CHAPTER IV

WATER RESOURCES

IV. WATER RESOURCES

A. ECOLOGICAL OVERVIEW

Water resources include streams, ponds, lakes and groundwater. These resources serve as sources of drinking water, recreation, stormwater conveyance and habitat for numerous organisms. Water quality can be significantly impacted by land disturbances and surface runoff. Over the past several years, Fairfax County has demonstrated a strong commitment to restore and protect its water resources through a variety of management efforts and public outreach initiatives. Unless water resources are managed properly, increasing demands put on watersheds, such as rapid development, can create many problems.

1. Watersheds

A watershed is a discrete area of land that drains to a common stream, river system or larger body of water. Watersheds include both surface water and groundwater. Everyone lives in a watershed. Large watersheds typically have sub-watersheds. There are 30 separate watersheds in Fairfax County (Figure IV-1). The largest watershed is Difficult Run (58 square miles) with ten streams that drain into the main stream, Difficult Run, which, in turn, drains into the Potomac River. The Potomac River watershed is a sub-watershed of an even larger watershed, the Chesapeake Bay watershed, which has an area of 64,000 square miles and includes portions of the states of New York, Pennsylvania, Delaware, West Virginia, Maryland and Virginia as well as the District of Columbia. All Fairfax County streams are in the Potomac River watershed and subsequently the Chesapeake Bay watershed.

2. Streams

Fairfax County is criss-crossed by a number of streams, often called runs or creeks. These streams are important aquatic habitats. Rainfall soaks into the earth and drains to low points in the surrounding land, and then emerges from the ground as seeps, springs and trickling headwaters. These small streams join with others in the same drainage area to create a stream system. There is a natural progression in size from the smallest tributaries to the largest rivers into which they eventually flow. Perennial streams flow throughout the year and intermittent streams flow only part of the year. There are approximately 860 miles of perennial streams in Fairfax County. One-third of the land in the Fairfax County Park system, approximately 7,000 acres, is comprised of stream valleys. These stream valleys are significant corridors for wildlife and the county trails system.

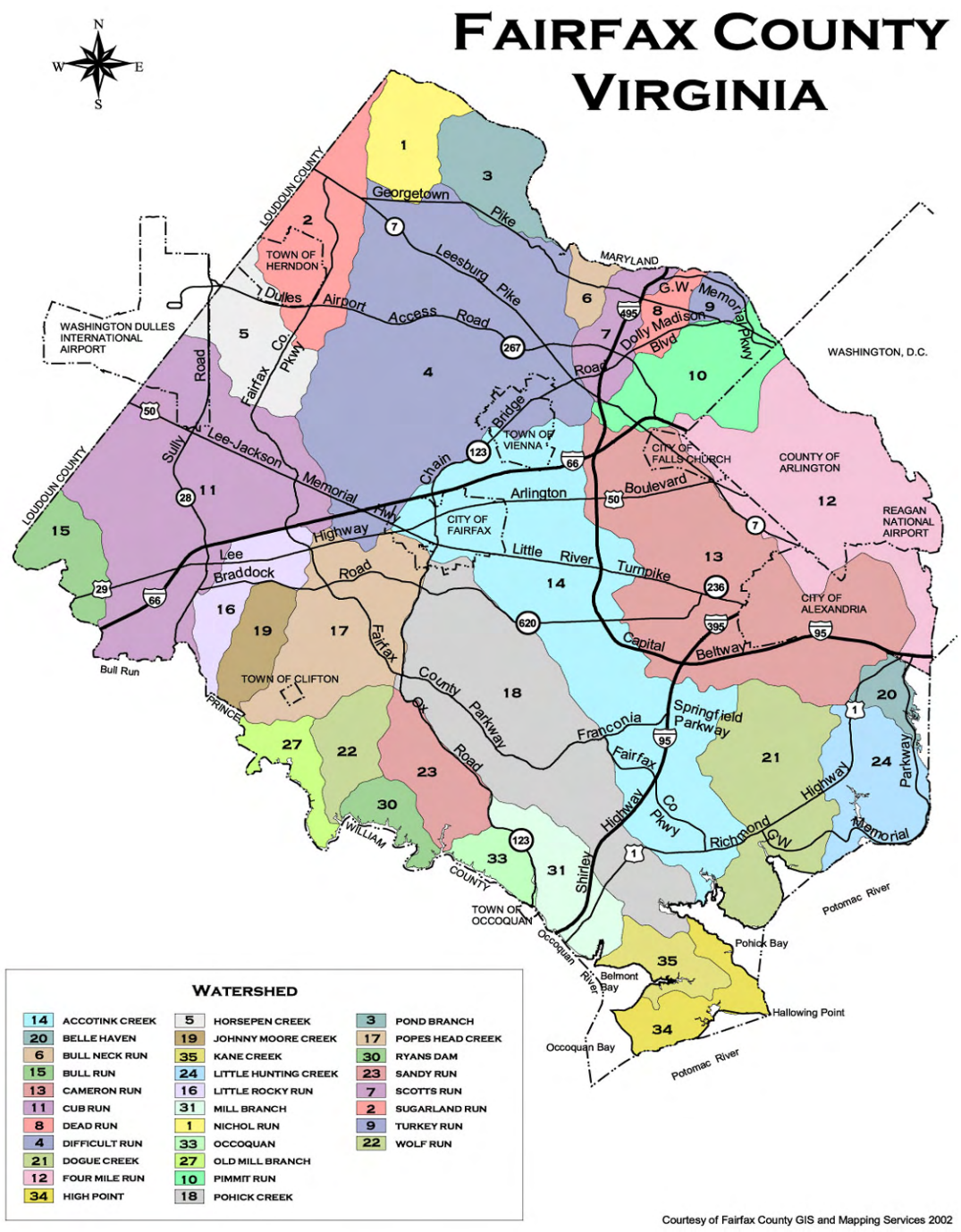

Figure IV-1: Fairfax County Watershed Map

The bottom, or bed, of a stream can consist of boulders, cobbles, gravel, sand and/or silt. The type and amount of substrate in a stream makes up the in-stream habitat. Within a stream are shallow, fast flowing areas called riffles. Dissolved oxygen levels are high because water is flowing over rocks, mixing air into the tumbling water. Alternating with riffles are deeper pools and runs where flows slow and particles of inorganic and organic matter fall to the bottom and oxygen levels are reduced. Streams support a diverse community of plants and animals that spend all or part of their life cycles in the water.

The aquatic food chain begins with leaves and other decaying plant and animal material called detritus. These materials are carried into the stream from the surrounding forests and fields by wind and water runoff. Aquatic vegetation such as algae is also an important food source. Benthic (bottom–dwelling) macro (large) invertebrates (without a back-bone) eat this organic matter. Benthic macroinvertebrates include aquatic insect larvae such as stoneflies, mayflies, caddisflies and true flies as well as snails, clams, aquatic worms and crustaceans such as crayfish. Fish, birds and other streamside wildlife, such as frogs, salamanders and small mammals, eat these macroinvertebrates.

3. Riparian Buffers

The area of trees and other types of vegetation adjacent to and lining the banks of streams is called a stream buffer or a riparian area. These areas are essential for healthy streams. The temperature in a stream greatly affects how much oxygen it can hold. Since cooler water holds more oxygen, shade providing trees and vegetation are vital along the edges of streams to help maintain cooler water temperatures so the water will hold more oxygen.

Tree cover provides food and shelter when leaves and branches fall into a stream. Streamside forests offer food, nesting sites and protection to a great diversity of wildlife, including birds, turtles, beaver and snakes. Tree roots help stabilize stream banks and provide cover for fish, crayfish and aquatic insects. Riparian areas help slow down and filter runoff. Excess nutrients carried in runoff are absorbed by vegetation.

B. IMPACTS ON WATER RESOURCES

1. Point and Nonpoint Source Pollution

Water pollution originates from either nonpoint or point sources. Nonpoint sources include surface runoff, atmospheric deposition and groundwater flow. Because of their diffuse and intermittent nature, nonpoint source pollution is difficult to control. Nonpoint source pollutant loads are greatest following rainfall and high flow events. A significant part of the nonpoint source load consists of nutrients, including nitrogen and phosphorus (organic matter, fertilizer), which stimulates algal growth. Other nonpoint source pollutants are sediment (from erosion, construction sites, eroded stream banks,

road sand), toxics (oil, paint, pesticides, chemicals and metals), pathogens and bacteria (animal waste, failing septic systems and leaking sewer systems) and trash.

Point sources are specific locations that discharge pollutants such as a discharge pipe. Because they are relatively constant and provide a steady flow of pollutants, they are easier to monitor and control. In the Potomac River watershed, most point sources are wastewater treatment plants or industrial discharges. Unlike nonpoint sources, point sources contribute relatively small portions of the nutrient loads during high flows and the majority during low flows.

