Abrams Creek and Lower Opequon Creek Combined

Sediment and Bacteria TMDL Action Plan

PERMIT NUMBER VAR040053

Submitted to DEQ:

October 2015

CITY OF WINCHESTER, VIRGINIA - ABRAMS CREEK AND LOWER OPEQUON CREEK COMBINED SEDIMENT AND BACTERIA TMDL ACTION PLAN

INTRODUCTION

The City of Winchester has prepared this Abrams Creek and Lower Opequon Creek Combined Sediment and Bacteria TMDL Action Plan to address the Special Condition for approved local TMDLs (Section I.B) in the City's MS4 Permit. The City's approach for preparation of this Action Plan is based on the requirements listed in the MS4 General Permit and DEQ's Draft Local TMDL Action Plan Guidance Document that was released on 4/9/2015. Each of the sections in this Action Plan will address one or more of the required action plan content items as listed on page 4 of DEQ's Draft Local TMDL Action Plan Guidance Document.

TMDL BACKGROUND INFORMATION

1. *The name(s) of the Final TMDL report(s);*
2. *The pollutant(s) causing the impairment(s);*
3. *The WLA(s) assigned to the MS4 as aggregate or individual WLAs.*
   [This section of the Action Plan directly addresses Section I.B of the MS4 Permit and DEQ Guidance Document Action Plan Content Items1-3]

The City of Winchester was assigned aggregated Waste Load Allocations (WLAs) under the approved TMDL report entitled *Opequon Watershed TMDLs for Benthic Impairments: Abrams Creek and Lower Opequon Creek, Frederick and Clarke Counties, Virginia dated July 2003 and Revised October 2003*. Stream segments on Abrams Creek (Segment ID: VAV-B09R_ABR01A00) and the Lower Opequon Creek (Segment ID: VAV-B09R_OPE01A00) were both listed as impaired on Virginia's Section 303(d) Total Maximum Daily Load Priority List and Report due to water quality violations of the general standard (listed as a benthic impairment). Analyses of physical, chemical, biological, and observational data indicated that sediment was the most probable cause of the benthic impairments in both stream segments. TMDLs were therefore developed for sediment to address the benthic impairments in Abrams Creek and Lower Opequon Creek. The City of Winchester (VAR040053) and VDOT (VAR040032) MS4s were assigned aggregated WLAs in the Final TMDL report as follows:

- Abrams Creek TMDL Sediment WLA = 442.7 Metric Tons/Year or 975,985 lbs/year
- Lower Opequon Creek Sediment WLA = 269.2 Metric Tons/Year or 593,484 lbs/year

The City of Winchester was also assigned an aggregated WLA under the approved TMDL report entitled *Bacteria TMDLs for Abrams Creek and Upper and Lower Opequon Creek Located in Frederick and Clarke County, Virginia dated October 2003 and Revised January 2004*. Stream segments on Abrams Creek (Segment ID: VAV-B09R_ABR01A00), Upper Opequon Creek (Segment ID VAV-B08R_OPE01A00), and the Lower Opequon Creek (Segment ID: VAV-

B09R_OPE01A00) were listed as impaired on Virginia's Section 303(d) Total Maximum Daily Load Priority List and Report due to water quality violations of the general standard for fecal coliform. In order to remedy the water quality impairment pertaining to fecal coliform, TMDLs were developed for the new water quality standards for bacteria, which state that the calendar-month geometric mean concentration of E. coli shall not exceed 126 cfu/100 mL, and that no single sample can exceed a concentration of 235 cfu/100mL. The City of Winchester (VAR040053) and VDOT (VAR040032) MS4s were assigned an aggregated WLA in the Final TMDL report as follows:

- Abrams Creek TMDL Bacteria WLA = $19.4x10^{12}$ cfu/year fecal coliform

The remainder of this Action Plan will focus on addressing the City's plan for complying with the WLAs assigned to the City under both of these TMDLs.

SIGNIFICANT SOURCES OF POC(S)

4. *Significant sources of POC(s) from facilities of concern owned or operated by the MS4 operator that are not covered under a separate VPDES permit. A significant source of pollutant(s) from a facility of concern means a discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL.*
   [This section of the Action Plan directly addresses Section I.B.2.d of the MS4 Permit and DEQ Guidance Document Action Plan Content Item 4]

During the first half of 2013, the City's engineering consultant evaluated City owned/operated properties for potential sources of pollutants for which the City was assigned a waste load allocation (WLA) in a State Water Control Board approved Total Maximum Daily Load (TMDL). The consultant performed an initial potential source evaluation task that utilized the City's Geographic Information System (GIS) to identify and characterize eighty one City owned/operated properties for land use type (the City's zoning layer) and the presence/absence of MS4 outfalls on the property. The outcome of the initial potential source evaluation task identified six City owned/operated properties requiring further site review and runoff characterization.

The City owned/operated properties found to require a site review and runoff characterization triggered an on-site field reconnaissance task to review and assess the on-the-ground conditions for each of the City owned/operated properties. The consultant documented potential pollutant of concern (POC) generating activities (storage, transfer, transport, or disposal) on each site, stormwater pollution potential from the site (exposure to precipitation), and locations of outfalls. Based on the results of this study, the City incorporated additional pollution prevention activities and training materials into the Pollution Prevention/Good Housekeeping for Municipal Operations (BMPs 6.1 thru 6.7) section of its MS4 Program Plan to further address bacteria and sediment as pollutants of concern. A copy of the full memo report documenting evaluation of the City owned/operated properties for potential WLA pollutant sources is provided in Attachment 1 to this Action Plan.

