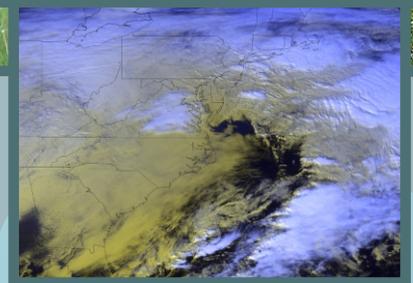


# Indicators of Stormwater Management Program Effectiveness

Fiscal Year 2006 (07/01/05 - 06/30/06)



## HAMPTON ROADS PLANNING DISTRICT COMMISSION

### CHESAPEAKE

- REBECCA C.W. ADAMS
- AMAR DWARKANATH
- \* CLIFTON E. HAYES, JR.
- ANNE F. ODELL
- ELLA P. WARD

### FRANKLIN

- JOSEPH J. SCISLOWICZ
- \* ROWLAND L. TAYLOR

### GLOUCESTER COUNTY

- JOHN J. ADAMS, SR.
- \* WILLIAM H. WHITLEY

### HAMPTON

- \* RANDALL A. GILLILAND
- ROSS A. KEARNEY, II
- JESSE T. WALLACE, JR.

### ISLE OF WIGHT COUNTY

- W. DOUGLAS CASKEY
- \* STAN D. CLARK

### JAMES CITY COUNTY

- \* BRUCE C. GOODSON
- SANFORD B. WANNER

### NEWPORT NEWS

- CHARLES C. ALLEN
- \* JOE S. FRANK
- RANDY W. HILDEBRANDT

### NORFOLK

- ANTHONY L. BURFOOT
- \* PAUL D. FRAIM
- DR. THERESA W. WHIBLEY
- REGINA V.K. WILLIAMS
- BARCLAY C. WINN

### POQUOSON

- \* CHARLES W. BURGESS, JR.
- GORDON C. HELSEL, JR.

### PORTSMOUTH

- JAMES B. OLIVER, JR.
- \* DOUGLAS L. SMITH

### SOUTHAMPTON COUNTY

- ANITA T. FELTS
- \* MICHAEL W. JOHNSON

### SUFFOLK

- LINDA T. JOHNSON
- \* JAMES G. VACALIS

### SURRY COUNTY

- \* TYRONE W. FRANKLIN
- JUDY S. LYTTLE

### VIRGINIA BEACH

- HARRY E. DIEZEL
- ROBERT M. DYER
- BARBARA M. HENLEY
- \* LOUIS R. JONES
- MEYERA E. OBERNDORF
- JAMES K. SPORE
- JOHN E. UHRIN

### WILLIAMSBURG

- \* JACKSON C. TUTTLE, II
- JEANNE ZEIDLER

### YORK COUNTY

- \* JAMES O. McREYNOLDS
- THOMAS G. SHEPPERD, JR.

\*EXECUTIVE COMMITTEE MEMBER

### PROJECT STAFF

ARTHUR L. COLLINS

JOHN M. CARLOCK  
JULIA B. HILLEGASS  
LAURA M. WHEELING

FRANCES D. HUGHEY

ROBERT C. JACOBS  
MICHAEL R. LONG  
BRIAN MILLER  
RACHAEL V. PATCHETT

EXECUTIVE DIRECTOR/SECRETARY

DEPUTY EXECUTIVE DIRECTOR, PHYSICAL PLANNING  
SENIOR PLANNER, ENVIRONMENTAL EDUCATION  
PHYSICAL AND ENVIRONMENTAL PLANNER

ADMINISTRATIVE ASSISTANT

DIRECTOR OF GRAPHIC & PRINTING SERVICES  
GRAPHIC ARTIST/ILLUSTRATOR TECHNICIAN II  
GRAPHIC TECHNICIAN II  
REPROGRAPHIC SUPERVISOR

**INDICATORS OF STORMWATER  
MANAGEMENT PROGRAM EFFECTIVENESS  
FISCAL YEAR 2005 - 2006**

**Preparation of this report was included in the  
HRPDC Unified Planning Work Program for  
FY 2006-2007, approved by the Commission  
at its Executive Committee Meeting of  
March 15, 2006.**

**Prepared by the Staff of the  
Hampton Roads Planning District Commission  
In Cooperation with Staff from the  
City of Chesapeake  
City of Hampton  
City of Newport News  
City of Norfolk  
City of Portsmouth  
City of Virginia Beach**

**November 2006**

## REPORT DOCUMENTATION

**TITLE:**  
**Indicators of Stormwater  
Management Program Effectiveness:  
Fiscal Year 2005-2006**

**REPORT DATE**  
**November 2006**

**GRANT/SPONSORING AGENCY**  
**LOCAL FUNDS**

**AUTHORS:**  
Laura M. Wheeling  
John M. Carlock, AICP  
Julia B. Hillegass

**ORGANIZATION NAME,  
ADDRESS AND TELEPHONE**  
Hampton Roads Planning  
District Commission  
723 Woodlake Drive  
Chesapeake, Virginia 23320  
(757) 420-8300  
<http://www.hrpdc.org>

### ABSTRACT

This document summarizes information stored in the Hampton Roads Regional Indicators of Stormwater Management Program Effectiveness database. This database tracks activities undertaken by the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach in implementing their local stormwater management programs. One of a series of Annual Reports, the document is used by the region's twelve localities with stormwater permits to assist in meeting permit requirements.

### ACKNOWLEDGMENTS

This report was prepared by the Hampton Roads Planning District Commission, in cooperation with the Regional Stormwater Management Committee.

Preparation of this report was included in the HRPDC Unified Planning Work Program for FY 2005 – 2006, approved by the Commission at its Executive Committee Meeting of March 15, 2006.

**TABLE OF CONTENTS**

**INDICATORS OF STORMWATER  
MANAGEMENT PROGRAM EFFECTIVENESS  
FISCAL YEAR 2005 – 2006**

**INTRODUCTION.....1**

**PART I. DESCRIPTION OF INDICATORS AND REGIONAL SUMMARY .....5**

**PART II. GRAPHICAL SUMMARY OF INDICATOR DATA .....11**

    Hampton Roads.....12

    City of Chesapeake .....27

    City of Hampton.....45

    City of Newport News .....61

    City of Norfolk.....76

    City of Portsmouth.....91

    City of Virginia Beach .....108

## **INTRODUCTION**

### **About this Report**

This report summarizes the information contained in the Stormwater Management Program Effectiveness Indicator Tracking Program database for Fiscal Year 2006 (7/01/2005 – 6/30/2006) for the six permitted Phase I localities in the Hampton Roads region. The Phase I localities include the cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach. Data from previous fiscal years are referenced in order to show trends in the region's stormwater management programs.

This document is divided into two parts. Part One describes each indicator and contains short data summaries and graphs for the region. Part Two contains graphic summaries of every indicator for the region and each permitted locality.

### **History of Local Stormwater Management Programs**

Stormwater is considered a point source discharge under the Clean Water Act (CWA) and is subject to regulation through the National Pollutant Discharge Elimination System (NPDES) permit program. Virginia is authorized to implement the NPDES permit program and does so through the Virginia Pollution Discharge Elimination System (VPDES) permits. In response to the Clean Water Act and the U.S. Environmental Protection Agency's Phase I stormwater regulations, the Virginia General Assembly established Virginia's Stormwater Management (SWM) Program in 1990 to address concerns associated with the quantity and quality of stormwater runoff from the developed landscape. As a part of Phase I, six localities within Hampton Roads were required to obtain municipal separate storm sewer system (MS4) Virginia Pollution Discharge Elimination System (VPDES) permits. The cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach received their first permits early in Calendar Year 1996. For this first permit term, the localities were required to monitor the chemical constituents of stormwater from selected stormwater outfalls.

While the chemical monitoring program was useful in determining that the stormwater runoff in Hampton Roads is comparable to other urban areas, it was not useful in communicating the effectiveness of local stormwater management programs. The high variability of the data, due to natural factors such as rainfall, made it very difficult to detect any actual increasing or decreasing trends in pollutant levels carried by stormwater runoff. In addition, the chemical monitoring program did not account for actions taken by local stormwater programs to reduce flooding and drainage problems. Due to these shortcomings, the permitted local governments of Hampton Roads proposed modifying their MS4 VPDES permits to replace the chemical monitoring requirement with a Stormwater Management Program Effectiveness Indicator Tracking Program for the second permit term. Accordingly, the Virginia Department of Environmental Quality accepted the proposed Tracking Program in lieu of chemical

monitoring and modified the MS4 VPDES permits accordingly when they were reissued in April 2001.

In the federal Phase II Stormwater Regulations enacted in 1999, the U.S. Environmental Protection Agency recognized the shortcomings of chemical monitoring. Rather than conduct a chemical monitoring program, Phase II communities are required to track the implementation of stormwater management measures. These management measures include public education and outreach, public involvement, illicit discharge detection and elimination, construction site runoff, post-construction runoff, and pollution prevention/good housekeeping activities. The Phase II Regulations recognize that this kind of tracking system provides a better measure of program effectiveness than chemical monitoring of stormwater outfalls.

### **Recent Stormwater Program Changes**

In the past, three separate state agencies, the Virginia Department of Conservation & Recreation (DCR), the Department of Environmental Quality (DEQ), and the Chesapeake Bay Local Assistance Department (CBLAD), each managed separate stormwater programs. In 2004, the General Assembly passed HB1177, which amended and reenacted the Virginia Stormwater Management Act of 1990 to consolidate the three separate stormwater management programs into the Virginia Stormwater Management Program (VSMP) under the oversight of the Virginia Soil and Water Conservation Board (VSWCB) and DCR. The VSMP established a statewide approach to stormwater management that required changes in the manner by which localities and state agencies address stormwater management. The VSWCB and DCR continue to take steps to transition from the 1990 SWM Program to the VSMP as envisioned in HB 1177. In the meantime, while these changes have been taking place, the Phase I municipalities have applied for their third MS4 VPDES permit.

The six Phase I localities submitted applications for renewal of their VPDES Permits to the Department of Conservation and Recreation during the fall of 2005. Anticipating these applications and desiring to address the requirements of the permit program and the integrated state stormwater management program, which resulted from the passage of HB 1177, in a consistent fashion, the region's localities acted in Spring 2005 to retain consultant assistance through the HRPDC. A consultant was retained to assist the localities in addressing the new state requirements and to develop regionally consistent applications for the Phase I MS4 Permits. This effort involved extensive review of existing programs, state and federal regulations, and the preliminary results of EPA Compliance audits of some MS4 Programs. Through intensive consultant and staff efforts, the permit applications were developed.

Ongoing permit negotiations with DCR continued through FY 2005-2006 in a cooperative fashion. Several iterations of draft permits have been reviewed by the Committee with comments and recommended modifications provided to DCR following each review. In February, 2006, DCR staff advised the Committee that detailed program plans, updating the localities' stormwater management plans originally

prepared in the early 1990's, would be required to support the reapplications. Again, through a cooperative process, the Phase I localities developed MS4 Program Plans, which were submitted to DCR in May 2006. Additional permit review meetings have been held since that time. It is now expected that the new permits will be issued during FY 2006-2007, following formal review by the U.S. Environmental Protection Agency and the public. The Phase I localities will continue to operate under the current permits until the new permits are issued.

In addition to the previously mentioned program modifications, DCR is also currently undertaking changes to the Virginia Stormwater Management Program (VSMP) Permit Regulations. A Stormwater Technical Advisory Committee (TAC) has been created to assist the Department in considering revisions to address the minimum water quality and quantity criteria, administrative procedures, and revisions to the statewide stormwater permit fee schedule. Regional representatives participating on the TAC are helping to keep the local governments informed of the proposed changes and how those changes may impact local programs.

### **Indicator Tracking**

The Stormwater Management Program Effectiveness Indicator Tracking Program was developed to help the region's local governments assess their achievement of common stormwater management goals developed by the Hampton Roads Regional Stormwater Management Program and adopted by the Hampton Roads Planning District Commission in 1999. These goals are:

- Manage stormwater quantity and quality to the maximum extent practicable (MEP).
  - Implement BMPs and retrofit flood control projects to provide water quality benefits.
  - Support site planning and plan review activities.
  - Manage pesticide, herbicide, and fertilizer applications.
- Implement public information activities to increase citizen awareness and support for the program.
- Meet the following needs of citizens.
  - Address flooding and drainage problems.
  - Maintain stormwater infrastructure.
  - Protect waterways.
  - Provide appropriate funding for the program.
- Implement cost-effective and flexible program components.
- Satisfy VPDES stormwater permit requirements.
  - Enhance erosion and sedimentation control.
  - Manage illicit discharges, spill response, and remediation.

The Tracking Program stores data on several indicators of stormwater management program effectiveness in a Microsoft Access database. The indicators that are recorded in the database can be grouped into one of four categories as illustrated in Table 1.

**Table 1: Classification of Indicators**

<b>Indicator Group</b>	<b>Indicator</b>
<b>Water Quality</b>	Pollutant Loadings
<b>Physical and Hydrological</b>	Greenlands Programs
<b>Programmatic</b>	Investigative Monitoring BMP Implementation Flooding and Drainage Control Flooding and Drainage Projects Erosion and Sediment Control Permitting and Compliance Operations and Maintenance
<b>Socioeconomic</b>	Public Information Programs

At the beginning of the fiscal year, the Stormwater Committee performed a review of the individual stormwater programs and the data collected through the Regional Stormwater Management Program Effectiveness Indicator Tracking Program. The review examined how each locality collects and reports data on the various stormwater program components. Through the process, localities identified reporting methods, revisited definitions, and developed tools to support consistent data reporting.

The Effectiveness Indicator Tracking Program will continue to be used until the new permits are issued. Although the latest draft of the new permit includes many reporting requirements, it does not include the Regional Stormwater Management Program Effectiveness Indicator Tracking program. DCR intends to provide localities with the forms and data collection schedules necessary to fulfill the reporting requirements of the new permits.

## PART I. DESCRIPTION OF INDICATORS AND REGIONAL SUMMARY

### Water Quality Nutrient Loadings

Stormwater pollutant loads for each of the local governments in Hampton Roads permitted by the Virginia Pollution Discharge Elimination System Program were estimated by CH2MHill in Fiscal Year 2001. The estimated pollutant loads were documented in a series of Technical Memoranda contained in each locality's annual report. For those localities with updated land use and BMP data, the Water Quality Nutrient Loadings were calculated for Fiscal Year 2006. The 2006 calculations were performed by Hampton Roads Planning District Commission staff using PLOAD, a geographic information system (GIS) tool developed by CH2MHILL, which is based on the U.S. Environmental Protection Agency's (EPA's) Simple Method for the calculation of nonpoint source pollutant loads. The PLOAD tool uses GIS coverages of land use, sub-watershed boundaries, and BMP locations as well as look-up tables for event mean concentrations (EMCs), imperviousness, and BMP pollutant removal efficiencies. The land use used in the PLOAD model is parcel-based and was acquired from municipal planning departments. The most recent BMP data and associated service areas were obtained from the municipalities as well.

The following table is a summary of the percent of pollutant load reduction that is attributable to the various BMPs employed by the localities. Percentages among the jurisdictions vary due to the differences in land area, land use, and the number and types of existing BMPs. A thorough description of the data components, methodology, and results of the Pollutant Load Analysis is presented in each jurisdiction's annual report.

#### Annual Percent Reduction of Pollutant Load Due to Existing BMPs

	Total Suspended Solids (TSS)	Total Nitrogen (TKN)	Total Phosphorus (TP)
<b>Chesapeake</b>	N/A	N/A	N/A
<b>Hampton</b>	3.20%	0.80%	1.40%
<b>Newport News</b>	17.30%	4.60%	9.50%
<b>Norfolk</b>	4.90%	2.10%	2.80%
<b>Portsmouth</b>	2.80%	0.8%	1.60%
<b>Virginia Beach</b>	14.55%	3.90%	9.50%

### Greenlands

Greenlands are lands that are permanently protected from development or lands that are restored to a more natural state during redevelopment. They provide a water quality benefit by reducing the imperviousness of the watershed. Such lands may include parklands, refuges, wetlands, and lands protected by conservation easements. The database is structured to maintain the number of acres of greenlands to assess

progress toward reducing the potential watershed imperviousness and nonpoint source pollution loads.

In Fiscal Year 2006, the localities estimate that approximately 206,549 acres of greenlands have been preserved. A number of municipalities have increased open space land acquisition and conservation programs over the past five years, yet much of the increase in greenlands acreage is the result of improved calculation methods and the underestimation of greenlands totals in earlier years. A graph of Fiscal Year 2006 greenlands totals by type is presented in Part II of this document.

## **BMP Implementation**

Stormwater best management practices (BMPs) help to minimize flooding and water quality impacts associated with development. Experience has shown that over time, lack of maintenance has caused BMPs to lose their effectiveness. In addition, older developed areas lack BMPs or the design of the BMPs that have been installed does not include water quality protection measures. To measure the success of BMPs in flood and water quality protection, the database is structured to include information on:

- The number and types of BMPs installed or retrofitted for water quality.
- The number of developed acres served by BMPs by land use.
- Inspection and maintenance activities.

This information will allow the estimation of pollutant removal by BMPs and the ascertainment of whether BMPs are functioning properly.

During Fiscal Year 2006, the permitted local governments of Hampton Roads conducted over 1,677 inspections of stormwater facilities. In addition, 119 major municipal stormwater facilities were installed and 175 facilities were maintained. The graphs presented in Part II illustrate the trends of stormwater facility installations and inspections in the six Phase I municipalities.

## **Erosion and Sediment Control**

Every local government in the Commonwealth of Virginia is required to administer an Erosion and Sediment Control Program. The Erosion and Sediment Control Law requires that land disturbing activities exceeding 10,000 square feet submit an Erosion and Sediment Control Plan and meet minimum standards. Under the Chesapeake Bay Preservation Act, the threshold is decreased to 2,500 square feet in a Chesapeake Bay Preservation Area. In addition, the new VSMP requires permits for all land disturbances greater than 2,500 square feet in all Chesapeake Bay Preservation Areas. The minimum standards specify practices that reduce the amount of sediment leaving a construction site and minimize downstream flooding and streambank erosion. The level of enforcement and compliance limits the effectiveness of local erosion and sediment control programs. To monitor the extent of land-disturbing activities, the

database is designed to include information on the number of approved erosion and sediment control plans and disturbed acreage. The number of inspections and enforcement actions are also included to evaluate enforcement and the level of compliance with the local erosion and sediment control regulations.

In Fiscal Year 2006, the six Phase I localities in Hampton Roads issued 4,868 erosion and sediment control permits, conducted 36,211 inspections, and carried out 2,404 enforcement actions. Projects requiring an erosion and sediment control permit disturbed a reported 2,975 acres. Graphs presented in Part II show the cumulative number of permits issued and the number of inspections performed from Fiscal Years 2001 through 2006 for the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach.

### **Flooding and Drainage Responses**

Calls and complaints received from citizens can be an indicator of the performance of a stormwater program. Responsiveness of a stormwater program, in the form of inspections and resulting maintenance activities, to citizen inquiries can also be an indicator of effective administration of the stormwater program. The database is structured to collect data on the number of citizen calls and responses.

Between Fiscal Years 2001 and 2006, the Hampton Roads Phase I municipalities have responded to an average of 12,787 citizen inquiries per year. In Fiscal Year 2006, the region responded to 11,348 citizen requests for service. Since tracking began, the Phase I localities have responded to over 76,723 inquiries. A graph presented in Part II illustrates how the number of responses to citizen requests has changed over the past five years.

### **Flooding and Drainage Projects**

An important function of a local stormwater program is to correct flooding and water quantity problems. These projects may be included in the local Capital Improvement Projects Program. These projects may involve retrofitting areas, installing BMPs, or restoration activities. To help determine whether a stormwater program is actively performing this important function, the database is designed to include the number and cost of flooding and drainage projects.

During Fiscal Year 2006, the localities allocated over \$19.8 million toward 93 stormwater management improvement projects. This is an increase from the estimated \$14.1 million spent during Fiscal Year 2005. Over the past six years, Fiscal Year 2001 through Fiscal Year 2006, the Hampton Roads Phase I communities constructed an estimated 721 new stormwater management projects requiring an investment of over \$98.3 million. Please see Part II for a graphic illustration of the number and cost of stormwater management improvement projects over the past six years.

## **Investigative Monitoring**

Non-stormwater discharges, such as hazardous material spills, wastewater cross connections, and other illicit discharges can represent a significant source of pollution. Implementing an effective illicit discharge/connection management program to control these sources can result in considerable improvements to water quality. In order to assess whether an illicit discharge/connection program is being effectively implemented, the database is structured to allow the collection of information on investigative and corrective actions. These actions include screening inspections and measures taken to locate and eliminate illicit discharges/connections.

During Fiscal Year 2006, the permitted Phase I local governments corrected 923 illicit discharges. A graph presented in Part II shows the trends in investigative monitoring for the region.

## **Operations and Maintenance**

Operation and maintenance activities are crucial to a stormwater conveyance system's ability to reduce flooding and minimize the amount of pollutants that are discharged into the region's waterways. Operation and maintenance activities include street sweeping and cleaning and repairing both catch basins and drainage facilities. By monitoring these activities, the proper functioning of the stormwater system can be assessed, and the amount of sediment that was prevented from being discharged by the stormwater system can be estimated.

In Fiscal Year 2006, the Phase I local governments cleaned an estimated 46,343 catch basins and 962 miles of drainage facilities. In addition, the localities also swept 83,110 miles of streets. These activities prevented an estimated 26,953 tons of material from polluting the region's waterways. A graph presented in Part II, illustrates operations and maintenance trends in Hampton Roads for the past six years.

## **Permitting and Compliance**

In general, development increases the amount of runoff and pollution in a watershed. In an effort to monitor development activity, the number of approved site and subdivision plans, and their associated developed or redeveloped acres, are maintained in the database.

During Fiscal Year 2006, the permitted Phase I local governments of Hampton Roads issued 13,399 construction permits and approved 2,367 development plans. Construction and development is estimated to have disturbed approximately 3,009 acres of land. A graph presented in Part II shows permitting and compliance trends in Hampton Roads from Fiscal Year 2001 through Fiscal Year 2006.

## Environmental Knowledge

Informing individuals about stormwater issues and measures they can take to reduce pollution is important to gaining public support of a stormwater program. It also helps protect water quality. The database maintains information on public education and outreach activities to help assess whether a stormwater program is adequately carrying out this function. The parameters that are examined include: number of publications produced and distributed, public outreach activities, media campaigns, riparian restoration activities by citizens, stream cleanup activities, and web site hits.

During Fiscal Year 2006, the permitted Phase I local governments of Hampton Roads, both individually and cooperatively through the HR STORM regional stormwater education program, carried out a number of activities to enhance the environmental knowledge of their citizens. Through these efforts, approximately 100,490 stormwater education publications were distributed, and approximately 68,489 people were reached through a variety of public education outreach activities. These activities included demonstrations, workshops, presentations, stream cleanups, and other educational events. In addition, the region was able to reach the population of Hampton Roads more than three times over through radio, television, and print advertisements. (Based on figures provided by the advertising media, when available.) The media spots released in Fiscal Year 2006 through HR STORM are presented in the table below. There are numerous opportunities, through print, television, and radio advertisements, for the citizens within Hampton Roads to learn about stormwater and pollution prevention practices. Using a variety of media outlets has allowed the region to broaden its outreach to multiple segments of the population; there is some audience overlap between outlets.

**Media Spots Released, Fiscal Year 2006**

<b>Station</b>	<b>Number of Spots</b>	<b>Audience (estimated)</b>
WVEC CHANNEL –13	56	75,300 monthly
WHRO CHANNEL –15	60	Household Frequency*: 3+
WHRV-FM 89.5	39	Household Frequency*: 3+
WHRO-FM 90.3	39	Household Frequency*: 3+
METRO TRAFFIC	362	561,476 monthly
COX MEDIA CABLE	1,499	413,151 subscribers
WGNT UPN CHANNEL –27	33	1,339,258
<b>TOTAL FOR FISCAL YEAR</b>	<b>2,069</b>	

\*Household frequency is the number of times a household has the opportunity to view or hear a spot during the contracted time period.

HR STORM has continued with a variety of program components through Fiscal Year 2006. Several program highlights are listed below.

- Print ads educating potential homebuyers on the maintenance needs of BMPs continue to be released monthly through The Daily Press's Home Hunter and The Virginian-Pilot's Home Search real estate magazines.
- The HR STORM Info-Line had over 200 visitors this year.
- The HR STORM website, <http://www.hrstorm.org/>, received over 26,979 page views throughout Fiscal Year 2006.
- New educational banners on proper pet waste and automotive waste disposal were developed and displayed at various public venues. New promotional items were also developed and distributed.
- The committee began developing an educational tabloid as part of the nationally recognized, *Newspapers In Education* campaign.
- HR STORM awarded over \$2,500 in HR<sup>3</sup> Mini-Grant funding during the past year. Over 4,000 youth were impacted by the awarded mini-grants.

Additional information about individual locality stormwater educational efforts can be found in Part II of this document. A complete description of the activities of HR STORM is available in a separate report, *HR STORM, Hampton Roads Regional Stormwater Education Initiative Fiscal Year 2005-2006 Annual Report*.

## CONCLUSION

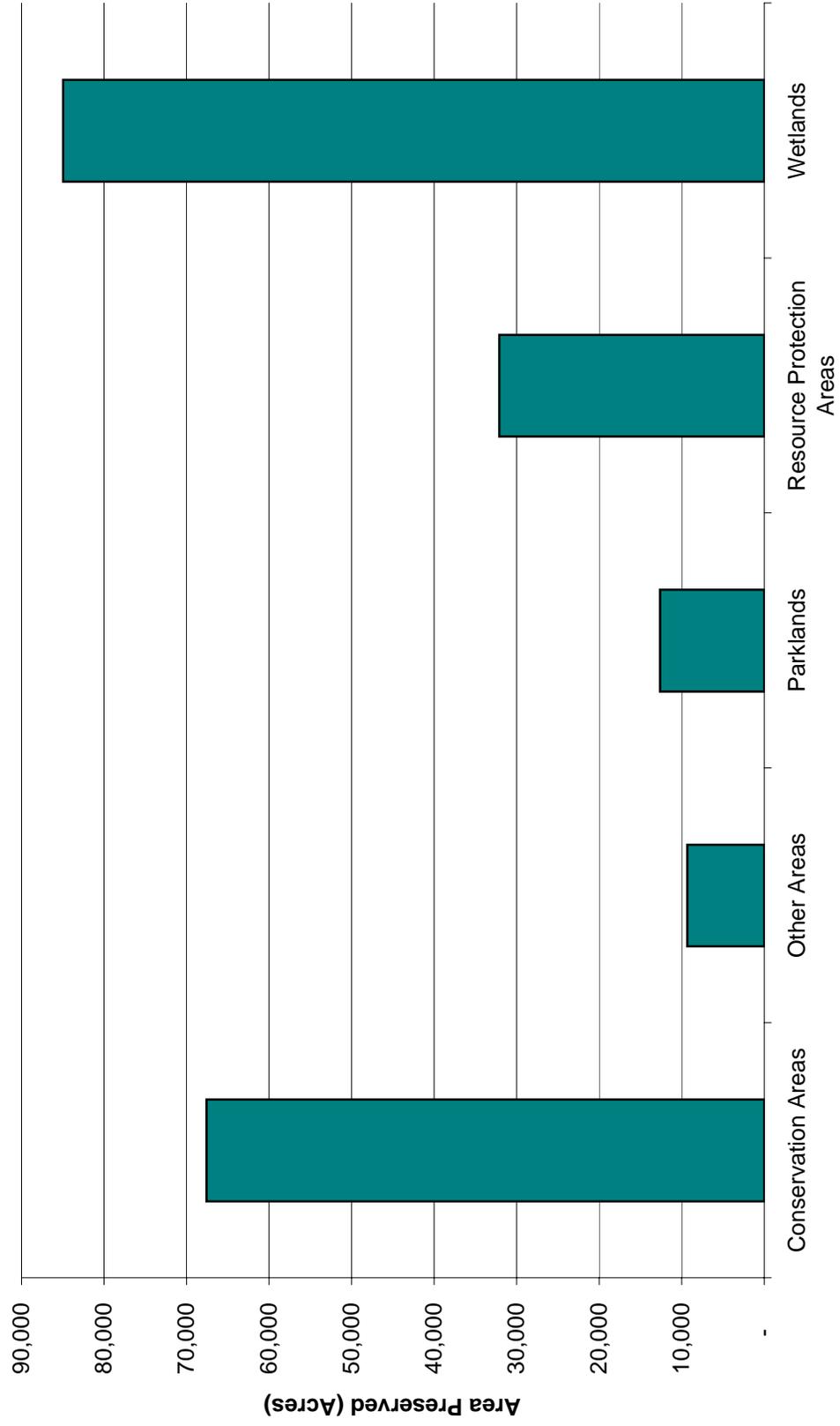
In October 2006, the cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach submitted their *Indicators of Stormwater Management Program Effectiveness* reports to DCR as part of their Fiscal Year 2006 Annual Reports. This document summarizes the information contained in the individual reports. The Regional Stormwater Program Effectiveness Indicators Tracking program will continue to be used until the expiration of the current stormwater permits, which will take place once the new permits are issued.

As ongoing permit negotiations take place with DCR, the Phase I localities in Hampton Roads are looking ahead to find innovative methods to meet anticipated requirements. Localities within Hampton Roads will continue to work in a cooperative fashion to find resourceful and improved solutions to regional stormwater management.

## **PART II. GRAPHICAL SUMMARY OF INDICATOR DATA**

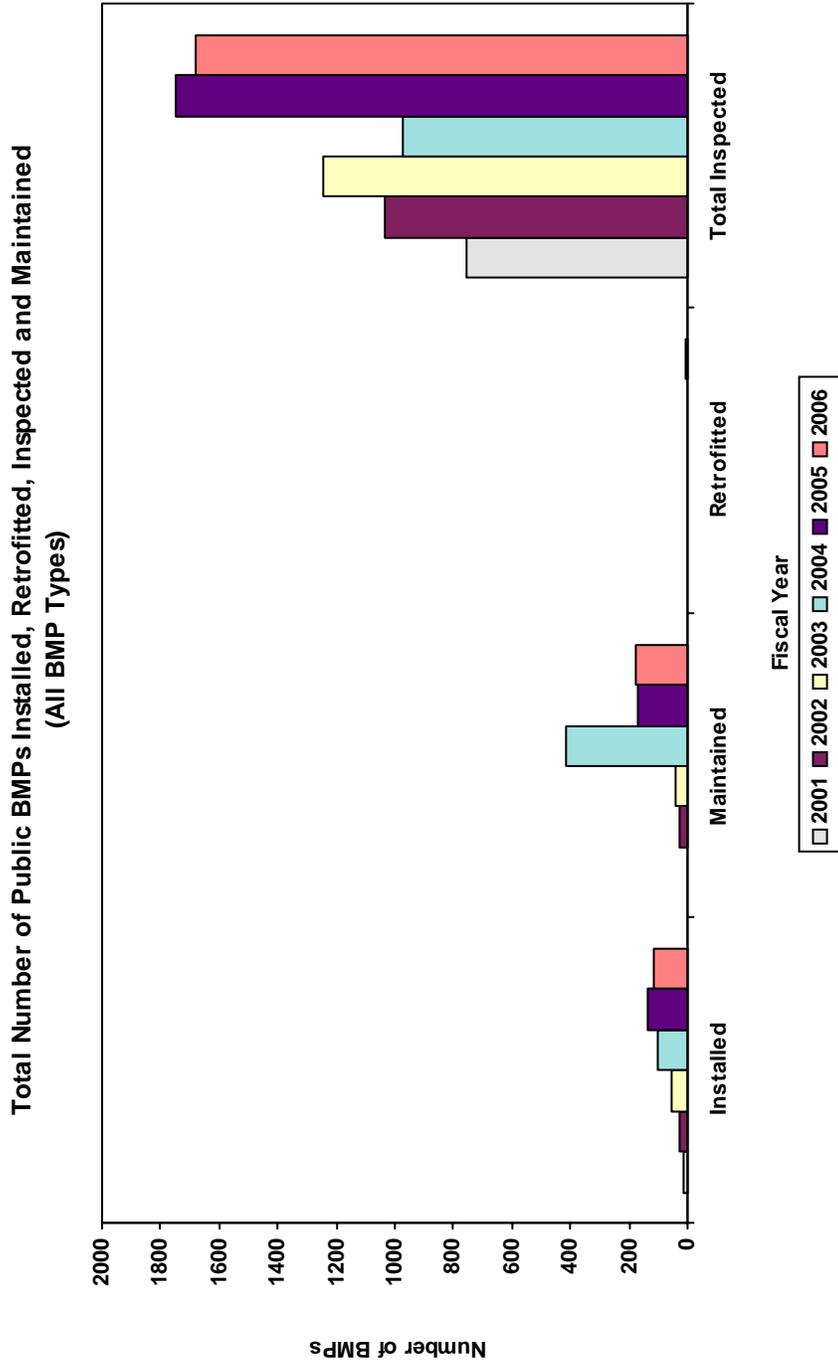
## **PART II. GRAPHICAL SUMMARY OF INDICATOR DATA**

## Region-Wide\* Greenlands Programs Green Areas Protected as of FY 2006



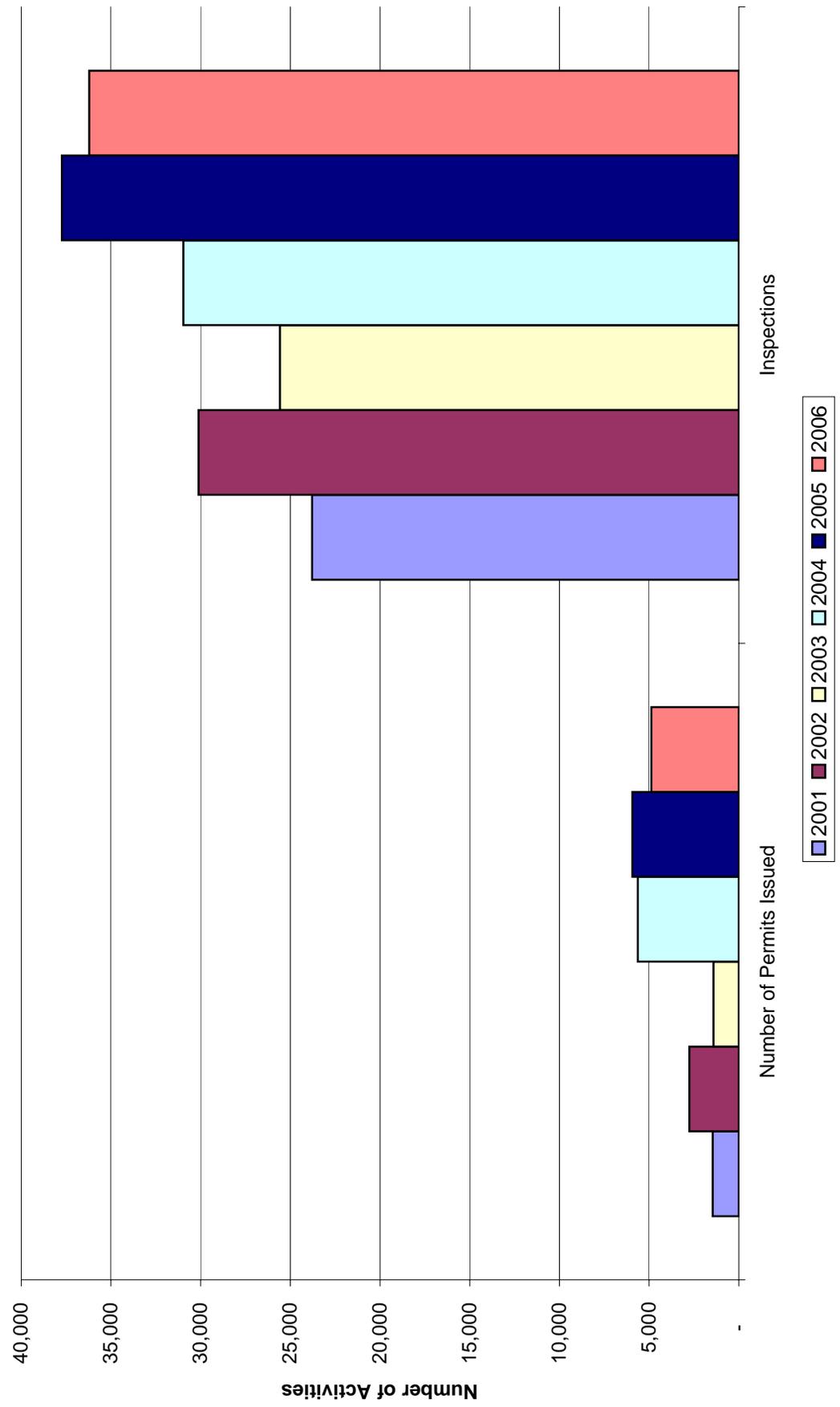
\*Includes the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach

# Region-Wide\* BMPs



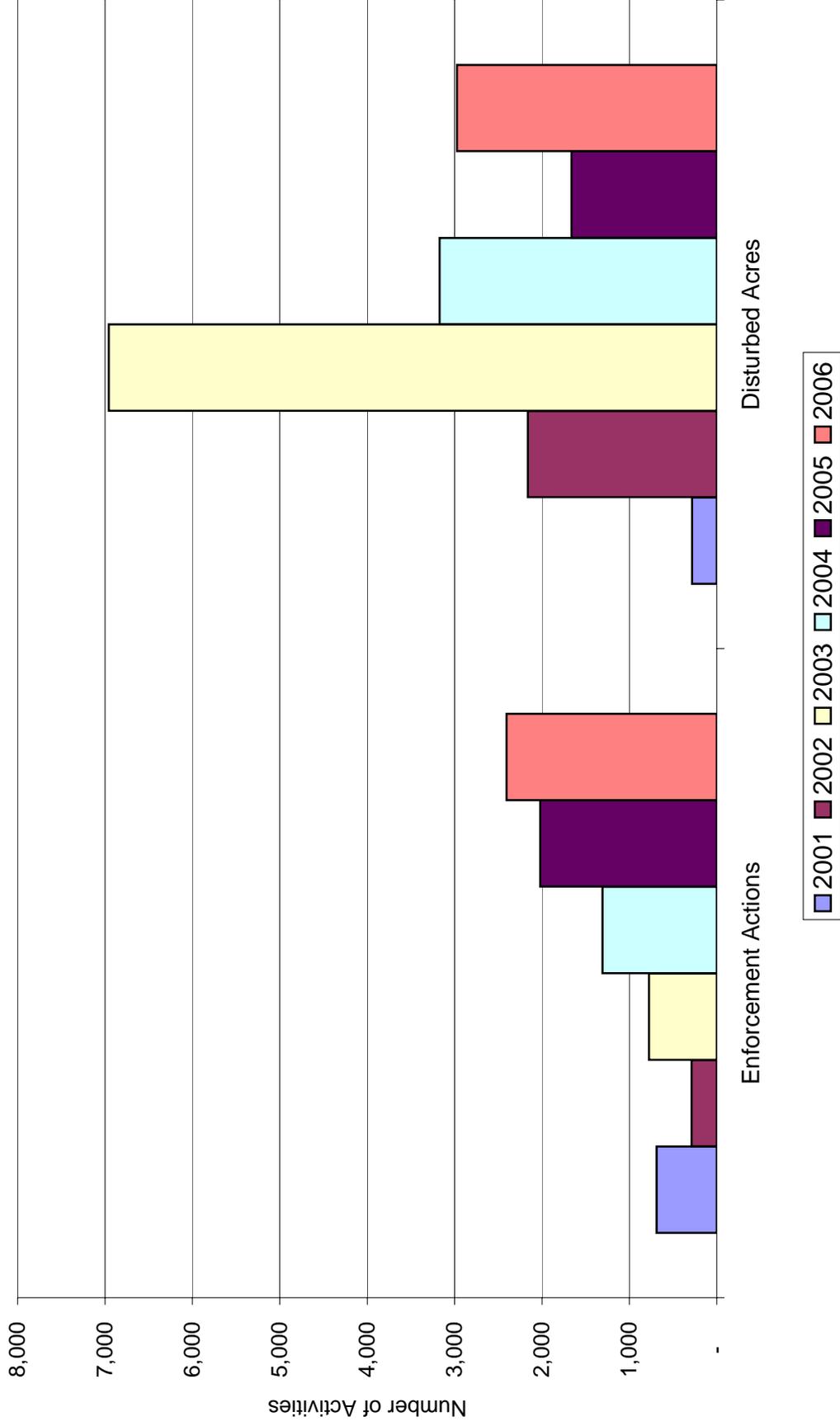
\*Includes the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach

