03 16:00	6662	28848	9327	1332	30180	12992	207	27	9793621
7/23/03 17:00	1982	4262	1031	317	4579	2597	182	91	1561914
7/23/03 18:00	0	0	0	0	0	0	0	0	0
Total	8644	33109	10358	1650	34759	15588	389	118	11355535
	EMC in	3.83	1.20	0.19	4.02	1.80	0.04	0.014	1314

Stormceptor Outflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
57121	NDOT 4B-2	7/23/03 15:20	4.10	1.43	0.02	4.12	1.85	0.034	0.006	1540.00
57122	NDOT 4B-3	7/23/03 16:25	2.25	0.60	0.027	2.28	1.15	0.028	0.004	772.00

Total Load (Out) miligrams

Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
7/23/03 15:00	0	0	0	0	0	0	0	0	0
7/23/03 16:00	6662	27316	9527	133	27449	12325	227	40	10259984
7/23/03 17:00	1982	4460	1189	54	4513	2279	55	8	1530200
7/23/03 18:00	0	0	0	0	0	0	0	0	0
Total	8644	31775	10716	187	31962	14605	282	48	11790184
	EMC out	3.68	1.24	0.02	3.70	1.69	0.03	0.006	1364

SR 28 at Secret Harbor Creek February 13, 2003 Loading

Stormceptor Inflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
		Average	3.21	1.68	0.46	3.66	0.67	0.051	0.017	430.00
		Average	3.21	1.68	0.46	3.66	0.67	0.051	0.017	430.00
57180	NDOT 4A-2	8/1/03 20:40	3.18	1.35	0.21	3.39	0.83	0.026	0.003	632.00
		Average	3.21	1.68	0.46	3.66	0.67	0.051	0.017	430.00
		Average	3.21	1.68	0.46	3.66	0.67	0.051	0.017	430.00
		Average	3.21	1.68	0.46	3.66	0.67	0.051	0.017	430.00
57181	NDOT 4A-3	8/2/03 0:30	3.23	2.00	0.70	3.93	0.51	0.075	0.030	228.00
		Average	3.21	1.68	0.46	3.66	0.67	0.051	0.017	430.00

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
8/1/03 19:00	0	0	0	0	0	0	0	0	0
8/1/03 20:00	717	2299	1202	326	2625	481	36	12	308452
8/1/03 21:00	2113	6718	2852	444	7162	1751	55	6	1335181
8/1/03 22:00	1598	5122	2677	727	5850	1071	81	26	687245
8/1/03 23:00	933	2989	1562	424	3413	625	47	15	401034
8/2/03 0:00	859	2752	1438	391	3142	575	43	14	369175
8/2/03 1:00	1438	4644	2876	1007	5651	735	108	43	327838
8/2/03 2:00	0	0	0	0	0	0	0	0	0
Total	7657	24525	12607	3319	27843	5238	370	117	3428925
	EMC in	3.20	1.65	0.43	3.64	0.68	0.048	0.015	447.80

Stormceptor Outflow

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l
		Average	7.87	1.91	0.18	8.05	1.80	0.044	0.016	805.00
		Average	7.87	1.91	0.18	8.05	1.80	0.044	0.016	805.00
57182	NDOT 4B-2	8/1/03 20:40	2.64	1.18	0.16	2.80	0.76	0.022	0.004	500.00
		Average	7.87	1.91	0.18	8.05	1.80	0.044	0.016	805.00
		Average	7.87	1.91	0.18	8.05	1.80	0.044	0.016	805.00
		Average	7.87	1.91	0.18	8.05	1.80	0.044	0.016	805.00
57183	NDOT 4B-3	8/2/03 0:30	13.10	2.64	0.19	13.29	2.84	0.066	0.028	1110.00
		Average	7.87	1.91	0.18	8.05	1.80	0.044	0.016	805.00

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
8/1/03 19:00	0	0	0	0	0	0	0	0	0
8/1/03 20:00	717	5645	1370	126	5771	1292	32	11	577451
8/1/03 21:00	2113	5577	2493	338	5915	1608	46	8	1056314
8/1/03 22:00	1598	12578	3053	280	12858	2878	70	26	1286587
8/1/03 23:00	933	7340	1781	163	7503	1679	41	15	750772
8/2/03 0:00	859	6757	1640	150	6907	1546	38	14	691131
8/2/03 1:00	1438	18836	3796	273	19110	4084	95	40	1596053
8/2/03 2:00	0	0	0	0	0	0	0	0	0
Total	7657	56734	14133	1330	58064	13086	322	114	5958308
	EMC out	7.41	1.85	0.17	7.58	1.71	0.042	0.015	778.12