EXISTING OR NEW BEST MANAGEMENT PRACTICES

5. *Existing or new management practices, control techniques, and system design and engineering methods , that have been or will be implemented as part of the MS4 Program Plan that are applicable to reducing the pollutant identified in the WLA. [This section of the Action Plan directly addresses Section I.B.2.b of the MS4 Permit and DEQ Guidance Document Action Plan Content Item 5]*

Recognizing that sediment and bacteria pollutant discharges from the City's MS4 need to be controlled to the maximum extent practicable in order to protect the water quality in the streams that flow throughout it, the City's political leadership and staff enacted several changes to the City's Code in order to facilitate a reduction in these pollutant discharges. These Code changes included:

- Reduced the threshold for regulated land disturbing activities from 10,000 ft^2 to 5,000 ft^2 under Chapter 9 Article 2 (Sediment)
- Instituted stream buffer protection under Chapter 9 Article 4 (Sediment and Bacteria)
- Prohibited feeding of waterfowl under Chapter 5 Article 3 (Bacteria)

In addition to these strong legal mechanisms for controlling pollutant discharges, the City also incorporated many new Best Management Practices (BMPs) into its MS4 Program Plan (revised in 2013) that target sediment and bacteria and focus on source control. The following is a list of thirty MS4 Program Plan BMPs that the City is implementing to specifically address the reduction of sediment and bacteria pollutant loads from the City's MS4:

- *BMP 1.1. City Stormwater Webpage (Sediment and Bacteria)* - The City will maintain a web page dedicated to the City's stormwater management program and will distribute stormwater program messages and related information to its citizens via this tool.
- *BMP 1.2. Social Media (Sediment and Bacteria)* - The City will use its Facebook and Twitter accounts to deliver its stomwater program messages and to distribute stormwater related information to its citizens.
- *BMP 1.3. Public Events (Sediment and Bacteria)* - The City will participate in public events such as the Community Wellness Festival to deliver its stomwater program messages and to distribute stormwater related information to its citizens.
- *BMP 1.4. Publications - Print and Electronic (Sediment and Bacteria)* - The City will use publications such as its Cit-E newsletter to deliver its stomwater program messages and to distribute stormwater related information to its citizens.
- *BMP 1.5. Watershed and Stormwater Educational Opportunities Program (Sediment and Bacteria)* - The City will continue to implement its Watershed and Stormwater Opportunities Education Program directed at students in Winchester City Public Schools.

- *BMP 1.6. Other Message Delivery (Sediment and Bacteria)* - The City will utilize other types of message delivery such as "Clean Up After Your Dog" signage at the City's Dog Park to reach targeted audiences within the City.
- *BMP 1.7. Educational Materials (Sediment and Bacteria)* - The City will retain copies (electronic or hard copy) of educational materials utilized in delivery of its messages regarding high priority water quality issues to target audiences.
- *BMP 2.3. Stormwater Complaint Hotlines (Sediment and Bacteria)* - The City will maintain its current stormwater complaint hotlines to encourage public reporting of water quality and stormwater maintenance related issues to include potential illicit discharges to the MS4.
- *BMP 2.4. Promotion of the Local Environmental Events (Sediment and Bacteria)* - The City will annually promote a total of four events encouraging public participation and involvement in Household Hazardous Waste Collection Days and the Adopt-A-Stream program.
- *BMP 2.6. Sponsorship of Adopt-A-Stream Program (Sediment and Bacteria)* - The City will continue to promote the Adopt-A-Stream program by sponsoring an annual stream clean-up day.
- *BMP 3.3. Legal Authority – IDDE (Sediment and Bacteria)* - The City will maintain legal authority prohibiting illicit discharges into the MS4.
- *BMP 3.4. IDDE Investigation and Follow-Up (Sediment and Bacteria)* - The City will investigate and conduct follow-up on potential illicit discharges in accordance with procedures included in the City's Illicit Discharge Detection and Elimination (IDDE) Standard Operating Procedures Manual.
- *BMP 3.5. MS4 Outfall Dry Weather Field Screening (Sediment and Bacteria)* - The City will conduct dry weather screening on fifty (50) MS4 outfalls annually using procedures included in the City's Illicit Discharge Detection and Elimination (IDDE) Standard Operating Procedures Manual.
- *BMP 3.6. Illicit Discharge Tracking and Documentation (Sediment and Bacteria)* - The City will track and document suspected and illicit discharges, as well as, the City's investigation, follow-up and enforcement actions in accordance with the procedures included in the City's Illicit Discharge Detection and Elimination (IDDE) Standard Operating Procedures Manual.
- *BMP 3.9. Household Waste Reduction (Sediment and Bacteria)* - The City will continue to provide weekly waste collection services for City residents to include fall leaf collection services, yard waste collection services, and bulky waste collection services.
- *BMP 3.10. Elimination of Sanitary Sewage Seepage from Public Sewers (Bacteria)* - The City will continue, as part of its sanitary sewer utilities program, to implement its inflow and infiltration program to replace or slipline sanitary sewers to prevent illicit discharges.
- *BMP 4.1. Legal Authority – E and SC (Sediment)* - The City will maintain legal authority for implementation of a local erosion and sediment control program consistent with 9VAC25-840-10 et. seq.

- *BMP 4.2. Land Disturbing Activity Plan Review (Sediment)* - The City will require submission of complete Land Disturbance Permit Application and Virginia Stormwater Management Program Permit Packages for regulated land disturbance activities.
- *BMP 4.3. VPDES Construction Activity Permit Coordination (Sediment)* - The City will not authorize initiation of land disturbance activities until it receives evidence that the applicant has applied for and obtained coverage under the Virginia General Permit for Discharges of Stormwater from Construction Activities, including a completed general permit registration statement as required under City Code Section 9-50.
- *BMP 4.4. Land Disturbing Activity Inspections (Sediment)* - The City will maintain a land disturbance inspection program consistent with the requirements of Section 9-39 of the City Code to include inspection for compliance with Section 9- 58 of the City Code which requires implementation of a pollution prevention plan and Section 9-67 of the City Code requiring compliance with the approved stormwater management plan.
- *BMP 4.5. Land Disturbing Activity Tracking and Recordkeeping (Sediment)* - The City will maintain its existing program to track land disturbance activities which provides the necessary information for routine inspections, as-built inspections, surveys, and determining which areas may be most likely to incur heavier than normal sediment loading.
- *BMP 5.2. Private Stormwater Management Facility Inspections (Sediment and Bacteria)* - The City will maintain a post development stormwater management facility inspection program in accordance with Section 9-67 of the City Code and will perform inspections on these facilities at least once every five (5) years.
- *BMP 5.3. Maintenance Agreements (Sediment and Bacteria)* - The City will continue to require executed maintenance agreements for stormwater management facilities in accordance with Section 9-63 of the City Code.
- *BMP 5.4. City-Owned Stormwater Management Facility Inspections (Sediment and Bacteria)* - The City Division of Engineering will inspect stormwater management facilities owned/operated by the City annually using procedures identified in the Public Stormwater Management Facility Inspection Standard Operating Procedures Manual.
- *BMP 5.5. City-Owned Stormwater Management Facility Maintenance (Sediment and Bacteria)* - The City Division of Public Works will conduct maintenance on City-Owned Stormwater Management Facilities, as necessary, and in response to Division of Engineering inspections.
- *BMP 6.1. Standard Operating Procedures (Sediment and Bacteria)* - The City will develop and implement standard operating procedures for pollution prevention to be incorporated into daily operational activities.
- *BMP 6.2. Stormwater Pollution Prevention Plans (Sediment and Bacteria)* - The City will develop a stormwater pollution prevention plan (SWPPP) for the equipment and maintenance facility located at Jim Barnett Park.
- *BMP 6.4. Pollution Prevention Inspections (Sediment and Bacteria)* - The City will conduct an annual pollution prevention inspection at the equipment and maintenance facility located at Jim Barnett Park.

