MS4 Program Plan for the Town of Blacksburg
Small MS4 General Permit
(VPDES Permit No. VAR 040019)
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Section 1 - Introduction

The purpose of the document is to serve as the Program Plan for the Town of Blacksburg (300 South Main Street, Blacksburg, Virginia 24060-9003) per 4VAC50-60-1230 to complete the application for reissuance of the General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems in order to continue uninterrupted coverage under the VSMP General Permit.

The Town of Blacksburg’s MS4 Program Plan is part of the information provided to the Department of Conservation and Recreation along with the Registration Statement for Coverage dated April 1, 2013 that includes the documents, policies and procedures necessary to implement all programs recommended and required for compliance with the Federal Clean Water Act and State Regulations.

This document is organized to follow the direction provided in 4VAC50-60-1230 (B) – Registration Statement. Section 2 is intended to provide the required general information per 4VAC50-60-1230, Part B, #1-6, Small MS4 General Permit towards completion of the Registration Statement. Section 3 provides the required information per 4VAC50-60-1230, Part B, #7, the MS4 Program Plan. Section 4 provides the administrative information and certification as per 4VAC50-60-1230, Part B, #9-12.
Section 2 – Watershed Descriptions

Located on the Eastern Continental Divide, the Town of Blacksburg is the headwaters of several watersheds and receives little surface runoff from outside its boundaries. These watersheds are the source of water for several streams located in the Town: Toms Creek, Stroubles Creek, Slate Branch, Wilson Creek, Cedar Creek, Indian Branch, and Dry Run. These stream systems recharge the regions aquifer through karst geography and other pervious areas and discharge at springs and creek beds. Several natural watershed features such as wetlands, ephemeral stream channels, and water impoundments are located throughout the Town.

In this section each watershed will be described with land use, watershed size and water quality condition.

Tom’s Creek Watershed

The Toms Creek Watershed a tributary of Poverty Creek, which flows to the New River. This watershed ultimately drains to the Ohio River and out to the Gulf of Mexico. The land use of this watershed is approximately 30% Residential and 70% Agricultural and Open Space. This combination results in a watershed that is impacted by both urban drainage and agricultural impacts. The Town of Blacksburg has been working for years to improve the existing stream corridor by reducing flooding and protecting the rural areas from degradation due to development. The watershed also has agricultural impacts, livestock entering the stream and bacteria inputs into the water column.
Toms Creek Watershed has an area of 5,357 acres inside the limits of the Town of Blacksburg, our largest watershed. Toms Creek is categorized as a stock-able Trout waters and has recently been listed on the 303(d)/303(b) list as impaired for temperature. A TMDL is scheduled for 2020.

**Stroubles Creek Watershed**

Stroubles Creek is a tributary of the New River, which drains to the Ohio River and the Gulf of Mexico. The Stroubles Creek watershed is approximately 25% Residential, 25% University, 25% Agricultural and 10% Commercial. The commercial area is a small area but it is very concentrated. Stroubles Creek is piped underneath the downtown corridor of Blacksburg and is impacted by many of the commercial businesses that it flows underneath.

Stroubles Creek watershed has an area of 5,415 acres within the limits of the Town of Blacksburg. Slate Branch is a tributary of Stroubles Creek. Stroubles Creek was originally listed as impaired in 1996 with a benthic impairment. A TMDL was completed in 2003 and a TMDL Implementation Plan was authored in 2006. In 2006 Stroubles Creek was also listed as impaired for Escherichia coli. This impairment is scheduled for a TMDL study in 2014.

**Wilson Creek Watershed**

Wilson Creek is a tributary of the North Fork of the Roanoke River. This watershed begins in Blacksburg, Virginia and drains through southern Virginia as the Staunton River and then to northeastern North Carolina to the Albemarle Sound. The Albemarle Sound is a large estuary that drains to the Atlantic Ocean. The Wilson Creek Watershed is 30% residential, 25% commercial, 25% undeveloped and the remaining portion is a mixture of agriculture, industrial and municipal uses.

Wilson Creek watershed has an area of 1,509 acres within the limits of the Town of Blacksburg. Cedar Run is a tributary of Wilson Creek. Wilson Creek was originally listed as impaired in 1998 for exceeding levels of fecal coliform and Escherichia coli. A TMDL was completed for Wilson Creek and the Upper Roanoke River in 2006.

**North Fork of the Roanoke River**

The North Fork of the Roanoke River is a Tributary of the Roanoke River. These waters drain to the Atlantic Ocean through the Albemarle Sound in North Carolina. Several minor tributaries of the North Fork drain the eastern side of Blacksburg. Some of the tributaries are un-named; others have names such as Indian Run. The North Fork watershed is 60% residential, 35% agriculture and undeveloped land and less than 10% is a mixture of commercial, and municipal.

The North Fork has an area of 573 acres within the Town limits, the smallest watershed in Town. The North Fork was originally listed as impaired in 1996 for sediment and 1998 for bacteria and a TMDL for both was completed in 2006. The Roanoke River was originally listed
as impaired for PCB’s in fish tissue in 1996 near the cities of Salem and Roanoke. A TMDL study was completed in 2009 identifying sources in the Blacksburg region.

Section 3 – MS4 Program Plan

In compliance with 4VAC50-60-1230 B.7, this currently implemented program plan is being included with our registration statement and request for re-issuance of the MS4 Permit. The Town of Blacksburg’s MS4 Program plan will continue to comply with Section II of 4VAC50-60-1240, the general permit. Included in this Program Plan is a schedule for updates to the plan to maintain the requirements of the MS4 permit in accordance with Table 1. The MS4 Program Plan includes a list of BMPs that the Town proposes to implement for each stormwater minimum control. Additionally, the Program Plan describes:

1. A list of the existing policies, ordinances, schedules, inspection forms, written procedures, and other documents necessary for best management practice implementation, along with the individual or department or department responsible for implementation or enforcement of the BMP, with a brief description of duties;
2. The objectives and expected results of each BMP in meeting the measurable goals of the stormwater minimum control measures;
3. The implementation schedule including any interim milestones for the implementation of a proposed new best management practice;
4. The method that will be utilized to determine the effectiveness of each best management practice and the MS4 program as a whole.
Control Measure 1: Public Education & Outreach on Stormwater Impacts

Continue to implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of storm water discharges on water bodies and the steps that the public can take to reduce pollutants in storm water runoff. Measures described below are intended to meet public outreach and measurable goals as described 4VAC50-60-1240, Section II B(1) and Section I B(2.C).

Control Measure #1 BMP’s:
A. Public Education and Outreach Plan (PEOP) Development.
B. Storm Drain Marking Program Implementation.
C. Demonstration Projects Enhancement.
E. Grease Program Enforcement.
F. Illicit Discharge Education.
G. Town Stormwater Page Maintenance.

A. Public Education and Outreach Plan (PEOP) Development (effective July 2014)
The Town will develop a public education and outreach plan (PEOP) to coordinate all outreach efforts into one campaign. This plan will identify a minimum of three high-priority issues that affect the Town of Blacksburg. The PEOP will identify population size of the target audience most likely to have an impact on the chosen high-priority issues. A relevant message will be selected and distributed to the selected audience. Opportunities for participation will be provided during the development of the PEOP. Activities will be conducted annually to reach 20% of the target audience. The plan will be evaluated annually for appropriateness of the high-priority issues, audience selection, and effectiveness of message and adjustments will be provided when needed.

B. Storm Drain Marking Program Implementation
The town plans to mark all storm drains within town limits with information regarding the storm drain system. A combination of painted storm drain stencils and the placement of permanent storm drain curb markers will be utilized for this program. Painted storm drain stencils will be used in areas where high traffic could dislodge a permanent curb marker. A permanent high visibility curb marker will be used in more pedestrian areas. An inventory has been created and will be updated with the type of mark for each storm drain and markings installed each of the following years.

C. Demonstration Projects Enhancement
The town will continue utilizing Demonstration Projects on Town property as examples and educational resources for citizens:
- Wong Park Bioretention
- Recreation Building Bioretention (research partnership with Virginia Tech)
- Aquatic Center Bioretention
- Wong Park Urban Forestry Grant (vegetative cover to enhance water quality)
- Blacksburg Motor Company (Bioretention, porous concrete, rain gardens, and rain barrels)
- South End Fire Station LID practices
- Farmer’s Market – redevelopment, reduction of impervious cover (proposed)

D. Household Waste, Business Waste, Universal and Hazardous Waste Education and Minimization
The Town’s Office of Waste Minimization and Recycling employs two full time positions dedicated to addressing municipal solid waste, universal waste, and hazardous waste issues. Staff also addresses employee awareness and community education regarding these topics.
- The Town conducts an annual Household Hazardous Waste Day in conjunction with neighboring jurisdictions so that residential homeowners may properly dispose of their household chemicals. The Hazardous Household Waste (HHW) day is publicized by mailing an informational brochure to each Town refuse collection customer with their water bill, utilizing the Town website, and Blacksburg Alert.
- The Town seeks partnerships to develop public outreach programs. Current partnerships include a community electronics recycling program with the local YMCA thrift shop. In addition, the recycling staff continues to work with the New River Valley Apartment Council to improve apartment recycling.

E. Grease Program Enforcement
The Town “grease program” has established education, inspection, and enforcement guidelines. The Town has identified food service businesses that use or generate grease and/or oils and send educational brochures for best management practices that address the storage, disposal, and spills annually. The Town also sends an annual reminder to the businesses on the potential enforcement actions for violators. The Town maintains a database with grease violators that are utilized in our geographical informational systems to track trends in the system.

F. Illicit Discharge Education
The Town continues to research and update the BMPs, alternative options, and proper disposal techniques for non-storm water discharges. This information will be sent to businesses annually. The Town will continue to send out a survey asking businesses about non-storm water discharges every five years. Responses to the survey will allow the Town to evaluate and prioritize potential hazards and actions to be taken.

G. Town Stormwater Page Maintenance
Stormwater related information is available on the Town’s website for the general public. The site contains links to DEQ, DCR, and EPA web pages related to stormwater pollution, MS4, and TMDLs. The Town’s stormwater management ordinance, MS4 Program plan and annual reports, and Stroubles Creek TMDL Implementation Plan are also posted on the website.

Schedule and Evaluation:
The public education programs listed above will continue to occur during every year of this permit. The Public Education and Outreach Plan (PEOP) Development will be completed by July 1, 2014 and submitted with Year One Annual Report as an update to the Program Plan.
**Responsible Party:**
Director of Engineering
Town Stormwater Engineer
Water Resource Inspector
Neighborhood Services Coordinator
Environmental & Sustainability Manager
Operations Coordinator
Office of Waste Reduction & Recycling

**Necessary Documents:**
Public Education and Outreach Plan
Storm Drain Marking Inventory
Demonstration Project Photos and Description
Educational Brochures Provided at any Outreach Event
Annual Grease Program Mailers

**Measurable Goals:**
Dates and attendance for each public education effort will be counted or estimated where necessary. At waste collection events, the amount of waste collected will also be recorded. The location of stream cleaned will be tracked. Illicit discharge and grease discharge database will be tracked. The target goal is to reach 20% of the intended audience within each outreach target audience.

**Items to be reported in the Annual Report:**
A summary of the measurable goals will be reported in the annual report including dates and attendance for each outreach event. Copies of educational materials will be provided upon request.
Control Measure 2: Public Involvement and Participation

The Town must, at a minimum, comply with state, tribal, and local public notice requirements when implementing a public involvement/participation program. The goal is to increase public notice, involvement and participation in the Town’s stormwater program. Measures described below are intended to meet these goals as described 4VAC50-60-1240, Section II B (2).

Control Measure #2 BMP’s:

A. Conduct stakeholder meetings for watershed management and storm water quality improvement.
B. TMDL Implementation Planning and Participation.
C. Participate and support stream clean-up efforts.
D. Posting of Program Plan and Annual Reports online for general public.
E. Outreach Event Participation.

A. Conduct stakeholder meetings for watershed management and storm water quality improvement.

The Town will attend community meetings and public hearings for new development projects and document citizen concerns with regards to stormwater as it pertains to new development projects. The Town will continue to conduct the Town Comprehensive Plan process and update every 5 years on watershed and storm water goals for the community. In addition, the Town also has periodic meetings with local watershed interest groups that have formed to address neighborhood water quality and flooding issues.

B. TMDL Implementation Planning and Participation

The Town will continue to be an active member of the Stroubles Creek TMDL Implementation Plan Steering Committee. The Roanoke River Implementation Plan Steering Committee has been created and the Town plans to become an active member of this committee as well.

C. Participate in stream clean-up efforts.

The Town will participate and assist local groups for stream clean-up efforts, including assistance with funding, mapping and documentation for determining stream stretches, drainage ways, channels and other areas in need of clean-up and record keeping of these activities.

D. Posting of Program Plan and Annual Reports online for general public.

The Town’s Program plan and Annual Reports serve as comprehensive documentation to educate the community of the measures taken to address stormwater pollution and its impact to water quality in our local waterways. Posting the latest version of the program plan and annual reports allows the public to be educated and aware of the number of measures the Town implements. This knowledge can lead to public involvement and participation in certain aspects of the program.
E. Outreach Event Participation

The town will continue public outreach efforts by sponsoring or participating in at least four of the following annual events. If additional events need to be added, these will be included in revisions to the Program Plan.

- Sustainability Week: This event provides informational sessions, community educational fair, and demonstration events to educate citizens on a wide variety of issues including impacts of household wastes on storm water quality.
- “Steppin’ Out” event: A watershed informational booth is set up to engage the public on local water quality issues.
- Blacksburg Watershed Open-house: The focus of the Open House is to inform citizens about the surrounding watersheds and the impacts of non-point source pollution from household, industrial, and urban storm water runoff.
- Summer Solstice Fest – This is an all day event targeting local families and students for food, crafts, and information of local interest. An information booth is set up to distribute information on local water quality issues and events.
- Greeks Giving Back – This is an annual event where the local sororities and fraternities volunteer to give back to their communities. A selection of water quality events have occurred such as watershed clean-ups and storm drain stenciling projects. An estimated 800 students participate.
- The Big Event engages student volunteers from the local university to provide service efforts throughout Blacksburg. Approximately 6800 students participated.
- Earth Day clean-ups and other local events.
- Gobblerfest is an annual festival occurring on Virginia Tech’s campus to engage students in on-campus and off-campus activities in addition to connecting with the surrounding community. An estimated 22,000 people attended in previous years.
- Citizens Institute is a nine week course where Town staff educates citizens on what the Town has to offer and illustrates ways to get involved with the community. Each week a different department highlights their duties and involvements. The stormwater staff provides an informational session about the water resources of Blacksburg and local water quality issues.

Schedule and Evaluation:

- The Town will document citizens concerns in regards to new development when these concerns are voiced during a community meeting or public hearing.
- The Town Comprehensive Plan will be updated every five years with annual amendments as needed on storm water issues and watershed management.
- The Town will continue to attend TMDL Implementation Plan meetings when scheduled.
- Stream clean-up efforts will be coordinated and assistance provided at a minimum of one clean-up per year. The Town is working to have every major stream corridor be cleaned at least once during the permit cycle.
- The Town will post the Program Plan on the website after receiving acceptance by DCR, and will post each Annual Report on the website by October 31st of each year.
**Responsible Party:**
Director of Engineering  
Town Stormwater Engineer  
Senior Comprehensive Planner  
Neighborhood Services Coordinator

**Necessary Documents:**
Comprehensive Plan  
TMDL Implementation Plans  
MS4 Program Plan and Annual Reports  
List of Annual Outreach Events

**Measurable Goals**
The dates and comments will be recorded for outreach events, community meetings and public hearings where stormwater concerns are voiced. The dates and attendance of stakeholder meetings will be maintained and either a summary or agenda will be kept. Updates to the Comprehensive Plan will be performed. TMDL Implementation plan measures will continue to be addressed and completed projects will be reported. The stream clean-up events will be attended, attendance recorded and the area will be mapped so that the Town can track the progress. The program plan will be posted to the website by July 1, 2013 or earlier if the Town receives approval from DCR before that date. Annual reports will be posted to the website by October 31st of each permit year.

**Items to be reported in the Annual Report:**
- Dates, attendance and description of each outreach event attended.
- Summary of stakeholder activities, attendance and pertinent community input.
- TMDL Implementation Program progress and updates.
- Dates attendance and location of stream clean-up efforts.
- Summary of updates to website.
Control Measure 3: Illicit Discharge Detection and Elimination

Develop a comprehensive map of the storm drain system, establish and carry out procedures to identify and remove illicit discharges, establish legal authority for enforcement actions, and encourage public education and involvement in eliminating illicit discharges. Measures described below are intended to meet public outreach and measurable goals as described 4VAC50-60-1240, Section II B (3).

Control Measure #3 BMP’s:
A. Develop a storm drain system map.
B. Develop procedures for identifying areas with high potential for introducing illicit discharge to the storm system.
C. Enforce an ordinance prohibiting illegal dumping and non-storm water discharges.
D. Enforce an ordinance prohibiting diverted stream flows in environmentally sensitive areas and encouraging buffering around creeks.
E. Establish a plan to identify and remove illicit discharges by utilizing public involvement, education, and enforcement of illicit discharge ordinance.
F. Estimate Volume of Stormwater discharged and quantity of WLA pollutant.
G. Develop written procedures to detect, identify, and address stormwater discharges including illegal dumping (July 2014)

A. Develop a storm drain system map.
The Town has been working with the Virginia Tech Civil Engineering Department to employ GIS and GPS technology to inventory the complete storm sewer system within the Town, including stormwater management facilities. The goal is to develop the tools to adequately inventory and model the hydrologic and hydraulic conditions associated with the storm sewer system. This information is planned to be used for a variety of applications and modeling efforts. In addition, the Town GIS department will continue to GPS and update new storm water infrastructure and incorporate this information into the overall storm structure database.

B. Develop procedures for identifying areas with high potential for introducing illicit discharge to the storm system.
During the previous permit cycle, the Town contracted Virginia Tech to perform an Illicit Discharge Potential (IDP) assessment and Outfall Reconnaissance Inventory (ORI) using procedures from the departments recommended publication entitled “Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments,” completed on April, 2008. The IDP assessment work included the following:
- Delineation of sub-watersheds and identification of outfalls;
- Compilation of mapping and base data to be used as screening factors;
- Derivation of sub-watershed discharge screening factors using GIS;
- Screening and ranking IDP at the sub-watershed and community level
- Generation of maps to support field investigation
With the identification of outfalls from the IDP, the ORI established data collection and water quality sampling protocol, along with a database for record keeping. In accordance with 4VAC50-60-1240 Section I.B.5, with the Town having less than 250 total outfalls discharging to the identified surface water, the Town must have an Outfall Reconnaissance monitoring that assures a minimum of 15% of outfalls discharging to the surface water for which the WLA has been assigned are monitored annually. A total of approximately 140 MS4 outfalls are identified in the ORI report. At least 1/5th of these outfalls will be screened each year to assure all outfalls are screened within the permit cycle. Future reconnaissance efforts will include an updated field sheets with focus on WLA pollutants.

The Town considers the requirements of 4VAC50-60-1240 Section I.B.5 to be met with:
- The modification to current ORI efforts to assure the required number of outfalls associated with the water body assigned a WLA are included in annual reconnaissance efforts and;
- The expansion of the focus of the presence of sediment during field investigation.

C. Enforce an ordinance prohibiting illegal dumping and illicit discharges.
The Town has established an ordinance to prohibit illicit discharges that was adopted by Town Council in spring of 2008 as part of a Comprehensive Stormwater Ordinance. The Town will track and enforce all known instances of illegal dumping and illicit discharges in a GIS database. The GIS database will be used to detect trends and identify repeat offenders.

D. Enforce an ordinance prohibiting diverted stream flows in environmentally sensitive areas and encouraging buffering around creeks.
The Town of Blacksburg has adopted by Ordinance two zoning overlay districts (“Creek Valley Overlay District”, “Floodplain Overlay District”) and has adopted amendments to the Subdivision Ordinance that protects floodplain areas, streams, and adjacent lands. (Ordinance Numbers 1184, 1215, 1225, 1308, 1310, and 1339.) The Overlay Districts prohibit development in areas detailed in Ordinances.

E. Establish a plan to identify and remove illicit discharges by utilizing public involvement, education, and enforcement of illicit discharge ordinance.
The Town of Blacksburg will utilize the Town website, Town newsletter, mailings to businesses, brochures, and Public Outreach events to publicize the Illicit Discharge Program. This plan will incorporate a comprehensive outreach element, covered in BMP 1-F. The plan will outline how Town employees will receive guidance on detecting illicit discharges and related enforcement actions covered in BMP 6-M. The plan will also detail how illicit discharges will continue to be tracked by the Town Geographical Information System to help detect trends and identify repeat offenders provided in BMP 3-D.
F. Estimate Volume of Stormwater discharged and quantity of WLA pollutant.
The VSMP permit requires the Town to estimate the volume discharged and the amount of WLA pollutant, in units consistent with the associated TMDL, for watersheds assigned a WLA. The TOB currently has the following WLAs associated with a TMDL:
- 211 tons/year sediment to Stroubles Creek
- 102 tons/year sediment to Upper Roanoke River watershed
- 3.15E+09 cfu/year bacteria (E coli) to Wilson Creek

G. Develop written procedures to detect, identify, and address stormwater discharges, including illegal dumping.
The development of this document requires the Town to identify and document written dry weather screening methodologies. A prioritized schedule of field screening activities determined by age of system, land use and other factors will be developed. The minimum amount of field screenings to be completed each year will be outlined. The methodologies to collect information such as last rain, conveyance type, estimated discharge rate and visual observations will be described. A time frame for follow-up investigation will be defined. The method to determine source and eliminate such source will be provided. These procedures will incorporate the current methods to use a database of tracking discharges. The existing outreach methods for publicizing and facilitation of public reporting of illicit discharges will be expanded. This will be completed by July 2014 and will be included with the Year 1 annual report submission.

Schedule and Evaluation:
- Detailed data collection of the complete storm sewer system (including stormwater management facilities) is ongoing and expected to be completed for the entire Town within this permit cycle. Town staff will inventory new storm water infrastructure as needed during all years of this permit.
- The Town will perform, or will have performed, data collection and water quality sampling, as described in the ORI and above as part of the BMP, for a minimum of 15% of all outfalls annually so that all outfalls are sampled during a 5-year cycle. Selection of outfalls inspected annually will assure at least 15% of the outfalls discharging to the WLA water body is included.
- The Town will continue ongoing enforcement of the Stormwater Ordinance, as described above, to its full extent.
- The Town will continue to enforce these Ordinances to protect floodplain areas, streams, and riparian zones during all years of this permit.
- Tracking of illicit discharges with analysis of trends will occur during all years of this permit.
- The Town will utilize yearly updated land use data, watershed area data, and soils data with the Purdue University’s Long Term Hydrologic Impact Assessment (L-THIA) Basic Model to calculate annual discharge and WLA pollutant loadings for the WLAs associated with a TMDL listed above.
**Responsible Party:**
Director of Engineering & GIS Department  
Town Stormwater Engineer  
GIS Coordinator  
Water Resources Inspector  
Zoning Administrator

**Necessary Documents:**
Mapping Results and watershed data (GIS database)  
Outfall Sampling Database  
ORI Field inspection sheets  
Stormwater Ordinance  
Illicit Discharge Database  
Zoning Overlay Districts and related Ordinance sections.  
Educational materials: Brochure, Enforcement letter, Town newsletter, etc.

**Measurable Goals:**
Annually map all new stormwater structures to maintain reliable storm structure data in a GIS database. Maintain an ongoing illicit discharge database, along with summary of actions, research and enforcement performed in all cases. Continue to enforce ordinance sections that prohibit development in protected Zoning Overlay Districts during all years of this permit. Distribute educational materials each year to reach desired audience. Continue to characterize Town properties for potential for discharge of pollutant and take actions necessary to prevent such discharge.

**Items to be reported in the Annual Report:**
- New mapping areas with updates of new stormwater structures and infrastructure from new development.  
- The ORI inspection field sheets.  
- New outfalls added to the database.  
- A report summarizing illicit discharge violations and enforcement actions taken by the Town.  
- Dates and details of information distributed in the prevention of illicit and non-stormwater discharges will be provided.
Control Measure 4: Construction Site Runoff Control

Develop, implement, and enforce a program to reduce pollutants in storm water runoff to the MS4 from construction activities that result in a land disturbance of greater than or equal to five thousand square feet. Additionally, reduction of storm water discharges from construction activity disturbing less than 5000 feet must be included in the program if that construction activity is part of a larger common plan of development or sale that would disturb 5000 square feet or more. Measures described below are intended to meet public outreach and measurable goals as described 4VAC50-60-1240, Section II B (4).

The program must include the development and implementation of, at a minimum:

1. An Ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance with the Erosion and Sediment Control Law, to the extent allowable under state, tribal, or local law;
2. Requirements for construction site operators to implement appropriate erosion and sediment control best management practices;
3. Requirements for construction site operators and owners to secure authorization to discharge stormwater from construction activities under a VSMP permit for construction activities that result in a land disturbance of greater than or equal to one acre (or less than one acre if part of a common plan of development or sale greater than one acre).
4. Procedures for receipt and consideration of information submitted by the public; and
5. Procedures for site inspection and enforcement of control measures.

Operator shall ensure that plan reviewers, inspectors, program administrators and construction site owners and operators obtain the appropriate certifications as required under the Erosion and Sediment Control Law;

The operator shall track regulated land-disturbance activities and submit the following information annually in accordance to Section II (E) (3) of 4VAC50-60

1. Total number of regulated land disturbing activities
2. Total disturbed acreage

Control Measure #4 BMP’s:

A. Erosion and Sediment Control Legal Authority.
B. Respond To Erosion and Sediment Control Complaints.
C. Require construction site operators to control waste.
D. Require acknowledgement from agent (design engineer) or owner when a VSMP permit is needed for a plan under review.
E. E&S Inspection Protocol (July 2014)
F. Pollution Prevention Plan Enforcement Protocol (July 2015)
A. Erosion and Sediment Control Legal Authority.
The Town of Blacksburg relies on its erosion and sediment control program as regulated under the Virginia Erosion and Sediment Control Law (ESCL) and attendant regulations. The Town has more restrictive controls than the ESCL to protect water quality by requiring land disturbers of more than 5,000 square feet to comply with the Town of Blacksburg Erosion and Sediment Control Program. The E&S Program has procedures for plan review, inspection, enforcement, and penalties. A certified Land Disturber is required prior to approval of any E&S plan and public plan reviewers will be certified E&S reviewers.

B. Respond To Erosion and Sediment Control Complaints.
The Town employs a full time Construction Manager and a Site Improvement Construction Inspector. The Construction Manager is the point of contact for E&S complaints and problems.

C. Require construction site operators to control waste.
The Town of Blacksburg Town Code and Adopted Building Code (20-140, and 20-306) require construction sites to control waste. The Building Official is the point of contact for complaints on construction site waste. A trash and debris report will be used to track violations and corrective action.

D. Require acknowledgement from agent (design engineer) or owner when a VSMP permit is needed for a plan under review.
The Town will provide a standard comment as part of site plan review that request the agent (design engineer typically) or owner to acknowledge in writing (comment response letter) when a VSMP permit is needed for the proposed construction and to provide a copy of the permit application, stating that it has been submitted. A link for Compliance Information for the VSMP Permit is also provided on the Town Stormwater web page.

- “The erosion and sediment control permit shall be issued at the conclusion of a preconstruction meeting at which the design professional engineer, the responsible land disturber (RLD), and the general contractor (GC) must be present with the Town Engineer and Town Site inspector. During that meeting, the securities shall be provided to the Town, the Storm Water Pollution Prevention Plan (SWPPP) shall be signed by all parties, the construction schedule and construction inspection fees shall be paid to the town.”
- “This preconstruction meeting is an opportunity for the Town to review with the development team the erosion and sediment control requirements and the SWPPP requirements, immediately prior to the start of construction. In addition, at the preconstruction meeting the sequence of erosion and sediment control measures, and the points at which certifications are required by the professional engineer shall be reviewed.”
- “The Erosion and Sediment Control Permit shall be issued at the preconstruction meeting.”

E. E&S Inspection Protocol (July 2014)
The Town of Blacksburg will document and implement and E&S schedule for inspections for a) initial installation of E&S controls, b) one every two weeks, c) within 48 hours of rain producing...
event and d) upon completion of the project prior to bond release. If an alternative inspection program is implemented as provided for in 4VAC50-30-60 B(2), this shall be implemented in lieu of the above-mentioned schedule. The following will become parts of the E&S Inspection Protocol:

- Documentation that inspections are being conducted by personnel who hold and appropriate certificate of competence.
- A public mechanism for the promotion and receipt of complaints regarding regulated land disturbing activities with follow-up mechanisms.
- The procedures for use of legal authority to require compliance with the approved plan when a discrepancy arises.
- The procedures for use of legal authority to require changes to approved plan when an inspection finds a discrepancy.