2. The Effect of Imperviousness

As development occurs, natural areas that once had vegetative cover capable of absorbing water and filtering pollutants are replaced by impervious surfaces such as roads, driveways and buildings. With the increase in impervious surface and loss of vegetative cover, there is a concurrent increase in the amount and speed of stormwater runoff flowing into streams. Increased uncontrolled runoff causes stream erosion, resulting in scouring, down cutting and over-widening of stream channels and loss of streamside vegetation. Loss of shade results in increased water temperatures. During summer storms, runoff from heated impervious surfaces also raises water temperatures. In urban and suburban watersheds, rain flows off impervious surfaces such as parking lots and highways, carrying oil and other automobile wastes into streams. When stream channels become incised from down cutting, they become disconnected from their floodplains. Water cannot get out of the banks onto the adjacent floodplain where flows can be dissipated and drop their sediment loads. High flows stay in the channel, resulting in increased erosion. Silt and sediment from erosion smother the stream bottom and destroy in-stream habitat for sensitive benthic macroinvertebrates.

Simultaneously, this results in an increased number of floods in downstream areas, due to the increased volume of water. Over time, increased erosion, flooding and sediment deposition leads to habitat loss, water quality problems and damage to utilities and infrastructure.

C. SURFACE WATER MONITORING AND ANALYSES

The Fairfax County Department of Public Works and Environmental Services, Fairfax County Park Authority, Virginia Department of Environmental Quality, local water treatment plants and other organizations regularly conduct water quality monitoring and testing. The Audubon Naturalist Society and Northern Virginia Soil and Water Conservation District also coordinate volunteer water quality monitoring programs. All of these data help provide a comprehensive understanding of the condition and health of Fairfax County's water resources.

1. Countywide Watershed and Stream Assessments

a. Stream Protection Strategy Baseline Study

The Stream Protection Strategy Baseline Study, published in 2001, provides a holistic ecological base-line assessment of county streams. The study provides information on fish taxa, benthic macroinvertebrates, general evaluation of watershed and stream features and calculations of the percent impervious cover within each watershed. The Stream Protection Strategy Baseline Study can be viewed online at: www.fairfaxcounty.gov/dpwes/environmental/sps_main.htm.

b. 2006 Annual Report on Fairfax County's Streams

This annual report provides results from sampling conducted in 2005. The report provides data from monitoring efforts and analyses of *E. coli* bacteria, water chemistry, benthic macroinvertebrates and fish. Monitoring sites are randomly selected using a probability-based stratification model or stratified random approach. Most county streams are in the "fair" to "very poor" condition or "unacceptable" based on fish and benthic macroinvertebrate monitoring data. The percentage of streams rated as "good" or "excellent" showed a slight decline from 2004. In 2005, there was an increase in sites that had better conditions for fish communities.

In 2005, fewer sites exceeded the water quality standard for *E. coli* bacteria than in 2004. Ten percent of the bacteria monitoring sites had concentrations that were consistently below state water quality standards (235 cfu/100 mL). Water quality chemical parameters that were monitored included pH, water temperature, specific conductance, nitrate, total phosphorus and dissolved oxygen.

Sampling results indicated that three-quarters of the county's stream ecosystems are impacted or impaired. Future sampling sites will continue to be randomly selected throughout the county. Project specific monitoring will also occur as more stream restoration and low impact development projects are implemented throughout the county. The 2006 Annual Report on Fairfax County's Streams can be viewed on-line at: www.fairfaxcounty.gov/dpwes/stormwater/streams/streamreports.htm.

c. Physical Stream Assessment

Completed in 2004, the Stream Physical Assessment Study provides field reconnaissance data for the county's watershed management plans including information on habitat conditions, impacts on streams, general stream characteristics and geomorphic classification of stream type. The Countywide Stream Assessment can be obtained by contacting the Fairfax County Stormwater Planning Division at 703-324-5500.

d. Perennial Stream Mapping

In 2003, the Board of Supervisors adopted a revised Chesapeake Bay Preservation Ordinance in order to comply with amendments to the state's Chesapeake Bay Preservation Area Designation and Management Regulations. The ordinance incorporated changes to the designation criteria for Resource Protection Areas to include water bodies with perennial flow, resulting in a significant expansion to the county's RPAs.

On November 17, 2003, based on the Perennial Streams Identification and Mapping program conducted by DPWES staff, the Board of Supervisors adopted new Chesapeake Bay Resource Protection Area maps, increasing the amount of stream miles protected by 52 percent (from 520 to 860 miles).

In 2004, the Quality Assurance/Quality Control Study of the Perennial Streams Identification and Mapping was conducted. A total of 10 percent of the streams initially surveyed between 2002 and 2003 were selected for the QA/QC study. The results of the QA/QC Study were presented to the Board of Supervisors in 2005 along with revised Chesapeake Bay Preservation Area Maps, which were approved.

The Fairfax County Stream Classification Protocol, Field Data Sheets, QA/QC study and the county's revised map of Chesapeake Bay Preservation Areas are available online at: www.fairfaxcounty.gov/dpwes/watersheds/perennial.htm.

2. Volunteer Water Quality Monitoring Programs

The Northern Virginia Soil and Water Conservation District and the Audubon Naturalist Society coordinate and manage volunteer stream monitoring programs in Fairfax County.

NVSWCD volunteers conduct biological and chemical monitoring and a habitat assessment, using the Save Our Streams protocol four times a year. The District added bacterial and temperature monitoring programs in 2005. There were 25 active monitoring sites in 2006. Information about the NVSWCD volunteer monitoring program can be found at http://www.fairfaxcounty.gov/nvswcd/monitoring.htm.

The ANS program uses a modified version of the EPA's Rapid Bioassessment II protocol, which includes assessment of in-stream and streamside habitat parameters and a survey of benthic macroinvertebrate populations. There are five monitoring stations in Fairfax County.

Both programs include training and certification of volunteer monitors, equipment, data management and analysis and quality control. Data are forwarded to Fairfax County, Virginia Department of Environmental Quality, Virginia Save Our Streams and other interested organizations. This program helps supplement the county's monitoring programs including the Annual Report on Fairfax County's Streams.

3. Fairfax County Park Authority Stream Monitoring

The Park Authority continues to support volunteer stream monitoring programs through partnerships with NVSWCD and ANS. Stream monitoring is conducted by staff and volunteers at Ellanor C. Lawrence, Riverbend, and Lake Accotink Parks.

Water quality monitoring was conducted at seven sites in Huntley Meadows Park in 2006 using the Rapid Bioassessment II protocol. Fifteen samples were collected, six from Dogue Creek and nine from Barnyard Run. On Dogue Creek, two samples were rated "good", three were "fair" and one was "poor". On Barnyard Run, one sample was rated "good", two were "fair" and the remaining six samples were "poor".

4. Virginia Department of Environmental Quality

DEQ performs long-term trend monitoring at 14 streams that are either in Fairfax County or border the county. DEQ has eight monitoring stations in the county. Monitoring was conducted from 2004 through 2006. DEQ staff conducts biological monitoring at four stations in the county. Failure to meet designated water quality standards may result in a stream being placed on the 303(d) list for impaired state waters.

5. Metropolitan Washington Council of Governments--The Chain Bridge Monitoring Program

Since 1983, the Metropolitan Washington Council of Governments has contracted with the Occoquan Watershed Monitoring Laboratory to operate the Chain Bridge monitoring station on the Potomac River. The purpose of this monitoring station is to measure water quality in the Potomac River as it crosses the fall line and enters the Potomac estuary. Parameters collected include dissolved oxygen, biological oxygen demand, turbidity, temperature, conductivity, total suspended solids, fecal and total coliforms, chlorophyll-a and nutrients.

The Chain Bridge monitoring station consists of an automated sampler that simultaneously monitors the river stage at Little Falls while directly sampling at Chain Bridge, about 1.5 miles downstream, in response to changes in river flow volume. Base and storm event samples are taken throughout the year and a storm event is monitored using a series of discrete samples taken incrementally at equal river flow volumes throughout the storm. These samples are combined into one composite for laboratory analysis. Grab samples are taken directly from the river on a weekly to biweekly basis (these are combination base flow or discrete storm event).

6. Occoquan River

The Occoquan River straddles the southern border of Fairfax County and the northern border of Prince William County. The river has been dammed near the town of

Occoquan. The Occoquan Reservoir, created by the damming, serves as one of two primary sources of drinking water for Fairfax Water, which operates a facility along, and withdraws water from, the reservoir. Because of its use as a drinking water source, water quality in the reservoir is highly monitored and water from a sewage treatment plant upstream of the reservoir is carefully treated.

a. Occoquan Watershed Monitoring Laboratory

The Occoquan Watershed Monitoring Program is administered by the OWML and has been in operation since 1972. It is funded by Fairfax Water and the six jurisdictions within the watershed: Fairfax, Prince William, Loudoun and Fauquier Counties; and the cities of Manassas and Manassas Park. The program consists of nine stream monitoring stations (automated flow monitoring at all and storm sampling at most) and four Occoquan Reservoir stations. Base flow sampling in the streams and all sampling in the reservoir is done manually. In addition to surface and bottom water samples, profiles of DO, temperature and pH are also obtained at the reservoir stations. Sampling is done weekly during the growing seasons and biweekly or monthly (if ice is present) in winter. Past water quality data indicate little change in water quality in the watershed. The Lake Manassas program is used for monitoring water and sediment at seven stream stations and eight lake stations. The eutrophication status of the Occoquan Reservoir and Lake Manassas is moderately eutrophic.