- *BMP 6.5. Staff Training (Sediment and Bacteria)* - The City will conduct staff training in accordance with the training schedule and training modules included in the City of Winchester Stormwater Training Plan.
- *BMP 6.6. Street Sweeping (Sediment and Bacteria)* - The City will continue its street sweeping program and track the amount of litter, sediment, and debris removed.

More detailed descriptions for each of these BMPs can be found in the City's MS4 Program Plan which is available for download at http://www.winchesterva.gov/engineering/stormwater . The City plans to continue implementation of these BMPs to address the sediment and bacteria WLAs listed in the aforementioned TMDLs. Based on the results of the City's Action Plan assessment methodology (as described in Section 9 of this Action Plan), an adaptive iterative approach will be used to enhance/replace these BMPs to achieve the most effective plan for reducing the discharge of sediment and bacteria from the City's MS4 and to meet the assigned TMDL WLAs.

LEGAL AUTHORITIES

6. *Legal authorities such as ordinances, state and other permits, orders, specific contract language, and inter-jurisdictional agreements applicable to reducing the POCs identified in each respective TMDL.*
[This section of the Action Plan directly addresses Section I.B.2.a of the MS4 Permit and DEQ Guidance Document Action Plan Content Item 6]

The City has reviewed its MS4 Program Plan and ordinances to evaluate its ability to comply with the Special Condition for approved (other than the Chesapeake Bay TMDL) TMDLs (Section I.B) in the MS4 Permit. Based on this review, it is our opinion that Winchester does not require any new or modified legal authorities or policies to meet the requirements of this special condition. The following is a list of the City's relevant existing legal authorities and policies:

- City of Winchester's Water Protection Ordinance (Chapter 9 of the City Code)
- City of Winchester's MS4 Program Plan
- City of Winchester's Public Services Standards Manual
- City of Winchester's Animals and Fowl Ordinance (Chapter 5 of the City Code)

However, the City may choose to coordinate with other adjacent MS4s (Frederick County Public Schools and VDOT) and explore the idea of establishing memoranda of understanding (MOU) to clarify MS4 service boundary lines and inter-jurisdictional responsibilities for POC loads and subsequent required POC load reductions in the future.

ENHANCEMENTS TO PUBLIC EDUCATION, OUTREACH, AND EMPLOYEE TRAINING

7. *Enhancements to public education, outreach, and employee training programs to also promote methods to eliminate and reduce discharges of the POC(s) for which a WLA has been assigned.*

[This section of the Action Plan directly addresses Section I.B.2.c of the MS4 Permit and DEQ Guidance Document Action Plan Content Item 7]

Enhancements to Public Education and Outreach Program

The City continues to implement a very robust public education and outreach program as part of its MS4 Program Plan. The City's webpage is the primary public education and outreach tool utilized for reaching the program's targeted audiences and providing for distribution of educational materials to convey the appropriate messages. Publications currently available for download from the City's Stormwater webpage include the following:

- Stormwater Complaint Hotline Flyer (Sediment and Bacteria)
- EPA's "After the Storm" Video Series (Sediment and Bacteria)
- "Pick it Up, It's Your Doodie" Pet Waste Brochure (Bacteria)
- "Please Do Not Feed the Waterfowl" Wildlife Waste Brochure (Bacteria)
- "How to Make Your Own Rain Barrel" Presentation (Sediment)
- "Adopt-A-Stream" Flyer (Sediment and Bacteria)

As can be seen from this list, the City has utilized several of these publications to directly address the pollutants of concern (sediment and bacteria) for which a WLA has been assigned to the City. The City has recently added to the list of publications available through the public education and outreach program. The following publications were recently customized for the City's use and are now available for download on the City's stormwater webpage:

- *After the Storm Brochure - English* - English version of this brochure customized with the City's contact information. (Sediment and Bacteria)
- *After the Storm Brochure - Spanish* - Spanish version of this brochure customized with the City's contact information. (Sediment and Bacteria)
- *SepticSmart Short Rack Brochure in English* - English version of this brochure customized with the City's contact information. (Bacteria)
- *SepticSmart Short Rack Brochure in Spanish* - English version of this brochure customized with the City's contact information. (Bacteria)
- *Make Your Home the Solution to Stormwater Pollution Brochure* - English version of this brochure customized with the City's contact information. (Sediment and Bacteria)
- *Kids Stormwater Stickers* - Print sheets of stormwater stickers that can be printed on sticky back paper. (Sediment and Bacteria)

These new publications will also be distributed at future public events. The City is seeking to broaden its reach of the targeted audiences for reduction of sediment and bacteria discharges by offering several of these publications in both English and Spanish.

Another enhancement to the City's program designed specifically to address source control of bacteria is the City's promotion of picking up pet waste through the use of "*Clean Up After Your*

Dog" signs which were placed at the Dog Park located in Jim Barnett Park. These signs along with the dog park rules clearly inform pet owners that they must clean up after their pets with the supplied waste bags and dispose of the bags in the provided sealed container located in the park.

Through these enhancements to the City's Public Education and Outreach Program, the City expects to further reduce the discharge of both sediment and bacteria into local streams.

Enhancements to Employee Training Program

The City's employee training program consists of four different PowerPoint training modules. All four modules have been recently modified to specifically address the pollutants of concern (sediment and bacteria) for which a WLA has been assigned to the City. These four training modules and their recent enhancements are described below:

Module 1: Recognition and Reporting of Illicit Discharges - Make City staff more aware of the City's focus and procedures to prevent, detect, and eliminate illicit discharges. This module was enhanced to include identification and reporting of illicit discharges associated with both sediment and bacteria sources.