This protocol will be completed by July 2014 and will be included with the updated Program Plan submitted with Year 1 Annual Report.

F. Pollution Prevention Plan Enforcement Protocol (July 2015)

The Town of Blacksburg will require the implementation of controls to prevent non-stormwater discharges to the MS4 such as wastewater, concrete washout, fuels and oils or other illicit discharges.

Schedule and Evaluation:
The Town of Blacksburg will implement the program during all years of this permit. The Town will continue to respond to all Erosion and Sediment Control complaints during all years of this permit and take the appropriate actions per the Virginia Erosion and Sediment Control regulations as deemed necessary. The Town will continue to monitor construction sites for waste violations and enforce Town Code as related to these violations during all years of this permit. The Town will request acknowledgement of the need for a VSMP and a copy of the permit application on a continuing basis during plan review process for all years of the permit cycle. The link for information for VSMP compliance will be maintained on the webpage.

Responsible Party:
Erosion and Sediment Control Administrator
Building Official
Town Stormwater Engineer

Necessary Documents:
Land Disturbance Permit
Plan Review Checklist
Site Inspection Checklist
Compliance and Enforcement Policy (Erosion and Sediment Control Ordinance)
Database of E&S violations and corrections
Trash and Debris Form

Measurable Goals:
The Town shall respond to all E&S complaints, continue to use trash and debris form to document number of violations and violators to identify repeat offenders and use appropriate enforcement actions. The Town shall continue to require the verification of VSMP permit compliance during pre-construction meetings.

**Items to be reported in the Annual Report:**
- Total number of disturbed acres.
- Number of plans approved.
- Number of erosion and sediment control complaints and actions taken.
- Trash and debris form results.
Control Measure 5: Post Construction Stormwater Management

Develop, implement and enforce a program to reduce the volume and improve the quality of storm water runoff from development with a land disturbance of greater than or equal to 5000 square feet. Additionally, reduction of storm water discharges from construction activity disturbing less than one acre must be included in the program if that construction activity is part of a larger common plan of development or sale that would disturb 5000 square feet or more. Measures described below are intended to meet public outreach and measurable goals as described 4VAC50-60-1240, Section II B (5).

Control Measure #5 BMP’s:
A. Enforce a storm water ordinance designed to control runoff impacts
B. Implement a storm water maintenance program that requires proper long term operation and maintenance of storm water management facilities and conduct inspections and enforcement measures consistent with Virginia Stormwater Management Act and attendant regulations.
C. Tracking of all known stormwater management facilities.
D. Develop Stormwater Facilities Protocol (July 2014)

A. BMP: Enforce a storm water ordinance designed to control runoff impacts.

The Town of Blacksburg relies on its Stormwater Management Program as regulated under the Virginia Stormwater Management Regulations and attendant regulations. The Storm Water Management Program has procedures for plan review, inspection, enforcement, and penalties. The Town has filled a full time Stormwater Engineer position that is responsible for administering the Storm Water Management Program.

A Stormwater Ordinance which includes water quality and illicit discharge sections was adopted into Town Code by the Town Council in April, 2008. The ordinance exceeds the minimum requirement by applying to sites that disturb greater than or equal to 5,000 square feet, as opposed to the minimum of one acre required. The selection of the threshold was based on being consistent with the Town’s Erosion and Sediment Control regulations.

A revised Stormwater is being drafted to comply with 4VAC50-60 Part II B of the Stormwater Regulations. This will be adopted by Town Council before July 1, 2014. This update will comply with all state regulations. The Town intends to keep its current threshold for stormwater management at 5000 square feet.

B. Implement a storm water maintenance program that requires proper long term operation and maintenance of storm water management facilities and conduct inspections and enforcement measures consistent with Virginia Stormwater Management Act and attendant regulations.
The Stormwater Management ordinance mentioned in the previous section requires a Maintenance Covenant on stormwater management facilities for new development. This is enforced at the plan review stage, and approval of the plan is not granted until a receipt is provided from the Montgomery County Courthouse. A template Covenant is provided on the Town’s Stormwater website. The covenant includes reference to maintenance and inspection requirements as provided with or on the plans. The covenant is signed by the Owner of the facility and reviewed by the Town Attorney and Town Stormwater Engineer prior to recordation.

The Covenant also provides access to the Town for inspection of these new stormwater facilities (those approved post-ordinance). As part of the Stormwater Program described in the Ordinance, the Town will inspect these facilities at least once during a permit cycle. Maintenance forms from these inspections will be maintained in a database. This database will be linked to a GIS database of stormwater facilities.

In addition to facilities with a maintenance covenant, the Town is also inspecting all other known stormwater facilities to assure they are being properly maintained. This is done with the legal authority of the Zoning Ordinance that requires the Owner to maintain stormwater management facilities.

If maintenance is found to be needed, a request to perform maintenance will be sent to the Owner. Upon failure of Owner response, the Town reserves the right to maintain the facility at the Owner’s expense. It is noted that training for stormwater facility inspections and maintenance will be obtained during the first year of the permit cycle.

C. Tracking of all known stormwater management facilities.
The Town is currently working with, and under contract with the Virginia Tech Civil Engineering Department as described above under BMP 3-A. This work includes efforts to compile data for stormwater modeling throughout the Town. As part of these efforts, GPS location of storm infrastructure is collected in the field. This field collection will include collection of data, and the mapped location of all found, and known stormwater facilities. New facilities will be added as constructed for all years of the permit cycle.

D. Develop Stormwater Facilities Protocol (July 2014)
The Town of Blacksburg will develop a stormwater facilities protocol that will include written policies and procedures utilized to ensure that facilities are designed and constructed in accordance with Section IIB 5b. Also included will be inspection procedures and policies for conducting all stormwater facility inspections, public and private. The roles and responsibilities of each of the Town departments, divisions or subdivisions will be defined. In addition the stormwater management database will be enhanced to include a) stormwater facility type, b) Location (lat or long), c) acres treated, d) date brought online, e) 6th order HUC code, f) impaired stream discharge, g) public or private, and h) date of last inspection. This Protocol will be completed by July 2014 and will be submitted with the Year 1 Annual Report.
**Schedule and Evaluation:**
The Town of Blacksburg will provide ongoing enforcement of the stormwater ordinance. The Town has taken the appropriate actions to draft an update to the Ordinance now that more stringent stormwater management regulations have been introduced by the Commonwealth. The Town will continue to provide maintenance for public storm water facilities during all years of this permit. The maintenance component of the stormwater management ordinance will be enforced during plan review. The town will continue to track existing and new stormwater facilities and include them in the database.

**Responsible Party:**
Director of Engineering and GIS  
Town Stormwater Engineer  
Director of Public Works

**Necessary Documents:**
Town of Blacksburg Draft Stormwater Ordinance  
Plan Review Checklist  
Site Inspection Checklist  
Compliance and Enforcement Policy  
Maintenance covenants for proposed stormwater facilities  
Annual inspection forms  
Stormwater database  
Stormwater Facilities Protocol (2014)

**Items to be reported in the Annual Report:**
- A summary of the number of plans approved and the number of stormwater record drawings accepted.  
- A summary of the tasks performed for the maintenance of stormwater facilities and infrastructure.  
- The BMP database.

**Measurable Goals:**
Continue to provide proper maintenance for Town Owned storm water facilities during all years of this permit. Continue to require maintenance covenants on record for all new stormwater management facilities. Continue to maintain an ongoing database that provides maintenance and inspection records for BMPs. Maintain a mapping database that provides information and location of stormwater facilities.
Control Measure 6: Pollution prevention/Good housekeeping

Develop and implement an operation and maintenance program to prevent or reduce pollutant runoff from municipal operations into the storm sewer system. Measures described below are intended to meet public outreach and measurable goals as described 4VAC50-60-1240, Section II B (6).

Control Measure #6 BMP’s:
A. BMP: Maintenance procedure and scheduling for pollutant reduction in roads, parking lots, and storage yards.
B. BMP: Controls for reducing the discharge of pollutants from publicly maintained areas.
C. BMP: Reduce the amount of solid waste from government facilities by encouraging employees to recycle and by implementing source reduction methods.
D. BMP: Reduce the use of hazardous chemicals where practicable and ensure that all chemicals are stored, handled, used, and disposed of properly.
E. BMP: Develop and implement an operation and maintenance program to prevent or reduce the pollutant runoff from municipal operations and train employees on proper procedures to accomplish pollution prevention objectives.
F. MS4 Operator Owned Properties/Facilities Evaluation
G. Regional Solid Waste Authority Hazardous Waste Collection Event (May)

A. Maintenance procedure and scheduling for pollutant reduction in roads, parking lots, and storage yards. The Town of Blacksburg has had an Environmental Management System in place since 2002 as part of its comprehensive Environmental Management Program. The program is designated an Exemplary Environmental Enterprise (E3) with the VDEQ as part of the Virginia Environmental Excellence Program. The Town utilizes its EMS to monitor and measure areas of environmental emphasis. The Environmental Management Program and underlying EMS allow the Town to continue to maintain regulatory compliance, meet new goals, and enhance our commitment to environmentally sound practices. Pollutant reduction programs include seasonal Leaf and Christmas tree pickup, twice yearly brush pickup, twice yearly pick-up of discarded larger items, and street sweeping. Town employees also pick up loose trash, leaves, and tree limbs as properties are maintained. Litter is removed from the Downtown area on a daily basis.

B. Controls for reducing the discharge of pollutants from publicly maintained areas. The Town will continue to evaluate all town operations for ways to reduce pollution through the Environmental Management Program. Pollution prevention activities will include evaluating public facilities for problems to correct, continue upgrades to sanitary sewer lines and manholes to reduce sanitary sewer overflows, recycling, employee training, spill prevention program, watershed management and incorporating LID practices on publicly owned properties.

C. Reduce the amount of solid waste from government facilities by encouraging employees to recycle and by implementing source reduction methods. Town facilities contain a
centralized recycling area. Employees recycle, co-mingled containers, mixed paper, toner cartridges, electronics, and rechargeable/alkaline batteries. Educational materials are displayed at each recycling site. Recycling Assistants from each department help the Waste Reduction and Recycling staff promote the program. The Public Works and Transit garages recycle oil, antifreeze, tires, and metal. The Town also recycles used fluorescent lamps and metal from discarded items. In addition, the Purchasing Division and Technology Department work closely to ensure that all electronic equipment is properly recycled.

The Town is included in the regional Solid Waste Management Plan developed by the Montgomery Regional Solid Waste Authority in conjunction with the member jurisdictions.

D. Reduce the use of hazardous chemicals where practicable and ensure that all chemicals are stored, handled, used, and disposed of properly. The Town Horticulturist will provide annual update training for all employees licensed as Registered Technicians or Certified Applicators through the State of Virginia. The Safety & Emergency Manager is responsible for developing and updating the MSDS Management Program. The Operations Coordinator in the Office of Waste Reduction and Recycling will finalize a Universal Waste Policy and provide employee training on the subject.

E. Develop and implement an operation and maintenance program to prevent or reduce the pollutant runoff from municipal operations and train employees on proper procedures to accomplish pollution prevention objectives. As outlined in sections 6A – 6D, the Town currently evaluates operations for ways to reduce pollution through the Environmental Management Program. As an example, current pollution prevention activities include yearly upgrades to sanitary sewer lines and manholes and lining sewer pipes to reduce sanitary sewer overflows; facility recycling; watershed management; street sweeping; incorporating LID practices on publicly owned properties; and proper application of chemicals in facilities and on Town properties. The Town will create a formal pollution prevention program that will include current pollution prevention activities, activities to be incorporated in future years, and training to accomplish these activities.

F. MS4 Operator Owned Properties/Facilities Evaluation. The VSMP permit requires that within three years of the required date for updating the MS4 Program Plan (January 9, 2010), the Town must evaluate all properties owned or operated by the Town for potential sources of TMDL WLA pollutants of concern. As a result, the Town must perform this evaluation for sediment for all public properties. The evaluation is only required in the Stroubles Creek watershed portion of the Town since this is the only water body within Town with a WLA (see Appendix C for mapping). This measure will help reduce the discharge of sediments into Stroubles Creek and will help the Town lead by example. As part of the site review, the Town shall:

- Collect a total of two samples from a representative outfall for each identified municipal property in accordance with the requirements of the VSMP permit.
- One sample shall be taken during each of the following six-month periods: October through March, and April through September.
• All collected samples shall be grab samples and collected within the first 30 minutes of a runoff producing event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previous measurable (> 0.1 inch rainfall) storm event.

  For properties where there is found to be a discharge of sediment, the Town shall develop and implement a schedule to minimize the discharge in a manner consistent with the approved TMDL.

Schedule and Evaluation: The Town will continue to participate in the Environmental Management Program throughout this permit cycle. Watershed Management is an ongoing workgroup of the Environmental Management Program. The above operational programs will also continue to be a part of the Town’s regular maintenance procedures to reduce pollutants in roads, parking lots, and storage yards. The Town and Blacksburg Transit Garages have SPCC plans in place. Capital improvement projects to reduce sanitary sewer overflows have been approved and for many, construction is complete. The Town will continue to recycle all categories of waste during all years of this permit. The Town will track metal, used oil, oil filters, used antifreeze, waste tires, electronics, and batteries by tonnage to evaluate recycling efforts.

All employees with a Registered Technicians Permit or Certified Applicators License will receive annual training on storing, handling, using, and proper disposal of hazardous chemicals. The Safety & Emergency Manager will conduct “Right to Know” Hazardous Awareness Training for employees and update MSDS sheets as needed. All employees handling universal waste will receive training on the Universal Waste Policy and will receive follow-up training if the policy changes. The Town will formalize a pollution prevention program with current activities in this MS4 cycle and begin adding pollution prevention activities and training in future years. The program will include employee training sessions for current activities in sections 6A – 6D and any future pollution prevention activities.

Responsible Party:
Director of Public Works
Environmental & Sustainability Manager
Town Stormwater Engineer
Town Sewer Engineer
Office of Waste Reduction & Recycling
Safety & Emergency Manager

Necessary Documents:
Town’s Environmental Management Program;
Virginia Environmental Excellence Program (VEEP) Documentation and Annual Report
Public Outreach Materials
SPCC Plans
Hazardous training media, “Applying Pesticides Correctly” published by the Virginia Cooperative Extension Office
MSDS Chemical Sheets
**Measurable Goals:**
Continue to maintain all programs during each year of this permit. Employees that hold either a Virginia Certified Applicator’s License or Registered Technician’s Permit will receive training in accordance with Virginia requirements. The Horticulturist will maintain the yearly training records. The Safety & Emergency Manager will conduct MSDS training as required by Federal regulations and maintain the corresponding training records.

**Items to be reported in the Annual Report:**
- Tons of brush and leaves collected.
- Status of programs, CIP projects and LID practices implemented.
- Tonnages reported to the Montgomery Regional Solid Waste Authority for inclusion in the required annual report.
- Employee training dates for yearly pesticides training.
- Employee training dates for “Right to Know” Hazardous Chemical training.
- Status of EPP Policy research.
Appendix A - Assessment of Ordinances and Legal Authorities, BMPs, Policies, Plans, and Procedures Applicable to TMDL Pollutant of Concern

In accordance with 4VAC50-60-1240 Section I.B.2, the Town must develop a list of current ordinances and legal authorities, BMPs, policies, plans, and procedures applicable to the TMDL pollutant of concern for which a WLA has been assigned (sediment). The Town must then perform an evaluation to identify any weakness or limitations and develop a schedule to implement procedures and strategies to address the weakness and limitations accordingly. As described in parts of this MS4 Program Plan, the Town has already developed ordinances and legal authorities, BMPs, policies, plans, and procedures that the Town feels adequately prevent sediment from entering the stormwater system to the maximum extent practical. These are specifically listed below. Outside of the items listed below, there is concern regarding the large areas developed without stormwater management requirements, or those subject to less rigorous requirements. Retrofit of these areas is intended in the future. However, this will be a challenge considering the need for land in these urbanized areas and appropriate analysis for determining placement. These improvements are intended to be supported by BMP5C (mapping/modeling project) in the future. Retrofit of areas with existing development will focus on reduction of stream-bank erosion.

<table>
<thead>
<tr>
<th>Ordinances, BMPs, Policies, Plans, and Procedures</th>
<th>Responsible Party</th>
<th>Pollutant</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS4 Program Plan BMP 1A</td>
<td>Stormwater Engineer</td>
<td>yes</td>
<td>The Town participates in public outreach efforts; a TMDL component is included in each.</td>
</tr>
<tr>
<td>MS4 Program Plan BMP 2B</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>Recommendations from the stormwater taskforce resulted in improved erosion and sedimentation regulation within the Town for construction projects. The Town now enforces these regulations during plan review and construction.</td>
</tr>
<tr>
<td>MS4 Program Plan BMP 3A</td>
<td>Stormwater Engineer</td>
<td>yes</td>
<td>A Town wide mapping and modeling project will provide the ability to make better informed decisions in regards to the placement of BMPs associated with capital projects and/or a regional stormwater management program.</td>
</tr>
<tr>
<td>MS4 Program Plan BMP 3B</td>
<td>Stormwater Engineer</td>
<td>yes</td>
<td>The Town currently performs data collection at outfalls as part of the Outfall Reconnaissance Inventory. This has been focused on illicit discharges, but this will be modified to assure adequate coverage of surface waters assigned the WLA and to specifically look to identify the WLA pollutant, per Section 1.B.5.</td>
</tr>
<tr>
<td>Ordinances, BMPs, Policies, Plans, and Procedures</td>
<td>Responsible Party</td>
<td>Pollutant</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------</td>
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</tr>
<tr>
<td>MS4 Program Plan BMP 3B - Illicit Discharge Protocol</td>
<td>Stormwater Engineer</td>
<td>yes</td>
<td>The Town has previously completed an Illicit Discharge Protocol which standardizes the illicit discharge protocol and establishes a guideline for scheduling, identifying and eliminating illicit discharges. All illicit discharge scheduling, identification, elimination and enforcement has been in conformance with this protocol.</td>
</tr>
<tr>
<td>MS4 Program Plan BMP 3D</td>
<td>Zoning Administrator</td>
<td>yes</td>
<td>Enforcement of the Floodplain and Creek Valley Overlay districts that prohibits development in sensitive areas can help prevent excessive sediment load near creeks that could be caused from development in these areas (steps slopes, etc.).</td>
</tr>
<tr>
<td>MS4 Program Plan BMP 4A</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>The Town enforces its erosion and sediment control program as regulated under the Virginia Erosion and Sediment Control Law (ESCL) and attendant regulations. The Town has more restrictive controls than the ESCL to protect water quality by requiring land disturbers of more than 5,000 square feet to comply with the Town of Blacksburg Erosion and Sediment Control Program. The E&amp;S Program has procedures for plan review, inspection, enforcement, and penalties.</td>
</tr>
<tr>
<td>Virginia Erosion and Sediment Control Handbook</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>The Town utilizes the VA Erosion &amp; Sediment Control Handbook for design standards and specifications for design and construction of BMPs.</td>
</tr>
<tr>
<td>MS4 Program Plan BMP 4B</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>The Town will continue to respond to all Erosion and Sediment Control complaints during all years of this permit and take the appropriate actions per the Virginia Erosion and Sediment Control regulations as deemed necessary.</td>
</tr>
<tr>
<td>MS4 Program Plan BMP 5A</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>The Town enforces a Stormwater Ordinance that has a water quality component per State regulations. Water quality BMPs are focused on Phosphorus reduction, but consequently also remove sediment from being conveyed downstream. In summary, this ordinance addresses reduction of sediment loads for new development and redevelopment - post-construction.</td>
</tr>
<tr>
<td>Virginia Stormwater Management Handbook</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>The Town utilizes the VA SWM Handbook for design standards and specifications for design and construction of BMPs.</td>
</tr>
<tr>
<td>Plan Review Procedure</td>
<td>Planning and Engineering</td>
<td>yes</td>
<td>The Town follows its Plan Review Procedure to effectively address compliance with the Erosion and Sediment Control Ordinance and the Stormwater Ordinance.</td>
</tr>
<tr>
<td>Ordinances, BMPs, Policies, Plans, and Procedures</td>
<td>Responsible Party</td>
<td>Pollutant Sediment</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
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</tr>
<tr>
<td>MS4 Program Plan BMP 5B</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>As part of the stormwater ordinance, the Town requires maintenance covenants allowing for annual inspection to assure proper maintenance of BMPs. In summary, this ordinance addresses reduction of sediment loads for new development and redevelopment - post-construction.</td>
</tr>
<tr>
<td>MS4 Program Plan BMP 5C</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>The Town is currently working towards town-wide mapping and modeling project that will provide data that can be utilized for a variety of engineering options. Some of these options will allow for analysis of the sub-basins contributing to the TMDL.</td>
</tr>
<tr>
<td>MS4 Program Plan BMP 6A</td>
<td>Environmental &amp; Sustainability Manager; Division of Environmental Planning &amp; Sustainability;</td>
<td>yes</td>
<td>Pollutant reduction programs include seasonal Leaf and Christmas tree pickup seasonally, monthly brush pickup, twice yearly pick-up of discarded larger items, and street sweeping. Town facilities also have weekly loose trash pickups, leaf pickup, and downed tree limbs are picked up immediately.</td>
</tr>
<tr>
<td>Inspection Protocol</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>The inspection protocol provides for consistent inspections so that inadequacies are identifies quickly and consistently within all of our active construction sites.</td>
</tr>
<tr>
<td>Plan Approval Policy and Procedures for Local Approval Process</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>Plan Approval policy and procedures outlines how the Town will review proposed projects and analyze how well they comply with local, state and federal standards.</td>
</tr>
<tr>
<td>Policy for Enforcement</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>The policy for enforcement identifies the process to follow to allow for iterative and increasing enforcement methods to compel compliance as quickly and effectively as possible.</td>
</tr>
<tr>
<td>Long Term Inspection and Maintenance of BMPs</td>
<td>Engineering &amp; GIS</td>
<td>yes</td>
<td>The Long Term Inspection and Maintenance protocol identifies how to methodically inspect and compel maintenance on the privately owned stormwater management facilities. It also identifies the Towns methods for communicating maintenance needs on its publicly owned stormwater facilities.</td>
</tr>
<tr>
<td>Standard Language for Stormwater Maintenance Covenants</td>
<td>Engineering &amp; GIS</td>
<td>Yes</td>
<td>The Stormwater Maintenance Covenant provides for the perpetual maintenance of the stormwater facilities to the identified party to run with the land. Therefore subsequent owners will have knowledge of this responsibility. The covenant also provides for the right of the Town to enter and inspect the facilities to ensure maintenance has occurred.</td>
</tr>
<tr>
<td>Construction Inspection Policy and Procedures for Local Approval Process</td>
<td>Engineering &amp; GIS</td>
<td>Yes</td>
<td>The construction inspection policy and procedures outlines how construction inspections for erosion and sediment control and stormwater management should be handled. This provides for consistent application of our standards across Town and quickly identifies areas for additional correction.</td>
</tr>
</tbody>
</table>
Appendix B - BMPs identified in the TMDL Implementation Plan

In accordance with 4VAC50-60-1240 Section I.B.4, the Town must implement BMPs identified in the TMDL Implementation Plan assigned to the Town. The Town has already been implementing the BMPs assigned in the Upper Stroubles Creek Watershed Implementation Plan, latest revision May 2006. Tables B.1 provide the Measurable Milestones listed in the Implementation Plan timeline that identify the Town of Blacksburg as the responsible party. Table B.2 is an update describing the implementation to date for each measure.

Table B.1 Summary of Measurable Milestones assigned to the Town of Blacksburg in the Upper Stroubles Creek TMDL Implementation Plan.

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Measurable Milestone</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>I. Develop a community educational workshop on water quality awareness and homeowner LID practices</td>
<td>WSC, TOB</td>
</tr>
<tr>
<td></td>
<td>II. Upgrade sanitary sewer line from Prices Fork Road to West Campus Drive</td>
<td>VT, TOB</td>
</tr>
<tr>
<td></td>
<td>III. Plan, install, and monitor demonstration water quality, LID, and other innovative storm water management practices</td>
<td>VT, TOB</td>
</tr>
<tr>
<td></td>
<td>IV. Arrange for external review and evaluation of the E&amp;S Program as implemented in the watershed</td>
<td>VT, TOB</td>
</tr>
<tr>
<td></td>
<td>V. Complete town-wide sewer model and analysis to rank the severity and probability of sewer overflows throughout the TOB sewer system</td>
<td>TOB</td>
</tr>
<tr>
<td></td>
<td>VI. Construct a combined salt storage facility with TOB to prevent runoff</td>
<td>VT, TOB</td>
</tr>
<tr>
<td>2007</td>
<td>I. Present a community educational workshop to homeowners and/or neighborhood associations.</td>
<td>WSC, SCSC, TOB</td>
</tr>
<tr>
<td>2008</td>
<td>I. Conduct a town-wide study to identify capital projects that could address severity and probability of sewer overflows</td>
<td>TOB</td>
</tr>
<tr>
<td>Annual</td>
<td>I. Conduct annual inspections of stormwater outfalls and maintain facilities infrastructure database.</td>
<td>VT, TOB</td>
</tr>
<tr>
<td></td>
<td>II. Inventory area of street sweeping on an annual basis. Clean roadways/parking areas after major storms</td>
<td>VT, TOB</td>
</tr>
<tr>
<td></td>
<td>III. Continue to monitor and maintain storm sewer intakes on an annual basis</td>
<td>VT, TOB</td>
</tr>
<tr>
<td>Ongoing</td>
<td>I. Plan and install demonstration homeowner LID practices</td>
<td>WSC, TOB</td>
</tr>
<tr>
<td></td>
<td>II. Actively promote enrollment of sponsors for the Adopt-A-Stream program in the watershed.</td>
<td>WSC, TOB</td>
</tr>
<tr>
<td></td>
<td>III. Provide clear guidance to Project Managers on Erosion and Sediment Control requirements</td>
<td>VT, TOB</td>
</tr>
<tr>
<td></td>
<td>IV. Retrofit existing facilities with LID practices, where practical.</td>
<td>VT, TOB</td>
</tr>
</tbody>
</table>

WSC = Watershed Coordinator; SCSC = Stroubles Creek Steering Committee; VT = Virginia Tech; TOB = Town of Blacksburg
Table B.2 Summary of actions completed as related to the Measurable Milestones described in Table B.1.