The OWML monitors quarterly for synthetic organic compounds in the watershed in a program established under the recommendation of EQAC in 1982 for water samples. In 1988, the OWML began monitoring for SOCs in sediment and fish samples within the reservoir. The Lake Manassas program also funds SOC monitoring. The most frequently detected SOC is atrazine, usually detected in springtime and early summer when it is being land applied. Concentrations “are usually lower” than the maximum contaminant level of three micrograms/liter for drinking water. The pesticide dual (metolachor) and phthalates are regularly found in concentrations one or more order of magnitude below the MCL.

7. Kingstowne Monitoring and Stream Restoration

During the July 2004-2005 monitoring period, storm events and base flow samples were collected and analyzed to determine pollutant loads in Dogue Creek. Based on the monitoring data, sediment removal efficiencies for the 1,148 acre watershed were achieved for all storm events. The phosphorus removal rate did not meet the 50 percent removal requirement of the South Van Dorn III permit. DPWES is working with the Army Corps of Engineers to resolve the problem.

In 1999, DPWES, Northern Virginia Soil and Water Conservation District, the USDA Natural Resources Conservation Service, the Friends of Huntley Meadows, and the Citizens Alliance to Save Huntley formed a partnership to restore a stream in the Kingstowne area, with the help of a grant from the Virginia Department of

Conservation and Recreation. The Kingstowne stream is a tributary of Dogue Creek, receives runoff from a 70 acre watershed and is upstream of Huntley Meadows Park. Monitoring and testing have substantiated that the stream segment is stable, erosion has been brought under control and water quality and habitat in the stream are improved.

8. Gunston Cove Aquatic Monitoring Program

Gunston Cove is the site of the outfall of Fairfax County's Noman M. Cole, Jr. Pollution Control Plant. The primary objective of this George Mason University program is to determine the status of the ecological communities and physical-chemical environment in the Gunston Cove area of the tidal Potomac for evaluation of long-term trends. This helps provide the basis for well-grounded management strategies to improve water quality and biotic resources in the tidal Potomac. Twenty years of data from Gunston Cove and the nearby Potomac River provide valuable long-term trends that will aid in the continued management of the watershed and point source inputs.

For a copy of the "Ongoing Aquatic Monitoring Program for the Gunston Cove Area of the Tidal Freshwater Potomac River 2004 & 2005" Final Report (Draft October 17, 2006), contact R. Christian Jones, Professor and Project Director at George Mason University.

9. Total Maximum Daily Loads

A Total Maximum Daily Load is a watershed-specific plan for bringing an impaired water body into compliance with the Clean Water Act goals. A 1999 Consent Decree required the state to develop TMDL plans for all impaired streams listed on the 1998 303(d) Impaired Waters List by 2010.

A total of 19 water bodies in Fairfax County are included in Virginia's listing of impaired waters. Ten of the water bodies are multi-jurisdictional. Of the listed water bodies, 12 are riverine systems totaling 58.45 miles, six are estuarine with a total area of 23.23 square miles and one is a drinking water reservoir (Occoquan) with an area of 1,700 acres. The cause of the impairment for the majority of riverine systems is either fecal coliform bacteria or impacts to benthic macroinvertebrates. For the estuarine water bodies, the cause of impairment is bacteria and/or PCBs in fish tissue. According to the schedule, seven water bodies require TMDL studies to be completed by 2010, nine by 2014 and three by 2016.

Bacteria TMDLs have been established for three stream segments in the county, including one section of Four Mile Run and two sections of Accotink Creek.

Bacteria and benthic TMDL plans have been or are being developed for seven tributaries to the Occoquan River. EPA approved TMDLs for Popes Head Creek, Bull Run and the Occoquan River in 2006. TMDLs for the lower section of Accotink Creek and for Difficult Run are to be developed by 2008.

The county is participating in a cooperative effort between Maryland, the District of Columbia and Virginia to develop a TMDL for PCBs for the Tidal Potomac River. County staff tracks developments of new TMDLs and addresses impairments on streams segments located within the county. Watershed management plans advocate best management practices to address uncontrolled stormwater runoff and associated pollutant loading to streams.

a. Accotink Creek TMDL

Due to high levels of fecal coliform bacteria, a 4.5 mile segment of Accotink Creek in Fairfax County, beginning at the confluence of Crook Branch and Accotink Creek to the start of Lake Accotink, was placed on the 1998 Virginia 303(d) TMDL list. A United States Geological Survey study was initiated in August 2001 to identify and isolate specific sources of human fecal coliform bacteria found in Accotink Creek. The study focuses on storm drains that flow during dry periods and sampling of locations with elevated fecal coliform bacteria levels. The results of these studies will be used to identify "hot-spots" for remedial work and inclusion in the TMDL implementation plan. The USGS paper on sampling Accotink Creek can be viewed on-line at: http://water.usgs.gov/pubs/wri/wri034160/wrir03-4160.htm.

An extensive Dry Weather Screening program has been undertaken in the Accotink Creek Watershed as part of the ongoing efforts to detect illicit connections and improper discharges.

b. Four Mile Run TMDL

Due to high levels of fecal coliform bacteria, Four Mile Run was listed in 1996 and 1998 on the 303(d) Impaired Waters List. Although only the very upper reaches of Four Mile Run are located in Fairfax County, it is important to note the existence of a TMDL study for Four Mile Run and the participation of Fairfax County in the Four Mile Run TMDL study and implementation plan.

The Four Mile Run Fecal Coliform Study, which identified the sources of fecal coliform bacteria in the watershed using DNA testing, was completed in 2000. The study found that waterfowl contribute over one-third (31 percent) of those bacteria that could be matched. Eighteen percent of the bacteria originated from humans, 13 percent from dogs, six percent from deer, 19 percent from raccoons and 13 percent from other sources. Bacteria from humans appear to be highly localized. There were indications in that, without regard to specific host animals, E. coli bacteria seem to regenerate, through cloning, within the storm drains and stream sediments, which in turn perpetuates bacteria levels.

In 2002, the bacteria TMDL study for Four Mile Run developed by the Northern Virginia Regional Commission and the VA DEQ was approved by the EPA. NVRC, under a grant from VA DEQ, worked with four jurisdictions (Fairfax and

Arlington counties and the cities of Falls Church and Alexandria) to develop an implementation plan for the TMDL study. Completed in 2003, the plan focuses on reducing bacteria contamination from human and pet sources in the watershed and includes several initiatives from community outreach efforts to large capital projects. The plan can be viewed on-line at: www.novaregion.org/bacteriaimplementation.htm.

10. Pond and Lake Monitoring and Management

There are a number of significantly sized private and public ponds and lakes throughout the county. All ponds and lakes in Fairfax County are man-made by excavation and/or the damming of streams. The majority of these ponds and lakes serve as stormwater management facilities for developments and have houses along their shorelines. There are also numerous smaller ponds associated with commercial developments, golf courses or farm properties.

These open water impoundments provide habitat for a number of aquatic organisms and waterfowl as well as recreational opportunities for humans. Due to increased runoff from development, these water bodies are often subject to heavy sedimentation, which requires frequent dredging in order to maintain pond or lake depth. Heavy nutrient loading results in large algal blooms during warmer months. Other problems that plague urban ponds and lakes include thermal stratification, reduced water clarity, decreased dissolved oxygen levels, trash and nuisance invasive vegetation.

a. Reston Lakes

The Reston Association, the homeowners association for the planned community of Reston, has an active watershed and lake management program. Four lakes, Audubon, Anne, Thoreau and Newport, as well as two ponds, Bright and Butler, are monitored. Dissolved oxygen, dissolved oxygen saturation, temperature, pH, conductivity, total phosphorus, Secchi depth transparency, chlorophyll a, phytoplankton and zooplankton are monitored. Fecal coliform and *E. coli* bacteria testing have been conducted in Lake Audubon for annual swimming events. Detailed monitoring information and data can be found in the 2006 Reston Lakes Annual Monitoring Report. This report and other information about Reston's lakes can be obtained by contacting the association's watershed manager at 703-435-6560 or visiting the Web site: www.reston.org.

b. Pohick Watershed Lakes

The six Pohick watershed lakes (Barton, Braddock, Huntsman, Mercer, Royal and Woodglen) are inspected annually for dam structure but are not monitored for biological or chemical parameters.