Module 2: Pollution Prevention Practices (PPP) used in Road, Street, and Parking Lot Maintenance - Provide City employees an understanding on how to prevent stormwater pollution during the City's street, parking, and drainage operations by adhering to SOPs and good housekeeping practices. This module was enhanced to include prevention of sediment laden runoff from entering the MS4. Specifically the training covers control of concrete cutting slurries, erosion & sediment controls, and building material stockpile protection.

Module 3: Pollution Prevention Practices used for Fleet and Facility Operations - Increase employee awareness on how to reduce stormwater pollution from daily fleet and facility operations by adhering to SOPs and good housekeeping practices. This module was enhanced to include proper storage of materials to minimize the release of sediment into the MS4 and implementation of a SWPPP on the City Yards facility.

Module 4: Minimizing Stormwater Pollution from Parks and Grounds Maintenance - Increase awareness on how to minimize stormwater pollution from parks and ground operation/maintenance activities by adhering to good housekeeping practices. This module was enhanced to include training on proper storage of materials to minimize the release of sediment into the MS4 and promotion of the use of the City's Dog Park along with enforcement of the City's requirements for clean-up and proper disposal of pet waste in City parks. Furthermore this module was enhanced to include landscaping techniques for reducing the congregation of waterfowl and enforcement of the City's ordinance against feeding waterfowl.

BMP/MILESTONES IMPLEMENTATION SCHEDULE

8. A schedule of interim milestones and implementation of the items in 5, 6, and 7. [This section of the Action Plan directly addresses Section I.B.1.b of the MS4 Permit and DEQ Guidance Document Action Plan Content Items 8]

As permitted in Section I.B.1 of the MS4 General Permit and referred to in DEQ's Draft Local TMDL Action Plan Guidance Document, the City is proposing to implement this Action Plan in multiple stages over multiple permit cycles using an adaptive iterative approach. This approach will allow the City to gather the necessary data and information to determine the most effective BMPs/management strategies for controlling POC loads along with identifying targeted areas for their implementation to meet the TMDL WLAs for bacteria and sediment. The following schedule is proposed for implementation of the BMPs and milestone activities included in this Action Plan for the current permit cycle ending on June 30, 2018:

BMP/Milestone Activity	Schedule
Submission of Local TMDL Action Plan to DEQ	October 1, 2015
BMP 1.1. City Stormwater Webpage	Annually
BMP 1.2. Social Media	Annually
BMP 1.3. Public Events	Annually
BMP 1.4. Publications - Print and Electronic	Annually
BMP 1.5. Watershed and Stormwater Educational Opportunities Program	Annually
BMP 1.6. Other Message Delivery	Annually
BMP 1.7. Educational Materials	Annually
BMP 2.3. Stormwater Complaint Hotlines	Annually
BMP 2.4. Promotion of the Local Environmental Events	Annually
BMP 2.6. Sponsorship of Adopt-A-Stream Program	Annually
BMP 3.3. Legal Authority – IDDE	Annually
BMP 3.4. IDDE Investigation and Follow-Up	Annually
BMP 3.5. MS4 Outfall Dry Weather Field Screening	Annually
BMP 3.6. Illicit Discharge Tracking and Documentation	Annually
BMP 3.9. Household Waste Reduction	Annually
BMP 3.10. Elimination of Sanitary Sewage Seepage from Public Sewers	Annually
BMP 4.1. Legal Authority – E and SC	Annually
BMP 4.2. Land Disturbing Activity Plan Review	Annually
BMP 4.3. VPDES Construction Activity Permit Coordination	Annually
BMP 4.4. Land Disturbing Activity Inspections	Annually
BMP 4.5. Land Disturbing Activity Tracking and Recordkeeping	Annually
BMP 5.2. Private Stormwater Management Facility Inspections	Every 5 Years
BMP 5.3. Maintenance Agreements	Annually
BMP 5.4. City-Owned Stormwater Management Facility Inspections	Annually
BMP 5.5. City-Owned Stormwater Management Facility Maintenance	As-Needed
BMP 6.1. Standard Operating Procedures	June 30, 2015
BMP 6.2. Stormwater Pollution Prevention Plans	June 30, 2017
BMP 6.4. Pollution Prevention Inspections	Annually

BMP 6.5. Staff Training	Annually
BMP 6.6. Street Sweeping	Annually
Prepare WQ Monitoring Program for POC Reductions Assessment	June 30, 2016
Purchase WQ Monitoring Equipment & Conduct Training	Aug 15, 2016
Commence WQ Monitoring Program	Sept 15, 2016
Prepare WQ Monitoring Reports	Annually
Prepare Estimate of "End Date" for Compliance with WLAs	March 30, 2018
Identify BMPs to be Implemented During Next Permit Cycle (2018-2023)	March 30, 2018

METHODS TO ASSESS TMDL ACTION PLAN

9. Methods to assess TMDL Action Plans for their effectiveness in reducing the pollutants identified in the WLAs.
[This section of the Action Plan directly addresses Section I.B.2.e of the MS4 Permit and DEQ Guidance Document Action Plan Content Item 9]

In order to assess the effectiveness of the City's Abrams Creek and Lower Opequon Creek Combined Sediment and Bacteria TMDL Action Plan, the City plans to prepare a Water Quality (WQ) Monitoring Program to be initiated during this permit cycle. The City envisions collecting water quality samples (TSS and fecal coliform) twice a year from representative MS4 outfalls that discharge into the impaired reaches of Abrams Creek and Lower Opequon Creek. The City will utilize the water quality data collected under the monitoring program to: Identify potential sources of discharge of the POCs; target locations within the MS4 permit area for implementation of BMPs; and ultimately to assess the overall effectiveness of the Action Plan in reducing the discharge of the POCs from the City's MS4.

In accordance with the schedule provided in Section 8 of this Action Plan, the WQ Monitoring Program will be fully developed by June 30, 2016 and documentation of the program details will be submitted to DEQ with the City's next Annual Report which is due on October 1, 2016. After commencement of the WQ Monitoring Program and appropriate amounts of sampling data become available, the City will analyze the data to determine if any adjustments are necessary to the Action Plan with regards to the BMPs/management strategies for controlling POC loads. This analysis may include utilization of a stormwater runoff/pollutant loading model such as L-THIA for estimation of the POC loads coming from the City's MS4. At the end of each MS4 permit reporting period, the City will also prepare annual WQ monitoring reports to be included with the City's MS4 Annual Report.