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Year</th>
<th>Actions</th>
<th>Participating Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hired a consultant and formed the LID steering committee to develop <em>Town of Blacksburg Low Impact Development Manual</em> for engineers, designers, and developers working in the area. Cost to TOB was $15,000</td>
<td>TOB, DCR, DEQ, BSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOB public outreach on Urban Watershed Hike and Presentation with citizens in 2006.</td>
<td>TOB, YMCA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOB staff participated in the Regional Planning and Development workshops and presented LID and Green Infrastructure presentations to citizens participating in the workshops.</td>
<td>TOB, PDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Build Your Own Rain Barrel Workshop&quot; - Extension partnered for two workshops for Town people. (April &amp; May 2008)</td>
<td>TOB, CDAC, VT extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Also see Minimum Control Measure 1, BMP A of this Program Plan</td>
<td>TOB</td>
</tr>
<tr>
<td>II.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOB installed Aquatic Center bioretention and Recreation Center bioretention. Performance was evaluated for a time period by BSE. (2007-2008)</td>
<td>BSE, TOB</td>
</tr>
<tr>
<td>III.</td>
<td></td>
<td>TOB constructed Phase I and II of the Wong Park Stormwater Pond Stabilization and Alternative Management Strategies project (2006-2009)</td>
<td>TOB, CDAC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOB constructed a bioretention facility at Wong Park (2009)</td>
<td>TOB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOB included porous pavement, rain-gardens, rain barrels and an infiltration trench on the site redevelopment of the Blacksburg Motor Company (2009)</td>
<td>TOB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Also see Minimum Control Measure 1, BMP A of this Program Plan</td>
<td>TOB</td>
</tr>
<tr>
<td>IV.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Minimum Control Measure 4, BMPs A, B, C and D of this Program Plan</td>
<td>TOB</td>
</tr>
<tr>
<td>V.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOB Phase I Town wide Sanitary Sewer Study ($200,000) that identified sewer overflow and capacity issues throughout the Town</td>
<td>TOB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOB web based Data Warehouse System (tobdata.blacksburg.gov/twm) and calibrated a town wide SewerCAD model that was used to rank the severity of potential overflows that may occur with the ten year rain event. A data warehouse was developed to store historical flow data in the sewer system and track improvements of the collection system from proposed capital projects,</td>
<td>TOB</td>
</tr>
<tr>
<td>VI.</td>
<td>2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I.</td>
<td></td>
<td>See above, 2006 I.</td>
<td>TOB</td>
</tr>
<tr>
<td>Year</td>
<td>No.</td>
<td>Actions</td>
<td>Participating Parties</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>2008</td>
<td>I.</td>
<td>TOB Phase II Town wide Sanitary Sewer Study ($150,000) - Options to Eliminate Overflows and Reduce Surcharges, Fall 2007. Report outlined and prioritized capital projects to address issues identified in the Phase I study.</td>
<td>TOB</td>
</tr>
<tr>
<td></td>
<td>I.</td>
<td>Annual inspections of outfalls - See Minimum Control Measure 3, BMP B ; Facilities infrastructure database - See Minimum Control Measure 3, BMP A (on-going)</td>
<td>TOB</td>
</tr>
<tr>
<td></td>
<td>II.</td>
<td>TOB Public Works does a monthly Town-wide street sweeping program. They break up the streets in quadrants and complete the entire town once a month. They do go out more frequently in the winter months due to the gravel in the streets.</td>
<td>TOB</td>
</tr>
<tr>
<td></td>
<td>III.</td>
<td>TOB Public Works provides on-going maintenance to stormwater related infrastructure. Maintenance includes cleaning grates and drop inlet boxes; repairing curb and gutter, storm drains and drop inlet boxes; cleaning out ditches and curb and gutter and storm drains. A spreadsheet tracking the costs and a description of work performed can be provided upon request.</td>
<td>TOB</td>
</tr>
<tr>
<td>Annual</td>
<td>I.</td>
<td>See Minimum Control Measure 1, BMP A of this Program Plan</td>
<td>TOB</td>
</tr>
<tr>
<td></td>
<td>II.</td>
<td>Comparable stream clean-up program with DEQ funding through neighborhood services – see BMP1A</td>
<td>TOB, VT</td>
</tr>
<tr>
<td>Ongoing</td>
<td>III.</td>
<td>See Minimum Control Measure 4, BMPs A, B, C and D of this Program Plan. Also, recently an amendment to the Town’s ESC Ordinance was adopted that includes additional assurance that proper ESC measures and practices are implemented with land disturbance projects. A preconstruction meeting is required with the Town and then a second meeting once initial ESC measures are installed prior to any other work being done. This will be ongoing and applicable to all land disturbance exceeding 5,000 sq. ft.</td>
<td>TOB</td>
</tr>
<tr>
<td></td>
<td>IV.</td>
<td>TOB has constructed stormwater retrofit project at the Wong Park, recreational and aquatic center. The TOB will continue to look for retrofit opportunities. See Minimum Control Measure 6B of this Program Plan.</td>
<td>TOB</td>
</tr>
</tbody>
</table>

TOB = Town of Blacksburg, CDAC = Community Design Assistance Center; BSE = Biological Systems Engineering at Virginia Tech; DEQ = Department of Environmental Quality; DCR = Department of Conservation and Recreation
Appendix C - Map of Town Owned Properties discharging within the surface water assigned a TMDL WLA
Appendix D: Public Education and Outreach Plan
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Introduction
The Town has developed a public education and outreach plan (PEOP) to coordinate all outreach efforts into one campaign. This plan will identify a minimum of three high-priority issues that affect the Town of Blacksburg. The PEOP will identify population size of the target audience most likely to have an impact on the chosen high-priority issues. A relevant message will be selected and distributed to the selected audience. Opportunities for participation will be provided during the development of the PEOP.

Goals
This program is intended to reach 20% of the defined target audience each year. The plan will be evaluated annually for appropriateness of the high-priority issues, audience selection, and effectiveness of message and adjustments will be provided when needed.
Background of the Town of Blacksburg

Located on the Eastern Continental Divide, the Town of Blacksburg is an incorporated Town located in Montgomery County, Virginia. The Town has a population of 42,620 based upon the 2010 census. This population includes the state university, Virginia Tech, which serves approximately 31,000 students. As more than 70% of the local population, the transitional student life impacts the Town in every way.

The Town is located at the headwaters of several watersheds and receives little surface runoff from outside its boundaries. These watersheds are the source of water for several streams located in the Town: Toms Creek, Stroubles Creek, Slate Branch, Wilson Creek, Cedar Creek, Indian Branch, and Dry Run. These stream systems recharge the regions aquifer through karst geography and other pervious areas and discharge at springs and creek beds. Several natural watershed features such as wetlands, ephemeral stream channels, and small water impoundments are located throughout the Town.

Community Profile

According to the 2010 US Census, the Town of Blacksburg population was 42,620 which was a 7% increase over the last ten years. Of this population, 7% is under the age of 15 years, 19% between 15 and 19 years, 41% between 20 and 24, 8% between 25 and 29, 7% in their 30’s, 10% in their 40’s or 50’s and 7% are 60 or older.

The median income for a household is $22,500 per year, but $51,810 for a family. English is the predominant language spoken in the Town of Blacksburg (96%). Eighty-five percent of the population has a college education, with 70% being graduates from Virginia Tech.

High Priority Water Quality Issues

The Town must identify at least three high-priority water quality issues and provide rationale for the selection of these issues in accordance with the General Permit. The Town believes that oil and grease illicit discharges, sediment and bacteria are the primary high-priority water quality
issues. The criteria used to determine these issues is 1) oil and grease illicit discharges are the most frequent known illicit discharge in recent history, 2) sediment and bacteria are the causes of impairment for major waterways with existing TMDL studies.

**Oil and Grease Illicit Discharges**

Oil and grease illicit discharges have been a re-occurring problem within the Town of Blacksburg. Within 20 square miles there are 31 restaurants, approximately 1.5 for every mile. Many of these are located in the historic district where infrastructure is older and surface water resources are underground. The high turn-over in staffing and transitional nature of the student work-force results in discharges to the system by uninformed staff.

![Restaurant in Downtown Blacksburg](image)

**Bacteria**

Approximately 50% of the land area in Blacksburg is within the drainage area of a watercourse impaired for bacteria. This includes the watersheds of Troubles Creek and the tributaries of the North Fork Roanoke River. Bacteria impairments can be attributed to human fecal matter, domestic and wild animal waste and agricultural practices. To reduce the levels of bacteria, the focus will be on pet waste from dogs. The areas in the Town that are identified as being impaired are overwhelmingly urban, so no outreach is planned to address agricultural industries.

**Sediment**

Similar to bacteria, about 50% of the land area in Blacksburg is inside a watercourse impaired for sediment. These two pollutants are the most predominant inside Blacksburg. Sediment pollution is the result of active construction, denuded open areas, uncontrolled stormwater runoff causing erosion and scouring of stream banks. Because of the age of commercialization in Blacksburg (mid-1960’s) much of the developed land was construction prior to any stormwater management.
Target Audience for High-Priority Water Quality Issue

The Town has chosen oil and grease discharges, bacteria and sediment to be the high-priority water quality issues. To address these pollution impacts within the town, the target audiences are listed below. The approximate size of the audience is illustrated in the chart below. The Town’s goal is to reach at a minimum of 20% of each target audience each year in outreach activities.

<table>
<thead>
<tr>
<th>High-Priority Water Quality Issue</th>
<th>Topic of Concern</th>
<th>Target Audience</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and Grease Illicit Discharges</td>
<td>Proper Disposal of Oil/Grease (restaurants)</td>
<td>Commercial Restaurant Employees</td>
<td>300</td>
</tr>
<tr>
<td>Bacteria</td>
<td>Pet Waste</td>
<td>Young residents (20-24)</td>
<td>17,474</td>
</tr>
<tr>
<td>Sediment</td>
<td>Single Family Construction &amp; Un-stabilized areas</td>
<td>Homeowners &amp; Families</td>
<td>13,162</td>
</tr>
</tbody>
</table>

Messages and Associated Educational Materials

The Town of Blacksburg intends to use every opportunity to develop relevant messages and associated educational and outreach materials. These materials will:

1. Increase the target audience’s knowledge about the steps that can be taken to reduce stormwater pollution;
2. Increase the target audience’s knowledge of hazards associated with illegal discharges and improper disposal of waste, including pertinent legal implications; and
3. Implementing a diverse program with strategies that are targeted towards audiences most likely to have significant stormwater impacts.

Oil and Grease Illicit Discharge Reduction Actions

Printed Materials – A laminated poster that identifies the water quality impacts of grease dumping in addition to the potential enforcement for illicit discharges will be developed and distributed to all restaurants in town.

Direct Engagement - The Town staff will visit restaurants to discuss issues with illegal dumping and educate management on the water quality impacts.

Bacteria Reduction Actions

Printed Materials – A trifold brochure that identifies the water quality impacts of pet waste will be developed and distributed at dog parks, veterinarian clinics, and pet supply stores.

Advertisements – An ad will be placed on the local public transit buses, these busses carry 3.5 million riders in a year. An ad will also be placed in the Collegiate Times, which distributes to 31,000 students and 6400 employees.

Direct Engagement - The trifold will be handed out at outreach events that are predominantly attended by young citizens.
Sediment Reduction Actions

Printed Materials – An informational pamphlet and refrigerator magnet will be developed with contact numbers to call when reporting observed sediment discharges will be distributed at local fairs and community events.

Poster Campaign – The Town will develop a poster campaign to direct interest to the issue of sediment. These posters will be displayed at outreach events where citizens can learn about the issues.

Advertisements – A slide will be created for the new IMAX movie theatre which will target local households and families.

Direct Engagement – Staff will attend outreach events to discuss the impacts that sediment has on our local waterways and encourage families and homeowners to do what they can to improve the situation.

Providing Public Participation during Program Development

The Town of Blacksburg has drafted this document to meet the requirements of the 9VAC890-40, General VPDES Permit for Discharges of Stormwater from Small Municipal Storm Sewer Systems, permit number VAR040019 dated July 1, 2013. Part of this regulatory document is the requirement that the community be involved in the program development. The Town is currently working with the Community Relations Office to determine the best way to incorporate public participation in program development. This document will not be finalized until public participation has been achieved.

Evaluation

On an annual basis, this public outreach and education document will be evaluated for effectiveness, weaknesses and shortcomings. The evaluation will be based upon the following: 1) Was the target audience reached to the extent intended; 2) Are there additional audiences that need to be added as targets in future years; 3) Are there additional way to reach the identified audience; 4) Is there a more effective way to reach the target audience; and 5) Is there evidence of a behavioral change?

A survey will be employed during this permit cycle to gauge feedback from the methods and provide opportunities for new ideas.
Appendix E : Policy and Procedures for Local Approval Process

Effective: JULY 1, 2014

1. Plan received at Engineering and GIS and Planning and Building Office.
2. Upon submittal, the plan review fee ($500) is paid and half (50%) of the local portion of the VSMP permit is paid, if applicable. The Town will not accept payment of the State portion of the VSMP permit fee.
3. Plan is checked for completeness by Town Staff and if deemed incomplete, a letter is provided to the applicant stating the reason for rejection and requirements for plan acceptance within seven (7) business days.
4. If the plan is deemed complete, the Plan Submittal Receipt is completed by Town Staff and applicant.
5. Plan review fees are paid by applicant.
6. Plan review schedule and deadlines are determined. Town Staff’s goal is to review and send a comment letter out within 15 business days of receipt of plans. The deadline for the comment letter follows State Code requirements of 45 days for Erosion and Sediment Control Plans and 60 days for site and subdivision and Stormwater Management Plans.
7. Plan is distributed to Engineering and Planning Staff.
8. Plan is reviewed by Engineering and GIS and Planning Staff using a standard plan review checklist which incorporates the following requirements: planning & zoning, water & sewer, transportation & streets, erosion & sediment control, and stormwater management.
9. Comments are provided and a letter is sent to the applicant and the applicant’s engineer.
10. A post review meeting is set up, if desired, so applicant can review comments with Town Staff.
11. Subsequent plan submittals and reviews for previously disapproved plans will be completed within 45 calendar days of the date of resubmission. An additional review fee is required for the third and subsequent plan reviews.
12. When all the comments are addressed, the applicant is informed and the SWPPP is submitted to the Town for review.
13. Prior to plan approval, the applicant shall submit Public Improvement, Stormwater BMP and landscaping securities if required and a stormwater maintenance agreement must be signed and recorded at the County.
14. The Town will collect registration statement and remaining 50% of the permit fee and submit applicant’s information to the DEQ electronic database for request for VSMP permit coverage.
15. Once permit coverage is notified via email or mail and securities, easements and agreements are submitted and approved by the Town, the mylars are signed and approved by Engineering and Planning Staff.
16. Prior to applicant commencing work, a pre-construction meeting with Engineering and GIS Staff is required. The required attendees at the pre-construction meeting are: the
owner or owner’s representative, the Responsible Land Disturber, the design professional, Town Engineer and Town Construction Inspector.

17. The VSMP coverage letter, erosion and sediment control security, construction inspection fee, and utility testing fees are provided at the pre-construction meeting.

18. The plans and the inspection process are discussed with all parties and a construction schedule established.

19. Land disturbance permit or “VSMP Authority Permit” is issued at the pre-construction meeting.

20. Town construction inspector performs erosion and sediment control, public infrastructure, and stormwater BMP inspections throughout the permit life.

21. Upon completion of construction, a punch list is prepared by the Town and all punch list items addressed by contractor.

22. Public infrastructure as-builts are reviewed and approved by Town Engineer.

23. Stormwater BMP certifications and as-builts are reviewed and approved by Town Stormwater Engineer.

24. Contractor requests a Termination of VSMP permit.

25. The Town submits termination information to DEQ electronic database.

26. Upon approval of termination, all securities are released by Town Engineer.
Appendix F: Construction Inspection Policy and Procedures for Local Approval Process

Updated: January 14, 2014

1. Plan is approved by Engineering and GIS and Planning and Building Departments. The stormwater management security has been provided prior to final plan approval.

2. Prior to applicant commencing work, a pre-construction meeting with Engineering and GIS Staff is required. The required attendees at the pre-construction meeting are: the owner or owner’s representative, the Responsible Land Disturber, the design professional, Town Engineer and Town Construction Inspector.

3. The Erosion and Sediment Control security, construction inspection fee, and utility testing fees are provided at the pre-construction meeting.

4. The plans and the inspection process are discussed with all parties and a construction schedule established.

5. Land disturbance permit or “VSMP Authority Permit” is issued at the pre-construction meeting.

6. Town Construction Inspector prepares a daily activity log for each project detailing the site visit.

7. Town Construction Inspector will inspect for compliance and implementation of the pollution prevention plan.

8. Town Construction Inspector will inspect site to ensure erosion and sediment control measures are installed per the approved plan.

9. Erosion and sediment control inspections are performed at least once every fourteen days and after any runoff producing storm event. Erosion and sediment control inspections are generally performed at least once every five days. All other inspections are performed as needed. The Town Construction Inspector performs site visits generally every day.

10. Any deficiencies in erosion and sediment control measures are reported during the site visit to the Responsible Land Disturber, if this person is on site, or the project superintendent of foreman responsible for erosion and sediment control. The nature of the deficiency is reported, necessary corrective action, and the time frame for correcting the deficiency is provided to the parties. This is noted in the Inspector’s daily log.

11. Site is re-inspected based on the time frame provided to make the corrective action. If the deficiency is corrected, no further action is taken. If the deficiency is not corrected, the appropriate action is taken. This may include additional time to repair if needed or warranted as determined by the Inspector, issuance of Notice to Comply, Notice of Violation, Stop Work Order, Civil Penalty or other appropriate action per the Town Code.

12. Town Construction Inspector performs public infrastructure and stormwater facilities inspections. These inspections include inspection of water and sanitary sewer installations, pressure testing of water and sanitary sewer mains, disinfection and bacteriological testing of water mains, inspection of subgrade, base stone, and pavement for public streets, inspection of any public storm structures installed for the
project including curb inlets, drop inlets, storm drains, culverts, etc. The inspection for stormwater facilities includes a visual inspection of pond construction or underground facility construction, visual inspection of any riser sections and outlet construction.

13. All stormwater management facilities are required by Town Code to be certified by the design engineer and as-built plans and certifications provided to the Town.

14. Any deficiencies with the public infrastructure and stormwater management facilities observed during construction are reported to the appropriate party which may include Project Owner, Project Superintendent, Project Foreman, Town Engineer, and Design Engineer for resolution.

15. Upon completion of construction, a punch list is prepared by the Town and all punch list items addressed by contractor.

16. Public infrastructure as-builts are reviewed and approved by Town Engineer.

17. Stormwater Management Facility certifications and as-builts are reviewed and approved by Town Stormwater Engineer.

18. All securities are released by Town Engineer.
Appendix G: Policy for Enforcement

Policy for Enforcement

If the Administrator determines that there is a failure to comply with the VSMP authority permit conditions or determines there is an unauthorized discharge, notice shall be served upon the permittee or person responsible for carrying out the permit conditions by any of the following: verbal warnings and inspection reports, notices of corrective action, consent special orders, and notices to comply. Written notices shall be served by registered or certified mail to the address specified in the permit application or by delivery at the site of the development activities to the agent or employee supervising such activities.
Appendix H: Stormwater Covenant Standard Language

TOWN OF BLACKSBURG, VIRGINIA
DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION OF COVENANTS, made this day _______ of ____________, 20____,
between, __________________________________________________________ and all
successors in interest, ("COVENANTOR(S)" and for indexing purposes, “Grantor”), owner(s) of
the following property:

Parcel Identification Number: __________________________________________

Legal Description: ______________________________________________________

Project or Subdivision Name: ____________________________________________

Document No. ________________________________________________________

OR Deed Book______________, Page No._______________, and the TOWN OF
BLACKSBURG, VIRGINIA ("TOWN" and for indexing purposes, “Grantee”).

WITNESSETH:

I (We), the COVENANTOR(S), with full authority to execute deeds, mortgages, other
covenants, and all rights, titles and interests in the property described above, do hereby covenant
with the TOWN as follows:

1. The COVENANTOR(S) shall provide maintenance for the drainage system including any
runoff control facilities, conveyance systems and associated easements, hereinafter referred to as
the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM
is and remains in proper working condition in accordance with approved design standards and
applicable laws, ordinances and regulations. The SYSTEM shall not include any elements
located within any Virginia Department of Transportation rights-of-way.

2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all
present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is
properly maintained.

3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-
ways to the SYSTEM for the TOWN, its agent and its contractor.

4. The COVENANTOR(S) shall grant the TOWN, its agent and its contractor a right of
entry to the SYSTEM for the purpose of inspecting, monitoring, operating, installing,
constructing, reconstructing, maintaining or repairing the SYSTEM.
5. If, after reasonable notice by the TOWN, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with the approved design standards and with and applicable laws, ordinances and regulations, the TOWN may perform all necessary repair or maintenance work, and the TOWN may assess the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

6. The COVENANTOR(S) shall indemnify and save the TOWN harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the SYSTEM.

7. The COVENANTOR(S) shall promptly notify the TOWN when the COVENANTOR(S) legally transfers any of the COVENANTOR(S)’ responsibilities for the SYSTEM. The COVENANTOR(S) shall supply the TOWN with a copy of any document of transfer, executed by both parties.

8. The covenants contained herein shall run with the land and shall bind the COVENANTOR(S) and the COVENANTOR(S)’ heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners, ground lessees and sub-ground lessees of any portion of property served by the SYSTEM, until and unless these covenants are superseded by subsequent maintenance covenants or revoked in writing by all parties.

9. This DECLARATION OF COVENANTS shall be recorded in the Land Records of Montgomery County, Virginia.

IN WITNESS WHEREOF, the COVENANTOR(S) has executed this DECLARATION OF COVENANTS as of the date first above written.

COVENANTOR:
By:
Title:

____________________________

ACKNOWLEDGMENT

COMMONWEALTH OF VIRGINIA
COUNTY OF ________________, to wit:

I hereby certify that on this _____ day of __________, 20___ , before the subscribed, a Notary Public for the Commonwealth of Virginia, personally appeared ___________________________ and did acknowledge the foregoing instrument to be his/her Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this _____ day of __________, 20___.

____________________________
Notary Public

Registration Number: ____________________________
My Commission expires: __________________________

Approved as to form:

______________________________________________
Town Attorney

Accepted pursuant to Resolution 8-H-08:
TOWN OF BLACKSBURG

By: ___________________________________________
Appendix I: Long Term Inspection and Maintenance of BMPs

1. Plan is approved following the Town of Blacksburg (TOB) Plan Approval Policy and Procedures.
2. Construction is inspected in conformance with the TOB Construction Inspection Policy and Procedures for Local Approval Process.
3. Upon completion of construction, a punch list is prepared by the Town and all punch list items addressed by contractor.
4. Public infrastructure as-builts are reviewed and approved by Town Engineer.
5. Stormwater Management Facility certifications and as-builts are reviewed and approved by Town Stormwater Engineer.
6. All securities are released by Town Engineer.
7. On a rolling 5 year schedule, each private stormwater facility is scheduled for inspection.
8. Town of Blacksburg stormwater facilities are inspected on an annual basis.
9. Any deficiencies found in the private facilities are communicated in writing to the owner or responsible party with an appropriate deadline for corrective action.
10. Any deficiencies found in the Town owned facilities are communicated in writing to the department head responsible or the SWM facility with an appropriate deadline for corrective action. If no action is made within set time limit, Town Public Works will resolve the deficiency and work through inter-departmental funding for reimbursement.
11. If no deficiencies are found, a letter of inspection is sent to owner or responsible party detailing the inspection date and that no action is necessary.
12. Site is re-inspected based on the time frame provided to make the corrective action. If the deficiency is corrected, no further action is taken. If the deficiency is not corrected, the appropriate action is taken per the Town Code.
Appendix J: Assessment of Significant Sources of Pollutants from Municipal Facilities

In the chart below is a list of all Town-owned facilities and their assessment of significant sources of pollutants from the facilities. All but one had no sediment, bacteria or PCB potential. The Public Works site was identified as our only site with potential for pollutant discharge and a SWPPP was created during the 2016-2017 permit year.
<table>
<thead>
<tr>
<th>#</th>
<th>Site</th>
<th>Pollutant(s) of Concern</th>
<th>TMDL Watershed</th>
<th>Site Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red Maple Water Tank</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>2</td>
<td>Neil Street Water Tank</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>3</td>
<td>Blacksburg Rescue Squad</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial contributions.</td>
</tr>
<tr>
<td>4</td>
<td>Blacksburg Rescue Squad</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>5</td>
<td>Community Center Complex</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>6</td>
<td>Dundas Heights Open Space</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>7</td>
<td>Windsor Hills Pump Station</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>8</td>
<td>Cork Drive Open Space</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Forested</td>
</tr>
<tr>
<td>9</td>
<td>McBryde Village Park</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Forested</td>
</tr>
<tr>
<td>10</td>
<td>Dundas Heights Park Land</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Forested</td>
</tr>
<tr>
<td>11</td>
<td>Owens Street Park</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>12</td>
<td>Kabrich Open Space</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>13</td>
<td>Clay St Water Tank</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Forested</td>
</tr>
<tr>
<td>14</td>
<td>Wong Park</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Forested</td>
</tr>
<tr>
<td>15</td>
<td>Oddfellows Hall</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>16</td>
<td>African American Cemetery</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>17</td>
<td>Cooks Clean Center</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>18</td>
<td>Progress Street Parking Lot</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>19</td>
<td>Dickerson Estates Park</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Forested</td>
</tr>
<tr>
<td>20</td>
<td>DOWNTOWN FIRE &amp; RESCUE</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>21</td>
<td>Knob Hill Open Space</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>22</td>
<td>Price House</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>23</td>
<td>Church Street Parking Lot</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>24</td>
<td>Clay Street Spring Park</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized. &amp; Forested</td>
</tr>
<tr>
<td>25</td>
<td>The Armory Building</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>26</td>
<td>Farmers Market</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>27</td>
<td>Black House and Thomas Conner</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>28</td>
<td>Municipal Building</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>29</td>
<td>Blacksburg Motor Company</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>30</td>
<td>Municipal Golf Course</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>31</td>
<td>Huckleberry Trail</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>32</td>
<td>Oak Manor Well House</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>33</td>
<td>Highland Park Pump Station</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>34</td>
<td>Crestview Water Tank and Park</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>35</td>
<td>Sheffield Open Space</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>36</td>
<td>Hardie Hills Open Space</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>37</td>
<td>Kipps Ball Fields</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>38</td>
<td>Linstead Open Space</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>39</td>
<td>Downtown Police Station</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>40</td>
<td>Nellies Cave Park</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>41</td>
<td>Dehart Open Space</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>42</td>
<td>Gardenspring Open space</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>43</td>
<td>Hubbard Street Fire Station</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>44</td>
<td>Tall Oaks Pump Station</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>45</td>
<td>CRC Run Open Space</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>46</td>
<td>CRC PH II Pump Station</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>47</td>
<td>CRC Hill Park</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>48</td>
<td>CRC Run Pump Station</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>49</td>
<td>Public Works Complex</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Some areas of exposed fill soil. Vehicles. Storage.</td>
</tr>
<tr>
<td>50</td>
<td>Cedar Run Springs and Open Space</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>51</td>
<td>Cedar Run Open Space</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>52</td>
<td>CRC PH I Pump Station</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>53</td>
<td>Blacksburg Transit</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>54</td>
<td>South Point Park</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>55</td>
<td>Hospital Pump Station</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
<tr>
<td>56</td>
<td>Industrial Park Pump Station</td>
<td>Sediment, Bacteria &amp; PCB</td>
<td>Roanoke River</td>
<td>Stabilized. No bacterial/PCB contributions.</td>
</tr>
<tr>
<td>57</td>
<td>Westview Cemetery</td>
<td>Sediment</td>
<td>Stroubles Creek</td>
<td>Stabilized</td>
</tr>
</tbody>
</table>
Purpose

The intent of this reference guide is to provide quick access to descriptions of common pollutant sources and common controls and practices to address the pollutants for each activity defined in the Stormwater Pollution Prevention Plan (SWPPP) map. Additional information for each pollutant source and activity, including source controls, standard operating procedures, and removal/disposal of pollutants is provided in the Town’s Good Housekeeping/Permit Manual, latest edition.

Qualification for Performing Site Evaluation

The individual completing the Site Compliance Evaluation Form shall have participated in the Town’s Municipal Separate Storm Sewer System (MS4) Good Housekeeping/Permit Prevention training that includes introduction to the General Operations & Maintenance (G&M) Procedures included with this SWPPP, by reference.

Frequency and Protocol

The Site Compliance Evaluation Form shall be completed a minimum of once annually. The completed form shall be provided to the Assistant Director of Public Works immediately after the evaluation is completed. The Assistant Director of Public Works will provide follow-up for findings. Once follow-up is completed, it shall be indicated or noted on the Site Compliance Evaluation Form, as appropriate. The Site Compliance Evaluation form shall be completed and forwarded to the Town Engineer within 24 hours and the necessary report per Section III G of the MS4 General Permit for submission to DEQ shall be maintained in a file with the SWPPP materials site.

For emergencies, call the Blacksburg Fire Department at 9-1-1.

Uncovered Vehicle/Equipment Storage

Potential Pollutant and Sources: Fuels spills from fueling activities and leaks from pumping equipment or storage tanks.

Source Controls: Maintain a spill kit in the immediate vicinity with safety equipment for use of the kit. Perform periodic maintenance repairs to address leaks. Identify location of cut-off switches.

Best Management Practice(s): Cover spills completely with absorbent and immediately flush with water. Promptly remove and dispose of material in a waste receptacle. For leaks, provide a drip pad or absorbent pad until repaired.

G&M Procedure Reference: Section 5.3

Points of Discharge

Potential Pollutant and Sources: Stormwater discharges from point sources, including sediment, petroleum products, etc.

Source Controls: Use source controls to prevent pollutants from entering the drainage area from being transported to the point of discharge.

Best Management Practice(s): Use source controls to prevent pollutants from entering the drainage area from being transported to the point of discharge.

G&M Procedure Reference: Section 5.5

Dustpans

Potential Pollutant and Sources: Various liquids can leak and solids can rust or leak chemicals on the ground.

Source Controls: If leaking, use absorbent, scrub with a broom to remove as much of the contaminant as possible, and promptly recover all material. For recurring issues, use cover or absorbent pads.

Best Management Practice(s): Keep dustpans and trash cans covered and replace damaged containers.

G&M Procedure Reference: Section 5.3

Fire

Fire (Non-Emergency): (540) 961-1175

Town Engineer: (540) 961-1124 (Kelli Howard)

Asst. Dir. of Public Works: (540) 961-1145 (Matt Stokle)

Office of Waste Reduction & Recycling: (540) 961-1806

Salt Storage/Operations

Potential Pollutant and Sources: Salt and sand/grit tracked from storage facilities and in mixing locations.

Source Controls: Cover provided by indoor salt storage is the primary source control. Use source controls for any outdoor stockpiling.