c. Lake Barcroft

The Lake Barcroft Watershed Improvement District is a local taxing district authorized under Virginia law for conservation purposes. In 1999, the WID dredged approximately 15,000 cubic yards of sediment from the lake. In order to avoid the costs associated with hauling it to a landfill, the WID rented a huge topsoil screening machine and excavator to load it, converting the waste material into topsoil by filtering out all the sticks, stones and trash. The topsoil was then made available to local residents. The WID is in the progress of planning another large-scale dredging project. Given the significant amount of sediment that needs to be removed, there are concerns with the lack of adequate local disposal areas. For more information about Lake Barcroft, contact the Operations Director at 703-820-1300 or see the Web site: www.lakebarcroft.org.

d. Lake Accotink

Lake Accotink is owned and managed by the Fairfax County Park Authority and is a key feature of Lake Accotink Park. Similar to other urban lakes and ponds, Lake Accotink has been significantly impacted by accelerated sedimentation, which has reduced the average depth of the lake to less than four feet. Project funding in the amount of $6.15 million was included in the 1998 Park Bond Program to dredge the lake and make repairs to the dam. The current plan includes hydraulically dredging 161,000 cubic yards of sediment from the lake and pumping the material to Virginia Concrete off-site. Mobile Dredging and Pumping Company is conducting the dredging operation. Mobilization began in October 2005 and the pipe line installation in January 2006. Dredging began in June 2006. The project also includes expanding and enhancing existing wetlands. The project was scheduled to have been completed in October 2007.

11. Groundwater Monitoring

The United States Geological Survey maintains a series of wells throughout the nation to monitor groundwater levels and drought. Two wells are located in Virginia; one such well (Site 385638077220101) in Fairfax County has been maintained since 1976. This well provides continuous real-time data that is used to assess ground water levels. Information on this well is available on-line at: http://groundwaterwatch.usgs.gov.

a. Leaking Underground Storage Tanks

In 2006, there were 123 new release cases investigated by the Virginia Department of Environmental Quality. As of June 2007, there were a total number of 2,238 cases, of which 86 remain open.

D. WATERSHED MANAGEMENT

1. Watershed Master Plans

In 2003, the Stormwater Planning Division of the Fairfax County Department of Public Works and Environmental Services commenced a watershed planning program to develop management plans for all 30 county watersheds. Data from the Physical Stream Assessment, Stream Protection Strategy Baseline Study and other monitoring information are being used in the development of the watershed plans. The plans encourage public involvement; provide an assessment of stormwater conditions; recommend protection strategies and improvement projects including stream restoration, riparian buffer restoration, installation of low impact development practices, and retrofitting and improving existing stormwater management facilities and infrastructure; and recommend modifications to the County Code and Public Facilities Manual.

Four watershed management plans (Little Hunting Creek, Popes Head Creek, Cub Run/Bull Run, and Difficult Run) have been completed and are being implemented. Plans for Cameron Run and Pimmit Run/Middle Potomac watersheds are in the final draft phase. Combined these six plans cover 11 watersheds and 50 percent of the land area in the county. Plans for the remaining watersheds in the county (Accotink Creek, Dogue Creek, Little Rocky Run/Johnny Moore Creek, Pohick Creek, Sugarland Run/Horsepen Creek, Lower Occoquan Watersheds and Nichol Run/Pond Branch) will be initiated in 2007. The completion of all watershed plans is expected by 2010.

2. Restoration Efforts

In 2006, Fairfax County completed construction on ten stream restoration and stabilization projects throughout the county. A number of additional projects were started and are scheduled to be completed in 2007. Many of the projects involved partnerships between DPWES, the Fairfax County Park Authority, the Northern Virginia Soil and Water Conservation District and private property owners. The 2006 Fairfax County Stormwater Status Report contains a full list and details of each project. The report can be viewed on-line at:
http://www.fairfaxcounty.gov/dpwes/stormwater/ms4reports.htm#2006Report.

a. Riparian Buffer Restoration

In 2006 Fairfax County continued its countywide riparian buffer restoration project in collaboration with volunteers and various other partners to help lessen the impacts of stormwater runoff on local streams. An evaluation of the inventory of buffer deficiencies from the countywide stream physical assessment was conducted to develop a planting priority list and schedule. Fourteen stream buffers were restored in 2006 and approximately 1,800 trees and shrubs were planted at sites throughout the county. The Fairfax County Park Authority, Fairfax ReLeaf and the

Virginia Department of Forestry conducted additional stream buffer restorations. FCPA planted 5.6 acres of county parkland with over 1,500 trees and shrubs.

b. Difficult Run Stream Valley Park

DPWES worked with FCPA to stabilize several hundred feet along two sections of Difficult Run near Georgetown Pike. The project involved a combination of structural and bioengineering techniques.

c. Huntley Meadows Park - Barnyard Run

In June 2006, the Fairfax County Park Authority and DPWES completed a stream stabilization and stormwater control improvement project on Barnyard Run above Huntley Meadows Park. The project involved creating a number of step pools in the stream to reduce energy and erosive force and stabilization of several hundred feet of stream bank using bioengineering techniques and native plant seedlings.

d. Reston

In 2006, Reston Association worked with Northern Virginia Stream Restoration, L.C., to establish the Reston stream mitigation bank. The restoration bank was approved in March 2006. Aerial photography of watersheds and surveying/tagging of thousands of trees in the stream valleys was conducted as part of establishing the groundwork for future restoration projects. The project will implement the recommended stream restoration projects outlined in the Reston Watershed Management Plan. A team of regulatory agencies, including the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish & Wildlife Service and the Virginia Department of Environmental Quality, will oversee the progress of the bank.

e. Little Pimmit Run

The Fairfax County Park Authority partnered with NVSWCD and several private property owners to restore 300 linear feet of Little Pimmit Run. Project features included j-hook weirs and large imbricated rock walls to direct flow and protect stream banks from high storm flows from the surrounding intensely developed watershed.

3. Support Programs

a. Northern Virginia Soil and Water Conservation District

The Northern Virginia Soil and Water Conservation District is a political subdivision of the commonwealth of Virginia that has the same boundaries as Fairfax County. The district's goal is to promote clean streams and protected natural resources. NVSWCD works to lessen the impacts of urban/suburban

activities on land and water resources in Fairfax County by working with government agencies, industry and the general public and providing technical assistance and outreach programs.

NVSWCD provides information, educational programs, volunteer opportunities and newsletters to residents on many aspects of water quality, erosion and drainage, nonpoint source pollution and stream health. NVSWCD reviews and provides comments to the county's Department of Planning and Zoning on rezoning and special exception applications, with particular attention to the properties of soils, the potential for erosion, the impact on drainage, stormwater management and the surrounding land uses and environment. The District has partnered with many groups to implement several stream restoration and LID projects.

b. Virginia Department of Forestry

The Virginia Department of Forestry helps protect water quality and forest resources in Fairfax County. In 2006, VDOF partnered with a number of organizations and volunteers including the Potomac Conservancy, FCPA, Earth Sangha, Fairfax ReLeaf, the Chesapeake Bay Foundation, eagle scouts and students to plant approximately 5,500 seedlings along 3,020 linear feet of streams throughout Fairfax County.

VDOF, FCPA and DPWES are partnering on a stream buffer restoration project that will replenish areas along streams with deficient riparian vegetation. Areas will be determined based on data from the Stream Physical Assessment Study, which identified deficient buffers along over 800 miles of streams.

E. STORMWATER MANAGEMENT, ENFORCEMENT AND INSPECTIONS

1. NPDES Municipal Separate Storm Sewer System Permit

Fairfax County's National Pollutant Discharge Elimination System) Municipal Separate Storm Sewer System permit (known as the "MS4 permit") requires the county to prevent the discharge of pollutants such as oil, fertilizer, pet waste and trash from the stormwater management system into waterways to the maximum extent practicable. The permit also prohibits non-stormwater discharges into the storm drain system, such as from sanitary sewer connections or illegal dumping. It also requires storm event monitoring and assessment of the effectiveness of stormwater controls being used in the county.

The Stormwater Planning Division and the Maintenance and Stormwater Management Division manage a comprehensive stormwater management program, which includes comprehensive watershed management planning, long term biological monitoring, infrastructure mapping, inspections and maintenance, retrofitting developed areas with

water quality control facilities and public outreach and education. Inspections of privately owned stormwater management facilities are conducted on a regular basis (every five years). Water quality is monitored at selected storm sewer outfalls four times per year (seasonally). Outfalls are monitored during dry weather to determine the presence of illicit discharges.

The Virginia Department of Conservation and Recreation administers the MS4 permit as part of the Virginia Stormwater Management Program Permit. DCR is currently in the process of updating VPDES permits. The county's current MS4 permit expired in January 2007; however, the county is operating under an administrative extension while the county and state work on the next permit. In July 2006, the county submitted its proposed NDPES permit for 2007-2012 to DCR. County staff members have been working with DCR and other municipalities on the development of the new permit requirements.