MEASURABLE GOALS AND METRICS TO TRACK COMPLIANCE

10. Measurable goals and the metrics that the permittee and Department will use to track those goals (and the milestones required by the permit). Evaluation metrics other than monitoring may be used to determine compliance with the TMDL(s).
[This section of the Action Plan directly addresses Section I.B.1.b of the MS4 Permit and DEQ Guidance Document Action Plan Content Item 10]

The City intends to demonstrate its progress on implementation of this Action Plan by tracking, monitoring, and reporting on BMP/milestone activity progress in its MS4 Program Annual Report that is submitted to DEQ on October 1st of each permit year. In the Annual Report, the City will provide updates on the status of each of the BMP/milestone activities listed under Section 8 of this Action Plan to include compliance with the proposed schedule. In accordance with the adaptive iterative approach adopted by the City, referenced in this Action Plan, the City may modify/replace BMPs, as necessary, to achieve the most effective plan for reducing the discharge of sediment and bacteria from the City's MS4 and meeting the assigned TMDL WLAs.

ATTACHMENT 1 – EVALUATION OF THE CITY OWNED/OPERATED PROPERTIES FOR POTENTIAL WLA POLLUTANT SOURCES REPORT

Memo

To: Ms. Kelly Henshaw

From: GKY & Associates, Inc.

Date: May 30, 2013

Re: Report of Evaluation of City Owned Properties for WLA Pollutant Sources

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Introduction

In accordance with the City of Winchester's MS4 Program plan, GKY & Associates, Inc. (GKY) evaluated City owned/operated properties for potential sources of pollutants for which the City was assigned a waste load allocation (WLA) in a State Water Control Board approved Total Maximum Daily Load (TMDL). GKY performed an initial potential source evaluation task that utilized the City's Geographic Information Systems (GIS) to identify and characterize City owned/operated properties, land use type (the City's zoning layer) for each property and regulated outfall location/presence on each property. The outcome of the initial potential source evaluation task identified City owned/operated properties requiring further site review and runoff characterization. For the City owned/operated properties found to require a site review and runoff characterization, GKY performed field reconnaissance on site to review and assess the on-the-ground conditions for each of the City owned/operated properties and document potential pollution generating activities (storage, transfer, transport, or disposal) on each site, stormwater pollution potential from the site (exposure to precipitation), and locations of outfalls. Detailed summaries for the initial potential source evaluation task and site review task are provided below.

Task 1. Perform Initial Potential Source Evaluation.

GKY utilized the City's GIS to perform a potential source evaluation by combining two data layers provided by the City of Winchester (Winchester_City_Parcels and Corporate_Limits). These two layers were merged with a regulated outfalls layer and overlaid on aerial imagery. Eighty one (81) City owned/operated properties were analyzed based on two criteria that would trigger the need for a field visit to the site. The criteria evaluated were as follows: (1) The presence of regulated outfalls on-site that would allow for an adequate water sampling location, and (2) The presence of potential sources of E.Coli (Animal/Waterfowl activity) or TSS (Denuded Areas or stockpiling)

Based on the GIS analysis, it was determined that six (6) City owned/operated properties met both criteria laid forth to warrant a site review. The sites are listed in Table 1.

Table 1. GIS determination of City owned or operated sites requiring a site field visit.

Site	Site Name	Site Address
1	Hollingsworth House	E S 1360 South Pleasant Valley Road
2	Moose Lodge	S S 215 East Cork Street
3	Court Square Auto park	E S 4-10 South Cameron Street
4	Jim Barnett Park	S S 1001 East Cork Street
5	Shawnee Springs Reserve	S S 301 East Pall Mall Street
6*	Frederick Douglas Elementary	S S 100 West Cedarmeade Avenue
**Note: Site 6 Was not evaluated per City of Winchester instructions*		

Task 2. Perform Site Reviews.

GKY performed field reconnaissance for each of the sites listed in Table 1 to evaluate and assess potential pollution generating activities on the City owned properties. Furthermore, the field visits allowed the team to analyze the drainage aspects, land cover, and infrastructure (piping, culverts, channels) that would result in determining representative sampling locations. GKY took several photos per site, as well as any important notes. A brief summary of each site, representative photo(s), and an explanation as to whether the site qualifies for sampling is provided below.

Site 1 – Hollingsworth House (Representative sampling locations not present).

The Hollingsworth House sits nested in the lower western corner of Jim Barnett Park. The land cover consists primarily of a grassed property, with a riparian buffer along the banks of the stream that divides the site. Due to the presence of the stream, waterfowl and other animal indicators raise the probability of an *E.Coli* presence. On site there are 3 regulated outfalls, but sampling at these locations would not be representative of the site itself. Two outfalls located closest to the road, drain only the road and none of the site, whereas the third outfall drains the

access road within the site, but doesn't have the sampling indicators needed to justify the presence of E.Coli or TSS. Figure 1 illustrates the land cover characteristics and outfall locations (red asterisks') for the Hollingsworth House.

Figure 1. Hollingsworth House Land Cover and Outfall Locations.

Site 2 – Moose Lodge (Representative sampling locations not present).

The Moose Lodge parcel runs parallel to a concrete channel, which conveys one of the City's urban streams. The property consists primarily of the lodge and its associated parking lot, as well as a grassed area towards the southern part of the site. Four outfalls drain this parcel and the significant presence of leaf detritus, sediment, and plant debris throughout the parking lot provide quality TSS indicators. Originally, this site met all of the criteria set forth to qualify as representative sampling location, but after correspondence with the City it was determined that the City property encompasses only the concrete channel area which includes the outfalls, and not the Moose Lodge property. Site photos are shown in Figures 2 and 3.

Figure 2. Moose Lodge Site Overall

Figure 3. Concrete Channel (Actual City Owned Property)

Site 3 – Court Square Auto Park (Representative sampling locations not present).

Court Square Auto Park is located in Downtown/Old Town Winchester. The property has a large, multi-deck parking garage on it and is almost 100% impervious. An urban stream runs under the parking garage which raises the probability of the presence of E.Coli essentially "on-site", but the representative outfalls derive from the roof drains of the parking garage, which are not likely to be sources of E.Coli or TSS. Due to the lack of optimal sampling locations on site these outfalls would not be classified as a representative outfall sampling locations. Site characteristics and outfalls are shown in Figures 4 and 5.