Best Management Practice(s): (1) Remove tracked salt, sand/grit from loading and mixing areas immediately following loading and mixing activities; (2) Install and maintain perimeter controls for outdoor stockpiles.

G&M Procedure Reference: Section 5.3

Pertinent Contacts

Emergency: 9-1-1

Police (Non-Emergency): (540) 961-1150

Fire (Non-Emergency): (540) 961-1175

Town Engineer: (540) 961-1124 (Kelli Howard)

Asst. Dir. of Public Works: (540) 961-1145 (Matt Stokle)

Office of Waste Reduction & Recycling: (540) 961-1806

G&M Procedure Reference: Section 5.3

Outdoor Material Storage

Potential Pollutant and Sources: Petroleum products, solvents, corrosive material, and materials stored outdoors.

Source Controls: Perimeter controls and cover.

Best Management Practice(s): Store materials that could introduce pollutants to runoff indoors. Remove and properly dispose of pollutants on ground surface.

G&M Procedure Reference: Section 5.8

Outdoor Material Washing

Potential Pollutant and Sources: Downstream transport of solvents, grease, sediment, and other pollutants through wastewater.

Source Controls: Wash only in designated areas that drain to sanitary sewer. No washing is allowed at the wash station.

Best Management Practice(s): (1) Ensure all wastewater is directed to the sanitary sewer by inspecting and maintaining diversion directing the wastewater to the sanitary sewer; (2) Provide signage clearly identifying the designated washing location(s); (3) Ensure leaks to the sanitary sewer are clear of debris and sediment.

G&M Procedure Reference: Section 5.1

Outdoor Material Loading

Potential Pollutant and Sources: Materials loaded and unloaded at storage area.

Source Controls: Material packaging and indoor storage.

Best Management Practice(s): Ensure prompt storage of material under cover. Load in dry weather.

G&M Procedure Reference: Section 5.7

Covered Material/Equipment Storage

Potential Pollutant and Sources: Petroleum products leaks from hydraulic hoses or equipment in dry weather.

Source Controls: Roof cover acts as the primary source control. Drip pans or absorbent pads placed under leaks and containment bags wrapped around leaking components if potential for intermixing with stormwater.

Best Management Practice(s): Repair equipment leaking fuel or oil. Utilize source controls while leaks occur and inspect regularly to ensure pollutants are not exposed to precipitation. Remove and properly dispose of pollutants on ground surface.

G&M Procedure Reference: Section 5.3 & 5.8
Appendix L: Illicit Discharge Detection and Elimination Protocol
Illicit Discharge Detection and Elimination Program

Town of Blacksburg, Virginia
Department of Engineering and GIS
300 South Main Street
PO BOX 90003
Blacksburg, VA 24062-9003
Revised June 17, 2014
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SECTION 1 - INTRODUCTION


SECTION 3 – MS4 PROGRAM PLAN

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Goals

The Town of Blacksburg has developed written procedures to detect, identify, and address unauthorized non-stormwater discharges, including illegal dumping, to the small MS4. These procedures shall be implemented and updated as needed to continue to minimize the occurrence of unauthorized discharged to the municipal separate storm sewer system.

Scheduling Outfall Inspection Activities

The Town of Blacksburg has previously performed a desktop analysis of all of the watersheds. This analysis ranked areas in town with a numerical rank representing its potential as a low, medium or high risk for illicit discharge potential. The ranking was based upon age of infrastructure, land use, known historic discharges and density to wastewater infrastructure. Based on this ranking, the Town has scheduled the field inspections of discharge points with the high-risk areas being inspected first. Some scheduling may have minor variations from the rankings due to the proximity to other field inspections. It is important that the Town also utilize staff time to the maximum and lower risk areas may be inspected with higher if the geographical location is close.

The Town has developed a five year plan to complete all outfall inspections within a permit cycle. The Town has 155 known outfalls within our jurisdiction. If 31 outfalls are inspected each year, Blacksburg will succeed in performing inspections as required.

Dry Weather Defined

The Town defines “dry weather” as beginning after a period of 72 hours
with less than 0.10 inches of rain. Alternatively, dry weather may be based on a waiting period, such as 48 to 72 hours, after rainfall events that produce runoff.

Dry Weather Screening Methodologies

Field inspection of the Town of Blacksburg’s MS4 outfalls are conducted during dry weather conditions. Data collection forms developed by the Center for Watershed Protection (CWP) are used to record the physical characteristics of each outfall, as well as its discharge if any is observed. The data collection form includes background information, outfall structural characteristics, quantitative characteristics of discharge, and physical indicators for both flowing and non-flowing outfalls. The original CWP data collection form was amended to include a field for recording the presence and concentration of potassium in observed outfall discharge. The basis for attempting to detect the presence of potassium is discussed later in the Water Quality Testing section of this document.

General information is also collected such as the time since the last rain, the quantity of the last rain, site descriptions (e.g., conveyance type and dominant watershed land uses), estimated discharge rate (e.g., width of water surface, approximate depth of water, approximate flow velocity, and flow rate), and visual observations (e.g., order, color, clarity, floatables, deposits or stains, vegetation condition, structural condition, and biology).

Field personnel are guided to outfalls by field maps depicting the local streets, parcels, and the storm sewer network. Upon arriving at an outfall, the worker will begin filling in the data collection sheet, while taking measurements as needed. Characteristics of the of the weather such as time since the last rain and quantity of the last rain shall be determined by referencing the NOAA weather station at the Virginia Tech Airport. If flow is observed at the outfall, water quality tests are started immediately and other measurements can be performed while waiting for the results of some of the tests. Width of water surface and approximate depth of water shall be measured onsite at the time of the outfall inspection. Watercourses in the Town are not so large as to become a navigation obstacle; this information can be gathered onsite.

Suspected Sanitary Sewer or other Significantly Contaminated Discharge

If characteristics of the outfall inspection have indications that sanitary sewer or other significantly contaminated discharge is in the water, the persons performing the inspection must do the following:

(a) Immediately contact the Town of Blacksburg Engineering Department and notify the Director of Engineering of the suspected contaminant.
(b) The Director, or designated person, shall perform a reconnaissance site visit within 24 hours of the notification. If immediate identification of the source is not apparent, the Engineering department must commence a formal investigation of the source of contaminant within 48 hours of notice. If the 48 hours falls outside of a typical work week, a formal investigation shall begin on the following business day.
Suspected Discharges from Less Hazardous Sources

If characteristics of the outfall inspection have indications that less hazardous discharge is in the water, such as non-contact cooling water or wash water, the persons performing the inspection must do the following:

(a) Contact the Town of Blacksburg Engineering Department and notify the Town Engineer of the suspected contaminant within 48 hours of discovery of the less hazardous discharge.

(b) The Town Engineer, or designated person, shall perform a reconnaissance site visit within 24 hours of the notification. If immediate identification of the source is not apparent, the Engineering department must commence a formal investigation of the source of contaminant within 5 days.

(c) If it is discovered that the discharge is authorized under a separate VPDES or state permit, then it requires no further action under this permit.

Illicit Discharge Source Identification

If an illicit discharge is detected and the source is not immediately identified further investigation is required. The source shall be confirmed by one or more of the following methods:

- Documented visual observation or physical indicators;
- Indicator parameter testing (chemical and bacterial sampling);
- MS4 Investigation: Field crews perform an investigation by either strategically inspecting or testing manholes or by moving systematically upstream or downstream within the storm drain network;
- Drainage Area Investigation – An initial desktop analysis is performed to determine potential generating sites by reviewing land uses followed by inspections or testing in areas where the illicit discharge appears to be specific to a certain type of land use or generating site;
- On-Site Investigation – Dye, video, or smoke testing can isolate segments of the storm drain network to allow for focused on-site investigations;
- Homeowner surveys and surface condition inspections for on-site sewage disposal systems

Methodologies to determine the source of all illicit discharges shall be conducted. If an illicit discharge is found, but within six months of the beginning of the investigation neither the source nor the same non-stormwater discharge has been identified, then the operator shall document such in accordance with Section II B 3 f. If the observed discharge is intermittent, the operator must document that a minimum of three separate investigations were made in an attempt to observe the discharge when it was flowing. If these attempts are unsuccessful, the operator shall document such in accordance with Section II B 3 f.

When a discharge has been eliminated, a follow-up investigation must be completed in 45 days in order to verify that the discharge has been eliminated.
**Enforcement Methods**

Contaminated spills and illicit discharges found through this methodology will be handled in the following manner:

1. The responsible persons will be notified of the discovery of the illicit discharge or contaminated spill. Notifications may be verbal warnings and inspection reports, notices of corrective action, consent special orders, and notices to comply. Written notices shall be served by registered or certified mail to the address specified in the permit application or by delivery at the site of the activities to the agent or employee supervising such activities.
2. The source, once identified, will be eliminated so that no additional impacts will continue to occur to surface waters.
3. Once the source is contained, any additional enforcement will be appropriate to the scale of the water quality impacts.
   a. Minor impacts may be handled with the promulgation of educational material.
   b. More serious impacts shall be subject to a civil penalty not to exceed $32,500 for each violation within the discretion of the court. Each day of violation of each requirement shall constitute a separate offense.
   c. Any person who willfully or negligently violates any provision of this article, any order of the Administrator, any condition of a permit or any order of a court shall be guilty of a Class 1 misdemeanor.

**Reporting Methods**

The Town will promote, publicize, and facilitate public reporting of illicit discharges into or from MS4s. The operator shall conduct inspections in response to complaints and follow-up inspections as needed to ensure that corrective measures have been implemented by the responsible party.

1. Receive the complaint/Identify discharge location
2. Inspection of the site.
3. Fill out field report w/ pictures.
4. Enter discharge into database.
5. Attempt to discover source on site.
6. When the source is determined, document the enforcement type and timeframe for follow-up. (see table below)

Notifications may be verbal warnings and inspection reports, notices of corrective action, consent special orders, and notices to comply. Written notices shall be served by registered or certified mail to the address specified in the permit application or by delivery at the site of the activities to the agent or employee supervising such activities.

<table>
<thead>
<tr>
<th>Infraction Type</th>
<th>Enforcement Type</th>
<th>Follow-Up Actions</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>Minor Infraction – No impact to MS4</th>
<th>Verbal Warning</th>
<th>Best Management Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate Infraction – Minimal impact to MS4</td>
<td>Written Warning, Inspection Report, Clean-up</td>
<td>Best Management Practices</td>
</tr>
<tr>
<td>Major Infraction – Remediation will be required to MS4 system OR Spill made contact with surface waters</td>
<td>Written Warning, Inspection Report, Consent Special Orders, Clean-up, Remediation Bill</td>
<td>Best Management Practices, Civil Penalties</td>
</tr>
<tr>
<td>Fish Kill – Spill made contact with surface waters and determined to be a fish kill event.</td>
<td>Written Warning, Inspection Report, Consent Special Orders, Clean-up, Remediation Bill</td>
<td>Best Management Practices, Civil Penalties</td>
</tr>
</tbody>
</table>

## Tracking

The Town of Blacksburg will employ a system to track the identification and elimination status of illicit discharges and enforcement actions. The system will also track confirmation that illicit connections are removed and the discharge permanently ceased. This system will be maintained in the town’s GIS system.

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Identification Information</th>
<th>Contact List</th>
<th>Response</th>
<th>Enforcement Type</th>
<th>Enforcement Actions</th>
<th>Elimination Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illicit Connection</td>
<td>Call received on Friday 7-1-10</td>
<td>Town Engineer</td>
<td>Site visit; Confirmed source; Contacted owners</td>
<td>Building Code</td>
<td>Violation written, provided 30 days to rectify</td>
<td>8-5-10 Confirmed. Site re-inspected after 30 days – no indication of continued discharge</td>
</tr>
<tr>
<td>Chemical Spill (transport truck)</td>
<td>Notified by local fire/rescue staff. 2-3-11</td>
<td>Fire &amp; Rescue Clean-up Service Virginia DEQ Town Engineer</td>
<td>Emergency Response and Spill Clean-up</td>
<td>Emergency Response</td>
<td>Spill response charged to company. DEQ to assess fish kill.</td>
<td>2-17-11 Confirmed. Re-inspection of site 14 days later showed no residual material.</td>
</tr>
</tbody>
</table>

## Training

The Town of Blacksburg will train staff who are involved in illicit discharge-related activities, or who have field jobs with the potential for witnessing illicit discharges and connections. The training shall be implemented according to the program and include the following:

- The definition of illicit discharges and connections,
- Techniques for finding illicit discharges, including field screening, source identification, and recognizing illicit discharges and connections,
- Methods for eliminating illicit discharges and the proper enforcement response,
- Contact information for staff that has emergency response responsibility,
- General recognition of illicit discharges,
- Where to report them when they are observed,
- Common types of illicit discharges that occur in the local area and the types of illicit discharges that are commonly associated with local land uses,
- The illicit discharge ordinance, including the requirements and authority given to the municipality to eliminate illicit discharges,
- The municipality’s storm water infrastructure, and where to obtain municipal storm sewer maps, and
- Illicit discharge preventative measures.
Outreach & Education

- Post illicit discharge protocol and emergency contact at Town of Blacksburg Planning and Engineering Department and Emergency Services offices.
- Have a biannual training session with emergency services personnel to update staff and emergency services on changes to the program.
Appendix M: Approved Nutrient Management Plans for the Town of Blacksburg
Nutrient Management planning is a large part of Virginia’s strategy to clean and protect the state’s waterways and to help meet the EPA’s goal of restoring the ecosystem of the Chesapeake Bay. When fertilizer is used improperly, the nutrients nitrogen and phosphorus are not used by the plant and can then be carried into streams, lakes, and rivers. These nutrients then cause major ecological problems. Turfgrass covers an estimated 1.2 million acres of the Chesapeake Bay watershed in Virginia. According to Virginia’s Watershed Implementation Plan (WIP), 500,000 acres must be addressed by nutrient management plans by 2025.

Urban Nutrient Management aims to limit the amount of nutrient rich runoff reaching the waters of Virginia ultimately the Chesapeake Bay from golf courses, athletic fields, homes, business complexes, etc. This is accomplished through following a site specific, agronomically and environmentally sound, Nutrient Management Plan written by a Certified Nutrient Management Planner. The goal of a Nutrient Management Plan is to manage the amount, placement, timing, and application of fertilizer, bio-solids and other nutrient rich materials all while achieving the healthiest turf or landscape area possible.

While not all of Virginia is included in the Chesapeake Bay Watershed, all of Virginia’s waters can be improved by following a nutrient management plan. The Chesapeake Bay cleanup is being used as a model for future endeavors. The Albemarle Sound and Gulf of Mexico may soon be under the same restrictions as the Bay. The Roanoke, Nottaway and Meherrin Rivers all flow into North Carolina’s Albemarle Sound, while the New, Holston and Clinch rivers flow to the Mississippi River and Gulf of Mexico.

These plans can be voluntary, but in several cases, they are required by law. Both golf courses and state owned lands are currently required to have plans, as well as fertilized land that is publicly owned within a Municipal Separate Storm Sewer System (MS4) permit area. These laws apply to both areas inside and outside of the Chesapeake Bay Watershed.

Thank you for choosing me to write your Nutrient Management Plan. It is my goal to provide you with the most agronomically and environmentally sound plan available. For this plan to be effective, it is important that you follow the soil test based guidelines of your plan and that you keep detailed records of your applications. While you do not have to follow the specific fertilizer analyses shown, the success of this plan hinges on not exceeding the nutrient amounts that are allowed for by the Standards and Criteria. These amounts are stressed multiple times in the discussion of Soil Test Results and Application Worksheets. In cases where plans are required by law, the limits set by the Standards and Criteria are law.

If this is a renewal plan, please be aware that the Standards and Criteria were revised in July 2014. Many guidelines have changed and old recommendations may be out of compliance with the new standards.

Together, we will do our part to protect Virginia’s natural beauty and the Chesapeake Bay. Please do not hesitate to contact me if you have questions or suggestions. Your input is integral to making your Nutrient Management Plan a living and usable document.

Thank You,

Robert Habel
Owner - CNMP - VT ’05
Nutrient Management Plan

Prepared For:
Town of Blacksburg
300 S. Main St., PO Box 90003
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Prepared By:
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Robert Habel, CNMP
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Amherst, Virginia 24521
Cell: 434-665-2813  habelrf@gmail.com
Certification Code: 654

Acreage – 7 Fields, 5 locations, 5 soil samples
(Breakdown on Page 5)

<table>
<thead>
<tr>
<th>Total:</th>
<th>13.02 Acres</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>County:</th>
<th>Montgomery – Town of Blacksburg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watershed:</td>
<td>NE59 – 9.88 Acres</td>
</tr>
<tr>
<td></td>
<td>NE60 – 3.14 Acres</td>
</tr>
</tbody>
</table>

Plan Written: December 1, 2016

Plan Expires: December 1, 2019

Planner Signature

Robert F. Habel

Certification Code: 654
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**Sources:**
Maps – Maps are produced using Google Earth or provided by client.
Photos/Logos – Obtained from client, clients website, or taken by planner.
Site information – Obtained from client or clients website.
Technical Information –
- Soil Fertility and Fertilizers 6th Ed. – Havlin, Beaton, Tisdale, Nelson – 1999
- Spectrum Analytic Agronomic Library – www.spectrumanalytic.com
- Sports Turf Management in the Transition Zone – Goatley, Askew, Ervin, Mcall, VSTMA, Etc. – 2008
- Turf Management for Golf Courses 2nd Ed. – Beard, USGA – 2002
- Turfgrass Soil Fertility and Chemical Problems – Carrow, Waddington, Rieke – 2001
- Virginia Nutrient Management Standards and Criteria – Commonwealth of Virginia – July 2014

**Disclaimer:** Statements and recommendations made within this document based on published research data and experience. Recommendations are based on the soil tests included in this document and not intended for use on any other facility. Products suggested are used in methods suggest by label guidelines when available, be sure to read label before using products as labels can change. Maximum rates are provided by Virginia Department of Conservation and Recreation Standards and Criteria and are not to be exceeded even when product label suggests otherwise. No guarantee or warranty is made, expressed or implied, concerning crop performance as a result of using the contents of this document.

**Definitions:**
- M = 1000 FT²
- # = Pounds of product
- N = Nitrogen
- P = Phosphorus
- K = Potassium
- NMP = Nutrient Management Plan
- MS4 = Municipal Separate Storm Sewer System
1. **Narrative**

1.1. **Statement of Compliance**

The Town of Blacksburg is required to have and follow this Nutrient Management Plan according to the Rules and Regulations of the Code of Virginia. According to 9VAC25-890-40 MS4 General Permit, permittees are required under the “Turf and Landscape Management” section of the permit (GP Section II.B.6.c) to develop NMPs on “all lands owned or operated by the MS4 operator where nutrients are applied to a contiguous area greater than one acre.” Thus, the Town of Blacksburg agrees to comply with all requirements set forth in the Nutrient Management Training and Certification Regulations, 4VAC50-85-10 et seq., and to follow recommendations for turf fertilization and management as described in the Virginia Nutrient Management Standards and Criteria, Revised July 2014. This includes implementing this Department of Conservation and Recreation reviewed Nutrient Management Plan and maintaining fertilization records. All nutrient applications to Town of Blacksburg properties, performed by Town of Blacksburg staff or other contractors, shall comply with the provisions of this Nutrient Management Plan as of December 1, 2016. This plan is affective for three years (until December 1, 2019) or until major renovations or major changes to maintenance occurs. The planner should be alerted if this occurs or if new soil tests are taken within the three-year period, a minor revision may be needed if tests show major differences. The process of updating this plan for a new three-year cycle should begin no later than 6 months prior to plan expiration.

1.2. **Plan Overview**

Established in 1798, Blacksburg is a Special Place to live, work, and visit. Nestled between the picturesque Blue Ridge and Alleghany Mountains, the natural beauty surrounding Blacksburg offers a vista for residents and visitors to enjoy, while taking in the many unique stores, art galleries, and restaurants.

Consistently ranked among the country’s best places to live, Blacksburg is known for award winning services, a reasonable cost of living, safety, moderate climate, and abundant leisure activities. Blacksburg is proud to be the home of Virginia Tech and major technology companies located in the Corporate Research Center and the Blacksburg Industrial Park, as well as the Edward Via School of Osteopathic Medicine, which all contribute to the town being recognized as one of the best educated work forces in the country.

While proud of our commitment to the future, we also celebrate our history. Blacksburg’s past plays a significant role in how we view the decades ahead. Our respect for the people and the traditions of those who helped build this region gives us a base. We build upon that base to form a dynamic, diverse community, ready to face the challenges ahead.

The town is fortunate to have an energetic and civic-minded citizenry which supports a local government at the forefront of providing progressive services. Because of the abundance of natural beauty surrounding Blacksburg, environmental consciousness is a way of living in the community. The town also treasures its rich history that includes numerous properties listed on the National Register of Historic Properties.

This plan covers 13.02 acres of cool season turf sports fields. This acreage represents 7 fields at 5 locations within the Town of Blacksburg.
1.3. Location
According to the United States Census Bureau, the town has a total area of 19.89 square miles of which 19.89 square miles is land and 0.04 square miles, or 0.10%, is water. Blacksburg is situated atop the Eastern Continental Divide at 2,080 feet above sea level. It is the 15th largest municipality and the largest town in the commonwealth of Virginia. The Eastern Continental Divide traverses the Virginia Tech Montgomery Executive Airport.

Due to its elevation, the climate of Blacksburg is either classified as mountain temperate or humid continental. Summers are warm and humid, although significantly cooler than low-elevation places within the state, with only 4.4 days of 90 °F + highs annually, and winters are generally cool to cold with occasional intervening warm periods and 9 nights of sub-10 °F lows. Monthly mean temperatures range from 31.5 °F in January to 71.2 °F in July. Snowfall averages 25.4 inches per season and generally occurs from December to March.

The maps on the following page show a general location of each site. Individual sites will be discussed separately and address and GPS information will be included in those sections.

<table>
<thead>
<tr>
<th>Location/Acreage/Watershed Code Breakdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>1. Municipal Park Complex</td>
</tr>
<tr>
<td>2. Seneca Drive Park</td>
</tr>
<tr>
<td>3. Winfrey Fields</td>
</tr>
<tr>
<td>4. Primrose Park</td>
</tr>
<tr>
<td>5. Toms Creek Park</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
1.4. **Nutrient Management Principals**

Nutrient Management Plans focus on two primary objectives healthy plants and clean water.

There are four different types of elements essential for plant health. Non-mineral, Primary and Secondary elements are all considered Macronutrients. The fourth is Micronutrients. Non-mineral elements consist of carbon, hydrogen, and oxygen; these elements are obtained from air and water. The Primary nutrients are nitrogen, phosphorus, and potassium. Secondary elements are calcium, magnesium, and sulfur. Micronutrients are iron, manganese, boron, zinc, copper, molybdenum, chlorine, cobalt, and nickel. These elements are obtained from the soil and must be supplemented with fertilizer, lime or other soil amendments when a soil test shows a deficiency. In high maintenance situations, some elements are spray applied and absorbed through the leaf tissue.

Nitrogen and phosphorus are the focus of a nutrient management plan, as these nutrients cause ecological problems. Lime is also important because having improper pH can make applied fertilizers unavailable to the plant and more likely to leach or runoff. While nitrogen and phosphorus are the focus, other nutrients are also discussed in the plan, these nutrients are beneficial to plant health, but do not cause water quality problems.

Soil tests are required to determine the current level of soil nutrients available to the plant so fertilizer can be applied at rates that ensure excess nutrients do not enter our waters. Basic soil tests provide data on phosphorus, potassium, magnesium, calcium and pH. Nitrogen cannot be tested for using a basic soil test as it is very volatile. Magnesium and calcium are included in basic soil tests so that proper liming materials can be chosen.

Soil test results are compared to a reference guide provided by DCR. These Standards and Criteria are based upon years of scientific research and the rates suggested are optimal for plant health within the intended usage. Low input areas, like home lawns, require some fertilizer to maintain plant vigor thus maintaining turf cover and preventing erosion. High use areas, like sports fields, require frequent fertilizer input to help maintain plant health and to aid in recovery from stress. Clean water is maintained by applying fertilizer in a responsible manner that ensures minimum movement away from the intended site.

The following information discusses the role of the nutrients in the plant. Highlighted information is specific to this plan.

**Nitrogen (N)** – This element is responsible for green color, shoot growth and density, root growth, carbohydrate reserves, recuperative potential, heat, cold, drought hardiness, wear tolerance, and disease susceptibility. Nitrogen has a very complex cycle and only certain forms are available to the plant. It leaches through the soil rapidly and does not accumulate thus you cannot soil test for N. Due to these factors, nitrogen management is a large part of nutrient management. Nitrogen management includes but is not limited to using slow release materials, timing the applications in accordance with plant growth, and making multiple applications so that the element is available when it is needed by the plant.

3#/M yearly N used in this plan for low input sports fields. Max rate per month is 0.9 if using at least 15% slow release. If using less than 15% slow release, max rate per month is 0.7. Please see each section and nutrient application worksheets for specifics.
Slow release products were used exclusively in this plan. If making changes, please continue to use slow release fertilizers, or contact your planner for help determining the proper rates.

**Phosphorus (P)** – Phosphorus controls the establishment rate of newly seeded turf, plant maturation, root growth, and seed production. Like nitrogen, P also has a complex cycle. The major difference is that P readily attaches soil, it can be quantified by a soil test and only leaches when it completely saturates the soil. Phosphorus moves away from the application site when it is improperly applied to compacted soil or other impervious surfaces, when applied in excess, and since it attaches to the soil, with sediment rich runoff. Phosphorus management is also important to nutrient management. It should only be applied when called for by a soil test, to soils that are not compacted to prevent runoff and only applied to actively growing turf with sufficient turf cover/rooting to hold the soil in place.

Maximum P rates are outlined in application worksheets. Do not exceed this number.

**Potassium (K)** - Potassium is responsible for root growth, heat, cold, and drought hardiness, wear tolerance, and disease susceptibility. While the Standards and Criteria do regulate the application of K, but in some cases, K input may exceed recommended levels, as it does not have the same detrimental effects on the health of Virginia’s waters as N and P. Potassium is considered the plant nutrient most responsible for turf quality. It helps plants respond to stresses like drought, extreme heat/cold, and insect/disease pressure. The plants increased ability to respond to stress in a positive manner can help reduce the need for increased N and P fertility and reseeding caused by stress. In addition to the benefits of K, it is difficult to limit the amount of K used as most modern slow release fertilizers contain both N and K while limiting or completely removing P. Nitrogen only products are not readily available in slow release form and custom blended fertilizers are expensive.

Potassium levels have been exceeded in most of areas of this plan. As discussed above, K helps the plant deal with stress. Sports fields and common areas are generally stressed be it from excessive use, compaction, improper pH, or lack of proper care due to budget and personnel restraints.

**Lime** - Liming is a critical management practice for maintaining soil pH at optimal levels for plant growth. Liming supplies the essential elements Calcium and/or Magnesium, reduces the solubility and potential toxicity of Aluminum and Manganese, and increases the availability of essential nutrients. Many soil elements change form because of chemical reactions in the soil due to pHs that are either too acidic or too basic. Plants may not be able to use elements in some of these forms making some elements essential to plant health unavailable. Most plants grow well in the pH range 5.8 to 6.5.

Buffer pH is used to provide an indication of the soil’s total (active + reserve) acidity and ability to resist a change in pH. This buffer measurement is the major factor in determining the amount of lime to apply. The Buffer pH starts at 7 (no lime needed) and goes lower as the soil’s total acidity increases and more lime is needed to raise the soil pH. As an example, a clay soil with a pH of 6.1 could have a buffer pH of 6.8 and need 1 ton/A of lime in order to maintain/increase that pH around 6.2. A sandy soil could have a much lower pH but have the same buffer pH thus, needing the same amount of lime to change the pH to 6.2. This is because sandy soils have a lower cation exchange capacity thus, less storage for reserve acid.
Attempting to change the pH in the deep rooting zone of an established turf is difficult at best. One method of getting lime somewhat deeper in established turf areas is to apply lime in conjunction with aeration. Applying lime in the fall and winter months is recommended because the freeze/thaw cycle aids in mixing lime throughout the root zone.

Lime provides the essential nutrients Calcium and Magnesium. Calcium is the main component of plant cell walls while magnesium is the atom upon which chlorophyll is built. It is important that these elements be present in the soil not only to help regulate the soils acidity but to insure plant health. When a soils pH is acidic, these elements can be added with lime. Calcitic lime should be used when calcium is deficient and magnesium is high. Dolomitic lime, which is more common, is used when the both are deficient or balanced. If pH does not need to be adjusted, calcium levels can be raised with gypsum and magnesium is raised with Epsom salts. The Standards and Criteria provide guidance on adjusting soil pH levels but do not include any recommendations for Ca or Mg, as they do not affect water quality.