Fairfax County MS4 reports can be viewed on-line at:
www.fairfaxcounty.gov/dpwes/stormwater/ms4permit.htm.

2. Regional Stormwater Management Program

Since the early 1980s, the county's Public Facilities Manual has included a provision that encourages the concept of regional stormwater management. As opportunities arose, major developers and county staff pursued regional stormwater management primarily through the development process. A plan identifying the most appropriate locations for regional facilities was needed to improve this process.

The Regional Pond Subcommittee, an ad hoc subcommittee of the Fairfax County Environmental Coordinating Committee, reviewed the county's stormwater management plan and developed recommendations. The Board of Supervisors tasked the subcommittee in January 2002 to examine the role of regional ponds as well as other alternative types of stormwater controls as watershed management tools. The report, which identified 61 recommendations to improve Fairfax County's stormwater management program and to clarify the role of regional ponds, was submitted to and accepted by the Board of Supervisors. The Regional Stormwater Management Plan is being replaced as countywide watershed management plans are being developed.

3. Stormwater Management Facilities and Infrastructure

Fairfax County maintains more than 1,200 stormwater management facilities, 1,400 miles of pipe and 45,000 drainage structures designed to protect the county's streams. The county completed over 27 improvement and retrofit projects in 2006. There are over 2,200 private stormwater facilities in the county. The county inspected all county facilities and approximately 20 percent, or 457, of the privately maintained facilities in 2006. The county's inventory of stormwater management facilities and infrastructure is being tracked through the use of the county's GIS databases. The county is working on

Infrastructure Reinvestment Infrastructure Program that includes digitizing the storm sewer inventory.

The 2006 Fairfax County Stormwater Status Report provides updated information on the number and types of public and private stormwater management facilities in the county as well as detailed information about the types of projects being undertaken to improve and protect water quality.

4. Low Impact Development Techniques

Environmentally sensitive site deign and low impact development practices serve to minimize impervious cover and replicate natural hydrologic conditions. The county is recommending and encouraging that "Better Site Design " development techniques and LID practices be used to the full extent allowed by the PFM.

Six low impact development practices (bioretention basins and filters, vegetated swales, tree box filters, vegetated roofs, permeable paving and reforestation) were developed for inclusion in the Public Facility Manual in 2006. In 2007, the Board of Supervisors adopted the amendments. The county is continuing its work with the Engineering Surveyors Institute, Northern Virginia Regional Commission and other local jurisdictions on developing a design and construction standards manual for LID applications. The manual will be recommended for adoption into the county's PFM. The county contributed to the design and implementation of ten LID projects in 2006. The county will soon be implementing a number of LID demonstration projects including several vegetated roofs.

With the addition of these important techniques comes the challenge of what will be a significant increase of small stormwater management facilities that will need to be inspected and maintained.

5. Erosion and Sediment Control

DPWES continues to make improvements to the county's erosion and sediment control program, resulting in a greater emphasis and a higher quality of inspection services. DPWES developed a quality assurance program and trained field specialists on how to handle erosion and sediment control violations. DPWES also developed a prioritized inspection program, in accordance with guidelines established by the Virginia Department of Conservation and Recreation, that will consider slope, soil type, proximity to streams and extents of buffer areas to determine an overall rating for any given site. In June 2006 the Virginia Department of Conservation and Recreation accepted this program as being "fully consistent with the requirements of the Virginia Erosion and Sediment Control Law and Regulations."

Also in 2006, DPWES and the Engineers and Surveyors Institute conducted a class and workshop on constructability issues. In addition, in February 2006, a Letter to Industry was issued to announce the addition of two amendments to the PFM. The first clarified

the requirements for drainage divides; the second clarified the adequate outfall requirements.

In 2006, 886 E&S plans were submitted and approved for projects that would disturb one acre or more of land. Land Development Services staff conducted 38,052 Erosion and Sediment control inspections, totaling over 3,170 inspections per month on average. Approximately 45 percent of these projects consisted of bonded site plans and subdivision plans. The remaining 55 percent consisted of individual residential grading plans and minor site plans. In 2006, the County issued 385 violations.

6. Illicit Discharges

In 2006, the Hazardous Materials and Investigative Services Section of the Fairfax County Fire and Rescue Department responded to 395 complaints involving hazardous materials; 347 involved reported spills, leaks or releases.

F. WASTEWATER TREATMENT

Wastewater is primarily treated two ways in Fairfax County. In most cases it is collected from homes and commercial sites and carried through the sanitary sewer pipe system to large treatment facilities that release the treated waters into local waterways. For a small percentage of Fairfax County residents, wastewater is treated on-site via septic systems where the water infiltrates into ground and ultimately reaches groundwater.

1. Treatment Facilities

a. Upper Occoquan Sewage Authority

The following information has been provided by UOSA:

UOSA operates an advanced water reclamation facility in Centerville, Virginia and serves the western portions of Fairfax and Prince William counties, as well as the cities of Manassas and Manassas Park. The water reclamation plant includes primary-secondary treatment followed by advanced waste treatment processes: chemical clarification, two-stage recarbonation with intermediate settling, multimedia filtration, granular activated carbon adsorption, chlorination for disinfection and dechlorination. The plant's rated capacity is 54 million gallons a day.

UOSA operates under a Virginia Pollutant Discharge Elimination System Permit, which is issued by the VA Department of Environmental Quality. The permit limits and 2006 plant performance are listed in Table IV-1.

Table IV-1. UOSA Permit Requirements and 2006 Performance		
Parameter	**Limit**	**Performance**
Flow	54 mgd	29.6 mgd
Fecal Coliform	<2 / 100 mg/l	<1.1 / 100 mg/l
Chemical oxygen demand	10.0 mg/l	<5.0 mg/l
Turbidity	0.5 NTU	<0.1 NTU
Total Suspended Solids	1.0 mg/l	<0.1 mg/l
Total Phosphorus	0.1 mg/l	<0.1 mg/l
Surfactants	0.1 mg/l	0.010 mg/l
Total Kjeldahl Nitrogen	1.0 mg/l	0.3 mg/l
Dissolved Oxygen	>5.0 mg/l	8.1
Disinfection Minimum Chlorine Residual	>0.6 mg/l	0.8 mg/l
Dechlorination Chlorine Residual (mg/l)	Non detect	Non detect

Source: Upper Occoquan Sewage Authority

The influent highest rolling 30-day flow was observed during the 30-day rolling period ending on July 2, 2006 at 37.6 mgd.

UOSA produces and treats two types of residuals: biosolids from conventional treatment and lime solids from chemical treatment. UOSA produces exceptional quality biosolids utilizing a dryer-pelletizer process. These biosolids have commercial potential in the horticultural and agricultural markets. As a back up to the exceptional quality biosolids process, UOSA produces Class B biosolids through a combination of digestion and dewatering or digestion and dewatering followed by lime stabilization. Thickened lime residuals are gravity thickened and dewatered on recessed chamber filter presses. All lime solids are disposed of on site in a permitted industrial landfill.

b. Noman M. Cole Jr. Pollution Control Plant

The NMCPCP, located in Lorton, is a 67 million gallon per day advanced wastewater treatment facility that incorporates preliminary, primary, secondary and tertiary treatment processes to remove pollutants from wastewater. The original plant, which began operation in 1970 at a treatment capacity of 18 million gallons a day, has undergone three capacity and process upgrades to meet more stringent water quality standards. After treatment, the wastewater is discharged into Pohick Creek, a tributary of Gunston Cove and the Potomac River. The plant operates under a VPDES permit. The plant is required to meet effluent discharge quality limits established by the Virginia Department of Environmental Quality. Table IV-2 presents the facility's performance and current effluent monthly limitations.

Table IV-2 NMCPCP Permit Requirements and 2006 Performance Averages		
Parameter	**Limit**	**Performance**
Flow	67 mgd	42.0 mgd
$CBOD_5$	5 mg/l	< 2 mg/l
Suspended Solids	6 mg/l	1.0 mg/l
Total Phosphorus	0.18 mg/l	0.09 mg/l
Chlorine Residual	0.008 mg/l	< 0.008 mg/l
Dissolved Oxygen	6.0 mg/l (minimum)	9.0 mg/l
pH	6.0-9.0 (range)	6.9
E. coli Bacteria	126/100mls*	< 1/100mls*
Ammonia Nitrogen	1.0 – 2.2 mg/l (seasonal)	< 0.12 mg/l
Total Nitrogen	No Limit	< 5.2 mg/l

*Geometric mean Source: Department of Public Works and Environmental Services

The last major construction was completed in July 2005. This project included process upgrades to remove ammonia to less than one mg/l and total nitrogen to less than eight mg/l in order to meet Virginia Water Quality Standards and the Chesapeake Bay Program goals for total nitrogen. Also included in the project were: flow equalization tanks; a new/upgraded laboratory for water quality testing; upgraded odor control systems; new instrumentation and control systems; and a new septage receiving facility.