Figure 4. Court Square outfall locations (Roof Drains)

Figure 5. Stream running parallel and under Court Square Auto Park. Note: The outfalls discharge to the stream, but only drain the parking garage.

Site 4 – Jim Barnett Park (Representative sampling locations not present).

Jim Barnett Park is a large park comprised of several different land covers. The park has recreational fields, drainage ponds, maintenance locations with large stockpiles, and a dog park all having indicators of TSS, E.Coli, or both. The site also has 3 regulated outfalls within the parcel limits. The park is an ideal location for representative sampling, but as seen with the previous sites, the regulated outfalls on site drain adjacent properties and thus cannot adequately represent the City parcel through sampling. Site characteristics are shown in Figures 6 and 7.

Figure 6. Duck Pond with waterfowl present. Note: There is no regulated outfall at the downstream portion of this pond, so sampling cannot be performed.

Figure 7. Regulated outfall within Jim Barnett Park limits. Outfall drains a Shenandoah University owned parking lot.

Site 5 – Shawnee Springs Reserve (Representative sampling location present).

Shawnee Springs Reserve is a wildlife and park area, having open grassed space, wooded riparian areas, a stream that runs the extent of the entire property, and a walking trail for pedestrian use. The site is bordered to the north by the City Yards Facility, and has five regulated outfalls. As seen in the previous sites, the majority of the outfalls drained adjacent properties, and thus cannot be used as representative outfalls for that specific site. Of the five

outfalls onsite, only one drained the site, showed the presence of TSS, and could easily be accessed to gather a representative sample, and thus was chosen as a quality sampling location. Figure 8 below shows the entire parcel and identifies the location of the representative outfall. Figures 9 and 10 show the representative outfall and upland drainage contributing to the outfall respectively.

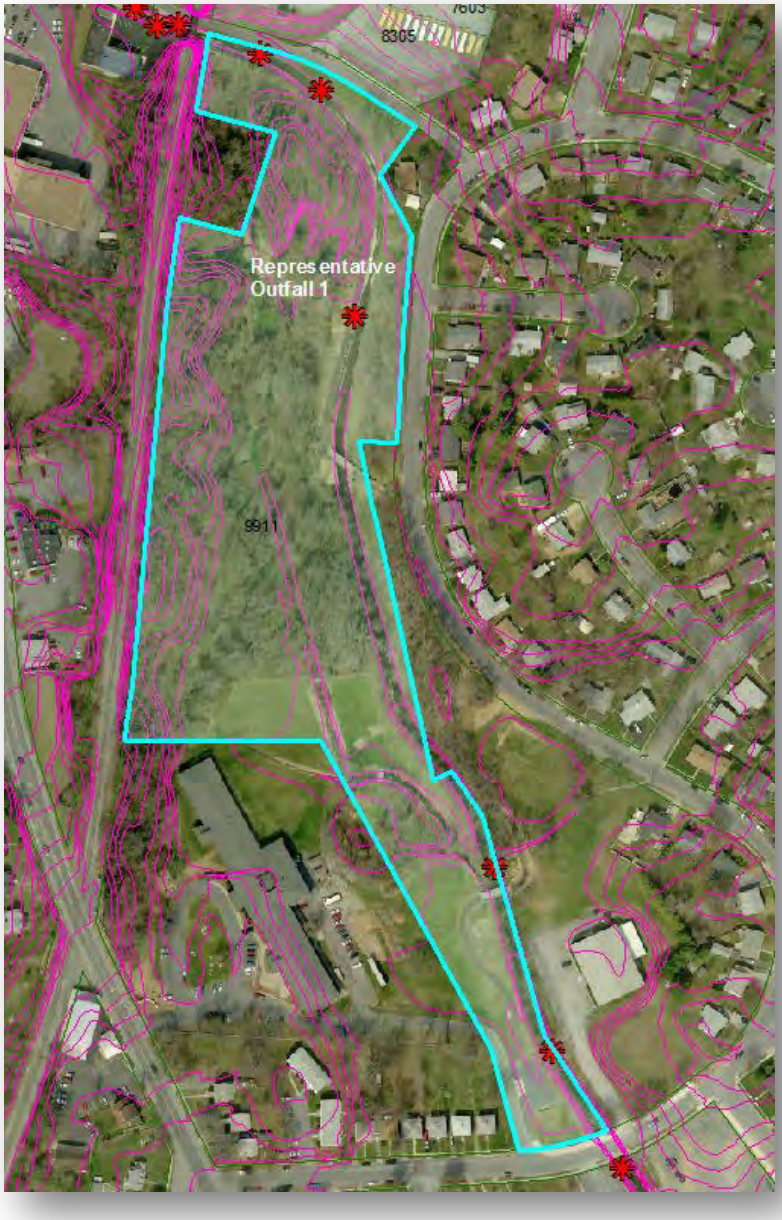

Figure 8. Shawnee Springs Reserve site overall. Representative Outfall 1 is shown in white text.

Figure 9. Front of Representative Outfall 1.

Figure 10. Upland drainage to Representative Outfall 1.

Task 3. Perform Representative Sampling

As part of the site review for Shawnee Springs Reserve, two samples (1) TSS, and (2) E.coli, were required during two sampling periods (October through March and April through September) in order to comply with the sampling procedures set forth in Section I.B.6.a and I.B.6.b of the current Virginia Small MS4 General Permit.

The first sampling took place on February 19, 2013. The field conditions were cold with a temperature right above freezing, and the total precipitation for that day was approximately 0.15 inches. The samples were collected approximately at 8:25 a.m. and received by Environmental Systems Service (ESS) by 10:30 a.m. The lab results are shown in Figure 11. The second of the two samplings took place on May 7, 2013. The field conditions were windy with a mean temperature of 56˚C, and a total daily precipitation of 1.35 inches. The sample was taken approximately at 10:15 a.m. and received by ESS by 12:30 pm. Figure 12 illustrates the sample results. The full laboratory analysis can be seen in Attachment 2.