Not all liming materials are the same, if the liming material chosen does not equate to 100% Calcium Carbonate Equivalent (CCE% should be listed on bag) see chart on page 37 to adjust the required amount of lime.

Lime is needed at Primrose Park. The buffer pH is 6.61 and 2 Tons of lime is required; this should be made in 4 apps of 50#/M. No more than 50#/M should be applied per month. Spring and fall are the best times for lime application. Attempt to coordinate with aerification.

Sulfur (S) - Sulfur is responsible for the plants green color, shoot growth and density, root growth, carbohydrate reserves, and disease susceptibility. Elemental sulfur applications should be avoided unless you are attempting to acidify (lower pH) the soil and should be applied at no more than 5#/M and watered in due to the turf burn potential. Unless called for by a soil test, the occasional use of sulfur containing fertilizers and micro nutrient packages should be the only S input needed to supplement the soil S content. This element is not included in the Standards and Criteria.

Iron (Fe) – Iron contributes to the plants green color, shoot growth and density, root growth, carbohydrate reserves, heat, cold and drought hardiness and wear tolerance. Iron is often included in fertilizer and micronutrient blends because it produces a faster greening of turf than nitrogen. According to the Standards and Criteria, Fe applications can be occasionally substituted for N applications because it produces greening. This is a good strategy, but Fe apps cannot replace N. While Fe is used inside the plant, the greening created by Fe is superficial and caused by the iron rusting on the plants surface. Fe should be used as an N replacement only when the plant is healthy and greening is desired without increased growth.

Micros – Other micronutrients are not mentioned by the Standards and Criteria. These elements are very important to plant growth, but regular input is not needed unless you are managing a sand based soil with low nutrient holding capacity. Most soils contain all the necessary micros and they will be available for the plant as long as the proper pH is maintained.
1.5. Best Management Practices for Water Quality Protection

The following list comes from the *Urban Nutrient Management Handbook* page 8-12 and details steps that can reduce the impact of nutrient management practices on water quality. A PDF of the complete handbook can be found online through ext.vt.edu, on the CD provided with the plan or a printed copy can be obtained from DCR.

- Base fertilization practices on a soil test.
- Supplement the soil test with a plant tissue test when necessary.
- Aerate compacted soil to reduce runoff and aid phosphorus and lime in entering the soil.
- Minimize fertilizer rates on slopes and sandy soils. If using quickly available sources of nitrogen on deep, sandy soils or near shallow water tables, use no more than 0.25 to 0.50 pound of nitrogen per 1,000 square feet per application.
- Establish and maintain a buffer zone of reduced- to zero-input vegetation around bodies of water. In some cases, native vegetation might be appropriate, but whatever plant material is selected, it must persist indefinitely to serve as a functional buffer zone.
- Consider using iron as a supplement to nitrogen for greening response.
- Use at least 50 percent slowly available sources of nitrogen on soils subject to leaching.
- Time applications carefully. Do not apply fertilizer before a heavy rainfall.
- Irrigate lightly (0.10 to 0.25 inch) after each application of quick-release fertilizer so it is washed off the foliage and moved into the soil. (Wait to irrigate if foliar activity is desired)
- Avoid over irrigation.
- Return grass clippings to the turf to improve nutrient cycling and reduce the amount of fertilizer needed to produce healthy plants. Use a mulching mower whenever possible and consider that a mulching mower can even be used to manage fall leaves (Goatley 2006).
- When collected, compost grass clippings rather than disposing of them in landfills.
- Use a drop (gravity) spreader near bodies of water or impenetrable areas to lessen the chance of spreading material on these surfaces.
- Perhaps the most important best management practice toward improving water quality is to simply sweep or blow fertilizers and clippings off hardscape surfaces and back into the turf.

1.6. Application Equipment Calibration

An agronomically and environmentally sound fertilizer program can be negated by improperly calibrated equipment. It is important to calibrate your equipment prior to every application. Even moving from one location to another can knock your application equipment out of adjustment so once you have your equipment calibrated for a product write down the setting. Use that setting to check the calibration for every site and adjust if necessary. The next time you use that product, use your records as a starting point and not a final calibration as equipment can wear over time thus changing the calibration point. For more information on how to calibrate your equipment see the *Urban Nutrient Management Handbook* Chapter 10 (ext.vt.edu) or visit your equipment manufactures website. Please remember that the number on the bag is not sufficient, every spreader and every application is different, and that the bag number only serves as a calibration starting point.
1.7. **Season of Fertilization**

According to the *Virginia Nutrient Management Standards and Criteria, Revised July 2014*, fertilizers must be applied in between the following dates. These are guidelines and averages, in warmer years fertilizers could be applied earlier and in cooler years fertilizers should be applied later. Fertilizers should not be applied to frozen ground or to grass that is not actively growing. For warm season grasses please wait for green up to occur. For warm season grasses that are overseeded, follow the cool season application window. If overseeding is skipped, please revert to warm season window.

<table>
<thead>
<tr>
<th></th>
<th><strong>Average Frost Dates</strong></th>
<th><strong>Cool Season Applications</strong></th>
<th><strong>Warm Season Applications</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spring</strong></td>
<td>April 20</td>
<td>March 9</td>
<td>April 20</td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td>October 15</td>
<td>November 26</td>
<td>September 15</td>
</tr>
</tbody>
</table>

**Maps** – Maps created using Google Earth are to scale as shown in bottom left of each map. For all maps, unless otherwise indicated, North is oriented towards top of page. Additional Flood maps created by Web Soil Survey.

**Nutrient Applications** - Each location addressed by this plan has its own section. Some sections cover multiple management areas. Soil tests were all similar, only one application schedule will be given for all locations. Application records are all located in one section together or on the disk provided. A blank worksheet is also included on the disk to help with calculations if any changes in fertilizer analysis occur. Do not hesitate to call if there are questions.

**Flooding Frequency Class Designations** – Areas indicated as flood prone by Web Soil Survey. Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;None&quot;</td>
<td>&quot;None&quot; means that flooding is not probable. The chance of flooding is nearly 0 percent in any year. Flooding occurs less than once in 500 years.</td>
</tr>
<tr>
<td>&quot;Very rare&quot;</td>
<td>&quot;Very rare&quot; means that flooding is very unlikely but possible under extremely unusual weather conditions. The chance of flooding is less than 1 percent in any year.</td>
</tr>
<tr>
<td>&quot;Rare&quot;</td>
<td>&quot;Rare&quot; means that flooding is unlikely but possible under unusual weather conditions. The chance of flooding is 1 to 5 percent in any year.</td>
</tr>
<tr>
<td>&quot;Occasional&quot;</td>
<td>&quot;Occasional&quot; means that flooding occurs infrequently under normal weather conditions. The chance of flooding is 5 to 50 percent in any year.</td>
</tr>
<tr>
<td>&quot;Frequent&quot;</td>
<td>&quot;Frequent&quot; means that flooding is likely to occur often under normal weather conditions. The chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year.</td>
</tr>
<tr>
<td>&quot;Very frequent&quot;</td>
<td>&quot;Very frequent&quot; means that flooding is likely to occur very often under normal weather conditions. The chance of flooding is more than 50 percent in all months of any year.</td>
</tr>
</tbody>
</table>
2. **Management Areas**

2.1. **Municipal Park Complex**

A: **Description**

The Blacksburg Municipal Park is located on 35 acres. It is also known as the Caboose Park or the Hand-in-hand park. The Municipal Park is one of the largest play areas in Blacksburg, several generations of children have enjoyed swinging and sliding at the park. Amenities: soccer fields, lighted softball fields, tennis courts, roller hockey court, skate park, horseshoe pits, playground, swings, barbecue grills, picnic tables/shelters, gazebos, benches.

The softball field behind the Aquatic Center is fertilized.

B: **Location**

From the intersection of Prices Fork and Main Street (traffic circle) head north on Main Street about 1 mile to Patrick Henry Drive. Take a right on to Patrick Henry Drive park will be located on the right in about 0.3 miles behind the Aquatic Center.

Address: 920 Turner St NE, Blacksburg, VA 24060

GPS Coordinates: 37.242200, -80.411397

C: **Areas Managed**

The cool season, unirrigated softball field is fertilized. It is 1.9 acres.

---

**Environmentally Sensitive –**

- There are many roads, sidewalks and storm water drains throughout the area. Be cautious when making fertilizer applications near these areas and always clean up any fertilizers accidently spread on pavement and sidewalks.
- There is no flood risk in this area according to Web soil Survey.
2.2. Seneca Drive Park

A: Description
Seneca drive park is a large field located near the Hunters Ridge Apartment Complex. The field is used for soccer.

B: Location
From the intersection of Prices Fork and Main Street (traffic circle) head north on Main Street about 1 mile to Patrick Henry Drive. Take a left on to Patrick Henry Drive and then in 0.2 miles take a right onto Seneca Drive Park, this is the entrance into Hunters Ridge Apartments. The park will be located on the right in about 0.1 miles.

Address: 1532-1582 Seneca Drive, Blacksburg, VA 24060
GPS Coordinates: 37.248332, -80.416431

C: Areas Managed
The cool season, unirrigated 1.45-acre field is fertilized.

Environmentally Sensitive –

- There are many roads, sidewalks and storm water drains throughout the area. Be cautious when making fertilizer applications near these areas and always clean up any fertilizers accidently spread on pavement and sidewalks.
- There is no flood risk in this area according to Web Soil Survey.
2.3. **Winfrey Fields**

A: **Description**
Winfrey Fields are located between Kips Elementary School and Blacksburg Middle. There are 2 multipurpose fields and 2 soccer fields.

B: **Location**
From the intersection of Prices Fork and Main Street (traffic circle) head west on Prices Fork 2.6 miles take left into Kips Elementary School Parking lot. Fields are located between the middle and elementary schools.

Address: 2801 Prices Fork Road, Blacksburg, Virginia 24060
GPS Coordinates: 37.215284, -80.457950

C: **Areas Managed**
The cool season, unirrigated fields are 6.53 acres.

**Environmentally Sensitive –**
- There are many roads, sidewalks and storm water drains throughout the area. Be cautious when making fertilizer applications near these areas and always clean up any fertilizers accidently spread on pavement and sidewalks.
- There is no flood risk in this area according to Web soil Survey.
2.4. **Primrose Lane Park**

**A: Description**
Primrose Lane Park is located on six acres and offers a soccer field, basketball court, playground, picnic tables and benches. The soccer field is fertilized.

**B: Location**
From the intersection of Prices Fork and Main Street (traffic circle) head north on Main Street about 1.7 miles then take a left onto Country Side Court. Primrose Dr. will be the next right. Park will 0.2 miles on right.

Address: 122 Primrose Dr., Blacksburg, VA 24060
GPS Coordinates: 37.259020, -80.414425

**C: Areas Managed**
The 1.25-acre cool season, unirrigated soccer field is fertilized.

**Environmentally Sensitive –**
- There is no risk of flooding in this area, but there is a creek in the bottom land to the north of this field where flooding may occur and any runoff from this area will end up in this creek. Please refrain from making fertilizer applications when heavy rains are expected.
2.5. **Toms Creek Park**

**A: Description**
Toms Creek Park has a lighted softball field, playground, swings, picnic tables, benches, bleachers, and public restrooms. The park is also home to the Blacksburg Dog Park.

The softball field is fertilized.

**B: Location**
From the intersection of Prices Fork and Main Street (traffic circle) head west on Prices Fork 0.3 miles then take right onto Toms Creek Road. Park will be on the right in 1.5 miles.

Address: 2100 Toms Creek Rd, Blacksburg, VA 24060
GPS Coordinates: 37.252634, -80.436328

**C: Areas Managed**
The cool season, unirrigated field is 1.89 acres.

**Environmentally Sensitive –**
- There are many roads, sidewalks and storm water drains throughout the area. Be cautious when making fertilizer applications near these areas and always clean up any fertilizers accidently spread on pavement and sidewalks.
- According to Web Soil Survey, there is a risk of flooding in the area across Toms Creek Road from the field. The fields are elevated about the flood prone area, but any run off will end up in Toms Creek. Please refrain from making fertilizer applications when heavy rains are expected.
3. **Soil Test Summaries**

Discussion of soil test results and allowable nutrient inputs. Specific applications details can be found in Nutrient Application Worksheet.

Soil samples were taken by Robert Habel on 3/8/16. A minimum of 10 random sub samples were collected, at a depth of 3-4 inches, using a soil probe and placed in plastic bags. Thatch and other organics were removed prior to boxing.

Soil tests are rated in terms of Very Low to Very High. In order to comply with Virginia Nutrient Management Standards and Criteria, Revised July 2014, no phosphorus or potassium may be applied if a soil test rates that element Very High. In economic terms, nutrients are not necessarily needed if they test above a medium rating; plant response is not guaranteed if soils already test above medium and therefore money can be saved by using a nitrogen only fertilizer. (See plant response chart page 23)

- All areas in this plan are low input cool season sports turf and will be treated the same.
- Plan will be written for maximum nitrogen input. The grounds manager will decide if all applications are needed.
- Application plans and Application Record sheets are grouped together. Additional blank record forms are available on included CD.

Soil tests average low (M+) levels of phosphorus and high (H) levels of potassium. 1 #/M of phosphorus is allowed. 0.75 #/M of potassium will be allowed.

Regulations allow for up to 3 lbs/M of nitrogen per year. If using 100% water-soluble nitrogen .7 lbs may be applied every 30 days. If using slow release materials, .9 lbs may be used every 30 days. Do not exceed stated per year total.

Lime is needed at Primrose Park. The buffer pH is 6.61 and 2 Tons of lime is required; this should be made in 4 apps of 50#/M. No more than 50#/M should be applied per month. Spring and fall are the best times for lime application. Attempt to coordinate with aerification.
# Soil Test Summary

**Customer Name:** Town of Blacksburg  
**Testing Lab:** WayPoint Analytical  
**Sample Date:** 11/8/16  
**Analysis Date:** 11/11/2016  
**Planner Name:** Five Oaks Agronomy Consulting, LLC  
**Certification Number:** 654

<table>
<thead>
<tr>
<th>Managed Area ID</th>
<th>Soil pH</th>
<th>Buffer pH (ppm)</th>
<th>Lab P (ppm)</th>
<th>VT P (H/M/L)</th>
<th>VT K (ppm)</th>
<th>VT K (H/M/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB WF Winfrey Fields</td>
<td>6.40</td>
<td>36</td>
<td>13.2</td>
<td>M</td>
<td>143</td>
<td>101.5</td>
</tr>
<tr>
<td>BB TCP Toms Creek Park</td>
<td>7.20</td>
<td>49</td>
<td>19.2</td>
<td>H-</td>
<td>178</td>
<td>126.4</td>
</tr>
<tr>
<td>BB SDP Seneca Drive Park</td>
<td>6.40</td>
<td>23</td>
<td>7.3</td>
<td>M-</td>
<td>177</td>
<td>125.7</td>
</tr>
<tr>
<td>BB PP Primrose Park</td>
<td>4.90</td>
<td>6.61</td>
<td>54</td>
<td>21.5</td>
<td>H-</td>
<td>126</td>
</tr>
<tr>
<td>BB MCP Municipal Park</td>
<td>6.50</td>
<td>56</td>
<td>22.4</td>
<td>H-</td>
<td>264</td>
<td>187.4</td>
</tr>
</tbody>
</table>

**Average Results**  
16.7 M+ 126.10 H

<table>
<thead>
<tr>
<th>Lime</th>
<th>P</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allowed Inputs</strong></td>
<td>1 #/M</td>
<td>0.75 #/M</td>
</tr>
</tbody>
</table>
4. **Nutrient Application Worksheets**

The following worksheets detail specific fertilizer applications using the previously discussed soil test information. All nutrient input level recommendations come from the Department of Conservation and Recreation's Nutrient Management Standards and Criteria, this document is part of the Code of Virginia and thus is law for those required to have a Nutrient Management Plan. While applications do not have to be followed specifically, it is important to note that per month nitrogen levels shall not be exceeded and per year phosphorus levels shall not be exceeded. In some cases, potassium input may exceed recommended levels, as it does not have the same detrimental effects on the health of Virginia's waters as nitrogen and phosphorus. Potassium is considered the plant nutrient most responsible for quality. It helps plants respond to stresses like drought, extreme heat/cold, and insect/disease pressure. The plants increased ability to respond to stress in a positive manner can help reduce the need for increased N and P fertility and reseeding caused by stress.
**NUTRIENT APPLICATION WORK SHEET**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Town of Blacksburg</th>
<th>Management Area:</th>
<th>All locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared:</td>
<td>12/1/2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expires:</td>
<td>12/1/2019</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Yearly Nutrient Needs**

<table>
<thead>
<tr>
<th>Application Month/Day</th>
<th>Analysis N - P - K</th>
<th>Interval (days)</th>
<th>Fertilizer Description</th>
<th>Rate/M</th>
<th>lbs/app</th>
<th>% Slow Release N</th>
<th>Total/M N - P - K</th>
<th>Lime</th>
<th>Gypsum</th>
<th>lbs/app</th>
<th>lime/gyp</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nitrogen</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 April 25 - 2 - 5 30</td>
<td>20% XRT 40% NB</td>
<td></td>
<td>2.40</td>
<td>1361</td>
<td>83</td>
<td>0.60 - 0.05 - 0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Phosphorus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 September 16 - 2 - 3 30</td>
<td>50%CRN; 20% NB; 15%AS; 2%Fe; Micros</td>
<td></td>
<td>5.00</td>
<td>2836</td>
<td>50</td>
<td>0.80 - 0.10 - 0.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Potassium</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.75 October 16 - 2 - 3 30</td>
<td>50%CRN; 20% NB; 15%AS; 2%Fe; Micros</td>
<td></td>
<td>5.00</td>
<td>2836</td>
<td>50</td>
<td>0.80 - 0.10 - 0.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 November 16 - 2 - 3 30</td>
<td>50%CRN; 20% NB; 15%AS; 2%Fe; Micros</td>
<td></td>
<td>5.00</td>
<td>2836</td>
<td>50</td>
<td>0.80 - 0.10 - 0.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

- Tested M+ in Phosphorus and H+ Potassium.
- Please stay within frost free days indicated.
- Application rates are based on use of at least 15% slow release fertilizer. 0.9 #/M N allowed if using at least 15% slow release nitrogen. If using less than 15% only 0.7 #/M nitrogen allowed.
- All fertilizer analyses are subject to change; do not exceed stated monthly Total N or yearly total P. Please contact your planner if you need help adjusting a fertilizer application to meet the requirements of this plan.

---

**Do not exceed yearly maximum allowed by Regulation:** 3 - 1 - 0.75

---

**See soil test discussion for info on needed lime applications**
## Fertilizer Application Records

<table>
<thead>
<tr>
<th>Location Information</th>
<th>Management Area Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Management Area ID:</td>
</tr>
<tr>
<td>Kafi Howard – Town Engineer</td>
<td>All locations</td>
</tr>
<tr>
<td>Address:</td>
<td>Management Area Size:</td>
</tr>
<tr>
<td>300 S. Main St., PO Box 90003</td>
<td>13.02</td>
</tr>
<tr>
<td>Blacksburg, Virginia 24062-9003</td>
<td>Plant Species: Mixed cool season</td>
</tr>
<tr>
<td>Phone#:</td>
<td>Notes:</td>
</tr>
<tr>
<td>(540) 961-1124</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Applicator/Supervisor</th>
<th>Weather Info</th>
<th>Fertilizer Analysis</th>
<th>Rate</th>
<th>Amount Fertilizer Used</th>
<th>Equipment Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Temp</td>
<td>Wind</td>
<td>Precip</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When was the last time your fertilizer equipment was calibrated???

For information on calibration, see Chapter 10 of the "Urban Nutrient Management Handbook".

6. **Reference Material**

Nutrient Availability According to pH

![Figure 1: Nutrient Availability at pH](image)

*Figure 1: Nutrient Availability at pH*
**Very low:** A plant response is most likely if the indicated nutrient is applied. A large portion of the nutrient requirement must come from fertilization.

**Low:** A plant response is likely if the indicated nutrient is applied. A portion of the nutrient requirement must come from fertilization.

**Medium:** A plant response may or may not occur if the indicated nutrient is applied. A small portion of the nutrient requirement must come from fertilization.

**High:** Plant response is not expected. No additional fertilizer is needed.

**Very high:** Plant response is not expected. The soil can supply much more than the turf requires. Additional fertilizer should not be added to avoid nutritional problems and adverse environmental consequences.
Standards and Criteria

Section VI. Turfgrass Nutrient Recommendations for Home Lawns, Office Parks, Public Lands and Other Similar Residential/Commercial Grounds

Definitions

For the purposes of this section, the following definitions, as presented by the Association of American Plant Food Control Officials (AAPFCO), apply:

“Enhanced efficiency fertilizer” describes fertilizer products with characteristics that allow increased plant nutrient availability and reduce the potential of nutrient losses to the environment when compared to an appropriate reference product.

“Slow or controlled release fertilizer” means a fertilizer containing a plant nutrient in a form which delays its availability for plant uptake and use after application, or which extends its availability to the plant significantly longer than a reference “rapidly available nutrient fertilizer” such as ammonium nitrate, urea, ammonium phosphate or potassium chloride. A slow or controlled release fertilizer must contain a minimum of 15 percent slowly available forms of nitrogen.

“Water soluble nitrogen”, “WSN”, or “readily available nitrogen” means: Water soluble nitrogen in either ammonical, urea, or nitrate form that does not have a controlled release, or slow response.

Recommended Season of Application For Nitrogen Fertilizers - Applies to all Turf

A nitrogen fertilization schedule weighted toward fall application is recommended and preferred for agronomic quality and persistence of cool season turfgrass; however, the acceptable window of applications is much wider than this for nutrient management. The nutrient management recommended application season for nitrogen fertilizers to cool season turfgrasses begins six weeks prior to the last spring average killing frost date and ends six weeks past the first fall average killing frost date (see Figures 6-1 & 6-2). Applications of nitrogen during the intervening late fall and winter period should be avoided due to higher potential leaching or runoff risk, but where necessary, apply no more than 0.5 pounds per 1,000 ft² of water soluble nitrogen within a 30-day period. Higher application rates may be used during this late fall and winter period by using materials containing slowly available sources of nitrogen, if the water soluble nitrogen contained in the fertilizer does not exceed the recommended maximum of 0.5 pounds per 1,000 ft² rate. Do not apply nitrogen or phosphorus fertilizers when the ground is frozen.

The acceptable nitrogen fertilizer application season for non-overseeded warm season turfgrass begins no earlier than the last spring average killing frost date and ends no later than one month prior to the first fall average killing frost date (see Figures 6-1 & 6-2).
Figure 6-1

VIRGINIA
AVERAGE DATES OF FIRST KILLING FROST IN FALL

Figure 6-2

VIRGINIA
AVERAGE DATES OF LAST KILLING FROST IN SPRING
Per Application Rates

Do not apply more than 0.7 pounds of water soluble nitrogen per 1,000 ft² within a 30-day period. For cool season grasses, do not apply more than 0.9 pounds of total nitrogen per 1,000 ft² within a 30-day period. For warm season grasses, do not apply more than 1.0 pounds of total nitrogen per 1,000 ft² within a 30-day period. Lower per application rates of water soluble nitrogen sources or use of slowly available nitrogen sources should be utilized on very permeable sandy soils, shallow soils over fractured bedrock, or areas near water wells.

Annual Application Rates for Home Lawns and Commercial Turf

Up to 3.5 pounds per 1,000 ft² of nitrogen may be applied annually to cool season grass species or up to 4 pounds per 1,000 ft² may be applied annually to warm season grass species using 100 percent water soluble nitrogen sources. Lower rates of nitrogen application may be desirable on those mature stands of grasses that require less nitrogen for long-term quality. As a result, lower application rates will probably be more suited to the fine leaf fescues (hard fescue, chewings fescue, creeping red fescue, and sheep fescue) and non-overseeded zoysiagrass. Lower rates should also be used on less intensively managed areas.

Use of Slowly Available Forms of Nitrogen

For slow or controlled release fertilizer sources, or enhanced efficiency fertilizer sources, no more than 0.9 pounds of nitrogen per 1,000 ft² may be applied to cool season grasses within a 30-day period and no more than 1.0 pounds of nitrogen per 1,000 ft² may be applied to warm season grasses within a 30-day period.

Provided the fertilizer label guarantees that the product can be used in such a way that it will not release more than 0.7 pounds of nitrogen per 1,000 ft² in a 30-day period, no more than 2.5 pounds of nitrogen per 1,000 ft² may be applied in a single application. Additionally, total annual applications shall not exceed 80 percent of the annual nitrogen rates for cool or warm season grasses.

Phosphorus and Potassium Nutrient Needs (Established Turf)

Apply phosphorus (P₂O₅) and potassium (K₂O) fertilizers as indicated necessary by a soil test using the following guidelines:

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P₂O₅</td>
</tr>
<tr>
<td>L</td>
<td>2-3</td>
</tr>
<tr>
<td>M</td>
<td>1-2</td>
</tr>
<tr>
<td>H</td>
<td>0.5-1</td>
</tr>
<tr>
<td>VH</td>
<td>0</td>
</tr>
</tbody>
</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range. (For example the recommendation for a P₂O₅ soil test level of L- would be 3 pounds per 1,000 ft².)

Do not use high phosphorus ratio fertilizers such as 10-10-10 or 5-10-10, unless soil tests indicate phosphorus availability below the M+ level.
Recommendations for Establishment of Turf

These recommendations are for timely planted turfgrass, that is, the seed or vegetative material (sod, plugs, and/or sprigs), are planted at a time of the year when temperatures and moisture are adequate to maximize turfgrass establishment. These recommended establishment periods would be late summer to early fall for cool-season turfgrasses and late spring through mid-summer for warm-season turfgrasses.

Nitrogen Applications

At the time of establishment, apply no more than 0.9 pounds per 1,000 ft² of total nitrogen for cool season grasses or 1.0 pounds per 1,000 ft² of total nitrogen for warm season grasses, using a material containing slowly available forms of nitrogen, followed by one or two applications beginning 30 days after planting, not to exceed a total of 1.8 pounds per 1,000 ft² total for cool season grasses and 2.0 pounds per 1,000 ft² for warm season grasses for the establishment period. Applications of WSN cannot exceed more than 0.7 pounds per 1,000 ft² within a 30-day period.

Phosphorus and Potassium Recommendations for Establishment

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft²) *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P₂O₅</td>
</tr>
<tr>
<td>L</td>
<td>3-4</td>
</tr>
<tr>
<td>M</td>
<td>2-3</td>
</tr>
<tr>
<td>H</td>
<td>2-1</td>
</tr>
<tr>
<td>VH</td>
<td>0</td>
</tr>
</tbody>
</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.
Nutrient Recommendations for Golf Courses

Nitrogen Timing

The beginning and ending dates for application of nitrogen shall be determined using guidance and frost date maps contained in the Season of Application for Nitrogen section, Figures 6-1 and 6-2.

If the full rate or the highest rate of the recommendation range for a monthly application is applied in a single application, then the interval of application for nitrogen shall be at least 30 days to allow turf to utilize previous nitrogen applications. If several applications are to be made for the monthly nitrogen rate, then the timing of the applications shall be at approximately even intervals, with the rate per application to be evenly divided between each application with the total nitrogen applied not to exceed the maximum monthly rate. Use of Water Insoluble Nitrogen forms of Nitrogen is encouraged.

Nitrogen Rates

<table>
<thead>
<tr>
<th>Grass Type</th>
<th>Maximum WSN Rate Per Application - pounds per 1,000 ft²</th>
<th>Total Annual Nitrogen Rate - pounds per 1,000 ft²a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greens</td>
<td>0.7 (b)</td>
<td>3-6</td>
</tr>
<tr>
<td>Tees</td>
<td>0.7 (b)</td>
<td>2-5</td>
</tr>
<tr>
<td>Fairways</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cool Season</td>
<td>0.7 (c)</td>
<td>2-3</td>
</tr>
<tr>
<td>Warm Season</td>
<td>0.7 (c)</td>
<td>3-4</td>
</tr>
<tr>
<td>Fairways – Intensive Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cool Season</td>
<td>0.5 (d)</td>
<td>3-4</td>
</tr>
<tr>
<td>Warm Season</td>
<td>0.5 (d)</td>
<td>3.5-4.5</td>
</tr>
<tr>
<td>Overseeding Warm Season Fairways</td>
<td>.5</td>
<td>1.25</td>
</tr>
<tr>
<td>Roughs</td>
<td>0.7 (c)</td>
<td>1-3</td>
</tr>
</tbody>
</table>

Fairways-Overseeding Warm Season Fairways

- For warm season grasses, up to 0.7 pounds of nitrogen per 1,000 ft² in a 30-day period may be applied in the Fall after perennial ryegrass overseeding is well established. An additional nitrogen application of 0.7 pounds per 1,000 ft² may be made in February-March to overseeded perennial ryegrass if growth and color indicate need. Applications using WSN may not exceed 0.7 pounds per 1,000 ft² within a 30-day period.