SR 28 at Secret Harbor Creek November 3, 2003 Loading

Stormceptor Inflow

Total Load (In) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
											11/3/03 10:00	0	0	0	0	0	0	0	0	0
			9.38	3.18	0.46	9.84	1.97	0.276	0.212	1260.00	11/3/03 10:10	53	497	169	24	521	104	15	11	66775
57779	NDOT 4A-2	11/3/03 10:20	9.38	3.18	0.46	9.84	1.97	0.276	0.212	1260.00	11/3/03 10:20	197	1846	626	91	1937	388	54	42	248020
57780	NDOT 4A-3	11/3/03 10:25	9.25	3.10	0.51	9.76	2.20	0.309	0.230	1300.00		98	910	305	50	961	217	30	23	127947
57781	NDOT 4A-4	11/3/03 10:30	9.99	2.16	0.44	10.43	3.03	0.337	0.255	2050.00	11/3/03 10:30	98	983	213	43	1027	298	33	25	201762
57782	NDOT 4A-6	11/3/03 10:40	9.27	2.18	0.42	9.69	2.67	0.350	0.262	1700.00	11/3/03 10:40	53	491	116	22	514	141	19	14	90093
57783	NDOT 4A-7	11/3/03 10:45	8.52	4.46	0.38	8.9	2.53	0.356	0.260	1570.00		49	419	219	19	438	125	18	13	77260
57784	NDOT 4A-8	11/3/03 10:50	8.52	4.23	0.37	8.89	2.46	0.351	0.255	1650.00	11/3/03 10:50	49	419	208	18	437	121	17	13	81197
57785	NDOT 4A-9	11/3/03 10:55	8.65	4.26	0.38	9.03	2.80	0.355	0.250	1720.00		49	426	210	19	444	138	17	12	84642
57786	NDOT 4A-10	11/3/03 11:00	9.53	4.37	0.38	9.91	3.23	0.354	0.251	1950.00	11/3/03 11:00	49	469	215	19	488	159	17	12	95960
57787	NDOT 4A-11	11/3/03 11:05	9.42	4.62	0.40	9.82	3.07	0.349	0.246	2110.00		26	250	122	11	260	81	9	7	55911
57788	NDOT 4A-12	11/3/03 11:10	9.07	4.62	0.39	9.46	3.05	0.340	0.248	2010.00	11/3/03 11:10	26	240	122	10	251	81	9	7	53261
57789	NDOT 4A-13	11/3/03 11:15	9.13	4.57	0.41	9.54	2.88	0.346	0.249	1760.00		26	242	121	11	253	76	9	7	46636
57790	NDOT 4A-14	11/3/03 11:20	9.20	4.67	0.39	9.59	2.85	0.353	0.251	1780.00	11/3/03 11:20	26	244	124	10	254	76	9	7	47166
57791	NDOT 4A-15	11/3/03 11:25	8.75	4.48	0.42	9.17	2.70	0.351	0.251	1750.00		9	83	42	4	87	26	3	2	16561
57792	NDOT 4A-16	11/3/03 11:30	8.65	4.57	0.39	9.04	2.55	0.349	0.243	1520.00	11/3/03 11:30	9	82	43	4	86	24	3	2	14385
57793	NDOT 4A-17	11/3/03 11:35	8.20	4.51	0.39	8.59	2.40	0.341	0.246	1460.00	11/3/03 11:40	19	155	85	7	163	45	6	5	27634
57794	NDOT 4A-18	11/3/03 11:50	8.13	4.71	0.36	8.49	2.20	0.348	0.248	1330.00	11/3/03 11:50	19	154	89	7	161	42	7	5	25173
57795	NDOT 4A-19	11/3/03 11:55	8.35	4.75	0.36	8.71	2.34	0.360	0.245	1460.00		26	221	126	10	231	62	10	6	38687
57796	NDOT 4A-20	11/3/03 12:00	8.65	4.72	0.39	9.04	2.55	0.348	0.240	1760.00	11/3/03 12:00	26	229	125	10	240	68	9	6	46636
57797	NDOT 4A-21	11/3/03 12:05	9.26	4.85	0.41	9.67	2.57	0.346	0.233	1600.00		0	0	0	0	0	0	0	0	0
57798	NDOT 4A-22	11/3/03 12:10	9.18	4.98	0.38	9.56	2.45	0.360	0.244	1550.00	11/3/03 12:10	0	0	0	0	0	0	0	0	0
57799	NDOT 4A-23	11/3/03 12:15	8.88	5.01	0.38	9.26	2.41	0.370	0.251	1480.00	11/3/03 12:20	0	0	0	0	0	0	0	0	0
											Total	912	8361	3281	389	8750	2271	296	218	1445706
												EMC in	9.17	3.60	0.43	9.59	2.49	0.32	0.24	1585

Stormceptor Outflow

Total Load (Out) miligrams
Average Concentration Value Used for flow volumes without concentrations