Sample ID#:	0013520	**Sample Source:**	Winchester VA
Sample Date/Time:	02/19/2013 / 08:25	**Date Received:**	02/19/2013

Parameter	Results	Unit	Report Limit	Method	Analysis Date	Time	INIT
Escherichia coli (100 ml)	<1	MPN	1	COLILERT	02/19/2013	11:25	JI
Total Suspended Solids	10.8	mg/l	1.00	SM 19 2540D	02/19/2013	16:07	JI

Figure 11. February 19, 2013 Sample Results

Sample ID#:	0016669	**Sample Source:**	Shawnee Park, Winchester VA
Sample Date/Time:	05/07/2013 / 10:15	**Date Received:**	05/07/2013

Parameter	Results	Unit	Report Limit	Method	Analysis Date	Time	INIT
Escherichia coli (100 ml)	161.6	MPN	1	COLILERT	05/07/2013	12:28	JI
Total Suspended Solids	19.6	mg/l	1.00	SM 19 2540D	05/08/2013	10:42	EP

Figure 12. May 7, 2013 Sample Results

Task 4. Estimate Runoff Volume & Pollutant Loads

Per Section I.B.7 of the current Virginia Small MS4 General Permit, the City of Winchester is required to estimate the runoff volume and pollutant loads (for pollutants identified in the WLAs) discharged by the MS4. GKY utilized Purdue University's Long Term Hydrologic Impact Analysis (L-THIA) model to determine the City of Winchester's MS4 hydrologic and non-point source pollutant discharge characteristics.

Model Background and Winchester L-THIA Development

L-THIA is based on more than 30 years of daily precipitation data for the United States. The model is primarily used to estimate changes in recharge, runoff volumes, and non-point source pollutant loads from MS4s for which the City was assigned a waste load allocation (WLA) in a State Water Control Board approved Total Maximum Daily Load (TMDL). The pollutant loading evaluated utilizing L-THIA was TSS and Fecal Coliform, the latter of the two converted to E.*Coli* concentrations using Equation's 1 and 2.

Equation 1. Fecal Coliform (FC) to E.*Coli* Translator Equation for L-THIA Pollutant Loads[1].

$$E.Coli = 0.988 \times FC^{0.919}$$

Where, the bacteria concentrations (FC and E.*Coli*) are millions of coliform.

[1] HSPF Model Calibration and Verification for Bacteria TMDLs, "Guidance Memo No. 03-2012 Commonwealth of Virginia, Department of Environmental Quality, Water Division, September 3, 2003, p.4.

Equation 2. Fecal Coliform (FC) to E.*Coli* Translator Equation for samples[2].

$$E.Coli\ Concentration = 2^{-0.0172} \times (FC\ Concentration^{0.91905})$$

Where, the bacteria concentrations (FC and E.*Coli*) are in cfu/100mL.

[2] Bacteria TMDLs for Abrams Creek and Upper and Lower Opequon Creek Located in Frederick and Clarke County, Virginia, Virginia Tech Department of Biological Systems Engineering, October 2003, Revised January 2004, p.135.

Model Inputs

L-THIA uses the following model inputs to generate pollutant loading results: (1) State and County, (2) Hydrologic Soil Group (HSG), and (3) Land use. Per Winchester's guidance, we utilized the City's zoning layer in GIS and converted their zoning land classifications to match the L-THIA land use classes. The conversions can be seen in Table 2.

After the land use was reclassified, soils data was needed to further develop the model. To date, the City of Winchester hasn't had a detailed soil study performed, and thus state soil survey data was used. The vast majority of the City had HSG B as the underlying soil media, with a small portion of HSG C in the lower south eastern corner.

The land use reclassification and soil group layers were evaluated in GIS to determine the area breakouts for each soil group and corresponding land use. These parameters became the final inputs to the L-THIA model and are summarized in Table 3.

Table 2. Land Use conversion from Winchester Zoning Layer to L-THIA Land use classification.

L-THIA LAND USES	WINCHESTER ZONING CLASSIFICATION	WINCHESTER TO L-THIA
Commercial	Central Business District	Commercial
Industrial	Commercial Industrial District	Commercial
Low Density Residential	Health Services District	Commercial
Agricultural	Highway Commercial District	Commercial
Water/Wetlands	Medical Center District	Commercial
Grass/Pasture	Planned Commercial	Commercial
Forest	High Density Residential District	High Density Residential
High Density Residential	Higher Education District	High Density Residential
	Limited High Density Residential	High Density Residential

	Medium Density Residential District	High Density Residential
	Residential Business District	High Density Residential
	Residential Office District	High Density Residential
	Intensive Industrial District	Industrial
	Limited Industrial District	Industrial
	Education, Institution, and Public Use District	Low Density Residential
	Low Density Residential District	Low Density Residential

Table 3. L-THIA Model Inputs

L_THIA Land Use	Soil Group	Area Total (ac)
Commercial	B	1207.38
High Density Residential	B	1465.51
Industrial	B	336.03
Low Density Residential	B	1772.39
Commercial	C	37.84
High Density Residential	C	74.77
Industrial	C	180.22

Model Results

Once the model inputs were generated, they were run in L-THIA to determine the pollutant loadings for both TSS and Fecal Coliform (Converted to E.Coli using Eq.1). The annual TSS and E.Coli results can be seen in Tables 4 and 5 respectively, and the L-THIA results are provided in Attachment 1.

Table 4. Annual Total Suspended Solids (TSS) in lbs. Pollutant Loading

Land Use	Soil	TSS (lbs.)
Commercial	B	202608
High Density Residential	B	94030
Industrial	B	42113
Low Density Residential	B	34674
Commercial	C	7822
High Density Residential	C	7632
Industrial	C	29343
Total		***418222***

Table 5. Annual E.Coli (millions) Pollutant Loading

Land Use	Soil	E.Coli (millions)
Commercial	B	44034
High Density Residential	B	76384
Industrial	B	13132
Low Density Residential	B	30538
Commercial	C	2213
High Density Residential	C	7599
Industrial	C	9421
Total		***183321***

Task 5. Document Results in a Brief Memorandum Report

This memo report serves as GKY's deliverable under Task 5 of the scope of work.