- Soluble nitrogen rates of 0.25 pounds per 1,000 ft² or less which may be a component of a pesticide or minor element application, may be applied any time during the application windows described in Recommended Season of Application for Nitrogen Fertilizers of this section, but must be considered with the total annual nitrogen application rate.

(a) Use higher rates for intensively used turf where accelerated growth and/or rapid recovery are required, use lower rates for maintenance of lesser used areas; do not exceed total annual nitrogen levels as stated above.
(b) Greens and Tees – Per application timing must be a minimum of 30 days between applications. A rate of 0.9 pounds per 1,000 ft² of total nitrogen may be applied for cool season grasses or 1.0 pounds per 1,000 ft² of total nitrogen may be applied for warm season grasses using a material containing slowly available forms of nitrogen.

(c) Fairways-Normal Management (Non-Irrigated or Irrigated) - Per Application timing must be a minimum of 30 days between applications. Total nitrogen application rates of 0.9 pounds per 1,000 ft² of total nitrogen may be applied for cool season grasses or 1.0 pound per 1,000 ft² of total nitrogen may be applied for warm season grasses using a material containing slowly available forms of nitrogen.

(d) Fairways-Intensive Management (Irrigated)- Per Application timing must be a minimum of 15 days between applications. This option requires optimized timing of more frequent applications of nitrogen with lesser rates per application. Alternatively, a maximum application rate of 0.9 pounds per 1,000 ft² of total nitrogen for cool season grasses or 1.0 pounds per 1,000 ft² of total nitrogen for warm season grasses using a material containing slowly available forms of nitrogen may be applied with a minimum of 30 days between applications.

(e) Foliar fertilizer may be applied to warm season grasses within 30 days prior to the first killing frost in the fall, at a rate not to exceed 0.1 pounds per 1,000 ft² of nitrogen per application. This application must be accounted for in the total annual nitrogen rate.

Phosphorus and Potassium Recommendations for Established Golf Courses

Apply phosphorus (P₂O₅) and potassium (K₂O) fertilizers as indicated by a soil test using the following guidelines:

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft²)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P₂O₅</td>
</tr>
<tr>
<td>L</td>
<td>2-3</td>
</tr>
<tr>
<td>M</td>
<td>1-2</td>
</tr>
<tr>
<td>H</td>
<td>0.5-1</td>
</tr>
<tr>
<td>VH</td>
<td>0</td>
</tr>
</tbody>
</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.

- For irrigated turf grown on Naturally Occurring and Modified Sand Based soils only, up to 0.5 pounds of P₂O₅ per 1,000 ft² may be applied, if needed, to aid in recovery of damaged turf during times of extreme use. No phosphorus applications shall be made when the soil phosphorus test level is above 65% saturation, based on the soil test phosphorus values and region as listed in Table 4-1 of Section IV.

- Avoid the general use of high phosphorus ratio fertilizers such as 10-10-10 or 5-10-10, unless soil tests indicate phosphorus availability below the M+ level.

Nitrogen Management on Athletic Fields - Cool Season Grasses

- This program is intended for those fields which are under heavy use.

- Nitrogen recommendations are based on the assumption that there is adequate soil moisture to promote good turf growth at the time of application. If no rainfall has occurred since the last application, further applications should be delayed until significant soil moisture is available.
<table>
<thead>
<tr>
<th>Cool Season Grasses</th>
<th>Maintenance Program&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Normal</th>
<th>Intensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to Apply&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Pounds per 1,000 ft&lt;sup&gt;2&lt;/sup&gt; Nitrogen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>After August 15</td>
<td>---</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>0.7</td>
<td>0.7&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>0.7&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.7&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>0.5</td>
<td>0.7&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>April 15 - May 15</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>June 1 - June 15</td>
<td>---</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

- Soluble nitrogen rates of 0.25 pounds per 1,000 ft<sup>2</sup> or less which may be a component of a pesticide or minor element application may be applied any time the turf is actively growing, but must be considered with the total annual nitrogen application rate.
- WSN = water soluble nitrogen; WIN = water insoluble nitrogen

(a) Intensive managed areas must be irrigated.

(b) The beginning and ending dates for application of nitrogen shall be determined using guidance and frost date maps contained in the preceding Season of Application for Nitrogen section, using Figures 6-1 and 6-2.

(c) Rates up to 0.9 pounds per 1,000 ft<sup>2</sup> of total nitrogen can be applied using a material containing slowly available forms of nitrogen, with a minimum of 30 days between applications.

(d) Make this application only if turf use warrants additional nitrogen for sustaining desirable growth and/or color.

**Nitrogen Management on Athletic Fields - Warm Season Grasses**

The following comments apply to both Naturally Occurring or Modified Sand based Fields and Predominantly Silt/Clay Soil Fields:

- Annual nitrogen rates for warm season grasses shall not exceed 4 pounds in areas which have the average first killing frost on or before October 20, and shall not exceed 5 pounds in areas which have the average first killing frost after October 20 as shown in Figure 6-1. Nitrogen rates and timings for overseeding warm season grasses are not included in these rates.
- April 15 - May 15 applications should not be made until after complete green-up of turf.
- Nitrogen applications June through August should be coordinated with anticipated rainfall if irrigation is not available.
- Use the lower end of the ranges for non-irrigated fields and the higher end of the ranges should be used on fields with irrigation.
• Nitrogen rates towards the higher end of the ranges may be applied on heavily used fields to accelerate recovery, however per application and annual rates cannot be exceeded.

<table>
<thead>
<tr>
<th>Bermudagrass - Predominantly Silt/Clay Soil Fields</th>
<th>When to Apply</th>
<th>Pounds per 1,000 ft² Nitrogen</th>
<th>First Fall Killing Frost Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 15 - May 15</td>
<td>0.5 - 0.7 (c)</td>
<td></td>
<td>Before Oct. 20</td>
</tr>
<tr>
<td>June</td>
<td>0.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>0.5 - 0.7 (d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>0.5 - 0.7 (d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept 1 - Sept 15</td>
<td>0.5 - 0.7 (c)</td>
<td>After Oct. 20</td>
<td></td>
</tr>
<tr>
<td>If overseeded with perennial ryegrass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct - Nov</td>
<td>0.5 (e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb - Mar</td>
<td>0.5 (e)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bermudagrass - Naturally Occurring or Modified Sand based Fields</th>
<th>When to Apply</th>
<th>Pounds per 1,000 ft² Nitrogen</th>
<th>First Fall Killing Frost Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 15 - May 15</td>
<td>0.5 - 0.7 (c)</td>
<td></td>
<td>Before Oct. 20</td>
</tr>
<tr>
<td>June</td>
<td>0.7 (c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>0.7 (c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>0.7 (c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept 1 - Sept 15</td>
<td>0.7 (c)</td>
<td>After Oct. 20</td>
<td></td>
</tr>
<tr>
<td>If overseeded with perennial ryegrass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct - Nov</td>
<td>0.5 (e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb - Mar</td>
<td>0.5 (e)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following notes apply to both of the Bermudagrass tables above:

(a) In the Piedmont and the Ridge and Valley areas of Virginia, the existing native soil will normally be comprised predominantly of clay and/or silt and these soils have inherently lower water infiltration and percolation rates and greater nutrient holding capacity. However, most areas of the Coastal Plain have existing native soils that are predominantly sandy textured soils and other facilities throughout the state may choose to install modified soil root zones that are predominantly sand (>50%) in order to maximize drainage and reduce compaction tendency. If subsurface drain tile surrounded by sand and/or gravel has been installed under the playing surface of any of these fields, their nitrogen programs should be managed as predominantly sand-based systems to minimize nutrient leaching.

(b) The beginning and ending dates for application of nitrogen shall be determined using guidance and frost date maps contained in the Season of Application for Nitrogen section, Figures 6-1 and 6-2.

(c) WSN must be applied as two applications not to exceed 0.35 pounds per 1,000 ft² each with a minimum of 15 days between applications. Alternatively, using a material that contains slowly available nitrogen sources, split applications of 0.5 pounds per 1,000 ft² may be applied with a minimum of 15 days between applications.
(d) If a material containing slowly available forms of nitrogen is used, rates up to 1.0 pounds of nitrogen per 1,000 ft² may be applied in a single application with a minimum of 30 days between applications.

(e) For overseeded warm season grasses, an additional 0.7 pounds per 1,000 ft² of WSN may be applied in the Fall after the perennial ryegrass overseeding is well established. The WSN must be applied as two applications not to exceed 0.35 pounds per 1,000 ft² of nitrogen each, with a minimum of 15 days between applications. Additional WSN application of 0.5 pounds per 1,000 ft² may be made in February-March to overseeded perennial ryegrass if growth and color indicate need. Alternatively, split applications of 0.5 pounds of nitrogen per 1,000 ft² each with a minimum of 15 days between applications may be applied using a material containing slowly available nitrogen sources.

**Phosphorus and Potassium Recommendations Athletic Fields**

Apply phosphorus (P₂O₅) and potassium (K₂O) fertilizers as indicated by a soil test using the following guidelines:

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft²)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P₂O₅</td>
</tr>
<tr>
<td>L</td>
<td>2-3</td>
</tr>
<tr>
<td>M</td>
<td>1-2</td>
</tr>
<tr>
<td>H</td>
<td>0.5-1</td>
</tr>
<tr>
<td>VH</td>
<td>0</td>
</tr>
</tbody>
</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.

- For irrigated turf grown on Naturally Occurring and Modified Sand Based soils only, up to 0.5 pounds of P₂O₅ per 1,000 ft² may be applied, if needed, to aid in recovery of damaged turf during times of extreme use. No phosphorus applications shall be made when the soil phosphorus test level is above 65% saturation, based on the soil test phosphorus values and region as listed in Table 4-1 of Section IV.

- Avoid the general use of high phosphorus ratio fertilizers such as 10-10-10 or 5-10-10, unless soil tests indicate phosphorus availability below the M+ level.
Establishment/Grow-In Recommendations for Golf Courses, Athletic Fields, and Sod Production
(These rates replace normal maintenance fertilizer applications that would have occurred during these time periods.)

Warm Season Grasses:

Predominantly Silt/Clay Soils
- Plant Date - late May -June for sprigs, plugs, sod, or seeding.
- Apply P₂O₅ and K₂O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - Up to 1.0 pounds of nitrogen per 1,000 ft² using a material containing slowly available forms of nitrogen may be applied as one application or lesser amounts applied at regular intervals, through the first 4 weeks, not to exceed a total of 1.0 pounds of nitrogen per 1,000 ft².
- Four weeks after planting - 0.25 pounds of WSN per 1,000 ft² per week for the next 4 weeks.

Naturally Occurring or Modified Sand Based Soils
- Plant Date - late May -June for sprigs, plugs, sod, or seeding.
- Apply P₂O₅ and K₂O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - Up to 1.0 pounds of nitrogen per 1,000 ft² using a material containing slowly available forms of nitrogen may be applied as one application or lesser amounts applied at regular intervals through the first 4 weeks, not to exceed a total of 1.0 pounds of nitrogen per 1,000 ft².
- Four weeks after planting - 0.25 pounds per 1,000 ft² using a material containing slowly available forms of nitrogen per week for the next 4 weeks.

Cool Season Grasses:

Predominantly Silt/Clay Soils
- Plant Date - August - September (preferred)
- Apply P₂O₅ and K₂O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - up to 0.9 pounds of nitrogen per 1,000 ft² using a material containing slowly available forms of nitrogen may be applied; 30 days after planting, apply up to 0.5 pounds of nitrogen per 1,000 ft² every week for the next 4 weeks.

Naturally Occurring or Modified Sand Based Soils
- Plant Date - August - September (preferred)
- Apply P₂O₅ and K₂O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - up to 0.9 pounds of nitrogen per 1,000 ft² using a material containing slowly available forms of nitrogen may be applied.
- Apply up to 0.25 pounds of nitrogen per 1,000 ft² per week after germination is complete, for the next 8 weeks. If using a material that contains slowly available forms of nitrogen, up to 0.5 pounds of nitrogen per 1,000 ft² every two weeks may be applied after germination is complete for the next 8 weeks.
Sod Installations:

Site preparation should include a soil test, which can be done several months before the project begins in order to have time to get test results back. Phosphorus, potassium and lime applications should be based on soil test analysis to increase the likelihood of a successful installation. Shallow incorporation of material into the top 2 inches of the soil is preferred prior to sod installation, especially if lime is required.

No more than 0.7 pounds of nitrogen per 1,000 ft² of WSN may be applied before sod is installed. Alternatively, using a material with slowly available forms of nitrogen, 0.9 pounds of nitrogen per 1,000 ft² for cool season grasses or 1.0 pounds of nitrogen per 1,000 ft² for warm season grasses may be applied before sod is installed.

After installation apply adequate amounts of water to maintain sufficient soil moisture (i.e. to prevent visible wilt symptoms). Excessive water will limit initial root development. After roots begin to establish (as verified by lightly tugging on the sod pieces), shift irrigation strategy to a deep and infrequent program in order to encourage deep root growth. Apply approximately 1 inch of water per week (either by rainfall or irrigation), making sure that the water is being accepted by the soil profile without running off. This will insure thorough wetting of the soil profile.

After sod has completed rooting and is well established, initiate the normal nitrogen management program as described for the appropriate use shall be recommended.

Phosphorus and Potassium Recommendations for Establishment/Grow-In/Installation

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft²)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P₂O₅</td>
</tr>
<tr>
<td>L</td>
<td>3-4</td>
</tr>
<tr>
<td>M</td>
<td>2-3</td>
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<td>H</td>
<td>2-1</td>
</tr>
<tr>
<td>VH</td>
<td>0</td>
</tr>
</tbody>
</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.
Other Turf Management Considerations for Golf Courses, Athletic fields, and Home Lawns

Lime Recommendations

Lime should be recommended based on a soil test to maintain soil pH within an agronomic range for turfgrass.

For new seedings where lime is recommended, incorporate the lime into the topsoil for best results.

Returning Grass Clippings

Recycling of clippings on turf should be encouraged as an effective means of recycling nitrogen, phosphorus, and potassium. Proper mowing practices that ensure no more than 1/3 of the leaf blade is removed in any cutting event will enhance turf appearance and performance when clippings are returned. Return all leaf clippings from mowing events to the turf rather than discharging them onto sidewalks or streets. Rotary mulching mowers can further enhance clipping recycling by reducing the size of clippings being returned to the turfgrass canopy.

Management of Collected Clippings

If clippings are collected they should be disposed of properly. They may be composted or spread uniformly as a thin layer over other turf areas or areas where the nutrient content of the clippings can be recycled through actively growing plants. They should not be blown onto impervious surfaces or surface waters, dumped down stormwater drains, or piled outside where rainwater will leach out the nutrients creating the potential for nutrient loss to the environment.

Use of Iron

Iron applications (particularly foliar applications) may periodically be used for enhanced greening as an alternative to nitrogen. These applications are most beneficial if applied in late spring through summer for cool season grasses and in late summer/fall applications for warm-season grasses.

Impervious Surfaces

Do not apply fertilizers containing nitrogen or phosphorus to impervious surfaces (sidewalks, streets, etc.). Remove any granular materials that land on impervious surfaces by sweeping and collecting, and either put the collected material back in the bag, or spread it onto the turf and/or using a leaf blower etc. to return the fertilizer back to the turfgrass canopy.
### Table 3-1
Lime Recommendations for Virginia Crops (tons/acre)
Lime Rates based on Va Tech Soil buffer pH

<table>
<thead>
<tr>
<th>Buffer pH</th>
<th>5.2</th>
<th>5.8</th>
<th>6.2</th>
<th>6.5</th>
<th>6.8</th>
<th>Acidity meq/100g</th>
</tr>
</thead>
<tbody>
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<td>0.00</td>
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<td>0.00</td>
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<td>0.75</td>
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</table>

Lime recommendations in the table above are based on the use of a liming material equivalent in neutralizing power to 100% CaCO₃. For application rates of liming material that is less than 100% neutralizing power of CaCO₃ (pure calcium carbonate) use the table in this section, Lime Rate Adjustment for CCE.
Lime Recommendations Using Other Testing Labs

For approved labs other than Virginia Tech, use the lime recommendations given by the lab. If there are no recommendations with the soil analysis, use the table below for A&L Agricultural, Spectrum Analytical, and Brookside Laboratories.

Table 3-2
Lime Application Rate1 (tons/acre) to achieve desired pH based on SMP Buffer Test

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<th>Soil-Buffer pH</th>
<th>Target Soil pH</th>
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<th>5.8</th>
<th>6.2</th>
<th>6.5</th>
<th>6.8</th>
</tr>
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<tbody>
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</tbody>
</table>

1 Ag-ground lime of 90% plus total neutralizing power (TNP) or CaCO3 equivalent, and fineness of 40% < 100 mesh, 50% < 60 mesh, 70% < 20 mesh and 95% < 8 mesh. Adjustments in the application rate should be made for liming materials with different particle sizes, or neutralizing value.

Waters Agricultural Laboratories uses the Adams and Evans single buffer method which uses a different table for recommendations than the Mehlich or the SMP tables supplied here. In the event you would have lab reports from Waters Lab, which do not have lime recommendations, contact the lab for recommendations based on their analysis procedure.

Lime Rate Adjustment for CCE

Using the lime application rate to achieve the desired target pH based on the soil test buffer pH, use the table below to adjust that rate based on the % CCE of the liming material to be applied.

Table 3-3
Lime Application Rate Adjustment Based on % CCE of Material

<table>
<thead>
<tr>
<th>% CCE of Liming Material</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
<th>110</th>
<th>120</th>
<th>130</th>
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</thead>
<tbody>
<tr>
<td>T/ac</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>0.5</td>
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<td>0.75</td>
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<td>0.75</td>
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<td>0.50</td>
<td>0.50</td>
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<td>0.25</td>
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<tr>
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<td>1.75</td>
<td>1.50</td>
<td>1.25</td>
<td>1.00</td>
<td>1.00</td>
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<td>1.50</td>
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<td>2.25</td>
<td>2.00</td>
<td>1.75</td>
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</tr>
<tr>
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</tr>
</tbody>
</table>

* Lime recommendation to adjust pH as determined from soil test analysis.

Figure 3: CEC Chart
### 7. Soil Test Results
See attached file.

<table>
<thead>
<tr>
<th>Location</th>
<th>Soil Test ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winfrey Fields</td>
<td>BB WF</td>
</tr>
<tr>
<td>Toms Creek Park</td>
<td>BB TCP</td>
</tr>
<tr>
<td>Seneca Drive Park</td>
<td>BB SDP</td>
</tr>
<tr>
<td>Primrose Park</td>
<td>BB PP</td>
</tr>
<tr>
<td>Municipal Park Complex</td>
<td>BB MCP</td>
</tr>
</tbody>
</table>
Nutrient Management planning is a large part of Virginia’s strategy to clean and protect the state’s waterways and to help meet the EPA’s goal of restoring the ecosystem of the Chesapeake Bay. When fertilizer is used improperly, the nutrients nitrogen and phosphorus are not used by the plant and can then be carried into streams, lakes, and rivers. These nutrients then cause major ecological problems. Turfgrass covers an estimated 1.2 million acres of the Chesapeake Bay watershed in Virginia. Per Virginia’s Watershed Implementation Plan (WIP), 500,000 acres must be addressed by nutrient management plans by 2025.

Urban Nutrient Management aims to limit the amount of nutrient rich runoff reaching the waters of Virginia ultimately the Chesapeake Bay from golf courses, athletic fields, homes, business complexes, etc. This is accomplished through following a site specific, agronomically and environmentally sound, Nutrient Management Plan written by a Certified Nutrient Management Planner. The goal of a Nutrient Management Plan is to manage the amount, placement, timing, and application of fertilizer, bio-solids and other nutrient rich materials all while achieving the healthiest turf or landscape area possible.

While not all of Virginia is included in the Chesapeake Bay Watershed, all of Virginia’s waters can be improved by following a nutrient management plan. The Chesapeake Bay cleanup is being used as a model for future endeavors. The Albemarle Sound and Gulf of Mexico may soon be under the same restrictions as the Bay. The Roanoke, Nottaway and Meherrin Rivers all flow into North Carolina’s Albemarle Sound, while the New, Holston and Clinch rivers flow to the Mississippi River and Gulf of Mexico.

These plans can be voluntary, but in several cases, they are required by law. Both golf courses and state owned lands are currently required to have plans, as well as fertilized land that is publicly owned within a Municipal Separate Storm Sewer System (MS4) permit area. These laws apply to both areas inside and outside of the Chesapeake Bay Watershed.

Thank you for choosing me to write your Nutrient Management Plan. It is my goal to provide you with the most agronomically and environmentally sound plan available. For this plan to be effective, it is important that you follow the soil test based guidelines of your plan and that you keep detailed records of your applications. While you do not have to follow the specific fertilizer analyses shown, the success of this plan hinges on not exceeding the nutrient amounts that are allowed for by the Standards and Criteria. These amounts are stressed multiple times in the discussion of Soil Test Results and Application Worksheets. In cases where plans are required by law, the limits set by the Standards and Criteria are law.

If this is a renewal plan, please be aware that the Standards and Criteria were revised in July 2014. Many guidelines have changed and old recommendations may be out of compliance with the new standards.

Together, we will do our part to protect Virginia’s natural beauty and the Chesapeake Bay. Please do not hesitate to contact me if you have questions or suggestions. Your input is integral to making your Nutrient Management Plan a living and usable document.

Thank You,

Robert Habel
Owner - CNMP - VT ’05
# Nutrient Management Plan

## Prepared For:
Blacksburg Municipal Golf Course  
800 Graves Avenue  
Blacksburg, VA 24060  
(540) 961-1137

## Prepared By:
Five Oaks Agronomy Consulting  
Robert Habel, CNMP  
192 Briarherst Drive  
Amherst, Virginia 24521  
Cell: 434-665-2813  
habelrf@gmail.com  
Certification Code: 654

<table>
<thead>
<tr>
<th>Acreage Total – 31.5</th>
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</thead>
<tbody>
<tr>
<td><strong>9 Soil Samples</strong></td>
</tr>
<tr>
<td>Greens: 0.75</td>
</tr>
<tr>
<td>Tees: 0.75</td>
</tr>
<tr>
<td>Fairways: 20</td>
</tr>
<tr>
<td>Rough: 10</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>County: Montgomery – Town of Blacksburg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watershed:</td>
</tr>
<tr>
<td>NE59 – 24.3 Acres</td>
</tr>
<tr>
<td>RU06 – 4.3 Acres</td>
</tr>
<tr>
<td>RU07 – 2.9 Acres</td>
</tr>
</tbody>
</table>

## Plan Written: December 1, 2016

## Plan Expires: December 1, 2021

[Planner Signature]
Sources:
Maps – Maps are produced using Google Earth or provided by client.
Photos/Logos – Obtained from client, clients website, or taken by planner.
Site information – Obtained from client or clients website.
Technical Information –
Soil Fertility and Fertilizers 6th Ed. – Havlin, Beaton, Tisdale, Nelson – 1999
Spectrum Analytic Agronomic Library – www.spectrumanalytic.com
Turf Management for Golf Courses 2nd Ed. – Beard, USGA – 2002
Turfgrass Soil Fertility and Chemical Problems – Carrow, Waddington, Rieke – 2001
Virginia Nutrient Management Standards and Criteria – Commonwealth of Virginia – July 2014

Disclaimer: Statements and recommendations made within this document based on published research data and experience. Recommendations are based on the soil tests included in this document and not intended for use on any other facility. Products suggested are used in methods suggest by label guidelines when available, be sure to read label before using products as labels can change. Maximum rates are provided by Virginia Department of Conservation and Recreation Standards and Criteria and are not to be exceeded even when product label suggests otherwise. No guarantee or warranty is made, expressed or implied, concerning crop performance as a result of using the contents of this document.
1. **Narrative**
As a golf course required to have a plan by July 2017, Blacksburg Municipal Golf Course, agrees to comply with all requirements set forth in the Nutrient Management Training and Certification Regulations, 4VAC50-85-10 et seq.; and to follow recommendations for turf fertilization and management as described in the Virginia Nutrient Management Standards and Criteria, Revised July 2014. This includes implementing the Department of Conservation and Recreation’s approved Nutrient Management Plan and maintaining fertilization records. All nutrient applications performed on Blacksburg Municipal Golf Course shall comply with the provisions of this Nutrient Management Plan as of December 1, 2016. This plan is effective for five years (until December 1, 2021) or until major course renovation or major changes to maintenance practices occur. The planner should be alerted if this occurs or if new soil tests are taken within the five-year period, a minor revision may be needed if tests show major differences. The process of updating for a new five-year cycle should begin no later than 6 months prior to plan expiration.

2. **Course Information**
"You haven’t really played golf until you’ve made it over The Hill."

The Municipal Golf Course, commonly referred to as “The Hill,” is a nine hole, 54 acre course that is open year round for public play. You can enjoy beautiful panoramic views of the mountains from anywhere on the golf course. Pro shop, cart rentals, golf club rentals and passes are available.

The course is all mixed cool season turf with bent grass greens.
3. **Course Location**

The course is located in Blacksburg, Virginia just off South Main.

**Address:** 800 Graves Avenue, Blacksburg, VA 24060  
**GPS:** 37.226391, -80.395799

**Directions:**

**From points north on I-81:**
- Take exit 118 C-B-A and merge onto US-460 West for 7 miles.
- Take exit 5B and merge onto US-460 Business, W/S Main St.
- Drive 2.4 miles and turn right onto Graves Avenue.

**From points south on 1-81:**
- Take exit 118 B and merge onto US-460 West for 7 miles.
- Take exit 5B and merge onto US-460 Business, W/S Main St.
- Drive 2.4 miles and turn right onto Graves Avenue.

**From US-460 East:**
- Take the Blacksburg, North Main Street exit on left.
- At the traffic circle, continue straight to stay on North Main Street.
- In 1.3 miles, turn left onto Graves Avenue.

**From US-460 Business in Christiansburg, VA:**
- Follow US-460 Business West into Blacksburg.
- Turn right onto Graves Avenue.
4. **Nutrient Management Principals**

Nutrient Management Plans focus on two primary objectives healthy plants and clean water.

There are four different types of elements essential for plant health. Non-mineral, Primary and Secondary elements are all considered Macronutrients. The fourth is Micronutrients. Non-mineral elements consist of carbon, hydrogen, and oxygen; these elements are obtained from air and water. The Primary nutrients are nitrogen, phosphorus, and potassium. Secondary elements are calcium, magnesium, and sulfur. Micronutrients are iron, manganese, boron, zinc, copper, molybdenum, chlorine, cobalt, and nickel. These elements are obtained from the soil and must be supplemented with fertilizer, lime or other soil amendments when a soil test shows a deficiency. In high maintenance situations, some elements are spray applied and absorbed through the leaf tissue.

Nitrogen and phosphorus are the focus of a nutrient management plan, as these nutrients cause ecological problems. Lime is also important because having improper pH can make applied fertilizers unavailable to the plant and more likely to leach or runoff. While nitrogen and phosphorus are the focus, other nutrients are also discussed in the plan, these nutrients are beneficial to plant health, but do not cause water quality problems.

Soil tests are required to determine the current level of soil nutrients available to the plant so fertilizer can be applied at rates that ensure excess nutrients do not enter our waters. Basic soil tests provide data on phosphorus, potassium, magnesium, calcium and pH. Nitrogen cannot be tested for using a basic soil test as it is very volatile. Magnesium and calcium are included in basic soil tests so that proper liming materials can be chosen.

Soil test results are compared to a reference guide provided by DCR. These *Standards and Criteria* are based upon years of scientific research and the rates suggested are optimal for plant health within the intended usage. Low input areas, like home lawns, require some fertilizer to maintain plant vigor thus maintaining turf cover and preventing erosion. High use areas, like sports fields, require frequent fertilizer input to help maintain plant health and to aid in recovery from stress. Clean water is maintained by applying fertilizer in a responsible manner that ensures minimum movement away from the intended site.

The following information discusses the role of the nutrients in the plant. Highlighted information is specific to this plan.

**Nitrogen (N)** – This element is responsible for green color, shoot growth and density, root growth, carbohydrate reserves, recuperative potential, heat, cold, drought hardiness, wear tolerance, and disease susceptibility. Nitrogen has a very complex cycle and only certain forms are available to the plant. It leaches through the soil rapidly and does not accumulate thus you cannot soil test for N. Due to these factors, nitrogen management is a large part of nutrient management. Nitrogen management includes but is not limited to using slow release materials, timing the applications in accordance with plant growth, and making multiple applications so that the element is available when it is needed by the plant.
Please refer to the chart for the maximum allowable N rates for this golf course. In the second column, WSN stands for water-soluble nitrogen and WIN stands for water insoluble nitrogen. To use the WIN rate, the fertilizer material must be a slow release product. Per DCR, the definition of “Slow or Controlled Release Fertilizer” means a fertilizer containing a minimum of 15% slowly available nitrogen. See page 28 for full definition.