# Region-Wide\* Erosion & Sediment Control Activities for Fiscal Years 2001-2006



\*Includes the cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach

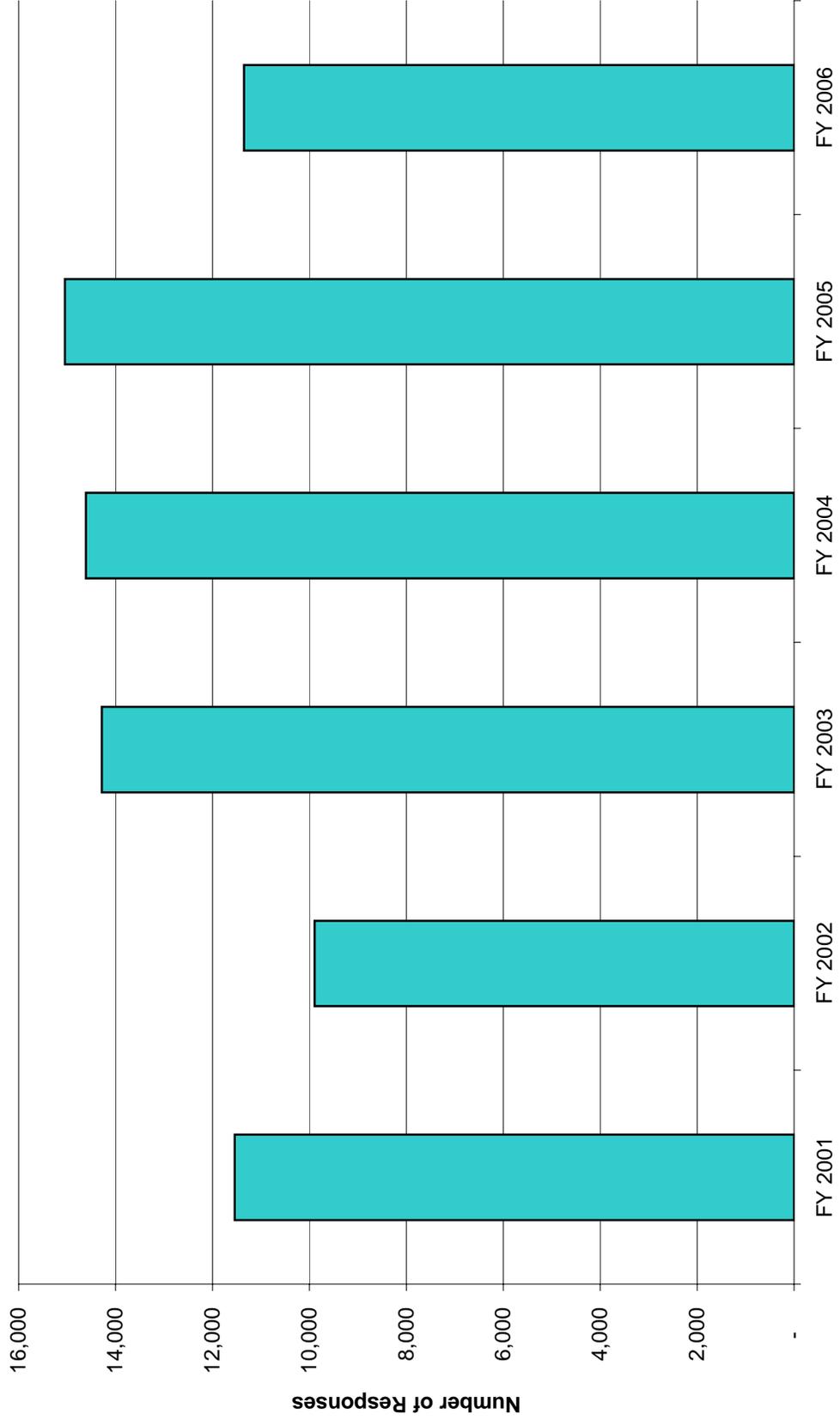
## Region-Wide\* Erosion and Sediment Control Activities for Fiscal Year 2001-2006



\*Includes the cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach

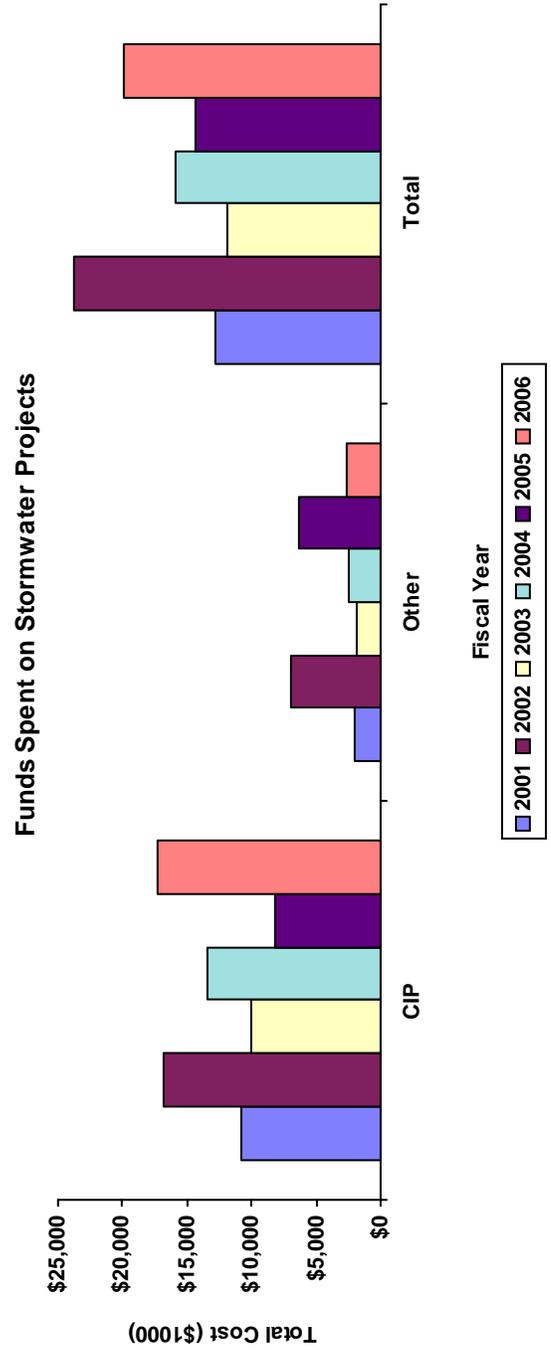
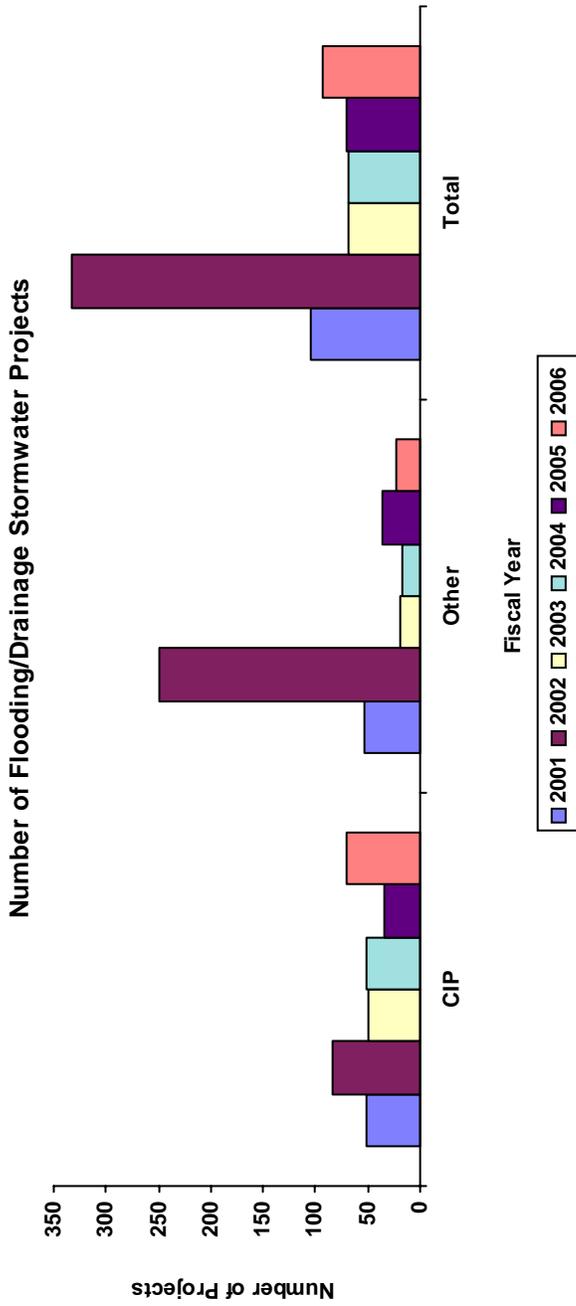
## Region-Wide\* Flooding & Drainage Problems

### Number of Responses to Assistance Requests (Inspection, Maintenance, and Repair Services)



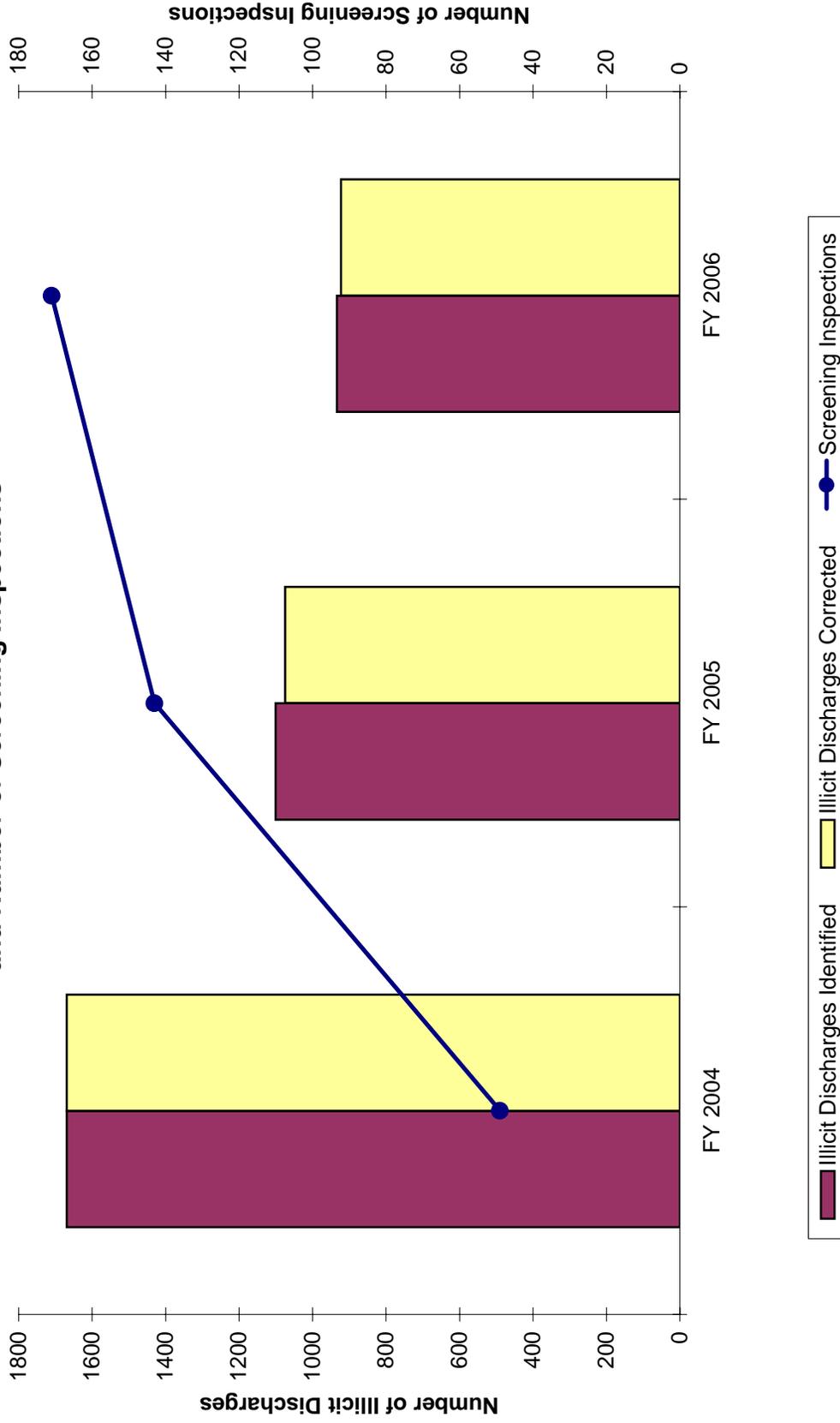
\* Includes the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, Virginia Beach

# Region-Wide\* Flooding and Drainage Problems



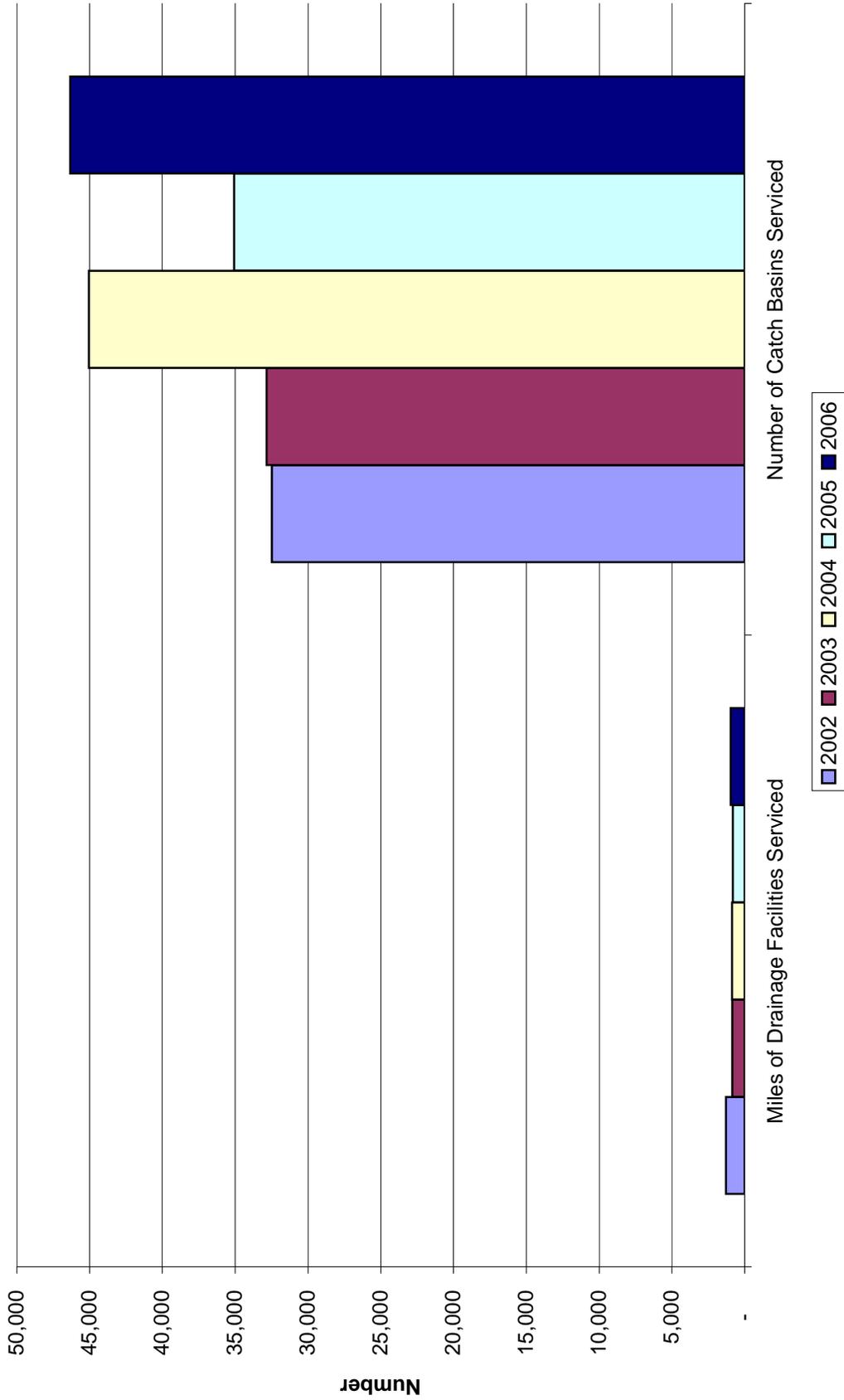
\*Includes the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach

## Region-Wide\* Investigative Monitoring Illicit Discharges Identified and Corrected and Number of Screening Inspections



\* Data includes the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach

# Region-Wide\* Operations & Maintenance Mileage of Drainage Facilities Serviced & Number of Catch Basins Serviced

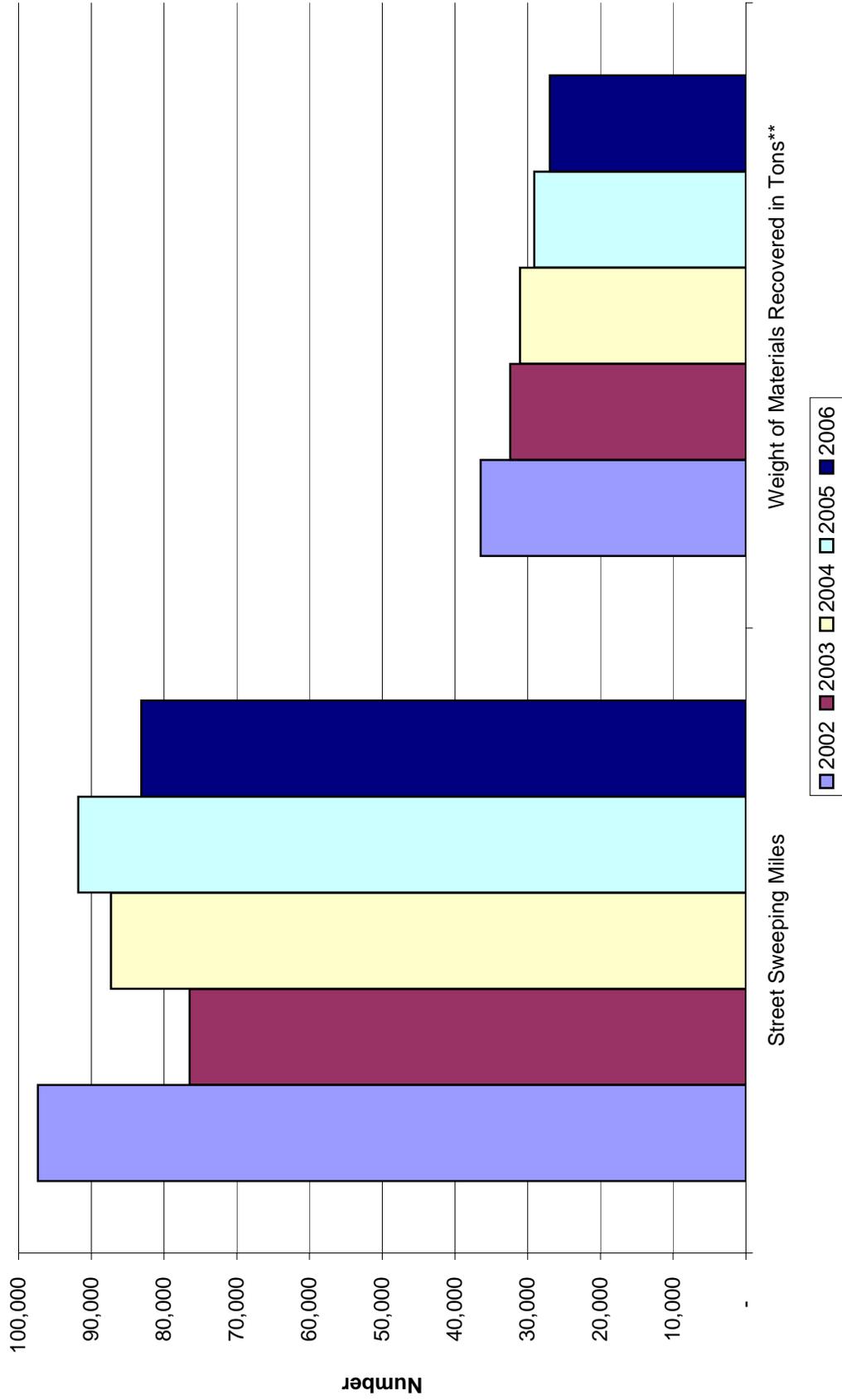


\*Includes the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach

# Region-Wide\*

## Operations & Maintenance

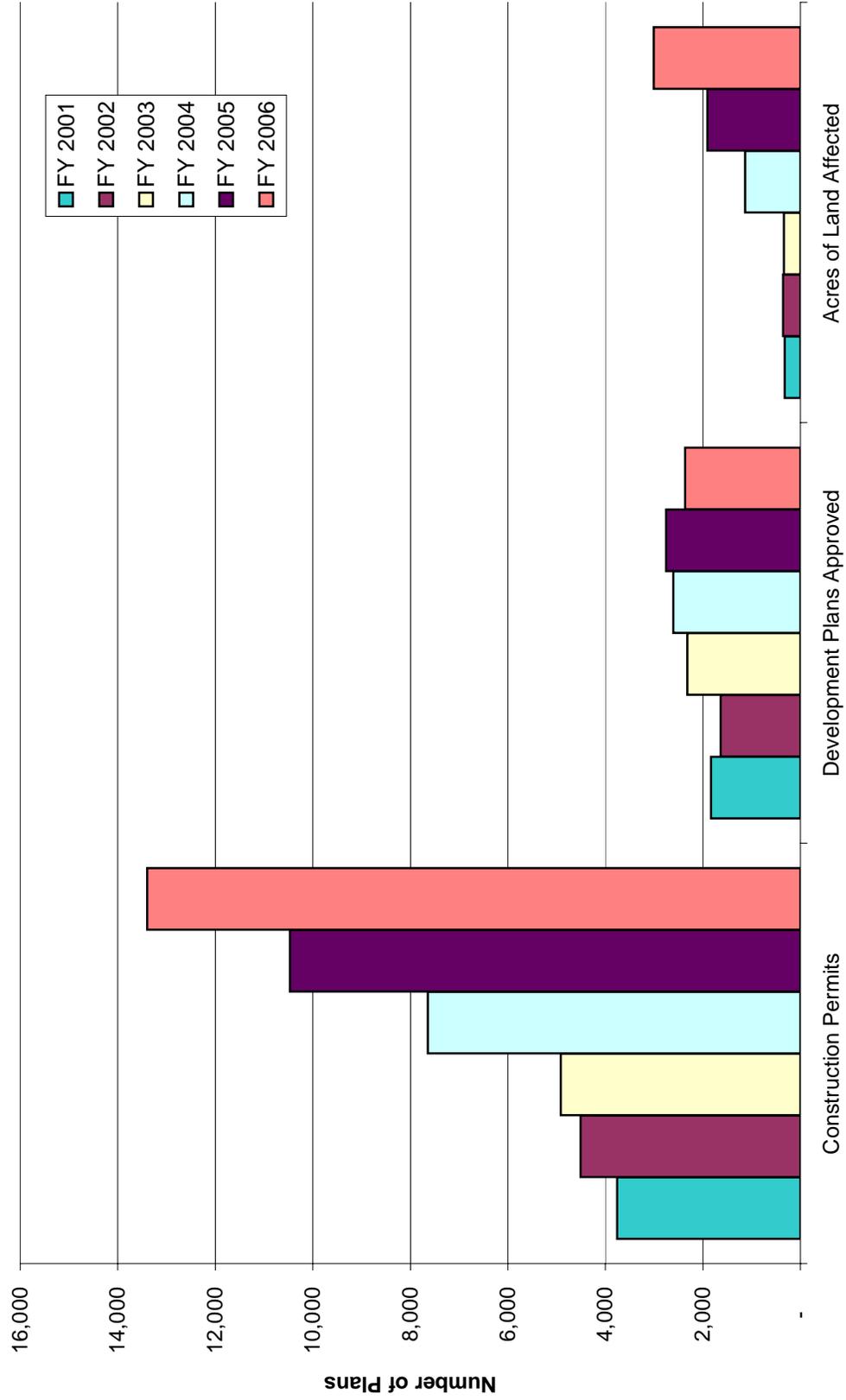
### Street Sweeping Miles & Weight of Materials Recovered



\* Includes the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach.

\*\* Weight of material collected is reported in tons by most localities. Other localities report material collected in cubic yds. For the purpose of comparison, one cubic yd. is assumed to equal one ton.

## Region-Wide\* Construction Permits, Development Plans Approved, and Acres of Land Affected



\*Includes the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach

---



---

# Environmental Knowledge

## Regional Summary

---



---

Activity Month	Activity Type	Knowledge Before Activity	Knowledge After Activity
July, 2005	Other	2	4
	Presentation	3	4
August, 2005	Presentation	2	4
September, 2005	Other	4	5
	Presentation	2	4
October, 2005	Presentation	2	4
	Workshop	2	4
November, 2005	Presentation	1	2
December, 2005	Presentation	2	4
January, 2006	Presentation	2	4
April, 2006	Presentation	2	3
May, 2006	Workshop	2	4
June, 2006	Presentation	3	5
<b>Regional Totals</b>		<b>29</b>	<b>51</b>

Environmental Knowledge is measured through surveys conducted before and after the presentation, workshop, or demonstration event. A scale of 1 to 5 (low to high environmental knowledge) is used.

---

---

# Website Hits

## HRPDC / Regional

---

---

Activity Month	Number of Hits
June, 2006	26979
<b>Municipality Totals:</b>	26979

# Public Outreach Activities

## Regional Summary

Activity Month	Activity Type	Number of Citizens Reached	Total Value	
July, 2005	Presentation	1072		
August, 2005	Demonstration	50		
	Other	3000		
	Presentation	85		
September, 2005	Other	3000		
	Presentation	49		
	Other	25000		
October, 2005	Presentation	129		
	Other	450		
	Presentation	138		
November, 2005	Demonstration	25		
	Other	61		
	Presentation	155		
December, 2005	Other	2035		
	Presentation	25		
	Other	400		
January, 2006	Demonstration	295		
	Presentation	60		
	Demonstration	40		
March, 2006	Other	1503		
	Stream Cleanup	N/A		
	Demonstration	15		
April, 2006	Distribute Give Away Ite	3275		
	Exhibit	3910		
	Other	15132		
	Presentation	2744		
	Stream Cleanup	5827		
	Workshop	14		
	<b>Regional Totals:</b>		<b>68489</b>	

---

---

# Publications

## Regional Summary

---

---

Activity Month	Topic	Number Distributed
July, 2005	General Stormwate	1671
August, 2005	General Stormwate	10792
September, 2005	General Stormwate	4591
October, 2005	General Stormwate	2463
November, 2005	General Stormwate	511
December, 2005	General Stormwate	281
January, 2006	General Stormwate	2060
April, 2006	General Stormwate	150
May, 2006	General Stormwate	1503
June, 2006	BMP Maintenance	35
	General Stormwate	70994
	Landscaping / Law	130
	Other	5145
	Pet Waste	165
<b>Regional Totals:</b>		<b>100491</b>

---



---

# Public Outreach Through Media

## Regional Summary

---



---

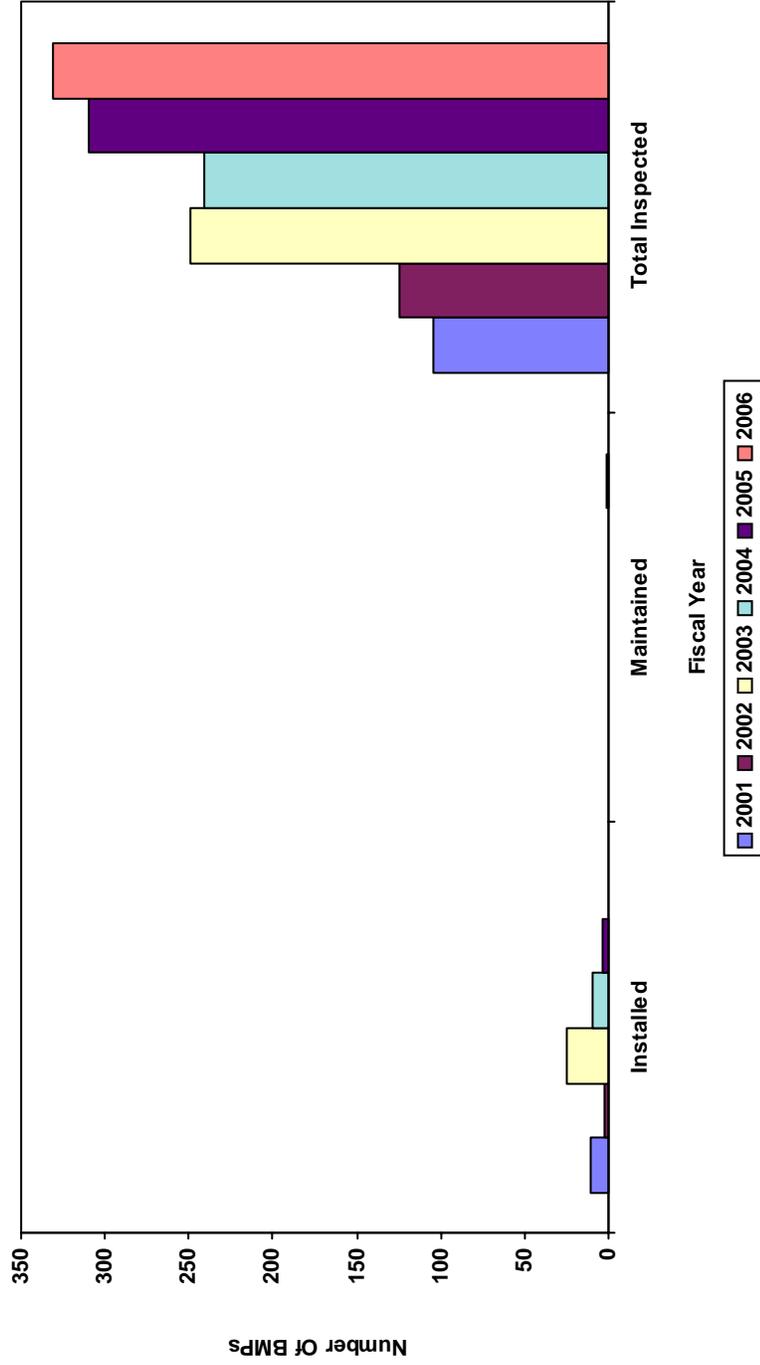
Activity Month	Spot Type	Number of Spots	Number of Citizens Reached	Total Value
July, 2005	Print	4	256000	
October, 2005	Print	2	128000	
November, 2005	Print	6	384000	
March, 2006	Print	5	320000	
April, 2006	Print	5	320000	
May, 2006	Print	4	256000	
June, 2006	Other	47		
	Print	3	1628000	
	Radio	440	561476 *	
	Television	1648	1827709 *	
<b>Regional Totals</b>		<b>2164</b>	<b>5681185</b>	

\*Estimates based on available data. Some media outlets were not able to estimate the number of citizens reached.

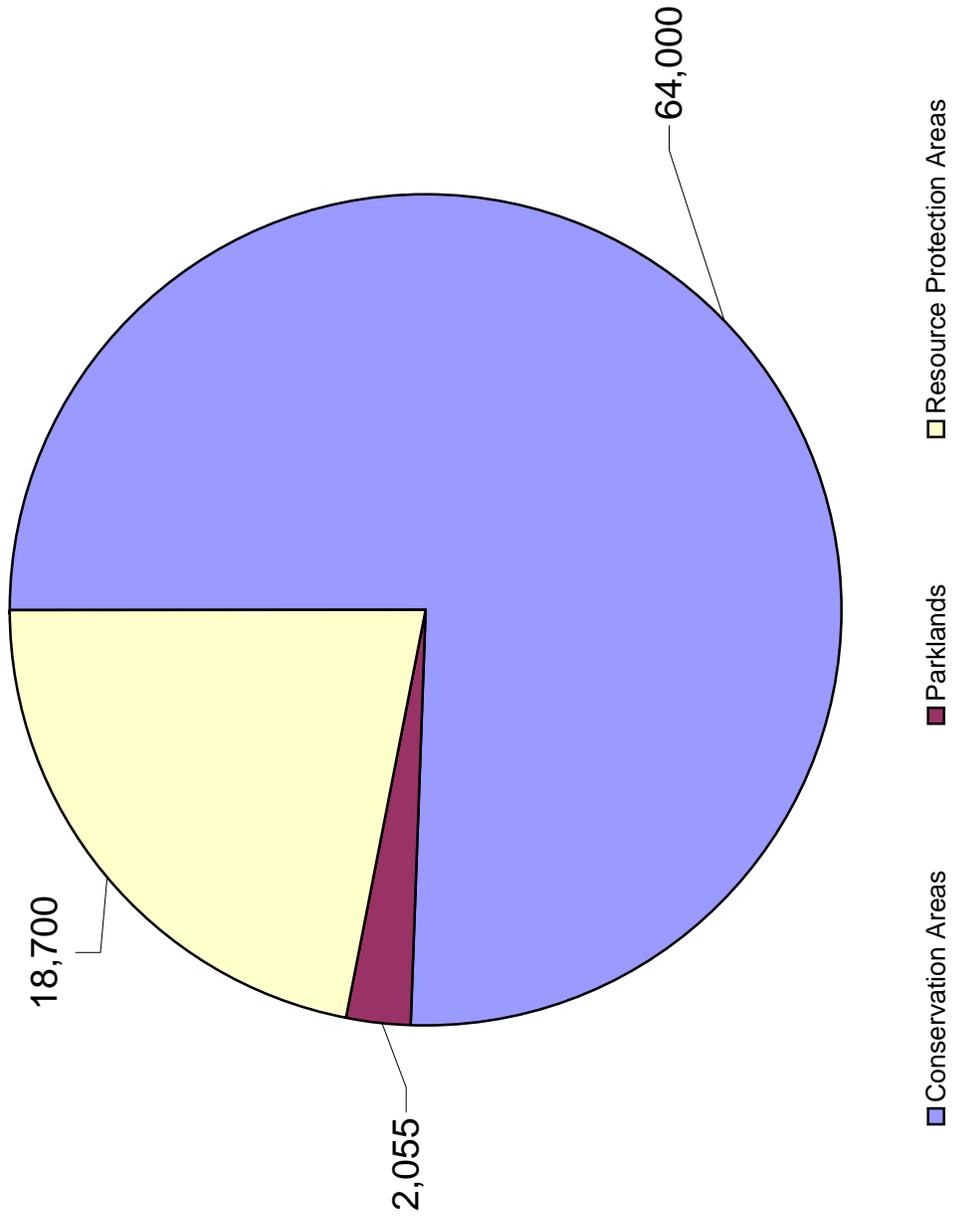
**CITY OF CHESAPEAKE**

# Chesapeake

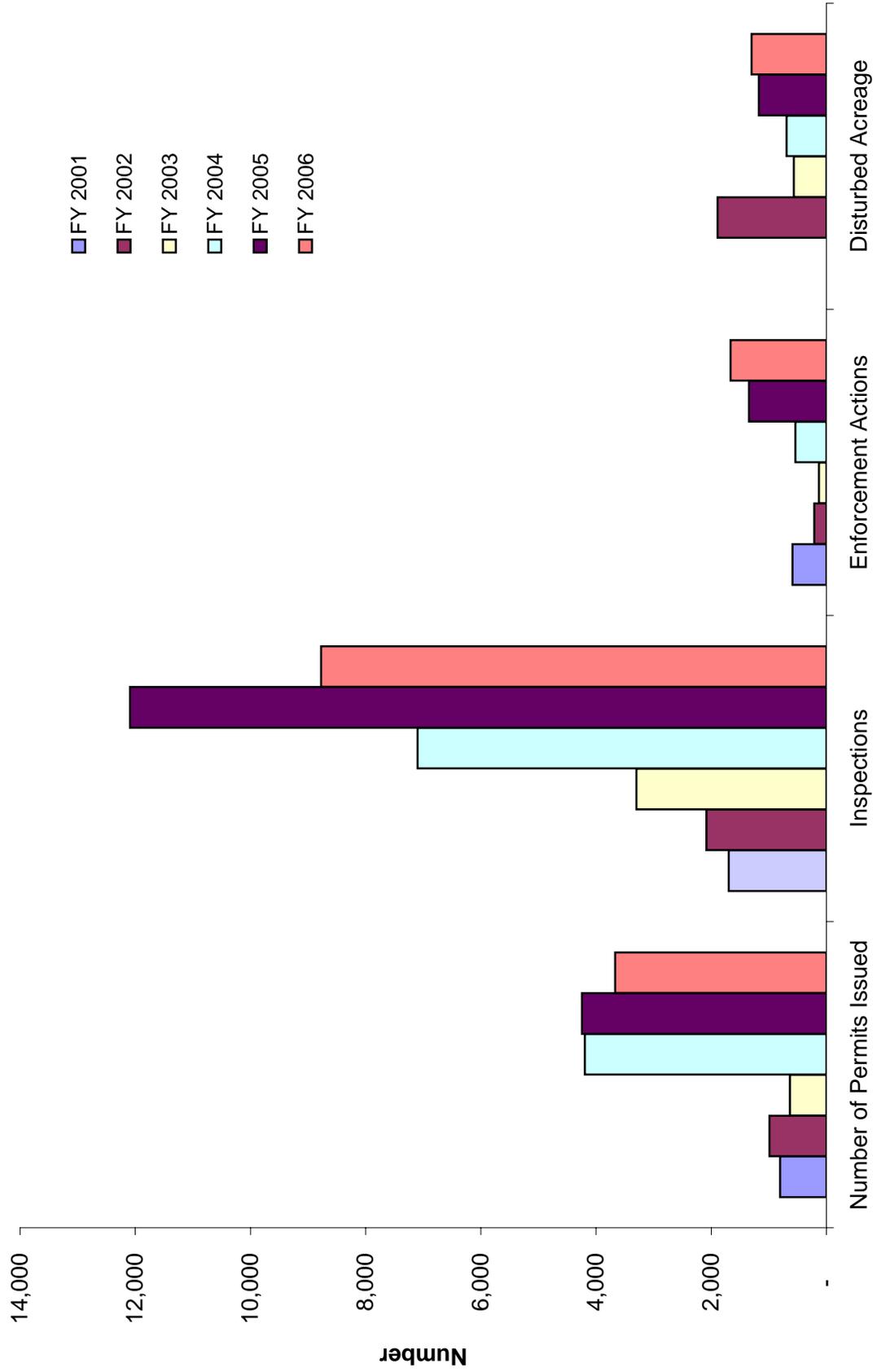
Total Number of Public BMPs Installed, Retrofitted, Inspected and Maintained  
(All BMP Types)



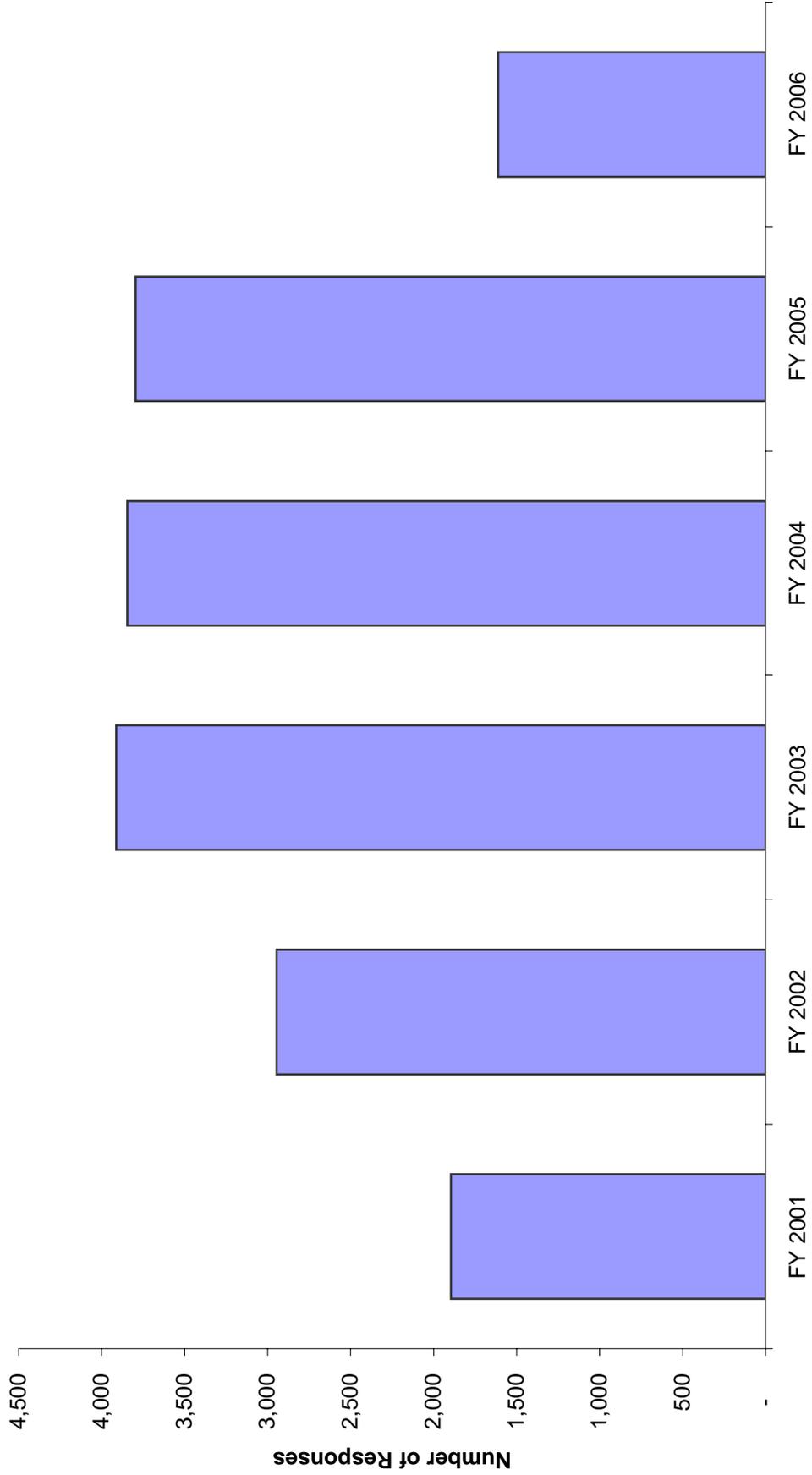
# City of Chesapeake Greenlands in Acres