Attachments

Attachment 1: L-THIA Model Results

SUMMARY OF SCENARIOS
State: Virginia
County: Winchester

Land Use	Hydrologic Soil Group	Current	acres Scenario 1	Scenario 2
Commercial	B	1207.38	0	0
High Density Residential	B	1465.514	0	0
Industrial	B	336.0322	0	0
Low Density Residential	B	1772.39	0	0
Commercial	C	37.84	0	0
High Density Residential	C	74.77	0	0
Industrial	C	180.224	0	0

RUNOFF RESULTS
Avg. Annual Runoff Volume (acre-ft)

Land Use	Current	Scenario 1	Scenario 2
Commercial	1339.84	0	0
High Density Residential	841.73	0	0
Industrial	255.47	0	0
Low Density Residential	310.39	0	0
Commercial	51.72	0	0
High Density Residential	68.32	0	0
Industrial	178.00	0	0
Total Annual Volume (acre-ft)	3045.51	0	0

Avg. Annual Runoff Depth (in)

Current	Scenario 2	Scenario 3
7.20	0	0

Avg. Runoff Depth by Landuse

Land Use	Hydrologic Soil group	Curve Number	Runoff Depth (in)
Commercial	B	92	13.37
High Density Residential	B	85	6.92
Industrial	B	88	9.16
Low Density Residential	B	70	2.11
Commercial	C	94	16.47
High Density Residential	C	90	11.01
Industrial	C	91	11.9
Average Annual Rainfall Depth (in)			39.71

NONPOINT SOURCE POLLUTANT RESULTS

Nitrogen (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	4891	0	0
High Density Residential	4174	0	0
Industrial	877	0	0
Low Density Residential	1539	0	0
Commercial	188	0	0
High Density Residential	338	0	0
Industrial	611	0	0
Total	12618	0	0

Phosphorous (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	1168	0	0
High Density Residential	1307	0	0
Industrial	194	0	0
Low Density Residential	482	0	0
Commercial	45	0	0
High Density Residential	106	0	0
Industrial	135	0	0
Total	3437	0	0

Suspended Solids (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	202608	0	0
High Density Residential	94030	0	0
Industrial	42113	0	0
Low Density Residential	34674	0	0
Commercial	7822	0	0
High Density Residential	7632	0	0
Industrial	29343	0	0
Total	418222	0	0

Lead (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	47	0	0
High Density Residential	20	0	0

Industrial	10	0	0
Low Density Residential	7	0	0
Commercial	1	0	0
High Density Residential	1	0	0
Industrial	7	0	0
Total	93	0	0

Copper (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	52	0	0
High Density Residential	20	0	0
Industrial	10	0	0
Low Density Residential	7	0	0
Commercial	2	0	0
High Density Residential	1	0	0
Industrial	7	0	0
Total	99	0	0

Zinc (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	657	0	0
High Density Residential	183	0	0
Industrial	170	0	0
Low Density Residential	67	0	0
Commercial	25	0	0
High Density Residential	14	0	0
Industrial	118	0	0
Total	1234	0	0

Cadmium (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	3	0	0
High Density Residential	1	0	0
Industrial	1	0	0
Low Density Residential	0.634	0	0
Commercial	0.135	0	0
High Density Residential	0.139	0	0
Industrial	0.970	0	0
Total	6.878	0	0

Chromium (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	36	0	0
High Density Residential	4	0	0
Industrial	4	0	0
Low Density Residential	1	0	0
Commercial	1	0	0
High Density Residential	0.390	0	0
Industrial	3	0	0
Total	49.39	0	0

Nickel (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	43	0	0
High Density Residential	22	0	0
Industrial	5	0	0
Low Density Residential	8	0	0
Commercial	1	0	0
High Density Residential	1	0	0
Industrial	4	0	0
Total	84	0	0

BOD (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	83963	0	0
High Density Residential	58482	0	0
Industrial	9745	0	0
Low Density Residential	21566	0	0
Commercial	3241	0	0
High Density Residential	4747	0	0
Industrial	6790	0	0
Total	188534	0	0

COD (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	423470	0	0
High Density Residential	113524	0	0
Industrial	31672	0	0

Low Density Residential	41863	0	0
Commercial	16349	0	0
High Density Residential	9215	0	0
Industrial	22067	0	0
Total	658160	0	0

Oil & Grease (lbs)

Land Use	Current	Scenario 1	Scenario 2
Commercial	32855	0	0
High Density Residential	3898	0	0
Industrial	2088	0	0
Low Density Residential	1437	0	0
Commercial	1268	0	0
High Density Residential	316	0	0
Industrial	1455	0	0
Total	43317	0	0

Fecal Coliform (millions of coliform)

Land Use	Current	Scenario 1	Scenario 2
Commercial	114496	0	0
High Density Residential	208493	0	0
Industrial	30691	0	0
Low Density Residential	76884	0	0
Commercial	4420	0	0
High Density Residential	16924	0	0
Industrial	21384	0	0
Total	473292	0	0

Fecal Strep (millions of coliform)

Land Use	Current	Scenario 1	Scenario 2
Commercial	298685	0	0
High Density Residential	583782	0	0
Industrial	19300	0	0
Low Density Residential	215276	0	0
Commercial	11531	0	0
High Density Residential	47388	0	0
Industrial	13447	0	0
Total	1189409	0	0

Attachment 2: ESS Lab Results

ESS
Environmental Systems Service, Ltd.

Analytical Report

GKY & Associates
ATTN: Casey Kight
4229 Lafayette Ctr Dr, St 1041
Chantilly, VA 20151

Report Date: 02/25/2013
Job #:
Customer #: 0001470
Customer PO #:
Collected By: Customer
Sample Location:

Sample ID#: 0013520 **Sample Source:** Winchester VA
Sample Date/Time: 02/19/2013 / 08:25 **Date Received:** 02/19/2013

Parameter	Results	Unit	Report Limit	Method	Analysis Date	Time	INIT
Escherichia coli (100 ml)	<1	MPN	1	COLILERT	02/19/2013	11:25	JI
Total Suspended Solids	10.8	mg/l	1.00	SM 19 2540D	02/19/2013	16:07	JI

ESS
Environmental Systems Service, Ltd.

Analytical Report

GKY & Associates
ATTN: David Breindel
4229 Lafayette Ctr Dr, St 1850
Chantilly, VA 20151

Report Date: 05/14/2013
Job #:
Customer #: 0001470
Customer PO #:
Collected By: Customer
Sample Location: City of Winchester

Sample ID#: 0016669 **Sample Source:** Shawnee Park, Winchester VA
Sample Date/Time: 05/07/2013 / 10:15 **Date Received:** 05/07/2013

Parameter	Results	Unit	Report Limit	Method	Analysis Date	Time	INIT
Escherichia coli (100 ml)	161.6	MPN	1	COLILERT	05/07/2013	12:28	JI
Total Suspended Solids	19.6	mg/l	1.00	SM 19 2540D	05/08/2013	10:42	EP