Lab #	Sample Name	Time	TKN mg/l	TKNsol mg/l	NO3-N mg/l	TN mg/l	TP mg/l	TPsol mg/l	OPO4-P mg/l	TSS mg/l	Time	Interval Liters	TKN	TKNsol	NO3-N	TN	TP	TPsol	OPO4-P	TSS
											11/3/03 10:00	0	0	0	0	0	0	0	0	0
			3.42	2.6	0.13	3.55	0.698	0.238	0.169	440.00	11/3/03 10:10	53	181	138	7	188	37	13	9	23318
57757	NDOT 4B-2	11/3/03 10:20	3.42	2.6	0.13	3.55	0.698	0.238	0.169	440.00	11/3/03 10:20	197	673	512	26	699	137	47	33	86610
57758	NDOT 4B-3	11/3/03 10:25	3.09	2.17	0.12	3.21	0.68	0.208	0.147	272.00		98	304	214	12	316	67	20	14	26770
57759	NDOT 4B-4	11/3/03 10:30	3.16	2.31	0.079	3.239	0.553	0.193	0.136	192.00	11/3/03 10:30	98	311	227	8	319	54	19	13	18897
57760	NDOT 4B-5	11/3/03 10:35	3.32	2.57	0.057	3.377	0.503	0.216	0.154	116.00		26	88	68	2	89	13	6	4	3074
57761	NDOT 4B-6	11/3/03 10:40	3.51	2.76	0.053	3.563	0.494	0.225	0.161	107.00	11/3/03 10:40	26	93	73	1	94	13	6	4	2835
57762	NDOT 4B-7	11/3/03 10:45	3.55	2.85	0.058	3.608	0.509	0.228	0.163	127.00		49	175	140	3	178	25	11	8	6250
57763	NDOT 4B-8	11/3/03 10:50	3.72	2.95	0.051	3.771	0.51	0.224	0.158	129.00	11/3/03 10:50	49	183	145	3	186	25	11	8	6348
57764	NDOT 4B-9	11/3/03 10:55	3.71	3.12	0.062	3.772	0.525	0.22	0.154	143.00		49	183	154	3	186	26	11	8	7037
57765	NDOT 4B-10	11/3/03 11:00	3.94	3.14	0.07	4.006	0.532	0.22	0.154	154.00	11/3/03 11:00	49	194	155	3	197	26	11	8	7578
57766	NDOT 4B-11	11/3/03 11:05	4.17	3.46	0.073	4.243	0.542	0.218	0.151	160.00		26	110	92	2	112	14	6	4	4240
57767	NDOT 4B-12	11/3/03 11:10	4.24	3.56	0.083	4.323	0.562	0.217	0.142	162.00	11/3/03 11:10	26	112	94	2	115	15	6	4	4293
57768	NDOT 4B-13	11/3/03 11:15	4.48	3.62	0.09	4.57	0.587	0.219	0.146	193.00		26	119	96	2	121	16	6	4	5114
57769	NDOT 4B-14	11/3/03 11:20	4.86	3.69	0.11	4.97	0.63	0.214	0.145	214.00	11/3/03 11:20	26	129	98	3	132	17	6	4	5671
57770	NDOT 4B-15	11/3/03 11:25	5.1	3.81	0.12	5.22	0.643	0.215	0.146	234.00		9	48	36	1	49	6	2	1	2214
57771	NDOT 4B-16	11/3/03 11:30	4.84	4.04	0.12	4.96	0.65	0.217	0.149	230.00	11/3/03 11:30	9	46	38	1	47	6	2	1	2177
57772	NDOT 4B-17	11/3/03 11:35	4.88	4.05	0.12	5	0.67	0.218	0.149	243.00	11/3/03 11:40	19	92	77	2	95	13	4	3	4599
57773	NDOT 4B-18	11/3/03 11:50	5.28	4.02	0.13	5.41	0.782	0.222	0.15	329.00	11/3/03 11:50	19	100	76	2	102	15	4	3	6227
57774	NDOT 4B-19	11/3/03 11:55	5.22	4.08	0.14	5.36	0.808	0.235	0.164	308.00		26	138	108	4	142	21	6	4	8161
57775	NDOT 4B-20	11/3/03 12:00	5.39	4.06	0.16	5.55	0.87	0.24	0.169	343.00	11/3/03 12:00	26	143	108	4	147	23	6	4	9089
57776	NDOT 4B-21	11/3/03 12:05	5.81	4.1	0.16	5.97	0.904	0.240	0.171	355.00		0	0	0	0	0	0	0	0	0
57777	NDOT 4B-22	11/3/03 12:10	5.42	4.4	0.17	5.59	0.924	0.245	0.168	375.00	11/3/03 12:10	0	0	0	0	0	0	0	0	0
57778	NDOT 4B-23	11/3/03 12:15	5.48	4.29	0.17	5.65	0.939	0.255	0.176	315.00	11/3/03 12:20	0	0	0	0	0	0	0	0	0
											Total	912	3423	2648	91	3514	570	203	142	240502
												EMC out	3.75	2.90	0.10	3.85	0.62	0.22	0.156	264

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