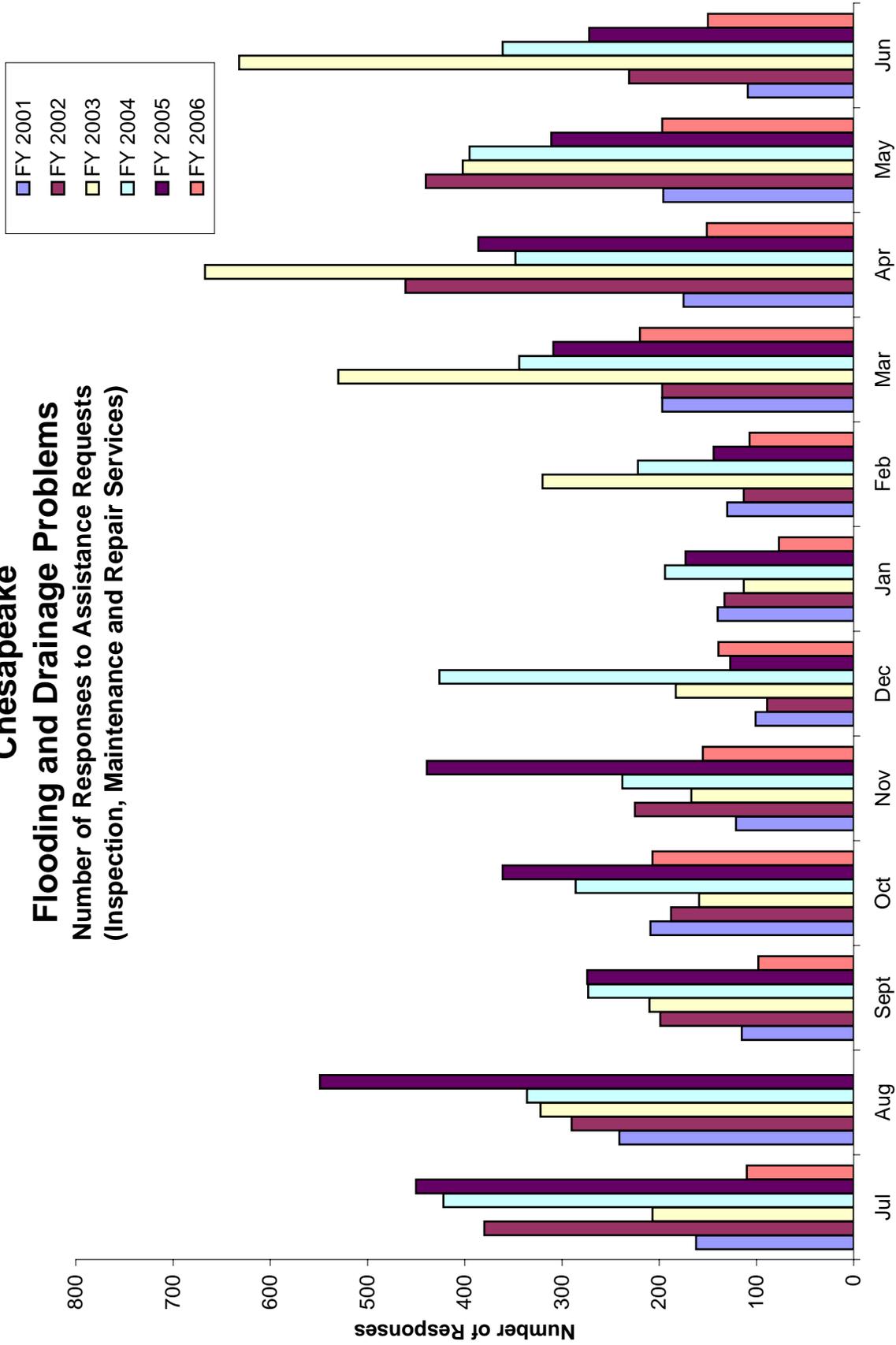
# Chesapeake Erosion and Sediment Control Activities



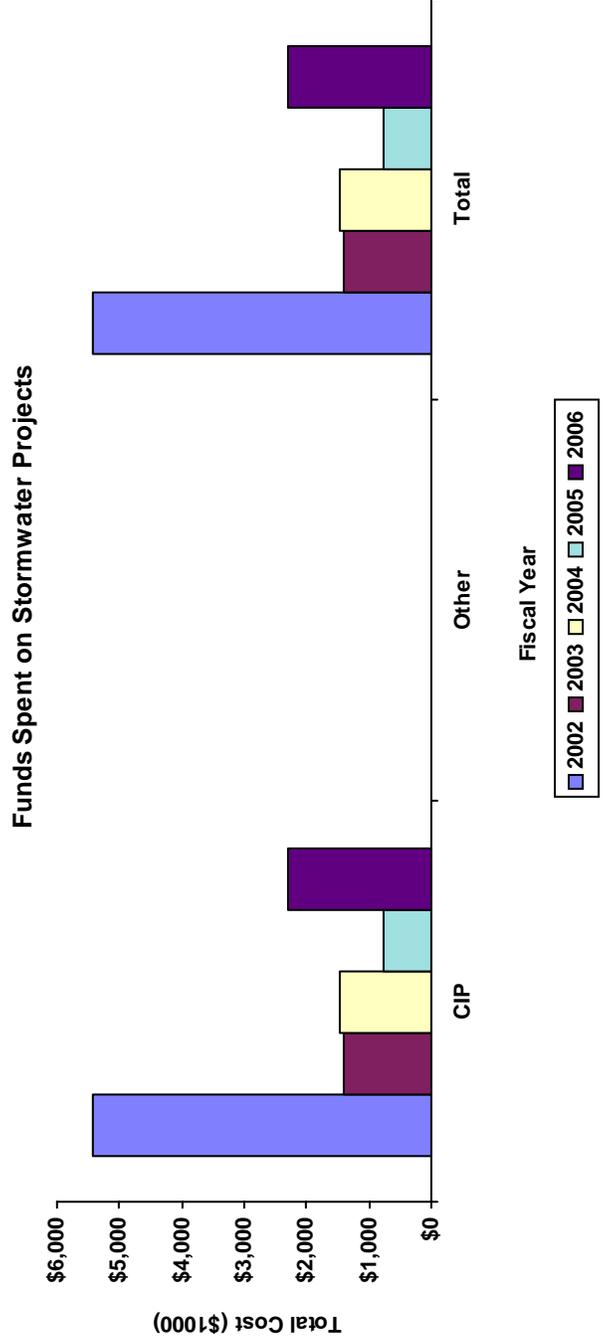
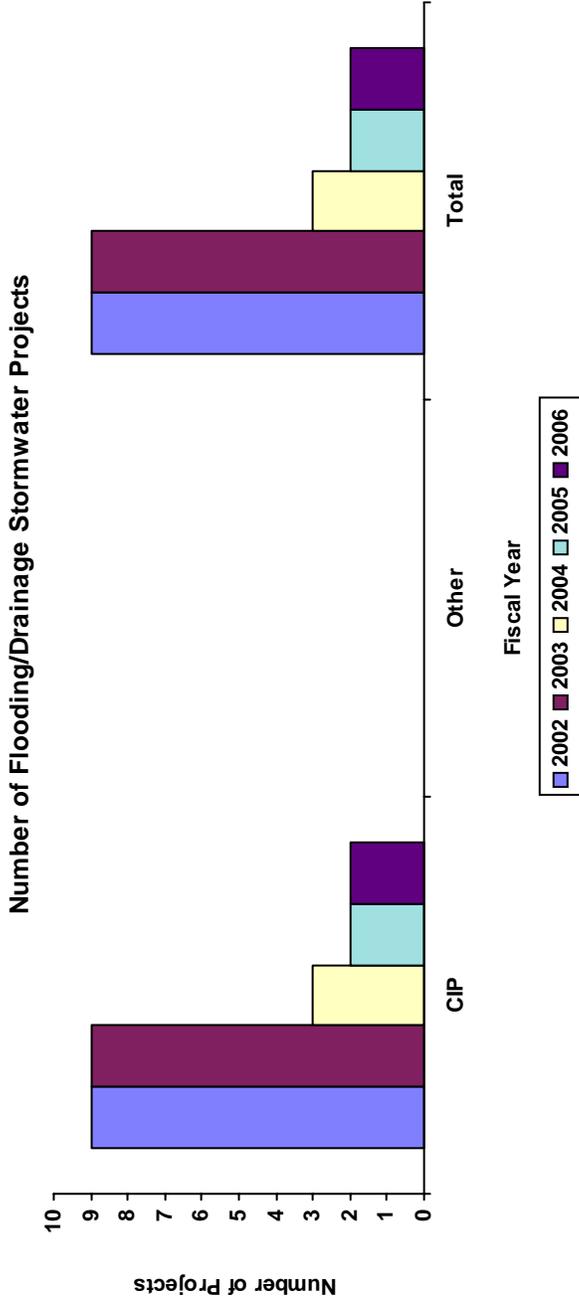
**Chesapeake**  
**Flooding and Drainage Problems**  
**Number of Responses to Assistance Requests**  
**(Inspection, Maintenance and Repair Services)**



# Chesapeake Flooding and Drainage Problems Number of Responses to Assistance Requests (Inspection, Maintenance and Repair Services)

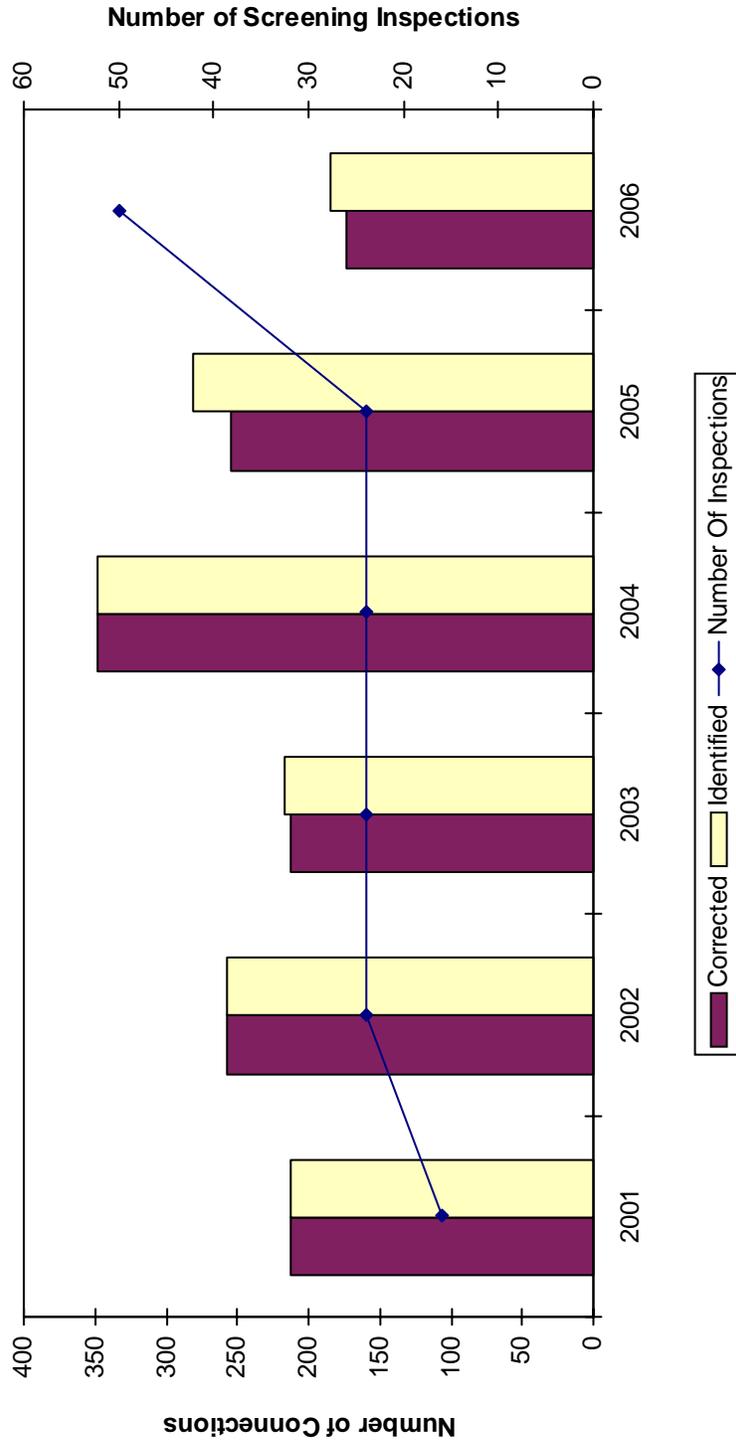


# Chesapeake Flooding and Drainage Problems

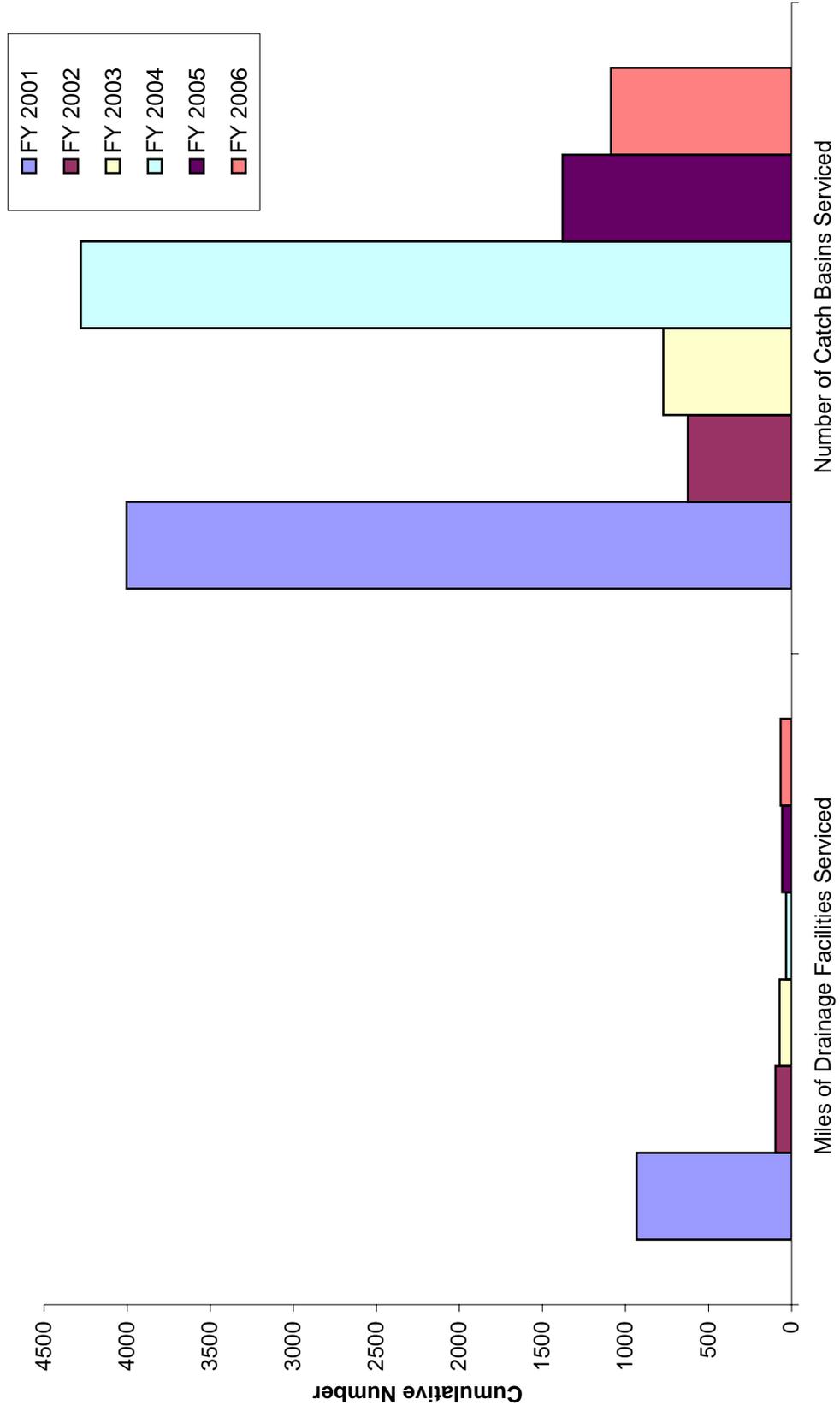


# Chesapeake

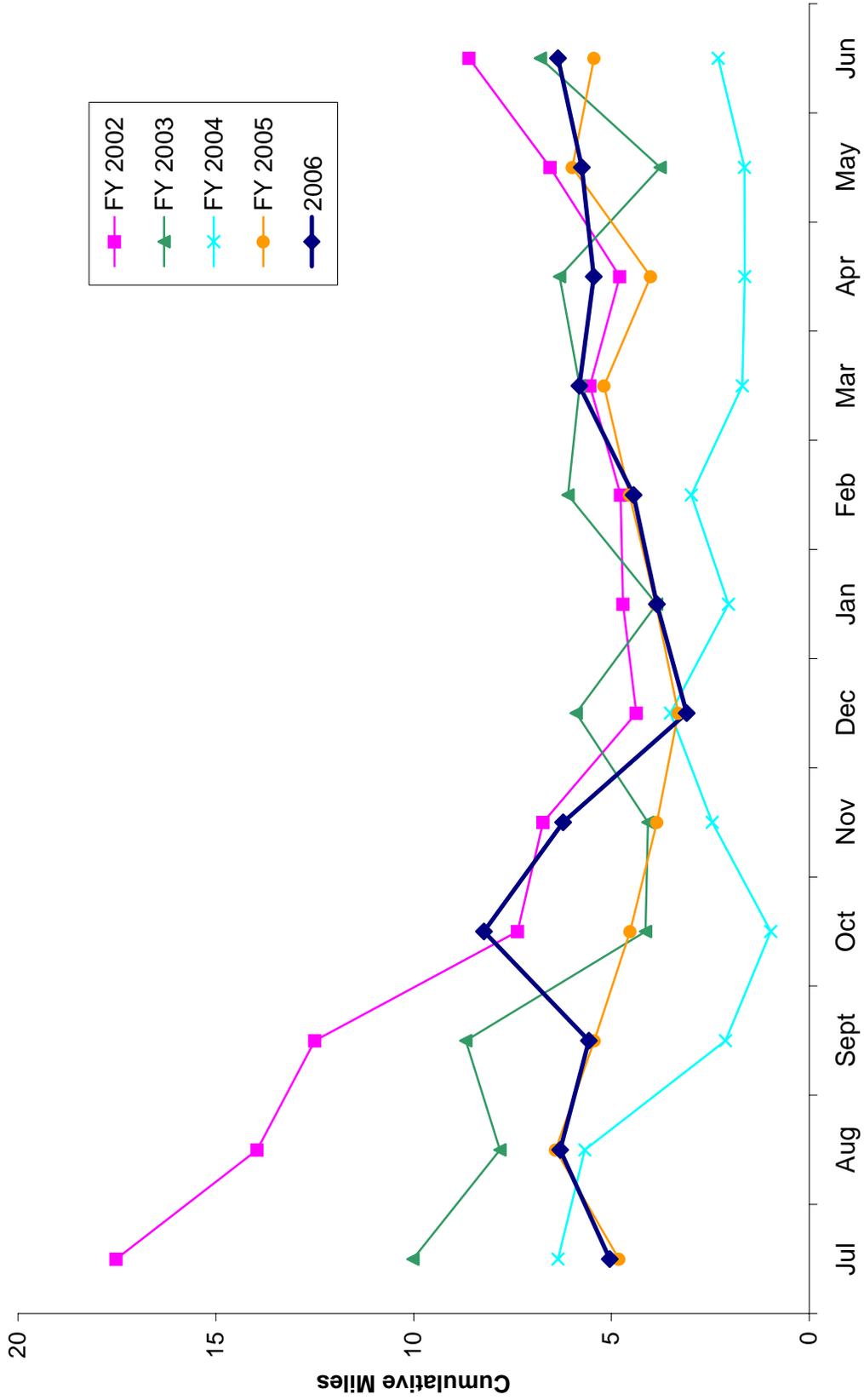
Number of Illicit Connections Identified and Corrected and Number of Screening Inspections



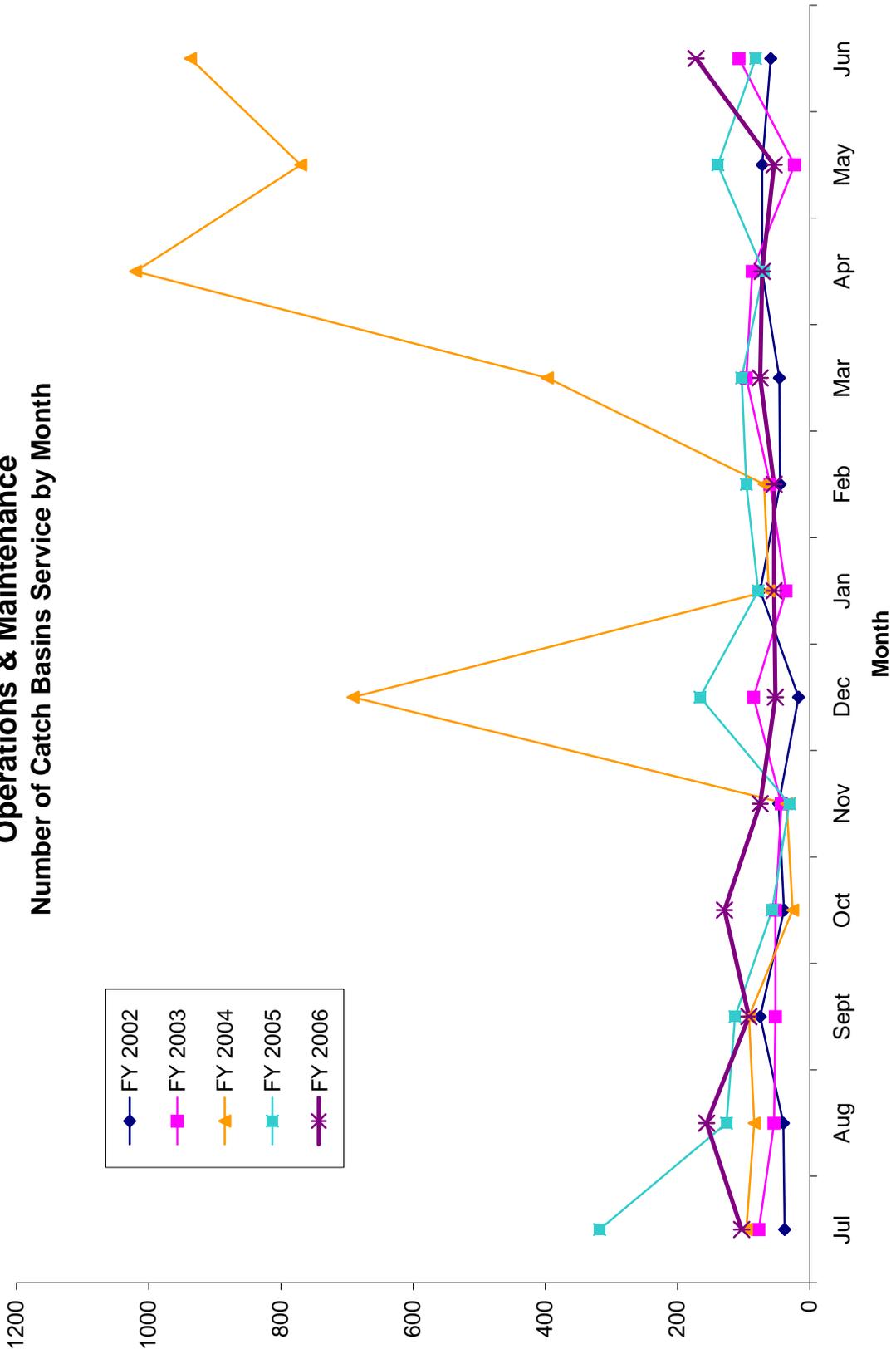
# Chesapeake Operations and Maintenance



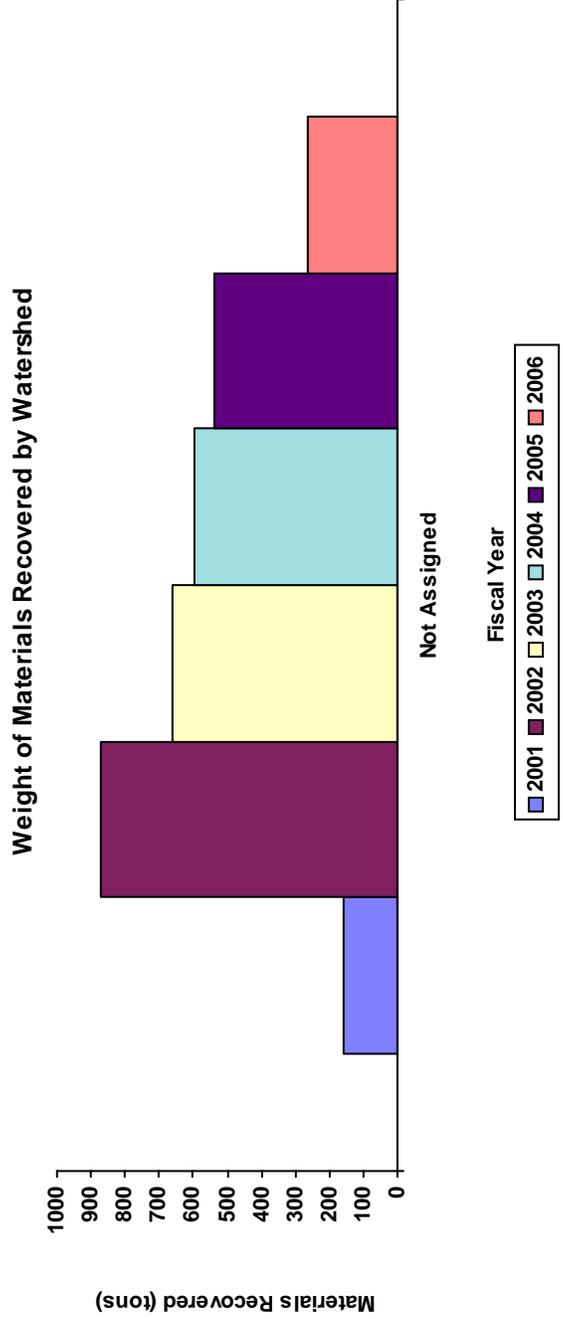
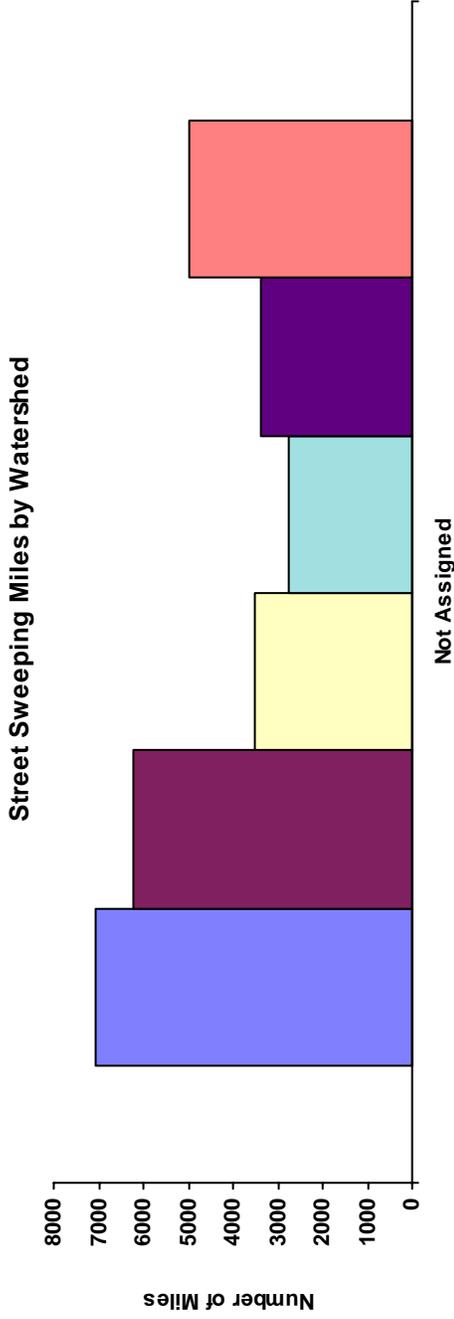
# Chesapeake Operations and Maintenance Miles of Drainage Facilities Serviced by Month



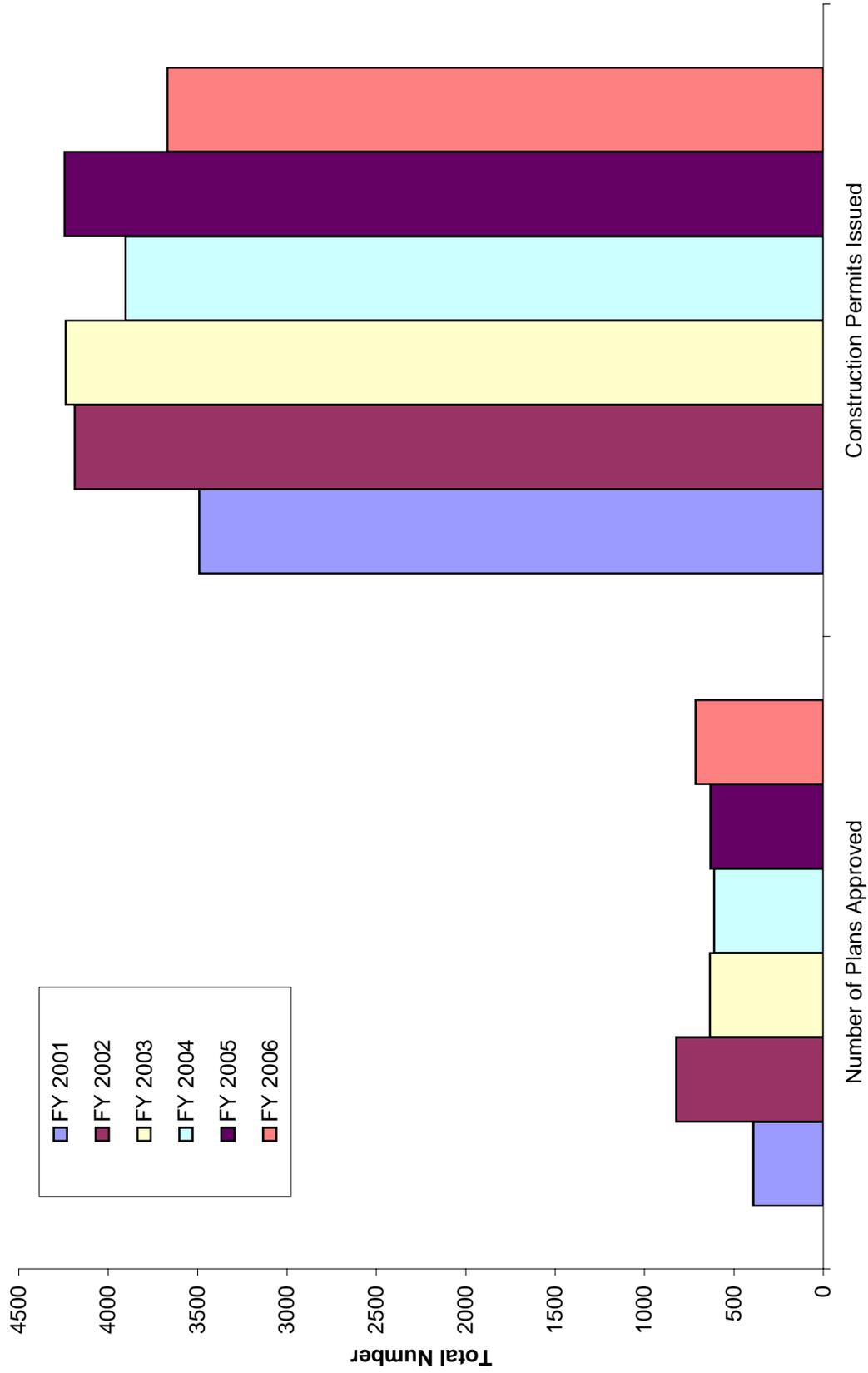
# Chesapeake Operations & Maintenance Number of Catch Basins Service by Month



# Chesapeake Operations and Maintenance



# Chesapeake Construction Permits and Site Subdivision Plans



---

---

# Publications

## Chesapeake

---

---

<b>Activity Month</b>	<b>Topic</b>	<b>Number Distributed</b>
August, 2005	General Stormwater Info	6000
June, 2006	Other	5000
<b>Municipality Totals:</b>		<b>11000</b>

---

---

# Public Outreach Activities

## Chesapeake

---

---

Activity Month	Activity Type	Number of Citizens Reached	Total Value
August, 2005	Demonstration	50	
December, 2005	Demonstration	25	
	Other	45	
March, 2006	Other	400	
April, 2006	Demonstration	295	
May, 2006	Demonstration	40	
June, 2006	Demonstration	15	
<b>Municipality Totals:</b>		<b>870</b>	

---

---

# Public Outreach Through Media

## Chesapeake

---

---

Activity Month	Spot Type	Number of Spots	Number of Citizens Reached	Total Value
July, 2005	Print	4	256000	
October, 2005	Print	2	128000	
November, 2005	Print	6	384000	
March, 2006	Print	5	320000	
April, 2006	Print	5	320000	
May, 2006	Print	4	256000	
June, 2006	Print	2	128000	
<b>Municipality Totals:</b>		<b>28</b>	<b>1792000</b>	

---

---

# Stream Cleanup Activities

## Chesapeake

---

---

Activity Month	Miles Covered	Materials Collected (tons)
May, 2006	50	52
<b>Municipality Totals:</b>	<b>50</b>	<b>52</b>

---

---

# Website Hits

## Chesapeake

---

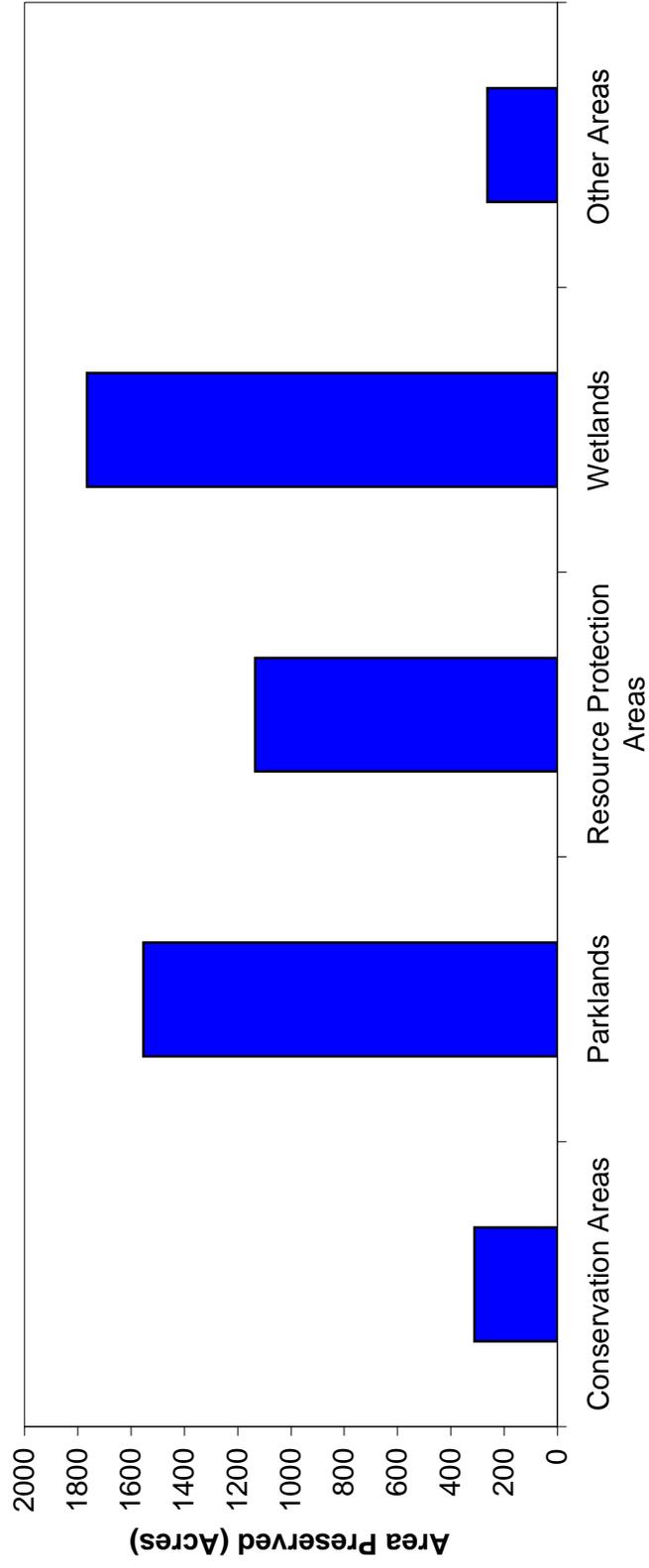
---

Activity Month	Number of Hits
June, 2006	11000
<b>Municipality Totals:</b>	11000

**CITY OF HAMPTON**

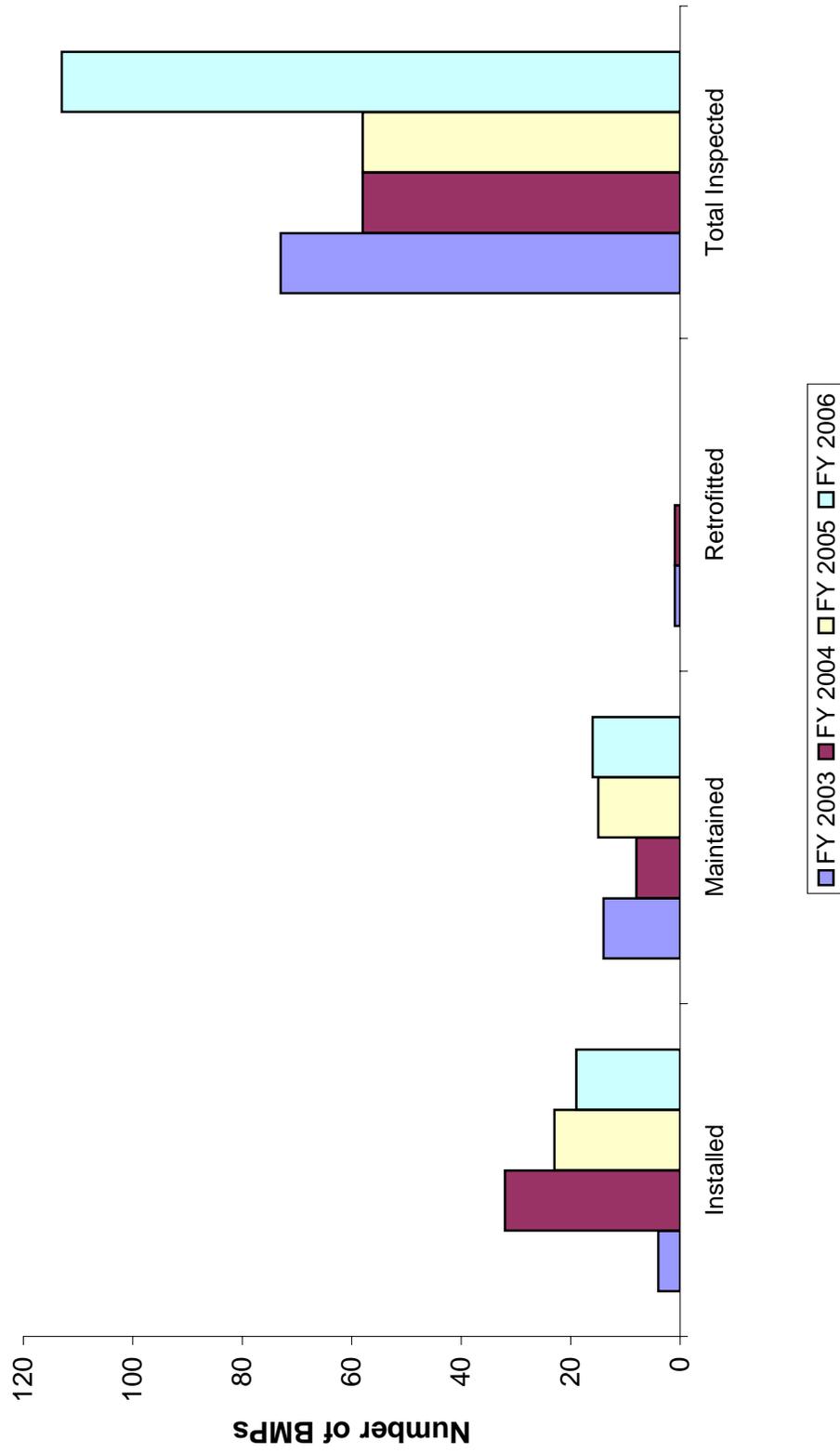
# Hampton

## Green Areas Protected (FY 2006)

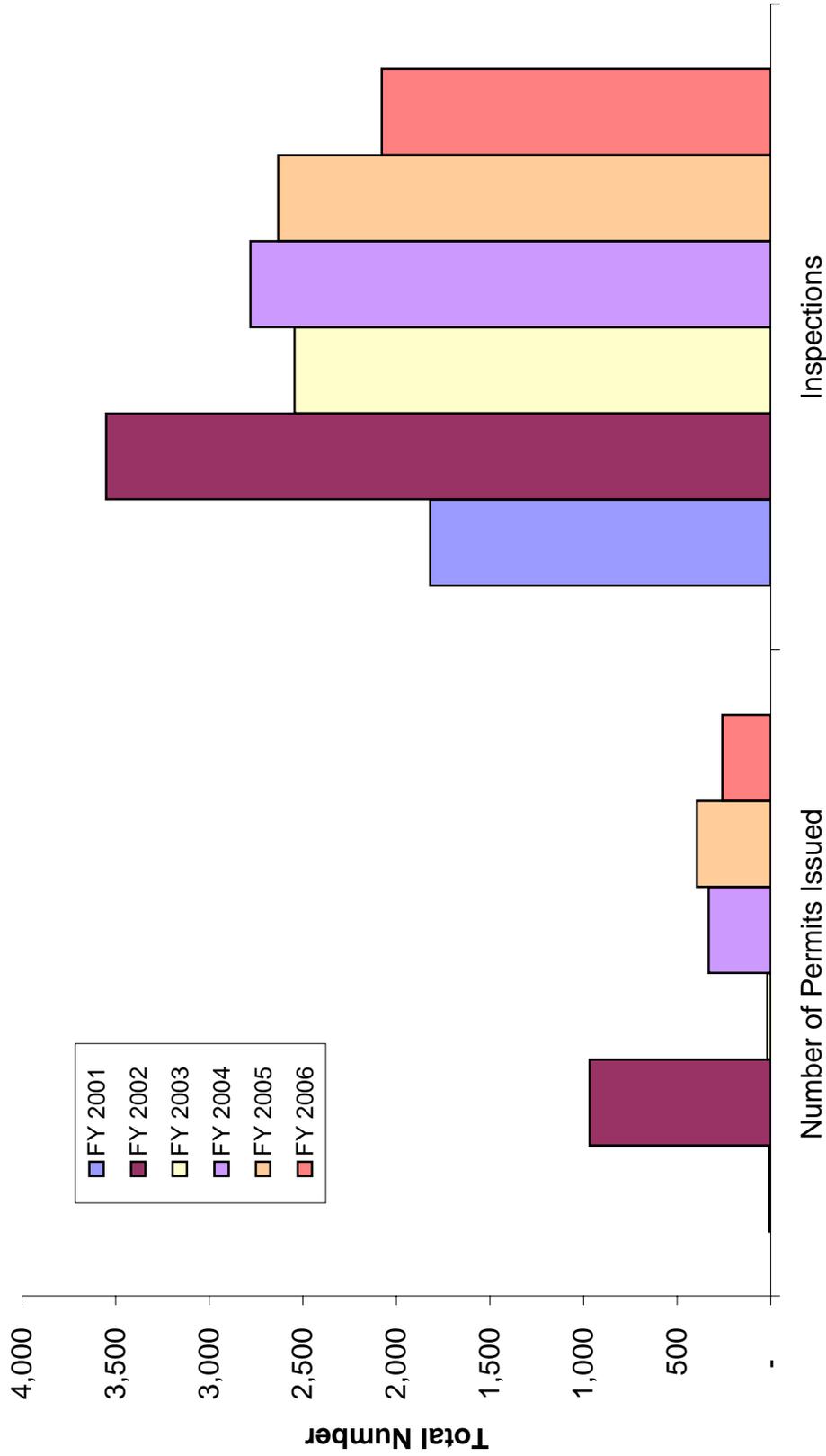


# Hampton

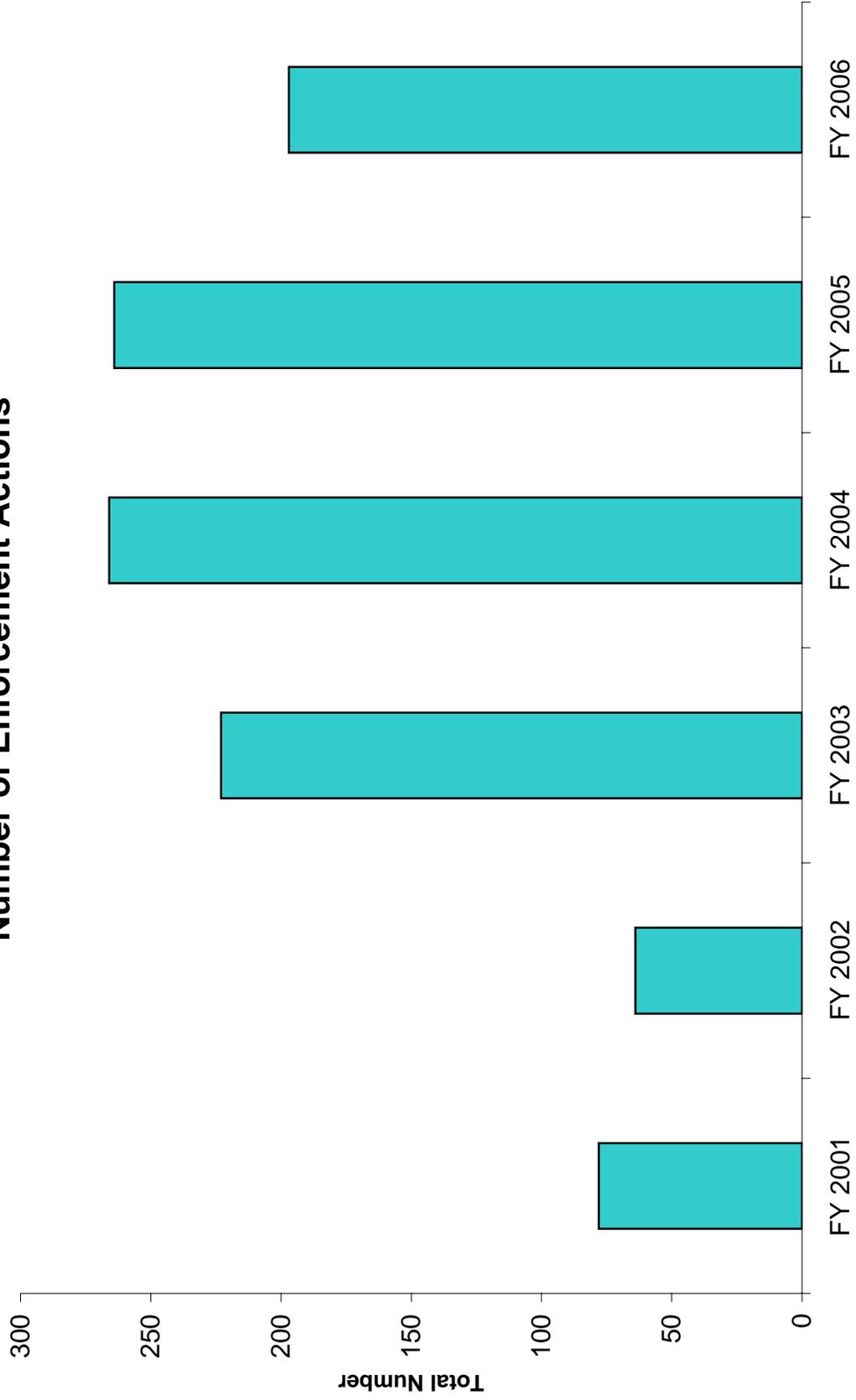
Total Number of Public BMPs Installed, Retrofitted, Inspected and Maintained (ALL BMP Types)