<table>
<thead>
<tr>
<th></th>
<th>30 days</th>
<th>Yearly Total Allowed by DCR</th>
<th>Amount Used in Plan</th>
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<tbody>
<tr>
<td>100% WSN</td>
<td>WIN &gt; 15%</td>
<td>Warm &amp; Cool</td>
<td>Warm</td>
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<tr>
<td>Greens</td>
<td>.7</td>
<td>.9</td>
<td>3-6 #/M</td>
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<td>Tees</td>
<td>.7</td>
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<tr>
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<td>.9</td>
<td>1-3 #/M</td>
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<tr>
<td>Grounds</td>
<td>.7</td>
<td>.9</td>
<td>3.5 #/M</td>
</tr>
</tbody>
</table>

**Phosphorus (P)** – Phosphorus controls the establishment rate of newly seeded turf, plant maturation, root growth, and seed production. Like nitrogen, P also has a complex cycle. The major difference is that P readily attaches soil, it can be quantified by a soil test and only leaches when it completely saturates the soil. Phosphorus moves away from the application site when it is improperly applied to compacted soil or other impervious surfaces, when applied in excess, and since it attaches to the soil, with sediment rich runoff. Phosphorus management is also important to nutrient management. It should only be applied when called for by a soil test, to soils that are not compacted to prevent runoff and only applied to actively growing turf with sufficient turf cover/rooting to hold the soil in place.

Maximum P rates are outlined in application worksheets. Do not exceed this number. In extreme cases of turf loss or damage, an additional .5 #/M of P is available. Contact your planner to determine if you are eligible.

**Potassium (K)** - Potassium is responsible for root growth, heat, cold, and drought hardiness, wear tolerance, and disease susceptibility. While the Standards and Criteria do regulate the application of K, but in some cases, K input may exceed recommended levels, as it does not have the same detrimental effects on the health of Virginia’s waters as N and P. Potassium is considered the plant nutrient most responsible for turf quality. It helps plants respond to stresses like drought, extreme heat/cold, and insect/disease pressure. The plants increased ability to respond to stress in a positive manner can help reduce the need for increased N and P fertility and reseeding caused by stress. In addition to the benefits of K, it is difficult to limit the amount of K used as most modern slow release fertilizers contain both N and K while limiting or completely removing P. Nitrogen only products are not readily available in slow release form and custom blended fertilizers are expensive.

Potassium levels have been exceeded in most of the areas of this plan. As discussed above, K helps the plant deal with stress.
**Lime** - Liming is a critical management practice for maintaining soil pH at optimal levels for plant growth. Liming supplies the essential elements Calcium and/or Magnesium, reduces the solubility and potential toxicity of Aluminum and Manganese, and increases the availability of essential nutrients. Many soil elements change form because of chemical reactions in the soil due to pHs that are either too acidic or too basic. Plants may not be able to use elements in some of these forms making some elements essential to plant health unavailable. Most plants grow well in the pH range 5.8 to 6.5. **For this plan, 6.2 is the target pH.**

Buffer pH is used to provide an indication of the soil’s total (active + reserve) acidity and ability to resist a change in pH. This buffer measurement is the major factor in determining the amount of lime to apply. The Buffer pH starts at 7 (no lime needed) and goes lower as the soil’s total acidity increases and more lime is needed to raise the soil pH. As an example, a clay soil with a pH of 6.1 could have a buffer pH of 6.8 and need 1 ton/A of lime to maintain/increase that pH around 6.2. A sandy soil could have a much lower pH but have the same buffer pH thus, needing the same amount of lime to change the pH to 6.2. This is because sandy soils have a lower cation exchange capacity thus, less storage for reserve acid.

Attempting to change the pH in the deep rooting zone of an established turf is difficult at best. One method of getting lime somewhat deeper in established turf areas is to apply lime in conjunction with aeration. Applying lime in the fall and winter months is recommended because the freeze/thaw cycle aids in mixing lime throughout the root zone.

Lime provides the essential nutrients Calcium and Magnesium. Calcium is the main component of plant cell walls while magnesium is the atom upon which chlorophyll is built. It is important that these elements be present in the soil not only to help regulate the soils acidity but to insure plant health. When a soils pH is acidic, these elements can be added with lime. Calcitic lime should be used when calcium is deficient and magnesium is high. Dolomitic lime, which is more common, is used when the both are deficient or balanced. If pH does not need to be adjusted, calcium levels can be raised with gypsum and magnesium is raised with Epsom salts. The Standards and Criteria provide guidance on adjusting soil pH levels but do not include any recommendations for Ca or Mg, as they do not affect water quality.

**Not all liming materials are the same, if the liming material chosen does not equate to 100% Calcium Carbonate Equivalent (CCE % should be listed on bag) see chart on page 42 to adjust the required amount of lime.**

Lime is needed on Greens, Tees, Fairways and Roughs. Specifics are discussed in soil test summaries and application worksheets.

In the reference area of this document there is a chart showing nutrient availability at different pHs (page 26).

**Sulfur (S)** - Sulfur is responsible for the plants green color, shoot growth and density, root growth, carbohydrate reserves, and disease susceptibility. Elemental sulfur applications should be avoided unless you are attempting to acidify (lower pH) the soil and should be applied at no more than 5#/M and watered in due to the turf burn potential. Unless called for by a soil test,
the occasional use of sulfur containing fertilizers and micro nutrient packages should be the only S input needed to supplement the soil S content. This element is not included in the Standards and Criteria.

Iron (Fe) – Iron contributes to the plants green color, shoot growth and density, root growth, carbohydrate reserves, heat, cold and drought hardiness and wear tolerance. Iron is often included in fertilizer and micronutrient blends because it produces a faster greening of turf than nitrogen. The Standards and Criteria recommends that Fe applications be occasionally substituted for N applications because it can produce the same greening results. This is a good strategy, but Fe apps cannot replace N. While Fe is used inside the plant, the greening created by Fe is superficial and caused the iron rusting on the plants surface. Fe should be used as an N replacement only when the plant is healthy and greening is desired without increased growth.

Micros – Other micronutrients are not mentioned by the Standards and Criteria. These elements are very important to plant growth, but regular input is not needed unless you are managing a sand based soil with low nutrient holding capacity. Most soils contain all the necessary micros and they will be available for the plant as long as the proper pH is maintained.


The following list comes from the Urban Nutrient Management Handbook page 8-12 and details steps that can reduce the impact of nutrient management practices on water quality. A PDF of the complete handbook can be found online through ext.vt.edu or a printed copy can be obtained from DCR.

• Base fertilization practices on a soil test.
• Supplement the soil test with a plant tissue test when necessary.
• Aerate compacted soil to reduce runoff and aid phosphorus and lime in entering the soil.
• Minimize fertilizer rates on slopes and sandy soils. If using quickly available sources of nitrogen on deep, sandy soils or near shallow water tables, use no more than 0.25 to 0.50 pound of nitrogen per 1,000 square feet per application.
• Establish and maintain a buffer zone of reduced- to zero-input vegetation around bodies of water. In some cases, native vegetation might be appropriate, but whatever plant material is selected, it must persist indefinitely to serve as a functional buffer zone.
• Consider using iron as a supplement to nitrogen for greening response.
• Use at least 50 percent slowly available sources of nitrogen on soils subject to leaching.
• Time applications carefully. Do not apply fertilizer before a heavy rainfall.
• Irrigate lightly (0.10 to 0.25 inch) after each application of quick-release fertilizer so it is washed off the foliage and moved into the soil. (Wait to irrigate if foliar activity is desired)
• Avoid over irrigation.
• Return grass clippings to the turf to improve nutrient cycling and reduce the amount of fertilizer needed to produce healthy plants. Use a mulching mower whenever possible and consider that a mulching mower can even be used to manage fall leaves (Goatley 2006).
• When collected, compost grass clippings rather than disposing of them in landfills.
• Use a drop (gravity) spreader near bodies of water or impenetrable areas to lessen the chance of spreading material on these surfaces.
• Perhaps the most important best management practice toward improving water quality is to simply sweep or blow fertilizers and clippings off hardscape surfaces and back into the turf.
6. **Application Equipment Calibration**

An agronomically and environmentally sound fertilizer program can be negated by improperly calibrated equipment. It is important to calibrate your equipment prior to every application. Even moving from one location to another can knock your application equipment out of adjustment so once you have your equipment calibrated for a product write down the setting. Use that setting to check the calibration for every site and adjust if necessary. The next time you use that product, use your records as a starting point and not a final calibration as equipment can wear over time thus changing the calibration point. For more information on how to calibrate your equipment see the *Urban Nutrient Management Handbook* Chapter 10 (ext.vt.edu) or visit your equipment manufactures website. Please remember that the number on the bag is not sufficient, every spreader and every application is different, and that the bag number only serves as a calibration starting point.

7. **Areas Managed**

Blacksburg Municipal 9-hole layout consists of 0.75 acres of greens, 0.75 acres of tees, 20 acres of fairways, and 10 acres of rough. These totals also include the practice area.

**Greens** — There are 0.75 acres of Bentgrass greens. Collars are fertilized with greens and are included in this acreage.

**Tees** — There are 0.75 acres of tees on the course. All tees are cool season.

**Fairways** — There are 20 acres of fairways. This includes all shaved areas around greens except for the greens collar. Fairways are cool season grass. Fairways and rough surrounding fairways are similar soil types and are managed the same but are represented by separate Nutrient Application Worksheets and Fertilization Record pages.

**Rough** — There are 10 acres of rough. This consists of about 5 to 10 yard strip around the greens, tees and fairways which are the “in play” maintained areas. These recommendations will cover all long rough or general turf areas on the course that may require fertilizer.

8. **Environmentally Sensitive Sites**

There are several environmentally sensitive sites on the course. While there are no required buffer zones for turf fertilizer applications, fertilizer should not be applied directly to water and in these areas, fertilizer should not be applied prior to a heavy rain/runoff event.

- There are no bodies of water in this area and according to Web Soil Survey, there is no risk of flooding.
- This course is in an urban area and as the nickname suggests it is on top of the hill. Any run off from this course will flow downhill and likely end up in the municipal storm water drains.
- Applications of inorganic fertilizers will not occur on frozen or snow-covered ground.
- Any fertilizer that makes its way onto impervious surfaces (sidewalks, cart paths, etc.) should be swept or blown back into pervious turfgrass-covered areas.
- Do not use fertilizers as ice melt.
9. **Season of Fertilization**
Per the Virginia Nutrient Management Standards and Criteria, Revised July 2014, fertilizers must be applied in between the following dates.

- These are guidelines and averages, in warmer years, fertilizer could be applied earlier and in cooler years, fertilizer should be applied later.
- Fertilizers should not be applied to frozen ground or to grass that is not actively growing. For warm season grasses please wait for green up to occur.
- For warm season grasses that are overseeded, follow the cool season application window. If overseeding is skipped, please revert to warm season window.

<table>
<thead>
<tr>
<th></th>
<th>Average Frost Dates</th>
<th>Cool Season Applications</th>
<th>Warm Season Applications</th>
</tr>
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<tbody>
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<td><strong>Spring</strong></td>
<td>April 20</td>
<td>March 9</td>
<td>April 20</td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td>October 15</td>
<td>November 26</td>
<td>September 15</td>
</tr>
</tbody>
</table>
10. Site Maps
   a. Overview Maps

Blacksburg Municipal Golf Course
The course is located in 3 different watersheds:
NE59 - 24.3
RU06 - 4.3
RU07 - 2.8

Legend
- Fairway
- Green
- Rough
- Tee
- Watershed Division
b. Management Areas

Blackburg Municipal Golf Course
Course Map

Legend
- Fairway
- Green
- Rough
- Tee
- Routing
11. **Acreage Breakdown**

<table>
<thead>
<tr>
<th>Acreage Total – 31.5</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Greens: 0.75</td>
<td>Fairways: 20</td>
</tr>
<tr>
<td>Tees: 0.75</td>
<td>Rough: 10</td>
</tr>
<tr>
<td>Grounds: 0.5</td>
<td></td>
</tr>
</tbody>
</table>

12. **Soil Test Results**

*Soil samples were taken by Robert Habel on 11/8/16. A minimum of 10 random sub samples were collected, at a depth of 3-4 inches, using a soil probe and placed in plastic bags. Thatch and other organics were removed prior to boxing. Testing was conducted by Waypoint Analytical.*

Soil tests are rated in terms of Very Low to Very High. To comply with Virginia Nutrient Management Standards and Criteria, Revised July 2014, no phosphorus may be applied if a soil test rates that element Very High. In economic terms, nutrients are not necessarily needed if they test above a medium rating, plant response is not guaranteed if soils already test above medium. (See plant response chart page 27)

**a. Greens**

Greens averaged high (H) levels of phosphorus and medium (M-) levels of potassium. 0.75 #/M phosphorus is allowed by regulation and 2 #/M of potassium will be allowed. Regulations allow for up to 6 #/M.

The average buffer pH of the greens is 6.9. 0.5 T/A of 100% Calcium Carbonate Equivalent (CCE) material will be needed to adjust the soil pH to 6.2. This would be about 25 #/M. If the liming material chosen does not equate to 100% CCE see chart on page 54 to adjust the required amount of lime. Calcium and Magnesium are both deficient, Dolomitic lime is recommended. Attempt to apply at aeration.

**b. Tees**

Tees averaged high (H) levels of phosphorus and medium (M) levels of potassium. 0.75 #/M phosphorus is allowed by regulation and 1.5 #/M of potassium will be allowed. Regulations allow for up to 5 #/M of N on tees.

The average buffer pH of the tees is 6.9. 0.5 T/A of 100% Calcium Carbonate Equivalent (CCE) material will be needed to adjust the soil pH to 6.2. This would be about 25 #/M. If the liming material chosen does not equate to 100% CCE see chart on page 54 to adjust the required amount of lime. Calcium and Magnesium are both deficient, Dolomitic lime is recommended. Attempt to apply at aeration.

**c. Fairways/Rough**

Fairways averaged high (H) levels of phosphorus and high (H-) levels of potassium. 0.75 #/M phosphorus and 1 #/M of potassium is recommended. Regulations allow for up to 3 #/M of nitrogen on fairways and 3 #/M on rough.
The average buffer pH of the fairways is 6.8. 1 T/A of 100% Calcium Carbonate Equivalent (CCE) material will be needed to adjust the soil pH to 6.2. This would be about 50#/M. If the liming material chosen does not equate to 100% CCE see chart on page 54 to adjust the required amount of lime. Calcium and Magnesium are both deficient, Dolomitic lime is recommended. Attempt to apply at aeration.

13. Soil Test Summaries

a. Greens

<table>
<thead>
<tr>
<th>Hole #</th>
<th>Soil Test ID#</th>
<th>Soil pH</th>
<th>Buffer pH</th>
<th>Lab P₂O₅ (ppm)</th>
<th>VT P (H/M/L)</th>
<th>VT (H/M/L)</th>
<th>Lab K₂O (ppm)</th>
<th>VT K (ppm)</th>
<th>VT (H/M/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BM 1G</td>
<td>6.00</td>
<td>6.86</td>
<td>80</td>
<td>33.4</td>
<td>H</td>
<td>67</td>
<td>47.6</td>
<td>M-</td>
</tr>
<tr>
<td>4</td>
<td>BM 4G</td>
<td>5.90</td>
<td>6.85</td>
<td>83</td>
<td>34.8</td>
<td>H</td>
<td>69</td>
<td>49.0</td>
<td>M-</td>
</tr>
<tr>
<td>7</td>
<td>BM7G</td>
<td>5.90</td>
<td>6.85</td>
<td>67</td>
<td>27.4</td>
<td>H-</td>
<td>59</td>
<td>41.9</td>
<td>M-</td>
</tr>
</tbody>
</table>

Recommendation 6.9 31.9 H 46.2 M-

Allowed Inputs Lime 0.5 T/A P 0.75#/M K 2#/M
### b. Tees

<table>
<thead>
<tr>
<th>Managed Area ID</th>
<th>Soil pH</th>
<th>Buffer pH</th>
<th>Lab P₂O₅ (ppm)</th>
<th>VT P (ppm)</th>
<th>VT (H/M/L)</th>
<th>Lab K₂O (ppm)</th>
<th>VT K (ppm)</th>
<th>VT (H/M/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BM 1T</td>
<td>6.10</td>
<td>6.86</td>
<td>105</td>
<td>44.8</td>
<td>H+</td>
<td>101</td>
<td>71.7</td>
</tr>
<tr>
<td>4</td>
<td>BM 4T</td>
<td>6.10</td>
<td>6.85</td>
<td>98</td>
<td>41.6</td>
<td>H</td>
<td>103</td>
<td>73.1</td>
</tr>
<tr>
<td>7</td>
<td>BM 7T</td>
<td>6.40</td>
<td>6.80</td>
<td>58</td>
<td>23.3</td>
<td>H-</td>
<td>72</td>
<td>51.1</td>
</tr>
</tbody>
</table>

**Recommendation**: 6.9 36.6 H 65.3 M

**Allowed Inputs**: Lime 0.5 T/A P 0.75 #/M K 1.5 #/M

### c. Fairways/Rough

<table>
<thead>
<tr>
<th>Managed Area ID</th>
<th>Soil pH</th>
<th>Buffer pH</th>
<th>Lab P₂O₅ (ppm)</th>
<th>VT P (ppm)</th>
<th>VT (H/M/L)</th>
<th>Lab K₂O (ppm)</th>
<th>VT K (ppm)</th>
<th>VT (H/M/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BM 1F</td>
<td>5.80</td>
<td>6.82</td>
<td>84</td>
<td>35.2</td>
<td>H</td>
<td>136</td>
<td>96.6</td>
</tr>
<tr>
<td>4</td>
<td>BM 4F</td>
<td>5.80</td>
<td>6.83</td>
<td>78</td>
<td>32.5</td>
<td>H</td>
<td>111</td>
<td>78.8</td>
</tr>
<tr>
<td>7</td>
<td>BM 7F</td>
<td>6.00</td>
<td>6.83</td>
<td>62</td>
<td>25.1</td>
<td>H-</td>
<td>138</td>
<td>98.0</td>
</tr>
</tbody>
</table>

**Recommendation**: 6.8 30.9 H 91.1 H-

**Allowed Inputs**: Lime 1 T/A P 0.75 #/M K 1 #/M
14. Nutrient Application Worksheets

The following worksheets detail the amount of total and monthly fertility allowed by DCR based on the previously discussed soil test information. All nutrient input level recommendations come from the Department of Conservation and Recreation’s Nutrient Management Standards and Criteria, this document is part of the Code of Virginia and thus is law for those required to abide by their recommendations or those required to have a Nutrient Management Plan. While applications do not have to be followed specifically, it is important to note that per month nitrogen levels shall not be exceeded and per year phosphorus levels shall not be exceeded. Please be aware that the nitrogen rates in this plan are based on usage of slowly available forms of N. The rates change when using water-soluble sources. In some cases, potassium input may exceed recommended levels, as it does not have the same detrimental effects on the health of Virginia’s waters as nitrogen and phosphorus. For more information on nutrients and rates see page 6.
a. **Greens**

<table>
<thead>
<tr>
<th>Location:</th>
<th>Blacksburg Municipal Golf Course</th>
<th>Management Area:</th>
<th>Greens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared:</td>
<td>12/1/16</td>
<td>Turf Type:</td>
<td>Bentgrass</td>
</tr>
<tr>
<td>Expires:</td>
<td>12/1/21</td>
<td>Acres:</td>
<td>0.75</td>
</tr>
</tbody>
</table>

- According to frost free dates, applications to cool season turf should not be made from November 26 through March 9.
- Greens tested H in P and M- in K.
- All applications are represented in#/M (pounds per 1000 sqft).
- Nutrient levels shown in yellow boxes are the maximum allowed per year.
- Foliar applications of nutrients, no matter how small, should be included in application records and totals.
- Applications of greater than 0.7#/M N are at least 15% WIN. Per month (30 days) totals of N shall not exceed 0.7#/M if using 100% WSN or 0.9#/M if using at least 15% WIN.
- Phosphorus applications in chart below are an example. There are no monthly or per application limits for phosphorus, thus applications can be made as needed, but stated yearly total shall not be exceeded.
- Potassium applications in chart below are an example. There are no monthly or per application limits for potassium, thus applications can be made as needed. Total potassium can exceed stated numbers if desired due to potassium’s ability to help the plant survive stress.
- 0.5 T/A of 100% Calcium Carbonate Equivalent (CCE) material will be needed to adjust the soil pH to 6.2. This would be about 25#/M. Dolomitic lime is recommended. This application is only needed once in the lifespan of the plan.

<table>
<thead>
<tr>
<th></th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Total Applied</th>
<th>Total Allowed Per Soil Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>4.5</td>
<td>6</td>
</tr>
<tr>
<td>P (P₂O₅)</td>
<td>0.1</td>
<td>0</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0</td>
<td>0.1</td>
<td>0.1</td>
<td>0.7</td>
<td>0.75</td>
</tr>
<tr>
<td>K (K₂O)</td>
<td>0.5</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.5</td>
<td>2.75</td>
<td>2</td>
</tr>
</tbody>
</table>

Dolomitic lime is recommended. This application is only needed once in the lifespan of the plan.
b. **Tees**

<table>
<thead>
<tr>
<th>Location:</th>
<th>Blacksburg Municipal Golf Course</th>
<th>Management Area:</th>
<th>Tees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared:</td>
<td>12/1/16</td>
<td>Turf Type:</td>
<td>Cool Season</td>
</tr>
<tr>
<td>Expires:</td>
<td>12/1/21</td>
<td>Acres:</td>
<td>0.75</td>
</tr>
</tbody>
</table>

- According to frost free dates, applications to cool season turf should not be made from November 26 through March 9.
- Greens tested H in P and M in K.
- All applications are represented in #/M (pounds per 1000 sqft).
- Nutrient levels shown in **yellow** boxes are the maximum allowed per year.
- Foliar applications of nutrients, no matter how small, should be included in application records and totals.
- Applications of greater than 0.7 #/M N are at least 15% WIN. Per month (30 days) totals of N shall not exceed 0.7 #/M if using 100% WSN or 0.9 #/M if using at least 15% WIN.
- Phosphorus applications in chart below are an example. There are no monthly or per application limits for phosphorus, thus applications can be made as needed, but stated yearly total shall not be exceeded.
- Potassium applications in chart below are an example. There are no monthly or per application limits for potassium, thus applications can be made as needed. Total potassium can exceed stated numbers if desired due to potassium’s ability to help the plant survive stress.
- 0.5 T/A of 100% Calcium Carbonate Equivalent (CCE) material will be needed to adjust the soil pH to 6.2. This would be about 25 #/M. Dolomitic lime is recommended. This application is only needed once in the lifespan of the plan.

<table>
<thead>
<tr>
<th>Tees</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Total Applied</th>
<th>Total Allowed Per Soil Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td></td>
<td>0.5</td>
<td></td>
<td>0.5</td>
<td></td>
<td></td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>3.7</td>
<td>5</td>
</tr>
<tr>
<td>P (P₂O₅)</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.2</td>
<td>.2</td>
<td>.2</td>
<td>0.6</td>
<td>0.75</td>
</tr>
<tr>
<td>K (K₂O)</td>
<td>0.25</td>
<td>0.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>2</td>
<td>1.5</td>
</tr>
</tbody>
</table>
c. Fairways

<table>
<thead>
<tr>
<th>Location:</th>
<th>Blacksburg Municipal Golf Course</th>
<th>Management Area:</th>
<th>Fairways</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared:</td>
<td>12/1/16</td>
<td>Turf Type:</td>
<td>Cool Season</td>
</tr>
<tr>
<td>Expires:</td>
<td>12/1/21</td>
<td>Acres:</td>
<td>20</td>
</tr>
</tbody>
</table>

- According to frost free dates, applications to cool season turf should not be made from November 26 through March 9.
- Greens tested H in P and H- in K.
- All applications are represented in #/M (pounds per 1000 sqft).
- Nutrient levels shown in yellow boxes are the maximum allowed per year.
- Foliar applications of nutrients, no matter how small, should be included in application records and totals.
- Applications of greater than 0.7 #/M N are at least 15% WIN. Per month (30 days) totals of N shall not exceed 0.7 #/M if using 100% WSN or 0.9 #/M if using at least 15% WIN.
- Phosphorus applications in chart below are an example. There are no monthly or per application limits for phosphorus, thus applications can be made as needed, but stated yearly total shall not be exceeded.
- Potassium applications in chart below are an example. There are no monthly or per application limits for potassium, thus applications can be made as needed. Total potassium can exceed stated numbers if desired due to potassium’s ability to help the plant survive stress.
- 1 T/A of 100% Calcium Carbonate Equivalent (CCE) material will be needed to adjust the soil pH to 6.2. This would be about 50 #/M. Dolomitic lime is recommended. This application is only needed once in the lifespan of the plan.

<table>
<thead>
<tr>
<th>Fairways</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Total Applied</th>
<th>Total Allowed Per Soil Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td>0.9</td>
<td>0.9</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>P (P₂O₅)</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.2</td>
<td>0.2</td>
<td></td>
<td>0.6</td>
<td>0.75</td>
</tr>
<tr>
<td>K (K₂O)</td>
<td>0.25</td>
<td>0.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.5</td>
<td>0.5</td>
<td></td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>
d. **Rough**

<table>
<thead>
<tr>
<th>Location: Blackburg Municipal Golf Course</th>
<th>Management Area: Rough</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared: 12/1/16</td>
<td>Turf Type: Cool Season</td>
</tr>
<tr>
<td>Expires: 12/1/21</td>
<td>Acres: 10</td>
</tr>
</tbody>
</table>

- According to frost free dates, applications to cool season turf should not be made from November 26 through March 9.
- Greens tested H in P and H- in K.
- All applications are represented in #/M (pounds per 1000 sqft).
- Nutrient levels shown in yellow boxes are the maximum allowed per year.
- Foliar applications of nutrients, no matter how small, should be included in application records and totals.
- Applications of greater than 0.7 #/M N are at least 15% WIN. Per month (30 days) totals of N shall not exceed 0.7 #/M if using 100% WSN or 0.9 #/M if using at least 15% WIN.
- Phosphorus applications in chart below are an example. There are no monthly or per application limits for phosphorus, thus applications can be made as needed, but stated yearly total shall not be exceeded.
- Potassium applications in chart below are an example. There are no monthly or per application limits for potassium, thus applications can be made as needed. Total potassium can exceed stated numbers if desired due to potassium’s ability to help the plant survive stress.
- 1 T/A of 100% Calcium Carbonate Equivalent (CCE) material will be needed to adjust the soil pH to 6.2. This would be about 50 #/M. Dolomitic lime is recommended. This application is only needed once in the lifespan of the plan.

<table>
<thead>
<tr>
<th></th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Total Applied</th>
<th>Total Allowed Per Soil Test</th>
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</thead>
<tbody>
<tr>
<td>N</td>
<td></td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td></td>
<td>0.9</td>
<td>0.9</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>P (P₂O₅)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td>0.75</td>
</tr>
<tr>
<td>K (K₂O)</td>
<td>0.25</td>
<td>0.25</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>
### 15. Fertilizer Application Records

<table>
<thead>
<tr>
<th>Date</th>
<th>Applicator/Supervisor</th>
<th>Weather Info</th>
<th>Fertilizer Analysis</th>
<th>Rate</th>
<th>Amount Fertilizer Used</th>
<th>Equipment Used</th>
<th>Temp</th>
<th>Wind</th>
<th>Precip</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When was the last time your fertilizer equipment was calibrated???
For information on calibration see Chapter 10 of the "Urban Nutrient Management Handbook".
**Fertilizer Application Records**

<table>
<thead>
<tr>
<th>Date</th>
<th>Applicator/Supervisor</th>
<th>Weather Info</th>
<th>Fertilizer Analysis</th>
<th>Rate</th>
<th>Amount Fertilizer Used</th>
<th>Equipment Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Temp</td>
<td>Wind</td>
<td>Precip</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When was the last time your fertilizer equipment was calibrated???