In 2006, 57,079 wet tons of sludge were generated and incinerated. Inert ash from the process was disposed of in a monofill at the county's I-95 campus.

In 2006, the Virginia Department of Environmental Quality issued a new general permit for nutrient discharge limits for sewage treatment facilities in Virginia's portion of the Chesapeake Bay watershed. These proposed changes will further limit nutrient discharges from the NMCPCP and require substantial modifications by 2010. Design and construction f the new modifications have begun.

2. Septic System Permitting and Repairs

Approximately 25,000 homes and business are served by septic tank systems in Fairfax County. The county's Health Department reported that, in fiscal year 2007, 162 new sewage disposal permits were issued for single family residences. There were 159 new sewage disposal systems installed, 51.6 percent were alternative type systems and 48.4 percent were conventional systems. Approximately 636 sewage disposal system repair permits were issued (repairs ranged from total replacement of the system to minor repairs such as broken piping or pump replacement). There were 4,079 septic tank pumps outs.

Sustainability of existing onsite sewage disposal systems and areas of marginal or highly variable soil remain concerns for future failing septic systems. Areas of the county with marginal or highly variable soils that were once deemed unbuildable in the past are now being considered for development utilizing alternative onsite sewage disposal technology. Alternative systems are also becoming the norm for developers who desire to maximize lot yield from properties. Alternative systems require more aggressive maintenance on a regular schedule for the systems to function properly. Some require maintenance contracts as part of the permitting process. Homeowners are not typically aware of their responsibilities for maintaining these systems. Education is essential for ensuring that maintenance is conducted to prevent system failure.

The Health Department is currently working with a private contractor to complete a feasibility study for the formation of a management entity to ensure that proper and required maintenance are conducted on private on-site sewage disposal systems.

3. Sanitary Sewer Maintenance and Repair

The Wastewater Collection Division within the Department of Public Works and Environmental Services manages the county's infiltration abatement program. Closed circuit television inspection is used to inspect trunk sewer mains to identify defective lines in need of repair. In 2006, 246 miles of old sewer lines and 22 miles of new sewer lines were inspected. Approximately 75,000 feet of sanitary sewer lines were rehabilitated. Over the past nine years, 233 miles of sewer lines have been repaired and 30 dig-up and 123 trenchless point repairs were completed.

G. DRINKING WATER

The county's water supply comes from the Potomac River, the Occoquan Reservoir, Goose Creek, community wells and private wells. Fairfax Water provides drinking water to most Fairfax County residents. Fairfax Water also provides drinking water to the Prince William County Service Authority, Loudoun County Sanitation Authority, Virginia America Water Company (City of Alexandria and Dale City), Town of Herndon, Fort Belvoir and Dulles Airport. However the City of Fairfax receives its water from the Goose Creek Reservoir in Loudoun County, and the City of Falls Church buys its drinking water from the Washington Aqueduct's Dalecarlia Plant on the Potomac River.

With the exception of some wells, water must be treated prior to use. Fairfax Water provided 57.349 billion gallons of drinking water in 2006.

Federal regulations require water suppliers to provide annual reports on the quality of the drinking water to their customers through the Consumer Confidence Report Rule. The 2006 Water Quality Report is available for review on the Fairfax Water Web site at www.fairfaxwater.org.

Table IV-3 Fairfax Water -Water Supply Sources, 2006	
Sources	Gallons (in billions)
Occoquan Reservoir (Lorton/Occoquan)	25.918
Potomac (Corbalis)	31.295
Wells	0.000
Purchased	0.023
Untreated	0.113
TOTAL	57.349

Source: Fairfax Water

1. Wells

The Fairfax County Health Department has developed and maintains an extensive data base and GIS layer of all water well systems installed in the county. The Health Department permits and inspects all new well construction, existing well repairs, and well abandonments. In FY 2006 there were 96 new well approvals, 25 well repairs, and 467 total well samples taken.

The Virginia State Health Department Office of Drinking Water regulates 78 public well water supplies in Fairfax County. The operators of these systems are required to conduct quarterly water sampling and analysis.

a. Fairfax Water and Public Wells

Fairfax Water no longer operates public wells. All former well systems have been permanently removed.

b. Private Wells

There are approximately 12,000 single family residences and businesses that are served by individual well water supplies in Fairfax County. In 2006, 104 New Well Permits were issued for single family residences.

2. Source Water Assessments

The 1996 Amendments to the Safe Drinking Water Act provided for source water assessment and protection programs designed to prevent contamination to drinking water. Under SDWA, states are required to develop comprehensive Source Water Assessment Programs that identify areas that supply public tap water, inventory contaminants and assess water system susceptibility to contamination. Fairfax Water

has completed an inventory of potential sources of contamination and a survey of land use activities within the Potomac and Occoquan Watersheds.

Fairfax Water's Source Water Assessment is available on-line at: www.fairfaxwater.org.

3. Treatment Facilities

a. Occoquan Water Treatment Plant (Griffith WTP)

The Griffith plant is currently treating 120 million gallons per day (mgd). The plant is designed for an ultimate capacity of 160 mgd. In addition to flocculation and sedimentation, the Griffith Water Treatment Plant includes advanced treatment processes of ozone disinfection and biologically active, deep bed, granular activated carbon filtration.

b. Potomac Water Treatment Plant (Corbalis WTP)

The Corbalis plant, located near Herndon, is currently treating up to 150 mgd taken from either an onshore or offshore intake on the Potomac River. A third 75 mgd phase, which will bring the plant capacity up to 225 mgd, is currently under construction and scheduled to be in service in 2008. The plant is designed for an ultimate capacity of 300 mgd. The plant uses ozone as a primary disinfectant, flocculation-sedimentation, biologically active filters with carbon caps and chloramine final disinfection.

c. Water Quality Monitoring at Corbalis and Griffith Plants

Trihalomethanes are by-products of chlorination water treatment and are suspected carcinogens at elevated levels. The 2006 distribution system averages continue to be below the Federally mandated Maximum Contaminant Levels for total trihalomethanes. In addition to the TTHM, haloacetic acid levels, another by-product of chlorination, continue to be below the required MCL. The presence of chlorine in drinking water supplies remained below the required Maximum Residual Disinfectant Level. Fairfax Water also tests for the following regulated elements: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, manganese, magnesium, mercury, nickel, potassium, selenium, silver, sodium, thallium and zinc. The levels of these metals in 2006 continued to be below their MCLs. The concentration levels for unregulated metals were within the expected range. Test results are available on-line at: http://www.fairfaxwater.org.

4. Tap Water Monitoring

In 2006 Fairfax Water monitored 3,306 taps for coliform bacteria. The monthly monitoring results were within EPA required limits. Fairfax Water also monitored

surface source water and finished drinking water for 42 volatile organic compounds and 39 synthetic organic compounds. No VOCs were detected in source waters. In finished waters, TTHMs (a subset of VOCs) were detected. Specific information on these programs can be found at: www.fairfaxwater.org.

5. Regional Cooperative Water Supply Agreements

In order to protect the Potomac River ecosystem during low flow periods, the three major water utilities in the Metropolitan Washington area developed water allocation agreements for water use during low flow periods. Two upstream dams, Jennings-Randolph on the Potomac River and the Savage River Dam, along with Seneca Lake in Montgomery County, Maryland, are storage facilities for drinking water supplies during low flow periods. While the Potomac River has flows that average above 7,000 million gallons a day, the river has often reached flows well below that, usually in late summer and early fall. The lowest recorded flow in this region was 388 mgd at Little Falls in September during the drought of 1966. This is an adjusted figure that does include the withdrawal allocation of 290 mgd (e.g., with the adjustment, the flow would be 98 mgd). In 1981, the three major metropolitan water utilities, including Fairfax Water, signed the Low Flow Allocation Agreement, which creates a protocol for allocation of water from the Potomac during periods of low water. The current environmental flow recommendations are 300 mgd downstream of Great Falls and 100 mgd downstream of Little Falls. In 2002, the Maryland Department of Natural Resources revisited this issue of the flow level necessary to support aquatic habitat in the Potomac River and was unable to replicate the methodology used to create the present low flow requirements in the agreement. Droughts that occurred in 1999 and 2002 called attention to the concern that these flows, derived by the 1981 study (which was conducted during a period without extreme low flows), needed to be revisited in light of new scientific methods and low-flow information. During the drought of 2002, the Maryland Department of Natural Resource's Power Plant Siting Program assembled teams of biologists from its staff and Versar, Inc, with assistance from Montgomery County, Maryland and the Interstate Commission on the Potomac River Basin, which performed habitat assessments during that year's low flow conditions.