# Hampton Erosion and Sediment Control Activities

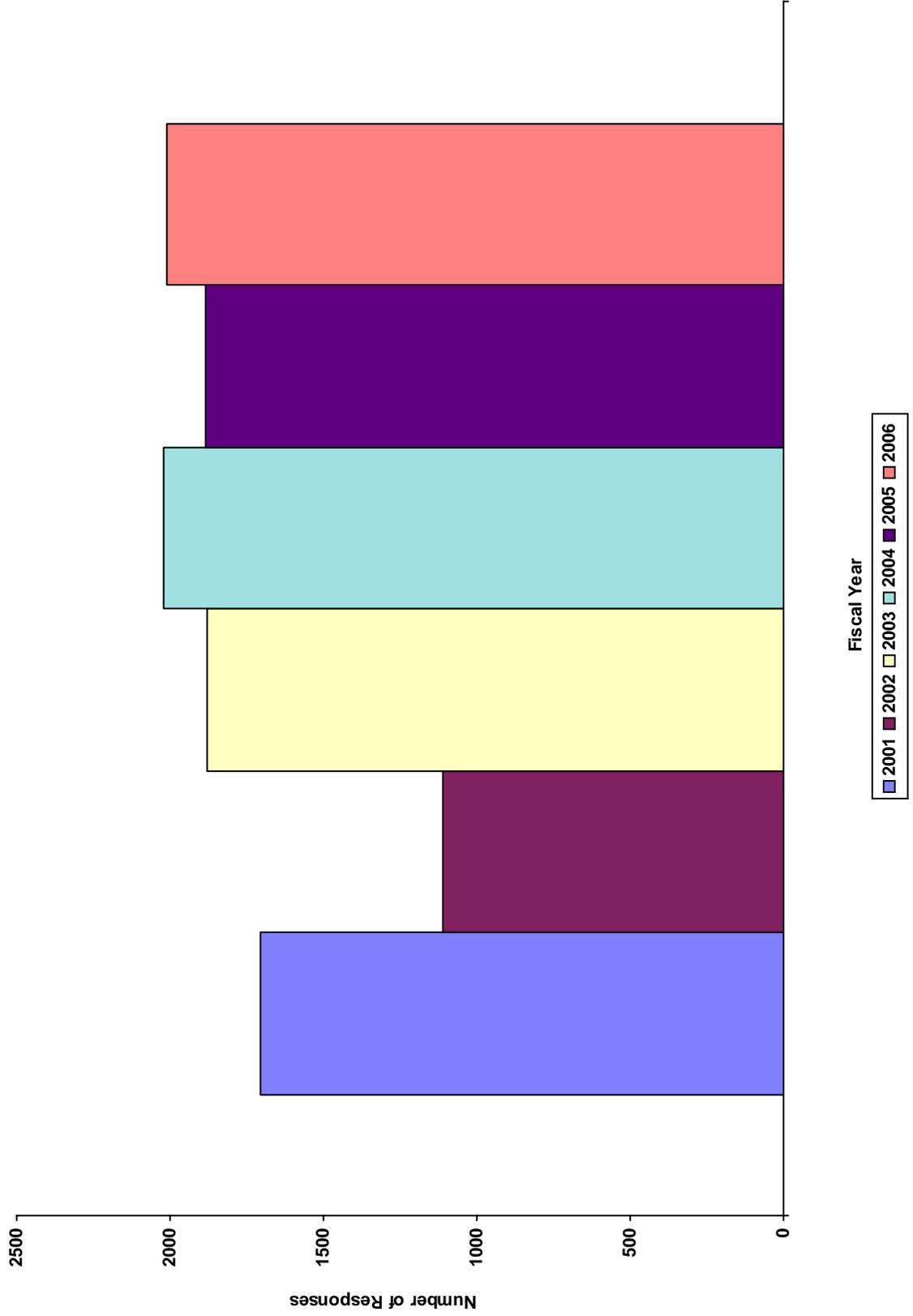


**Hampton  
Erosion and Sediment Control Activities  
Number of Enforcement Actions**

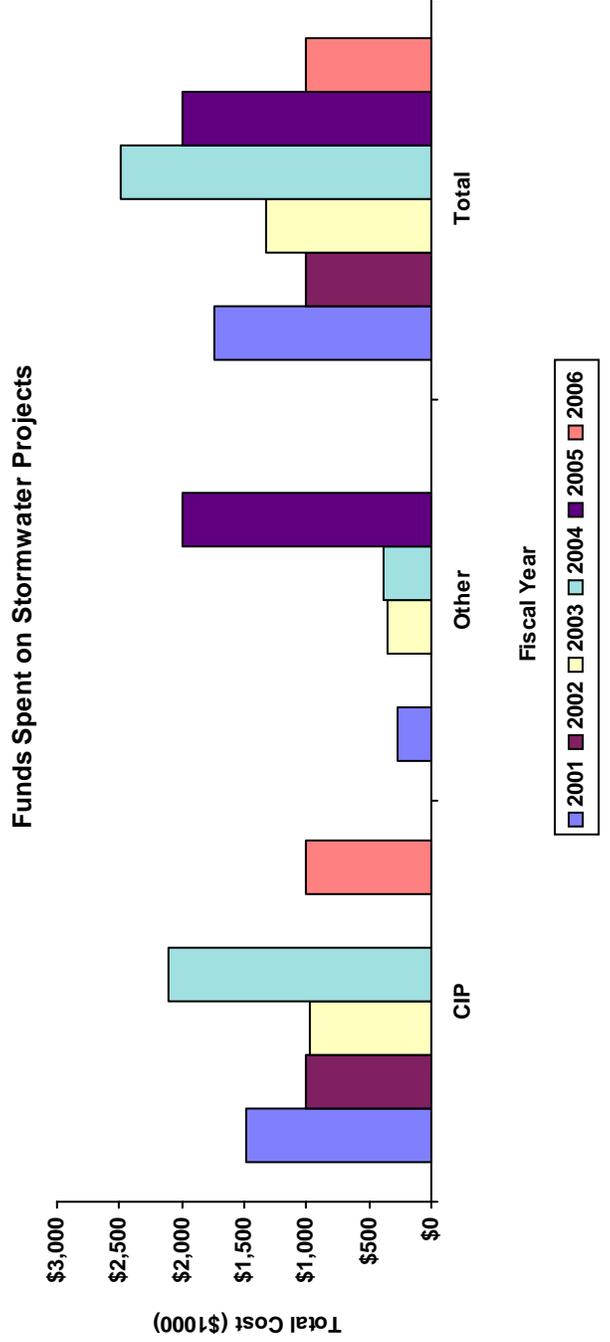
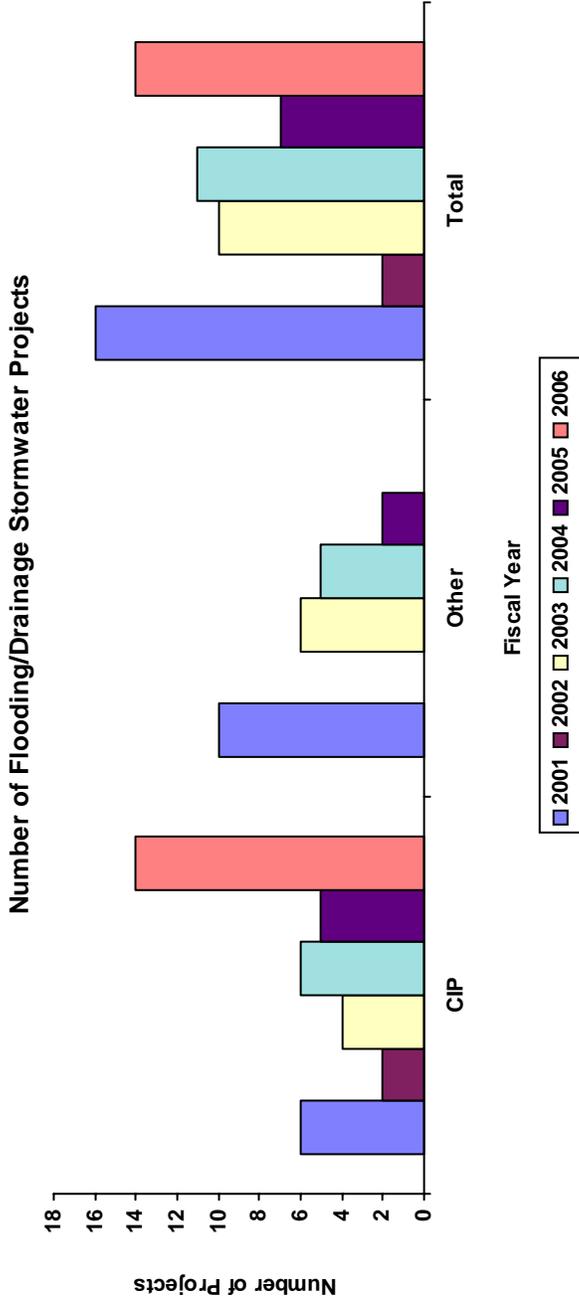


# Hampton Flooding and Drainage Problems

Number of Responses to Assistance Requests  
(Inspection, Maintenance and Repair Services)

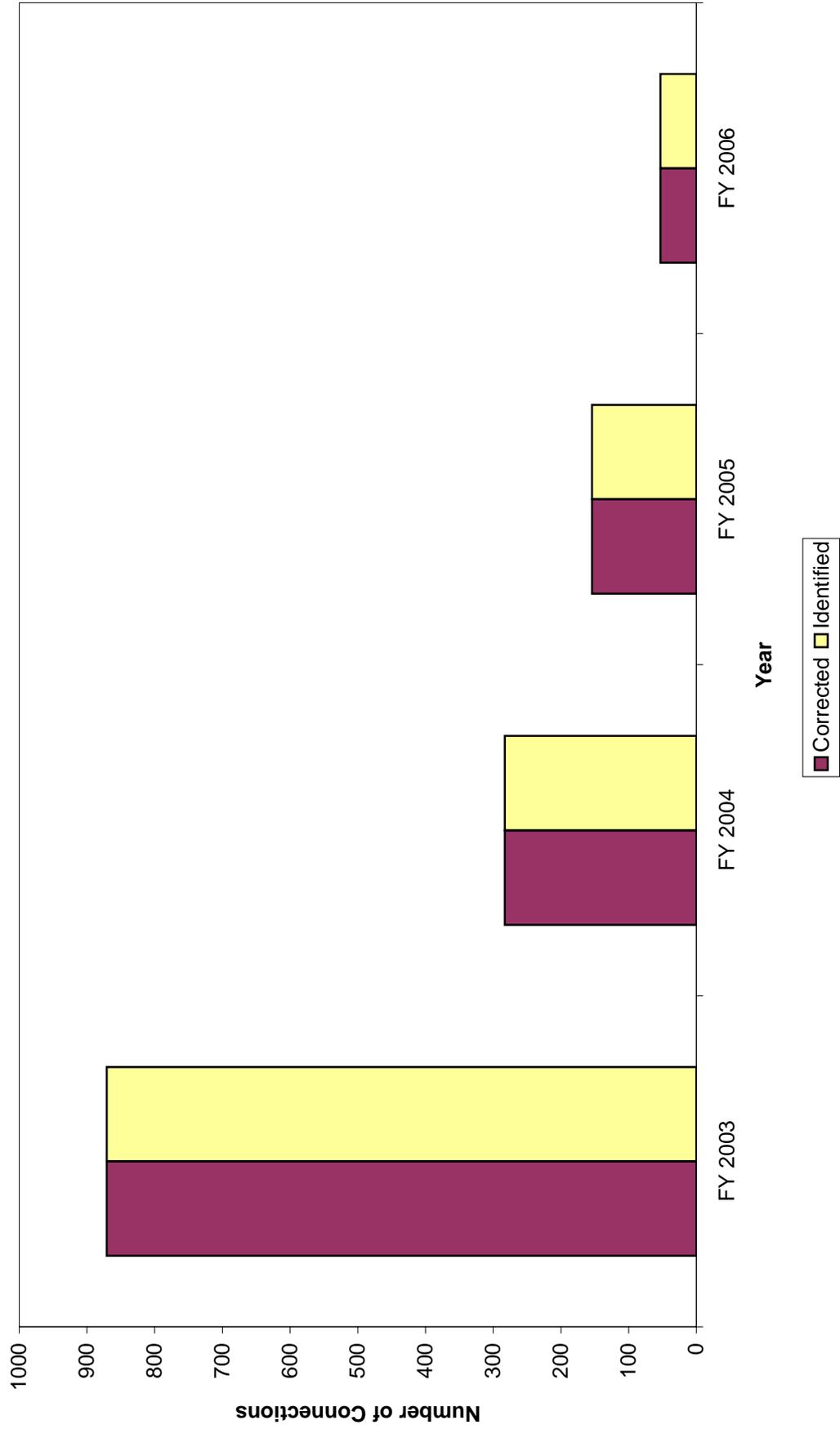


# Hampton Flooding and Drainage Problems

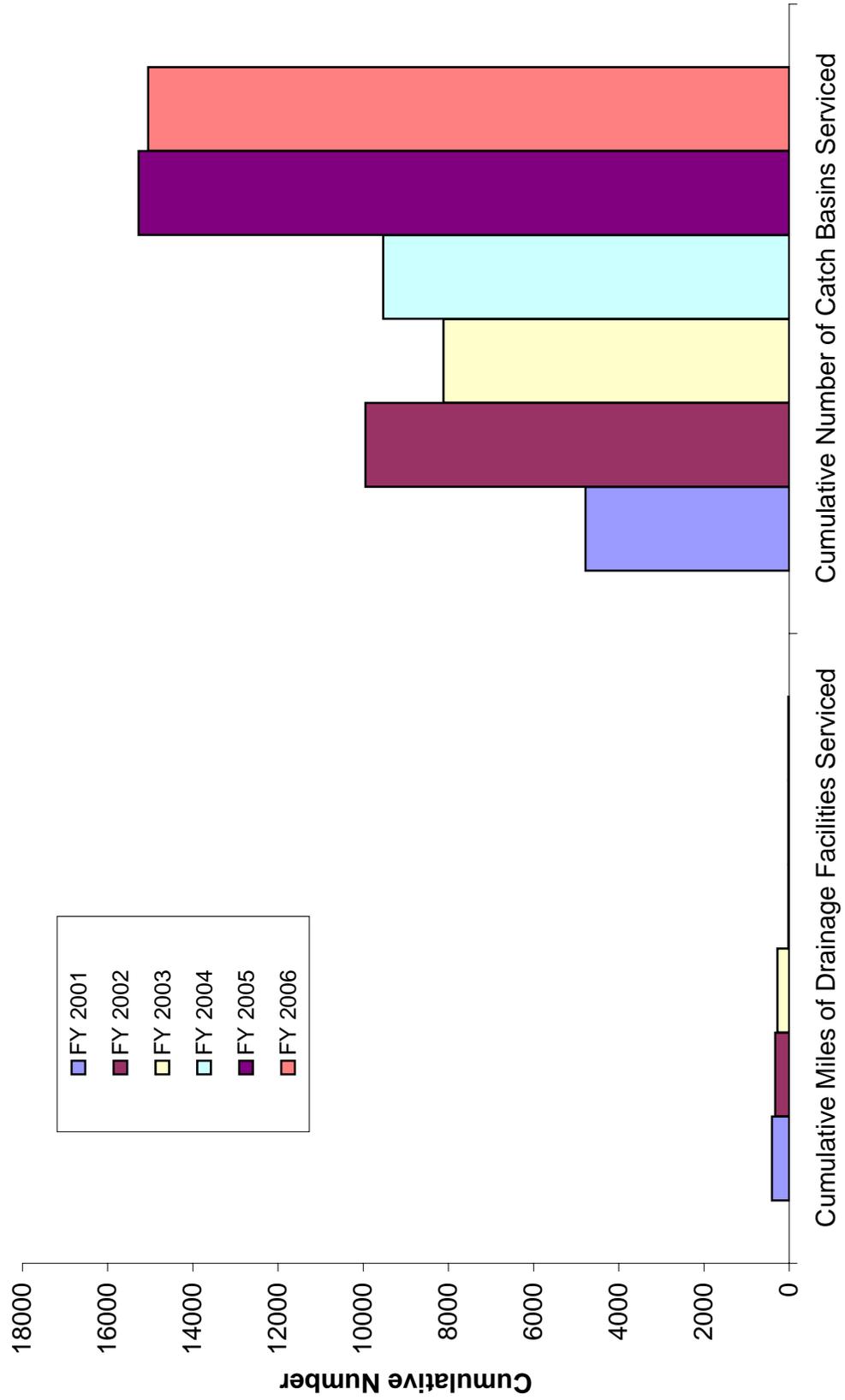


# Hampton

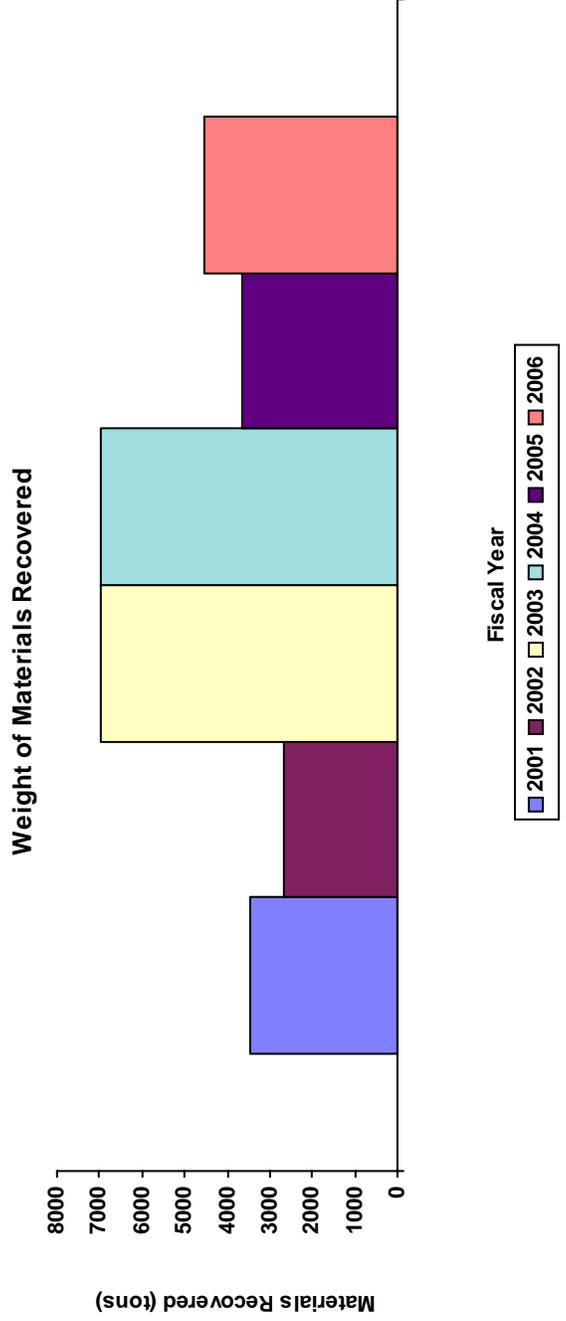
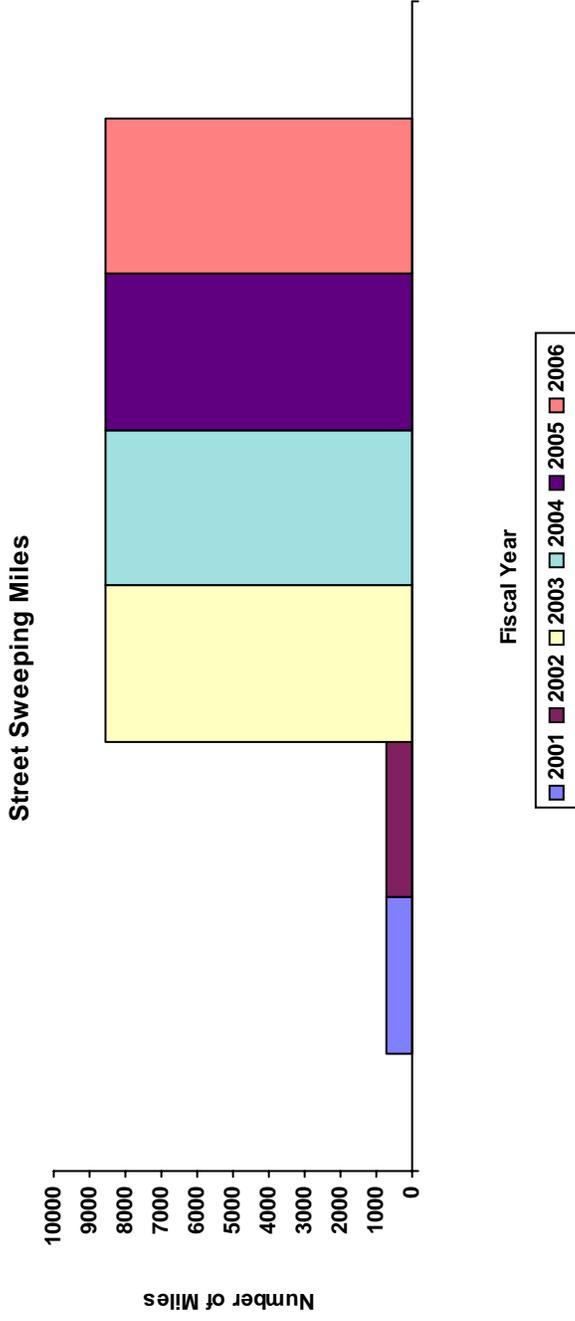
## Number of Illicit Connections Identified and Corrected



# Hampton Operations and Maintenance

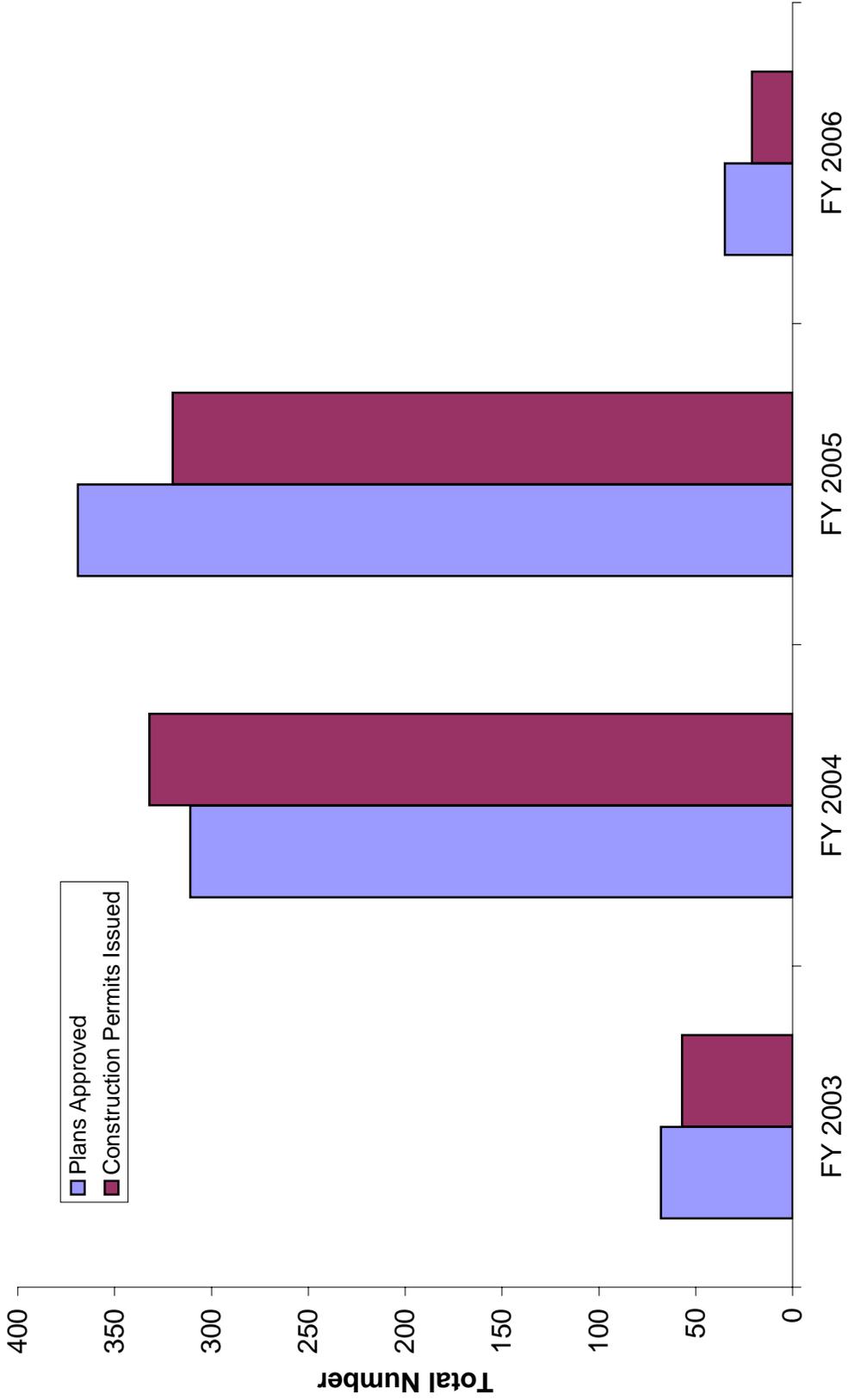


# Hampton Operations and Maintenance



# Hampton

## Construction Permits and Site Subdivision Plans Approved



---

---

# Publications

## Hampton

---

---

Activity Month	Topic	Number Distributed
June, 2006	General Stormwater Info	59230
<b>Municipality Totals:</b>		<b>59230</b>

---

---

# Public Outreach Activities

## Hampton

---

---

Activity Month	Activity Type	Number of Citizens Reached	Total Value
June, 2006	Distribute Give Away Ite	3275	
	Exhibit	3910	
	Other	180	
	Presentation	2724	
	Stream Cleanup	5240	
	Workshop	14	
<b>Municipality Totals:</b>		<b>15343</b>	

---

---

# Public Outreach Through Media

## Hampton

---

---

Activity Month	Spot Type	Number of Spots	Number of Citizens Reached	Total Value
June, 2006	Other	47		
<b>Municipality Totals:</b>		47		

---

---

# Stream Cleanup Activities

## Hampton

---

---

Activity Month	Miles Covered	Materials Collected (tons)
June, 2006		1374
<b>Municipality Totals:</b>		<b>1374</b>

---

---

# Website Hits

## Hampton

---

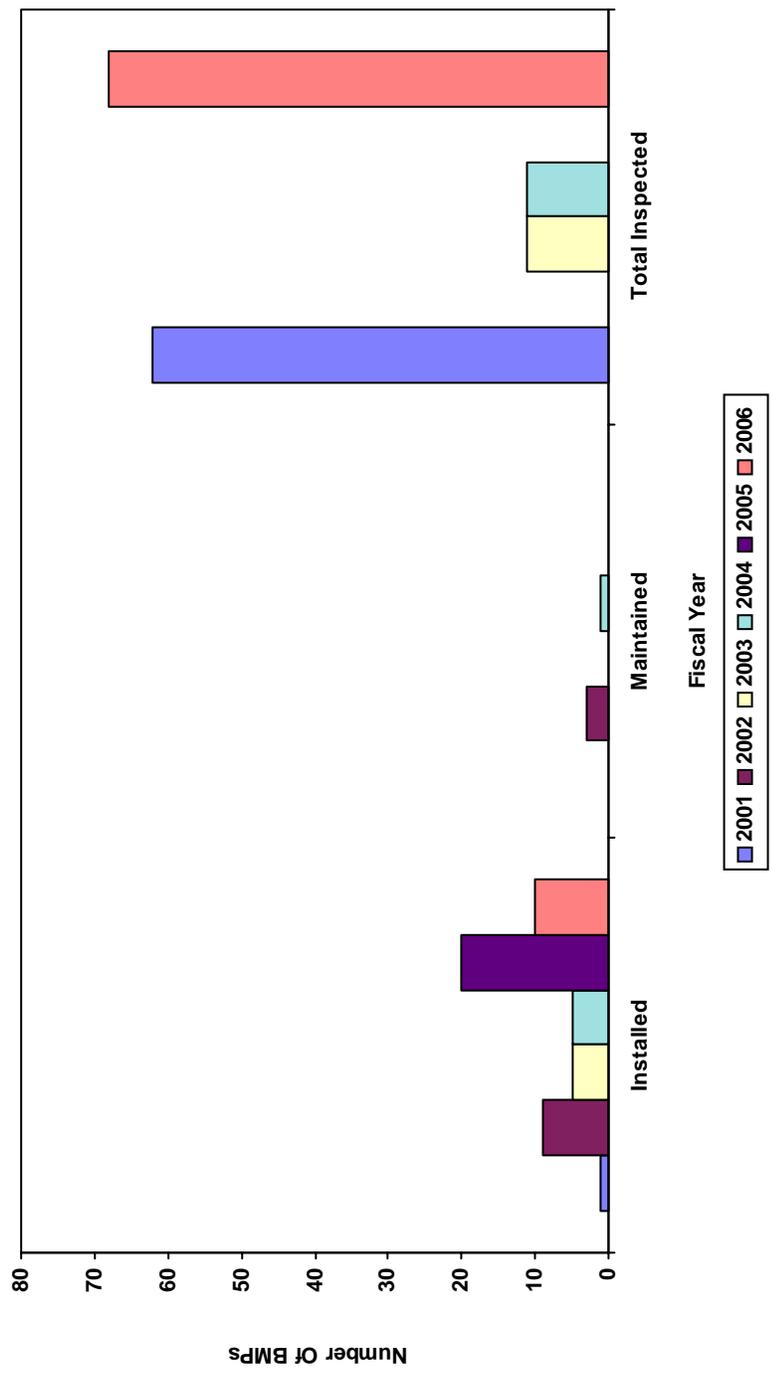
---

Activity Month	Number of Hits
June, 2006	11021
<b>Municipality Totals:</b>	11021

**CITY OF NEWPORT NEWS**

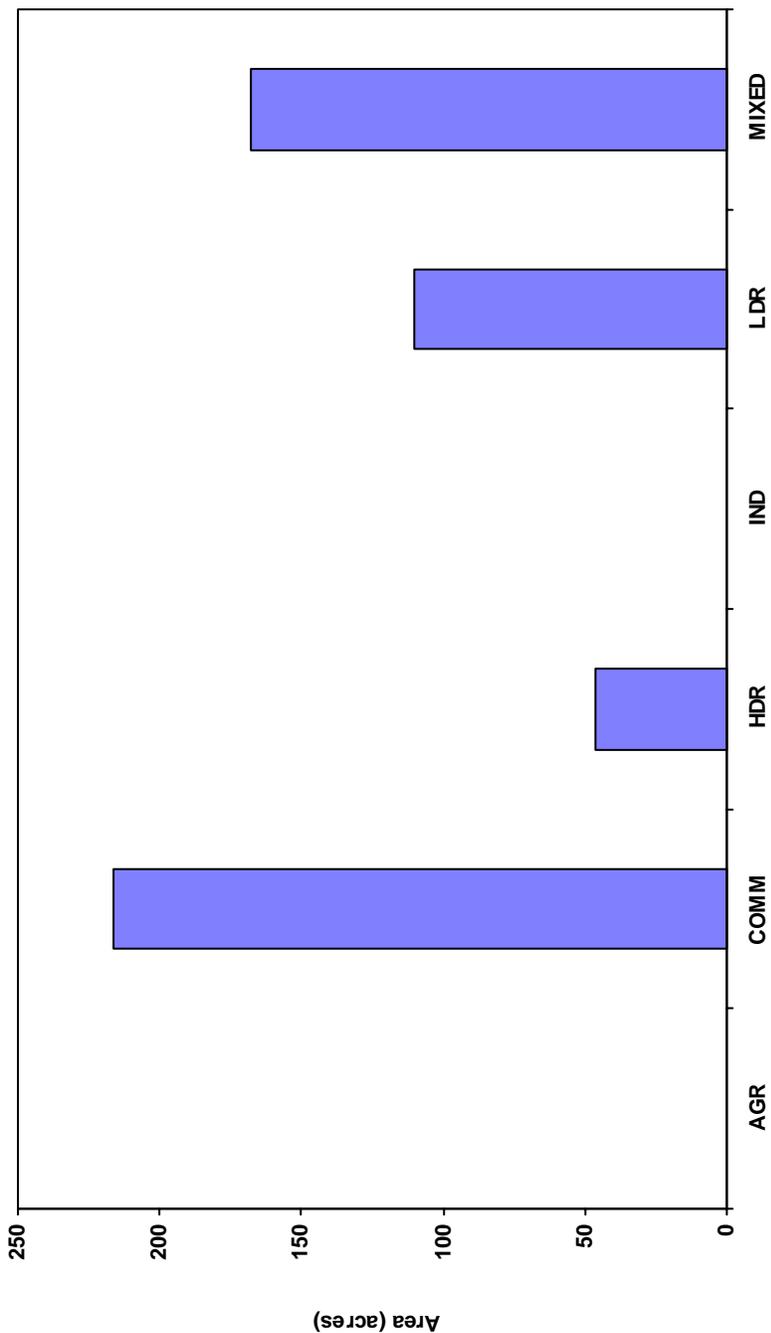
# Newport News

Total Number of Public BMPs Installed, Inspected and Maintained  
(All BMP Types)

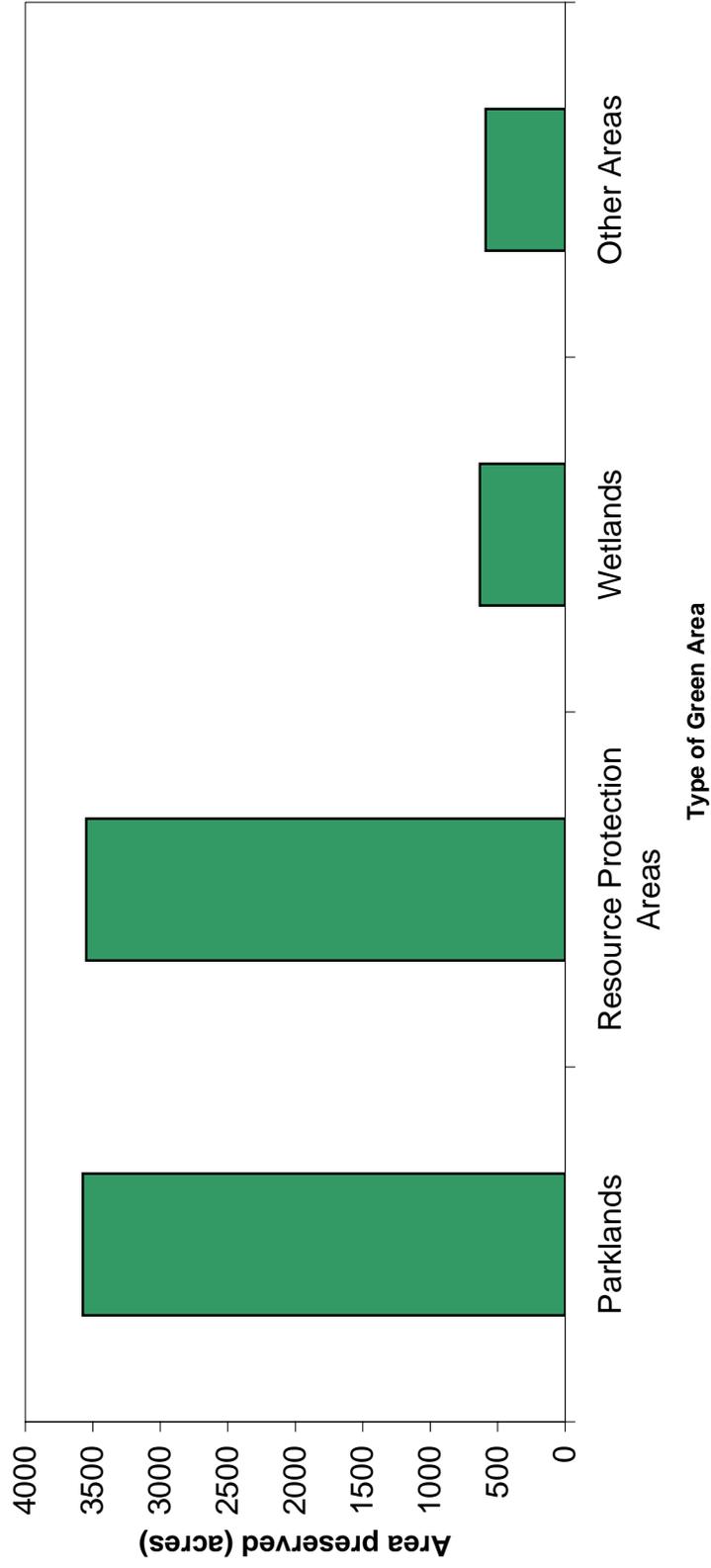


# Newport News

## Cumulative Area Served by BMPs by Land Use for Fiscal Years 2001 - 2006



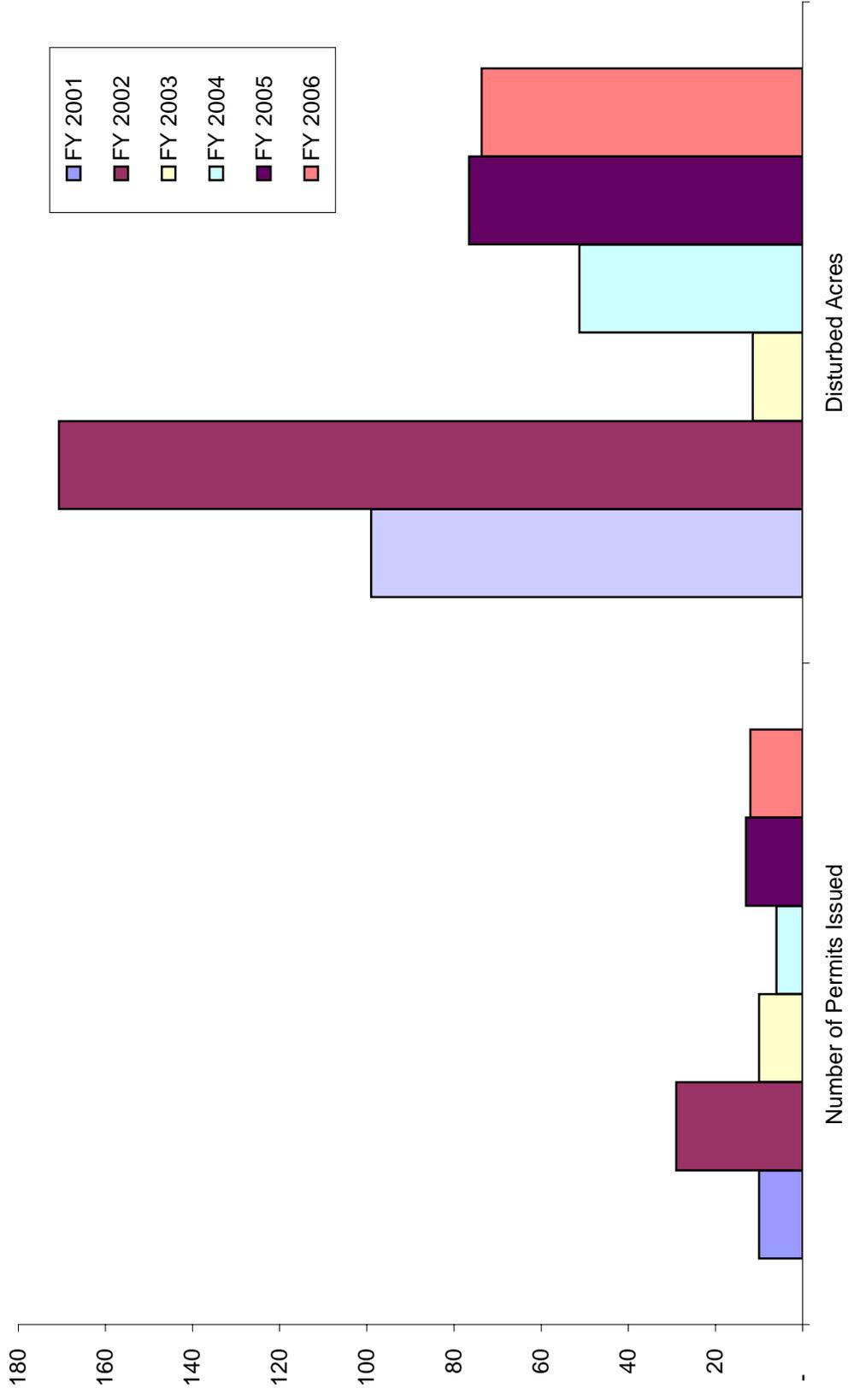
## Newport News Green Areas Protected & Restored (FY 2006)