**Fertilizer Application Records**

<table>
<thead>
<tr>
<th>Location Information</th>
<th>Management Area Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name:</strong> Blacksburg Municipal Golf Course</td>
<td><strong>Management Area ID:</strong> Fairways</td>
</tr>
<tr>
<td><strong>Address:</strong> 800 Graves Avenue Blacksburg, VA 24060</td>
<td><strong>Management Area Size:</strong> 20</td>
</tr>
<tr>
<td><strong>Plant Species:</strong> Cool Season</td>
<td><strong>Notes:</strong></td>
</tr>
<tr>
<td><strong>Phone#:</strong> (540) 961-1137</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Applicator/Supervisor</th>
<th>Weather Info</th>
<th>Fertilizer Analysis</th>
<th>Rate</th>
<th>Amount Fertilizer Used</th>
<th>Equipment Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Temp</td>
<td>Wind</td>
<td>Precip</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When was the last time your fertilizer equipment was calibrated???
### Fertilizer Application Records

<table>
<thead>
<tr>
<th>Date</th>
<th>Applicator/Supervisor</th>
<th>Weather Info</th>
<th>Fertilizer Analysis</th>
<th>Rate</th>
<th>Amount Fertilizer Used</th>
<th>Equipment Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Temp</td>
<td>Wind</td>
<td>Precip</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Location Information**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Blacksburg Municipal Golf Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address:</td>
<td>800 Graves Avenue</td>
</tr>
<tr>
<td>Phone#:</td>
<td>(540) 961-1137</td>
</tr>
</tbody>
</table>

**Management Area information**

<table>
<thead>
<tr>
<th>Management Area ID:</th>
<th>Rough</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Area Size:</td>
<td>10</td>
</tr>
<tr>
<td>Plant Species:</td>
<td>Cool Season</td>
</tr>
</tbody>
</table>

Notes:

When was the last time your fertilizer equipment was calibrated???
16. Reference Material
Nutrient Availability According to pH

Figure 1: Nutrient Availability at pH
Very low: A plant response is most likely if the indicated nutrient is applied. A large portion of the nutrient requirement must come from fertilization.

Low: A plant response is likely if the indicated nutrient is applied. A portion of the nutrient requirement must come from fertilization.

Medium: A plant response may or may not occur if the indicated nutrient is applied. A small portion of the nutrient requirement must come from fertilization.

High: Plant response is not expected. No additional fertilizer is needed.

Very high: Plant response is not expected. The soil can supply much more than the turf requires. Additional fertilizer should not be added to avoid nutritional problems and adverse environmental consequences.
Standards and Criteria

Section VI. Turfgrass Nutrient Recommendations for Home Lawns, Office Parks, Public Lands and Other Similar Residential/Commercial Grounds

Definitions

For the purposes of this section, the following definitions, as presented by the Association of American Plant Food Control Officials (AAPFCO), apply:

“Enhanced efficiency fertilizer” describes fertilizer products with characteristics that allow increased plant nutrient availability and reduce the potential of nutrient losses to the environment when compared to an appropriate reference product.

“Slow or controlled release fertilizer” means a fertilizer containing a plant nutrient in a form which delays its availability for plant uptake and use after application, or which extends its availability to the plant significantly longer than a reference “rapidly available nutrient fertilizer” such as ammonium nitrate, urea, ammonium phosphate or potassium chloride. A slow or controlled release fertilizer must contain a minimum of 15 percent slowly available forms of nitrogen.

“Water soluble nitrogen”, “WSN”, or “readily available nitrogen” means: Water soluble nitrogen in either ammonical, urea, or nitrate form that does not have a controlled release, or slow response.

Recommended Season of Application For Nitrogen Fertilizers - Applies to all Turf

A nitrogen fertilization schedule weighted toward fall application is recommended and preferred for agronomic quality and persistence of cool season turfgrass; however, the acceptable window of applications is much wider than this for nutrient management. The nutrient management recommended application season for nitrogen fertilizers to cool season turfgrasses begins six weeks prior to the last spring average killing frost date and ends six weeks past the first fall average killing frost date (see Figures 6-1 & 6-2). Applications of nitrogen during the intervening late fall and winter period should be avoided due to higher potential leaching or runoff risk, but where necessary, apply no more than 0.5 pounds per 1,000 ft² of water soluble nitrogen within a 30-day period. Higher application rates may be used during this late fall and winter period by using materials containing slowly available sources of nitrogen, if the water soluble nitrogen contained in the fertilizer does not exceed the recommended maximum of 0.5 pounds per 1,000 ft² rate. Do not apply nitrogen or phosphorus fertilizers when the ground is frozen.

The acceptable nitrogen fertilizer application season for non-overseeded warm season turfgrass begins no earlier than the last spring average killing frost date and ends no later than one month prior to the first fall average killing frost date (see Figures 6-1 & 6-2).
Figure 6-1

VIRGINIA
AVERAGE DATES OF FIRST KILLING FROST IN FALL

Figure 6-2

VIRGINIA
AVERAGE DATES OF LAST KILLING FROST IN SPRING
Per Application Rates

Do not apply more than 0.7 pounds of water soluble nitrogen per 1,000 ft² within a 30-day period. For cool season grasses, do not apply more than 0.9 pounds of total nitrogen per 1,000 ft² within a 30-day period. For warm season grasses, do not apply more than 1.0 pounds of total nitrogen per 1,000 ft² within a 30-day period. Lower per application rates of water soluble nitrogen sources or use of slowly available nitrogen sources should be utilized on very permeable sandy soils, shallow soils over fractured bedrock, or areas near water wells.

Annual Application Rates for Home Lawns and Commercial Turf

Up to 3.5 pounds per 1,000 ft² of nitrogen may be applied annually to cool season grass species or up to 4 pounds per 1,000 ft² may be applied annually to warm season grass species using 100 percent water soluble nitrogen sources. Lower rates of nitrogen application may be desirable on those mature stands of grasses that require less nitrogen for long-term quality. As a result, lower application rates will probably be more suited to the fine leaf fescues (hard fescue, chewings fescue, creeping red fescue, and sheep fescue) and non-overseeded zoysiagrass. Lower rates should also be used on less intensively managed areas.

Use of Slowly Available Forms of Nitrogen

For slow or controlled release fertilizer sources, or enhanced efficiency fertilizer sources, no more than 0.9 pounds of nitrogen per 1,000 ft² may be applied annually to warm season grasses within a 30-day period and no more than 1.0 pounds of nitrogen per 1,000 ft² may be applied annually to cool season grasses within a 30-day period.

Provided the fertilizer label guarantees that the product can be used in such a way that it will not release more than 0.7 pounds of nitrogen per 1,000 ft² in a 30-day period, no more than 2.5 pounds of nitrogen per 1,000 ft² may be applied in a single application. Additionally, total annual applications shall not exceed 80 percent of the annual nitrogen rates for cool or warm season grasses.

Phosphorus and Potassium Nutrient Needs (Established Turf)

Apply phosphorus (P₂O₅) and potassium (K₂O) fertilizers as indicated necessary by a soil test using the following guidelines:

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P₂O₅</td>
</tr>
<tr>
<td>L</td>
<td>2-3</td>
</tr>
<tr>
<td>M</td>
<td>1-2</td>
</tr>
<tr>
<td>H</td>
<td>0.5-1</td>
</tr>
<tr>
<td>VH</td>
<td>0</td>
</tr>
</tbody>
</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range. (For example, the recommendation for a P₂O₅ soil test level of L would be 3 pounds per 1,000 ft².)

Do not use high phosphorus ratio fertilizers such as 10-10-10 or 5-10-10, unless soil tests indicate phosphorus availability below the M+ level.
Recommendations for Establishment of Turf

These recommendations are for timely planted turfgrass, that is, the seed or vegetative material (sod, plugs, and/or sprigs), are planted at a time of the year when temperatures and moisture are adequate to maximize turfgrass establishment. These recommended establishment periods would be late summer to early fall for cool-season turfgrasses and late spring through mid-summer for warm-season turfgrasses.

Nitrogen Applications

At the time of establishment, apply no more than 0.9 pounds per 1,000 ft$^2$ of total nitrogen for cool season grasses or 1.0 pounds per 1,000 ft$^2$ of total nitrogen for warm season grasses, using a material containing slowly available forms of nitrogen, followed by one or two applications beginning 30 days after planting, not to exceed a total of 1.8 pounds per 1,000 ft$^2$ total for cool season grasses and 2.0 pounds per 1,000 ft$^2$ for warm season grasses for the establishment period. Applications of WSN cannot exceed more than 0.7 pounds per 1,000 ft$^2$ within a 30-day period.

Phosphorus and Potassium Recommendations for Establishment

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft$^2$) *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P$_2$O$_5$</td>
</tr>
<tr>
<td>L</td>
<td>3-4</td>
</tr>
<tr>
<td>M</td>
<td>2-3</td>
</tr>
<tr>
<td>H</td>
<td>2-1</td>
</tr>
<tr>
<td>VH</td>
<td>0</td>
</tr>
</tbody>
</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.
Nutrient Recommendations for Golf Courses

Nitrogen Timing

The beginning and ending dates for application of nitrogen shall be determined using guidance and frost date maps contained in the Season of Application for Nitrogen section, Figures 6-1 and 6-2.

If the full rate or the highest rate of the recommendation range for a monthly application is applied in a single application, then the interval of application for nitrogen shall be at least 30 days to allow turf to utilize previous nitrogen applications. If several applications are to be made for the monthly nitrogen rate, then the timing of the applications shall be at approximately even intervals, with the rate per application to be evenly divided between each application with the total nitrogen applied not to exceed the maximum monthly rate. Use of Water Insoluble Nitrogen forms of Nitrogen is encouraged.

<table>
<thead>
<tr>
<th>Grass Type</th>
<th>Maximum WSN Rate Per Application - pounds per 1,000 ft²</th>
<th>Total Annual Nitrogen Rate - pounds per 1,000 ft²&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greens</td>
<td>0.7&lt;sup&gt;(e)&lt;/sup&gt;</td>
<td>3-6</td>
</tr>
<tr>
<td>Tees</td>
<td>0.7&lt;sup&gt;(b)&lt;/sup&gt;</td>
<td>2-5</td>
</tr>
<tr>
<td>Fairways - Cool Season</td>
<td>0.7&lt;sup&gt;(c)&lt;/sup&gt;</td>
<td>2-3</td>
</tr>
<tr>
<td>Warm Season</td>
<td>0.7&lt;sup&gt;(c)&lt;/sup&gt;</td>
<td>3-4</td>
</tr>
<tr>
<td>Fairways - Intensive Management</td>
<td>0.5&lt;sup&gt;(d)&lt;/sup&gt;</td>
<td>3-4</td>
</tr>
<tr>
<td>Overseeding Warm Season Fairways</td>
<td>0.5&lt;sup&gt;(e)&lt;/sup&gt;</td>
<td>1.25</td>
</tr>
<tr>
<td>Roughs</td>
<td>0.7&lt;sup&gt;(e)&lt;/sup&gt;</td>
<td>1-3</td>
</tr>
</tbody>
</table>

Fairways-Overseeding Warm Season Fairways

- For warm season grasses, up to 0.7 pounds of nitrogen per 1,000 ft² in a 30-day period may be applied in the Fall after perennial ryegrass overseeding is well established. An additional nitrogen application of 0.7 pounds per 1,000 ft² may be made in February-March to overseeded perennial ryegrass if growth and color indicate need. Applications using WSN may not exceed 0.7 pounds per 1,000 ft² within a 30-day period.

- Soluble nitrogen rates of 0.25 pounds per 1,000 ft² or less which may be a component of a pesticide or minor element application, may be applied any time during the application windows described in Recommended Season of Application for Nitrogen Fertilizers of this section, but must be considered with the total annual nitrogen application rate.

(a) Use higher rates for intensively used turf where accelerated growth and/or rapid recovery are required, use lower rates for maintenance of lesser used areas; do not exceed total annual nitrogen levels as stated above.
(b) Greens and Tees – Per application timing must be a minimum of 30 days between applications. A rate of 0.9 pounds per 1,000 ft$^2$ of total nitrogen may be applied for cool season grasses or 1.0 pounds per 1,000 ft$^2$ of total nitrogen may be applied for warm season grasses using a material containing slowly available forms of nitrogen.

(c) Fairways-Normal Management (Non-Irrigated or Irrigated) - Per Application timing must be a minimum of 30 days between applications. Total nitrogen application rates of 0.9 pounds per 1,000 ft$^2$ of total nitrogen may be applied for cool season grasses or 1.0 pound per 1,000 ft$^2$ of total nitrogen may be applied for warm season grasses using a material containing slowly available forms of nitrogen.

(d) Fairways-Intensive Management (Irrigated)- Per Application timing must be a minimum of 15 days between applications. This option requires optimized timing of more frequent applications of nitrogen with lesser rates per application. Alternatively, a maximum application rate of 0.9 pounds per 1,000 ft$^2$ of total nitrogen for cool season grasses or 1.0 pounds per 1,000 ft$^2$ of total nitrogen for warm season grasses using a material containing slowly available forms of nitrogen may be applied with a minimum of 30 days between applications.

(e) Foliar fertilizer may be applied to warm season grasses within 30 days prior to the first killing frost in the fall, at a rate not to exceed 0.1 pounds per 1,000 ft$^2$ of nitrogen per application. This application must be accounted for in the total annual nitrogen rate.

**Phosphorus and Potassium Recommendations for Established Golf Courses**

Apply phosphorus ($P_2O_5$) and potassium ($K_2O$) fertilizers as indicated by a soil test using the following guidelines:

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft$^2$)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$P_2O_5$</td>
</tr>
<tr>
<td>L</td>
<td>2-3</td>
</tr>
<tr>
<td>M</td>
<td>1-2</td>
</tr>
<tr>
<td>H</td>
<td>0.5-1</td>
</tr>
<tr>
<td>V/H</td>
<td>0</td>
</tr>
</tbody>
</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.

* For irrigated turf grown on Naturally Occurring and Modified Sand Based soils only, up to 0.5 pounds of $P_2O_5$ per 1,000 ft$^2$ may be applied, if needed, to aid in recovery of damaged turf during times of extreme use. No phosphorus applications shall be made when the soil phosphorus test level is above 65% saturation, based on the soil test phosphorus values and region as listed in Table 4-1 of Section IV.

* Avoid the general use of high phosphorus ratio fertilizers such as 10-10-10 or 5-10-10, unless soil tests indicate phosphorus availability below the M+ level.

**Nitrogen Management on Athletic Fields - Cool Season Grasses**

- This program is intended for those fields which are under heavy use.

- Nitrogen recommendations are based on the assumption that there is adequate soil moisture to promote good turf growth at the time of application. If no rainfall has occurred since the last application, further applications should be delayed until significant soil moisture is available.
<table>
<thead>
<tr>
<th>Cool Season Grasses</th>
<th>Maintenance Program&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
</tr>
<tr>
<td>When to Apply&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Pounds per 1,000 ft&lt;sup&gt;2&lt;/sup&gt; Nitrogen</td>
</tr>
<tr>
<td>After August 15</td>
<td>-----</td>
</tr>
<tr>
<td>September</td>
<td>0.7</td>
</tr>
<tr>
<td>October</td>
<td>0.7&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>November</td>
<td>0.5</td>
</tr>
<tr>
<td>April 15 - May 15</td>
<td>0.5</td>
</tr>
<tr>
<td>June 1 - June 15</td>
<td>-----</td>
</tr>
</tbody>
</table>

Notes:

- Soluble nitrogen rates of 0.25 pounds per 1,000 ft<sup>2</sup> or less which may be a component of a pesticide or minor element application may be applied any time the turf is actively growing, but must be considered with the total annual nitrogen application rate.
- WSN = water soluble nitrogen; WIN = water insoluble nitrogen

(a) Intensive managed areas must be irrigated.

(b) The beginning and ending dates for application of nitrogen shall be determined using guidance and frost date maps contained in the preceding Season of Application for Nitrogen section, using Figures 6-1 and 6-2.

(c) Rates up to 0.9 pounds per 1,000 ft<sup>2</sup> of total nitrogen can be applied using a material containing slowly available forms of nitrogen, with a minimum of 30 days between applications.

(d) Make this application only if turf use warrants additional nitrogen for sustaining desirable growth and/or color.

Nitrogen Management on Athletic Fields - Warm Season Grasses

The following comments apply to both Naturally Occurring or Modified Sand based Fields and Predominantly Silt/Clay Soil Fields:

- Annual nitrogen rates for warm season grasses shall not exceed 4 pounds in areas which have the average first killing frost on or before October 20, and shall not exceed 5 pounds in areas which have the average first killing frost after October 20 as shown in Figure 6-1. Nitrogen rates and timings for overseeding warm season grasses are not included in these rates.

- April 15 - May 15 applications should not be made until after complete green-up of turf.

- Nitrogen applications June through August should be coordinated with anticipated rainfall if irrigation is not available.

- Use the lower end of the ranges for non-irrigated fields and the higher end of the ranges should be used on fields with irrigation.
- Nitrogen rates towards the higher end of the ranges may be applied on heavily used fields to accelerate recovery, however per application and annual rates cannot be exceeded.

<table>
<thead>
<tr>
<th>Bermudagrass - Predominantly Silt/Clay Soil Fields a</th>
<th>Pounds per 1,000 ft² nitrogen</th>
<th>First Fall Killing Frost Date b</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to Apply b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April 15 - May 15</td>
<td>0.5 - 0.7 (c)</td>
<td>Before Oct. 20</td>
</tr>
<tr>
<td>June</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>0.5 - 0.7 (d)</td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>0.5 - 0.7 (d)</td>
<td></td>
</tr>
<tr>
<td>Sept 1 - Sept 15</td>
<td>0.5 - 0.7 (c)</td>
<td>After Oct. 20</td>
</tr>
<tr>
<td>If overseeded with perennial ryegrass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct - Nov</td>
<td>0.5 (e)</td>
<td></td>
</tr>
<tr>
<td>Feb-Mar</td>
<td>0.5 (e)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bermudagrass - Naturally Occurring or Modified Sand based Fields a</th>
<th>Pounds per 1,000 ft² nitrogen</th>
<th>First Fall Killing Frost Date b</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to Apply b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April 15 - May 15</td>
<td>0.5 - 0.7 (c)</td>
<td>Before Oct. 20</td>
</tr>
<tr>
<td>June</td>
<td>0.7 (c)</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>0.7 (c)</td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>0.7 (c)</td>
<td></td>
</tr>
<tr>
<td>Sept 1 - Sept 15</td>
<td>0.7 (c)</td>
<td>After Oct. 20</td>
</tr>
<tr>
<td>If overseeded with perennial ryegrass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct - Nov</td>
<td>0.5 (e)</td>
<td></td>
</tr>
<tr>
<td>Feb - Mar</td>
<td>0.5 (e)</td>
<td></td>
</tr>
</tbody>
</table>

The following notes apply to both of the Bermudagrass tables above:

(a) In the Piedmont and the Ridge and Valley areas of Virginia, the existing native soil will normally be comprised predominantly of clay and/or silt and these soils have inherently lower water infiltration and percolation rates and greater nutrient holding capacity. However, most areas of the Coastal Plain have existing native soils that are predominantly sandy textured soils and other facilities throughout the state may choose to install modified soil root zones that are predominantly sand (>50%) in order to maximize drainage and reduce compaction tendency. If subsurface drain tile surrounded by sand and/or gravel has been installed under the playing surface of any of these fields, their nitrogen programs should be managed as predominantly sand-based systems to minimize nutrient leaching.

(b) The beginning and ending dates for application of nitrogen shall be determined using guidance and frost date maps contained in the Season of Application for Nitrogen section, Figures 6-1 and 6-2.

(c) WSN must be applied as two applications not to exceed 0.35 pounds per 1,000 ft² each with a minimum of 15 days between applications. Alternatively, using a material that contains slowly available nitrogen sources, split applications of 0.5 pounds per 1,000 ft² may be applied with a minimum of 15 days between applications.
(d) If a material containing slowly available forms of nitrogen is used, rates up to 1.0 pounds of nitrogen per 1,000 ft$^2$ may be applied in a single application with a minimum of 30 days between applications.

(e) For overseeded warm season grasses, an additional 0.7 pounds per 1,000 ft$^2$ of WSN may be applied in the Fall after the perennial ryegrass seeding is well established. The WSN must be applied as two applications not to exceed 0.35 pounds per 1,000 ft$^2$ of nitrogen each, with a minimum of 15 days between applications. Additional WSN application of 0.5 pounds per 1,000 ft$^2$ may be made in February-March to overseeded perennial ryegrass if growth and color indicate need. Alternatively, split applications of 0.5 pounds of nitrogen per 1,000 ft$^2$ each with a minimum of 15 days between applications may be applied using a material containing slowly available nitrogen sources.

**Phosphorus and Potassium Recommendations Athletic Fields**

Apply phosphorus ($P_2O_5$) and potassium ($K_2O$) fertilizers as indicated by a soil test using the following guidelines:

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft$^2$)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>$P_2O_5$: 2-3, $K_2O$: 2-3</td>
</tr>
<tr>
<td>M</td>
<td>$P_2O_5$: 1-2, $K_2O$: 1-2</td>
</tr>
<tr>
<td>H</td>
<td>$P_2O_5$: 0.5-1, $K_2O$: 0.5-1</td>
</tr>
<tr>
<td>VH</td>
<td>0</td>
</tr>
</tbody>
</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.

- For irrigated turf grown on Naturally Occurring and Modified Sand Based soils only, up to 0.5 pounds of $P_2O_5$ per 1,000 ft$^2$ may be applied, if needed, to aid in recovery of damaged turf during times of extreme use. No phosphorus applications shall be made when the soil phosphorus test level is above 65% saturation, based on the soil test phosphorus values and region as listed in Table 4-1 of Section IV.

- Avoid the general use of high phosphorus ratio fertilizers such as 10-10-10 or 5-10-10, unless soil tests indicate phosphorus availability below the M+ level.
Establishment/Grow-In Recommendations for Golf Courses, Athletic Fields, and Sod Production

(These rates replace normal maintenance fertilizer applications that would have occurred during these time periods.)

Warm Season Grasses:

Predominantly Silt/Clay Soils
- Plant Date - late May - June for sprigs, plugs, sod, or seeding.
- Apply P₂O₅ and K₂O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - Up to 1.0 pounds of nitrogen per 1,000 ft² using a material containing slowly available forms of nitrogen may be applied as one application or lesser amounts applied at regular intervals, through the first 4 weeks, not to exceed a total of 1.0 pounds of nitrogen per 1,000 ft².
- Four weeks after planting - 0.25 pounds of WSN per 1,000 ft² per week for the next 4 weeks.

Naturally Occurring or Modified Sand Based Soils
- Plant Date - late May - June for sprigs, plugs, sod, or seeding.
- Apply P₂O₅ and K₂O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - Up to 1.0 pounds of nitrogen per 1,000 ft² using a material containing slowly available forms of nitrogen may be applied as one application or lesser amounts applied at regular intervals through the first 4 weeks, not to exceed a total of 1.0 pounds of nitrogen per 1,000 ft².
- Four weeks after planting - 0.25 pounds per 1,000 ft² using a material containing slowly available forms of nitrogen per week for the next 4 weeks.

Cool Season Grasses:

Predominantly Silt/Clay Soils
- Plant Date - August - September (preferred)
- Apply P₂O₅ and K₂O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - up to 0.9 pounds of nitrogen per 1,000 ft² using a material containing slowly available forms of nitrogen may be applied; 30 days after planting, apply up to 0.5 pounds of nitrogen per 1,000 ft² every week for the next 4 weeks.

Naturally Occurring or Modified Sand Based Soils
- Plant Date - August - September (preferred)
- Apply P₂O₅ and K₂O as needed based on soil test recommendations, incorporate into the top 2 inches if possible.
- At Planting - up to 0.9 pounds of nitrogen per 1,000 ft² using a material containing slowly available forms of nitrogen may be applied.
- Apply up to 0.25 pounds of nitrogen per 1,000 ft² per week after germination is complete, for the next 8 weeks. If using a material that contains slowly available forms of nitrogen, apply up to 0.5 pounds of nitrogen per 1,000 ft² every two weeks may be applied after germination is complete for the next 8 weeks.
Sod Installations:

Site preparation should include a soil test, which can be done several months before the project begins in order to have time to get test results back. Phosphorus, potassium and lime applications should be based on soil test analysis to increase the likelihood of a successful installation. Shallow incorporation of material into the top 2 inches of the soil is preferred prior to sod installation, especially if lime is required.

No more than 0.7 pounds of nitrogen per 1,000 ft² of WSN may be applied before sod is installed. Alternatively, using a material with slowly available forms of nitrogen, 0.9 pounds of nitrogen per 1,000 ft² for cool season grasses or 1.0 pounds of nitrogen per 1,000 ft² for warm season grasses may be applied before sod is installed.

After installation apply adequate amounts of water to maintain sufficient soil moisture (i.e. to prevent visible wilt symptoms). Excessive water will limit initial root development. After roots begin to establish (as verified by lightly tugging on the sod pieces), shift irrigation strategy to a deep and infrequent program in order to encourage deep root growth. Apply approximately 1 inch of water per week (either by rainfall or irrigation), making sure that the water is being accepted by the soil profile without running off. This will insure thorough wetting of the soil profile.

After sod has completed rooting and is well established, initiate the normal nitrogen management program as described for the appropriate use shall be recommended.

Phosphorus and Potassium Recommendations for Establishment/Grow-In/Installation

<table>
<thead>
<tr>
<th>Soil Test Level</th>
<th>Nutrient Needs (pounds per 1,000 ft²)*</th>
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<tr>
<td>M</td>
<td>2-3</td>
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</table>

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.
Other Turf Management Considerations for Golf Courses, Athletic fields, and Home Lawns

Lime Recommendations

Lime should be recommended based on a soil test to maintain soil pH within an agronomic range for turfgrass.

For new seedings where lime is recommended, incorporate the lime into the topsoil for best results.

Returning Grass Clippings

Recycling of clippings on turf should be encouraged as an effective means of recycling nitrogen, phosphorus, and potassium. Proper mowing practices that ensure no more than 1/3 of the leaf blade is removed in any cutting event will enhance turf appearance and performance when clippings are returned. Return all leaf clippings from mowing events to the turf rather than discharging them onto sidewalks or streets. Rotary mulching mowers can further enhance clipping recycling by reducing the size of clippings being returned to the turfgrass canopy.

Management of Collected Clippings

If clippings are collected they should be disposed of properly. They may be composted or spread uniformly as a thin layer over other turf areas or areas where the nutrient content of the clippings can be recycled through actively growing plants. They should not be blown onto impervious surfaces or surface waters, dumped down stormwater drains, or piled outside where rainwater will leach out the nutrients creating the potential for nutrient loss to the environment.

Use of Iron

Iron applications (particularly foliar applications) may periodically be used for enhanced greening as an alternative to nitrogen. These applications are most beneficial if applied in late spring through summer for cool season grasses and in late summer/fall applications for warm-season grasses.

Impervious Surfaces

Do not apply fertilizers containing nitrogen or phosphorus to impervious surfaces (sidewalks, streets, etc.). Remove any granular materials that land on impervious surfaces by sweeping and collecting, and either put the collected material back in the bag, or spread it onto the turf and/or using a leaf blower etc. to return the fertilizer back to the turfgrass canopy.
### Table 3-1
**Lime Recommendations for Virginia Crops (tons/acre)**
Lime Rates based on Va Tech Soil buffer pH

<table>
<thead>
<tr>
<th>Buffer pH</th>
<th>5.2</th>
<th>5.8</th>
<th>6.2</th>
<th>6.5</th>
<th>6.8</th>
<th>Acidity meq/100g</th>
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</table>

Lime recommendations in the table above are based on the use of a liming material equivalent in neutralizing power to 100% CaCO₃. For application rates of liming material that is less than 100% neutralizing power of CaCO₃ (pure calcium carbonate) use the table in this section, Lime Rate Adjustment for CCE.
Lime Recommendations Using Other Testing Labs

For approved labs other than Virginia Tech, use the lime recommendations given by the lab. IF there are no recommendations with the soil analysis, use the table below for A&L Agricultural, Spectrum Analytical, and Brookside Laboratories.

Table 3-2
Lime Application Rate¹ (tons/acre) to achieve desired pH based on SMP Buffer Test

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<th>Soil-Buffer pH</th>
<th>Target Soil pH</th>
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</tbody>
</table>

¹ Ag-ground lime of 90% plus total neutralizing power (TNP) or CaCO₃ equivalent, and fineness of 40% < 100 mesh, 50% < 60 mesh, 70% < 20 mesh and 95% < 8 mesh. Adjustments in the application rate should be made for liming materials with different particle sizes, or neutralizing value.

Waters Agricultural Laboratories uses the Adams and Evans single buffer method which uses a different table for recommendations than the Mehlich or the SMP tables supplied here. In the event you would have lab reports from Waters Lab, which do not have lime recommendations, contact the lab for recommendations based on their analysis procedure.

Lime Rate Adjustment for CCE

Using the lime application rate to achieve the desired target pH based on the soil test buffer pH, use the table below to adjust that rate based on the % CCE of the liming material to be applied.

Table 3-3
Lime Application Rate Adjustment Based on % CCE of Material

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<th>100</th>
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* Lime recommendation to adjust pH as determined from soil test analysis.
Figure 4: CEC Chart
9. Soil Test Results

See attached PDF files for soil test results.