On April 8, 2003, the Maryland Power Plant Research Program and the Interstate Commission on the Potomac River Basin sponsored a one-day workshop with a panel of nationally recognized experts on habitat assessment to investigate and develop methods to evaluate the environmental flow-by requirements. Their conclusion of the present low-flow agreement is that: "Existing biological data and understanding are inadequate to support a specific, quantitative environmental flow-by." At this workshop, members of the special panel collectively considered and debated the various methodologies applicable to the Potomac River to address the flow-by issue. The final product of the workshop is a set of recommendations for 1) the best method or approach, given current financial resource limitations, to address the Potomac Flow-by Study objectives and the level of confidence associated with their recommendations and 2) an alternative long-term method or approach which could better accomplish

those objectives, yet might exceed current resources or available data, and recommended guidelines for achieving the objectives in a longer time-frame.

In September 2003, the Maryland Department of Natural Resource's Power Plant Siting Program issued a report entitled Habitat Assessment of the Potomac River From Little Falls to Seneca Pool (Final Document #PPAD-03-1), which provided substantial background information describing the history of current low-flow requirements, a review of the studies conducted to support those requirements and a report on habitat assessment conducted during low-flow conditions in 2002. The assessment included development of a habitat map, a field survey of habitat types and measurements of hydraulic and water quality conditions, spanning the period of July through October 2002 when flows were as low as 151 million gallons per day at the gage at Little Falls Dam.

In November 2004, ICPRB convened an update meeting to discuss recent developments in USGS mussel studies and further defining desired hydrological regimes. The next step will be a workshop with regional and national aquatic biologists to develop targeted species and guilds for re-evaluating ranges of tolerance during low-flow events in the study area.

Full reports on these activities can be viewed at:
www.esm.versar.com/pprp/potomac/default.htm.

In December 2005, Fairfax Water adopted a revision to the Occoquan Reservoir Shoreline Easement Policy, which places limits on what may be done within the utility's easement surrounding the reservoir. The policy prohibits construction of any structures other than piers and floats. Removal of any vegetation, storage of fuels or chemicals, application of pesticides and placement of debris are also prohibited in this area. The policy is intended to protect the reservoir's riparian buffer.

The State Water Control Board's Water Supply Planning Regulation (9 VAC 25-780) requires all cities and counties in the commonwealth to submit water supply plans to the Virginia Department of Environmental Quality. Each water supply plan must include a description of existing water resources and water use, projected demands, a description of water management actions/conservation measures, segment of need for future supplies and alternative analysis and local government resolution approving the plan. Fairfax County is participating in a Regional Water Supply Plan, which is required to be submitted to DEQ by November 2011.

a. Interstate Commission on the Potomac River Basin Cooperative Water Supply Operations

The ICPRB plays several important roles in providing for the region's current and future water supply needs. The Cooperative Water Supply Operations Section facilitates the agreement among the three major water utilities (including Fairfax Water) that requires water suppliers to coordinate resources during times of low

flows in the Potomac River. The Water Resources Section also provides technical water resources management assistance to the jurisdictions throughout the basin. Flow in the Potomac River was more than adequate to meet drinking water withdrawal needs by the region's major utilities in 2005. No releases from upstream reservoirs to augment water supplies were needed. The ICPRB annually coordinates a weeklong drought management exercise that simulates water management operations and decision making under drought conditions for the Metropolitan Washington area. Annual simulation allows for renewal of coordination procedures with the water suppliers and other agencies, opportunities for public education and outreach and review and improvement of operational tools and procedures.

Information on water supply status, recent streamflow, reservoir storage, water supply outlooks and precipitation maps can be found on-line at: www.potomacriver.org/water_supply/status.htm.

The 2006 study is available on-line at:
www.potomacriver.org/water_supply/coop-pubs.htm.

b. Metropolitan Washington Area Council of Governments Water Supply and Drought Awareness Plan

In response to the droughts of 1998 and 1999, COG brought together a task force in May, 2000 to coordinate regional responses during droughts to reduced availability of drinking water supplies. The plan consists of two components: (1) a year-round plan emphasizing wise water use and conservation; and (2) a water supply and drought awareness and response plan. The Interstate Commission on the Potomac River Basin handles the administration of the coordinated drought response for water withdrawals from the Potomac River and during low flows. Additionally, the Cooperative Water Supply Operations Section works with COG and the Drought Coordination Committee to assist in providing accurate and timely information to residents during low-flow conditions.

COG is also looking at issues such as effects of chemical environmental pollutants, specifically endocrine disruptors, in the Potomac River and their impacts on wildlife and humans. COG staff is working with members and other stakeholders to organize workshops over the next year that will address subjects such as endocrine disruptors in the Chesapeake Bay watershed and contaminants of emerging concern in the Potomac and Anacostia Rivers.

H. REGULATIONS AND LAWS

1. The Virginia Chesapeake Bay Preservation Act and Regulations

The Virginia Chesapeake Bay Preservation Act was passed as part of Virginia's commitment to the second Chesapeake Bay Agreement's goals to reduce nonpoint source phosphorus and nitrogen entering the Bay. In November 2004, the Board of Supervisors adopted an amendment to the Comprehensive Plan to ensure it was consistent with the Act and satisfied all requirements. The amendment included revisions to text in the environment section of the Policy Plan as well as the incorporation of a Chesapeake Bay Supplement. In March 2005, the Chesapeake Bay Local Assistance Board determined that the Comprehensive Plan, as amended, is fully consistent with the Chesapeake Bay Preservation Act and Regulations. The Chesapeake Bay Exception Review Committee was formed to hear requests for exceptions to the regulations. The Committee is composed of 11 county citizens appointed by the Board of Supervisors, one member from each magisterial district and two at-large members. As part of the exception review and approval process, public notice and a public hearing is required. In 2006, the committee heard and denied one exception request.

The Chesapeake Bay Program is a cooperative arrangement among three states (Virginia, Pennsylvania and Maryland), the District of Columbia and the federal government (represented by the Environmental Protection Agency) for addressing the protection and restoration of the water quality, habitats and living resources of the Chesapeake Bay and its tributaries. Each state determines how it will meet the various commitments, and the approaches to implementation often vary greatly among states. All streams in Fairfax County are tributaries of the Potomac River, which flows into the Chesapeake Bay.

2. Stormwater Legislation HB 1177

This legislation, signed on April 8, 2004 by Governor Warner, encourages jurisdictions to adopt stormwater management ordinances that use the concept of Low Impact Development to the maximum extent practicable. The bill also transferred regulatory authority of the National Pollutant Discharge Elimination System programs associated with municipal separate storm sewer systems and construction activities from the State Water Control Board to the Soil and Water Conservation Board and transferred oversight of these programs from the Department of Environmental Quality to the Department of Conservation and Recreation. As a result, DCR is responsible for the issuance, denial, revocation, termination and enforcement of NPDES permits for the control of stormwater discharges from municipal separate storm sewer systems and land disturbing activities under the Virginia Stormwater Management Program. The legislation allows the state to transfer the administration of the Erosion and Sedimentation permitting for land disturbing activities to jurisdictions, allows these jurisdictions to charge permitting fees for review and establishes that jurisdictions must transmit 30 percent of these fees to the state.

3. Virginia Stormwater Management Program (Chapter 60)

Changes to the Virginia Stormwater Management Program (Chapter 60) became effective in July 2006. The legislation requires that "*stormwater management programs maintain post-development runoff rate of flow and characteristics that replicate, as nearly as practicable, the existing predevelopment runoff characteristics and site hydrology, or improve upon the contributing share of the existing predevelopment runoff characteristics and site hydrology if stream channel erosion or localized flooding is an existing predevelopment condition. Any land-disturbing activity that provides for stormwater management shall satisfy the conditions of this subsection if the practices are designed to (i) detain the water quality volume and to release it over 48 hours; (ii) detain and release over a 24-hour period the expected rainfall resulting from the one year, 24-hour storm; and (iii) reduce the allowable peak flow rate resulting from the 1.5, 2, and 10-year, 24-hour storms to a level that is less than or equal to the peak flow rate from the site assuming it was in a good forested condition, achieved through multiplication of the forested peak flow rate by a reduction factor that is equal to the runoff volume from the site when it was in a good forested condition divided by the runoff volume from the site in its proposed condition, and shall be exempt from any flow rate capacity and velocity requirements for natural or manmade channels.*"

The legislation is available on-line at: http://www.dcr.virginia.gov/lawregs.shtml

I. PROBLEMS

Fairfax County streams and watersheds continue to be impacted by several problems, including uncontrolled stormwater runoff, erosion, high levels of bacteria and sedimentation. Progress has been made with modifications to the Policy Plan section of the county's Comprehensive Plan; watershed and stream protection, however, need to be maximized in land use planning and site design decisions. The cumulative effects of land use decisions on Fairfax County's streams still need to be effectively considered. Only a few streams, such as Walney Creek in E. C. Lawrence Park, remain undisturbed and excellent examples of healthy streams in Fairfax County.