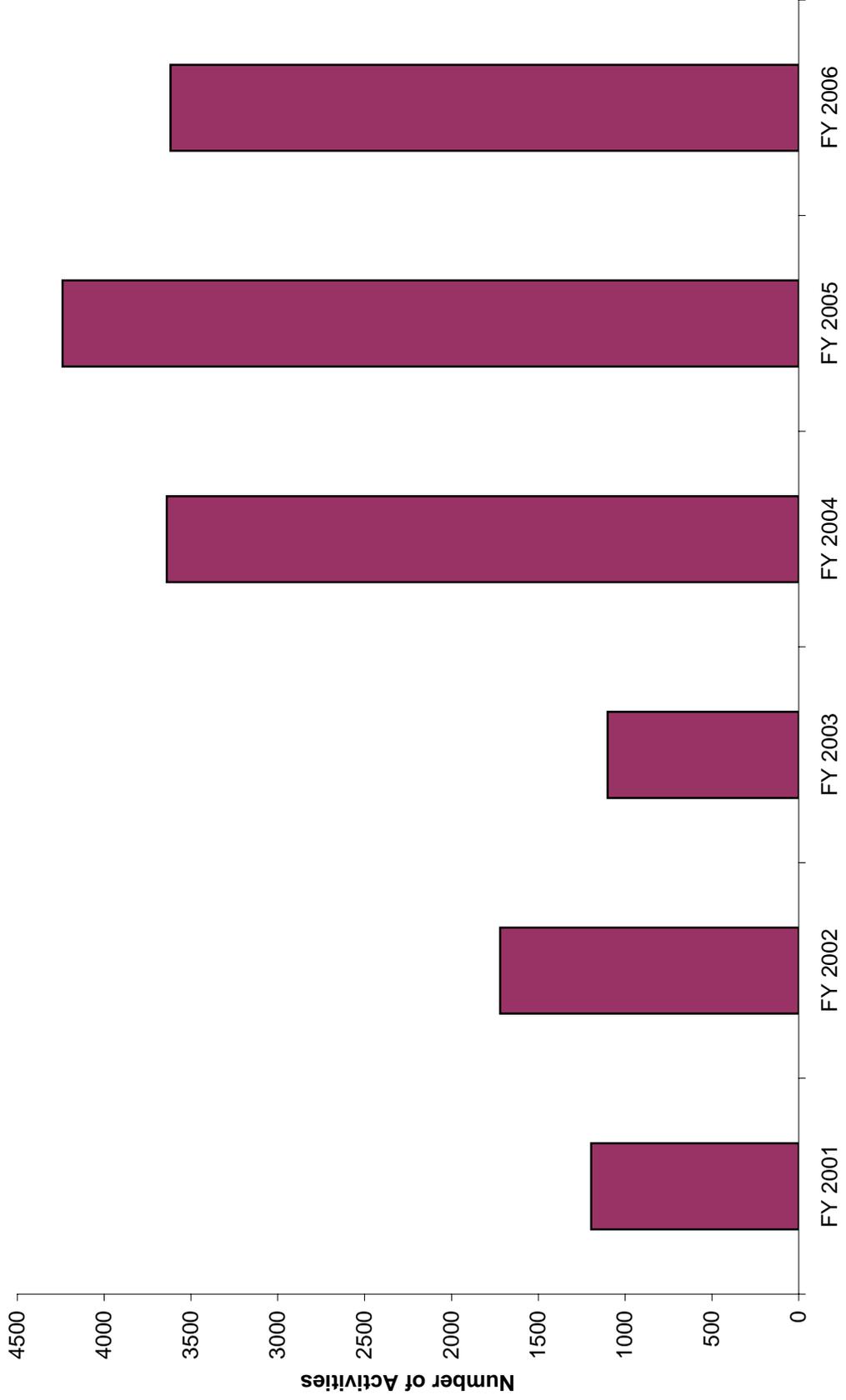
# Newport News

## Erosion and Sediment Control Activities

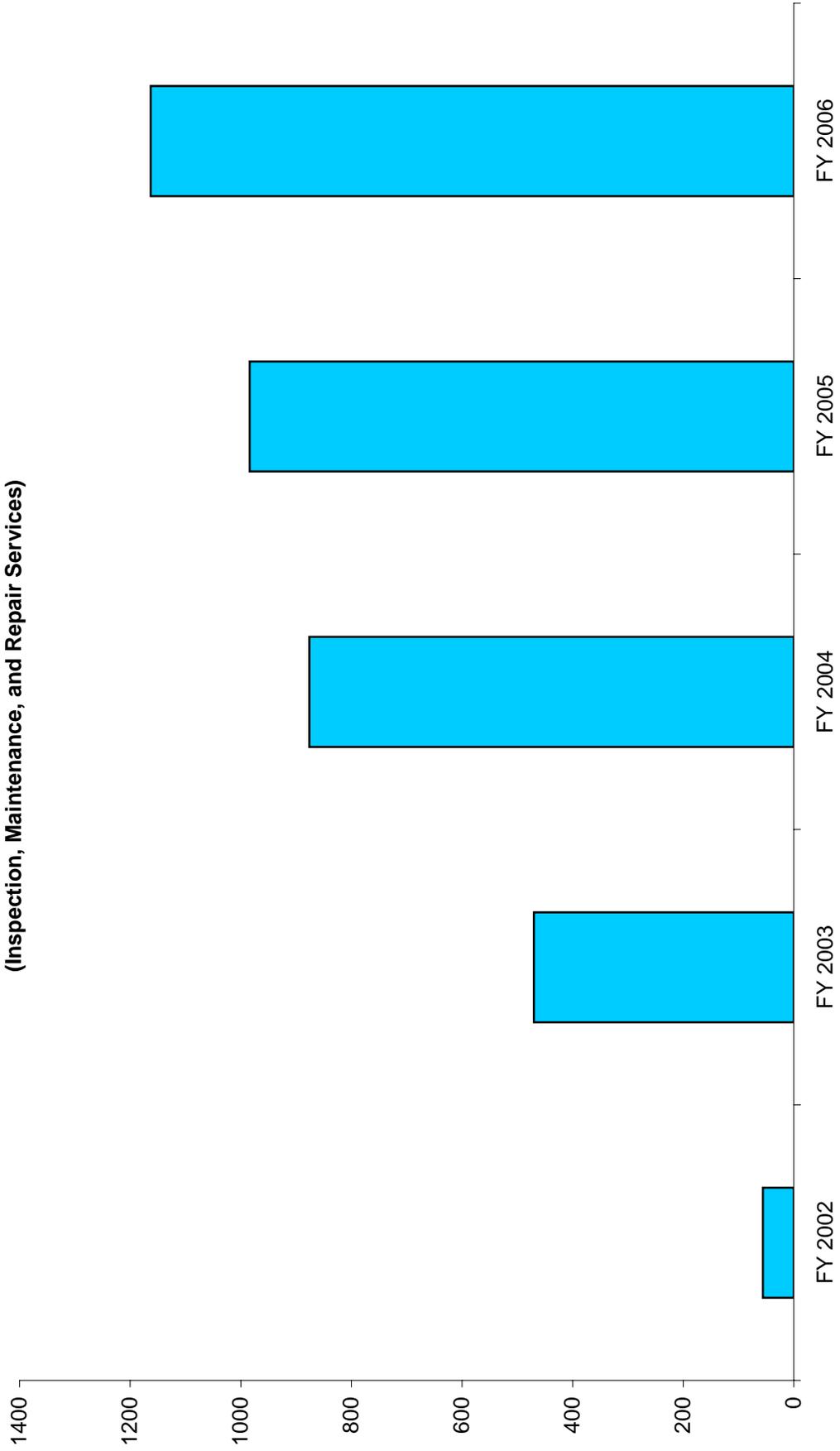
### Number of Permits Issued & Disturbed Acreage



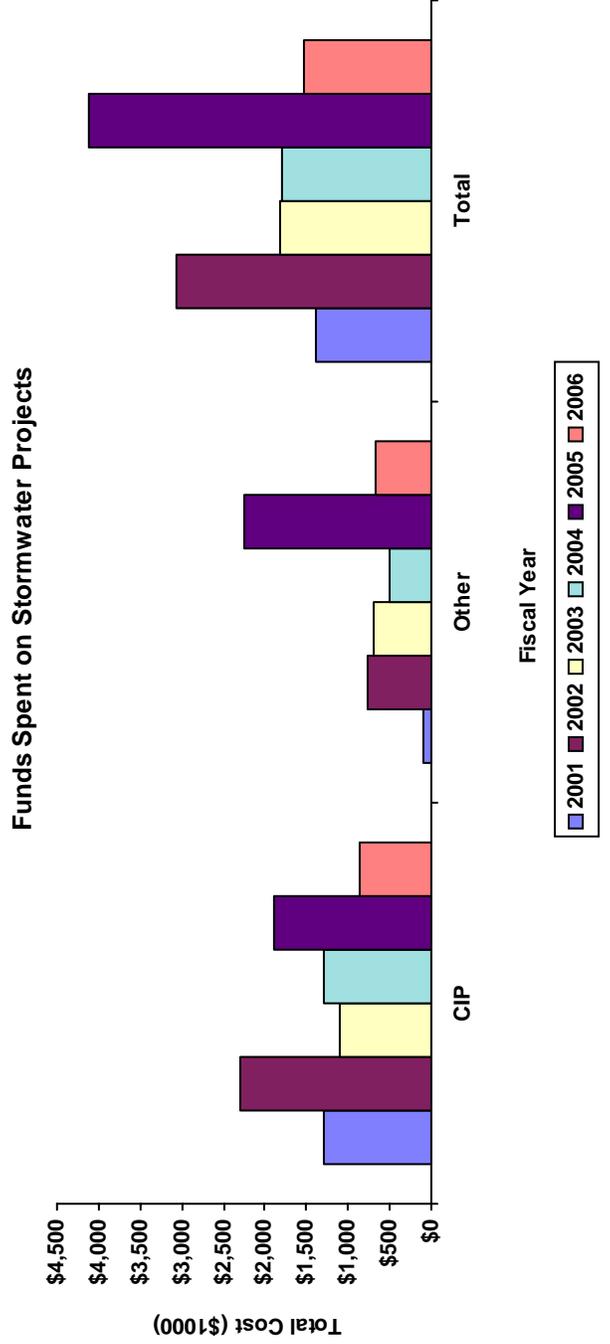
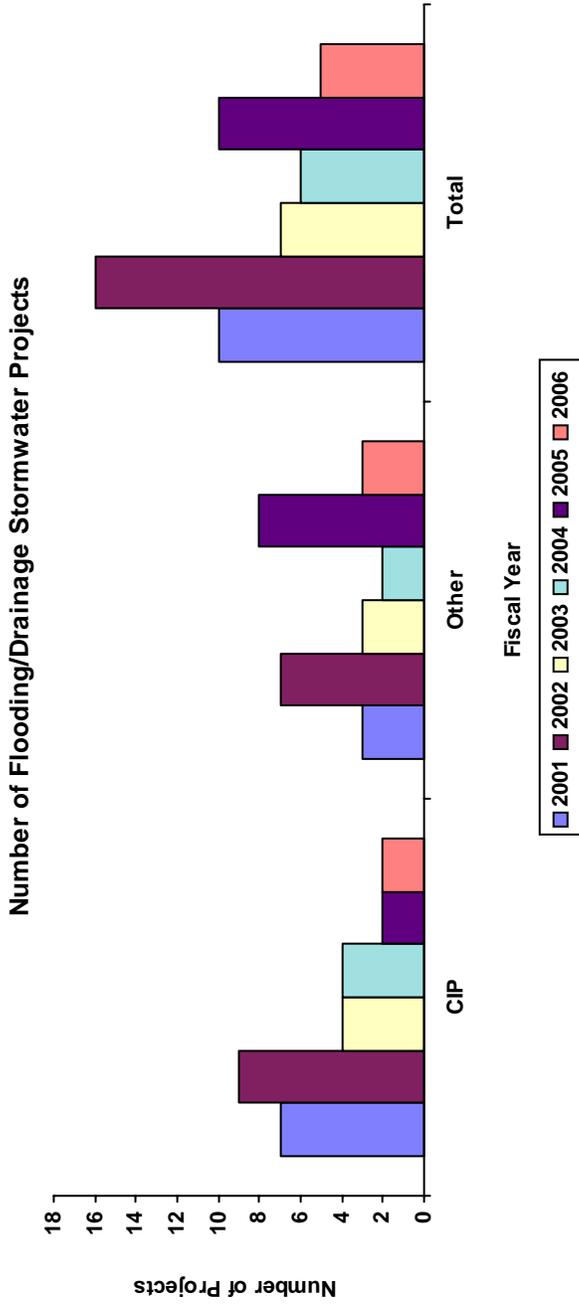
# Newport News Erosion and Sediment Control Activities Number of Inspections



**Newport News**  
**Flooding and Drainage Problems**  
**Number of Responses to Assistance Requests**  
(Inspection, Maintenance, and Repair Services)

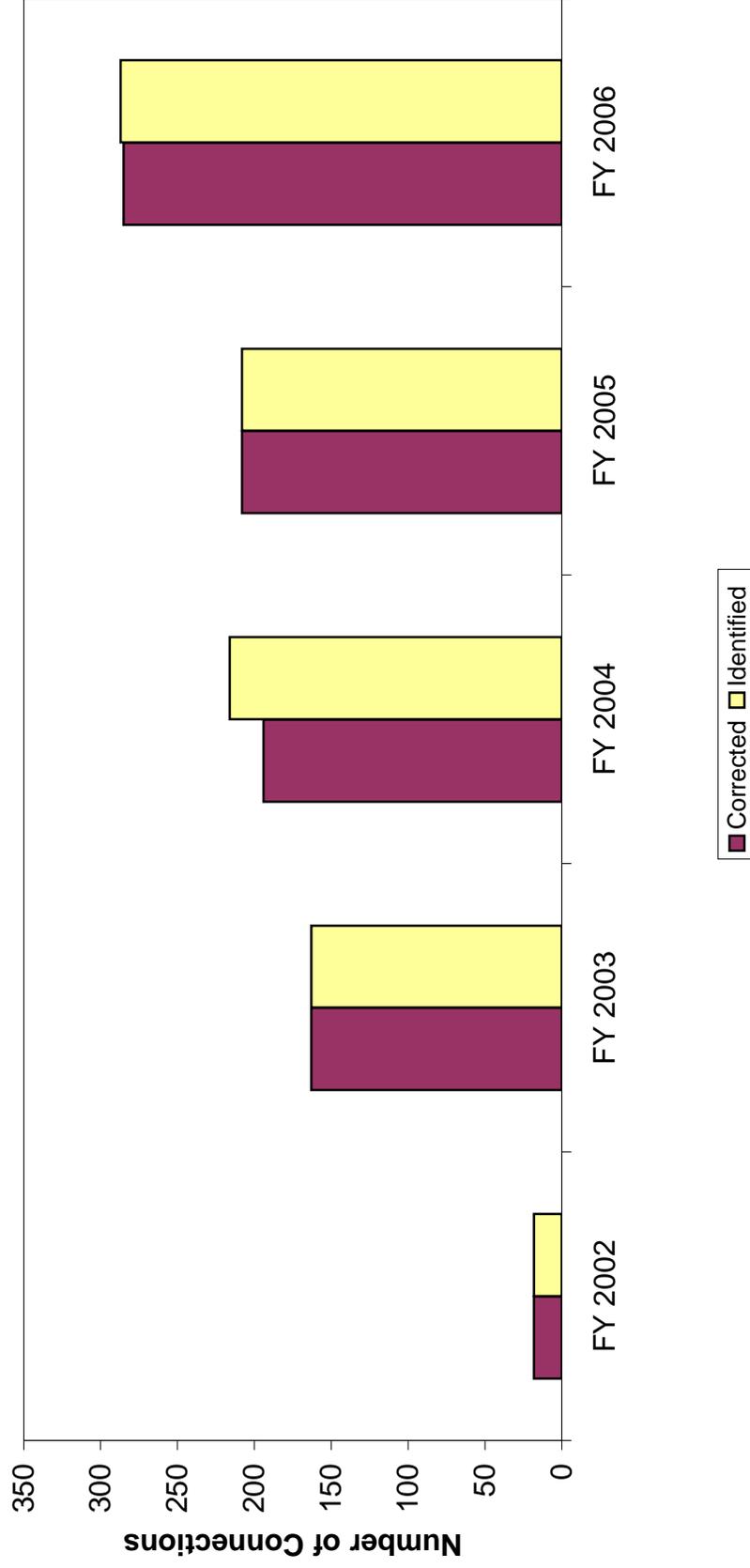


# Newport News Flooding and Drainage Problems

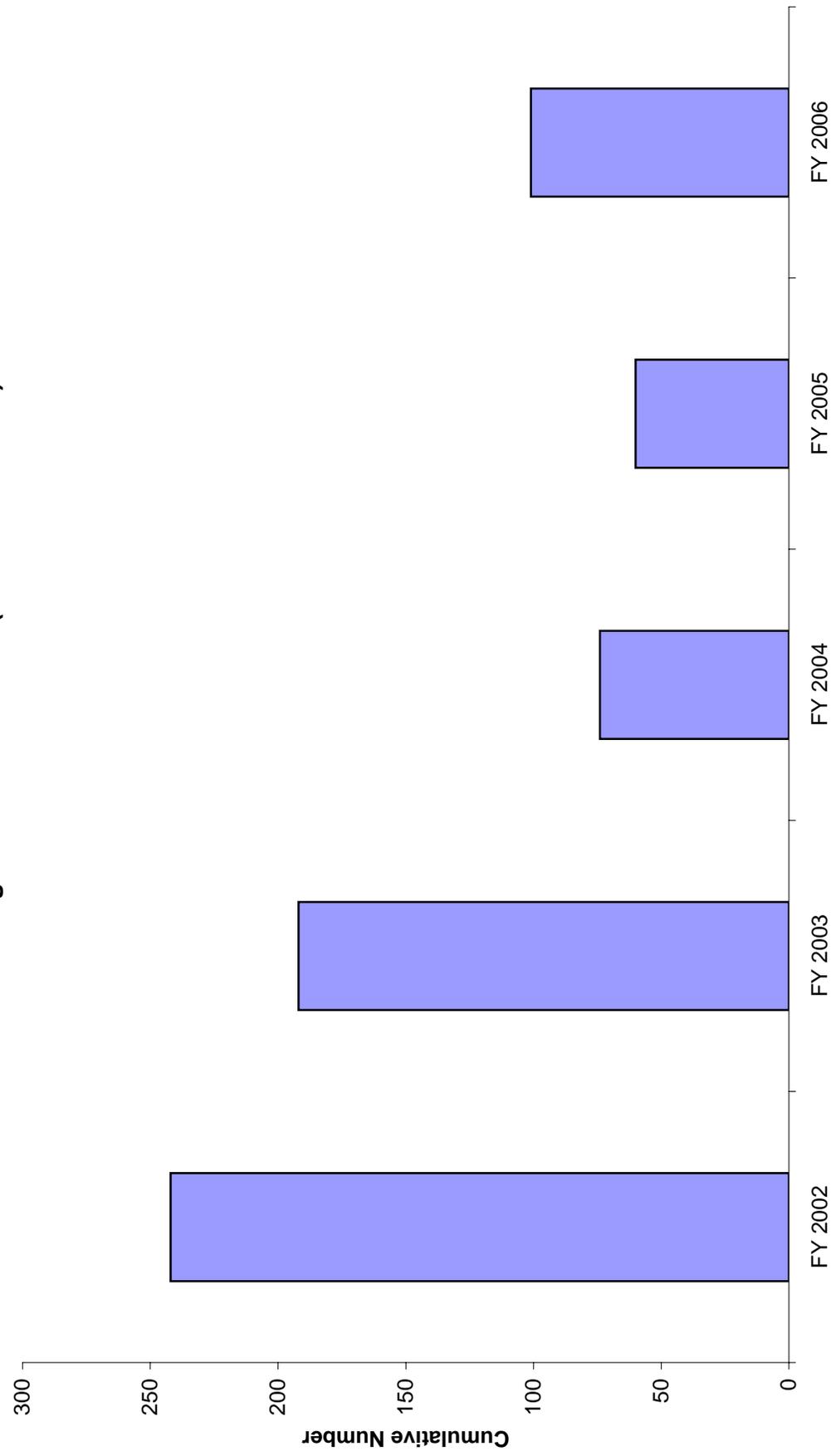


# Newport News

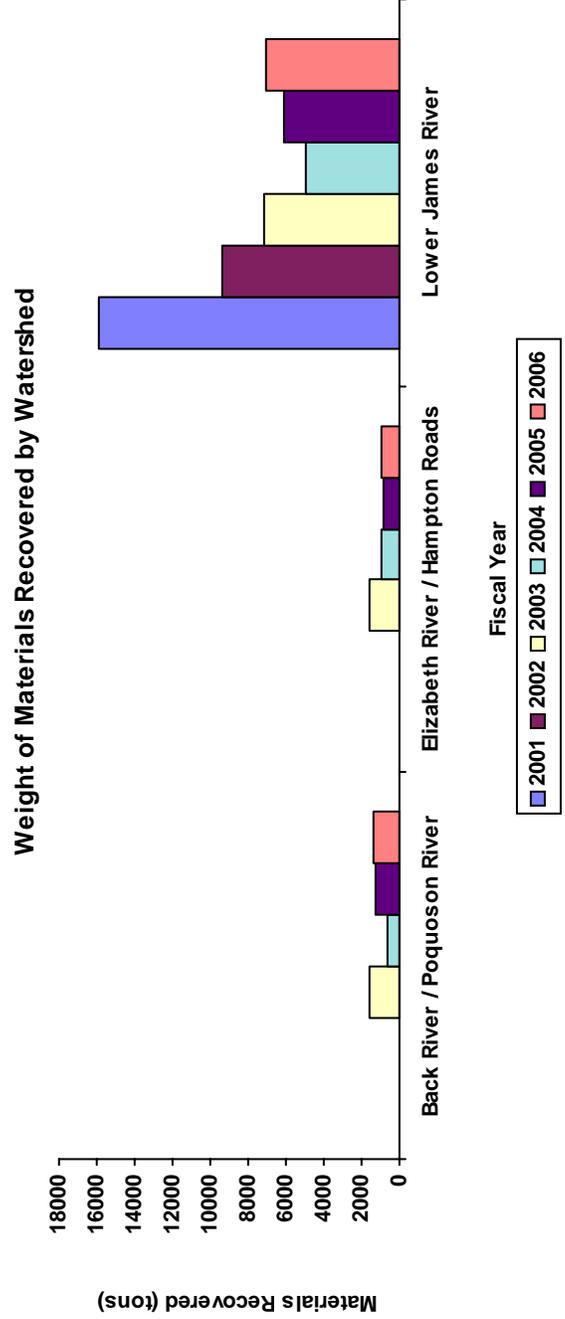
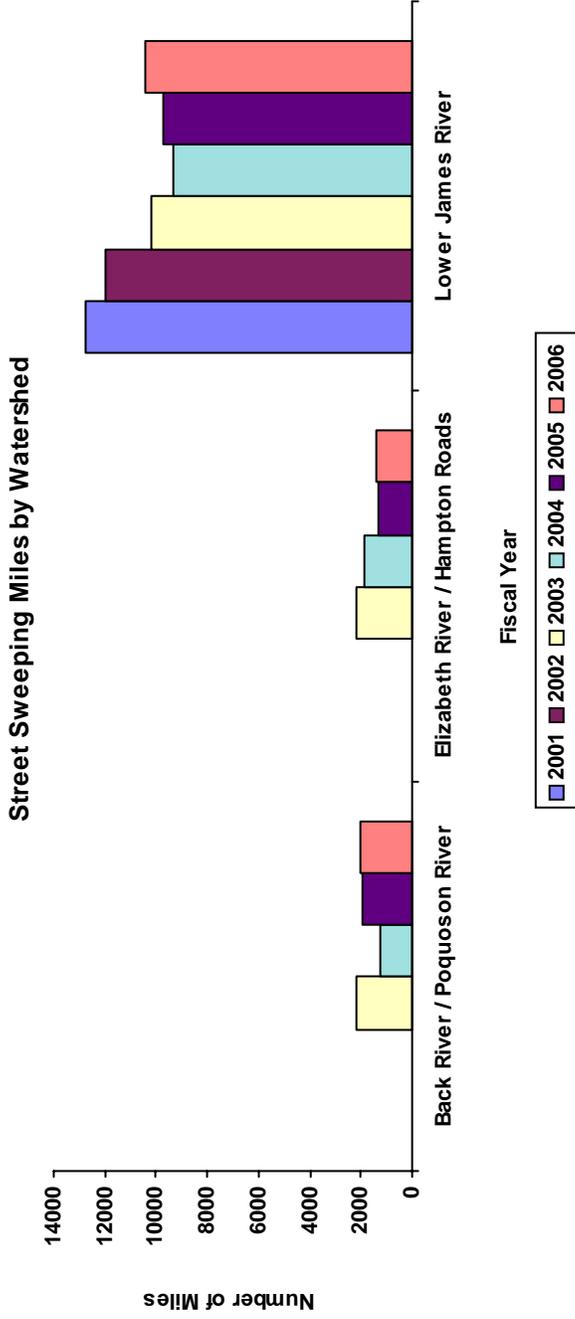
Number of Illicit Connections Identified and Corrected



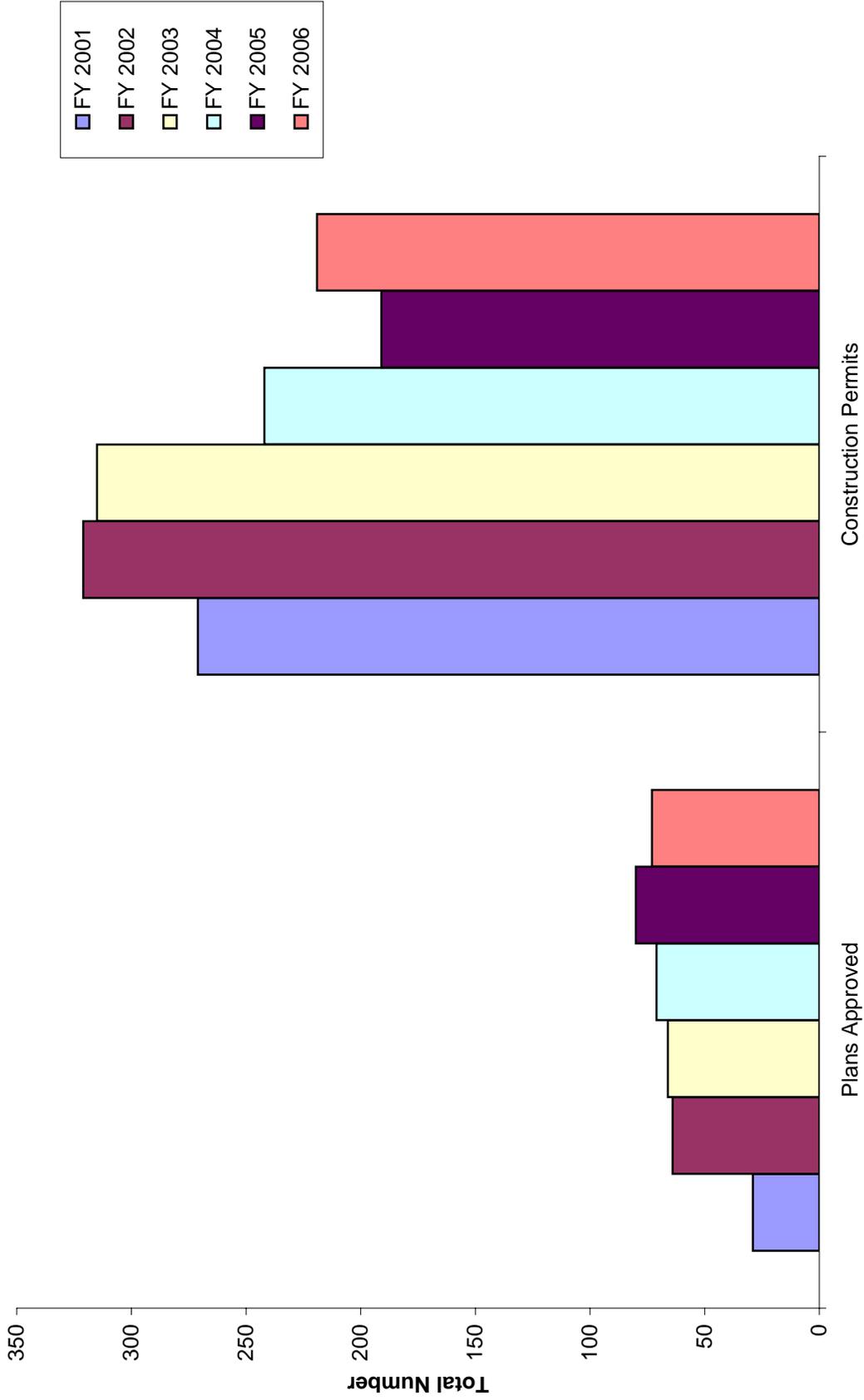
**Newport News  
Operations and Maintenance  
Miles of Drainage Facilities Serviced (FY 2002 - FY 2006)**



# Newport News Operations and Maintenance

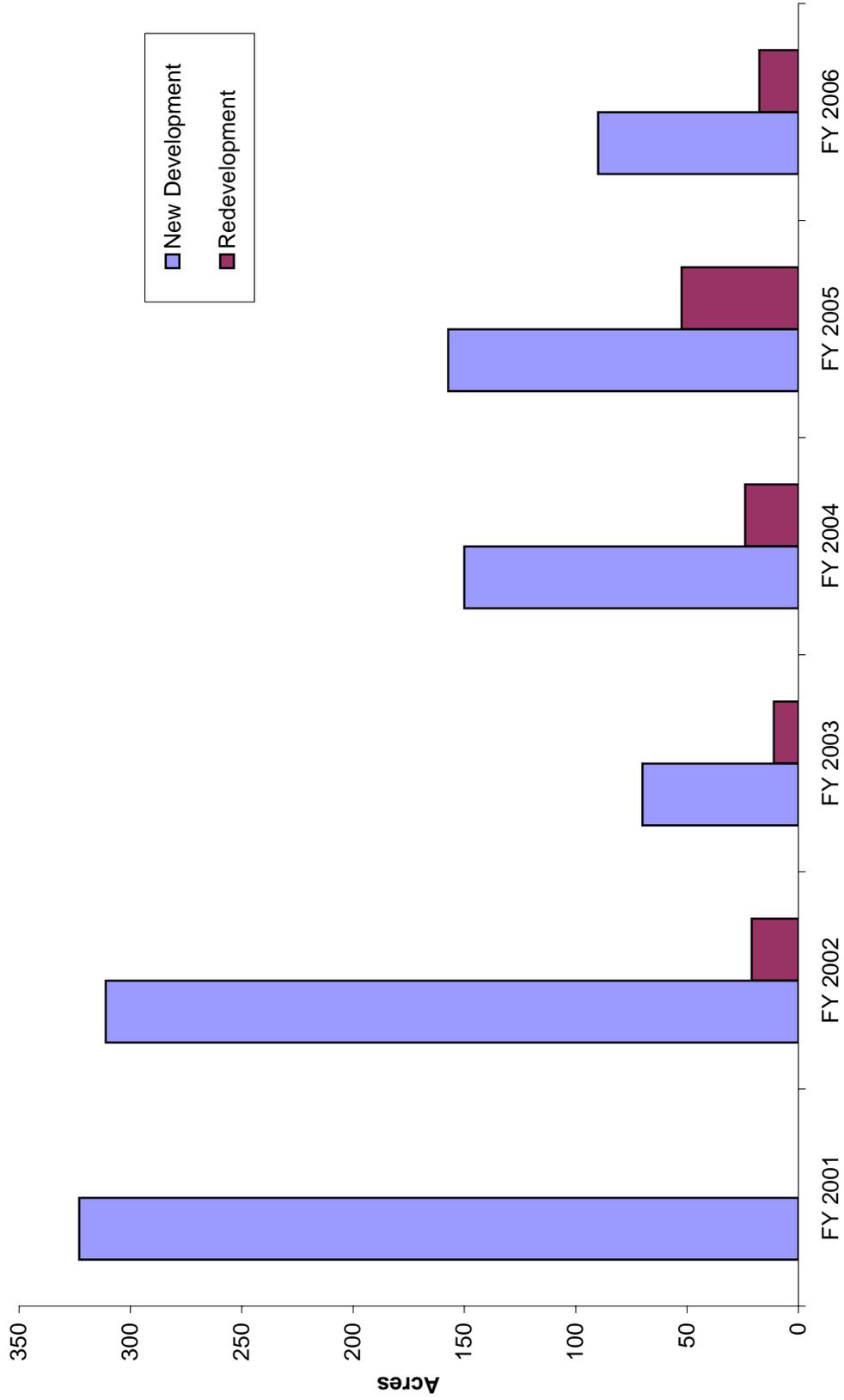


# Newport News Construction Permits and Site Subdivision Plans



## Newport News

### Construction Permits and Site Subdivision Plans Approved Developed and Redeveloped Acres



---

---

# Public Outreach Activities

## Newport News

---

---

Activity Month	Activity Type	Number of Citizens Reached	Total Value
June, 2006	Other	2700	
	Stream Cleanup		
<b>Municipality Totals:</b>		<hr/> 2700	<hr/>

---

---

# Stream Cleanup Activities

## Newport News

---

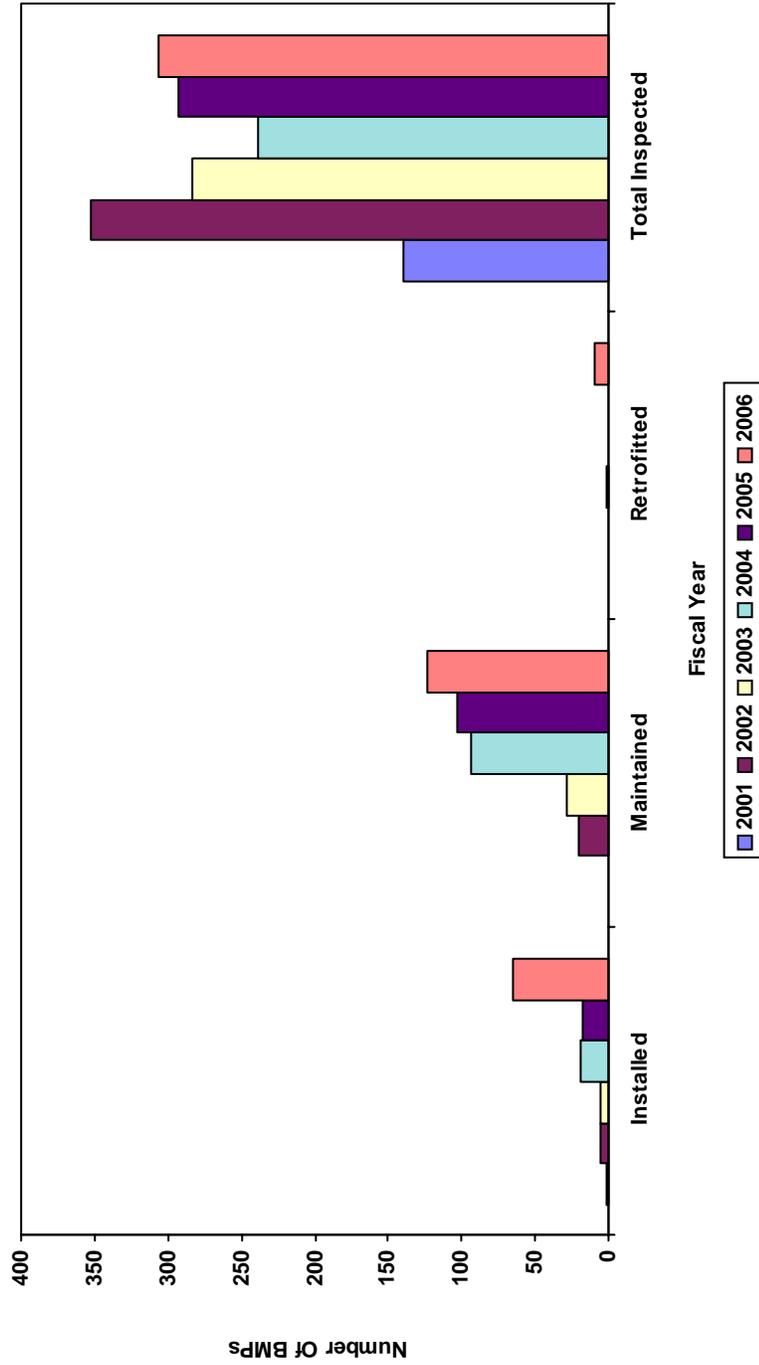
---

Activity Month	Miles Covered	Materials Collected (tons)
June, 2006		45
<b>Municipality Totals:</b>		<b>45</b>

**CITY OF NORFOLK**

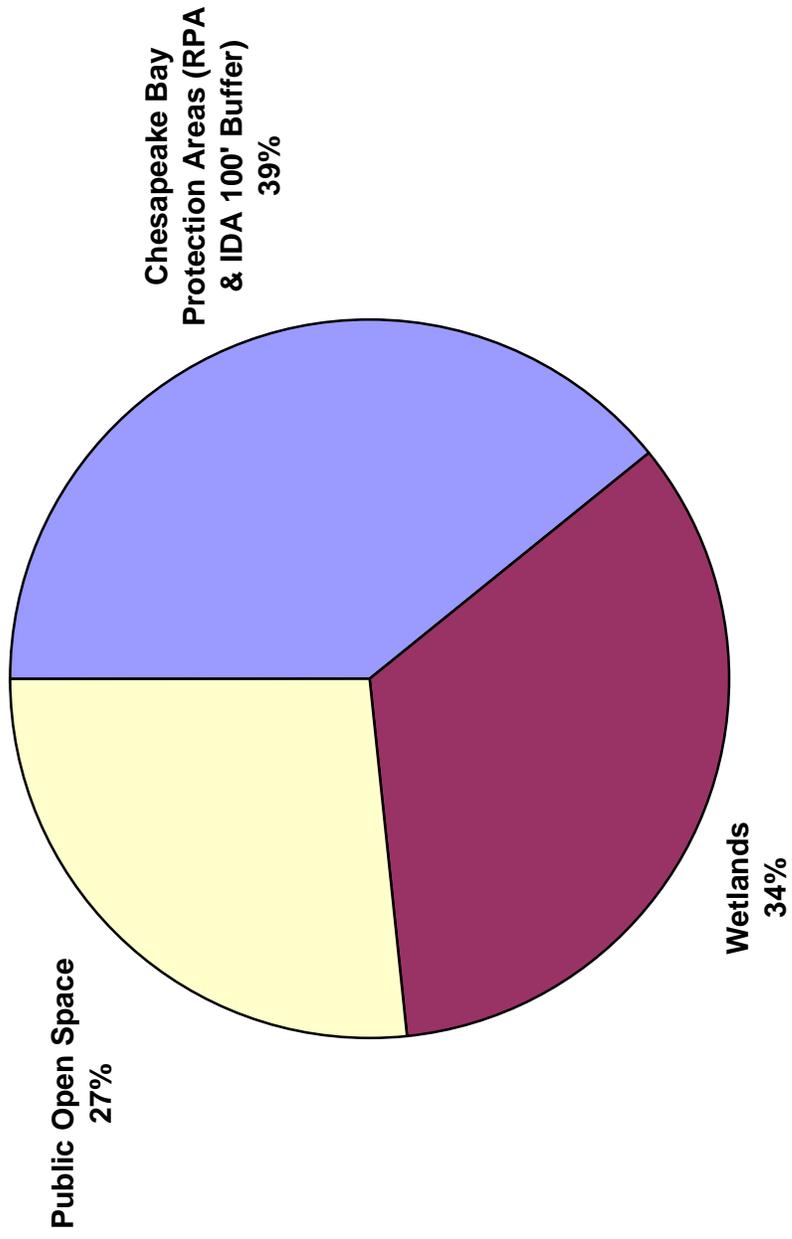
# Norfolk

Total Number of Public BMPs Installed, Retrofitted, Inspected and Maintained  
(All BMP Types)

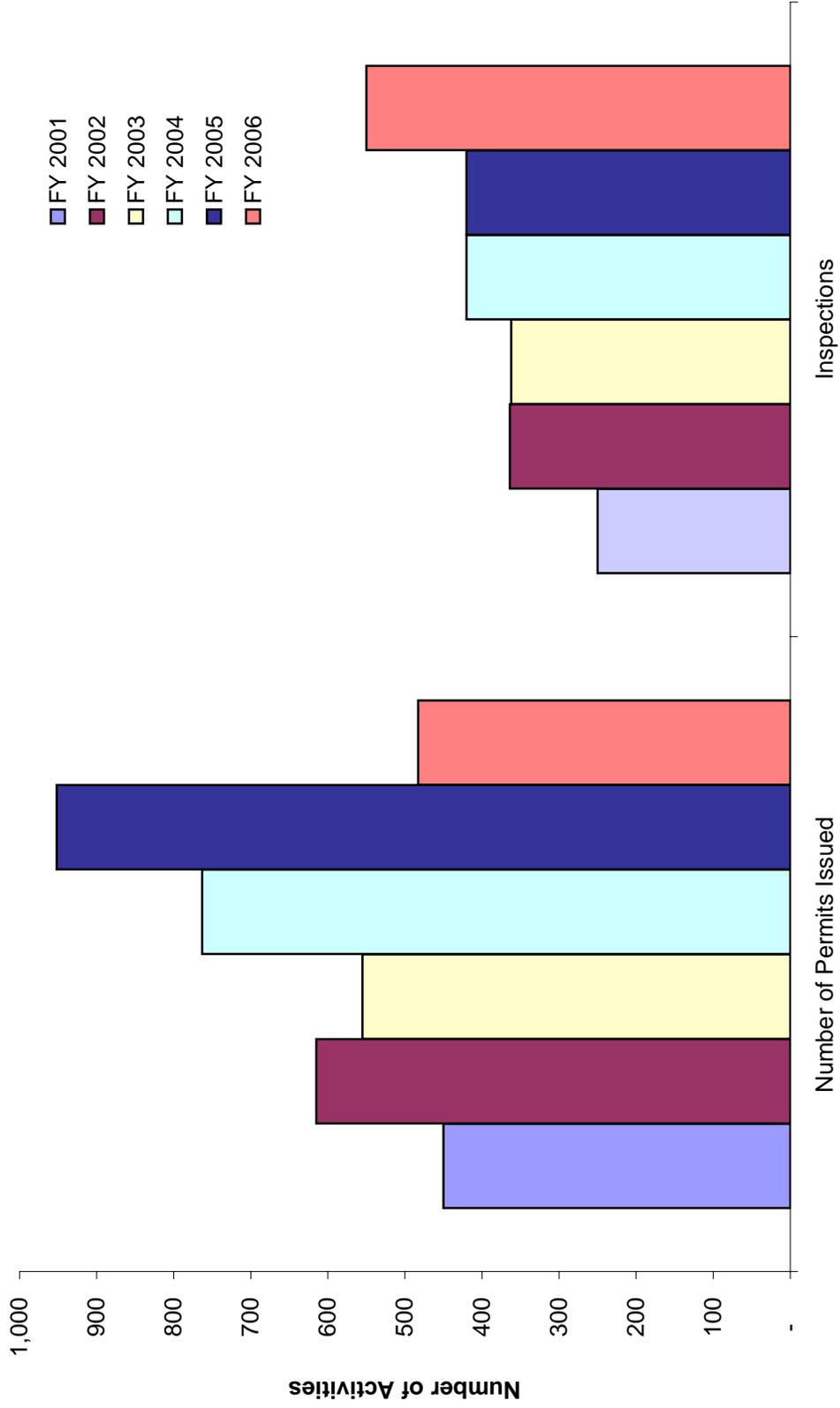


# Norfolk

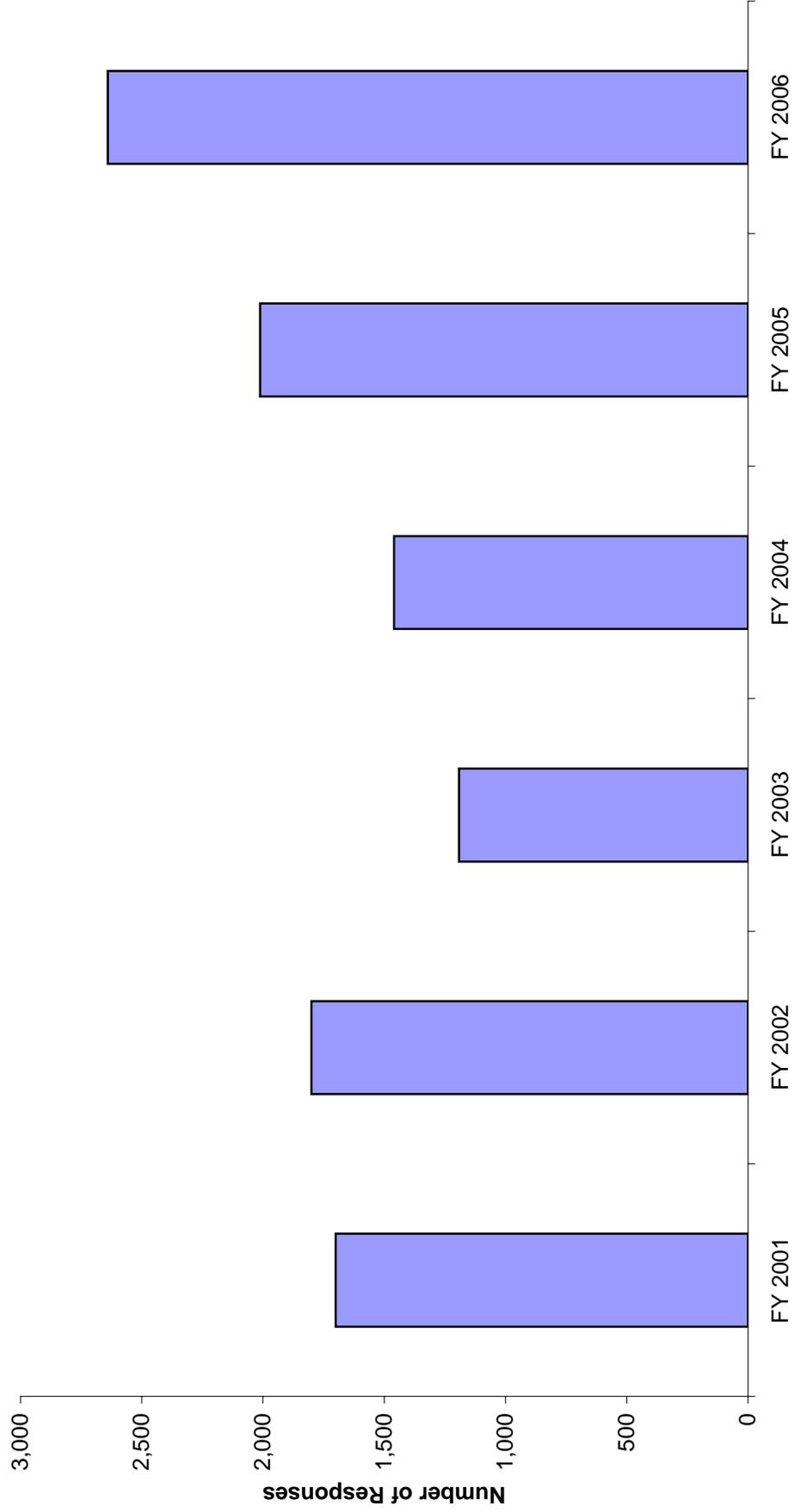
## Components of Greenlands



# Norfolk Erosion and Sediment Control Activities

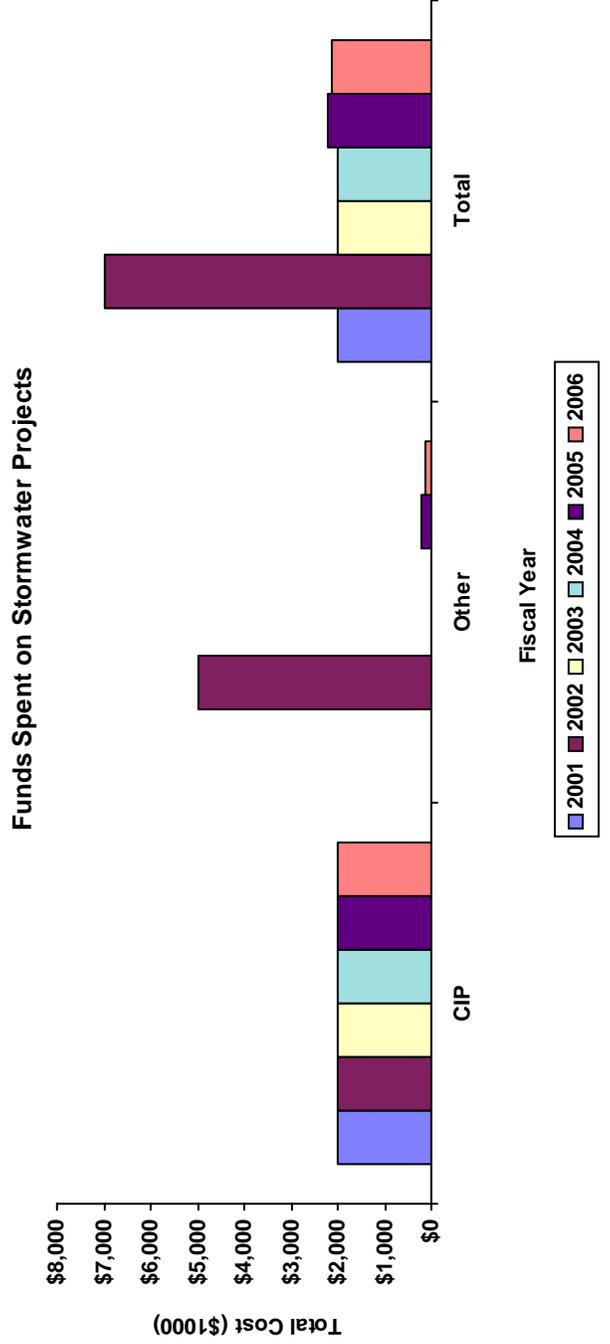
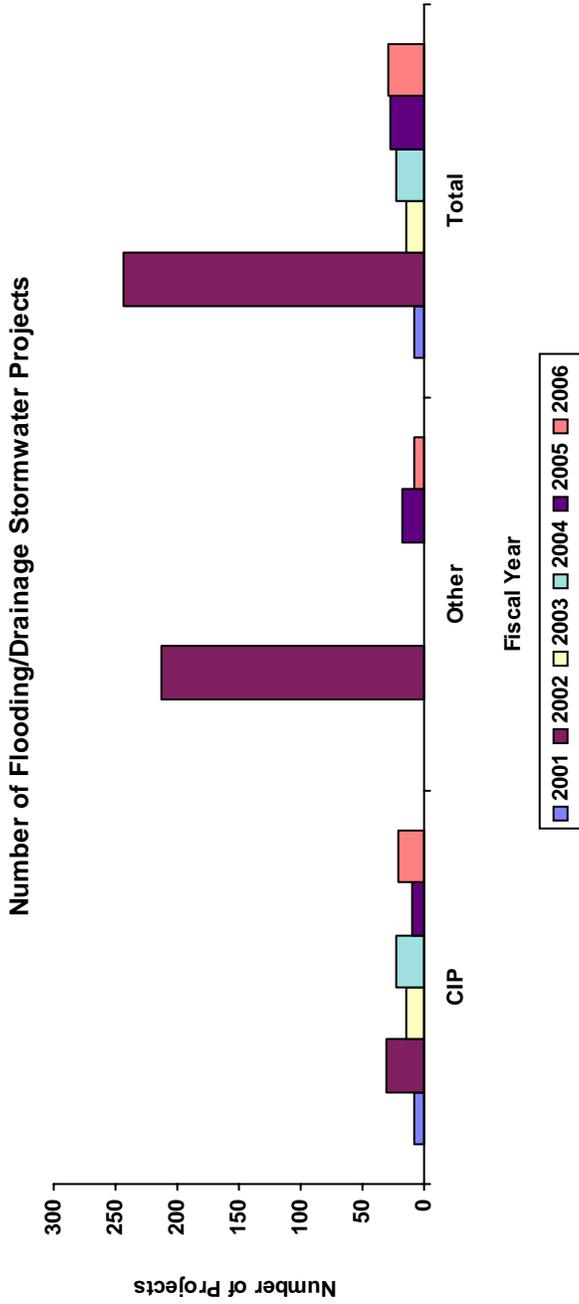


**Norfolk**  
**Flooding and Drainage Problems**  
Number of Responses to Assistance Requests  
(Inspection, Maintenance and Repair Services)



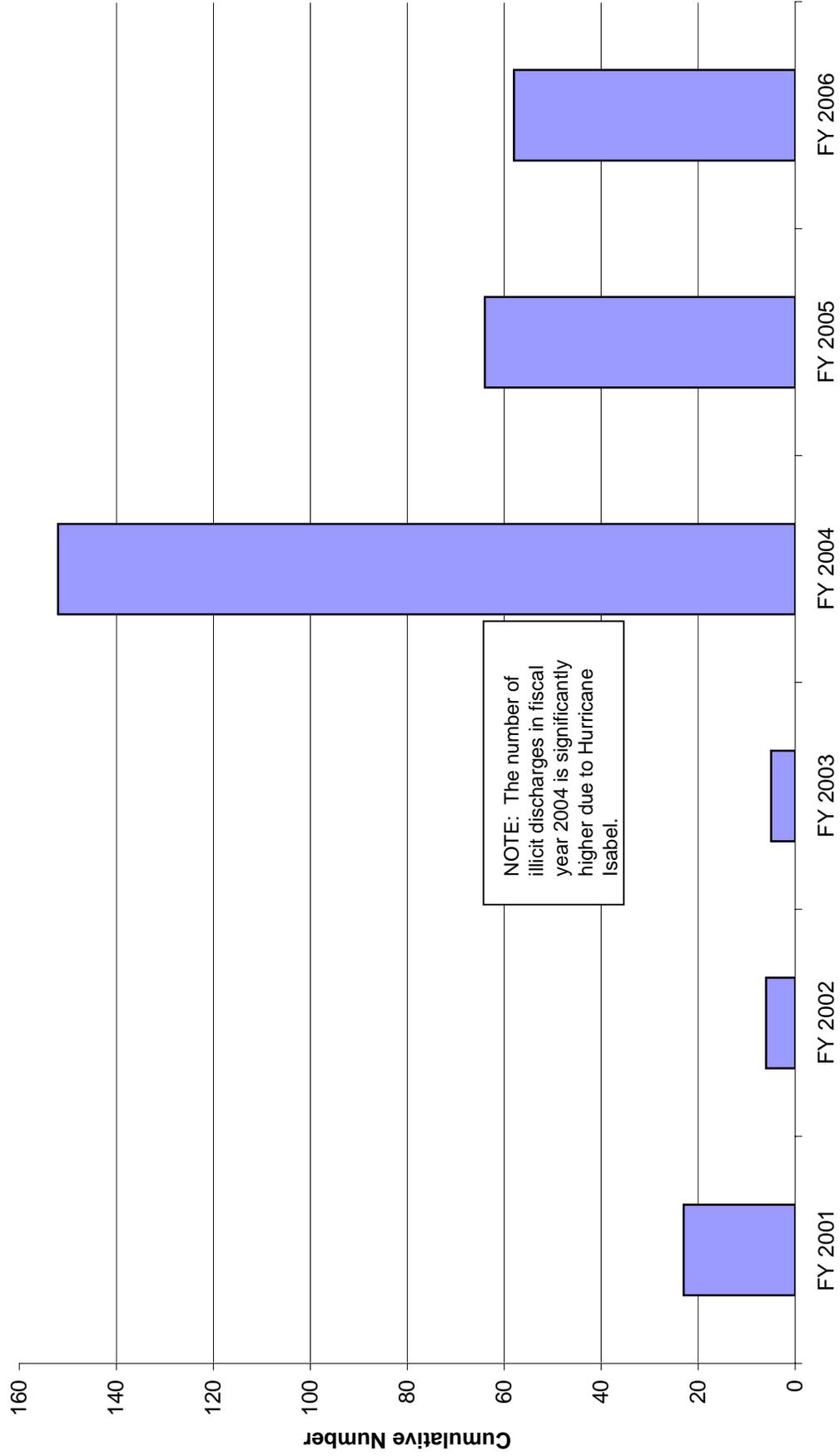
# Norfolk

## Flooding and Drainage Problems

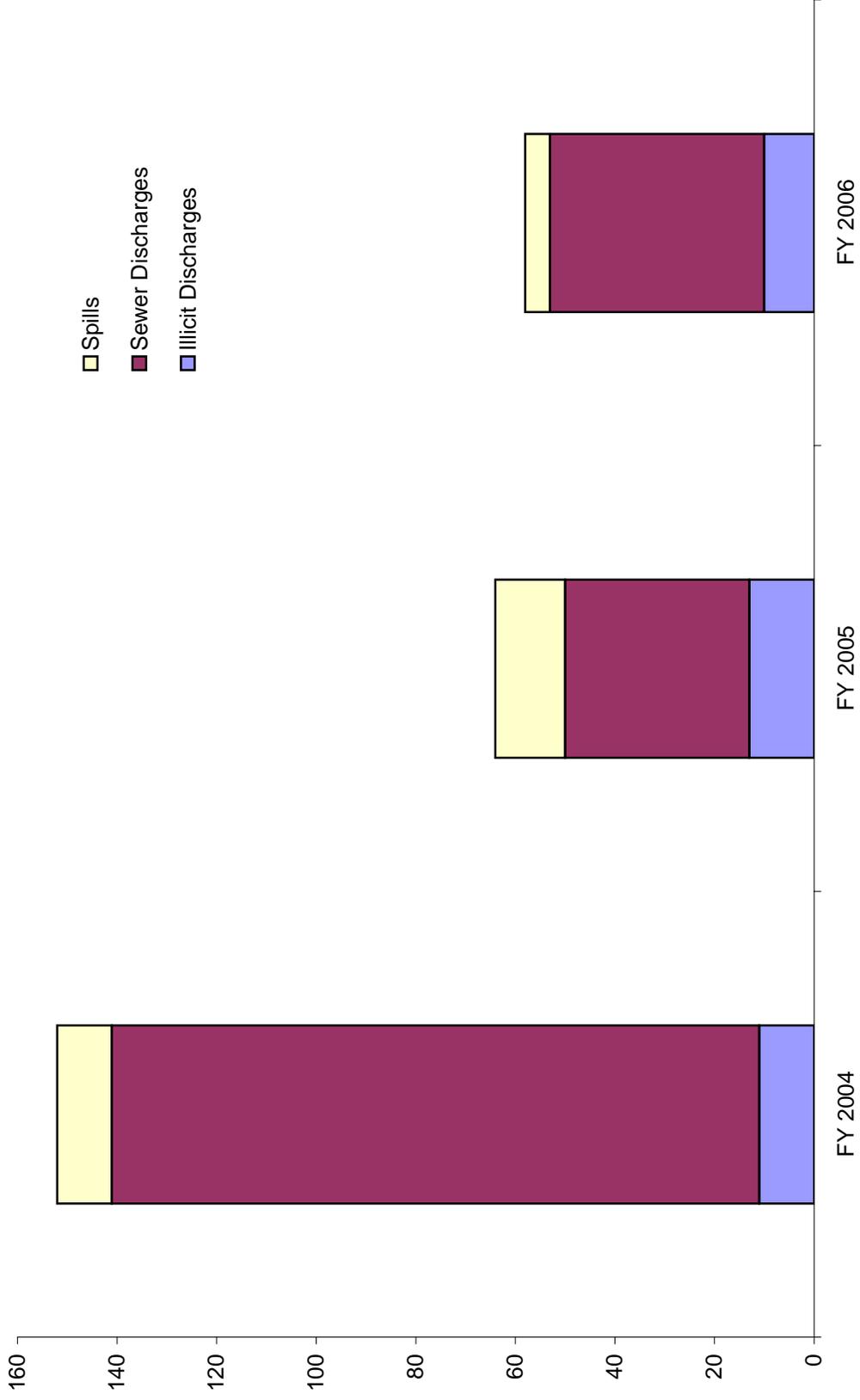


# Norfolk

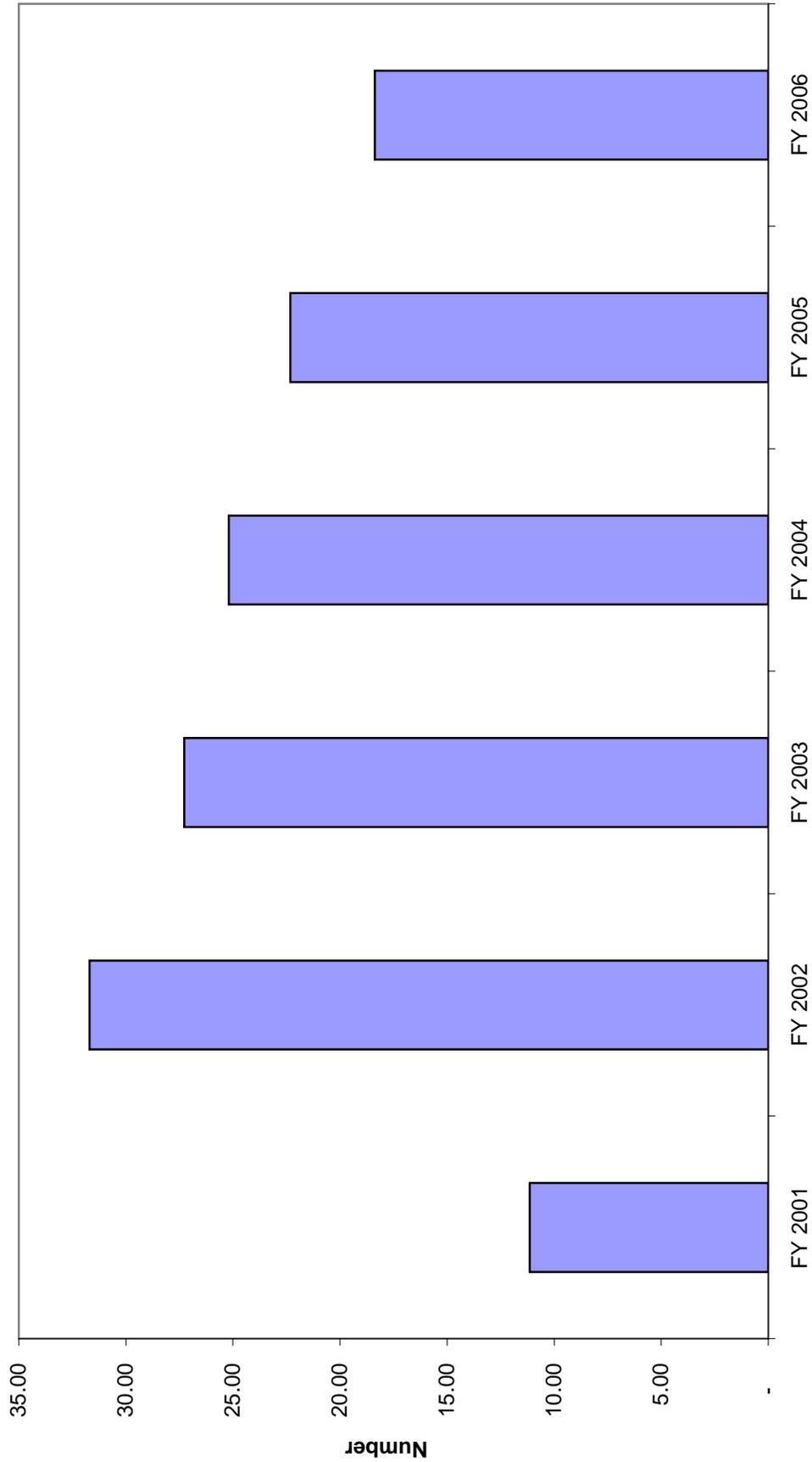
## Number of Illicit Discharges Identified and Corrected



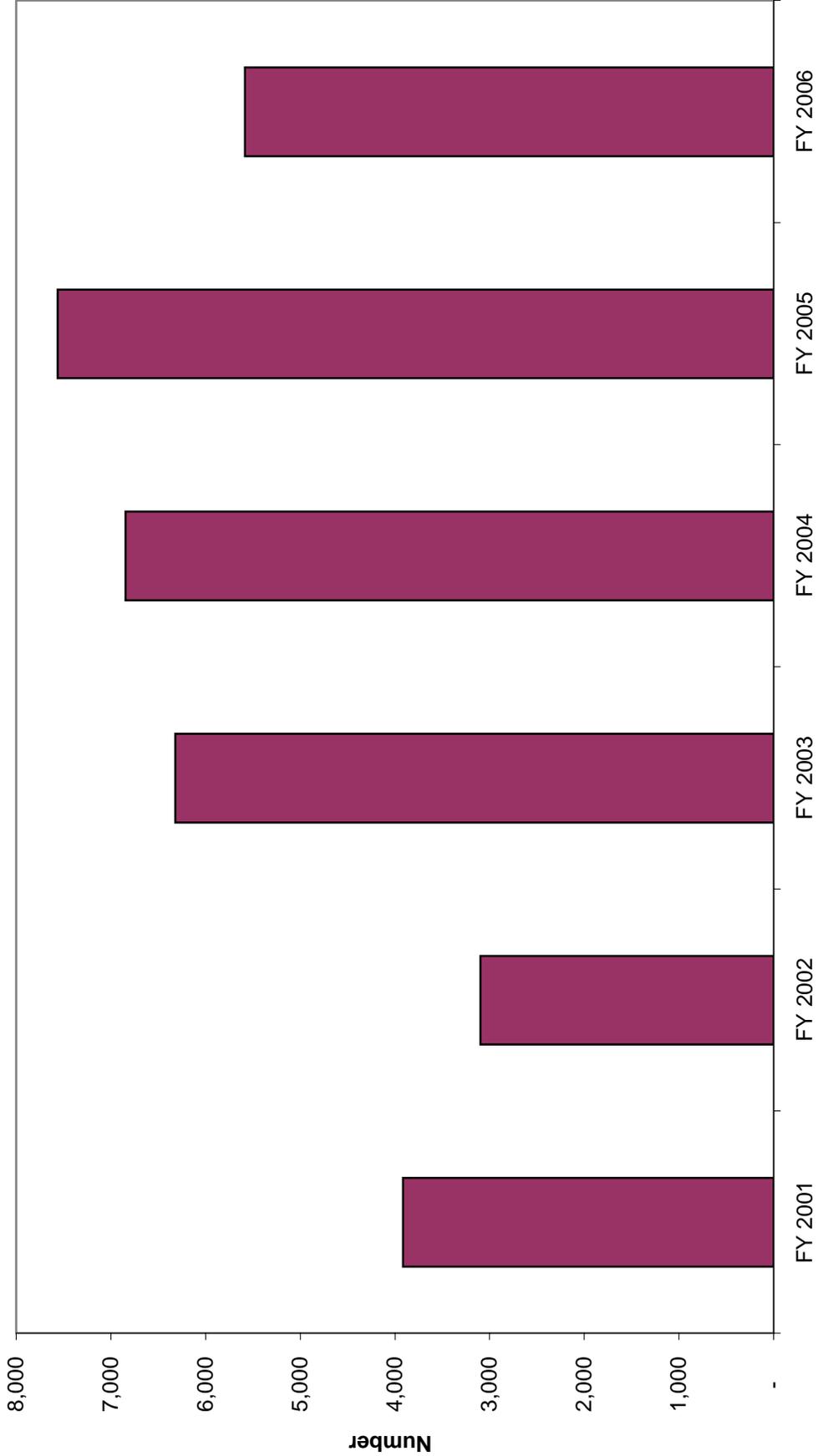
# City of Norfolk Investigative Monitoring by Discharge Type



**Norfolk  
Operations & Maintenance  
Miles of Drainage Facilities Serviced**

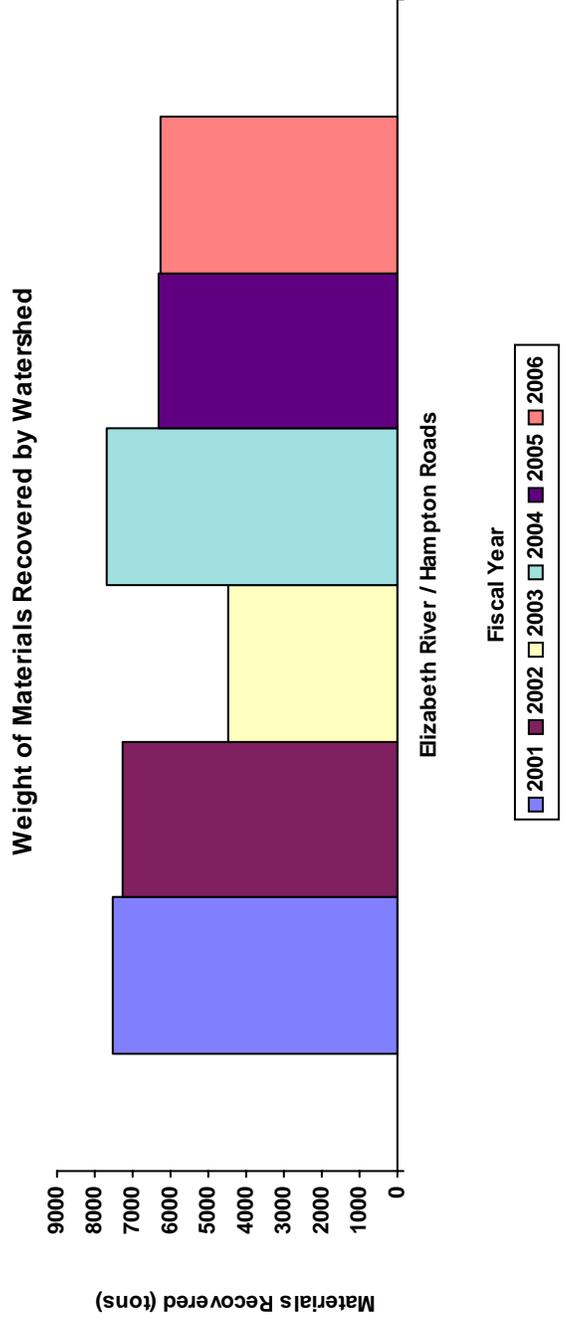
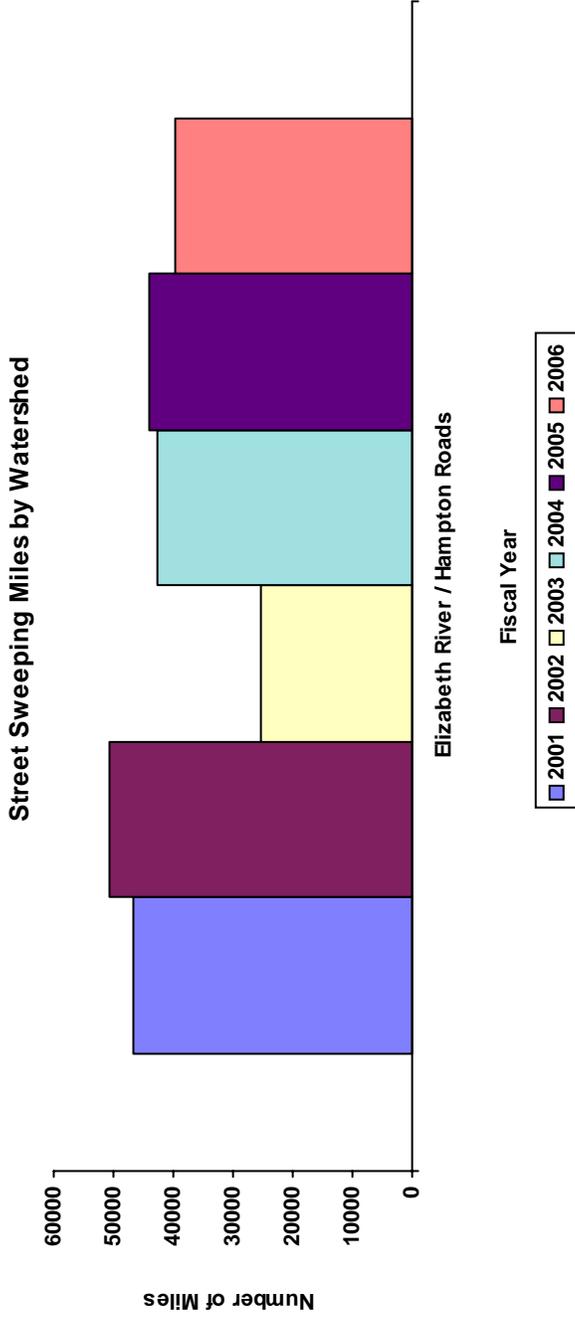


**Norfolk  
Operations & Maintenance  
Number of Catch Basins Serviced**

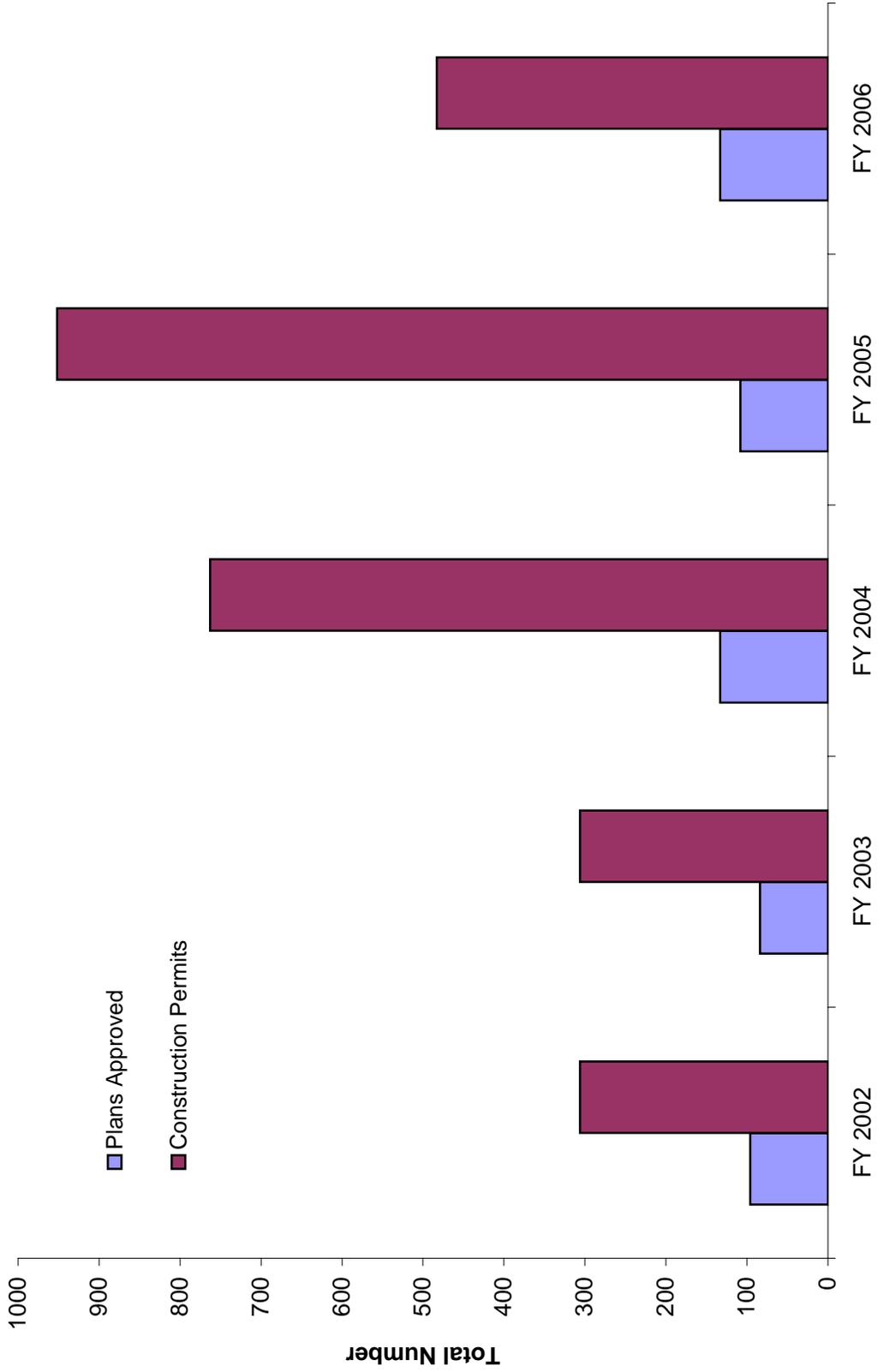


# Norfolk

## Operations and Maintenance



# Norfolk Construction Permits & Site Plans Approved



---



---

# Environmental Knowledge

## Norfolk

---



---

Activity Month	Activity Type	Knowledge Before Activity	Knowledge After Activity
July, 2005	Other	2	4
	Presentation	3	4
August, 2005	Presentation	2	4
September, 2005	Other	4	5
	Presentation	2	4
October, 2005	Presentation	2	4
	Workshop	2	4
November, 2005	Presentation	1	2
December, 2005	Presentation	2	4
January, 2006	Presentation	2	4
April, 2006	Presentation	2	3
May, 2006	Workshop	2	4
June, 2006	Presentation	3	5
<b>Municipality Totals:</b>		<b>29</b>	<b>51</b>

---

---

# Publications

## Norfolk

---

---

<b>Activity Month</b>	<b>Topic</b>	<b>Number Distributed</b>
July, 2005	General Stormwater Info	1671
August, 2005	General Stormwater Info	4792
September, 2005	General Stormwater Info	4591
October, 2005	General Stormwater Info	2463
November, 2005	General Stormwater Info	511
December, 2005	General Stormwater Info	281
January, 2006	General Stormwater Info	2060
April, 2006	General Stormwater Info	150
May, 2006	General Stormwater Info	1503
June, 2006	General Stormwater Info	124
<b>Municipality Totals:</b>		<b>18146</b>

---



---

# Public Outreach Activities

## Norfolk

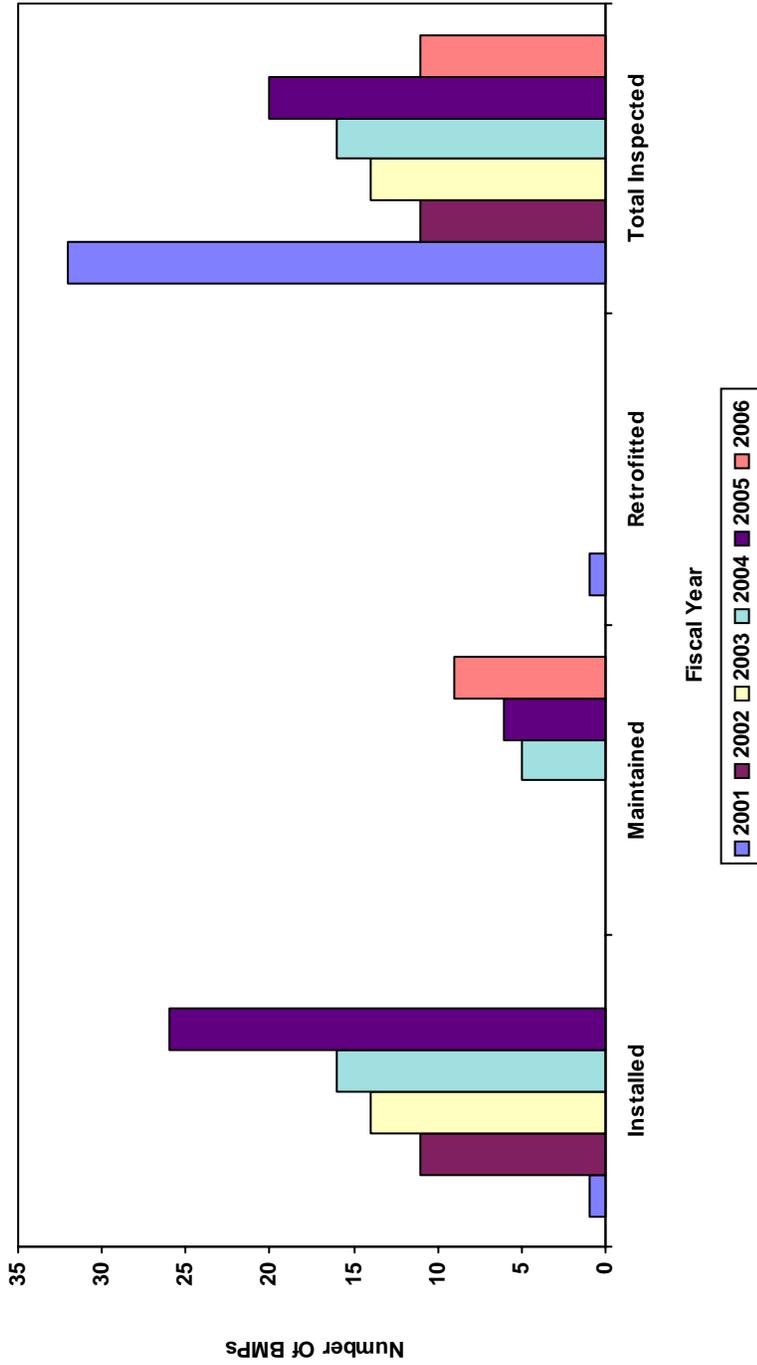
---

Activity Month	Activity Type	Number of Citizens Reached	Total Value
July, 2005	Presentation	1072	
August, 2005	Other	3000	
	Presentation	85	
September, 2005	Other	3000	
	Presentation	49	
October, 2005	Other	25000	
	Presentation	129	
November, 2005	Other	450	
	Presentation	138	
December, 2005	Other	16	
	Presentation	155	
January, 2006	Other	2035	
	Presentation	25	
April, 2006	Presentation	60	
May, 2006	Other	1503	
June, 2006	Other	124	
	Presentation	20	
<b>Municipality Totals:</b>		<b>36861</b>	