Stormwater runoff and erosion continue to have the greatest detrimental impacts on Fairfax County streams. **A key requirement for controlling stormwater discharge is to limit post development runoff to that which does not exceed pre-development runoff rates.** Most Fairfax County streams have increased runoff flows that exceed the capacities of their stream channels. This has created an ongoing erosion cycle that includes eroding stream banks, heavy sediment loads and sediment-smothered stream bottoms. Streams can become damaged by the changes brought about by changes in stream hydrology and increased flow during the pre-development clearing phase. The stream sees an overall increased flow due to the increased runoff caused by the clearing. This is not just the increase in peak flow, but the increase in the total volume of the water entering the stream. These increased flows start the cycle of damage, and once the stream is damaged it may

take years or decades for the stream banks to revegetate and restabilize. This has resulted in erosion problems throughout the county that impact trail systems, homeowners' back yards, parks, utilities and infrastructure. Sediment on stream bottoms results in reduced habitat and diversity, which compromises the stream ecology and food chains.

Sediment also compromises the quality of, and increases the expense of, treating surface drinking water supplies. Poor land use planning, inadequate enforcement of erosion and sediment control laws and inadequate stormwater management have significantly contributed to erosion problems and impaired water quality. Prevention of such damage would not only be good for the environment but would also be cost effective. Strict monitoring and enforcement of adequate stormwater management and erosion and sediment controls prior to construction can help prevent damage from erosion and sediment.

In addition to problems created in streams, runoff and erosion have resulted in numerous ponds and lakes having enormous sediment deposition. Stormwater management ponds are designed to protect downstream water quality. Ponds also provide additional amenities including recreation (boating, fishing), aesthetics and wildlife habitat. Depending on the size of the surrounding drainage area, the land uses in that area and the volume of runoff, a pond can fill up with sediment, trash and organic debris in a relatively short period of time. Although dredging is a necessary management component to remove accumulated materials and help protect water quality downstream, private pond owners are experiencing increasing difficulty conducting dredging operations given the significant expense and lack of local, adequate disposal areas.

Much credit needs to be given to Fairfax County for its comprehensive watershed management efforts, including stream restoration and protection, adequate monitoring of water resources and adding new tools such as LID and other innovative practices to its stormwater management program. All of these efforts indicate a significant change in county policy and practice towards the protection and restoration of county streams. However, as long as the rate of stream degradation surpasses stream protection and restoration efforts in Fairfax County, the trend will continue to be a downward one.

J. ACCOMPLISHMENTS

Over the past several years, Fairfax County has demonstrated a clear commitment to improve, restore and protect the county's water resources. 2006 was another significant year for watershed protection in Fairfax County.

- EQAC would like to commend county staff for its timely and effective response to the flooding event that occurred in June 2006.

- The Environment Agenda (Environmental Excellence for Fairfax County: 20-Year Vision) adopted in 2004 continues to have significant impacts on water quality protection and environmental stewardship efforts in the county. In 2006, in response to the Board of

Supervisors' directive for follow up action on the plan, the Environmental Coordinating Committee prepared the FY 2007 Environmental Improvement Plan. The EIP addresses environmental and policy needs and assists county officials in making decisions regarding environmental funding and project planning. The EIP supports environmental initiatives and objectives identified in the Environmental Agenda. The ECC anticipates updating the EIP annually prior to the development of the county budget to provide sufficient time for funding decisions. Additionally, the plan will report on progress made and additional needs.

- In February 2006, the Board of Supervisors adopted amendments to the Public Facilities Manual's provision for adequate drainage. The amendments provide greater protection to receiving streams and areas downstream from areas being developed. The county requires that plans proposing land-disturbing activity must include an analysis of the adequacy of all outfalls from the site during the construction phase in addition to the requirements already in place for the developed site. This analysis helps decrease adverse impacts to outfalls and receiving streams during construction.

- Six low impact development practices (bioretention basins and filters, vegetated swales, tree box filters, vegetated roofs, permeable paving and reforestation) were developed for inclusion in the Public Facility Manual in 2006. In 2007, the Board of Supervisors adopted the amendments.

- The county continued developing and completing watershed management plans for each of the county's 30 watersheds. Watershed management plans have been adopted for Little Hunting Creek. Popes Head Creek, Cub Run/Bull Run, and Difficult Run watersheds. Final drafts have been prepared for Cameron Run and the Middle Potomac (Bull Beck Run, Scott's Run, Dead Run and Turkey Run) watersheds. The remaining plans are to be initiated in 2007. It is anticipated that this countywide watershed planning effort will be completed in 2010. These plans will serve as guidance for all stream restoration and protection efforts in the county. Implementation of these plans is estimated to occur over the next twenty-five years.

- At times, high levels of fecal coliform bacteria, particularly *E. coli* bacteria, occur in various streams throughout the county. The county has begun a public outreach and information campaign to increase awareness about potential health hazards from coming in contact with impaired surface waters needs to be developed.

- In 2006 the Fairfax County Park Authority revised its policy for evaluating all forms of stormwater related projects to include conservation easements, stream restoration, stream buffer enhancement, LID facilities and stormwater ponds.

K. COMMENTS AND ONGOING CONCERNS

1. EQAC commends the Board of Supervisors for its actions the past four years authorizing one penny of the real estate tax to be dedicated to the stormwater management program.

The amount increased from $21 million for FY 2007 to $22.7 million for FY 2008. This additional funding is a significant contribution to implementing the recommendations outlined in the county's comprehensive watershed management plans, including retrofitting and rehabilitating existing and aging stormwater management facilities and infrastructure. EQAC continues to encourage the creation of a sustainable and stable funding source for watershed improvement initiatives.

2. EQAC commends the county for developing and adopting amendments to the Public Facilities Manual's provision for adequate drainage that require analysis of adequacy of outfalls during the construction phase. This is another enforcement tool that will protect streams during the construction phase. However, EQAC cannot over-emphasize the importance and need for increased monitoring of predevelopment stormwater management controls and for enforcement action to ensure inadequate controls are corrected prior to construction and, if necessary, during construction. It is also important that the county hire the appropriate number of staff to handle the estimated inspection workload.

3. EQAC continues to support the full funding and implementation of the comprehensive countywide watershed management program. EQAC strongly endorses the ongoing work of county staff on the watershed planning and public outreach efforts and the comprehensive stream monitoring program. EQAC continues to support continued assessments of watersheds and development of a stream protection and restoration program that has adequate sustainable funding. EQAC continues to stress that equal importance should be devoted to environmental protection, restoration and monitoring as compared to infrastructure improvement and maintenance.

4. EQAC commends the county for its existing stream protection requirements for perennial streams. EQAC further encourages the Board of Supervisors to support future protective measures for intermittent and headwater streams such as the establishment of protective buffers.

5. EQAC is pleased to note the MS4 requirement to develop a long-term watershed monitoring program to verify the effectiveness and adequacy of stormwater management goals and identify areas of water quality improvement or degradation is being implemented. While EQAC understands that a comprehensive countywide program to monitor effectiveness can be cost-prohibitive, data are still needed, as it is still unclear as to which structures and requirements are effective and working well.

6. EQAC continues to encourage Fairfax County (the Board of Supervisors, the Planning Commission, the Board of Zoning Appeals, the Fairfax County Park Authority and various county agencies) to coordinate efforts and develop a protocol for assessing the impacts and cumulative effects of land use considerations and decisions on the county's water resources. EQAC urges these groups to use and disseminate information to protect the county's watersheds. EQAC commends the Board of Supervisors for adopting Residential Development Criteria that include supporting the provision of adequate outfall drainage and innovative water quality measures.

7. As sedimentation of stormwater management ponds from upstream bank erosion continues, the need to dredge facilities becomes more frequent. Facility owners are having difficulty conducting necessary dredging operations given rising expenses and lack of local, adequate disposal areas. EQAC commends the county for establishing an interagency work group to explore options, such as creating spoil disposal/recycling areas in various parts of the county to assist private facility owners and help protect water quality. EQAC is pleased that staff will investigate the pros and cons of dredging, hauling, and disposal options and will present its findings and recommendations to the Board of Supervisors by the end of Fiscal Year 2008.

8. Given the anticipated increase in the number of small individual LID facilities that will be installed throughout the county, EQAC recognizes that the county will have an additional challenge of developing a program to inspect and ensure adequate maintenance of these LID facilities.

L. RECOMMENDATIONS

1. The single most important thing Fairfax County should do is to continue to adequately fund and implement its ongoing water resource monitoring, management, restoration and educational stewardship programs.

2. EQAC is aware that approximately 12,000 single-family residences and businesses are served by individual well water supplies in Fairfax County, and that approximately 30,000 homes and businesses have septic systems that ultimately infiltrate into groundwater. Areas of the county that have been unbuildable in the past now are now being developed and are using alternative onsite sewage disposal technology. These alternative systems are often more difficult to maintain and are therefore subject to failure. The Health Department staff and the American Water/Applied Water Management are developing a report, which will establish a framework for ensuring that proper and timely septic system maintenance is preformed. EQAC supports the efforts and recommends that this report include the requirement that owners with alternative septic systems be required to file a maintenance plan for their systems and provide evidence of compliance.

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