**CITY OF PORTSMOUTH**

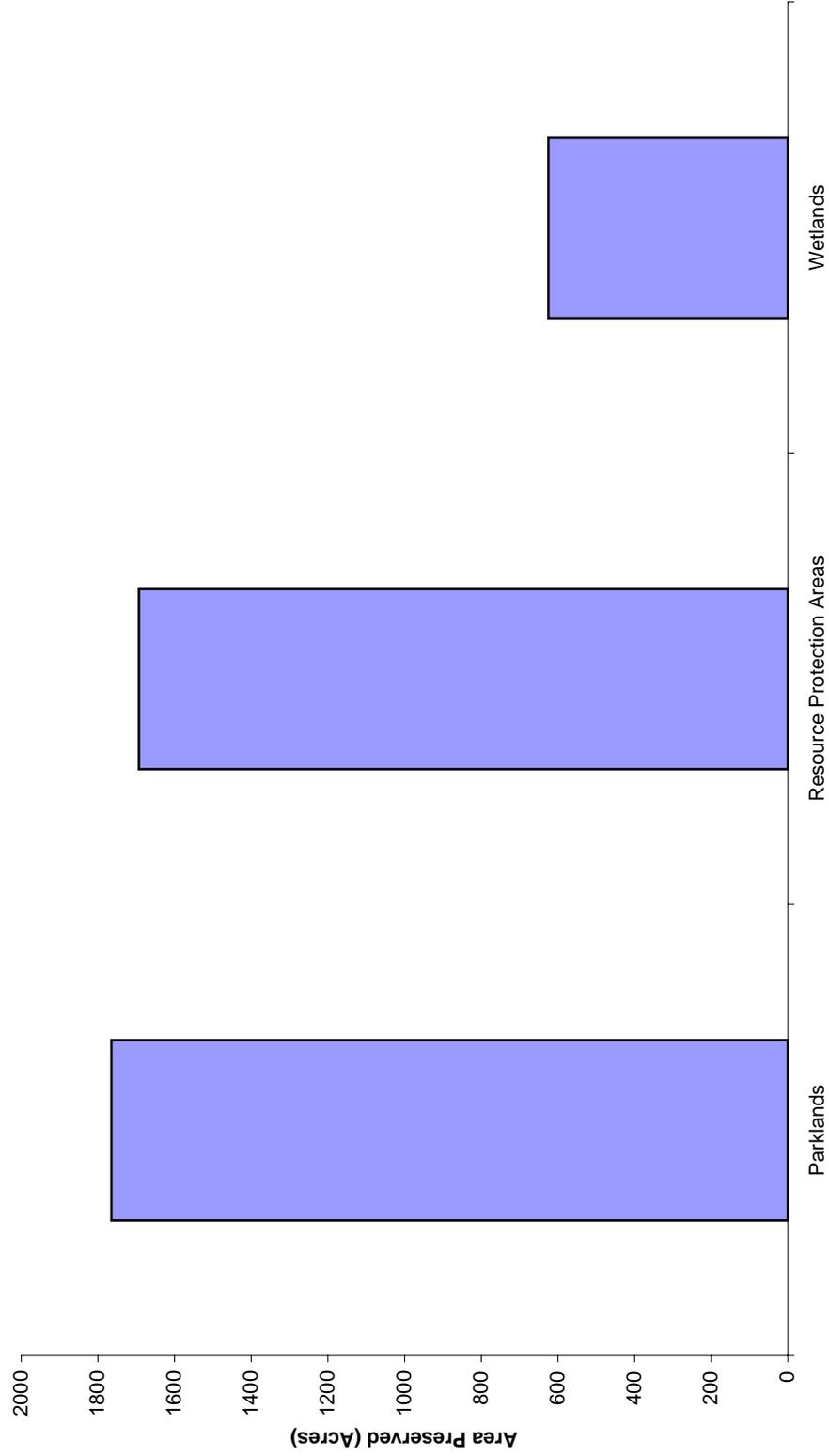
# Portsmouth

Total Number of Public BMPs Installed, Retrofitted, Inspected and Maintained  
(All BMP Types)

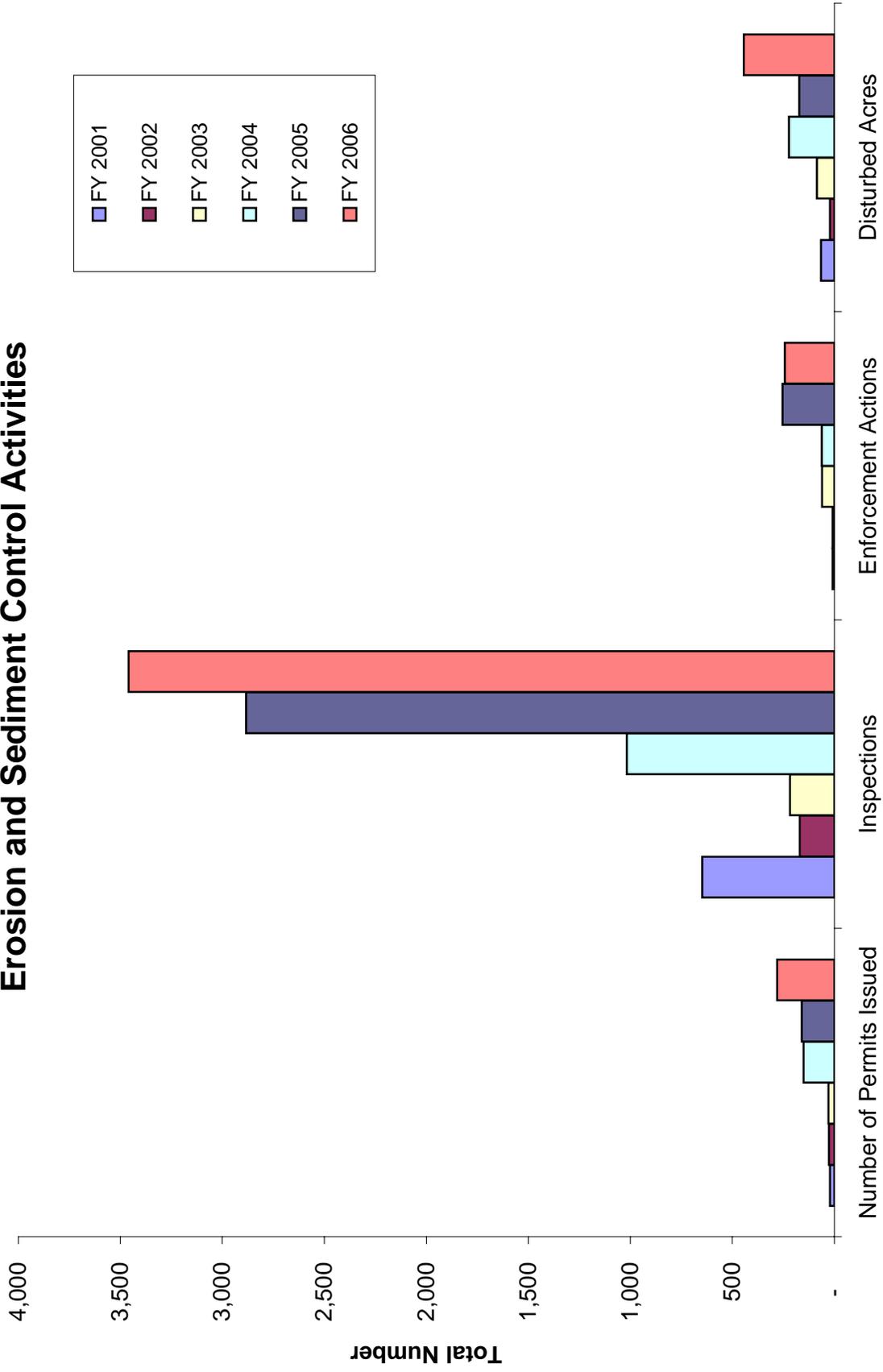


# Portsmouth

## Green Areas Protected and Restored (FY 2006)

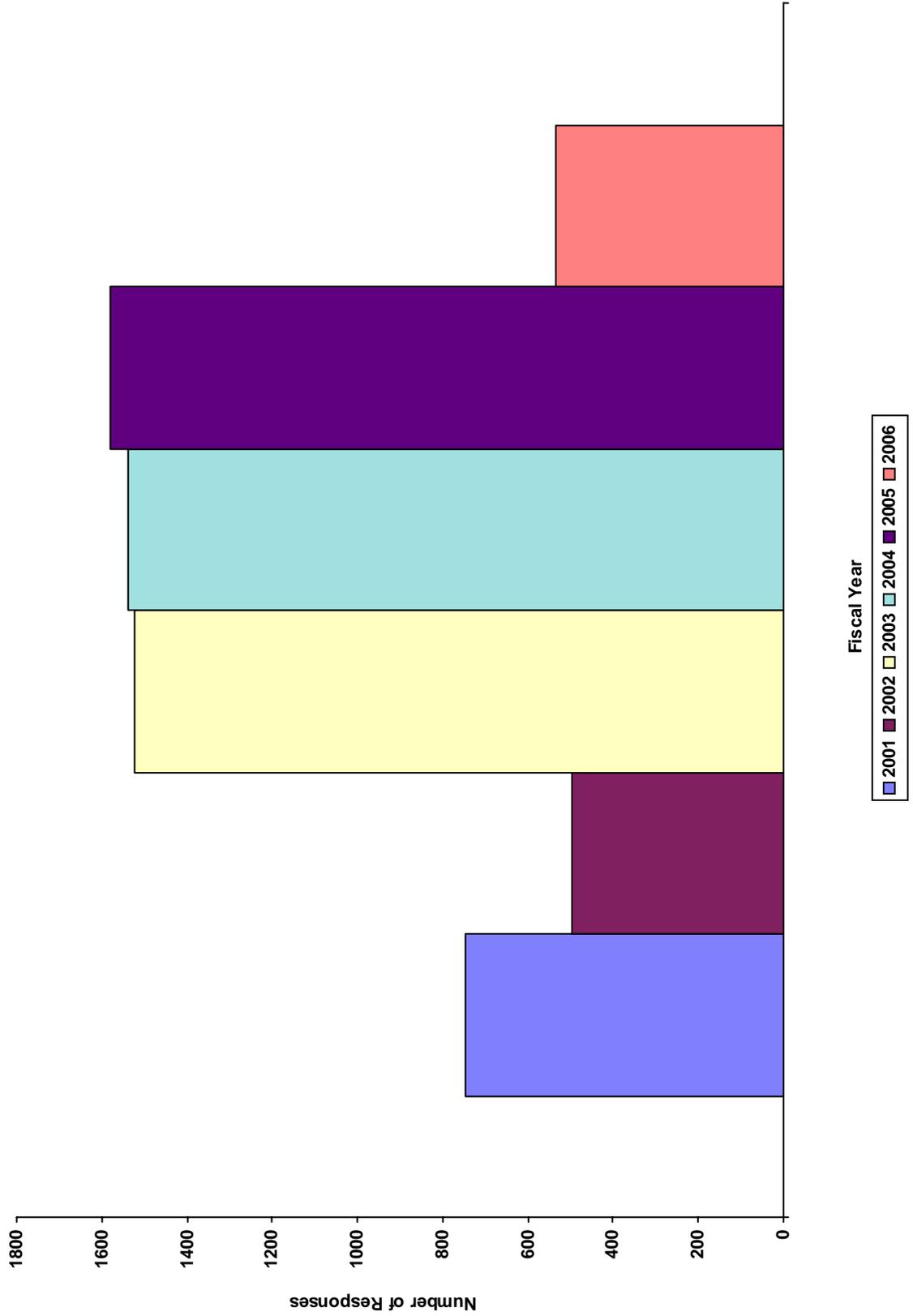


# Portsmouth Erosion and Sediment Control Activities

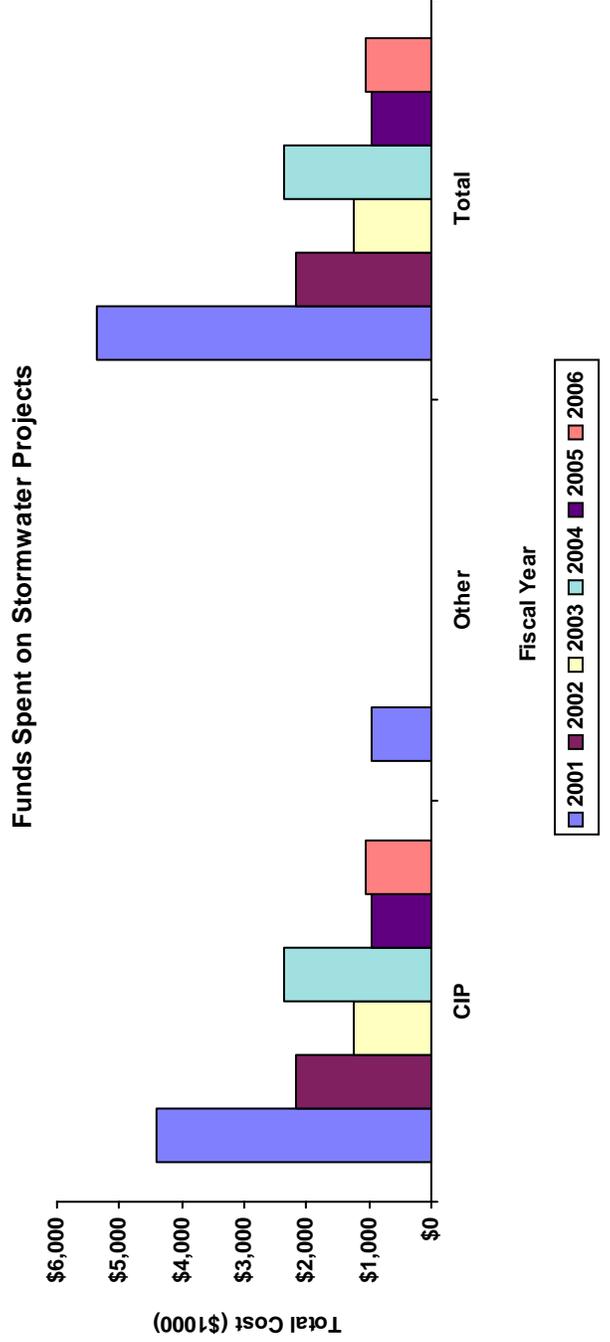
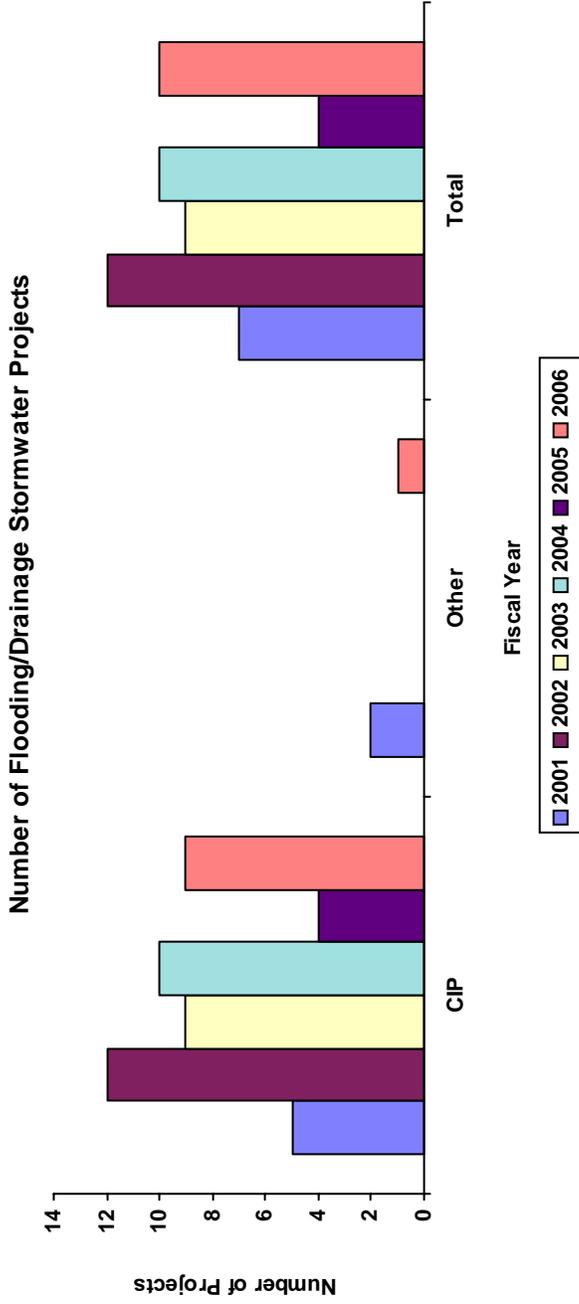


# Portsmouth Flooding and Drainage Problems

Number of Responses to Assistance Requests  
(Inspection, Maintenance and Repair Services)

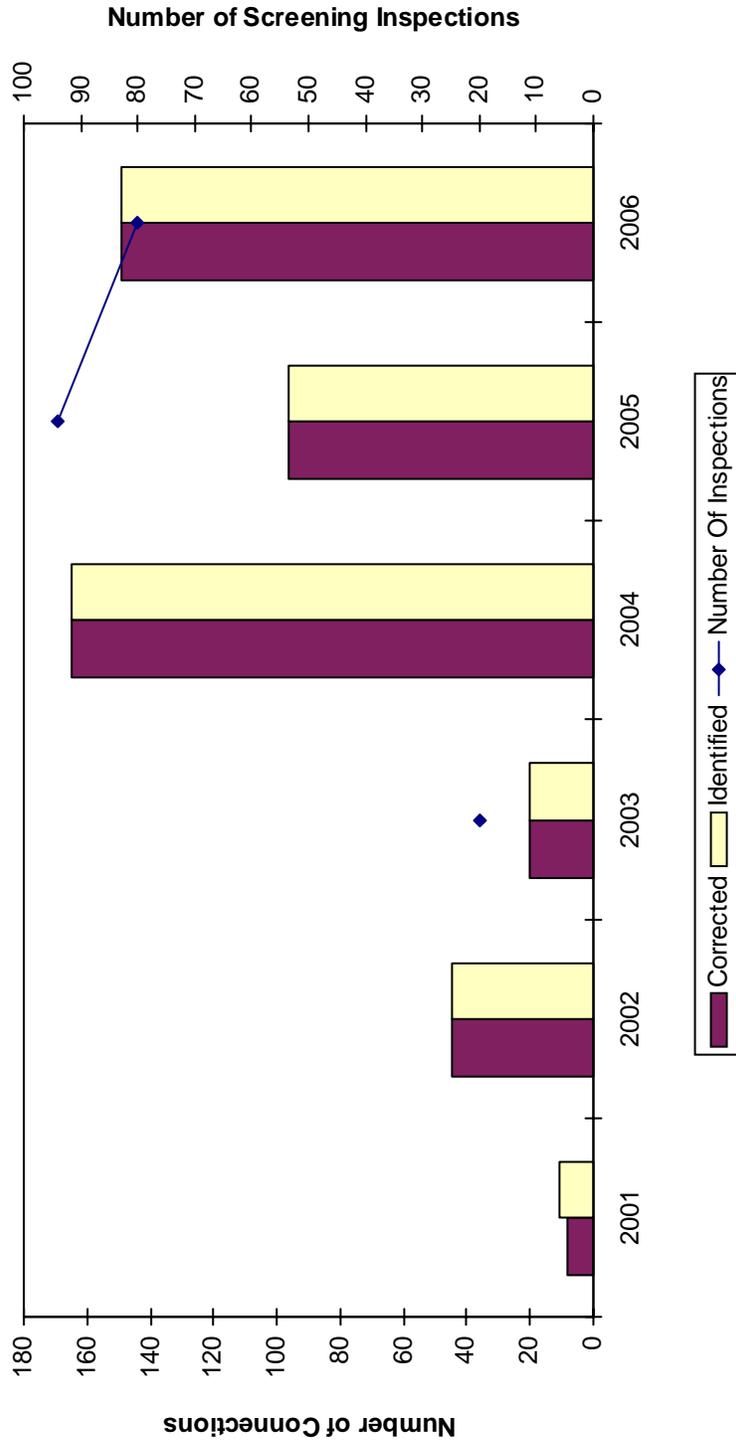


# Portsmouth Flooding and Drainage Problems

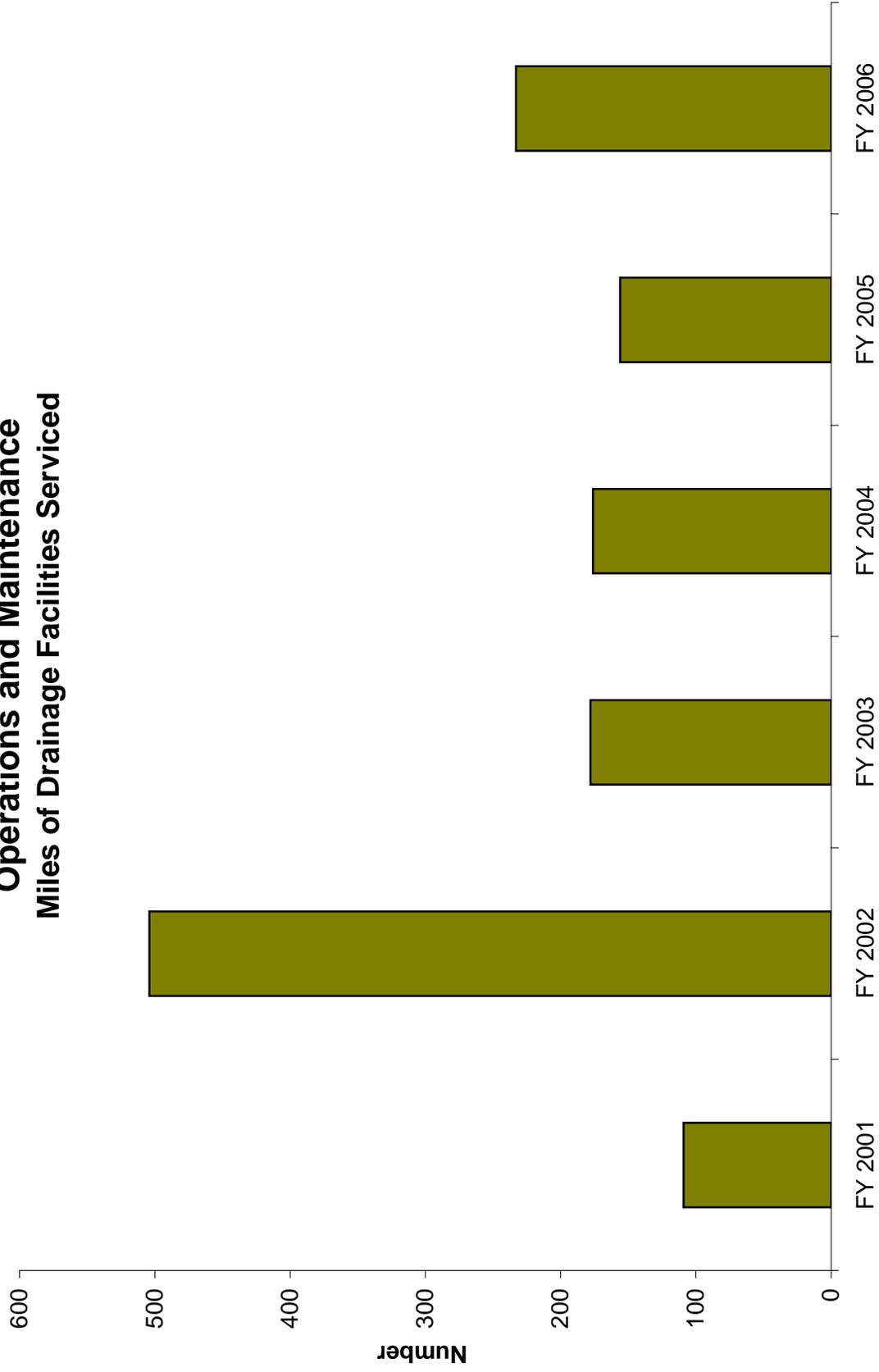


# Portsmouth

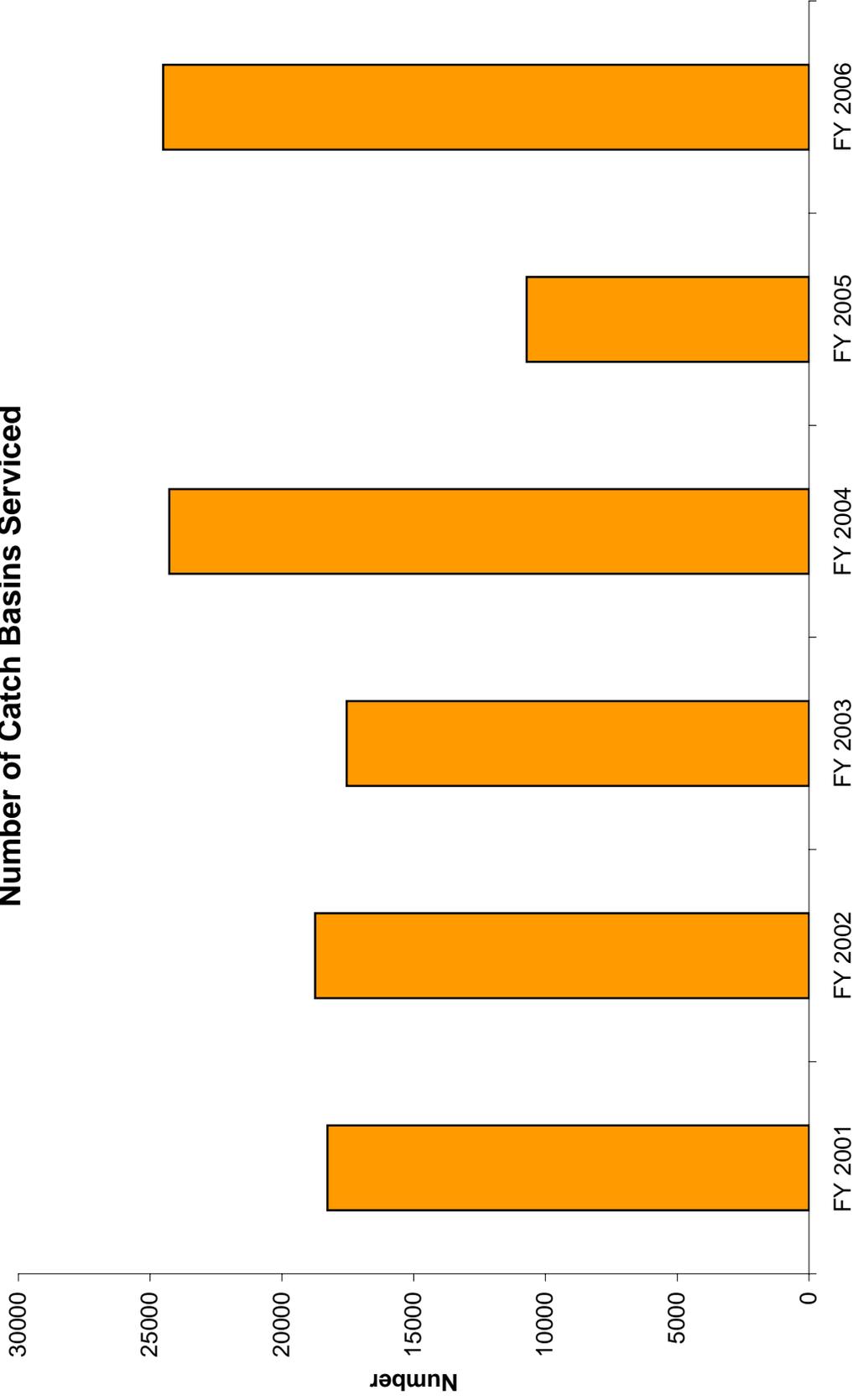
Number of Illicit Connections Identified and Corrected and Number of Screening Inspections



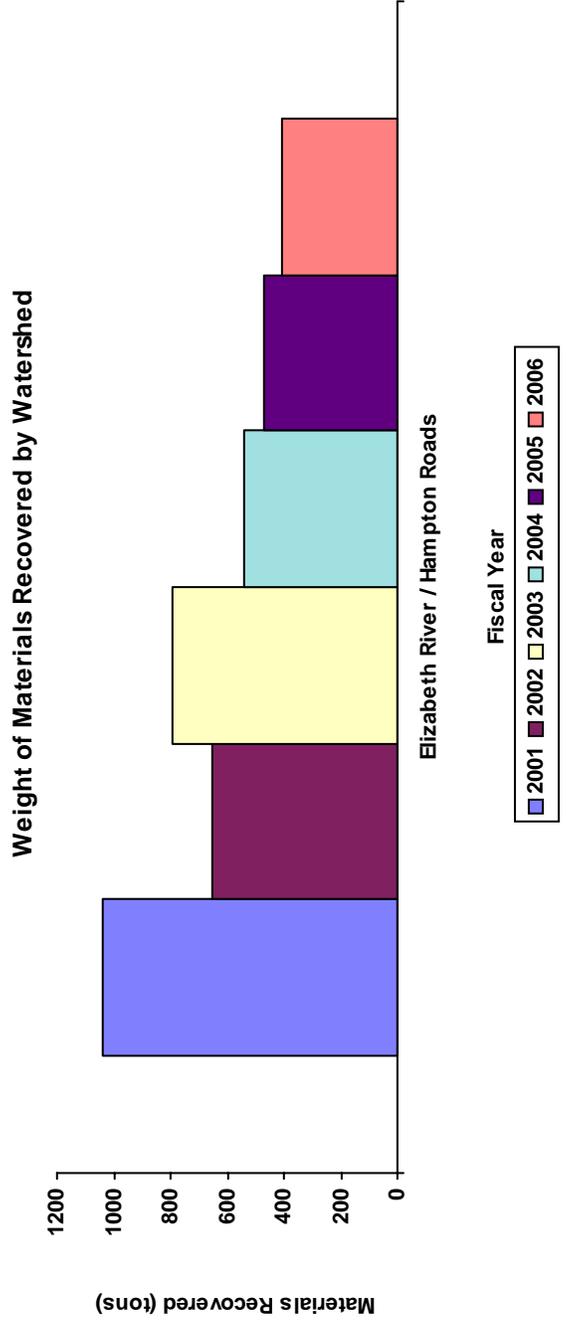
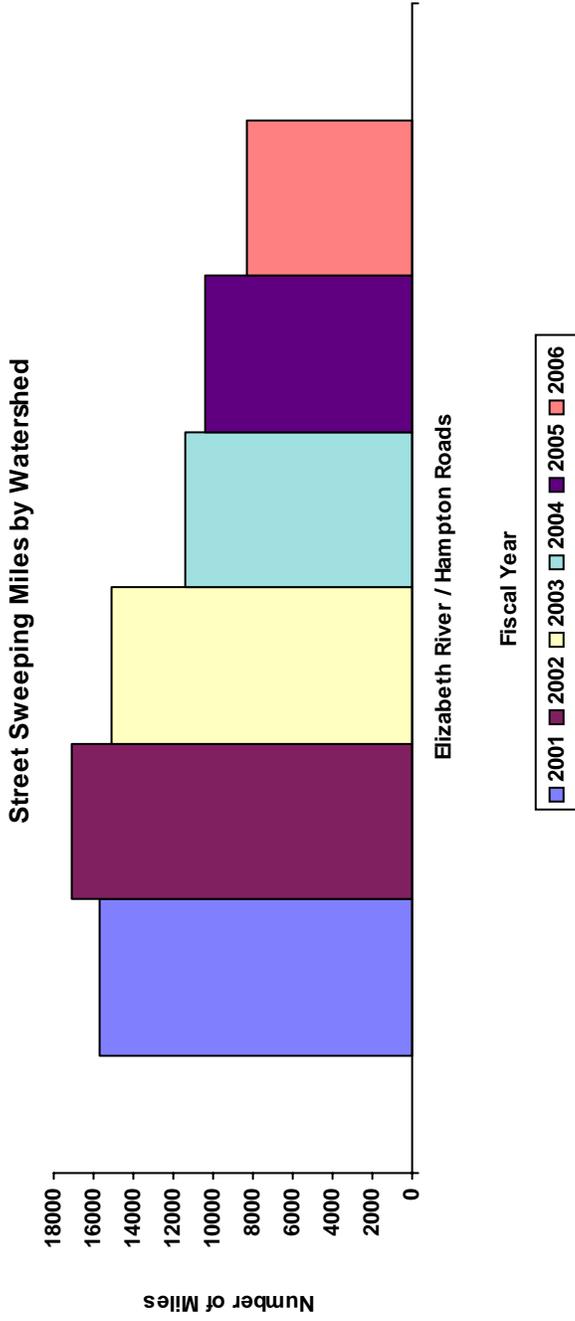
# Portsmouth Operations and Maintenance Miles of Drainage Facilities Serviced



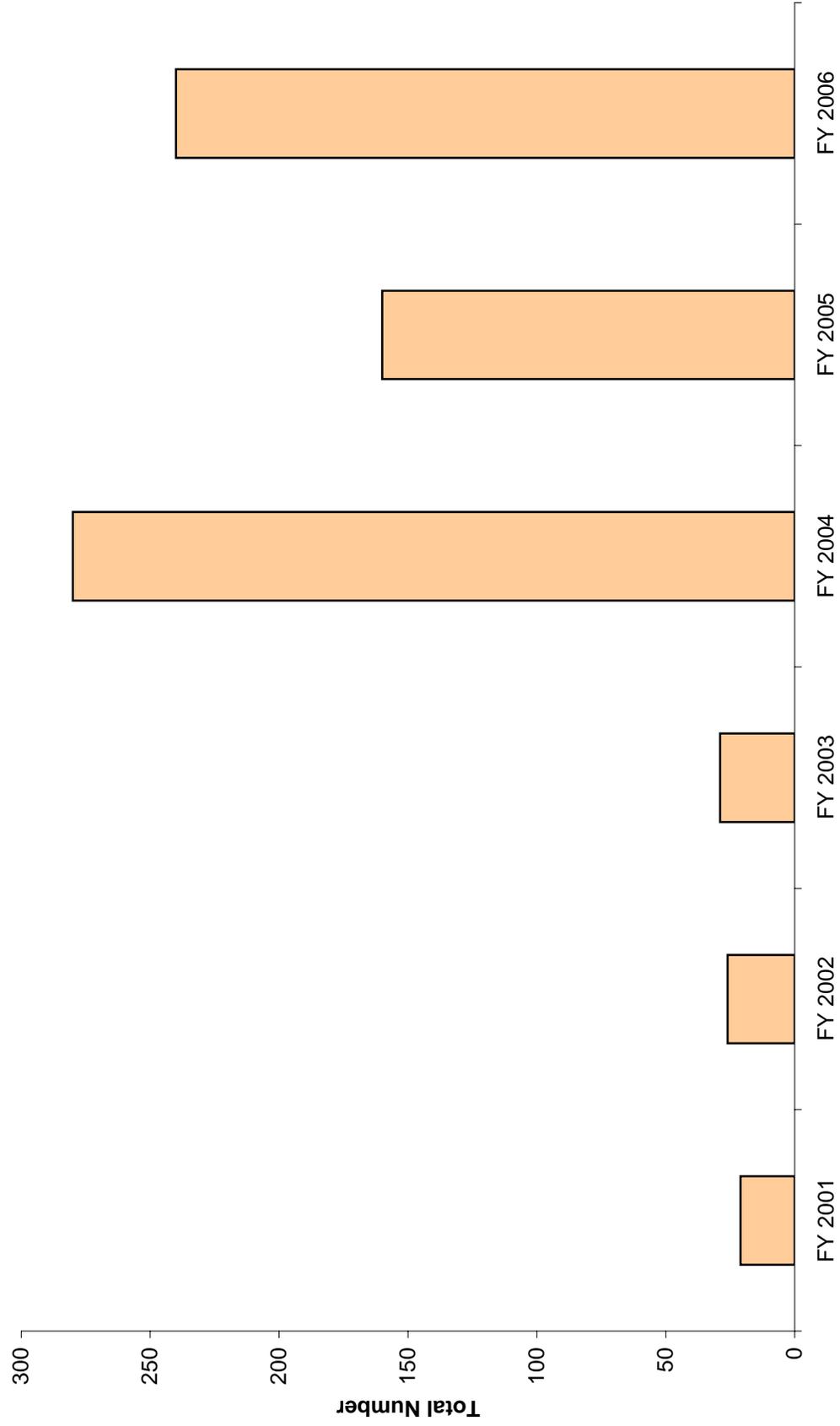
# Portsmouth Operations and Maintenance Number of Catch Basins Serviced



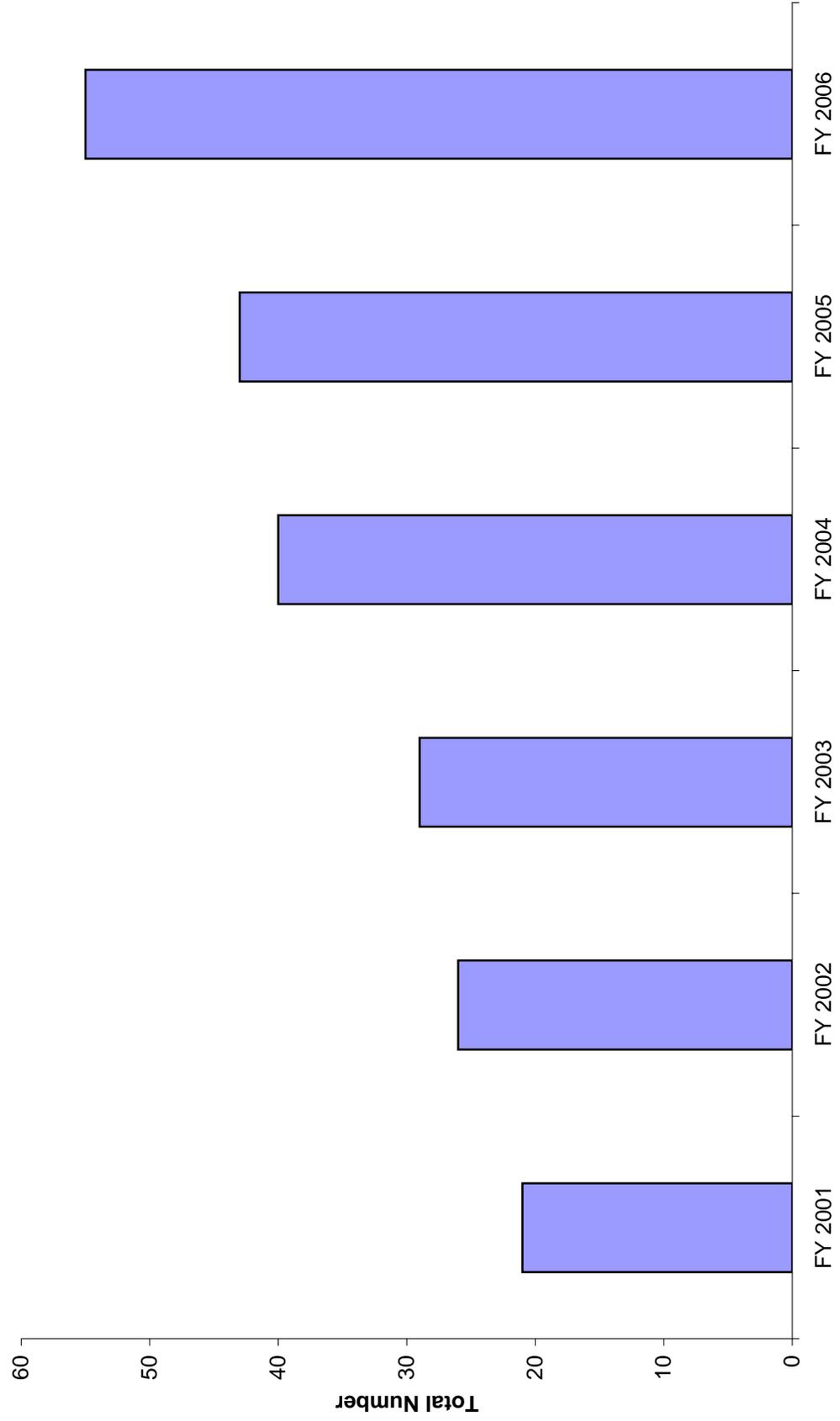
# Portsmouth Operations and Maintenance



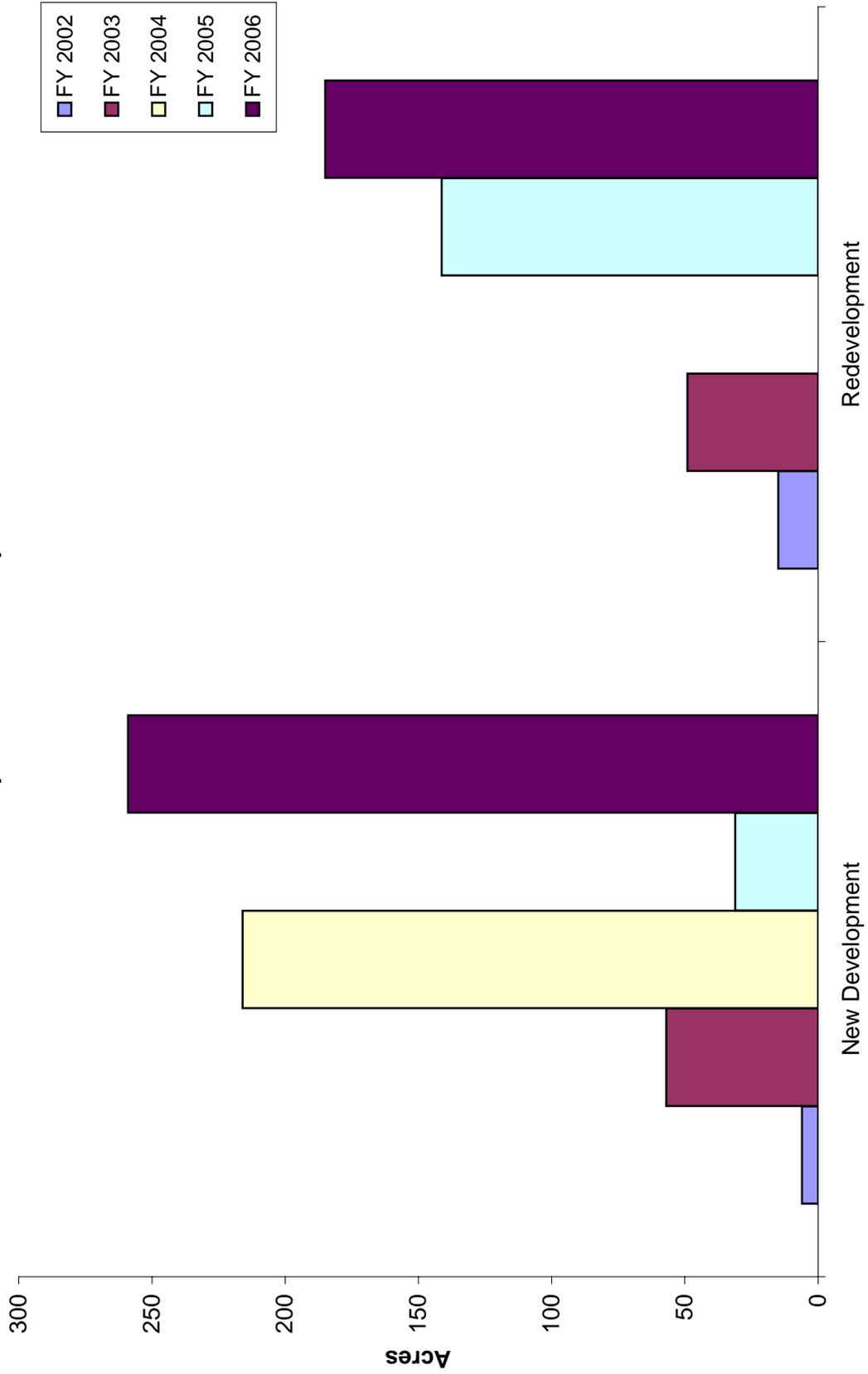
# Portsmouth Permitting & Compliance Construction Permits



# Portsmouth Permitting & Compliance Number of Plans Approved



**Portsmouth  
Construction Permits and Site Subdivision Plans Approved  
Developed and Redeveloped Acres**



---

---

# Publications

## Portsmouth

---

---

<b>Activity Month</b>	<b>Topic</b>	<b>Number Distributed</b>
June, 2006	BMP Maintenance	35
	General Stormwater Info	1640
	Landscaping / Lawncare	130
	Other	145
	Pet Waste	165
<b>Municipality Totals:</b>		<hr/> <b>2115</b>

---

---

# Environmental Knowledge Portsmouth

---

---

Activity Month	Activity Type	Knowledge Before Activity	Knowledge After Activity
June, 2006	Presentation	_____	_____
<b>Municipality Totals:</b>			

---

---

# Public Outreach Activities

## Portsmouth

---

---

Activity Month	Activity Type	Number of Citizens Reached	Total Value
June, 2006	Other	1200	
	Stream Cleanup	587	
<b>Municipality Totals:</b>		<u>1787</u>	<u></u>

---

---

# Stream Cleanup Activities

## Portsmouth

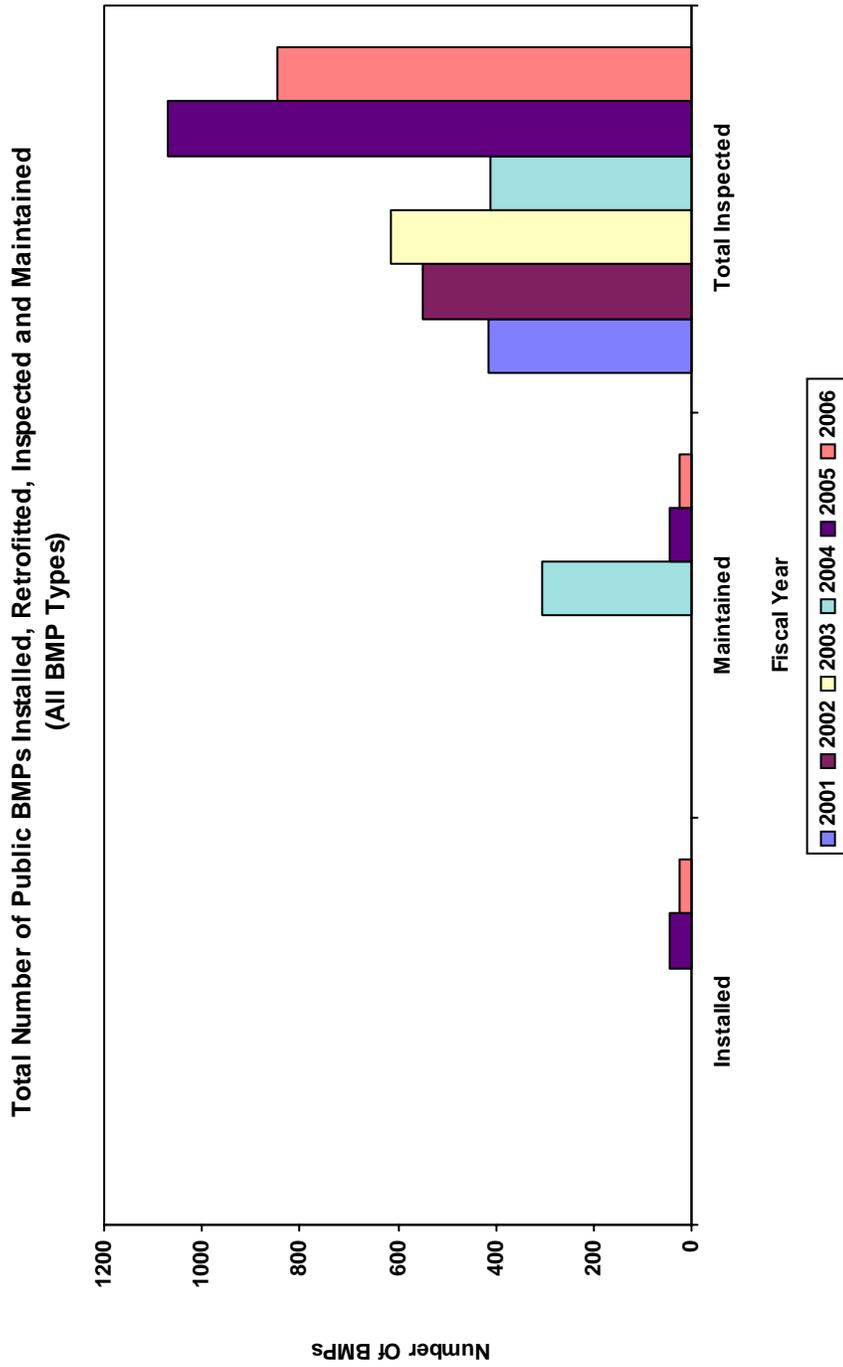
---

---

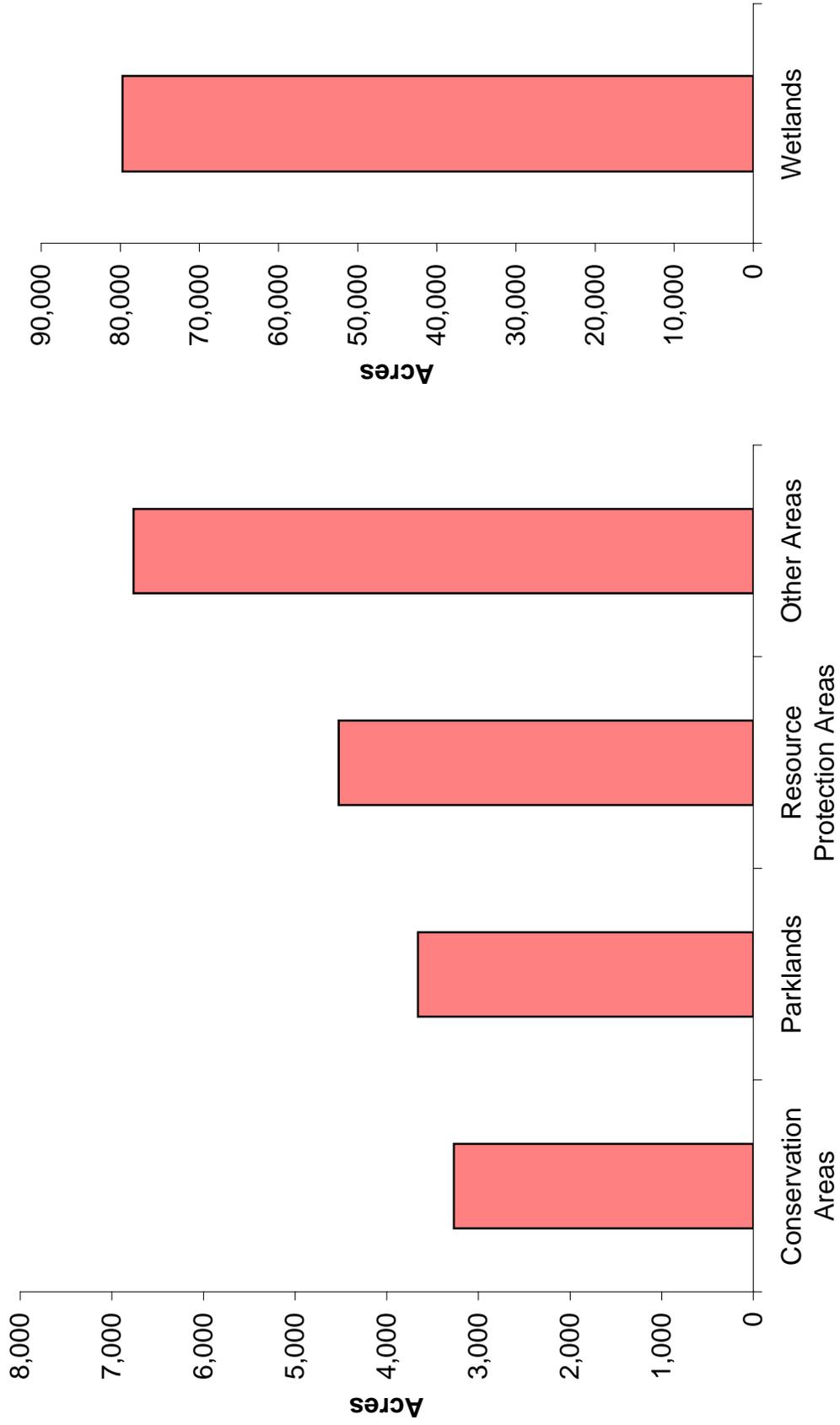
Activity Month	Miles Covered	Materials Collected (tons)
June, 2006	16	17
<b>Municipality Totals:</b>	<b>16</b>	<b>17</b>

**CITY OF VIRGINIA BEACH**

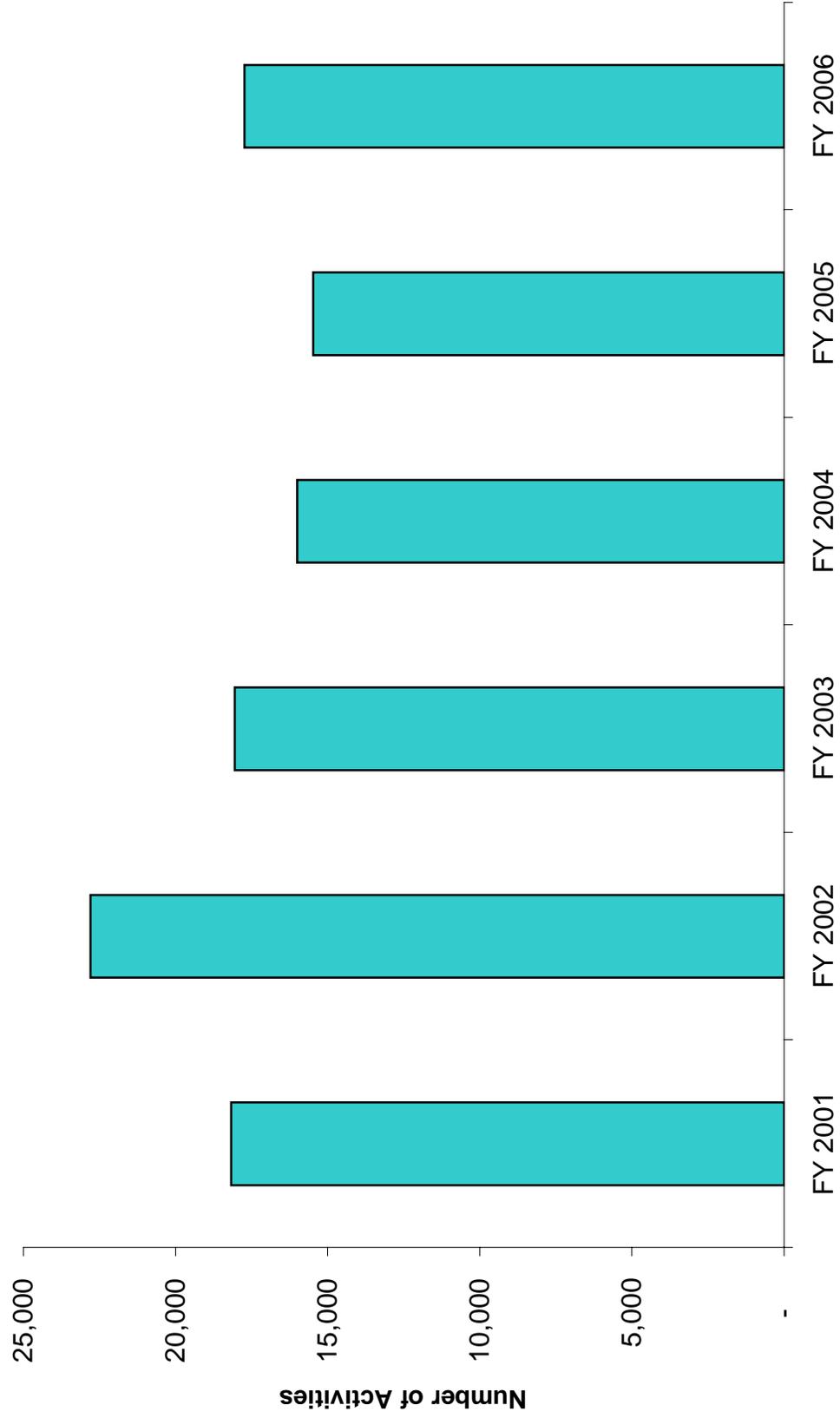
# Virginia Beach



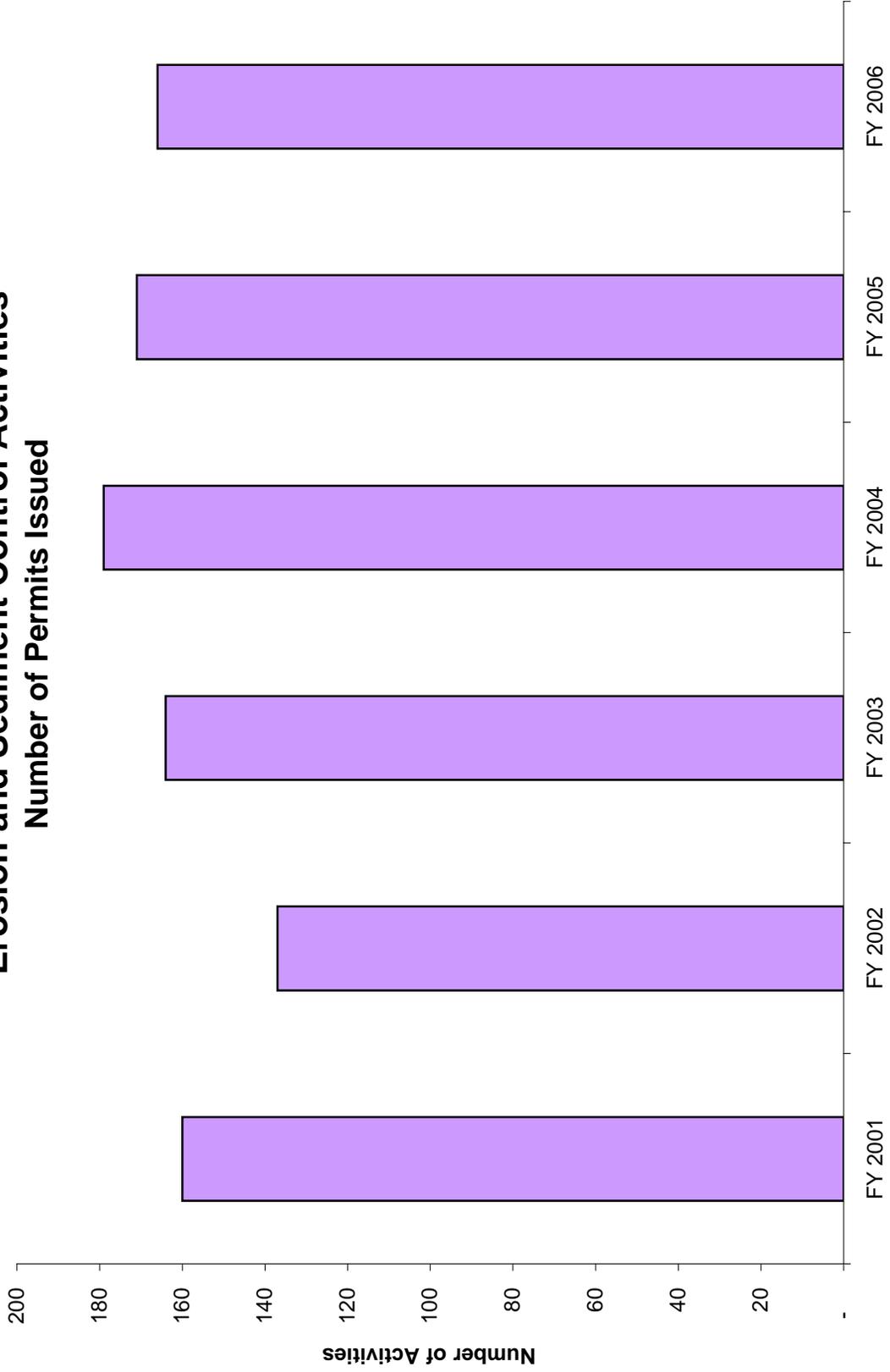
## Virginia Beach Green Areas Protected and Restored (FY 2006)



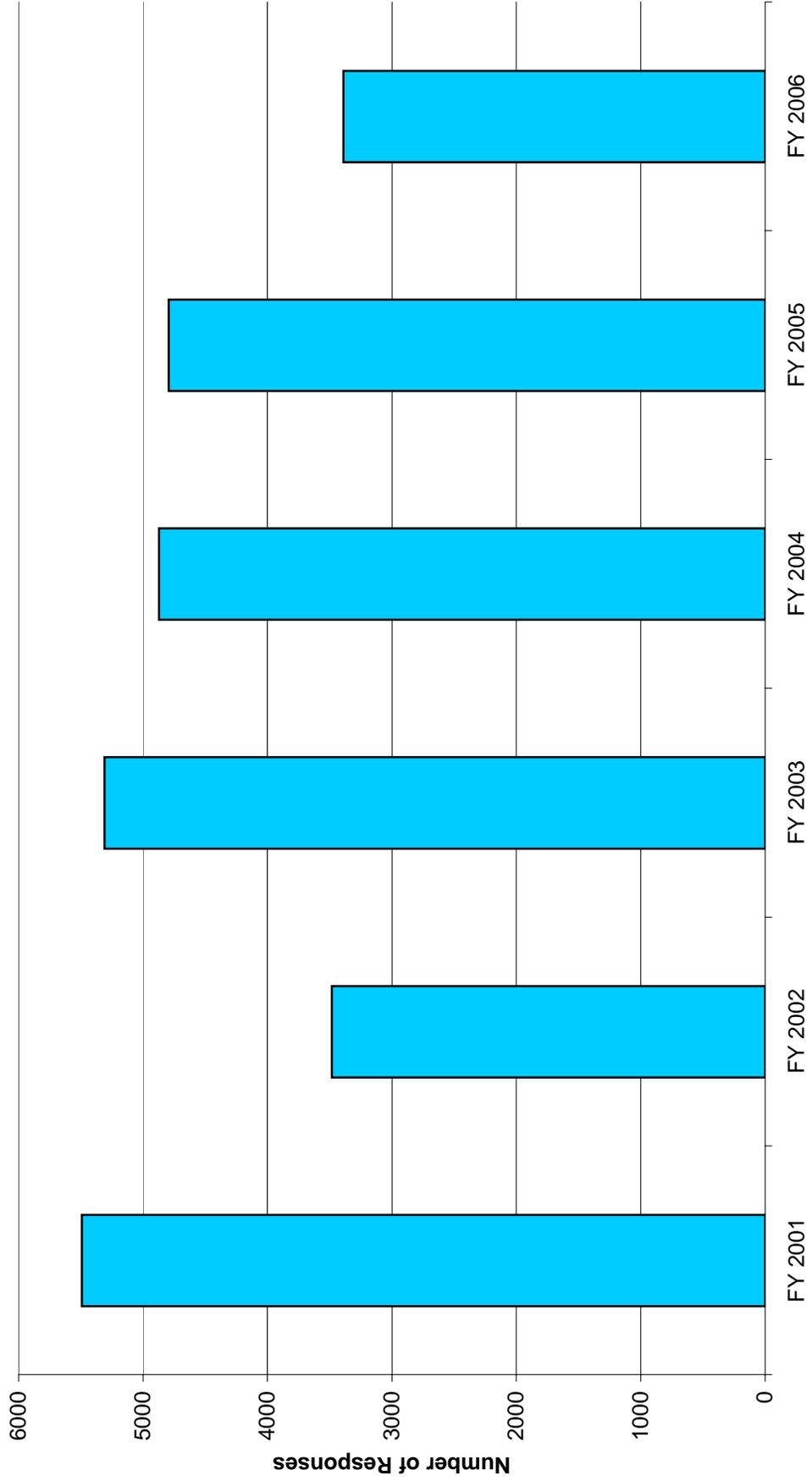
# Virginia Beach Erosion and Sediment Control Activities Number of Inspections



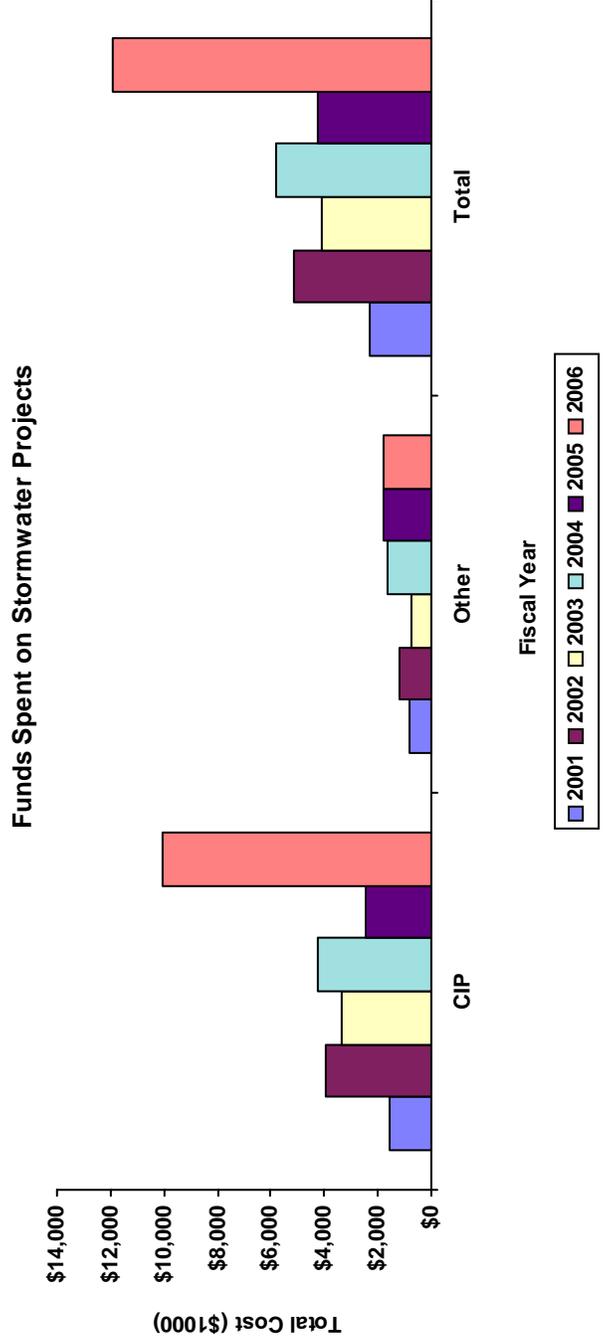
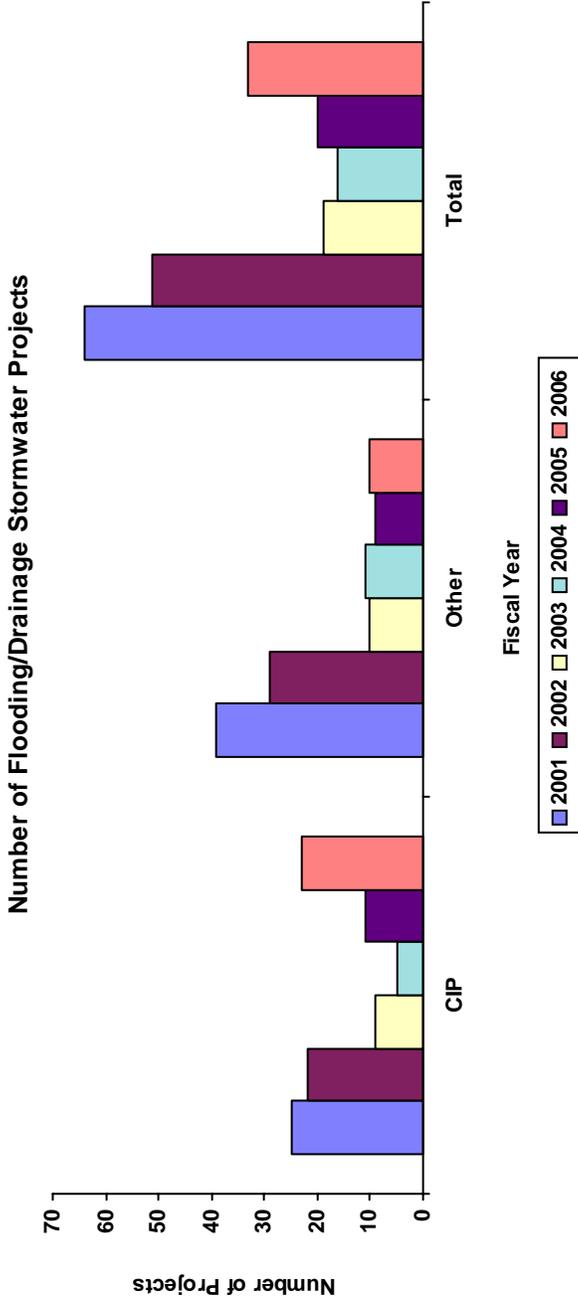
# Virginia Beach Erosion and Sediment Control Activities Number of Permits Issued



**Virginia Beach**  
**Flooding and Drainage Problems**  
Number of Responses to Assistance Requests  
(Inspection, Maintenance, and Repair Services)

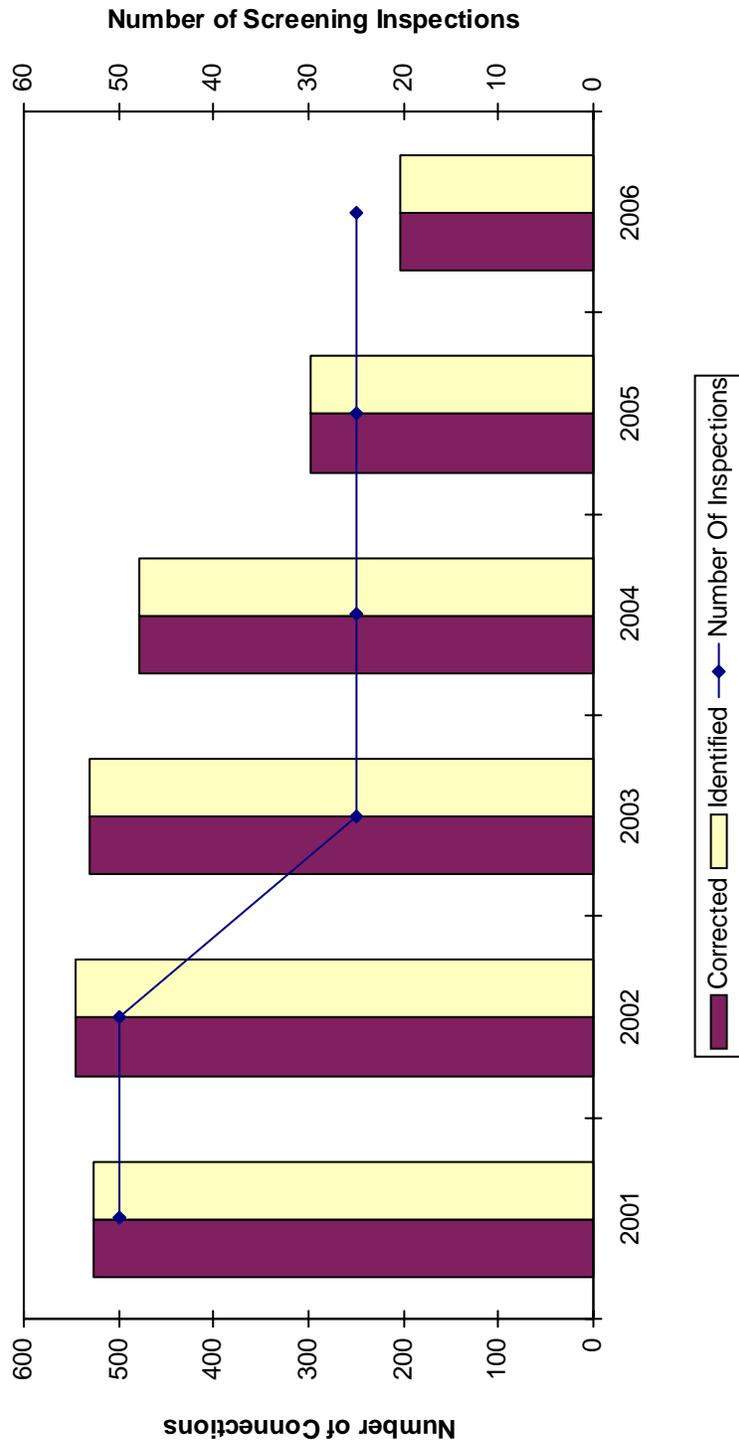


# Virginia Beach Flooding and Drainage Problems

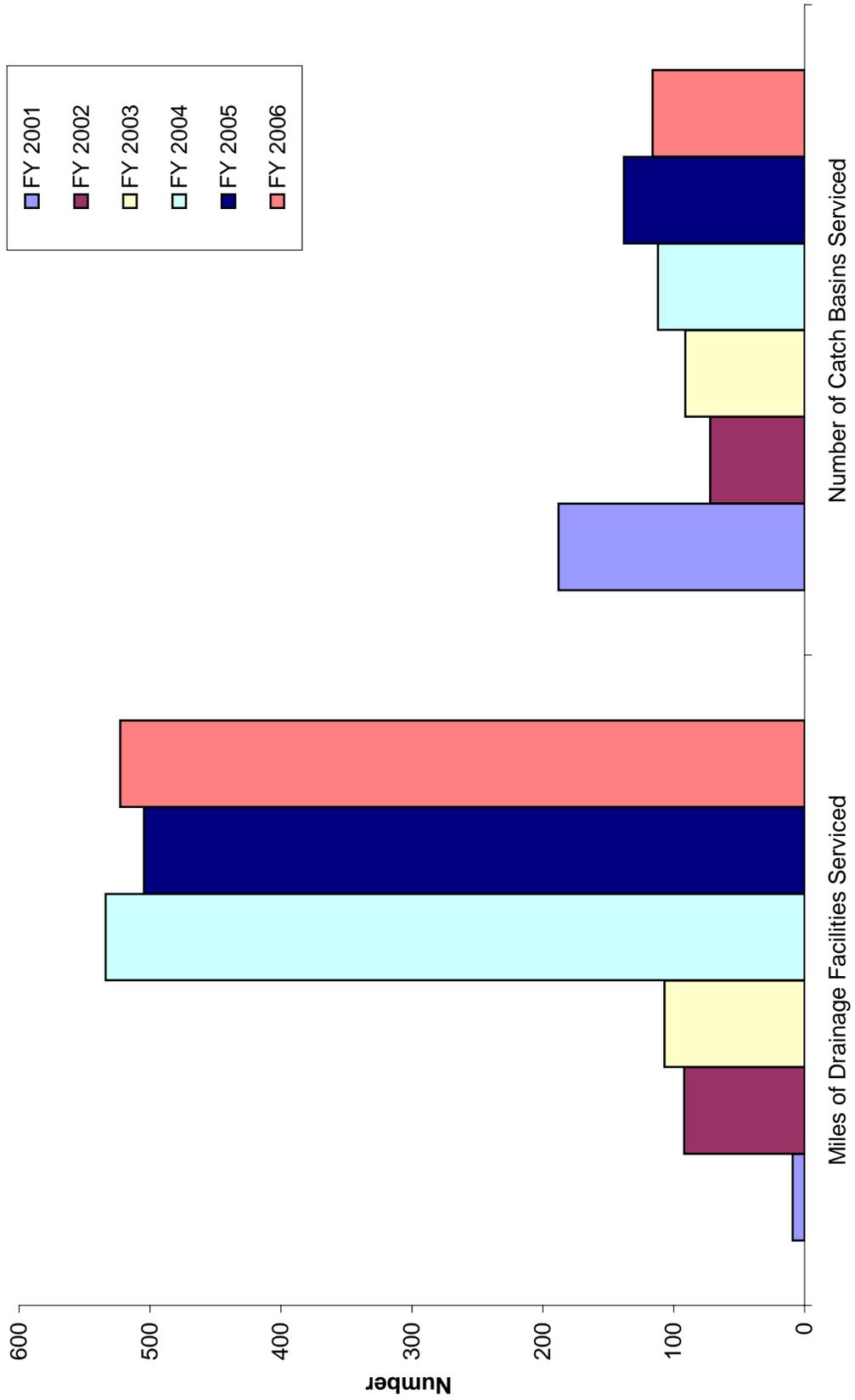


# Virginia Beach

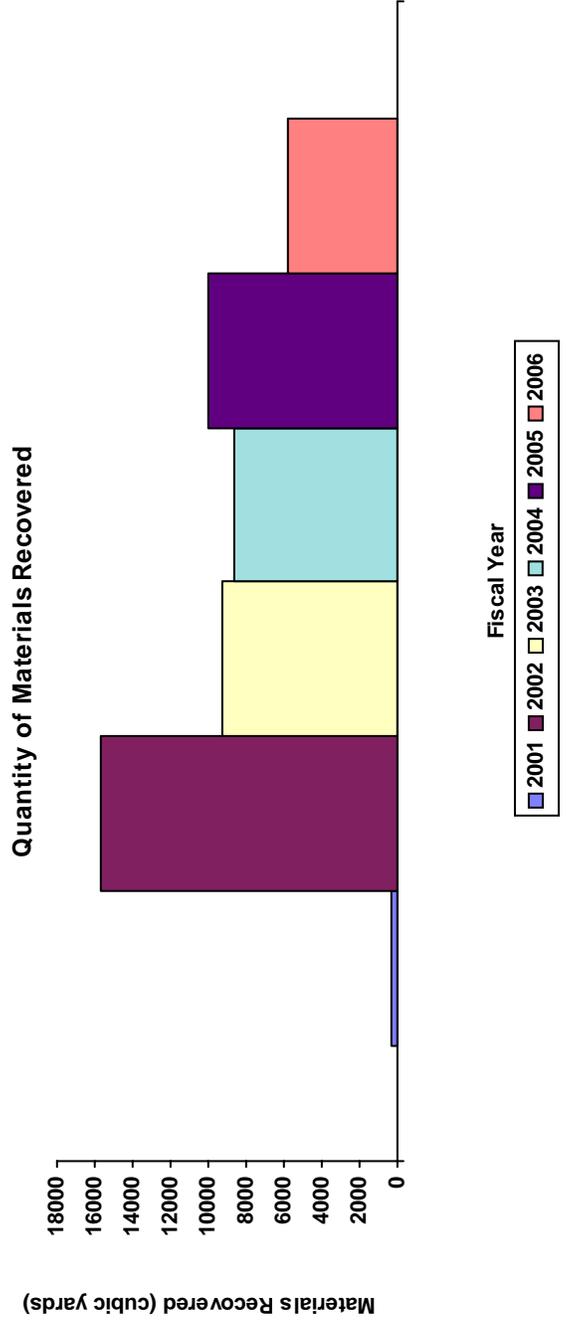
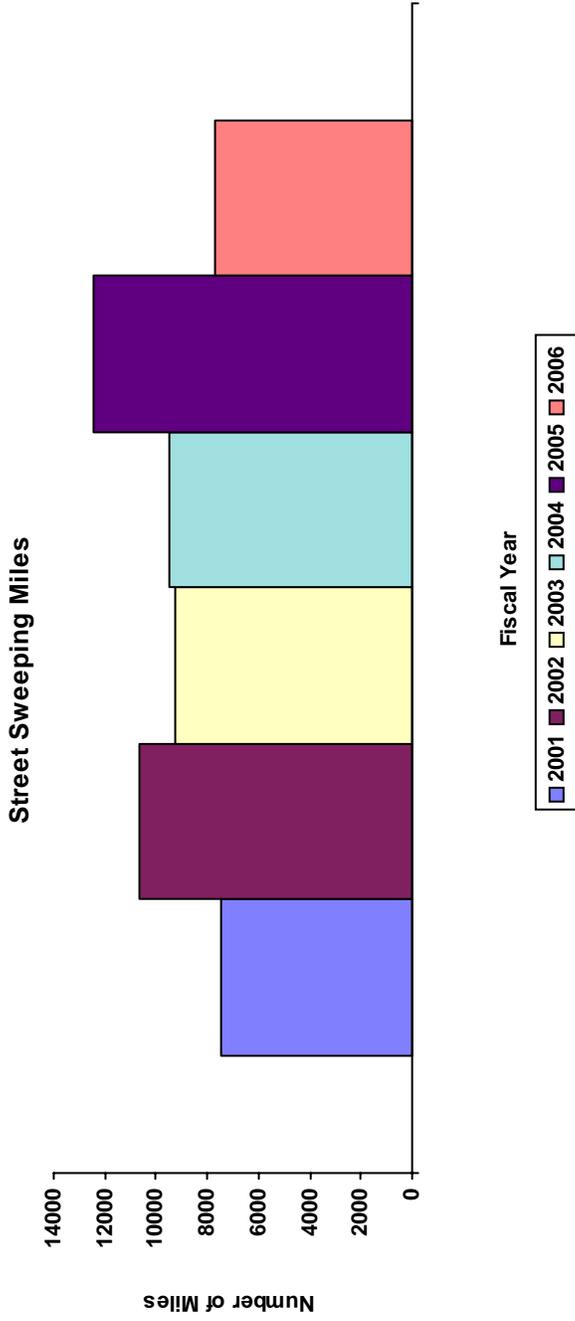
Number of Illicit Connections Identified and Corrected and Number of Screening Inspections



# Virginia Beach Operations and Maintenance

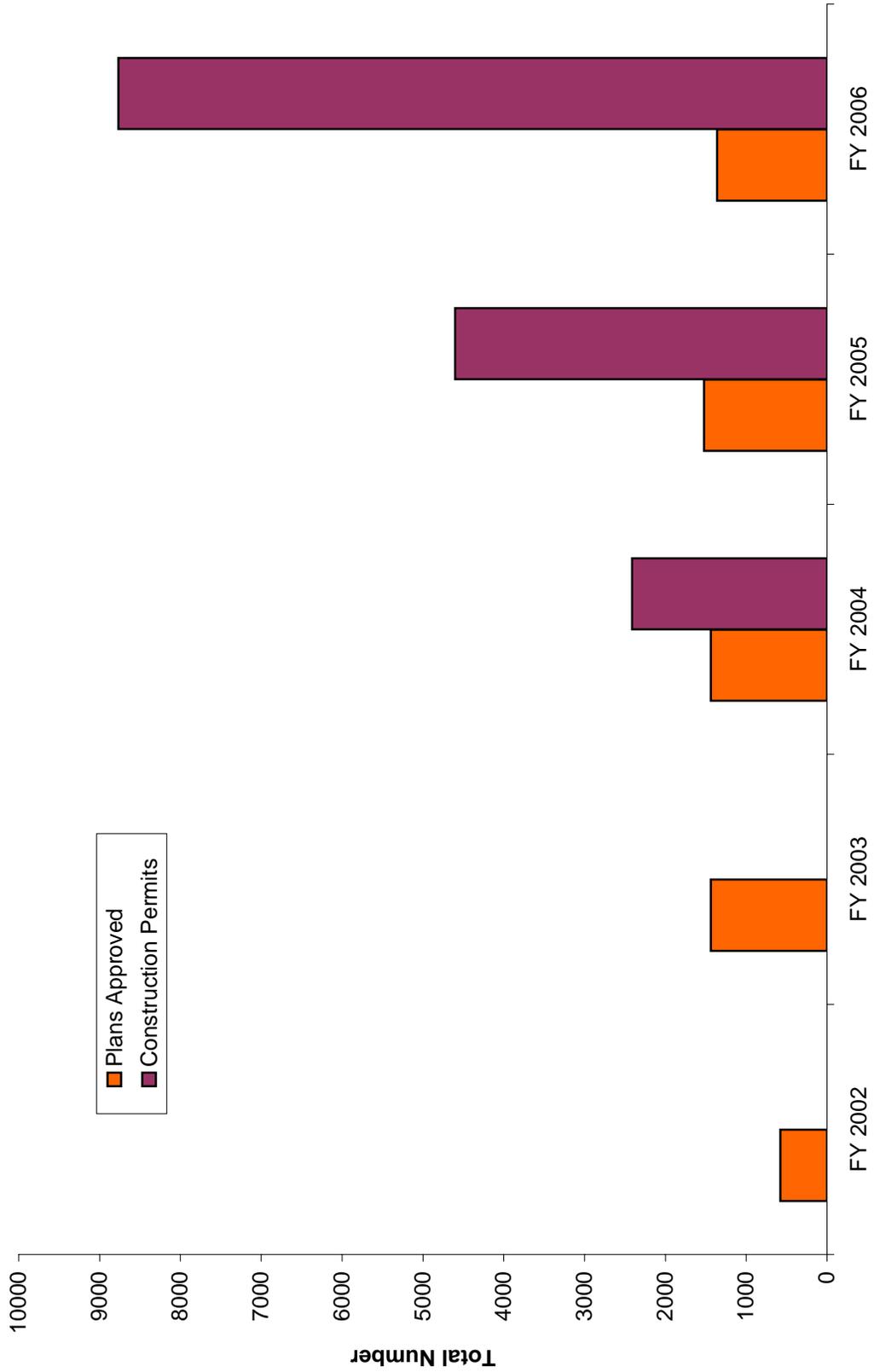


# Virginia Beach Operations and Maintenance



# City of Virginia Beach

## Permitting & Compliance: Construction Permits and Plans Approved



---

---

# Public Outreach Activities

## Virginia Beach

---

---

Activity Month	Activity Type	Number of Citizens Reached	Total Value
June, 2006	Other	10928	
<b>Municipality Totals:</b>		<b>10928</b>	

---

---

# Publications

## Virginia Beach

---

---

Activity Month	Topic	Number Distributed
June, 2006	General Stormwater Info	10000
<b>Municipality Totals:</b>		<b>10000</b>